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Programmable Logic Control

XGK/XGB Instructions and Programming

XGT Series **User Manual**

Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

LS ELECTRIC

Revision History

version	Date	Remark	Revised position
V 1.0	2006.3	1. First Edition	-
V 1.3	2006.8	1. XGB instructions added.	-
V 1.4	2008.3	1. Contents added	
		(1) “Safety Instruction” added.	-
		(2) “About User’s Manual” added.	-
		(3) LOAD4(8) instruction added.	3-18
		(4) AND4(8) instruction added.	3-19
		(5) OR4(8) instruction added.	3-20
		(6) R2L(P) instruction added.	4-76
		(7) L2R(P) instruction added.	4-77
		(8) LOAD4 X, LOAD8 X instruction added.	4-98
		(9) AND4 X, AND8 X instruction added.	4-99
		(10) OR4X, OR8 X instruction added.	4-100
		(11) Sample Programs added	4-49, 4-53, 4-126, 4-191, 4-193, 4-194, 4-195, 4-196
		(12) Data Control instruction added	4-261, 4-265
		2. Contents modified	
		(1) Instructions modified.	4-78, 4-95, 4-96, 4-97, 4-105, 4-147, 4-149, 4-153, 4-167, 4-172, 4-173, 4-185, 4-187, 4-218, 4-228, 4-230, 4-232, 4-245, 4-266, 4-272, 4-274, 4-275, 4-278, 4-287, 4-289, 4-292, 4-298, 4-301, 4-306, 4-310, 4-315, 4-362
V 1.5	2009.12	1. Contents added	
		(1) “SFC language” added	Ch.5
		(2) “ST language” added	Ch.6
		(3) 16 instructions for converting real data added	Ch4.13.7~4.13.10
		(4) 6 instructions for comparing input added	Ch4.15.19~4.15.21
		(5) 4 instructions for moving added	Ch4.18.9~4.18.10
		(6) 4 instructions for exchanging added	Ch4.19.5~4.19.6
		(7) 16 instructions for logical operation added	Ch4.22.9~4.22.16
		(8) Instructions related with XPM added	Ch4.42
		2. Contents modified	

version	Date	Remark	Revised position
		(1) Available languages added	Ch3.1
		(2) “G X, GD X” instruction modified	Ch4.14.4
		(3) “POR, FLT” instructions modified	Ch4.41.4, Ch.4.41.2
		(4) “STP, PIDINIT” instructions modified	Ch4.41.10, Ch4.28.7
		(5) Instruction list modified	Ch3.4
		(6) Special relay list modified	Appendix 3
V 2.0	2010.09	1. Contents added or modified	
		(1) XPM dedicated instructions added or modified	Ch3.5.4, Ch.4.42
		(2) 4 positioning instructions added	Ch3.5.4 Ch.4.41~4.42
		(3) Description on ST language user function/function block added	Ch6.5
		(4) Special relay (F) added:_OS_VER_PATCH	App.3
		(5) TRAMP, RTRAMP instructions added	Ch3.4.12, Ch4.24.19
V 2.1	2013.06	1. Contents added or modified	
		(1) PUTE/GETE instructions added	4.39.2, 4.39.4
		(2) ADS and 15 others instructions added	4.12.7, 4.24.20 4.27.10, 4.28.3
V 2.2	2014.04	1. Contents added or modified	
		(1) UDATA instructions added	4.40.6 ~ 4.40.9
		(2) Torque synchronization instruction(XSTC) added	4.42.61
		(3) STP instruction modified	4.41.10
		(4) 8 XPM instructions added	4.42.53 ~ 4.42.60
		(5) XEPRS operand error fixed	4.42.24
		(6) 13 instructions operand type error fixed	Ch4
V 2.3	2016.07	1. Contents added or modified	
		(1) TRAMP instruction information modified	4.26.19
		(2) Special function use device modified - U device available at D operand	4.27
		(3) UDATA instruction is available with XGB	4.40.6~4.40,9
		(4) IORF example contents modified	4.24.9
V2.4	2018.02	1. GETIP, SETIP instruction added	4.40.10~4.40.11
V2.5	2018.06	1. XSETOVR, XCAMA instruction added	4.42.65~4.42.66

version	Date	Remark	Revised position
V2.6	2019.05	1. INLATCH instruction added	4.24.21
V2.7	2020.05	1. LSIS to change its corporate name to LS ELECTRIC	Entire
V2.8	2020.08	1. SETPORT, GETPORT instruction added	4.40.18~4.40.19
V2.9	2020.12	1. LOADP NOT, LOADN NOT, ANDP NOT, ANDN NOT, ORP NOT, ORN NOT instruction added	3.3.1, 4.1.4 ~ 4.1.5
		2. R_EDGE, F_EDGE instruction added	4.1.5

Thank you for purchasing PLC of LS ELECTRIC Co., Ltd.
Before use, make sure to carefully read and understand the User's Manual about the functions, performances, installation and programming of the product you purchased in order for correct use and importantly, let the end user and maintenance administrator to be provided with the User's Manual.

The User's Manual describes the product. If necessary, you may refer to the following description and order accordingly. In addition, you may connect our website (http://www.lselectric.co.kr/) and download the information as a PDF file.

Relevant User's Manuals

Title	Description
XG5000 User's Manual (for XGK, XGB)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGK, XGB CPU.
XG5000 User's Manual (for XGI, XGR)	XG5000 software user manual describing online function such as programming, print, monitoring, debugging by using XGI, XGR CPU.
XGK/XGB Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGK, XGB CPU.
XGI/XGR/XEC Instructions & Programming User's Manual	User's manual for programming to explain how to use instructions that are used PLC system with XGI, XGR, XEC CPU.
XGK CPU User's Manual (XGK-CPUA/E/H/S/U)	XGK-CPUA/CPUE/CPUH/CPUS/CPUU user manual describing about XGK CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard.
XGI CPU User's Manual (XGI-CPUU/CPUH/CPUS)	XGI-CPUU/CPUH/CPUS user manual describing about XGI CPU module, power module, base, IO module, specification of extension cable and system configuration, EMC standard.
XGR Redundant Series User's Manual	XGR- CPUH/F, CPUH/T user manual describing about XGR CPU module, power module, extension drive, base, IO module, specification of extension cable and system configuration, EMC standard.
XG-PM User's Manual	XG-PM software user manual describing online function such as motion programing, monitoring, debugging by using Motion Control Module.

◎ Contents ◎

Chapter 1 Overview and features

1.1 Overview

This manual describes performance, function and available instructions of CPU module designed to use PLC XGT series.

1.2 Characteristics

1) Easy programming tool supported (XG5000).
2) Program modification available during run mode.
3) Open network intended by international standard of communication protocol adopted
4) Modification available simultaneously with monitoring during run mode.
5) Various special modules completely provided to enlarge the PLC application range.
6) Various instructions of about 758 kinds supported including floating point operation and string type operation.

Notes

Precautions for compatibility of XGK CPU PLC programs

1) I/O area and data register (D) area are different from each other, based on CPU module.
   Refer to Device Area (2.3) to change programs.

2) The existing program should be made back-up prior to change to a compatible program.
3) Parameters cannot be converted.

Precautions for XGB PLC programming
1) This manual was made mainly the usage for XGK CPU. So in case of no supporting in XGB CPU,
   it is marked that XGB is not available.

Chapter 2 Functions

2.1 Performance specifications

Performance specifications of standard CPU module (XGK-CPUE/S) and high performance CPU module (XGK-CPUA/H/U) are as follows.

Item		Specification					Remarks
		XGK-CPUE	XGK-CPUS	XGK-CPUA	XGK-CPUH	XGK-CPUU	
Operation Method		Cyclic operation,Constant Scan,Fixed scan					
I/O control method		Scan synchronous batch processing method (Refresh method), Directed by program instruction					
Program language		Ladder Diagram Instruction List SFC (Sequential Function Chart) ST (Structured Text)					
Number of instructions	Basic Instructions	40					
	Instruction	232 Type 717					
Operation Processing Speed (Basic Instructions	LD	0.084 ㎲/Step		0.028 ㎲/Step			
	MOV	0.252 ㎲/Step		0.084 ㎲/Step			
	Real operation	±: 1.442 ㎲(S), 2.87 ㎲(D) x : 1.948 ㎲(S), 4.186 ㎲(D) ÷ : 1.974 ㎲(S), 4.2 ㎲(D)		±: 0.602 ㎲(S), 1.078 ㎲(D) x : 1.106 ㎲(S), 2.394 ㎲(D) ÷ : 1.134 ㎲(S), 2.66 ㎲(D)			S: Short Real number D: Long Real number
0.24 ㎲/Step		16kstep	32kstep	32kstep	64kstep	128kstep	
I/O Point(Installation available)		1,536 points	3,072 points	3,072 points	6,144 points		
Data Area	P	P00000 ~ P2047F(32,768 point)					
	M	M00000 ~ M2047F(32,768 point)					
	K	K00000 ~ K2047F(32,768 point)					
	L	L00000 ~ L11263F(180,224 point)					
	F	F00000 ~ F2047F(32,768 point)					
	T	100ms: T0000 – T0999 10ms: T1000 – T1499 1ms: T1500 – T1999 0.1ms: T2000 – T2047					Area changeable according to parameter setting
	C	C0000 ~ C2047					
	S	S00.00 ~ S127.99					
	D	D0000 ~ D19,999		D0000 ~ D32,767			
	U	U0.0 ~ U1F.31	U0.0 ~ U3F.31	U0.0 ~ U3F.31	U0.0 ~ U7F.31		Special Module data refresh area
	Z	128 points					Index
	N	N00000 ~ N21,503					
	R	1 blocks		2 blocks			32K words per block (R0 ~ R32767)
FLASH area		2 Mbyte, 32 Block					Controllable using R device

Item		Specification					Remarks
		XGK- CPUE	XGK-CPUS	XGK-CPUA	XGK-CPUH	XGK-CPUU	
Configuration of program	Total program	256 blocks					
	Initial Task	1 blocks					
	Cycle task	32 blocks					
	Internal device task	32 blocks					
Operation mode		RUN, STOP, DEBUG					
Self-diagnosis function		Detection of operation delay, memory error, I/O error, battery error, power error, etc					
Program port		RS-232C(1CH), USB(1CH)					RS-232C port supports Modbus slave
Back-up method		Latch area setting in basic parameter					
Maximum base expansion stage		2 stages	4 stages	4 stages	8 stages		Total length 15m
Internal consumption current		940mA		960mA			
Weight		0.12kg					

Performance specifications of high performance CPU module (XGK-CPUUN/CPUHN/CPUSN) are as follows.

Item		Specification			Remarks
		XGK-CPUSN	XGK-CPUHN	XGK-CPUUN	
Operation Method		Cyclic operation,Constant Scan,Fixed scan			-
I/O control method		Scan synchronous batch processing method (Refresh method),Directed by program instruction			-
Program language		Ladder Diagram Instruction List SFC (Sequential Function Chart) ST (Structured Text)			-
Number of instructions	Basic Instructions	About 40			-
	Application instruction	About 700			-
Operation processing speed(Basic instruction)	LD	8.5 ns/Step			-
	MOV	25.5 ns/Step			-
	Real operation	±: 182.8 ns(S), 327.3 ns(D) x : 336 ns(S), 727 ns(D) ÷ : 345 ns(S), 808 ns(D)			S: Short Real number D: Long Real number
Program memory capacity (Automatic device assignment)		64kstep (512KB)	128kstep (1,024KB)	256kstep (2,048KB)	-
I/O Point(Installation available)		3,072 points	6,144 points		-
Data Area	P	P00000 ~ P4095F(65,536 point)			-
	M	M00000 ~ M4095F(65,536 point)			-
	K	K00000 ~ K4095F(65,536 point)			-
	L	L00000 ~ L11263F(180,224 point)			-
	F	F00000 ~ F4095F(65,536 point)			-
	T	100ms: T0000 – T2999 10ms: T3000 – T5999 1ms: T6000 – T7999 0.1ms: T8000 – T8191			Area changeable according to parameter setting
	C	C0000 ~ C4095			-
	S	S00.00 ~ S255.99			-
	D	D0000 ~ D262143	D0000 ~ D524287		-
	U	U0.0 ~ U3F.31	U0.0 ~ U7F.31		Special Module data refresh area
	Z	256 points			Index
	N	N00000 ~ N21503			-
	R	2 blocks	8 blocks	16 blocks	32K words per block (R0 ~ R32767)
FLASH area		2 MB, 32 blocks (32K words per block)			Controllable using R device

Item		Specification			Remarks
		XGK-CPUSN	XGK-CPUHN	XGK-CPUUN	
Configuration of program	Total program	256 blocks			-
	Initial Task	1 blocks			-
	Cycle task	32 blocks			-
	Internal device task	32 blocks			-
Operation mode		RUN, STOP, DEBUG			-
Self-diagnosis function		Detection of operation delay, memory error, I/O error, battery error, power error, etc			-
Program port		USB(1CH), Ethernet(1CH)			-
Back-up method		Latch area setting in basic parameter			-
Maximum extension base number		3 stages	7 stages		Total length 15m
Internal consumption current		960mA			-
Weight		0.12kg			-

XGK-CPUUN/CPUHN/CPUSN has built-in Ethernet communication The Performance specifications of the XGT series are as follows.

Item		Products	Remarks
		XGK-CPUSN/CPUHN/CPUUN	
Ethernet	Characteristics	1 Port	-
		10/100BASE-TX	-
		Auto negotiation (Full-duplex and half duplex)	-
		Auto MDIX Crossover	-
		Max. 4 Channel supported	Supports 8KByte each send/receive per channel
		Up to 100M distance between nodes	-
		Maximum 1500Byte protocol size	IP Fragmentation is not supported.
	Cable	Use UTP, STP, FTP cable	STP and FTP are recommended in noisy environments.
	Service	CPU communication parameter setting in XG5000	-
		The loader service (XG5000) is supported:	Support remote 1 connection function
		Own protocol support (XGT) - Dedicated communication	Server function support (Client function not supported) TCP supported UDP not supported
		Third-party protocol support(MODBUS TCP/IP)	

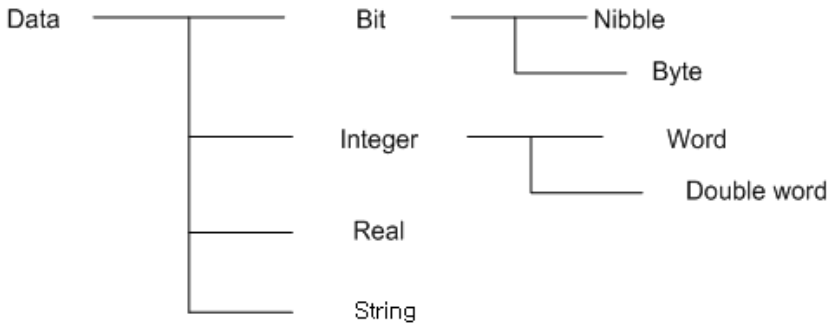
In case of XGB series, performance specifications of standard CPU module (XBM-DR16S, XBM-DN16S, XBM-DN32S) are as follows.

Item		Specification			Remarks
		XBM-DR16S	XBM-DN16S	XBM-DN32S	
Operation Method		Cyclic operation,Constant Scan,Interrupt operation,Fixed scan			
I/O control method		Scan synchronous batch processing method (Refresh method), Directed by program instruction			
Program language		Ladder Diagram Instruction List			
Number of instructions	Basic	28			
	Application	677			
Processing speed		0.16 ㎲/Step			
0.24 ㎲/Step		10ksteps			
Maximum I/O score		480points(Main+Extension base 7-stage)			
Data area	P	P0000 ~ P127F(2,048 point)			
	M	M0000 ~ M255F(4,096 point)			
	K	K00000 ~ K2559F(Special area : K2600~2559F) (40,960points)			
	L	L00000 ~ L1279F(20,480 point)			
	F	F000 ~ F255F(4,096 point)			
	T	100ms, 10ms, 1ms : T000 ~ T255 (Area changeable according to parameter setting)			
	C	C000 ~ C255			
	S	S00.00 ~ S127.99			
	D	D0000 ~ D5119(5120 Word)			WORD
	U	U00.00 ~ U07.31 (Analog data refresh area: 256 word)			WORD
	Z	Z000 ~ Z127(128 Word)			WORD
	N	N0000 ~ N3935(3936 Word)			WORD
Total program		128 blocks			
Initial Task		1(_INT)			
Cycle task		Max. 8			
External contact		Max. 8			
Internal device task		Max. 8			
Operation mode		RUN, STOP, DEBUG			
Self-diagnostics function		Detects errors of scan time, memory, I/O			
Program port		RS-232C(Loader), RS-232C , RS-485			
Back-up method		Latch area setting in basic parameter			
Internal consumption current		400mA	240mA	300mA	
Weight		140g	100g	110g	

Item			Specification Built-in Functions	Note
Built-in Functions	PID control		Control by instruction, Auto-tuning, PWM output function Force output, Set up operation scan time, Anti Windup Delta MV function, SV-Ramp function	
	Cnet I/F function		Dedicated protocol support Modbus protocol supported User frame definition protocol support } RS-232C 1Port RS-485 1 Port	
	High Speed Counter Function	Performance	1 phase : 20 kHz 4 channel 2 phase : 10 kHz 2 channel	
		Counter Mode	4 different counter modes according to input pulse and addition/subtraction method • When 1 phase pulse is inputted, addition / subtraction counter. • When 1 phase pulse is inputted addition / subtraction counter by B phase input. • When 2 phase pulse is inputted, addition / subtract pulse input counter. • When 2 phase pulse is inputted, addition / subtraction counter by phase difference.	
		Additional functions	• Internal/external preset • Latch counter • Comparison output • Revolution number per unit time	
	Positioning Function	Basic Function	Control axis : 2 axis(X, Y) Control method : Position, Speed control Control unit : Pulse Positioning data : Select 30 data of every axis (Operation step no.: 1~30) Operation mode : End, Keep, Continuous operation Operation method : Single, Repeat operation method	TR output type is supported
		Positioning	Positioning method : Absolute / Incremental method Positioning address range : -2,147,483,648 ~ 2,147,483,647 Speed : Max. 100kpps (Setting speed range: 1 ~ 100,000pps) Addition / subtraction processing (operation pattern: Trapezoidal method)	
		Homing- method	DOG Signal* (Off) and HOME Signal method DOG Signal* (On) and HOME Signal method DOG Signal method	
		JOG Operation	Setting speed range: 1 ~ 100,000pps (High-speed/Low-speed)	
		Additional functions	Inching operation, speed synchronization, position synchronization, linear interpolation operation, etc.	
	Pulse catch		Pulse width: 50 ㎲ 8 points (P0000 ~ P0007)	
	External interrupt		Pulse width: 50 ㎲ 8 points (P0000 ~ P0007)	
	Input filter		Choose one among 1, 3, 5, 10, 20, 70, and 100ms.(Selectable by module)	

2.2 Data Types and Application Methods

2.2.1 Data types

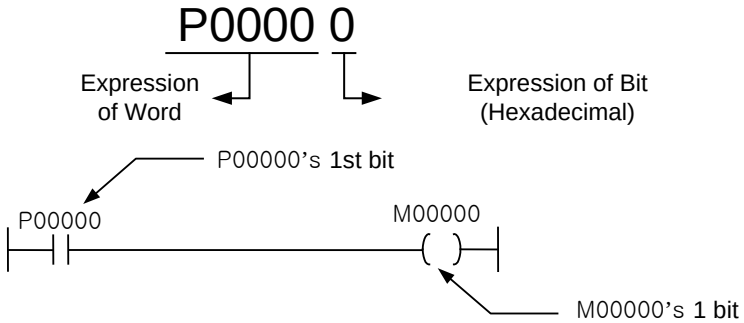


2.2.2 Bit data(Bit)

Bit data refers to data that is processed in 1-bit units in memory, such as a contact or a coil, that displays 1 bit on / off or does not perform input / output. The bit data can be used by bit device or word device to set the bit of a method.

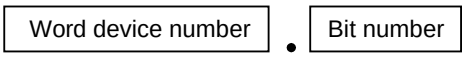
1) Bit device

Can be saved or read in bit unit (P, M, L, K, F, T, C and S are available.Refer to 2.3 Device Area for details). In order to access bit data, bit unit should be specified. Word data is expressed in decimal. which will make word data easily displayed in bit through the bit device.

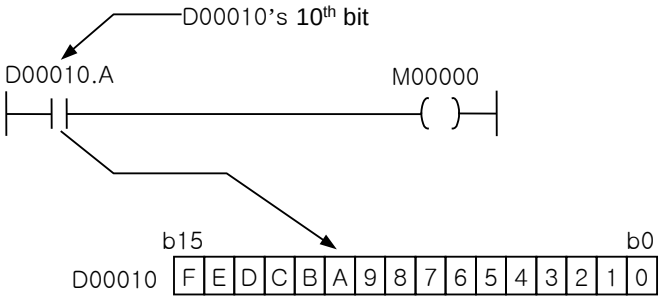


2) How to set the bit of a word device

Specify the bit number applicable to word device number to use bit data.
Expression is as follows:



Here, a Word device's number is displayed in decimal and bit number in hexadecimal. For example, in order to express D0010's bit number 1, let it set D0010.1. The b10 bit in D0011 is specified as D0011.A.



Notes

(1) Bits of word can read from or written to as a word value. However, such expression as P0010.1 is unavailable differently from word device.

2.2. 3 Nibble / Byte data (Nibble/Byte)

Nibble and byte as newly added types of data to XGT are used in instructions with 4 or 8 attached at the back of the name of each instruction.

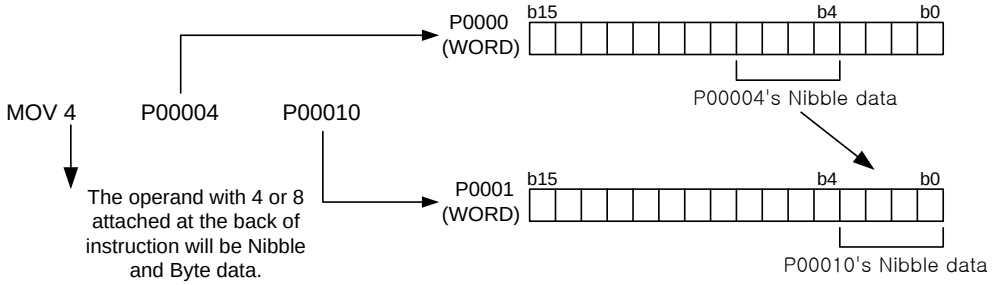
Nibble and byte can be used with start bit input. And from input contact to 4/8 bits will be the data to process.

1) Expression range

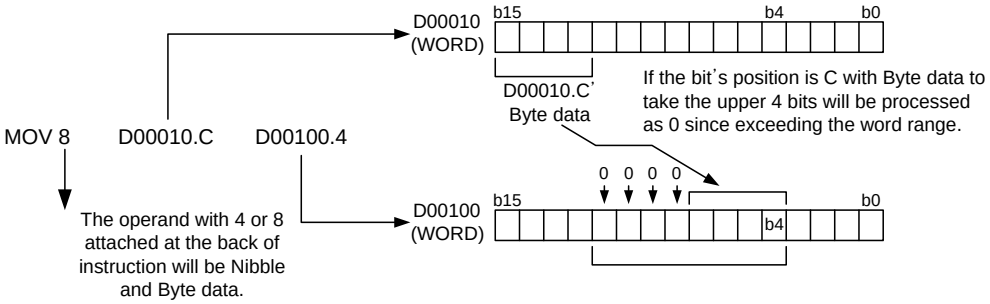
Nibble: 0~15 (4 bits)
Byte: 0~255 (8 bits)

2) How to use

(1) Bit device (P,M,K,F,L) : takes 4 or 8 bits from bit device's contact used as operand. When 4 or 8 bits is taken, the bit which exceeds the applicable bit device's area only will be processed as 0. If the operand is the destination specified, the data of the exceeded area will be lost



(2) Word device: takes 4 or 8 bits from word device's bit contact used as operand. When specified bit contact is used as the source and 4 or 8 bits is taken from specified contact, the bit which exceeds the applicable word unit will be processed as 0. As similarly as above, if specified bit contact is used as the destination, the data exceeding the word will disappear.



For more information, reference of MOV4/8 instruction.

Notes

(1) T,C device cannot be used in nibble/byte instructions. Since T and C are used as bit or word data based on the instruction applied, which may cause confusion, T and C devices can not be used in nibble & byte instructions.

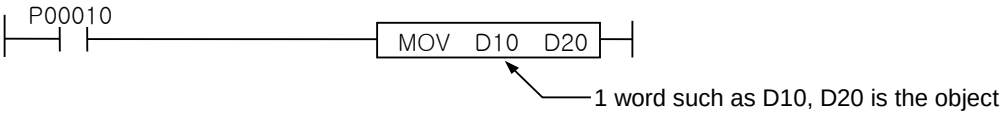
2.2.4 Word data (Word)

Word data is 16-bit numeric data. It can be expressed in decimal and hexadecimal. If data is to be expressed in hexadecimal, H should be added in front of the number.

·Decimal: -32,768 ~ 32,767 (Signed operation) or 0 ~ 65,535 (Unsigned operation)
· Hexadecimal: H0 ~ HFFFF
Word data can be expressed through word device or bit device.

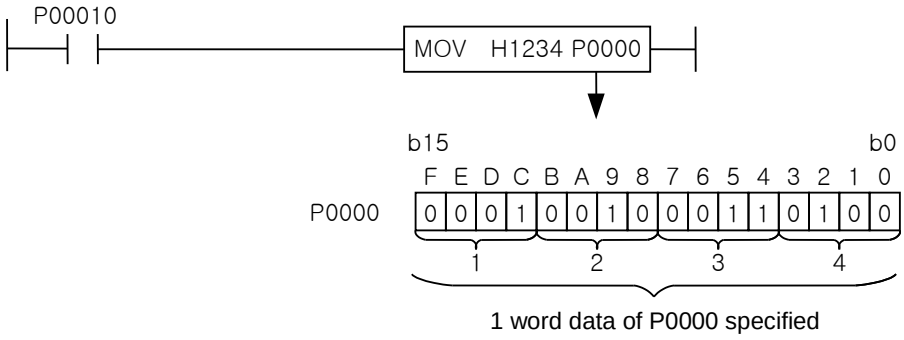
1) Word device

Word device is specified in 1 word unit.



2) Bit device

The bit device is expressed with its lowest digit (Digits expressed in hexadecimal - position to display bit) taken out and will be designated as word data.



Notes

(1) XGK/XGB instructions are based on signed operation. U will be added to instructions based on unsigned operation.
Example) ADD : Signed operation
ADDU: Unsigned operation

2.2.5 Double word data (DWORD)

Double word data is 32-bit numeric data. It can be expressed in decimal and hexadecimal. If data is to be expressed in hexadecimal, H should be added in front of the number.

·Decimal: -2.1474, 83,648 ~ 2,147,483,647 (Signed operation) or 0 ~ 4,294,967,295 (Unsigned operation)

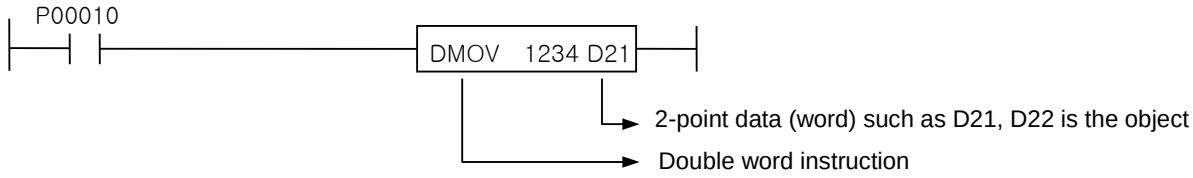
·Hexadecimal : H0 ~ HFFFFFFFF

Double word data can be expressed through word device or bit device.

1) Word device

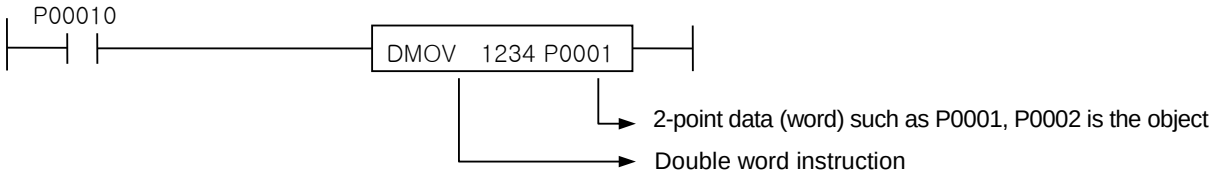
It specifies device number applicable to lower 16-bit data among 32-bit data.

Data of (Specified device number) and (Specified device number + 1) is used as double word data.



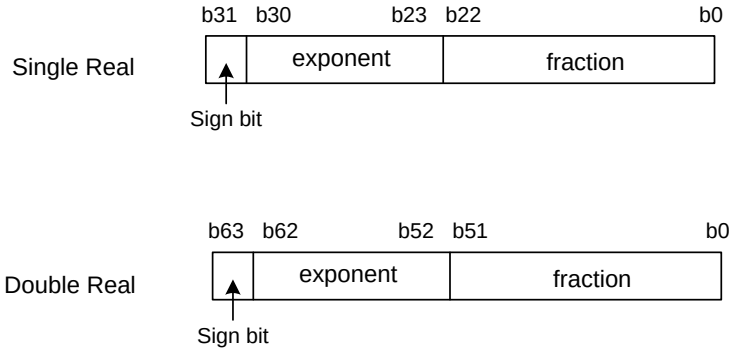
2) Bit device

Like the expression of word data, the bit device is expressed with its lowest digit taken out, using the data of (Specified device number) and (Specified device number + 1) as double word data.



2.2. 6 Real data (REAL, LREAL)

Real data is 32bit/64bit floating decimal point data. 32bit floating decimal point data is called Single Real and 64bit floating decimal point data is called Double Real.
Expression is available only in decimal format (decimal point displayed). And both word device and bit device are available.



(1) Expression range
Short real number : - 3.402823466e+038 ~ -1.175494351e-038 or 0 or 1.175494351e-038 ~ 3.402823466e+038
Long real number : - 1.7976931348623157e+308 ~ -2.2250738585072014e-308 or 0 or 2.2250738585072014e-308 ~ 1.7976931348623157e+308
(2) Supported operation instructions
Arithmetic operations, conversion, comparison, and trigonometric functions are supported
(3) Area unavailable to express exists(Area symmetrically unavailable to express exists even in negative data)
Short Real number: Unsigned 0 ~ 1.40129846e-45
Signed -1.175494351e-038 ~ 1.175494351e-038
Long Real number: Unsigned 0 ~ 4.9406564584124654e-324
Signed -2.2250738585072014e-308 ~ 2.2250738585072014e-308

※ Floating decimal point operation error : Exception (operation error) supported in IEEE754 standard

Flag	Name	Condition of Operation Error	Note
F00570	Incorrect operation error latch	If operation result is not correct due to limit of expression range	
F00571	Underflow latch	If operation result is less than min. regular absolute value	
F00572	Overflow latch	If operation result is more than max. regular absolute value	
F00573	0-devision error latch	If dividend is limited value other than 0, and divisor is 0	
F00574	Invalid operation error latch	If operation process is executed incorrectly	
F0057A	Incorrect operation error	If operation result is not correct due to limit of expression range	
F0057B	Underflow	If operation result is less than min. regular absolute value	
F0057C	Overflow	If operation result is more than max. regular absolute value	
F0057D	0-devision error	If dividend is limited value other than 0, and divisor is 0	
F0057E	Invalid operation error	If operation process is executed incorrectly	
F0057F	Irregular value input error	If irregular data input	

Notes

(1) Expression of real data meets IEEE754 format. However, its direct input with the format is impossible.
(2) In case of XGB, even though it is satisfied to operation error condition, flag applied isn't set.

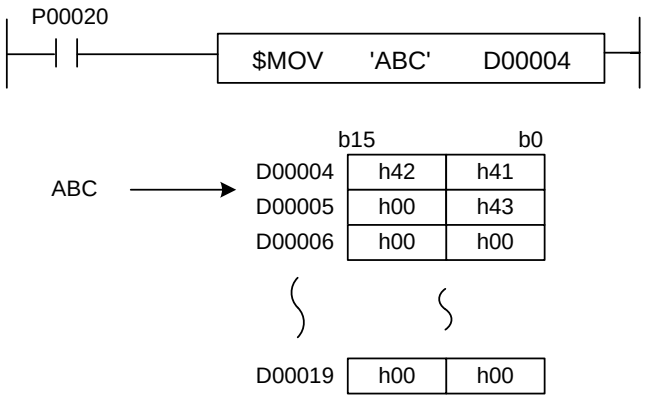
2.2.7 String data

Among application instructions, string related instructions use the data type of number alphabet, special sign, etc. to save in ASCII code. In addition, Korean and Chinese letters which need 16-bit code also can be used.

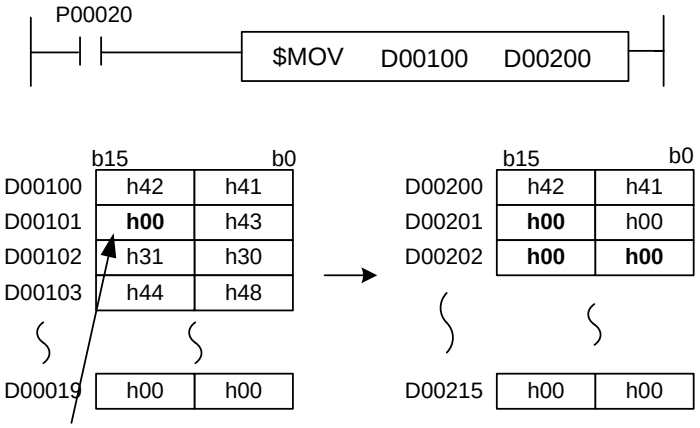
String data up to NULL code (h00) is regarded as one string row. And the maximum length of a string row is 32 bytes (including NULL). In other words, up to 31 letters are available in English only, and up to 15 letters are available in Korean only. And mixing them is also available.

If direct input string's size the programming tool the maximum limit, a warning message will be displayed in the programming tool of XG5000. Data of maximum string input is of 31 bytes + NULL (1 byte).

Example)



If $MOV instruction used, string up to D00004~D00019 will be transferred unconditionally in 16 words (31letters+null).



Null code included in a string if there is null code between strings

2.3 Device Area

2.3.1 Classification of devices

Devices are classified into bit device and word device, based on and and operand processing method..

1) Bit device

(1) Available to express the bit without a '.' (dot) when used in basic instructions as LOAD or OUT.(2) P, M, K, F, T (bit contact), C (bit contact), L, S

(3) When index function used: If index function is used in bit device, it indicates the bit with the bit position to which index register's value is added. However, if bit device is used in application instruction and the instruction's operand is of word data, its operation will be in word.

Example) LOAD P00001[Z1] → If Z1=8, LOAD P(1+8) = LOAD P00009

MOV P00001[Z1] D10 → If Z1=8, MOV P00009 D00010

2) Word device

(1) Basic expression of device is in word unit.

(2) A '.' (dot) is used to specify the device number's desired bit position

Example) D10's BIT4 will be expressed as D10.4.

(3) Applicable device: D, R, U, T (present value area), C (present value area), Z

(4) When index function used: Indexing will be in word unit And if index is used in operand which expresses word device in bit, its indexing will be in word unit too. For example, if Z10 is to be used in operand, its expression will be as D10[Z10].4 with the meaning identical to D(10+Z10's value).4.

2.3.2 Input range per device

Area	Size		Bit contact		Word data		Note
	XGK	XGB	XGK	XGB	XGK	XGB	
P	32,768 points	2,048 points	P00000 ~ P2047F	P0000 ~ P127F	P0000 ~ P2047	P000 ~ P127	
M	32,768 points	4,096 points	M00000 ~ M2047F	M0000 ~ M255F	M0000 ~ M2047	M000 ~ M255	
K	32,768 points	40,960 points	K00000 ~ K2047F	K00000 ~ K2559F	K0000 ~ K2047	K0000 ~ K2559	
F	32,768 points	4,096 points	F00000 ~ F2047F	F0000 ~ F255F	F0000 ~ F2047	F000 ~ F255	
T *1)	2,048 points	256 points	T0000 ~ T2047	T000 ~ T255	T0000 ~ T2047	T000 ~ T255	
C *2)	2,048 points	256 points	C0000 ~ C2047	C000 ~ C255	C0000 ~ C2047	C000 ~ C255	
U	3,072 Word	256 Word	U00.00.0 ~ U7F.31.F	U00.00.0 ~ U07.31.F	U00.00 ~ U7F.31	U00.00 ~ U07.31	
Z	128 Word	128 Word	Unavailable	Unavailable	Z0 ~ Z127	Z0 ~ Z127	
S	128 Word	128 Word	S00.00 ~ S127.99	S00.00 ~ S127.99	Unavailable	Unavailable	
L	180,224 points	20,480 points	L000000 ~ L11263F	L00000 ~ L1279F	L00000 ~ L11263	L0000 ~ L1279	
N	21K Word	3,936 Word	Unavailable	Unavailable	N00000 ~ N21503	Unavailable	
D	32K Word	5,120 Word	D00000.0 ~ D32767.F	D0000.0 ~ D5119.F	D00000 ~ D32767	D0000 ~ D5119	
R	32K Word n *3)3)	-	R00000.0 ~ R32767.F	-	R00000 ~ R32767	-	
ZR *4)	(32K n) Word	-	Unavailable	-	ZR00000 ~ ZR65535	-	

⚠ Caution

In case of XGK
(1) For N area, other than the area used for P2P in communication module is only available
(2) If P2P is used, assigning to N area is available up to 1~8 for P2P number, P2P No.1 consist of 00~63 blocks and for 1 block 41-word N area from N00000 to N00040 is automatically assigned for P2P service.
(3Therefore, please do not use the N area in the system for P2P service. If it is used, calculate the system use area of the N area and program it so that it is not used repeatedly.
In case of XGB
(1) In case of XGB, N area can be monitored only.
(2) XGB standard type doesn't support R, ZR area

*1) The word data in timer represents the bit contact's present value
*2) The word data in timer represents the bit contact's present value
*3) n' expression is a block number, If XGK-CPUU, XGK-CPUH, XGK-CPUA, 'n=2' and XGK-CPUS, XGK-CPUE, XGB compact type 'n=1'. The block size is 32K word for XGK,Regardless of the number of blocks, the bit expression range is R00000.0 ~ R32767.F and the word representation range is R00000 ~ R32767. In case of XGB compact type, it is 10K words, the bit expression range is R00000.0 ~ R10239.F, and the word expression range is R00000 ~ R10239. Refer to 2.3.13 for more details
*4) n' expression is a block number, ZR expression range is different according to the size of the 'n'. Refer to 2.3.13 for more details

2.3.3 I/O P

I/O P, as the area equivalent to external equipment is composed of push button used as input device, input section to receive signals of switch or limit switch, solenoid used as output device, and output section to deliver operation result to motor and lamp.
As for input section P, since input status is kept in PLC's internal memory, contact A and B are available to use. And as for output section P, contact A and B are also available.
Other sections than used for I/O in P area can be used just like the auxiliary relay M. According to instructions applied.
According to instructions applied, it can be used in word unit.

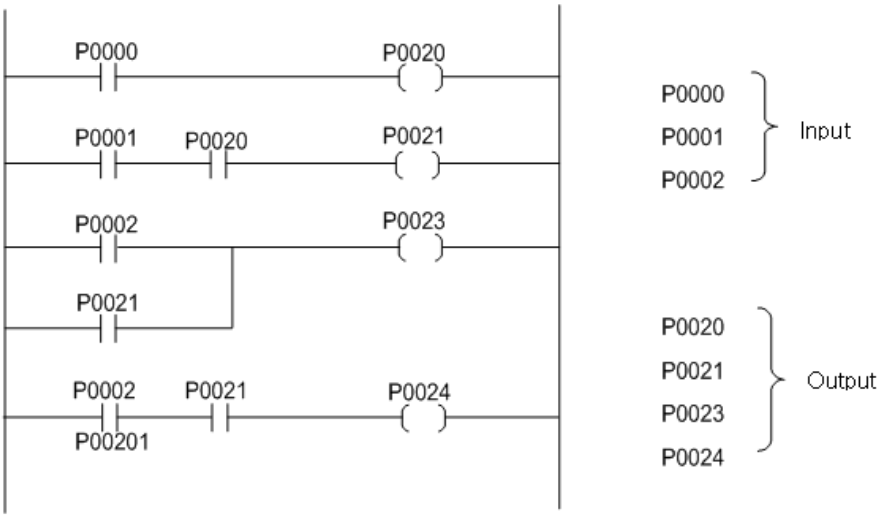


Fig.2.1 Example of I/O Program

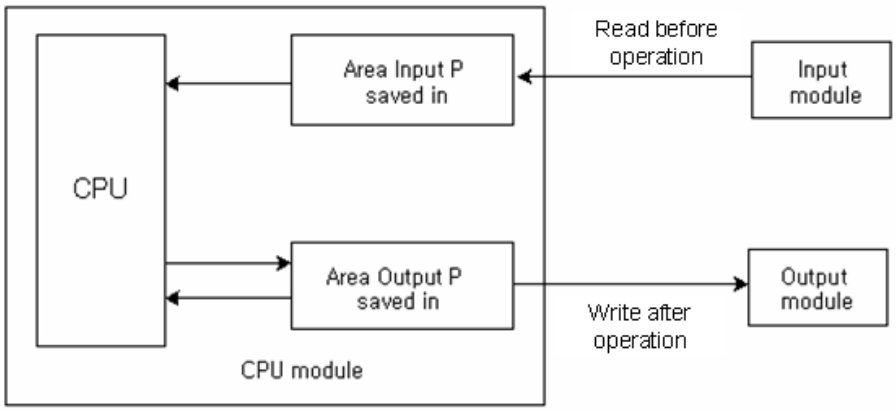


Fig. 2.2 How to Embody P Area

As shown in Fig. 2.2, P area has sections correspondent 1:1 to each contact of I/O module, which performs operation with CPU's internal memory (P area) status regardless of I/O module's contact status while PLC is scanning (operating), wholly outputs the content of the internal memory P area correspondent to output contact after the operation, and then saves the input module's contact status in the internal memory P area for the next operation.
Be careful input and output's contact are assigned all to P area regardless of the status, which may cause error due to confusion between input P area and output P area when programming.

2.3.4 Auxiliary relay M

As an internal relay inside PLC, direct external output is impossible, but if connected with I/O P, it will be then possible. When power is On or RUN, other areas than specified as latch area by parameter setting will be all eliminated to 0. A and B contacts can be used.

2.3.5 Keep relay K

Its application purpose is identical to the auxiliary relay M. However, when power is On or RUN, act like a latch area 1 in basic parameter used as latch area to preserve the previous data. A and B contacts be available.
Data is erased to 0 only in the following 3 cases. (Identically the operation characteristic of latch area 1. Refer to XGK CPU user's manual 5.5 Configuration Diagram of Data Memory and XGB CPU user's manual 5.5.1 Configuration Diagram of Data Memory)
(1) Making a Delete program and execute a Delete program.
(2) Execute a function to delete memory of the PLC delete menu in XG5000.
(3) Reset key operating of CPU module or Overall reset by XG5000.

2.3.6 Link relay L

The area is for communication module use of flag area when communication module installed.. It is provide the information of communication module (O/S information, service information, flag information). It is preserve the data identically to the operation characteristic of latch area 1.
If communication module is not used, it can be used identically to the auxiliary relay M.

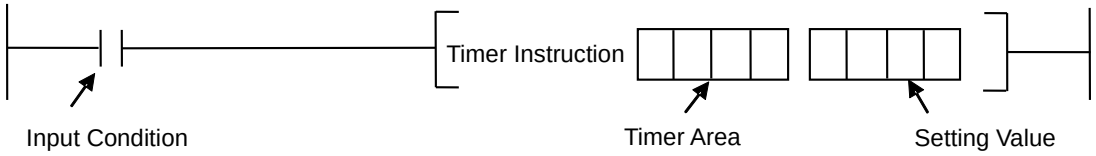
Notes

(1) Refer to the content of View Flag in Variable/comment in XG5000 Software for details on P2P and High-speed link flag used for L area, or the manual of applicable communication module.

2.3.7 Timer T

4 types of basic cycle available are 0.1ms(XGB not available), 1ms, 10ms and 100ms, whose operation method is different respectively based on 5 kinds of instructions (TON, TOFF, TMR, TMON, TRTG).

Maximum setting value is available up to hFFFF (65535) in decimal or in hexadecimal. Timer types and Operation methods are as shown below in (Figure2.3).



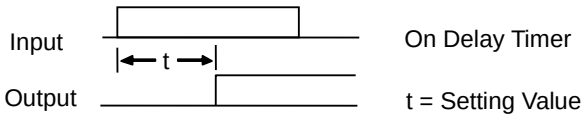
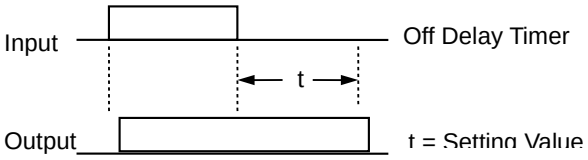
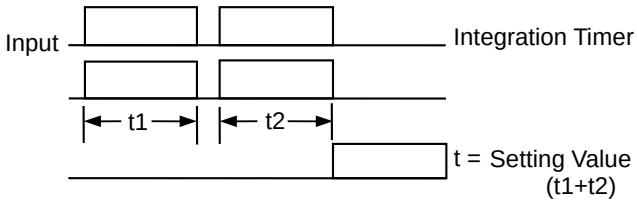
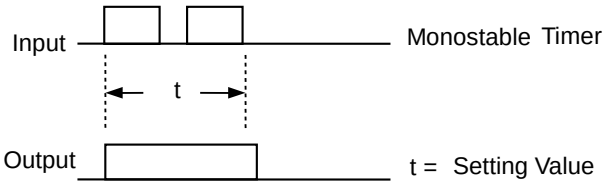
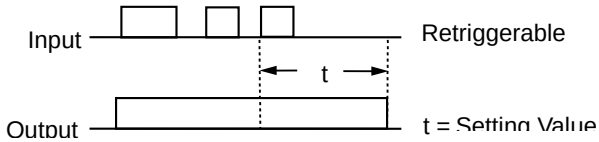
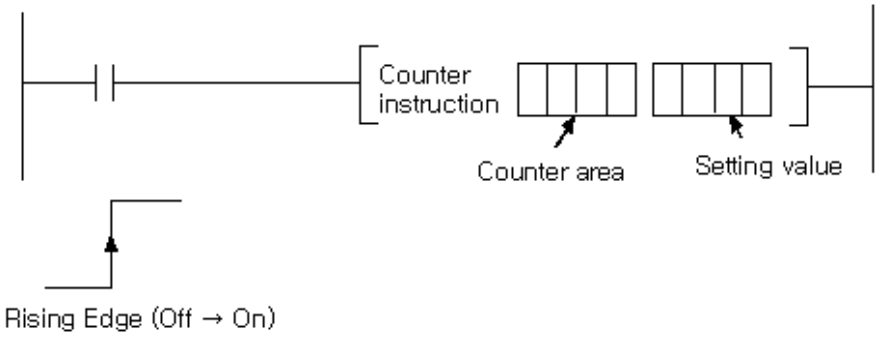
Timer type	Detail	Operation	Time Chart
TON	On Delay	Up	
TOFF	Off Delay	Down	
TMR	Integration On Delay	Up	
TMON	Monostable	Down	
TRTG	Retriggerable	Down	

Figure 2.3 Timer types & Operation

2.3.8 Counter C

The count starts at Rising Edge (Off → On) of input condition and stops if reset input then to eliminate the present value to 0 or to replace it with setting value.

Operation methods are different from each other based on 4 kinds of instructions (CTU, CTD, CTUD, CTR), with maximum setting value available up to hFFFF. Counter types Operation Methods are as shown below in Fig. 2.4.



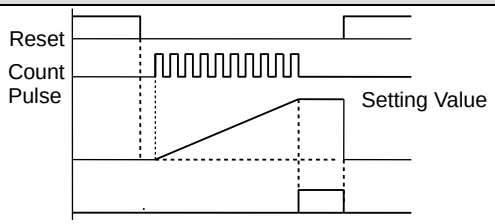
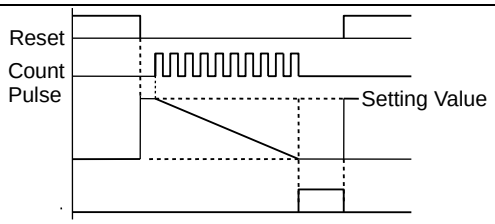
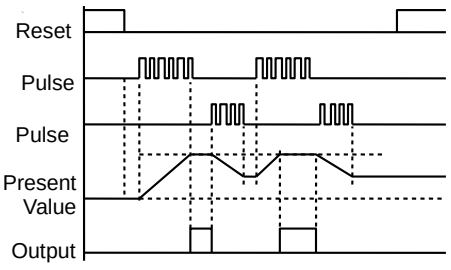
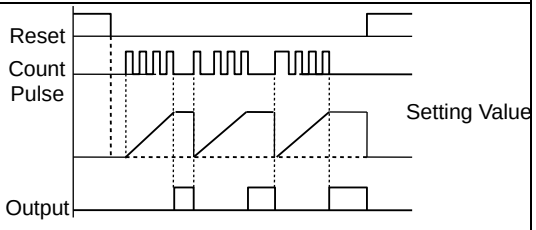
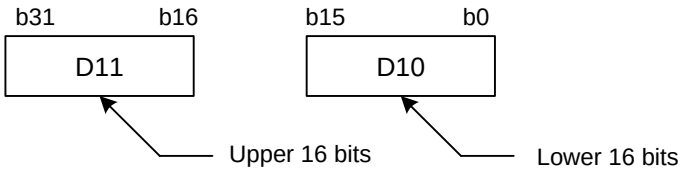
Counter Type	Detail	Operation	Time Chart
CTU	Up Counter	Up	
CTD	Down Counter	Down	
CTUD	Up/Down Counter	Up/Down	
CTR	Ring Counter	Up	

Fig. 2.4 Type of Counters and Operation Methods

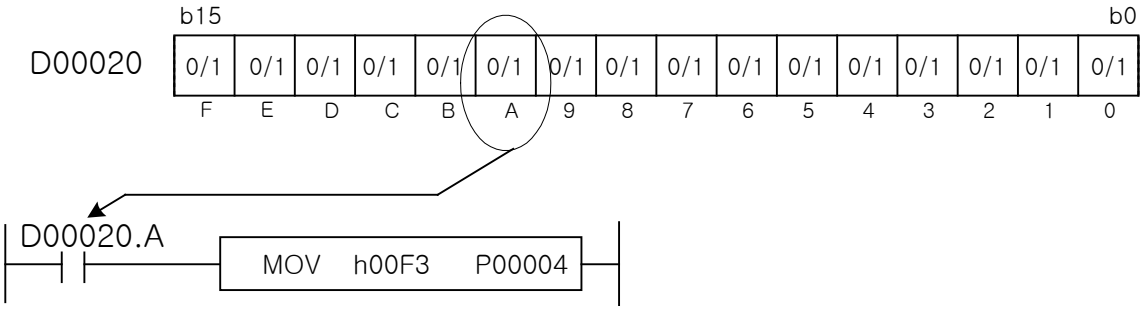
2.3.9 Data register D

It preserves internal data, where Read/Write is available in 16 bits, 32 bits and bit by bit in addition with bit expression. As for 32 bits, specified number is processed in the lower 16 bits, and specified number + 1 is processed in the upper 16 bits.
Bit expression in data register uses the format of “Specified number.Specified bit”. At this moment, specified bit is expressed in hexadecimal. (Refer to 2.2)
When power is On or RUN, other areas than specified as latch area by parameter will be all eliminated to 0, and the latch area will be kept as before. Refer to Parameter Setting to specify the latch area.

Example) If 32-bit instruction is used with D10 specified.



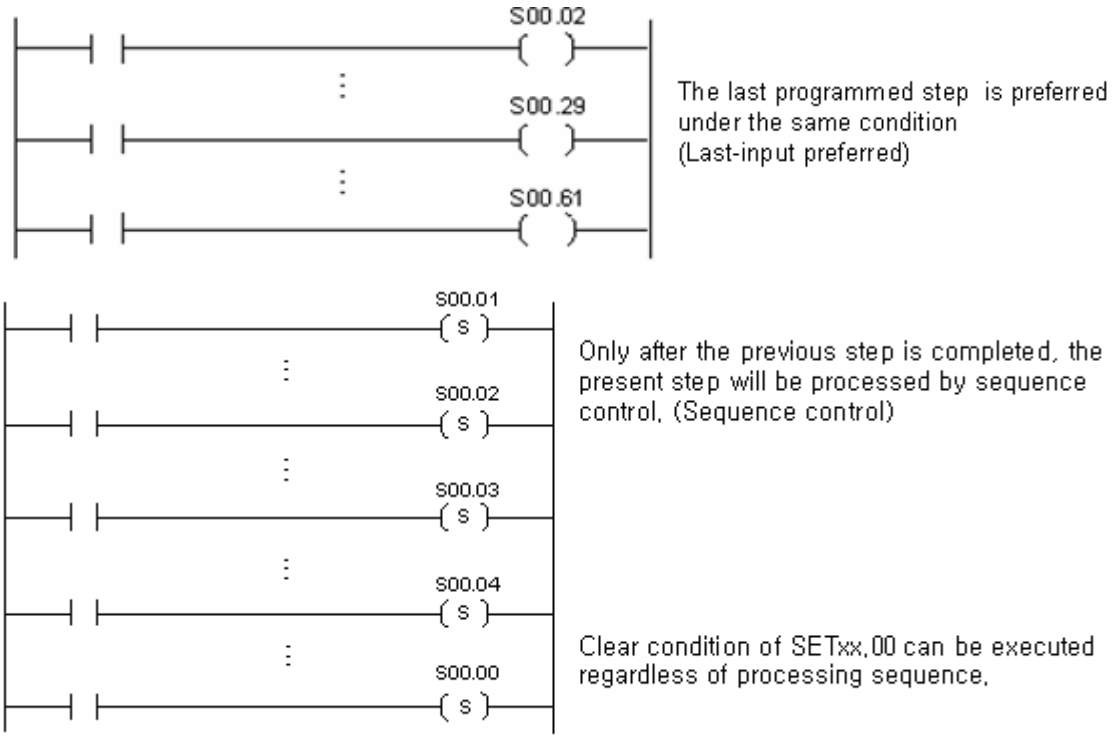
Example) Expression of data register D’s bit.



Description: The Execution of MOV instruction depends on D20’s bit A value.

2.3.10 Step control relay S

As a relay used to control step, it is divided into Last-input preferred and sequence control, based on instructions (OUT, SET) applied.
When power is On or RUN starting, other areas than specified by parameter will be all eliminated to the first step of 0.



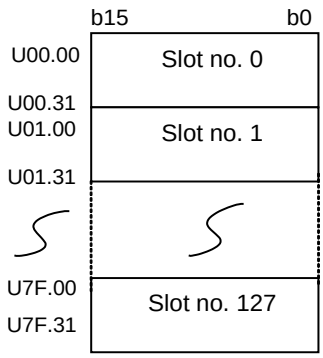
Refer to the section of chapter 4 OUT Sxx.xx, SET Sxx.xx for more details.

2.3.11 Special relay F

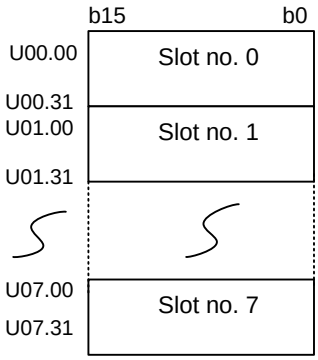
This is an area that provides system-related information. It is an area where only F0000 to F1023 (F200 for XGB) words can be read. It is provide for overall information of PLC current status, O/S information, RTC data and System clock etc.
Next area of F1024 (F200 in case of XGB) word is possible limited Write use of private instruction. This area can be use inspection of external device Warning and Error. Refer to CPU user's manual Chapter 6.7.(in case of XGB, Chapter 6.6)

2.3.12 Special module register U (Refresh area)

This register is used to read data from special module installed on slot.
Data of special module installed by back-plain controller will be automatically updated in refresh area.
32 words per slot are assigned to U area.
Thus, U area is made up of 4,096 words in total (8 bases * 16 slots * 32 words = 4,096 words). In XGB case, 256 words in total (1 base * 8 slots * 32 words = 256 words).
U area value used per slot is fixed regardless of slot which module is installed on or which is empty.



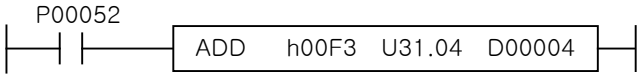
XGK



XGB

Basic expression of U area is in Uxy.z, where x is for base number 0~ 7, y is for slot number 0 ~ F, and z is for internal memory's word number of special module.

U area is also expressed in bit with U3A.12.x (x: Bit position, in hexadecimal). If no special module is installed on the actually specified slot, or effective data area specified is exceeded, the specified area's value will be 0 with no error found.
For example, if the refresh area of the special module installed on slot No.1 of base No. 1 are effective only up to 4 words (No.0 ~ No.3), the word No.4 (U31.04) will be read as 0. Thus, h00F3 will be saved in D00004.



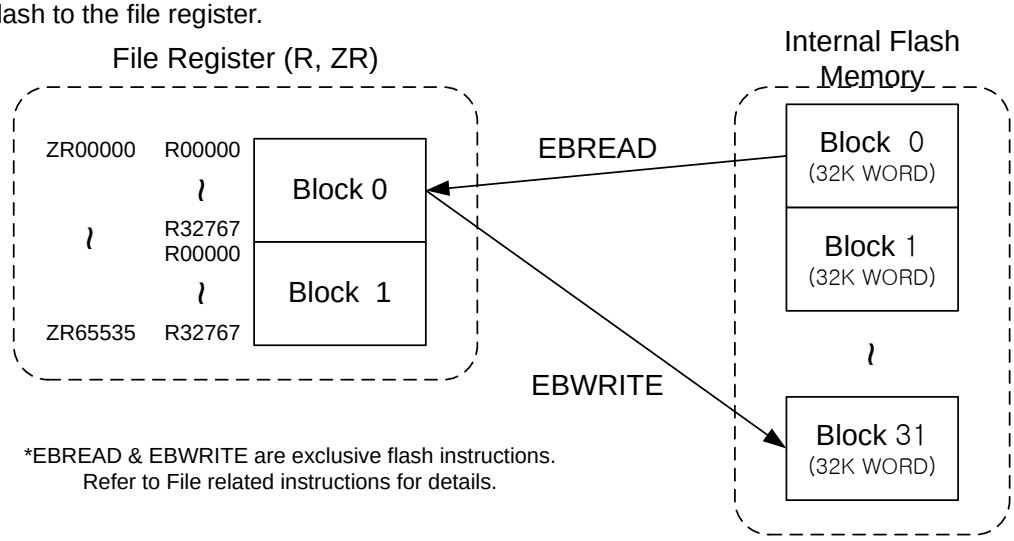
Use PUT(P) or GET(P) instruction to read or write value in other area than refresh area of the special module installed
Refer to Information about area of each module with special module user's manual.
If the data is written in U area of D/A conversion module installed, It is refreshed at Scan End and it is outputted
If an instruction is used to save data in position on which other module than D/A conversion module is installed, it is processed by NOP instruction. In this case, no error may occur.

2.3.13 File register R(in case of XGB standard type, not available)

File register is exclusively used for internal flash memory.
Flash memory can not save the data when processing scan program, since it takes a little time to save the data. So scan program using the flash memory data move to the file register.If need to save the data, save to the flash memory again.

1) Characteristics

(1)As an exclusively used register for internal flash memory, it is used to read or write a block of internal flash to the file register.



(2)The size of one block[*1)]is 32K word, identical to that of the block of internal flash memory.
(3)Write the data of file register in flash memory with EBWRITE instruction to keep the data permanently.
(4)File register operates same as latch area 1 Namely, Data is eliminated by Overall reset with reset switch, reset with D.CLR and reset with XG5000.
(5)It will need several scans to read or write the block of file register to the block of flash memory. Completion state can be checked via the bit of applicable block of F160 (_RBLOCK_RD_FLAG) and F162 (_RBLOCK_WR_FLAG).
(6)Both index function and indirect setting are available At this time, indirect setting range for ZR is up to ZR0~ZR32767 words, and Index function ([Z]) range available is -32768~32767 among device number of ZR. As for R, both indirect setting and index function are all available in the specified block range. If applicable block range is exceeded, index-exceeded error occurred.

2) Size

Classification	XGK-CPUS/CPUE	XGK-CPUU/CPUH/CPUA	XGB Compact type (XBC-DxxH)
File register	32K WORD * 1 block	32K WORD * 2 block	10K WORD * 1 block
Internal flash memory	32K WORD * 32 block	32K WORD * 32 block	10K WORD * 2 block

*1) Only one block (block 0) of the file register is provided for XGK-CPUS, XGK-CPUE and XGB Compact type(XBC-DxxH). And 2 blocks are provided for XGK-CPUU, XGK-CPUH and XGK-CPUA. In XGK PLC the internal flash memory have 32 blocks in total and in XGB compact type have 2blocks.

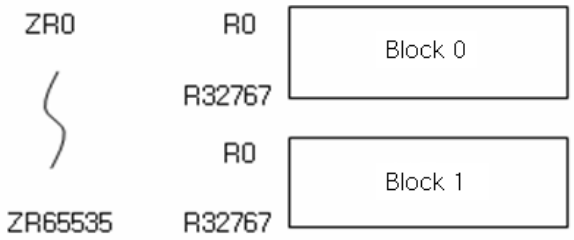
※ In case of XGB standard type, file register (R) is not available.

3) Expression

(1) (1)R - File register block unit expression (32K word fixed per block).
(2) (2)ZR – Whole file register expression (range depends on unit type).
(3) (3)Flash area has no device name, accessible by exclusive instruction.

Device name	Bit expression	Word expression (including DW)	Write	Read	#	[Z]	Data preserved
R	O	O	O	O	O	O	Level of latch 1 area
ZR	X	O	O	O	O	O	Level of latch 1 area
Internal flash memory	X	X	Dedicated instruction	Dedicated instruction	X	X	Permanently

(4) (4)As for XGK-CPUH, configuration example of file register is as shown below



4) Error flag

Number	Size	Name	Content	Note
F158	Word	Flag of block No.	Displays presently used block No.	
F1590	BIT	Representative flag of flash block Read.	ON if any flash block Read flag is ON.	
F1591	BIT	Representative flag of flash block Write.	ON if any flash block write flag is ON.	
F1592	BIT	Representative flag of flash block Write error. Flag	ON if any flash block Write error flag is ON.	
F1600~ F161F	BIT	Flag of flash block n Read Flag	ON if data is read in block n.	32 blocks
F1620~ F163F	BIT	Flag of flash block n Write Flag	ON if data is written in block n	32 blocks
F1640~F1 65F	BIT	Flag of flash block n Write error Flag	ON if Write data in block n fails. If error occurs, both applicable Write flag and Write representative flag keep ON state.	32 blocks

Notes

(1) R, ZR device is not supported at XGB standard type.
So reading/writing flash is not supported and error flag is not supported.

2.3.14 Communication register N

Communication register is exclusively used for P2P register which is available for P2P service setting when communication module of Cnet, FEnet, FDEnet and the others are installed on slot. P2P setting is available with Network Manager (XG-PD) and dedicated instructions. Communication register N used for P2P setting with instructions.
Dedicated instructions for P2P setting refer to 'chapter 4. Details of instructions'.
(XGB is not supported.)

XGK can set 64 blocks (0 ~ 63) per P2P service (P2P 1 ~ P2P 8), and XGB can set 32 blocks (0 ~ 31) per P2P service (P2P 1 ~ P2P 3). One block can assign 1 word station number, 4 read areas and 4 save areas (1~4). Also, there are device name save area of 4 words and variable number save area each read and save area. The table is summarized below.

P2P number	Station no. and save area	Block number		N Device		Note
		XGK	XGB	XGK	XGB	
P2P 1	Station number	0		N00000	N00000	
	WRITE Device1 Name			N00001 ~ N00004	N00001 ~ N00004	
	WRITE Device1 Size			N00005	N00005	
	WRITE Device2 Name			N00006 ~ N00009	N00006 ~ N00009	
	WRITE Device2 Size			N00010	N00010	
	WRITE Device3 Name			N00011 ~ N00014	N00011 ~ N00014	
	WRITE Device3 Size			N00015	N00015	
	WRITE Device4 Name			N00016 ~ N00019	N00016 ~ N00019	
	WRITE Device4 Size			N00020	N00020	
	READ Device1 Name			N00021 ~ N00024	N00021 ~ N00024	
	READ Device1 Size			N00025	N00025	
	READ Device2 Name			N00026 ~ N00029	N00026 ~ N00029	
	READ Device2 Size			N00030	N00030	
	READ Device3 Name			N00031 ~ N00034	N00031 ~ N00034	
	READ Device3 Size			N00035	N00035	
	READ Device4 Name			N00036 ~ N00039	N00036 ~ N00039	
	READ Device4 Size			N00040	N00040	
		1 ~ 63	1 ~ 31	N00041 ~ N02623	N00041 ~ N01311	
P2P 2		0 ~ 63	0 ~ 31	N02624 ~ N05247	N01312 ~ N02623	
P2P 3		0 ~ 63	0 ~ 31	N05248 ~ N07871	N02624 ~ N03935	
P2P 4		0 ~ 63	-	N07872 ~ N10495	-	
P2P 5		0 ~ 63	-	N10496 ~ N13119	-	
P2P 6		0 ~ 63	-	N13120 ~ N15743	-	
P2P 7		0 ~ 63	-	N15744 ~ N18367	-	
P2P 8		0 ~ 63	-	N18368 ~ N20991	-	

Notes

(1) N20992~N21503 area not used in P2P service can be used for Data register(D). But, it is basically latched area different from D.
(2) N area is only available to be monitored

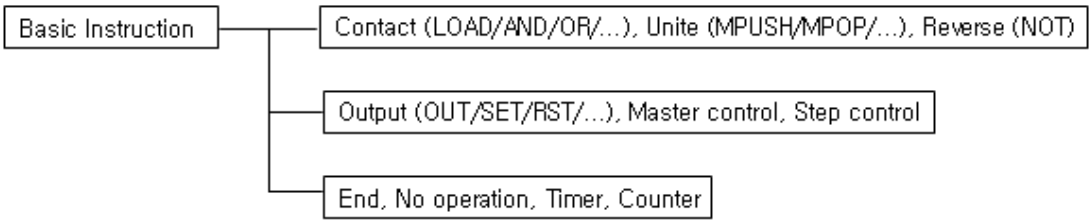
2.4 Comprehension of Instructions

2.4.1 Types of instructions

XGK/XGB instructions are widely classified into basic instructions, application instructions and special instructions.

1) Basic instruction

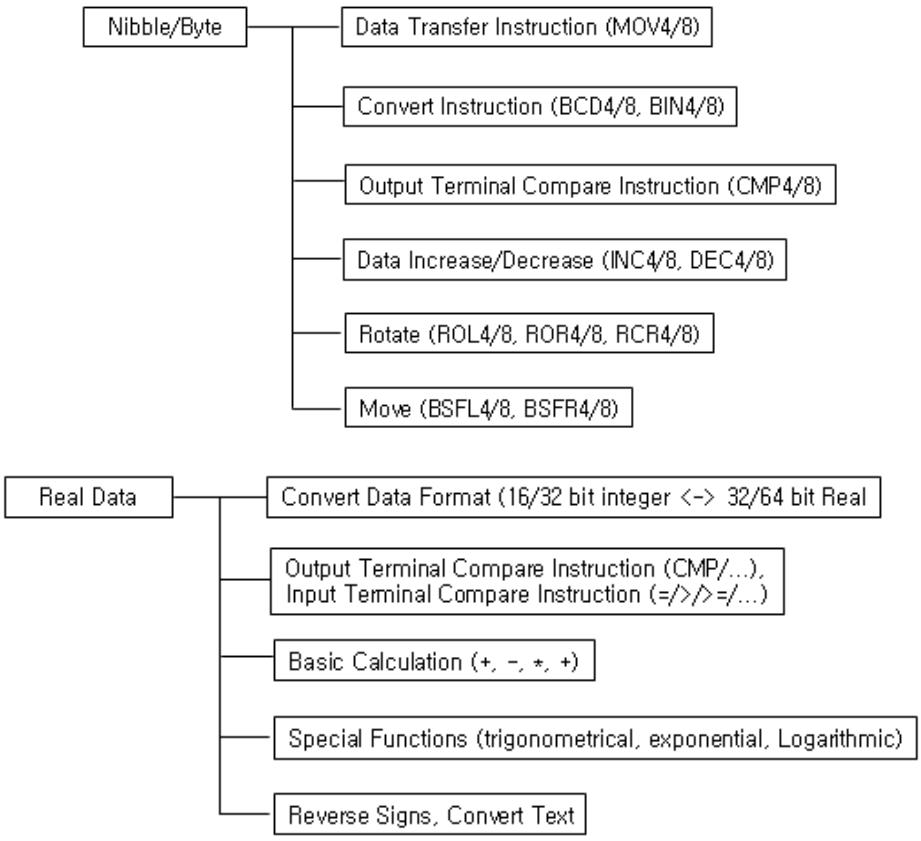
Basic instructions are composed of contact /coil related instruction such as LOAD/OUT,timer/counter, master control and step control instruction.

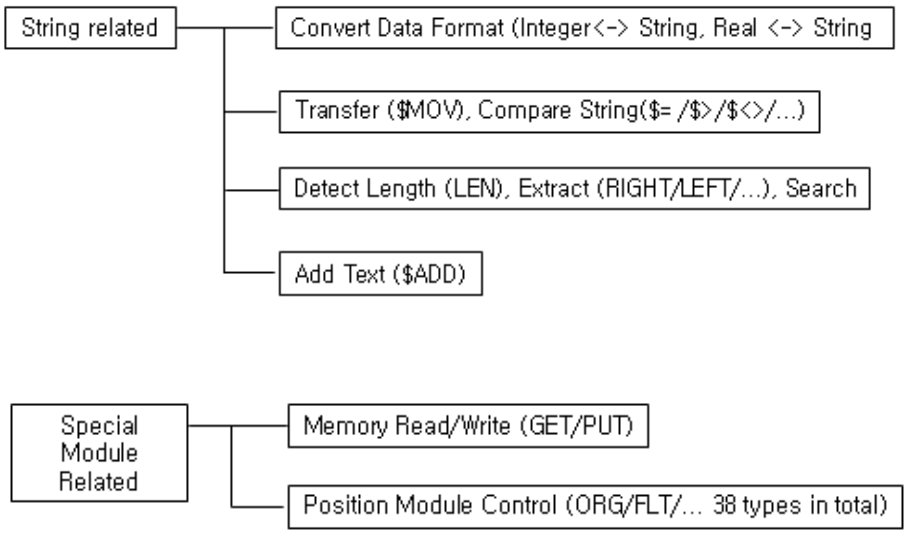


2) Application instruction

Application instructions are almost the others than basic instructions. According to functions of instructions, they can be classified as described in 3.4. In this chapter, they will be classified based on operand types so to understand XGK/XGB instructions without difficulty.

Operand types are bit, nibble/byte, word/double word, real, string, etc.




String related
Convert Data Format (Integer<-> String, Real <-> String
Transfer ($MOV), Compare String($= /$>/$<>/...)
Detect Length (LEN), Extract (RIGHT/LEFT/...), Search
Add Text ($ADD)
Special Module Related
Memory Read/Write (GET/PUT)
Position Module Control (ORG/FLT/... 38 types in total)

2.4.2 Mnemonic generation

1) Data Type

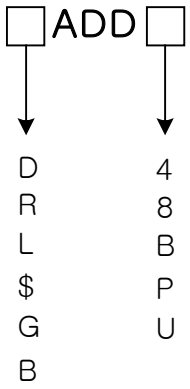
① None : Word
② D : double word
③ R : Short Real number
④ L : Long Real number
⑤ $: String
⑥ 4 : Nibble
⑦ 8 : Byte
⑧ B : Bit

2) Other Expressions

① G : Group
② P : Pulse type instruction
③ B : Data in BCD format
④ U : Unsigned data

Even if with some exceptions, the instructions derivable from one instruction will confirm to the regulations specified below.
Only one letter can be positioned in front of the basic instruction, and 2 or more letters at the back.

Ex) DADDBP



<Exceptions >
In Input Terminal Compare Instruction, the data type is positioned at the back of instruction.
All the instructions with prefix or suffix in front or at the back are not always derived instructions.

Ex) GET, SUB, STOP

2.4.3 Signed operation and Unsigned operation

Basic instruction system of XGK/XGB is of signed operation. Both Signed / Unsigned operations are all available for operations, Increase/Decrease operation, and Compare operation among operation instructions.

1) Operation instruction

(1) Signed operation instructions :ADD, SUB, MUL, DIV, DADD, DSUB, DMUL, DDIV, INC, DEC,DINC,DDEC.

(2) Unsigned operation instructions:ADDU, SUBU, MULU, DIVU, DADDU, DSUBU, DMULU, DDIVU, INCU,DECU,DINCU, DDECU.

(3) Difference: Signed operation dose not set CY, Z flag according to operation result.

Namely,if the program is prepared to add 1 to h7FFF with ADD instruction, its result will be h8000 (-32768) with no flag set.

On the other hand, unsigned operation instruction sets CY,Z flag according to operation result.

2) Compare instructions

(1) Signed instructions : LOAD X, AND X, OR X, LOADR X, ANDR X, ORR X, LOAD$ X, AND$ X, OR$ X,LOAD3 X, AND3 X, OR3 X etc.

(2) Unsigned instructions: CMP, DCMP, CMP4, CMP8, TCMP, GCMP, etc.

(3) Since Compare instructions have no flag (CY, Z) generated, the difference only is between Signed and Unsigned compared.

2.4.4 Indirect setting type (#)

(1) Value of the number that device's data value specified in a device indicates is taken.

(2) For example, if the value of 20 is saved in D10 with #D10 used, it means that the value of 20 in D10, namely, D area's 20th D20 is specified.

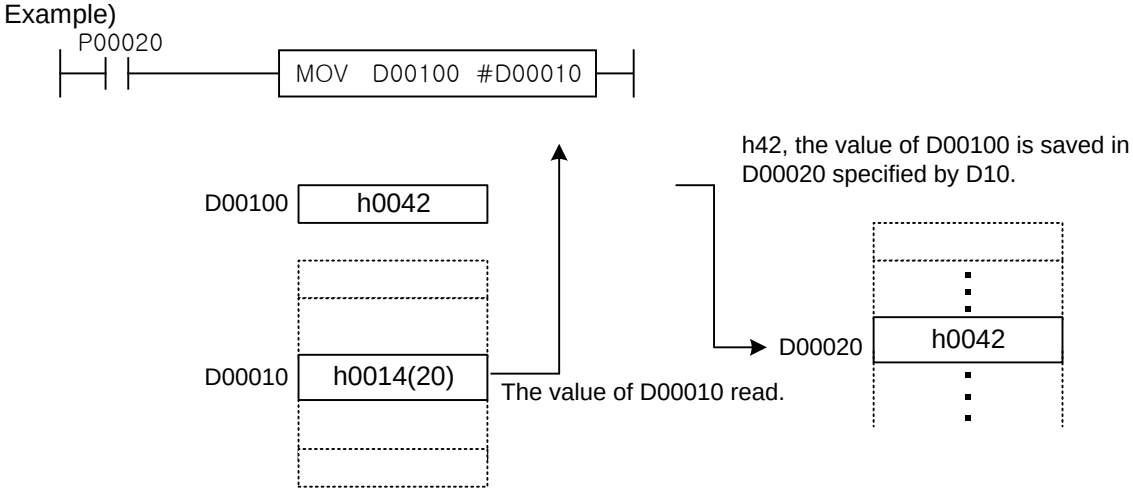
(3) Available device: P area, M area, K area, L area, N area, D area, R area, ZR area.

(4) At this moment, each indirect setting can not exceed each device's range In other words, #P can not be used to indicate M area.

(5) If any value of indirectly specified device exceeds applicable device's area, operation error flag (F110) will be On.

(6) Indirect setting is not available for bit, nibble and byte operand.

Example)



Notes

In the case of XGK, the indirect specification range of each device is as follows.
P area, M area, L area, K area : respectively 0 ~ 2047
D area : 0 ~ 32767
R area : 0 ~ 32767
ZR area : 0 ~ 65535 (Limited by CPU type)
(2) If the device value indirectly specified exceeds applicable device area, Operation Error Flag (F110) will be Set. If the Error operation setting is set by 'Continue running when an arithmetic error occurs', Operation Error Flag will be Set and the instruction will be skip. If it is not, Operation Error Flag becomes Set and CPU module error is occurred and operation is stop concurrently.

2.4.5 Index function (Z)

1) Characteristics
(1) With device setting through index register, use index function in sequence program to let the used device positioned with directly specified device number plus index register value. For example, if Z1 is 5 with P10 [Z1] used, P (10+5)=P15 will be the object to use.
(2) Index register : Z0 ~ Z127 (128)
- XGK-CPUSN,CPUHN,CPUUN index register : Z0 ~ Z256 (256)
(3) Setting range of the value available : -32768~32767
- XGK-CPUSN,CPUHN,CPUUN Setting range : -2,147,483,648 ~ 2,147,483,647
However, an error occurs when the device size is exceeded
(4) Index function of word/bit device
(5) Available in indirect setting: #D00100[Z12]
(6) If index result area is exceeded, operation error flag will be set (F110). If the Error operation setting is 'Continue running when an arithmetic error occurs', operation error flag will be set and instruction will be skip.

2) Devices available
(1) Bit device : P, M, L, K, F, T, C
(2) Word device : Present value of U, D, R, N, T, present value of C
Example) MOV T1 [Z1] D10 : If Z1's value is 5, T(1+5) → T6's present value is transferred to D10.
(3) How to use index for U device : Index is unavailable for slot number like U10.3 [Z10], but only available for channel. However, based on index value, different slot's channel can be specified.

3) How to use
(1) Attach [] at the back of the operand to use.
(2) Example of bit device : Based on types of operands (bit/word) used for applicable instruction, its indexing will be in bit/word unit.
Example.1) LOAD P10 [Z1]: If Z1's value is 5, LOAD P (10+5) → LOAD P15 (bit).
Example.2) MOV P10 [Z1] D10: Where, since P10 means word, P10 [Z1] will be as P (10+5) = P15word.

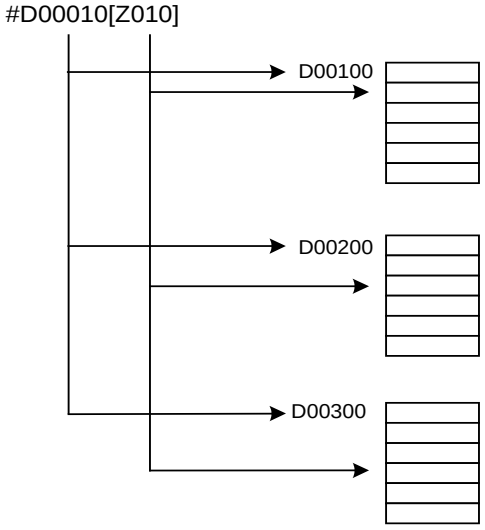
(3) Example of word device: Indexing will be only in word unit. Absolute bit unit indexing is unavailable.
Example) LOAD D10[Z1].5 : If Z1's value is 5, LOAD P(10+5).5 → LOAD P15.5 (bit).
Caution) Expression such as LOAD D10.5 [Z1] can not be used.

(4) The index function can be helpfully used in variable with the meaning of arrangement, to take the variable value designated as index or to save the value in the specified variable.

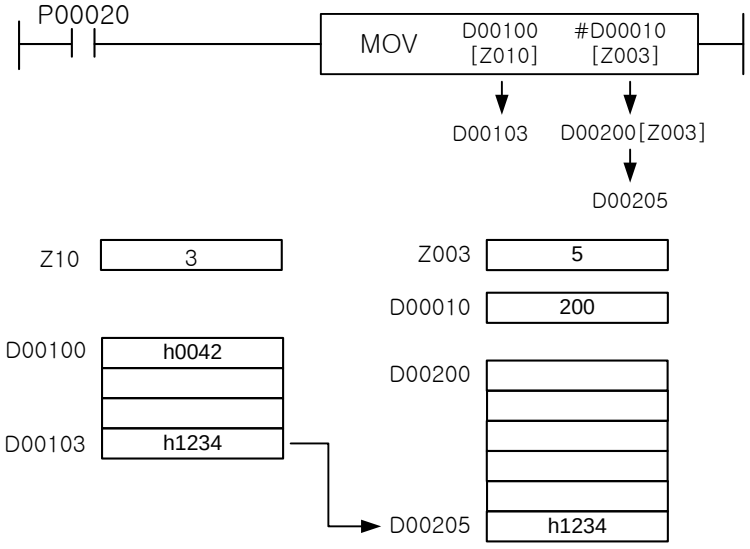
(5) Indirectly specified index formula is also available.
Expression: #D00010 [Z010]

Description: Process #D00010 first. In other words, if D00010's value is 100, it means #D00010 → D00100. Then process D00100 [Z010].

Application: It can be applied as the arrangement notion of structure as shown below. Namely, it can be set the start position D00100, D00200, D00300 etc. use of indirect designation. Then using the function of Index, find the specified position



Example of program)



2.5 Precautions for Programming

1) Error occurrence status

(1) If the error found is the one described in the description of each instruction.
(2) If an applicable network dose not exist with link device used.
(3) If an applicable module dose not exist with analog data register used.
(4) If applicable device's range is exceeded with index formula used.
(5) If applicable device's range is exceeded with indirectly setting applied.
(6) If the size to save converted value exceeds the range of expression.
(If real value exceeds -32,768~32,767 range with R2I instruction used, operation error may occur)

2) Inspection of device range

Instructions dealing with devices with variable length (instructions to specify the number of data transferred such as GMOV, FMOV, GSWAP, etc.) inspect the device's range. If the range is exceeded, operation error (F110) may occur.
For details, see the error description of each instruction.
(2) Index formula when used will cause operation error if exceeding the used device's range.
(3) Indirect setting when applied will cause operation error if exceeding the used device's range
(4) String instruction when used will cause operation error (F110) if exceeding the applicable device range earlier than 31 letters starting from specified head number
(5) Device's last number is unavailable for 32-bit or 64-bit related instructions.
In this case, the input will be limited in XG5000.

3) Inspection of device's data

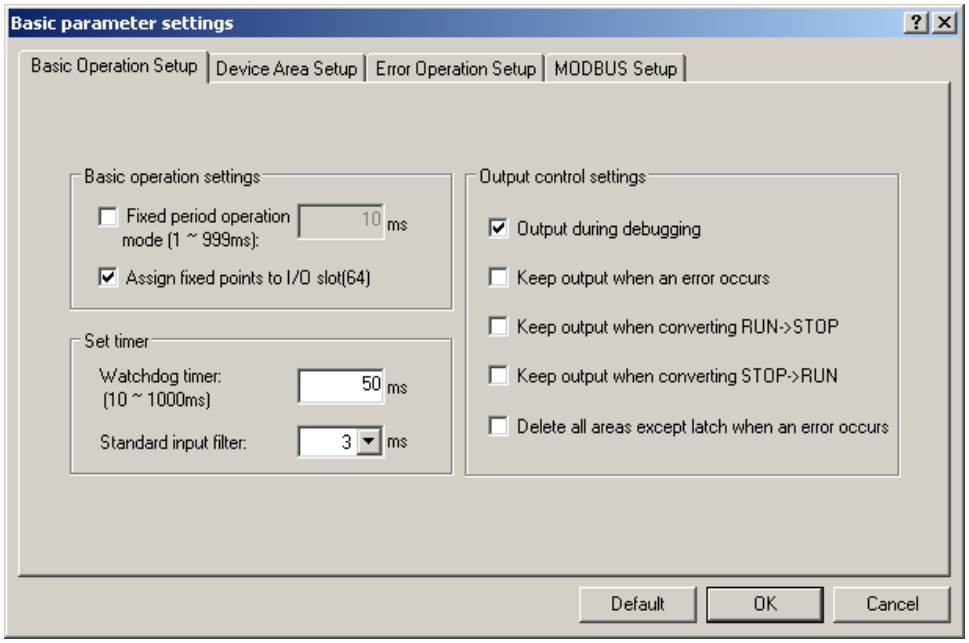
As for BCD data, other range than specified in the table will cause operation error (F110).

Instruction	Data size	BCD Formatting
BCD4(P)	4 bit	0~9
BCD8(P)	8 bit	0~99
BCD(P)	16 bit	0~9,999
DBCD(P)	32 bit	0~99,999,999

String data is not inspected. If data value is unavailable to express when applicable device value is monitored in XG5000, its expression may be abnormal.
And the real data if exceeding the expression range available will cause operation error (F110).

2.6 Parameter Setting

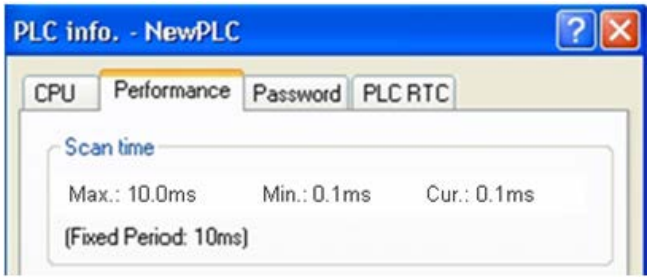
Parameter setting can be through basic parameter settings on XG5000. Basic parameter setting window is as shown below



2.6.1 Fixed period operation mode

This function used for operating the PLC program by Fixed period operation mode.
It is available to set 1ms~999ms in Fixed operation time mode.. The time should be less than the value of Watchdog timer and longer than Scan time. PLC do not operate normally since Watchdog timer error will be occur. (If it is set smaller than the scan time, error 503 occurs.)

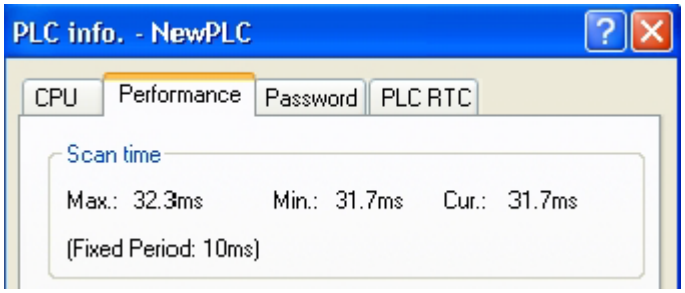
The way of checking status of Fixed period operation is menu [Online]-[PLC Information] on XG5000. The status '(Fixed Period: 10ms)' will be expressed on the PLC information window.



In case of current Scan time means execution of real program time that is not execution cycle time. In case of current Scan time means execution of real program time that is not execution cycle time.As providing real Scan time of current program.
Maximum Scan time indicates Fixed Period time If time exceed the Fixed Period time, Scan time will be shown real exceeded Scan time.

Notes

(1) If Scan time is longer than 'Fixed time operation' setting time, '_CONSTANT_ER [F0005C]' flag is 'ON'. And CHK LED is blinking. Also, Scan time is recorded in maximum Scan time.



2.6.2 Assign points of I/O slot

Each slot can designates sharing points of I/O in 16, 32 or 64 unit to specify special/communication module if applicable.
Empty slot shares 64 points at Fixed type and 16 points at Variable type.

Assignment of I/O number is divided into Fixed type and Variable type (XGB is not supported) available based on basic parameter setting.

<table>
<tr><th colspan="2">Classification</th><th>Assignment example of I/O number</th></tr>
<tr><td rowspan="2">Assignment of I/O number (fixed value)</td><td>XG K</td><td>•64 points are assigned to each slot in the base regardless of module and or module type.
•The I/O number for 16 slots is assignment to one base. In other word, the start number of No. 1 base is P00640.
•For example, assignment of I/O number to 12-slot base will be as follows.
Slot number 0 1 2 3 4 5 6 7 8 9 10 11
PWR | CPU | Input 16 | Input 16 | Input 32 | Input 64 | Output 16 | Output 32 | Output 32 | Output 64 | Input 32 | Output 16 | Output 32 | Output 32
P0 ~ P3F | P40 ~ P7F | P80 ~ P11F | P120 ~ P15F | P160 ~ P19F | P200 ~ P23F | P240 ~ P27F | P280 ~ P31F | P320 ~ P35F | P360 ~ P39F | P400 ~ P43F | P440 ~ P47F</td></tr>
<tr><td>XG B</td><td>•All modules is allocated per 64 points.(including special, communication)
Slot Nnumber
0 1 2 3 4 5 6 7
Main Unit | Input 16 | Input 16 | Output 32 | Input 64 | Comm. | Special | Special
P0 ~ P3F | P40 ~ P7F | P80 ~ P11F | P120 ~ P15F | P160 ~ P19F | P200 ~ P23F | P240 ~ P27F | P280 ~ P31F
In case of setting module type by I/O parameter and real module type is different, module mismatch error occurs and Run is not possible. Main unit</td></tr>
</table>

Classification	Assignment example of I/O number
Assignment of I/O number (Variable type)	•Points are assigned according to the designation of the mounting module for each slot. - Specified points will be assigned if installed module specified by I/O parameter. - To the slot not specified by I/O parameter, points will be automatically assigned according to actually installed module. (Caution: 16 points will be assigned to 8-point module) - 16 points will be assigned to empty slot which is not specified by I/O parameter. •Points only available to specify without module specified by I/O parameter. •Slots equipped with special modules and communication modules are allocated to 16 points •For example, assignment of I/O number to 12-slot base will be as follows.

Slot No.		0	1	2	3	4	5	6	7	8	9	10	11
PWR	CPU	Input 16	Input 16	Input 32	Input 64	Output 16	Output 32	Output 32	Output 64	Input 32	Output 16	Output 32	Output 32
		P00 ~ P0F	P10 ~ P1F	P20 ~ P3F	P40 ~ P7F	P80 ~ P8F	P90 ~ P10F	P110 ~ P12F	P130 ~ P16F	P170 ~ P18F	P190 ~ P19F	P200 ~ P21F	P220 ~ P23F

Notes

In case of XGK
(1) Assignment type of I/O number is specified in basic parameter.
(2) Base number of main base is '0' fixed, and a switch to specify base number is installed on the extension base.
(3) If module type is specified by I/O parameter, it should be identical to the type of actually installed module to start operation.
Fixed type assigns of I/O number in extension step 1 first slot of 16 points Output module at P00640~P0064F, Variable type assigns P00240~P0024F. Assigning I/O number of extension base can be certificated on System Monitor in XG5000.
(5) For details, refer to 2.3 Basic System in the CPU User's manual.
(6) Function of reserving module points to draw up a program without changing I/O number when module replace with alternative device expansion or malfunctioning. . (The setting has to set in advance.)

2.6.3 Setting of time

1) Watchdog time setting

The time value setting of Scan Watchdog timer is to remove stop of PLC by error of program. Watchdog time is to set available from 10ms to maximum 1000ms (1 second). Initial value is 50ms.

2) Setting of standard input filter

Set the value of input filter in DC input module. Refer to XG5000 user's manual chapter 9 Parameter for more details.

2.6.4 Setting of output control

It provides a function of output in debugging, maintaining output when error occurring, maintaining output when Run changed to Stop, maintaining output when Stop changed to Run, deleting except for latch area when error occurring as part of setting the output control on PLC operation status.

2.6.5 Setting of timer area

Time setting (100ms, 10ms, 1 ms, 0.1ms) follows the timer number.

Classification	XGK		XGB	
	Setting available area	If not set (Default)	Setting available area	If not set (Default)
100ms	T0000 ~ T2044	T0000 ~ T0999	T000 ~ T253	T000 –T191
10ms	T0001 ~ T2045	T1000 ~ T1499	T0001 ~ T254	T192 ~ T200
1ms	T0002 ~ T2046	T1500 ~ T1999	T0002 ~ T255	T201 ~ T255
0.1ms	T0003 ~ T2047	T2000 ~ T2047	-	-

2.6.6 Setting of latch area in data memory

1) After power is On (Reset), during [Program (Stop) mode → RUN mode] or [RUN mode → Program (Stop) mode], it specifies latch area to keep present data. Devices with such a latch area available to set are D, M, S, C, T, etc. K, L, N and R devices will be latched even if latch is not specified for a latch device.
2) Latch area can be set in device setting with latch area 1 and 2 as divided.
3) Latch area 1 and 2 can not be duplicated.
4) Both latch area 1 and 2 have latch function to keep data even if reset. The difference between the two is that data of latch area 1 is deleted if overall reset in XG5000 while data of latch area 2 is being preserved.
5) In order to delete data of latch area 2, keep Data Clearing Switch On for 3 seconds or more while PLC is in Stop mode.

Classification	Stop<->Run	Reset	Overall reset	Data clearing key (minimum 3 second)
Latch area 1	Data hold	Data hold	Data clear	Data clear
Latch area 2	Data hold	Data hold	Data hold	Data clear
K, L, R devices	Data hold	Data hold	Data clear	Data clear
N Device	Data hold	Data hold	Data hold	Data hold

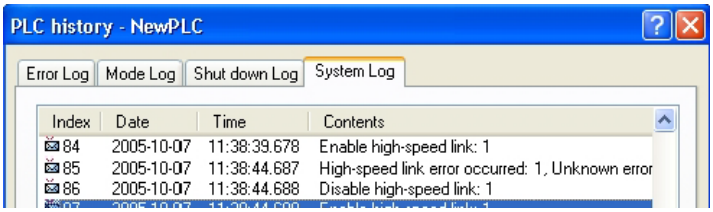
Notes

(1) XGB doesn't have data clear key. So latch area 2 is deleted only by Online -> Clear PLC.

2.6.7 Setting program progress when errors occurring

1) Continue running when an arithmetic error occurs
It determines continuing operation whether or not error occurred when instruction is executed (except for floating-point operation instruction).

(1) Operation in set
Operation error flag is changed to Set, Error Step is recorded in F0048 (DWORD) when operation error is occurred. In the case of Error information is recorded in System Log, PLC operation status is continued Run status. Also, CHK LED is blinking until operation error is removed.



(2) Operation in cancellation PLC operation status is immediately changed on error status when operation error is occurred. Operation error flag is changed to Set, Error Step is recorded in F0048 (DWORD). In the case of should be remove operation error and execute Run again.

2) Continue running when a floating point error occurs (XGB not available)
It determines whether operation will continue or not by error occurred when floating point operation instruction is executed.
Set/Cancellation operation is identical with 'Continue running when an arithmetic error occurs'.

3) Continue running when a fuse error occurs (XGB not available)
It determines whether operation will continue or not by short of fuse built in module.
After setting of Error information is recorded in System Log and PLC operation status continue Run status.
PLC operation status will be changed error status when function setting is canceled.

4) Continue running when a I/O module error occurs (XGB not available)
It is not possible control at CPU by malfunctioning I/O module installed, it determines whether operation will continue or not.

5) Continue running when a special module error occurs (XGB not available)
It is not possible control at CPU by malfunctioning Special module installed, it determines whether operation will continue or not.

6) Continue running when a communication module error occurs (XGB not available)
It is not possible control at CPU by malfunctioning communication module installed, it determines whether operation will continue or not.

Notes

If module need to change the reason of 3), 4), 5), 6), it can be change in running status using [Online]-[Module Changing Wizard] at XG5000.

2.6.8 Interrupt setting

1) Function

It tentatively stops scan program's operation to process internal/external signals produced regularly or irregularly and then deal with applicable functions according to priority which is available from 2 to 7.

2) Type of task programs and setting range of task number

- Task programs are classified into 3 types as follows.
  - ▶ Cyclic cycle task program: up to 32 available for XGK, up to 8 for XGB.
  - ▶ Internal device task program: up to 32 available, up to 8 for XGB.

- Cyclic cycle task program
  - ▶ Program is executed based on the specified time interval.
  - ▶ Setting range of the task number available is 0 ~ 31 for XGK, 0 ~ 7 for XGB.

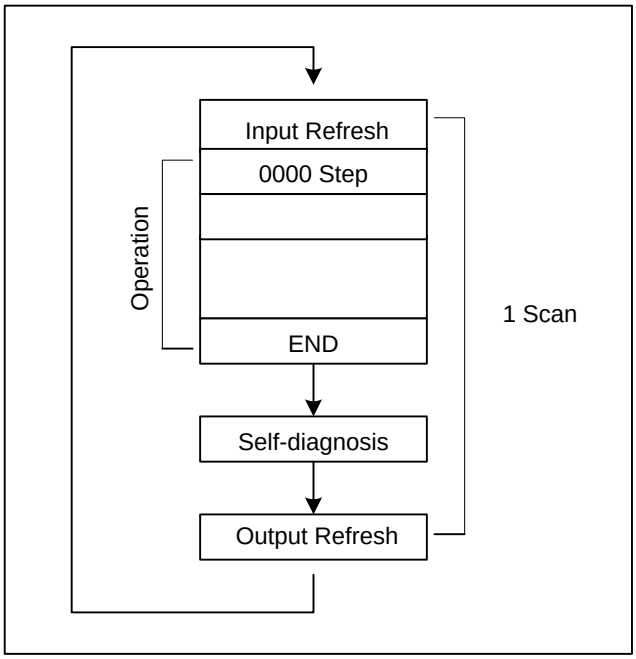
- Internal device task program.
  - ▶ Executes the corresponding program when the start condition of internal device occurs.
  - ▶ Detection of device's start condition is executed after scan program
  - ▶ Setting range of the task number available is 0 ~ 31 for XGK, 0 ~ 23 for XGB.

Notes

(1) Please refer to 2.8.1 Interrupt function for more details.

2.7 CPU processing

2.7.1 Operation processing



Input is refreshed and then operation is from step 0000 to END orderly. It is operated by Self-diagnosis, Timer process and Counter Process orderly. Finally Output is refreshed and then the result is to input. The operation is processed with same routine.

1) Input refresh
It reads data from input module before program is executed to save wholly in specified data memory's input (P) area.

2) Output refresh
It outputs data in data memory's output (P) area wholly to output module after END instruction is executed.

3) In case I/O direct instruction is executed (IORF instruction)
It will perform I/O refresh while program is executed for the I/O module specified by instruction.

4) In case output's OUT instruction is executed
It will save sequence program's operation result in output area of data memory and refresh output contact after END instruction is executed.

Notes

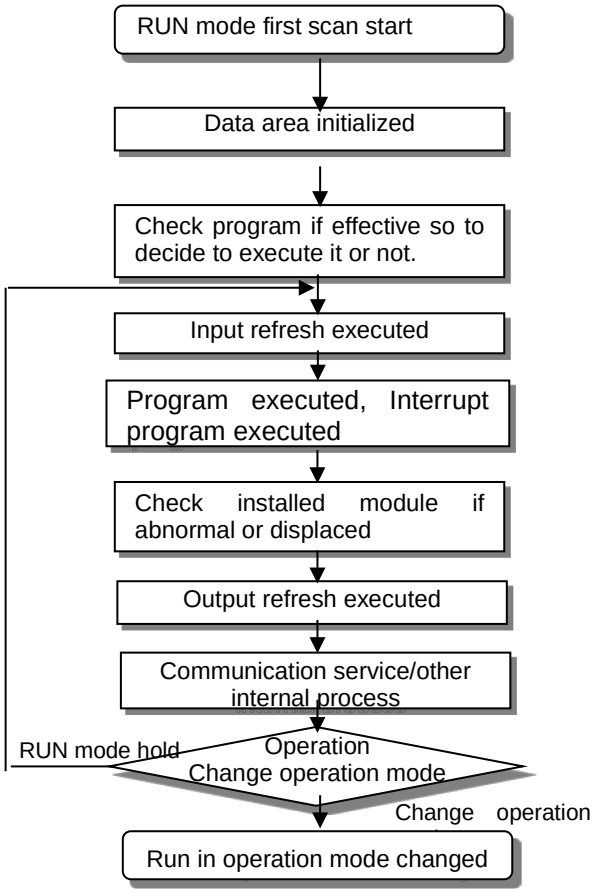
(1) Scan: It is a series of operations to read contact status from input module to save in P area (input refresh) and then perform instructions from 0000 step to END in cyclic sequence based on the previous process to deal with self-diagnosis, timer and counter, and write the value changed by program executed in output module (output refresh).

2.7.2 Description of operation in applicable mode

CPU module's operation status is classified into Run mode, Stop mode and Debug mode.
This describes the operation processing of each operation mode.

1) RUN mode

Executes program operation normally.



(1) Process after mode changed
Data area will be initialized at start, and program will be checked if effective to decide to execute or not.

(2) Operation process
I/O refreshes and program operation will be executed
It detects operation condition of interrupt program to execute interrupt program.
Inspect the normal operation and detachment of the installed module.
Communication service or other internal processing

2) STOP mode

It is the mode in Stop status without program operation. Program transfer is available only in remote STOP mode via XG5000.

(1) Process after mode changed
Output image area will be eliminated, with output refresh executed.

(2) Operation process
① It executes I/O refresh.
② It checks installed module if abnormal or detachment.
③ Communication service or other internal processing

3) Debug mode

It is a mode to find the error of the program or to trace the operation process. Switching to this mode is only possible in the STOP mode. This mode allows you to verify the program while checking the program execution status and contents of each data.

(1) Process after mode changed
① Data area will be initialized in the beginning of the mode changed.
② Output image area will be eliminated, with input refresh executed.

(2) Operation process
① It executes I/O refresh.
② It performs debug run according to setting status.
③ After debug run to the last of the program, it executes output refresh.
④ It checks installed module if abnormal or detachment.
⑤ It performs communication and other services.

(3) Conditions of debug run
4 conditions of debug run are as described below. And if ever reached, the brake pointer of different kind can be specified.

Operation condition	Description about operation
Executed one by one operation unit (step over)	After one operation unit executed by Run instruction, it will stop.
Break Point executed (Break Point) Break Point executed as specified	If Break Point is specified in program, it will stop at the specified point.
Executed based on contact's status	If contact area to detect or status to stop is specified (Read, Write, Value), it will stop when the specified operation occurs at the specified contact.
Executed based on the number of scans specified	If the number of scans to run is specified, it will stop after run as many as the specified number of scans.

(4) How to operate
① Perform Run after conditions of debug run are set in XG5000.
② Interrupt program can be specified in each interrupt unit to decide to run or not (Enable / Disable). (Refer to Chapter 12. Debugging in XG5000 user's manual for more details.)

4) Change of operation mode

(1) How to change operation mode

Run mode can be changed as follows.

① Changeable by mode key of CPU module.
② Changeable by connecting programming tool (XG5000) with CPU's communication port.
③ By changing the operation mode of other CPU module connected to network by XG5000 connected to communication port of CPU.
④ Changeable by XG5000, HMI and computer link module connected to network.
⑤ Changeable by 'STOP' instruction' while program is executed.

(2) Types of Operation modes

① The operation mode setting is as follows.

Operation mode Switch	XG5000 command	XGK		XGB
		Remote allowable switch	Operation mode	Operation mode
RUN	X	X	RUN	Local RUN (RUN)
STOP	RUN	On	Remote RUN	Remote RUN (RUN)
	STOP		Remote STOP	Remote STOP (STOP)
	Debug		Debug RUN	Debug
	Executing mode change	Off	Previous Operation mode	Changed operation mode
RUN -> STOP	-	X	STOP	Remote STOP (STOP)

② In case of XGK, operation mode can be changed to remote mode only if in status of 'Remote Allowable: On', 'Mode Switch: STOP'.In case of XGB, operation mode can be changed to remote mode if in status of 'Mode Switch: STOP.

③ To change 'RUN' to 'STOP' with the switch, let the switch positioned at (Stop) →Run → Stop.

Notes

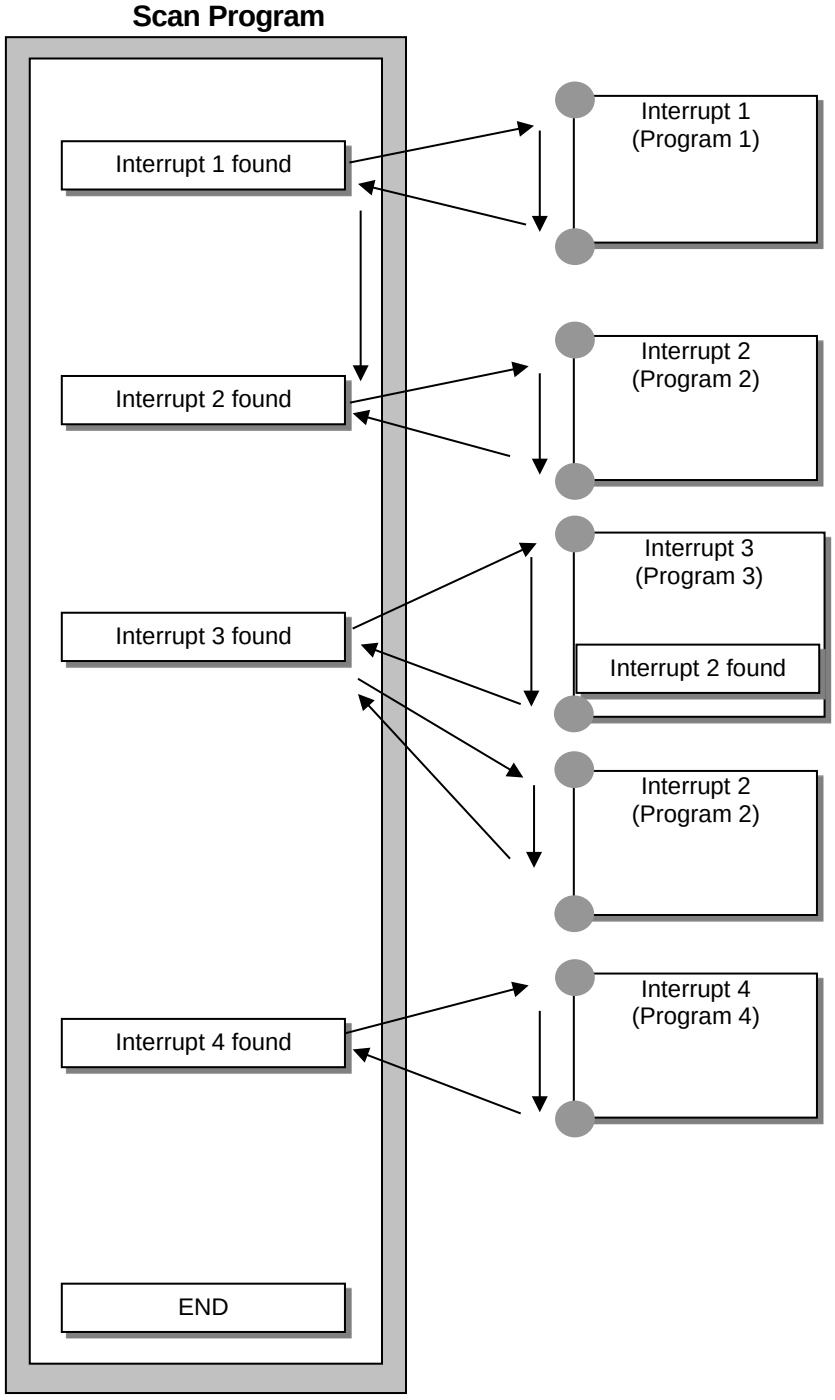
(1) If operation mode is changed to RUN mode by using switch in remote RUN mode, PLC will keep on running without interruption.

(2) Though modification during RUN is available in Local RUN mode, the operation of the mode change via XG5000 is limited. Let it set to Local RUN mode only not to allow mode to change in remote area.

2.8 Special Function

2.8.1 Interrupt function

How to set XG5000 of XGT programming S/W will be described below simply to help understand interrupt function. (Refer to XG5000 manual for details on XG5000.)

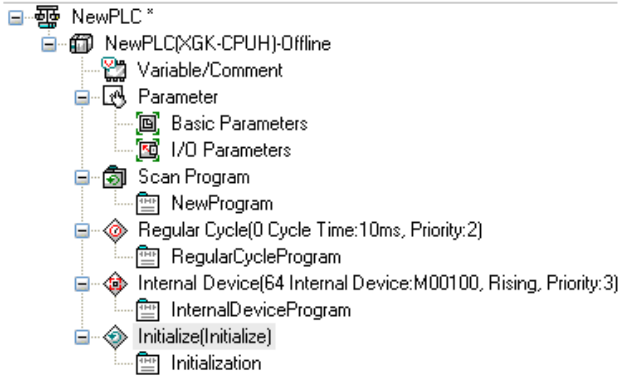


Notes

(1) If power is On, all the interrupt will be enabled.

1) Interrupt programming

Create the task in the XG5000's project window as below and add the program for each task to execute. Refer to XG5000 manual for more details.



2) Types of tasks

Types and functions of tasks are as specified below.

Type / Specifications	Cycle task (Interval task)		Internal contact (Single task)	
	XGK	XGB	XGK	XGB
Quantity	32 blocks	8 blocks	32	8 blocks
Starting condition	Cycle time((up to 4,294, 967. 295 second available in 1ms unit)		Internal device's designated conditions	
Detection and execution	Executed periodically per setting time		Executed by searching for condition after scan program completed.	
Detection delay time	Max. 0.2 ms delayed		Delayed as much as max. scan time	
Execution Priority	2 ~ 7 levels setting (Level 2 is most prioritized)		As specified in the left	
task No.	With 0~31 range without user duplication	With 0~7 range without user duplication	With 64~95 range without user duplication	With 16~23 range without user duplication

3) Processing of task program

Common processing method and precautions for task program will be described.

(1) Characteristics of task program

. Task program dose not repeat every scan differently from scan program but perform execution only when its conditions are met. Task program shall be prepared in due consideration of this.

. For example, if timer and counter are used for cyclic cycle task program with a cycle of 10 seconds, tolerance of the timer can be maximum 10 seconds. And since the counter checks its input status every 10 seconds, any input changed within 10 seconds will not be counted.

(2) Execution priority

. In the event several tasks to be executed are waiting, execute from the highest Task Program in priority. When the same priority tasks are waiting, execute consecutively.

. Priority of tasks can be assigned only in each task.

. The task program priority should be set considering the program requirements, importance, and the emergency when the execution is requested

(3) Processing delayed time

Processing delay of task program is caused by the following factors, which shall be considered when setting task or programming.

. Task's detection delay (refer to details of each task)
. Program execution delay due to execution of precedent task program.

(4) Initialization and Relation between scan program and task program

. User frame definition task dose not start when initialization task program is executed.

. Since scan program's priority is the lowest, task program will be preferably processed with the scan program stopped if task occurs. Thus, if tasks occur frequently during 1 scan or are concentrated intermittently, scan time may increases abnormally, which needs precautions against when setting condition of task.

(5) Protection of executed program from task program

. If continuity of program execution might be lost while performed, by a task program with higher priority, the task program can be partially prevented from execution. At this time, DI (task program operation disallowed) or 'EI (task program operation allowed)' application instruction can be used to protect program.

. Insert 'DI' application instruction in the start position to protect or 'EI' application instruction in the position to cancel the protection. Initialization Task is not influenced by 'DI' or 'EI' application instruction.

4) Processing of cycle task program

When task program's task (operation condition) is set to cyclic cycle, its processing is as described below.

(1) Setting items in task

. Specify execution cycle and priority of the task which will be operation condition of the task program to execute. Check the task number for task management.

(2) Processing of cycle task
. Execute cyclic cycle task program applicable at specified time intervals (execution cycle).

(3) Precautions for cycle task program used

. If the same task program is requested to operate with cycle task program presently executed or standing by, the newly generated task will be ignored.

. Only in Run mode, timer that requests execution of cycle task program will be added. Power failure time will be all ignored. The shutdown time shall be all disregarded.

. When setting cyclic cycle task program's execution cycle, consider that execution request of several cycle task programs may occur at a time..
If 4 cyclic cycle task programs are used with a cycle of 2, 4, 10 and 20 seconds, execution request of 4 cycle task programs will occur at a time every 20 seconds, causing a problem to increase the scan time in a moment.

5) Processing of internal device task program

When execution range of task program's task (operation condition) is extended from the contact to device, the extended internal device task program will be processed as described below.

(1) Setting items in task

Specify device's condition and priority which will be the operation condition of the task program to execute. Check task number to manage task.

(2) Processing of internal device task

. If devices' conditions which will be operation condition of internal device task program are identical according to priority after scan program is executed completely in CPU module, it will start to execute.

(3) Precautions for internal device task program used

. Internal device task program starts to execute when the moment of scan program is completed. Thus, even if internal device task program's execution conditions are produced in the scan program or task program, its execution will be allowed not instantly but the moment scan program is completed.

. Execution request of internal device task program inspects the execution conditions when the moment scan of program is completed. Thus, internal device task's execution conditions if once produced and lost for 1 scan by scan program or task program will not execute the task because the execution can not be detected at the time when execution conditions are inspected.

2.8.2Timer function (Not supported in XGB standard type)

Timer device (RTC) is built in CPU module. RTC keeps timer operation with battery back-up despite power off or momentary power failure.
RTC's timer data can be used to manage system running history or error record. Present time of RTC is renewed every scan in Flag (F0053, F0054, F0055, F0056) related with timer.
Refer to CPU user's manual 6.2 more details about function of timer.

2.8.3 Program modification during RUN

1) If XG5000 program identify with PLC's program, program can be modified without change to operation mode.
2) Only one Program Block (PB) can be modified when one cycle modification in Run, modification has no limitation in the one Program Block (PB). (There are 2 Program Block in the PLC)
3) There is a difference of modification time during Run by media type (RS-232C/USB) which is connected with PLC and Read/Write data size during Run mode. Also, The shorter modification time during Run, The larger Scan change quantity
4) If error occurs in modification during Run, PLC executes previous program modification during Run.

2.8.4 Self-diagnosis function

(1) Self-diagnosis function is used to diagnose PLC system error of CPU module itself.
(2) If PLC system is powered on or an operation error occurs, it will be detected to prevent the system from abnormal operation.

1) Scan Watch-dog Timer

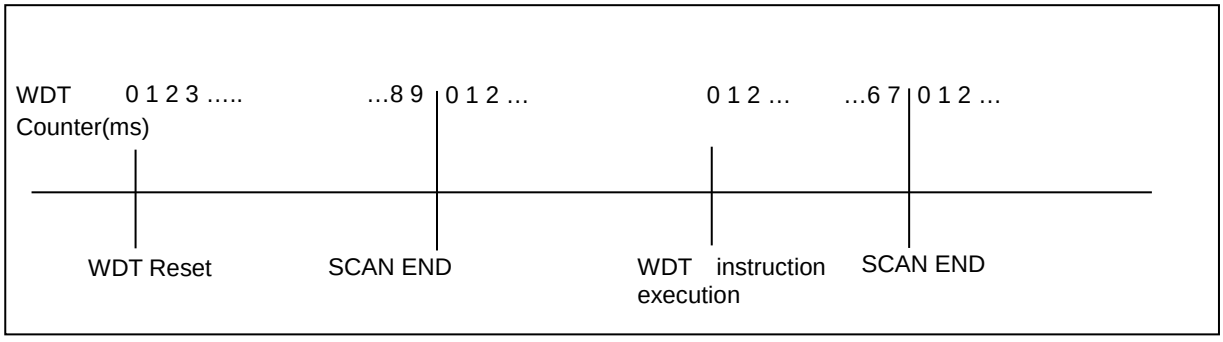
WDT (Watch-Dog Timer) is used to detect program overloaded due to PLC CPU module's H/W or S/W error.

(1) Watch-dog timer is used to detect operation delayed due to user program error. Detection time of Watch-dog timer is set in XG5000's basic parameter. Detection time of Watch-dog timer is set in XG5000's basic parameter.

(2) Watch-dog timer monitors scan progressing time during operation, and when the specified detection time if exceeded is detected, it will stop PLC operation immediately and then make all output off.

(3) If detection time of delayed operation (Scan Watch-dog Time) is expected to be exceeded in processing specific area of user program while being executed (with FOR ~ NEXT instruction, CALL instruction used), use 'WDT' instruction to clear the timer. 'WDT' instruction will initialize the elapsed time of the detection timer of delayed operation and restart to measure the time starting from 0.

(4) In order to delete the Watch-dog error status, let it powered back on, operate manual reset switch, or change the mode to STOP.



Notes

(1) Setting range of watch-dog timer is 10 ~ 1000ms (1ms unit).
(2) Please refer to 6.1 Self-diagnosis in XGK CPU manual for more details and 6.2 in XGB hardware manual.

2) I/O module check function

This function is used to check I/O module for error at start and during run.

(1) In case a module is installed different from specified in parameter or in error at start, or
(2) In case I/O module is displaced or in error during run,

Applicable error will be detected with warning lamp (ERR) on in front of CPU module and CPU will stop running.

If module installation error is detected, applicable bit in F area will be respectively ON as described below.

F area	Content	Note
F104[0~B]	Applicable slot bit will be On if module installed on main base is in installation error.	
F105[0~B]	Applicable slot bit will be On if module installed on expansion base step 1 is in installation error.	Not support-ed in XGB
F106[0~B]	Applicable slot bit will be On if module installed on expansion base step 2 is in installation error.	
F107[0~B]	Applicable slot bit will be On if module installed on expansion base step 3 is in installation error.	
F108[0~B]	Applicable slot bit will be On if module installed on expansion base step 4 is in installation error.	
F109[0~B]	Applicable slot bit will be On if module installed on expansion base step 5 is in installation error.	
F110[0~B]	Applicable slot bit will be On if module installed on expansion base step 6 is in installation error.	
F111[0~B]	Applicable slot bit will be On if module installed on expansion base step 7 is in installation error.	

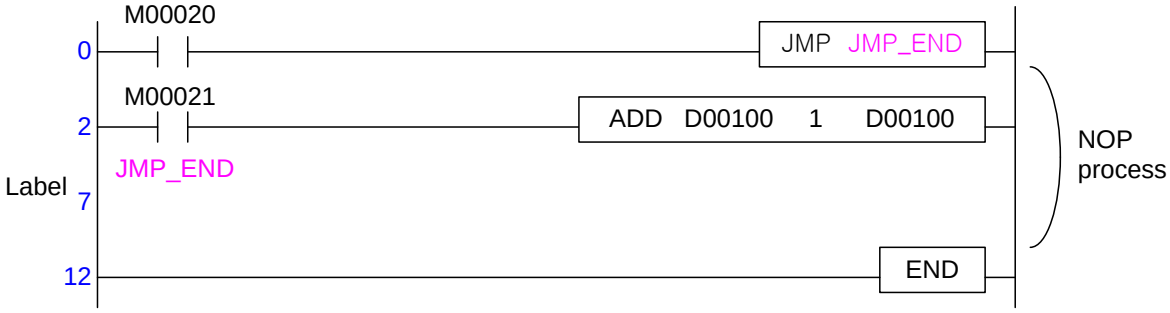
3) Checking battery voltage used for memory back-up (Not supported in XGB standard type)

It is used to detect the battery voltage lower than the memory back-up voltage and inform the user of the status. The warning lamp (BAT) will be on in front of CPU module. At this time, the battery error flag F00045 is turned on.
Please refer to 4.3.3 Battery durability in CPU manual for details on action to take.

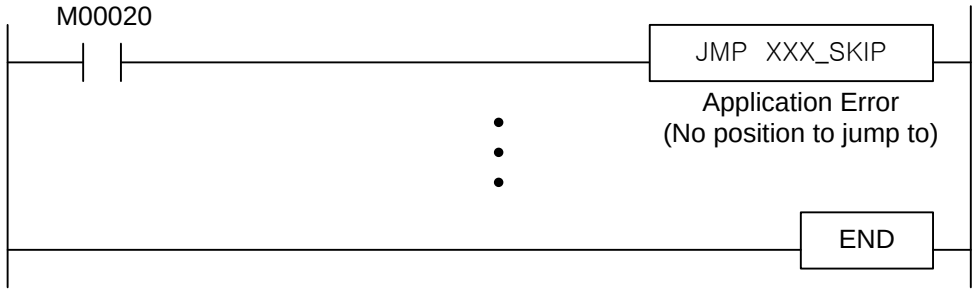
2.9 Program check function

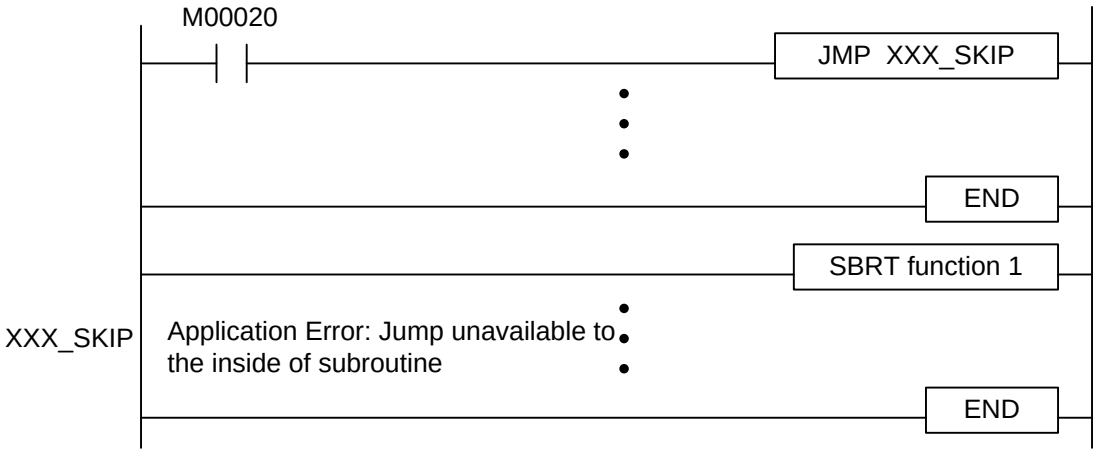
2.9.1 JMP-LABLE

1) The number of JMPs is 512 available for XGK, 128 for XGB in the whole program. If used JMPs exceed 512(XGK) or 128(XGB), no program will be downloaded.
With JMP conditions satisfied to jump to applicable label, all instructions between JMP instruction and LABEL will not be operated.



JMP instruction without label can not be downloaded as checked when downloading program. In addition, in case there is label inside SBRT – RET block, which is regarded error too, no program will be downloaded.

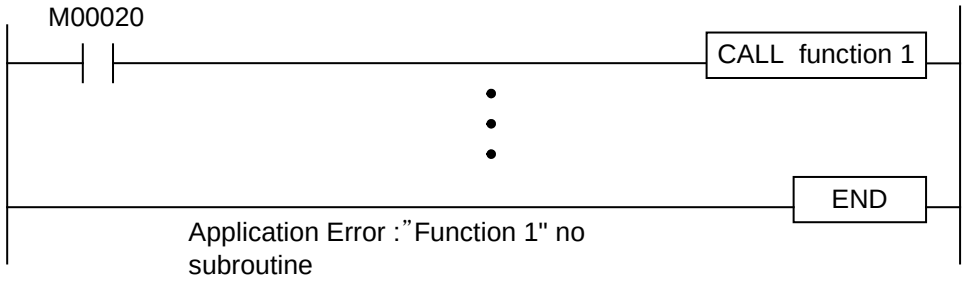




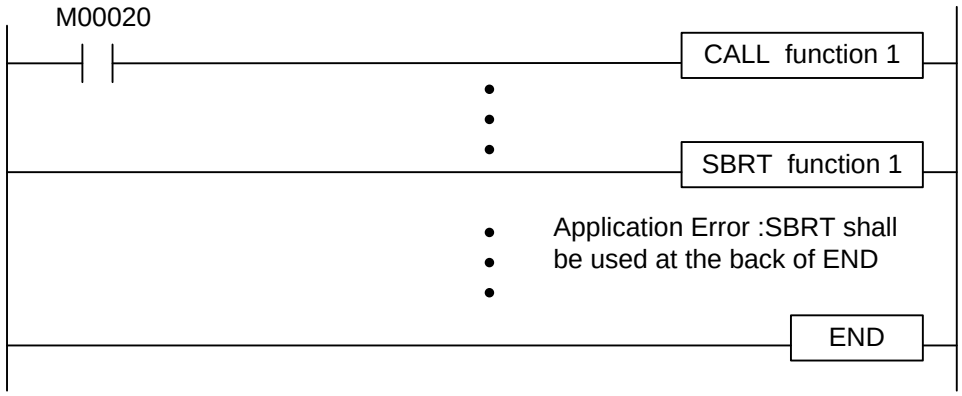
3) Please refer to Chapter 4.30.1 JMP, LABEL about the JMP-LABEL for more details.

2.9.2 CALL-SBRT/RET

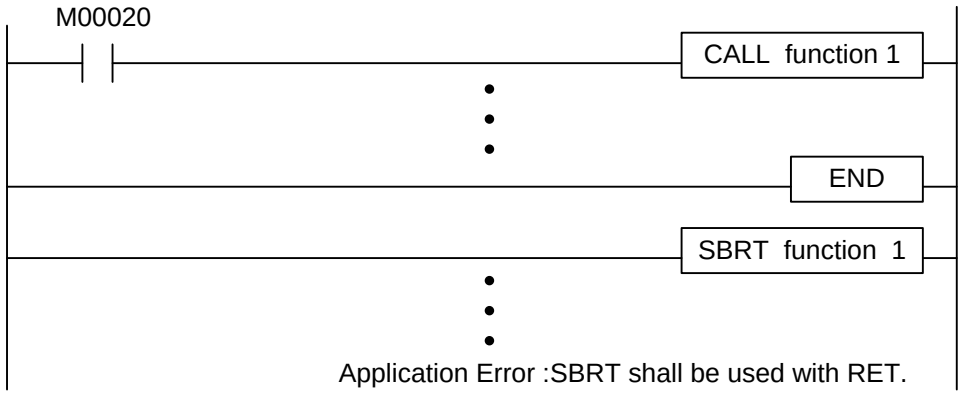
1) The number of SBRT is 512 available for XGK, 128 for XGB in the whole program. CALL instruction can be used as duplicated, but SBRT/RET can not be duplicated. If CALL instruction used, SBRT/RET instruction should be surely used.



2) The subroutine should be used at the back of END.



3) In addition, the subroutine should be finished by RET instruction. If SBRT and RET are used only without CALL, it can be set as Warning/Error in Inspect Program menu in XG5000.



4) Refer to Chapter 4.30.2 CALL, CALLP, SBRT, RET instruction about the CALL-SBRT/RET for more details.

2.9.3 MCS-MCSCLR

1) Interlock with higher priority will be first performed, and its cancellation in reverse order.

```
MCS          0 : High
             ↕    ≀
MCS          7 : LOW
```

2) If an interlock with higher priority cancel, interlocks with lower priority will be cancelled too.

```
MCS          0
MCS          1
                  ≀
MCSCLR       0 ( 0,1 all cancelled )
MCSCLR    1 : Error
```

3) Stand Alone or END, RET instruction included block will be processed as error.

```
MCS          0
                  ≀
 END
≀
 MCSCLR       0 : Error
```

4) Refer to Chapter 4.4.1 MCS, MCSCLR about the MCS-MCSCLR for more details.

2.9.4 FOR-NEXT / BREAK

1) Number of application times of FOR and NEXT instruction should be identical. FOR-NEXT Block Nesting is available up to 16 steps.
2) Stand Alone or END, RET instruction included block will be processed as error.
3) BREAK instruction should be positioned between FOR-NEXT.

```
LOAD      P0000
  FOR     1     : Normal
  FOR           2
  FOR           3
 ≀
  NEXT
  NEXT
  NEXT
 ≀
  END
```

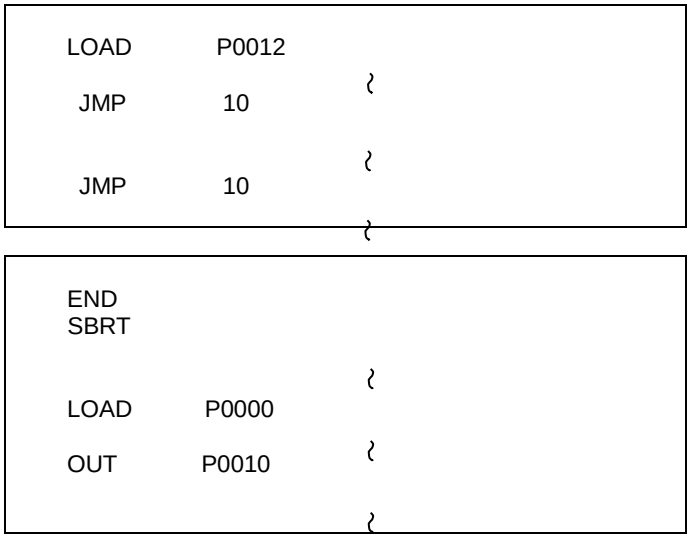
```
  LOAD      P0001
 ≀
  FOR       20
 ≀
  NEXT
  NEXT                    : Error
≀
  END
```

```
  LOAD      P0002
  FOR       20          : Error(Stand Alone)
 ≀
  END
 ≀
  NEXT                    : Error
  END
```

4) Please refer to chapter 4.31 Loop Instruction about the FOR-NEXT/BREAK for more details.

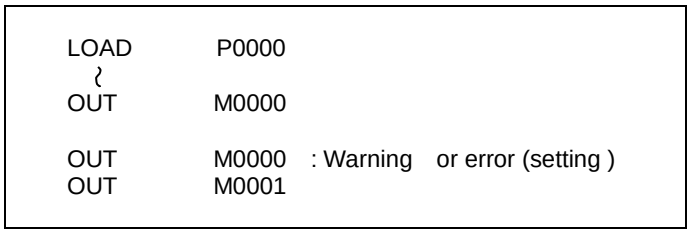
2.9.5 END/RET

In case there is no END instruction to complete 1 scan or no RET instruction to finish subroutine in the program, it will be regarded as error.



2.9.6 Duplicated Coil

If the same devices are programmed as duplicated among prepared instructions, it can be set as warning or error on Inspect Program menu in XG5000.



Notes

1) Item available for setting warning or error in XG5000
- Solely used label (without JMP)
- Solely used subroutine (without CALL)
- Duplicated coil processed

The item above can be processed with warning or error selected in Check Program menu of Menu - View in XG5000.

2.10 Error Handling

2.10.1 Error handling during RUN mode

If operation error is found during Run (indirectly specified address exceeded, BCD operation error, etc.), to keep running or not will be decided in Error Operation Setup (depends on setting of 'Continue running when an arithmetic error occurs') of XG5000 basic parameter settings item.
If 'Continue running when an arithmetic error occurs' is set PLC status keeps Run mode and PLC history record 'Continue running, arithmetic error, error step: XX, error code: XX' in System Log. If 'Continue running when an arithmetic error occurs' is not set the error information window will be pop-up and PLC is changed to Stop mode when error is occurred.
'Continue running when an arithmetic error occurs' is a default setting in basic parameter settings.

2.10.2 Error handling of error flag

F0110 checks for error whenever each instruction is executed to display ON (if abnormal) and OFF (if normal). However, instructions which are not under the influence of error will keep the previous status.
F0115 if once error occurs will be latched as kept ON. Thus, if an error is found in previous instruction and no error found in present instruction, F0110 will be OFF and F0115 will be ON.

Program	Result	F110	F115
ADD D0000 h0010 M020	Normal	Off	Off
MOV D0000 #D0010	error	On	On
LOAD P0000		On	On
INC D0000		Off	On
LOAD P0001		Off	On
WAND P001 M010 #D0400	error	On	On
LOAD P0002		On	On
WAND P001 M010 D0300		Off	On
CLE		Off	Off
WAND P001 M010 D0500	error	On	On
LOAD P0003		On	On

2.10.3 LED display of error

LED Name	Status	LED sign	
		XGK	XGB
RUN/STOP	Warning or error displayed during Run	Green flicker	-
	1. Warning or error displayed during Stop 2. If an error to stop Run detected	Red flicker	
ERR	If an error detected to make Run unavailable	On	Red flicker
BAT	Battery voltage low	On	-
CHK	1. When the 'Change module' switch is set to 'Change module'. 2. During run in 'Debug mode' 3. In 'Compulsory ON' setting status 4. If 'Error mask' or 'SKIP' flag is set. 5. If slight error (warning) is found during Run. 6. If extension base is in power error.	On	
	In case error occurred when 'Continue running when an arithmetic error occurs' is set at Error Operation Setup in XG5000 Basic Parameter Settings.	Red LED Blinking	

Notes

In case of CPU module error, please refer to 4.2 Part Names and Functions in CPU manual for details on LED display.

2.10.4 Error handling during RUN mode

Code	Cause of error	Action (Restart Mode After Action)	Operation Status	LED status	Diagnostics point
2	Data Bus Error	A / S request if repeated on power up	Error	Whole LEDs blink in regular order	Power on
3	Data RAM Error	A / S request if repeated on power up	Error	Blink in full LED order	Power on
4	Clock IC (RTC) Error	A / S request if repeated on power up	Error	ERR : On	Power on
6	Program memory error	A / S request if repeated on power up	Error	ERR : On	Power on
10	USB IC error	A / S request if repeated on power up	Error	ERR : On	Power on
11	backup RAM Error	A / S request if repeated on power up	Error	ERR : On	Power on
12	backup Flash Error	A / S request if repeated on power up	Error	ERR : On	Power on
13	Base information error	A / S request if repeated on power up	STOP	ERR : On	Power on RUN mode change
22	Backup flash memory program error	Restart after modifying program of backup Flash	Error	ERR : On	Reset Convert to RUN mode
23	Program execution error	Rerun after reloading program □ Change the battery in error □ Change CPU module if program reloaded is abnormal in preservation state	STOP	ERR : On	Reset Convert to RUN mode
24	I/O parameter error	Rerun after reloading I/O parameter □ Change the battery in error □ Change CPU module if I/O parameter reloaded is abnormal in preservation state	STOP	ERR : On	Reset Convert to RUN mode
25	Basic parameter error	Rerun after reloading basic parameter Change the battery in error Change CPU module if basic parameter reloaded is abnormal in preservation state	STOP	ERR : On	Reset Convert to RUN mode
26	Execution area exceeded error	Restart after downloading program A / S request when repeated	STOP	ERR : On	Reset Convert to RUN mode
27	Compile error	Restart after downloading program A / S request when repeated	STOP	ERR : On	Reset Convert to RUN mode
30	The module set in the parameter and the loaded module do not match.	Check the location of wrong slot with XG5000 and restart after modifying the module or parameter. Reference flag: module type mismatch error flag	STOP(RUN)	ERR : On (P.S. : On)	RUN mode change
31	Module failing during setup or during operation	Restart the module after checking the position of detach / additional slot with XG5000 and modifying the mounting status of the module. Reference flag: Module detach error flag	STOP(RUN)	ERR : On (P.S. : On)	Scan end
32	Fuse break of module with fuse during operation	Restart the fuse after replacing the fuse by checking the position of the slot where the fuse is broken by xG5000. Reference flag: Fuse break error flag	STOP(RUN)	ERR : On (P.S. : On)	Scan end
33	I / O module data is not normally accessed during operation	Check the location of the slot where access error occurred with XG5000, replace the module and restart (according to the parameter). Reference flag: I / O module read / write error flag	STOP(RUN)	ERR : On (P.S. : On)	Scan end

Code	Cause of error	Action (Restart Mode After Action)	Run Status	LED status	Diagnostics point
34	Special /link module data is not normally accessed during operation	Rerun after module replaced by checking for slot position where access error found via XG5000 (based on parameter) Reference flag : special/link module interface error	STOP(RUN)	ERR : On (P.S. : On)	Scan end
39	Abnormal stop of CPU or malfunction	Abnormal system shutdown due to noise or hardware failure 1) A / S request if repeated on power up 2) Noise measures implementation	STOP	RUN: On ERR : On	Always
40	The scan time of the program during operation exceeds the scan watchdog time specified by the parameter.	Check the the scan watchdog time time specified by the parameter and restart after modifying the parameter or program.	STOP	RUN: On ERR : On	While program executed
41	Operation error while user program executed	Eliminate operation error -> Reload program -> Rerun	STOP	RUN: On ERR : On	While program executed
42	Stack exceeds normal range while program executed	Restart	STOP	RUN: On ERR : On	While program executed
43	Duplicated base setup error	Reset after checking base setting switch	STOP	ERR : On	Reset Convert to RUN mode
44	Timer index user error	Start after modifying and reloading the timer index program	STOP(RUN)	RUN: On ERR : On	Scan end
50	Detecting critical error of external device by user program during operation	Repair and restart the wrong device by referring to the fault detection flag of the external device (according to the parameter).	STOP(RUN)	ERR : On (P.S. : On)	Scan end
55	The number of tasks waiting to run exceeds the specified range	If it occurs repeatedly after restarting, check the installation environment (A / S request if it still occurs)	STOP(RUN)	ERR : On (P.S. : On)	While program executed
60	E_STOP PLC Function	Remove the error factor that triggered the E_STOP function in the program and turn the power on again	STOP	RUN: On ERR : On	While program executed
61	Instruction error	When STOP: Correct the program by checking the operation error details with XG5000. When RUN: Refer to error step of F area	STOP(RUN)	ERR : On (P.S. : On)	While program executed
500	No data memory backup	If the battery is OK, turn the power back on. Switch to STOP mode in remote mode	STOP	ERR : On	Reset
501	Clock data abnormal	If there is no problem with the battery, resetting the time with a device such as XG5000.	-	CHK: On	Always
502	Low battery voltage	Battery change with power on	-	BAT: On	Always

2.10.5 Operation error code

Code	error	CPU state	Cause	Action
16	Indirect setting/index error	Run/Stop based on parameter setting	If operand with indirect setting or index used exceeds applicable device's range	Modify applicable step's indirect setting/index area
17	Group instruction range check error	Run/Stop based on parameter setting	If N value to set group range in group instructions exceeds device's range	Modify N value
18	0-division error	Run/Stop based on parameter setting	If divisor is 0, when Divide instructions (except RDIV, LDIV) executed.	Change the value of divisor to other than 0.
19	BCD convert error	Run/Stop based on parameter setting	If BCD related instruction's operand value exceeds BCD format.	Modify data to be within BCD displayed range.
20	File bank setting error	Run/Stop based on parameter setting	If bank setting value in file related instructions exceeds the max. bank range.	Modify bank setting value.
21	FPU operation related error	Run/Stop based on parameter setting	If an error occurs when real operation instruction is used.	Modify data
22	Data type conversion error	Run/Stop based on parameter setting	If available data size to display is different when converting data format(Real<->Integer) .	Modify data
23	BMOV error	Run/Stop based on parameter setting	If BMOV instruction's setting value exceeds 16.	Modify setting value
24	DECO/ENCO Error	Run/Stop based on parameter setting	With DECO, ENCO instruction used if range setting value exceeds 8.	Modify setting value
25	DIS/UNI error	Run/Stop based on parameter setting	With DIS/UNI instruction used if N value exceeds 4.	Modify N value
26	Data type related error	Run/Stop based on parameter setting	If data control related instruction's range is exceeded.	
27	Time Data Error	Run/Stop based on parameter setting	Time related instruction error	Modify time data
28	MUX error	Run/Stop based on parameter setting	MUX/DMUX instruction setting value error.	Modify setting value
29	Data table instruction error	Run/Stop based on parameter setting	FIINS, FIDEL instruction setting value error.	Modify setting value
30	SEG error	Run/Stop based on parameter setting	If the number to be converted among formats specified exceeds 4.	Modify setting value
31	ASCII value error	Run/Stop based on parameter setting	ASCII data related instruction error	Modify data
32	Position module setting axis error	Run/Stop based on parameter setting	If 3 or more axes are set with position module instruction used. (check only for 3 or more unconditionally)	Modify axis setting value.
33	String Process error	Run/Stop based on parameter setting	String process related instruction error refer to Instructions List.	Modify based on instructions.
34	SORT error	Run/Stop based on parameter setting	SORT/DSORT instruction setting error.	Modify setting value
35	FOR nesting error	Run/Stop based on parameter setting	If the number of FOR instruction's nesting exceeds 16.	Modify program
36	Task number error	Run/Stop based on parameter setting	If the task number is 96 or higher.	Modify task number
37	Device range check error	Run/Stop based on parameter setting	If the device area settings exceeds instruction specification.	Modify device area
38	Data related P2P setting error	Run/Stop based on parameter setting	If the setting related with P2P instruction exceeds the range.	Modify data

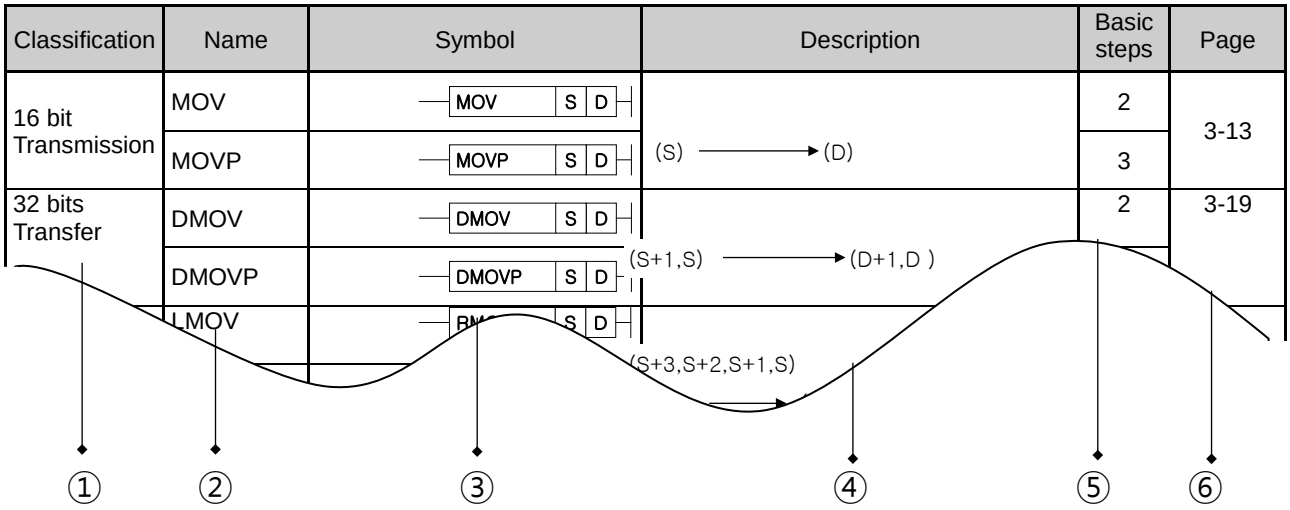
Chapter 3 Instruction List

3.1 Classifications of Instructions

Classification	Type of command	Content	Note
Basic Instructions	Contact Point Instruction	LOAD, AND, OR related Instructions	
	Unite Instruction	AND LOAD, OR LOAD, MPUSH, MLOAD, MPOP	
	Reverse Instruction	NOT	
	Master Control Instruction	MCS, MCSCLR	
	Output	OUT, SET, RST, 1 Scan Output Instruction, Output Reverse Instruction (FF)	
	Sequence/Last-input Preferred Instruction	Step Control Instruction (SET Sxx.xx, OUT Sxx.xx)	
	End Instruction	END	
	Non-Process Instruction	NOP	
	Timer Instruction	TON, TOFF, TMR, TMON, TRTG	
	Counter Instruction	CTD, CTU, CTUD, CTR	
Application Instructions	Data Transfer Instruction	Transfers specified Data, Group, String	4/ 8/ 64 bits available
	Conversion Instruction	Converts BIN/BCD of specified Data & Group	4/8 bits available
	Data Type Conversion Instruction	Converts Integer/Real Number	
	Output Terminal Compare Instruction	Saves compared results in special relay.	Compare to Unsigned
	Input Terminal Compare Instruction	Saves compared results in BR. Saves compared results in BR. Compares Real Number, String & Group. Compares 3 Operands.	Compare to Signed
	Increase/Decrease Instruction	Increases or decreases specified data 1 by 1	4/8 bits available
	Rotate Instruction	Rotates specified data to the left and right,including Carry.	4/8 bits available
	Move Instruction	Moves specified data to the left and right, word by word, bit by bit.	4/8 bits available
	Exchange Instruction	Exchanges between devices, higher , lower byte, group data	
	BIN Operation Instruction	Addition, Subtraction, Multiplication, Division for Integer/ Real Number, Addition for String, Addition & Subtraction for Group	
	BCD Operation Instruction	Addition, Subtraction, Multiplication, Division.	
	Logic Operation Instruction	Logic Multiplication, Logic Addition, Exclusive OR, Exclusive NOR, Group Operation.	
	System instruction	Error Display, WDT Initialize, Output Control, Operation Stop, etc.	
	Data Process Instruction	Encode, Decode, Data Disconnect/Connect, Search, Align, Max., Min., Total, Average, etc.	
	Data Table Process Instruction	Data Input/Output of Data Table	
	String Process Instruction	String related Convert, Comment Read, String Extract, ASCII Convert, HEX Convert, String Search, etc.	
	Special function instruction	Trigonometric Function, Exponential/Log Function, Angle/ Radian Convert, etc.	
	Data control instruction	Max/Min Limit Control, Dead-zone Control, Zone Control.	
	Time related Instruction	Date Time Data Read/Write, Time Data Adjust and Convert	
	Diverge Instruction	JMP, CALL	
	Loop Instruction	FOR/NEXT/BREAK	
	Flag related Instruction	Carry Flag Set/Reset, Error Flag Clear.	
	Special/Communication related Instruction	Data Read/Write by BUSCON Direct Access.	
	Interrupt related Instruction	Interrupt Enable/Disable	
	Sign Reverse Instruction	Reverse Integer/Real Signs, Absolute Value Operation.	

3.2 How to See Instruction List

* How to see XGK Instructions list is as follows.



① Classification: classifies instructions into applications.

② Designations: displays instruction names to be used in program.

- Display rules: Instructions shall be basically displayed in word unit. According to data size, operation characteristics, real number data process, string process, the rules are as follows;
- Based on Data Size & Type

D: stands for Double Word related instruction.
R: stands for Single Real Number related instruction.
L: stands for Double Real Number related instruction.
$: stands for String related instruction.
G: stands for Group operation.
4: stands for Nibble related instruction, used only at the back of instruction.
8: stands for Byte related instruction, used only at the back of instruction.
3: stands for process instruction for 3 operands, used only at the back of instruction.

- Based on Operation Characteristics

P: stands for 1 time executable instruction when input signal is changed OFF → ON, used only at the back of instruction.

③ Symbol: displays symbols used in program, showing the number of used operands and the type of Source or Destination.

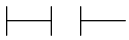
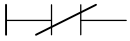
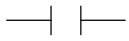
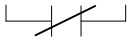
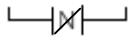
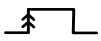
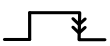
Operand display rules are as follows.
S: stands for Source, with data value not changed after calculated. At the moment, Data Size depends on used instruction.
D: stands for Destination, with data value changeable after calculated. At the moment, Data Size depends on used instruction.
N, n: displays the number to process.
St, En: stands for Start and End, used only in BSFT & WSFT.
Sb: stands for Source in case Bit Position is specified, mostly used in Nibble/Byte instruction.
Db: stands for Destination in case Bit Position is specified, mostly used in Nibble/Byte instruction.
Z: stands for control word, which means previously specified format as based on each instruction.
T, t(Ts, Tv) : stands for timer area and setting value.

④ Description: describes general functions of instruction.

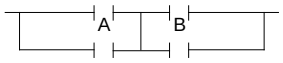
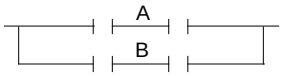
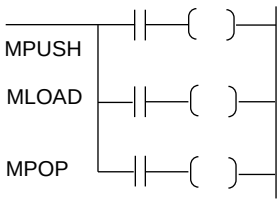
⑤ Basic: stands for the number of Basic Steps of instruction, which means the number of steps in case indirect specification, index formula and direct variable input were not used.

3.3 Basic Instructions

3.3.1 Contact-point instruction

Classification	Name	Symbol	Description	Basic steps	Note
Contact Point	LOAD		A Contact Point Operation Start	1	
	LOAD NOT		B Contact Point Operation Start	1	
	AND		A Contact Point Series-Connected	1	
	AND NOT		B Contact Point Series-Connected	1	
	OR		A Contact Point Parallel-Connected	1	
	OR NOT		B Contact Point Parallel-Connected	1	
	LOADP		Positive Convert Detected Contact Point	2	
	LOADP NOT		Positive Convert Detected B Contact Point	2	
	LOADN		Negative Convert Detected Contact Point	2	
	LOADN NOT		Negative Convert Detected B Contact Point	2	
	ANDP		Positive Convert Detected Contact Point Series-Connected	2	
	ANDP NOT		Positive Convert Detected B Contact Point Series-Connected	2	
	ANDN		Negative Convert Detected Contact Point Series-Connected	2	
	ANDN NOT		Negative Convert Detected B Contact Point Series-Connected	2	
	ORP		Positive Convert Detected Contact Point Parallel-Connected	2	
	ORP NOT		Positive Convert Detected B Contact Point Parallel-Connected	2	
	ORN		Negative Convert Detected Contact Point Parallel-Connected	2	
	ORN NOT		Negative Convert Detected B Contact Point Parallel-Connected	2	
	R_EDGE		Positive Convert Detected	1.5	
	F_EDGE		Negative Convert Detected	1.5	

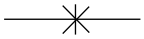
3.3.2 Unite instruction

Classification	Name	Symbol	Description	Basic steps	Note
Unite	AND LOAD		A,B Block Series-Connected	1	
	OR LOAD		A,B Block Parallel-Connected	1	
	MPUSH		Operation Result Push up to present	1	
	MLOAD		Operation Result Load Previous to Diverge Point	1	
	MPOP		Operation Result Pop Previous to Diverge Point	1	

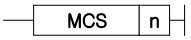
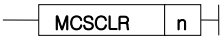
Notes

(1) The number of Basic Steps means the case that indirect specification, index formula and direct variable input were not used. In other words, it represents the minimum number of the steps of the applicable instruction.
(2) The number of steps depends on indirect specification, index formula and pulse application used.

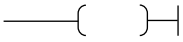
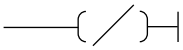
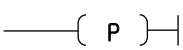
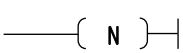
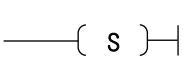
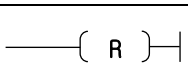
3.3.3 Reversion instruction

Classification	Name	Symbol	Description	Basic steps	Note
Reversal	NOT		Previous Operation results Reverse	1	

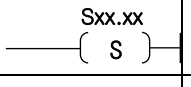
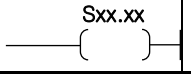
3.3.4 Master Control instruction

Classification	Name	Symbol	Description	Basic steps	Note
Master Control	MCS		Master Control Setting (n:0~7)	1	
	MCSCLR		Master Control Cancel (n:0~7)	1	

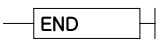
3.3.5 Output instruction

Classification	Name	Symbol	Description	Basic steps	Note
Output	OUT		Operation Results Output	1	
	OUT NOT		Operation Results Reverse Output	1	
	OUTP		1 Scan Output if Input Condition rises	2	
	OUTN		1 Scan Output if Input Condition falls	2	
	SET		Contact Point Output On kept	1	
	RST		Contact Point Output Off kept	1	
	FF		Output Reverse if Input Condition rises	1	

3.3.6 Sequence/Last-input preferred instruction

Classification	Name	Symbol	Description	Basic steps	Note
Step control	SET S		Sequence Control	1	
	OUT S		Last-input Preferred	1	

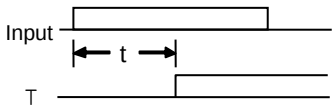
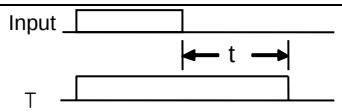
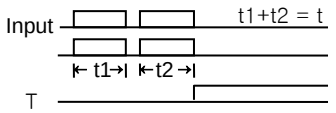
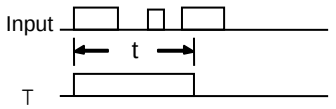
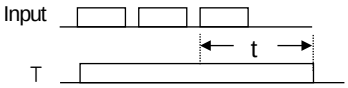
3.3.7 End instruction

Classification	Name	Symbol	Description	Basic steps	Note
End	END		Program End	1	

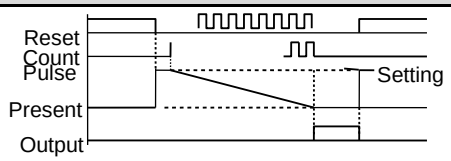
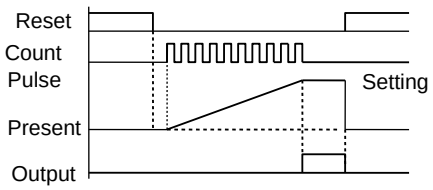
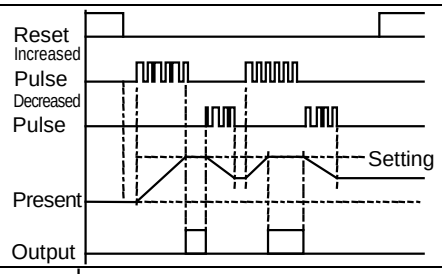
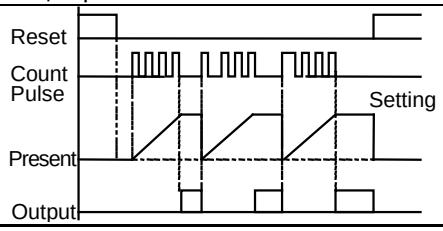
3.3.8 Non-process instruction

Classification	Name	Symbol	Description	Basic steps	Note
Non-Process	NOP	Ladder not displayed	Non-process Instruction, used in Mnemonic	1	

3.3.9 Timer instruction

Classification	Name	Symbol	Description	Basic steps	Note
Timer	TON	TON T t		2	
	TOFF	TOFF T t		2	
	TMR	TMR T t		2	
	TMON	TMON T t		2	
	TRTG	TRTG T t		2	

3.3.10 Counter instruction

Classification	Name	Symbol	Description	Basic steps	Note
Counter	CTD	CTD C c		2	
	CTU	CTU C c		2	
	CTUD	CTUD C U D c		4	
	CTR	CTR C c		2	

3.4 Application Instruction

3.4.1 Data transfer instruction

Classification	Name	Symbol	Description	Basic steps	Note
16 bit Transmission	MOV	MOV S D	(S) → (D)	2	
	MOVP	MOVP S D		3	
32 bit Transmission	DMOV	DMOV S D	(S+1,S) → (D+1,D)	2	
	DMOVP	DMOVP S D		3	
Short Real Number Transfer	RMOV	RMOV S D	(S+1,S) → (D+1,D)	2	
	RMOVP	RMOVP S D		3	
Long Real Number Transfer	LMOV	LMOV S D	(S+3,S+2,S+1,S) → (D+3,D+2,D+1,D)	2	
	LMOVP	LMOVP S D		3	
4 bit Transmission	MOV4	MOV4 Sb Db	(Sb):Bit, b15, b0, 4bit, (Db):Bit	3	
	MOV4P	MOV4P Sb Db		4	
8 bit Transmission	MOV8	MOV8 Sb Db	(Sb):Bit, b15, b0, 8bit, (Db):Bit	3	
	MOV8P	MOV8P Sb Db		4	
1's complement Transmission	CMOV	CMOV S D	(S) 1's → (D)	2	
	CMOVP	CMOVP S D		3	
	DCMOV	DCMOV S D	(S+1,S) 1's → (D+1,D)	2	
	DCMOVP	DCMOVP S D		3	
16 bits Group Transfer	GMOV	GMOV S D N	(S), (D), N	4	
	GMOVP	GMOVP S D N			
Multiple Transfer	FMOV	FMOV S D N	(S), (D), N	4	
	FMOVP	FMOVP S D N			
Specified Bits Transfer	BMOV	BMOV S D Z	b15, b0, (S), (D), * Z: Control Word	4	
	BMOVP	BMOVP S D Z			
Specified Bits Group Transfer	GBMOV	GBMOV S D Z N	(S) : (S+N), (D) : (D+N), b15, b0, N, * Z: Control Word	4	
	GBMOVP	GBMOVP S D Z N		5	

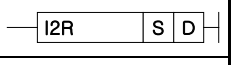
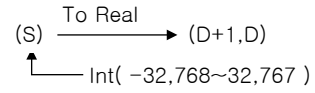
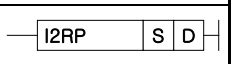
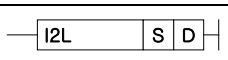
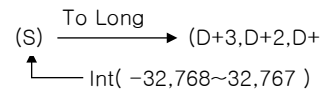
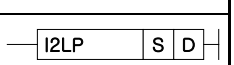
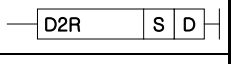
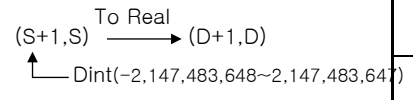
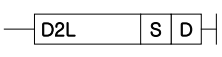
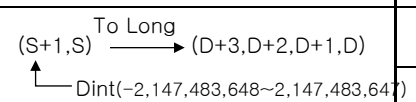
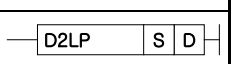
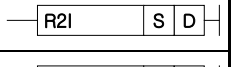
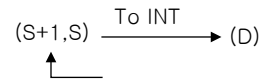
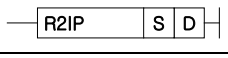
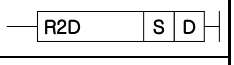
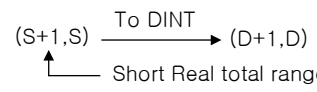
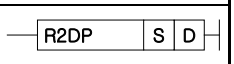
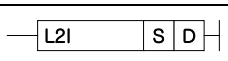
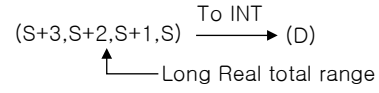
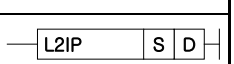
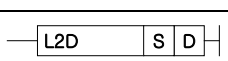
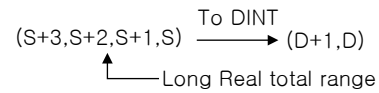
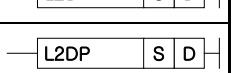
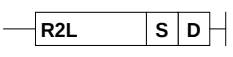
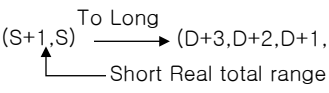
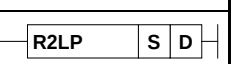
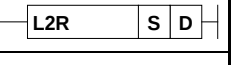
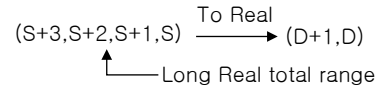
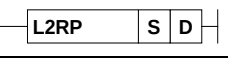
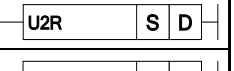
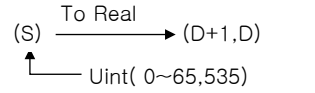
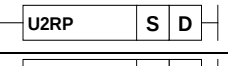
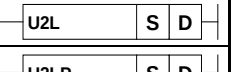
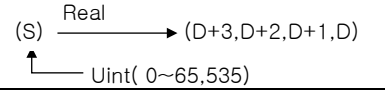
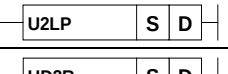
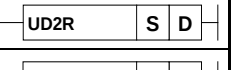
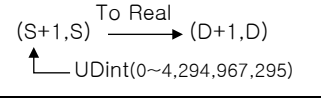
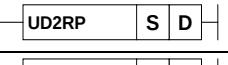
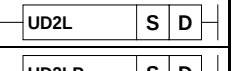
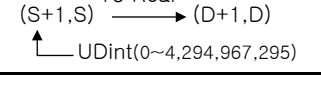
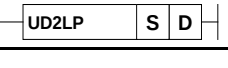
3.4.1 Data Transfer Instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
String Transmission	$MOV	$MOV S D	String started from (S) → String started from (D)	2	
	$MOVP	$MOVP S D		3	

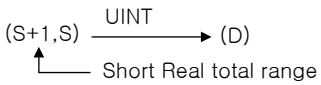
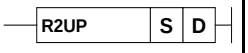
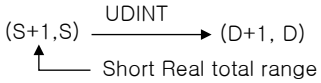
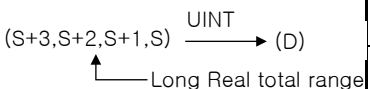
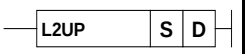
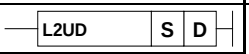
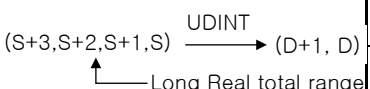
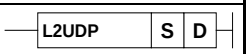
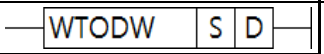
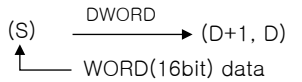
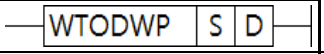
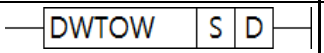
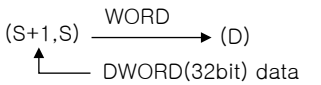
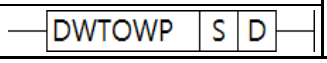
3.4.2 BCD/BIN conversion instruction

Classification	Name	Symbol	Description	Basic steps	Note
BCD Conversion	BCD	BCD S D	To BCD (S) → (D); BIN(0~9999)	2	
	BCDP	BCDP S D		3	
	DBCD	DBCD S D	To BCD (S+1,S) → (D+1,D); BIN(0~99999999)	2	
	DBCDP	DBCDP S D		3	
4/8 Bits BCD Conversion	BCD4	BCD4 Sb Db	(Sb):Bit, BIN(0~9); b15 b0; To 4bit BCD; (Db):Bit	3	
	BCD4P	BCD4P Sb Db		4	
	BCD8	BCD8 Sb Db	(Sb):Bit, BIN(0~99); b15 b0; To 8bit BCD; (Db):Bit	3	
	BCD8P	BCD8P Sb Db		4	
BIN Conversion	BIN	BIN S D	To BIN (S) → (D); BCD(0~9999)	2	
	BINP	BINP S D		3	
	DBIN	DBIN S D	To BIN (S+1,S) → (D+1,D); BCD(0~99999999)	2	
	DBINP	DBINP S D		3	
4/8 Bits BIN Conversion	BIN4	BIN4 Sb Db	(Sb):Bit, BCD(0~9); b15 b0; To 4bit BIN; (Db):Bit	3	
	BIN4P	BIN4P Sb Db		4	
	BIN8	BIN8 Sb Db	(Sb):Bit, BCD(0~99); b15 b0; To 8bit BIN; (Db):Bit	3	
	BIN8P	BIN8P Sb Db		4	
Group BCD,BIN Conversion	GBCD	GBCD S D N	Data (S) to N converted to BCD, and (D) to N saved.	4	
	GBCDP	GBCDP S D N			
	GBIN	GBIN S D N	Data (S) to N converted to BIN, and (D) to N saved	4	
	GBINP	GBINP S D N			

3.4.3 Data type conversion instruction

Classification	Name	Symbol	Description	Basic steps	Note
16 Bits Integer/Real Conversion	I2R			2	
	I2RP			3	
	I2L			2	
	I2LP			3	
32 Bits Integer/Real Conversion	D2R			2	
	D2RP			3	
	D2L			2	
	D2LP			3	
Short Real/Integer Conversion	R2I			2	
	R2IP			3	
	R2D			2	
	R2DP			3	
Long Real/Integer Conversion	L2I			2	
	L2IP			3	
	L2D			2	
	L2DP			3	
Short Real Long Real Conversion	R2L			2	
	R2LP			3	
Long Real Short Real Conversion	L2R			2	
	L2RP			3	
16bit unsigned integer/Real conversion	U2R			2	
	U2RP			3	
	U2L			2	
	U2LP			3	
32bit unsigned integer/Real conversion	UD2R			2	
	UD2RP			3	
	UD2L			2	
	UD2LP			3	

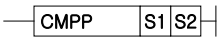
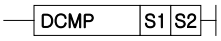
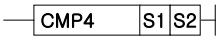
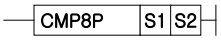
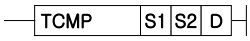
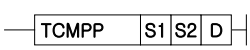
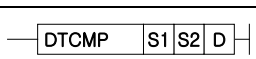
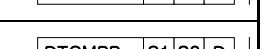
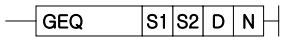
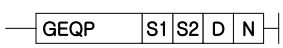
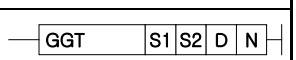
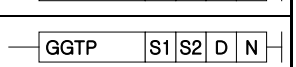
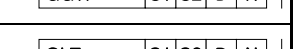
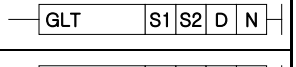
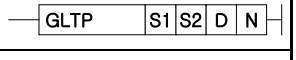
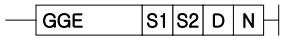
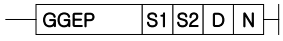
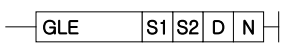
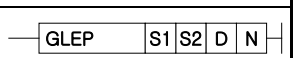
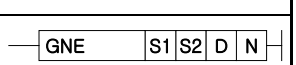
3.4.3 Data type conversion instruction (Cont.)

Classification	Name	Symbol	Description	Basic steps	Note
Short Real Unsigned integer Conversion	R2U			2	
	R2UP			3	
	R2UD			2	
	R2UDP			3	
Long Real Unsigned integer Conversion	L2U			2	
	L2UP			3	
	L2UD			2	
	L2UDP			3	
WORD /DWORD Conversion	WTODW			4	
	WTODWP			4	
	DWTOW			4	
	DWTOWP			4	

Notes

In XGK, integer and real values are stored in completely different formats. For this reason, , Real Number Data should be converted as applicable before used for Integer Operation.

3.4.4 Comparison instruction

Classification	Name	Symbol	Description	Basic steps	Note
Unsigned Compare with Special Relay used	CMP		CMP(S1,S2) and applicable Flag Set (S1, S2 is Word)	2	
	CMPP			3	
	DCMP		CMP(S1,S2) and applicable Flag Set (S1, S2 is Double word)	2	
	DCMPP			3	
4/8 Bits Compare	CMP4		CMP(S1,S2) and applicable Flag Set (S1, S2 is nibble)	3	
	CMP4P			4	
	CMP8		CMP(S1,S2) and applicable Flag Set (S1, S2 is byte)	3	
	CMP8P			4	
Table Compare	TCMP		CMP(S1,S2)): CMP(S1+15,S2+15) Result:(D) ~ (D+15), 1 if identical	4	
	TCMPP				
	DTCMP		CMP((S1+1,S1),(S2+1,S2)): CMP((S1+31,S1+30),(S2+31,S2+30)) Result:(D) ~ (D+15)	4	
	DTCMPP				
Group Compare(16 Bits)	GEQ		Compares S1 data to S2 data word by word, and saves its result in Device (D) bit by bit from the lower bit. (N ≤ 16)	4	
	GEQP				
	GGT			4	
	GGTP				
	GLT			4	
	GLTP				
	GGE			4	
	GGEP				
	GLE			4	
	GLEP				
	GNE			4	
	GNEP				

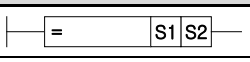
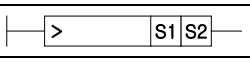
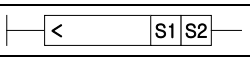
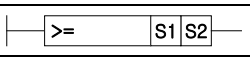
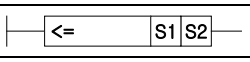
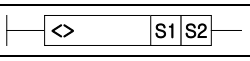
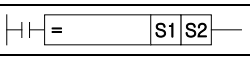
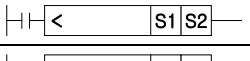
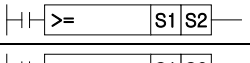
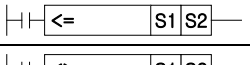
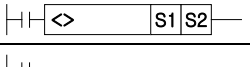
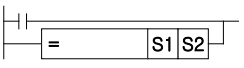
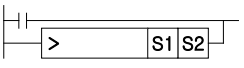
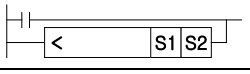
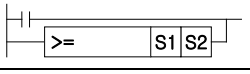
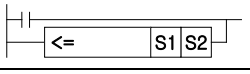
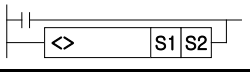
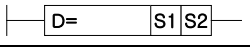
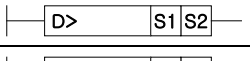
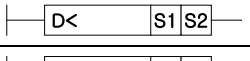
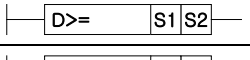
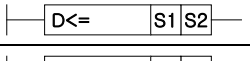
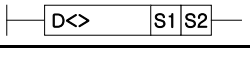
Notes

CMP(P), DCMP(P), CMP4(P), CMP8(P), TCMP(P) , DTCMP(P) Instructions all process the results of Unsigned Compare. All the other Compare Instructions will perform Signed Compare.

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Group Compare(32 Bits)	GDEQ	GDEQ S1 S2 D N	Compares S1 data to S2 data by 2 word, and saves its result in Device (D) bit by bit from the lower bit. (N ≤ 16)	4	
	GDEQP	GDEQP S1 S2 D N			
	GDGT	GDGT S1 S2 D N		4	
	GDGTP	GDGTP S1 S2 D N			
	GDLT	GDLT S1 S2 D N		4	
	GDLTP	GDLTP S1 S2 D N			
	GDGE	GDGE S1 S2 D N		4	
	GDGEP	GDGEP S1 S2 D N			
	GDLE	GDLE S1 S2 D N		4	
	GDLEP	GDLEP S1 S2 D N			
	GDNE	GDNE S1 S2 D N		4	
	GDNEP	GDNEP S1 S2 D N			

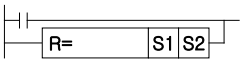
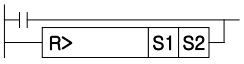
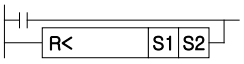
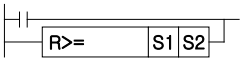
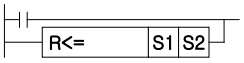
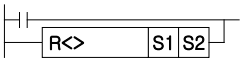
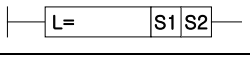
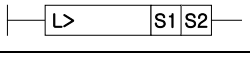
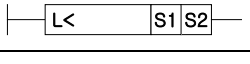
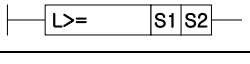
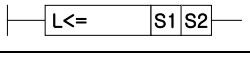
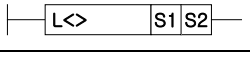
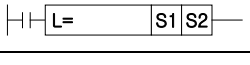
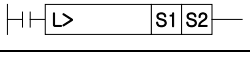
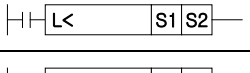
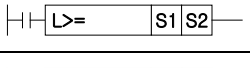
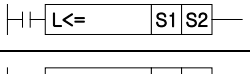
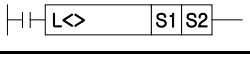
3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
16 bit Data compare(LOAD)	LOAD=		Compares (S1) to (S2), and saves its result in Bit Result(BR) (Signed Operation)	2	
	LOAD>				
	LOAD<				
	LOAD>=				
	LOAD<=				
	LOAD<>				
16 bit Data compare(AND)	AND=		Performs AND operation of (S1) & (S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	2	
	AND>				
	AND<				
	AND>=				
	AND<=				
	AND<>				
16 Bit data Compare(OR)	OR=		Performs OR operation of (S1) & (S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	2	
	OR>				
	OR<				
	OR>=				
	OR<=				
	OR<>				
32 bit Data compare(LOAD)	LOADD=		Compares (S1) to (S2), and saves its result in Bit Result(BR) (Signed Operation)	2	
	LOADD>				
	LOADD<				
	LOADD>=				
	LOADD<=				
	LOADD<>				

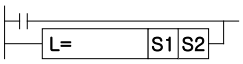
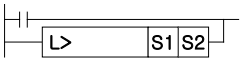
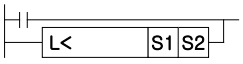
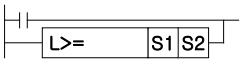
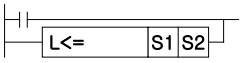
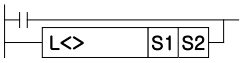
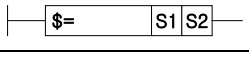
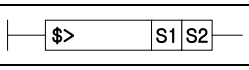
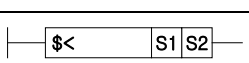
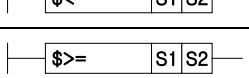
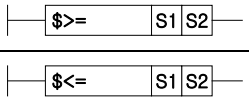
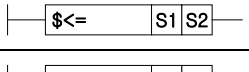
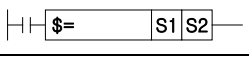
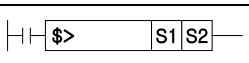
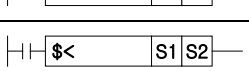
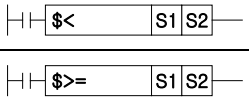
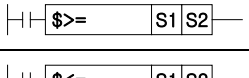
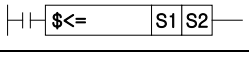
3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
32 bit Data compare(AND)	ANDD=	D= S1 S2	Performs AND operation of (S1) & (S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	2	
	ANDD>	D> S1 S2			
	ANDD<	D< S1 S2			
	ANDD>=	D>= S1 S2			
	ANDD<=	D<= S1 S2			
	ANDD<>	D<> S1 S2			
32 bit Data compare(OR)	ORD=	D= S1 S2	Performs OR operation of (S1) & (S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	2	
	ORD>	D> S1 S2			
	ORD<	D< S1 S2			
	ORD>=	D>= S1 S2			
	ORD<=	D<= S1 S2			
	ORD<>	D<> S1 S2			
Short Real Number Compare(LOAD)	LOADR= Performs	R= S1 S2	Performs OR operation of (S1) & (S2) Compare Result and Bit Result (BR), and then saves its result in BR (Signed Operation)	2	
	LOADR>	R> S1 S2			
	LOADR<	R< S1 S2			
	LOADR>=	R>= S1 S2			
	LOADR<=	R<= S1 S2			
	LOADR<>	R<> S1 S2			
Short Real Number Compare(AND)	ANDR=	R= S1 S2	Compares (S1+1,S) to (S2+1,S2) and saves its result in Bit Result (BR) (Signed Operation)	2	
	ANDR>	R> S1 S2			
	ANDR<	R< S1 S2			
	ANDR>=	R>= S1 S2			
	ANDR<=	R<= S1 S2			
	ANDR<>	R<> S1 S2			

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Short Real Number Compare(OR)	ORR=		Compares (S1+1,S1) to (S2+1,S2) and saves its result in Bit Result (BR) (Signed Operation)	2	
	ORR>				
	ORR<				
	ORR>=				
	ORR<=				
	ORR<>				
Long Real Number Compare(LOAD)	LOADL=		Compares (S1+1,S1) to (S2+1,S2) and saves its result in Bit Result (BR) (Signed Operation.	2	
	LOADL>				
	LOADL<				
	LOADL>=				
	LOADL<=				
	LOADL<>				
Long Real Number Compare(AND)	ANDL=		Performs AND operation of (S1+ 1,S1) & (S2+1,S2) Compare Result and Bit Result(BR), and then saves its result in BR (Signed Operation).	2	
	ANDL>				
	ANDL<				
	ANDL>=				
	ANDL<=				
	ANDL<>				

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Long Real Number Compare(OR)	ORL=		Performs OR operation of (S1 +1,S1) & (S2+1,S2) Compare Result and Bit Result(BR), and then saves its result in BR (Signed Operation).	2	
	ORL>				
	ORL<				
	ORL>=				
	ORL<=				
	ORL<>				
String Compare(LOAD)	LOAD$=		Compares (S1) to (S2) Starting String and saves its result in Bit Result(BR).	2	
	LOAD$>				
	LOAD$<				
	LOAD$>=				
	LOAD$<=				
	LOAD$<>				
String Compare(AND)	AND$=		Performs AND operation of (S 1) & (S2) Starting String Compare Result and Bit Result(BR), and then saves its result in BR.	2	
	AND$>				
	AND$<				
	AND$>=				
	AND$<=				
	AND$<>				

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
String Compare(OR)	OR$=	$= S1 S2	Performs OR operation of (S1) & (S2) Starting String Compare Result and Bit Result(BR), and then saves its result in BR.	2	
	OR$>	$> S1 S2			
	OR$<	$< S1 S2			
	OR$>=	$>= S1 S2			
	OR$<=	$<= S1 S2			
	OR$<>	$<> S1 S2			
16 bit Data Group compare(LOAD)	LOADG=	G= S1 S2 N	Compares (S1), (S1+1), …, (S1+N) to (S2), (S2+1), … , (S2+N) 1 to 1, and then saves 1 in Bit Result(BR) if each value compared meets given condition.	4	
	LOADG>	G> S1 S2 N			
	LOADG<	G< S1 S2 N			
	LOADG>=	G>= S1 S2 N			
	LOADG<=	G<= S1 S2 N			
	LOADG<>	G<> S1 S2 N			
16 bit Data Group compare(AND)	ANDG=	G= S1 S2 N	Performs AND operation of (S1), (S1+1), …, (S1+N) & (S2), (S2+1), … , (S2+N) 1 to 1 Compare Result and Bit Result (BR), and then saves its result in BR.	4	
	ANDG>	G> S1 S2 N			
	ANDG<	G< S1 S2 N			
	ANDG>=	G>= S1 S2 N			
	ANDG<=	G<= S1 S2 N			
	ANDG<>	G<> S1 S2 N			
16 bit Data Group compare(OR)	ORG=	G= S1 S2 N	Performs OR operation of (S1), (S1+1), …, (S1+N) & (S2), (S2+1), … , (S2+N) 1 to 1 Compare Result and Bit Result (BR), and then saves its result in BR.	4	
	ORG>	G> S1 S2 N			
	ORG<	G< S1 S2 N			
	ORG>=	G>= S1 S2 N			
	ORG<=	G<= S1 S2 N			
	ORG<>	G<> S1 S2 N			

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
32 bit Data Group compare(LOAD)	LOADDG=	DG= S1 S2 N	Compares (S1), (S1+1), …, (S1+N) to (S2), (S2+1), … , (S2+N) 1 to 1, and then saves 1 in Bit Result(BR) if each value compared meets given condition.	4	
	LOADDG>	DG> S1 S2 N			
	LOADDG<	DG< S1 S2 N			
	LOADDG>=	DG>= S1 S2 N			
	LOADDG<=	DG<= S1 S2 N			
	LOADDG<>	DG<> S1 S2 N			
32 bit Data Group compare(AND)	ANDDG=	DG= S1 S2 N	Performs AND operation of (S1), (S1+1), …, (S1+N) & (S2), (S2+1), … , (S2+N) 1 to 1 Compare Result and Bit Result (BR), and then saves its result in BR.	4	
	ANDDG>	DG> S1 S2 N			
	ANDDG<	DG< S1 S2 N			
	ANDDG>=	DG>= S1 S2 N			
	ANDDG<=	DG<= S1 S2 N			
	ANDDG<>	DG<> S1 S2 N			
32 bit Data Group compare(OR)	ORDG=	DG= S1 S2 N	Performs OR operation of (S1), (S1+1), …, (S1+N) & (S2), (S2+1), … , (S2+N) 1 to 1 Compare Result and Bit Result (BR), and then saves its result in BR.	4	
	ORDG>	DG> S1 S2 N			
	ORDG<	DG< S1 S2 N			
	ORDG>=	DG>= S1 S2 N			
	ORDG<=	DG<= S1 S2 N			
	ORDG<>	DG<> S1 S2 N			

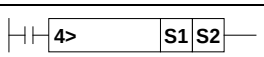
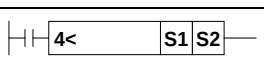
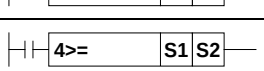
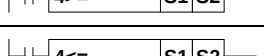
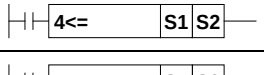
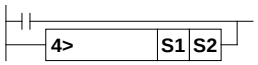
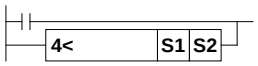
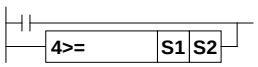
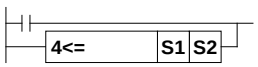
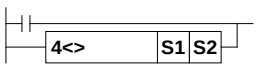
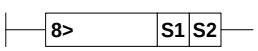
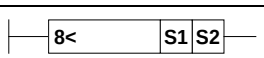
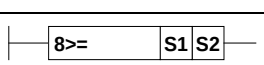
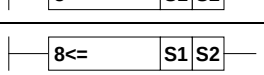
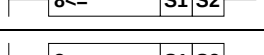
3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Three 16-Bit Data Compare(LOAD)	LOAD3=	=3 S1 S2 S3	Saves 1 in Bit Result(BR) if each value of (S1), (S2), (S3) meets given condition.	4	
	LOAD3>	>3 S1 S2 S3			
	LOAD3<	<3 S1 S2 S3			
	LOAD3>=	>=3 S1 S2 S3			
	LOAD3<=	<=3 S1 S2 S3			
	LOAD3<>	<>3 S1 S2 S3			
Three 16-Bit Data Compare(AND)	AND3=	=3 S1 S2 S3	Performs AND operation of (S1), (S2), (S3) Compare Result by given condition and Bit Result (BR), and then saves its result in BR.	2	
	AND3>	>3 S1 S2 S3			
	AND3<	<3 S1 S2 S3			
	AND3>=	>=3 S1 S2 S3			
	AND3<=	<=3 S1 S2 S3			
	AND3<>	<>3 S1 S2 S3			
Three 32-Bit Data Compare(OR)	OR3=	=3 S1 S2 S3	Performs OR operation of (S1), (S2), (S3) Compare Result by given condition and Bit Result (BR), and then saves its result in BR.	4	
	OR3>	>3 S1 S2 S3			
	OR3<	<3 S1 S2 S3			
	OR3>=	>=3 S1 S2 S3			
	OR3<=	<=3 S1 S2 S3			
	OR3<>	<>3 S1 S2 S3			
Three 16-Bit Data Compare(LOAD)	LOADD3=	D=3 S1 S2 S3	Saves 1 in Bit Result(BR) if each value of (S1+1,S1), (S2+1,S2), (S3+1,S3) meets given condition.	4	
	LOADD3>	D>3 S1 S2 S3			
	LOADD3<	D<3 S1 S2 S3			
	LOADD3>=	D>=3 S1 S2 S3			
	LOADD3<=	D<=3 S1 S2 S3			
	LOADD3<>	D<>3 S1 S2 S3			

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Three 32-Bit Data Compare(AND)	ANDD3=	D=3 S1 S2 S3	Performs AND operation of (S1 +1, S1), (S2 +1, S2), (S3 +1, S3) Compare Result by given condition and Bit Result (BR), and then saves its result in BR.	4	
	ANDD3>	D>3 S1 S2 S3			
	ANDD3<	D<3 S1 S2 S3			
	ANDD3>=	D>=3 S1 S2 S3			
	ANDD3<=	D<=3 S1 S2 S3			
	ANDD<>	D<>3 S1 S2 S3			
Three 32-Bit Data Compare(OR)	ORD3=	D=3 S1 S2 S3	Performs OR operation of (S1 +1, S1), (S2 +1, S2), (S3 +1, S3) Compare Result by given condition and Bit Result (BR), and then saves its result in BR.	4	
	ORD3>	D>3 S1 S2 S3			
	ORD3<	D<3 S1 S2 S3			
	ORD3>=	D>=3 S1 S2 S3			
	ORD3<=	D<=3 S1 S2 S3			
	ORD3<>	D<>3 S1 S2 S3			
4 bit Data compare(LOAD)	LOAD4=	4= S1 S2	Performs LOAD compare operation of (S1), (S2) as Nibble unit by given condition and then saves its result in Bit Result (BR).(Unsigned opereation)	3	
	LOAD4>	4> S1 S2			
	LOAD4<	4< S1 S2			
	LOAD4>=	4>= S1 S2			
	LOAD4<=	4<= S1 S2			
	LOAD4<>	4<> S1 S2			

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
4 bit Data compare(AND)	AND4=		Performs compare operation of (S1), (S2) as Nibble unit, after AND operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	3	
	AND4>				
	AND4<				
	AND4>=				
	AND4<=				
	AND4<>				
4 bit Data compare(OR)	OR4=		Performs compare operation of (S1), (S2) as Nibble unit, after OR operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	3	
	OR4>				
	OR4<				
	OR4>=				
	OR4<=				
	OR4<>				
8 bit Data compare(LOAD)	LOAD8=		Performs LOAD compare operation of (S1), (S2) as Byte unit and then saves its result in Bit Result (BR).(Unsigned operation)	3	
	LOAD8>				
	LOAD8<				
	LOAD8>=				
	LOAD8<=				
	LOAD8<>				

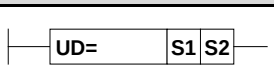
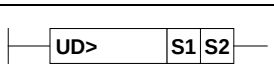
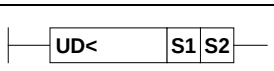
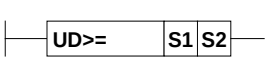
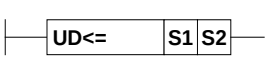
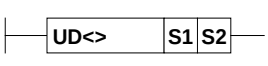
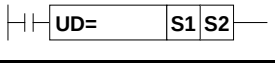
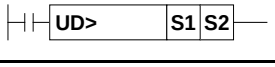
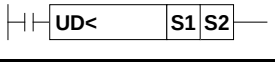
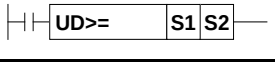
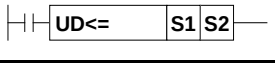
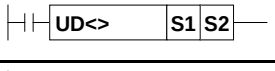
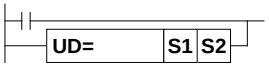
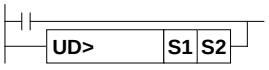
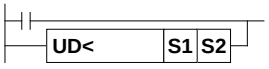
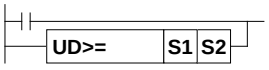
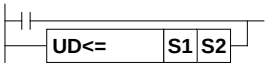
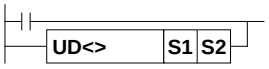
3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
8 bit Data compare(AND)	AND8=	8= S1 S2	Performs compare operation of (S1), (S2) as Byte unit, after AND operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	3	
	AND8>	8> S1 S2			
	AND8<	8< S1 S2			
	AND8>=	8>= S1 S2			
	AND8<=	8<= S1 S2			
	AND8<>	8<> S1 S2			
8 bit Data compare(OR)	OR8=	8= S1 S2	Performs compare operation of (S1), (S2) as Byte unit, after OR operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	3	
	OR8>	8> S1 S2			
	OR8<	8< S1 S2			
	OR8>=	8>= S1 S2			
	OR8<=	8<= S1 S2			
	OR8<>	8<> S1 S2			
Unsigned 16 bit Data compare(LOAD)	ULOAD =	U= S1 S2	Performs compare operation of (S1) and (S2), and then save Bit Result (BR). (Unsigned operation)	2	
	ULOAD >	U> S1 S2			
	ULOAD <	U< S1 S2			
	ULOAD >=	U>= S1 S2			
	ULOAD <=	U<= S1 S2			
	ULOAD <>	U<> S1 S2			

3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Unsigned 16 bit Data compare(AND)	UAND=	U= S1 S2	Performs compare operation of (S1), (S2), after AND operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	2	
	UAND>	U> S1 S2			
	UAND<	U< S1 S2			
	UAND>=	U>= S1 S2			
	UAND<=	U<= S1 S2			
	UAND<>	U<> S1 S2			
Unsigned 16 bit Data compare(OR)	UOR=	U= S1 S2	Performs compare operation of (S1), (S2), after OR operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	2	
	UOR>	U> S1 S2			
	UOR<	U< S1 S2			
	UOR>=	U>= S1 S2			
	UOR<=	U<= S1 S2			
	UOR<>	U<> S1 S2			

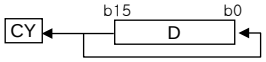
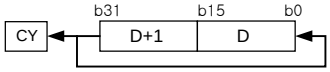
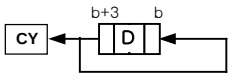
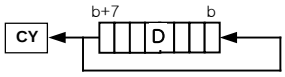
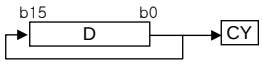
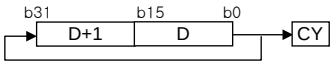
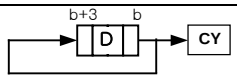
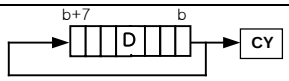
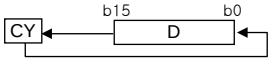
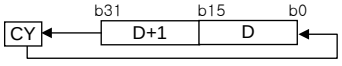
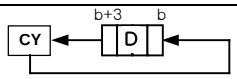
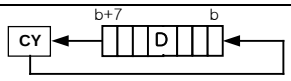
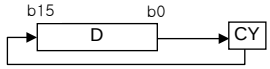
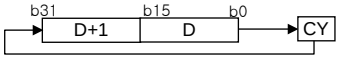
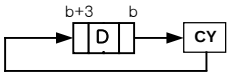
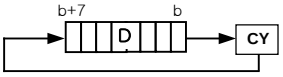
3.4.4 Comparison instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Unsigned 32 bit Data compare(LOAD)	ULOADD=		Performs compare operation of (S1) and (S2), and then save Bit Result (BR). (Unsigned operation)	2	
	ULOADD>				
	ULOADD<				
	ULOADD>=				
	ULOADD<=				
	ULOADD<>				
Unsigned 32 bit Data compare(AND)	UANDD=		Performs compare operation of (S1), (S2), after AND operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	2	
	UANDD>				
	UANDD<				
	UANDD>=				
	UANDD<=				
	UANDD<>				
Unsigned 32 bit Data compare(OR)	UORD=		Performs compare operation of (S1), (S2), after OR operation of its result and Bit Result(BR), and then save BR.(Unsigned operation)	2	
	UORD>				
	UORD<				
	UORD>=				
	UORD<=				
	UORD<>				

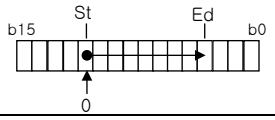
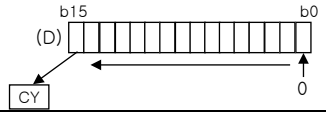
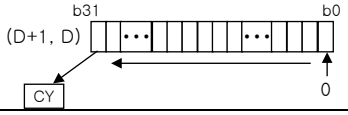
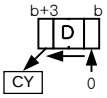
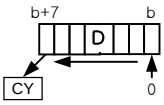
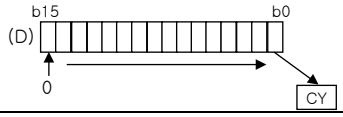
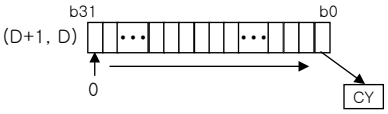
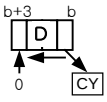
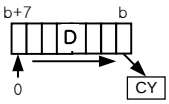
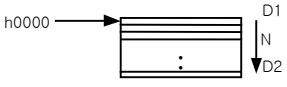
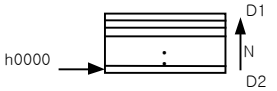
3.4.5 Increase/Decrease instruction

Classification	Name	Symbol	Description	Basic steps	Note
BIN Data Increase/Decrease(Signed)	INC	INC D	(D)+1 → (D)	2	
	INCP	INCP D			
	DINC	DINC D	(D+1,D)+1 → (D+1,D)	2	
	DINCP	DINCP D			
	DEC	DEC D	(D)−1 → (D)	2	
	DECP	DECP D			
	DDEC	DDEC D	(D+1,D)−1 → (D+1,D)	2	
	DDECP	DDECP D			
4/8 Bits Data Increase/Decrease(Signed)	INC4	INC4 Db	(D:x bit ~ D:x bit+4) + 1 → (D:x bit ~ D:x bit+4)	2	
	INC4P	INC4P Db		3	
	INC8	INC8 Db	(D:x bit ~ D:x bit+8) + 1 → (D:x bit ~ D:x bit+8)	2	
	INC8P	INC8P Db		3	
	DEC4	DEC4 Db	(D:x bit ~ D:x bit+4) − 1 → (D:x bit ~ D:x bit+4)	2	
	DEC4P	DEC4P Db		3	
	DEC8	DEC8 Db	(D:x bit ~ D:x bit+8) − 1 → (D:x bit ~ D:x bit+8)	2	
	DEC8P	DEC8P Db		3	
BIN Data Increase/Decrease(Unsigned)	INCU	INCU D	D+1 → (D)	2	
	INCUP	INCUP D			
	DINCU	DINCU D	(D+1,D)+1 → (D+1,D)	2	
	DINCUP	DINCUP D			
	DECU	DECU D	(D)−1 → (D)	2	
	DECUP	DECUP D			
	DDECU	DDECU D	(D+1,D)−1 → (D+1,D)	2	
	DDECUP	DDECUP D			

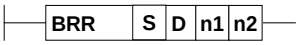
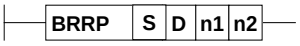
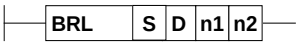
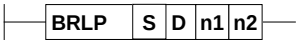
3.4.6 Rotation instruction

Classification	Name	Symbol	Description	Basic steps	Note
Rotate to Left		ROL D n		2	
	ROLP	ROLP D n		3	
	DROL	DROL D n		2	
	DROLP	DROLP D n		3	
4/8 Bits Rotate to Left	ROL4	ROL4 Db n		3	
	ROL4P	ROL4P Db n		4	
	ROL8	ROL8 Db n		3	
	ROL8P	ROL8P Db n		4	
Rotate to Right	ROR	ROR D n		2	
	RORP	RORP D n		3	
	DROR	DROR D n		2	
	DRORP	DRORP D n		3	
4/8 Bits Rotate to Right	ROR4	ROR4 Db n		3	
	ROR4P	ROR4P Db n		4	
	ROR8	ROR8 Db n		3	
	ROR8P	ROR8P Db n		4	
Rotate to Left(including Carry)	RCL	RCL D n		2	
	RCLP	RCLP D n		3	
	DRCL	DRCL D n		2	
	DRCLP	DRCLP D n		3	
4/8 Bits Rotate to Left(including Carry)	RCL4	RCL4 Db n		3	
	RCL4P	RCL4P Db n		4	
	RCL8	RCL8 Db n		3	
	RCL8P	RCL8P Db n		4	
Rotate to right(including Carry)	RCR	RCR D n		2	
	RCRP	RCRP D n		3	
	DRCR	DRCR D n		2	
	DRCRP	DRCRP D n		3	
4/8 Bits Rotate to right(including Carry)	RCR4	RCR4 Db n		3	
	RCR4P	RCR4P Db n		4	
	RCR8	RCR8 Db n		3	
	RCR8P	RCR8P Db n		4	

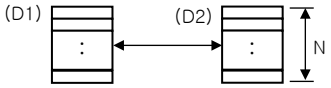
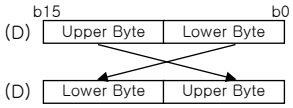
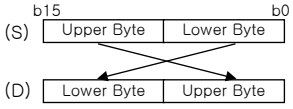
3.4.7 Move instruction

Classification	Name	Symbol	Description	Basic steps	Note
Bit Move	BSFT	BSFT St Ed		3	
	BSFTP	BSFTP St Ed		4	
Move to Higher Bit	BSFL	BSFL D n		2	
	BSFLP	BSFLP D n		3	
	DBSFL	DBSFL D n		2	
	DBSFLP	DBSFLP D n		3	
Move to Higher Bit within 4/8 Bits range	BSFL4	BSFL4 Db n		3	
	BSFL4P	BSFL4P Db n			
	BSFL8	BSFL8 Db n		3	
	BSFL8P	BSFL8P Db n			
Move to Lower Bit	BSFR	BSFR D n		2	
	BSFRP	BSFRP D n		3	
	DBSFR	DBSFR D n		2	
	DBSFRP	DBSFRP D n		3	
Move to Lower Bit within 4/8 Bits range	BSFR4	BSFR4 Db n		3	
	BSFR4P	BSFR4P Db n			
	BSFR8	BSFR8 Db n		3	
	BSFR8P	BSFR8P Db n			
Word Move	WSFT	WSFT St Ed		2	
	WSFTP	WSFTP St Ed		3	
Word Data Move to Left/Right	WSFL	WSFL D1 D2 N		3	
	WSFLP	WSFLP D1 D2 N			
	WSFR	WSFR D1 D2 N		3	
	WSFRP	WSFRP D1 D2 N			
Bit Move	SR	SR Db I D N	Moves N bits starting from Db bit along Input direction (I) and Move direction (D).	2	

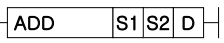
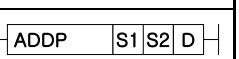
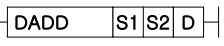
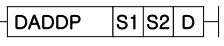
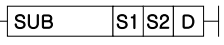
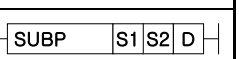
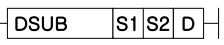
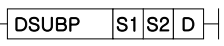
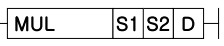
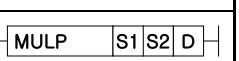
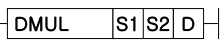
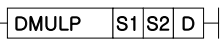
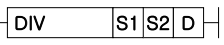
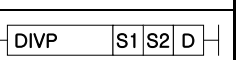
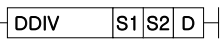
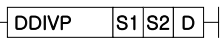
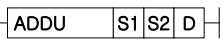
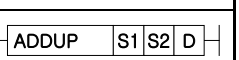
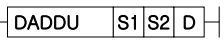
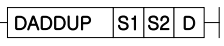
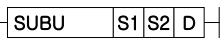
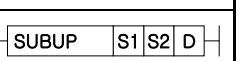
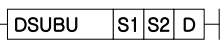
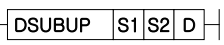
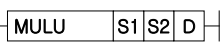
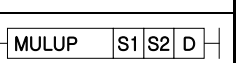
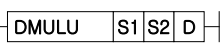
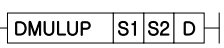
3.4.7 Move insturction (Continued)

Classification	Name	Symbol	Description	Basic steps	Note
Byte move(Right)	BRR		Rotates data of S[0] ~ S[n1-1] byte n2 time right and saves result in D[0] ~ D[n1-1].	5	
	BRRP			5	
Byte move(Left)	BRL		Rotates data of S[0] ~ S[n1-1] byte n2 time left and saves result in D[0] ~ D[n1-1].	5	
	BRLP			5	

3.4.8 Exchange instruction

Classification	Name	Symbol	Description	Basic steps	Note
Data exchange		XCHG D1 D2	(D1) ⟷ (D2)	2	
	XCHGP	XCHGP D1 D2		3	
	DXCHG	DXCHG D1 D2	(D1+1, D1) ⟷ (D2+1, D2)	2	
	DXCHGP	DXCHGP D1 D2		3	
Group Data exchange	GXCHG	GXCHG D1 D2 N		4	
	GXCHGP	GXCHGP D1 D2 N			
Higher/Lower Byte Exchange	SWAP	SWAP D		2	
	SWAPP	SWAPP D			
Group Byte Exchange	GSWAP	GSWAP D N	Exchanges Higher/Lower Byte of Words N starting from D.	2	
	GSWAPP	GSWAPP D N		3	
Higher/Lower Byte Exchange	SWAP2	SWAP2 S D		2	
	SWAP2P	SWAP2P S D		3	
Byte Group Exchange	GSWAP2	GSWAP2 S D	Exchanges Higher/Lower Byte of Words N starting from S and saves result from D.	2	
	GSWAP2P	GSWAP2P S D N		3	

3.4.9 BIN operation instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Integer Addition(Signed)	ADD		(S1)+(S2) ⟶ (D)	4	
	ADDP				
	DADD		(S1+1,S1)+(S2+1,S2) ⟶ (D+1,D)	4	
	DADDP				
Integer Subtraction(Signed)	SUB		(S1)−(S2) ⟶ (D)	4	
	SUBP				
	DSUB		(S1+1,S1)−(S2+1,S2) ⟶ (D+1,D)	4	
	DSUBP				
Integer Multiplication(Signed)	MUL		(S1)×(S2) ⟶ (D+1,D)	4	
	MULP				
	DMUL		(S1+1,S1)×(S2+1,S2) ⟶ (D+3,D+2,D+1,D)	4	
	DMULP				
Integer Division(Signed)	DIV		(S1)÷(S2) ⟶ (D) Quotient (D+1)	4	
	DIVP				
	DDIV		(S1+1,S1)÷(S2+1,S2) ⟶ (D+1,D) Quotient (D+3,D +2)	4	
	DDIVP				
Integer Addition(Unsigned)	ADDU		(S1)+(S2) ⟶ (D)	4	
	ADDUP				
	DADDU		(S1+1,S1)+(S2+1,S2) ⟶ (D+1,D)	4	
	DADDUP				
Integer Subtraction(Unsigned)	SUBU		(S1)−(S2) ⟶ (D)	4	
	SUBUP				
	DSUBU		(S1+1,S1)−(S2+1,S2) ⟶ (D+1,D)	4	
	DSUBUP				
Integer Multiplication (Unsigned)	MULU		(S1)×(S2) ⟶ (D+1,D)	4	
	MULUP				
	DMULU		(S1+1,S1)×(S2+1,S2) ⟶ (D+3,D+2,D+1,D)	4	
	DMULUP				

3.4.9 BIN operation instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Integer Division(Unsigned)	DIVU	DIVU S1 S2 D	(S1)÷(S2) → (D) Quotient (D+1)	4	
	DIVUP	DIVUP S1 S2 D			
	DDIVU	DDIVU S1 S2 D	(S1+1,S1)÷(S2+1,S2) → (D+1,D) Quotient (D+3,D +2)	4	
	DDIVUP	DDIVUP S1 S2 D			
Real Number Addition	RADD	RADD S1 S2 D	(S1+1,S1)+(S2+1,S2) → (D+1,D)	4	
	RADDP	RADDP S1 S2 D			
	LADD	LADD S1 S2 D	(S1+3,S1+2,S1+1,S1) +(S2+3,S2+2,S2+1,S2) → (D+3,D+2,D+1,D)	4	
	LADDP	LADDP S1 S2 D			
Real Number Subtraction	RSUB	RSUB S1 S2 D	(S1+1,S1)−(S2+1,S2) → (D+1,D)	4	
	RSUBP	RSUBP S1 S2 D			
	LSUB	LSUB S1 S2 D	(S1+3,S1+2,S1+1,S1) −(S2+3,S2+2,S2+1,S2) → (D+3,D+2,D+1,D)	4	
	LSUBP	LSUBP S1 S2 D			
Real Number Multiplication	RMUL	RMUL S1 S2 D	(S1+1,S1)×(S2+1,S2) → (D+1,D)	4	
	RMULP	RMULP S1 S2 D			
	LMUL	LMUL S1 S2 D	(S1+3,S1+2,S1+1,S1) ×(S2+3,S2+2,S2+1,S2) → (D+3,D+2,D+1,D)	4	
	LMULP	LMULP S1 S2 D			
Real Number Division	RDIV	RDIV S1 S2 D	(S1+1,S1)÷(S2+1,S2) → (D+1,D)	4	
	RDIVP	RDIVP S1 S2 D			
	LDIV	LDIV S1 S2 D	(S1+3,S1+2,S1+1,S1) ÷(S2+3,S2+2,S2+1,S2) → (D+3,D+2,D+1,D)	4	
	LDIVP	LDIVP S1 S2 D			
String Addition	$ADD	$ADD S1 S2 D	Connects S1 String with S2 String to save in D.	4	
	$ADDP	$ADDP S1 S2 D			
Group Addition	GADD	GADD S1 S2 D N	(S1) + (S2) = (D) N	4	
	GADDP	GADDP S1 S2 D N		5	
Group Subtraction	GSUB	GSUB S1 S2 D N	(S1) − (S2) = (D) N	4	
	GSUBP	GSUBP S1 S2 D N		5	

3.4.10 BCD operation instruction(continued)

Classification	Name	Symbol	Description	Basic steps	Note
BCD Addition	ADDB	ADDB S1 S2 D	(S1)+(S2) ⟶ (D)	4	
	ADDBP	ADDBP S1 S2 D			
	DADDB	DADDB S1 S2 D	(S1+1,S1)+(S2+1,S2) ⟶ (D+1,D)	4	
	DADDBP	DADDBP S1 S2 D			
BCD Subtraction	SUBB	SUBB S1 S2 D	(S1)−(S2) ⟶ (D)	4	
	SUBBP	SUBBP S1 S2 D			
	DSUBB	DSUBB S1 S2 D	(S1+1,S1)−(S2+1,S2) ⟶ (D+1,D)	4	
	DSUBBP	DSUBBP S1 S2 D			
BCD Multiplication	MULB	MULB S1 S2 D	(S1)×(S2) ⟶ (D+1,D)	4	
	MULBP	MULBP S1 S2 D			
	DMULB	DMULB S1 S2 D	(S1+1,S1)×(S2+1,S2) ⟶ (D+3,D+2,D+1,D)	4	
	DMULBP	DMULBP S1 S2 D			
BCD Division	DIVB	DIVB S1 S2 D	(S1)÷(S2) ⟶ (D) Quotient (D+1)	4	
	DIVBP	DIVBP S1 S2 D			
	DDIVB	DDIVB S1 S2 D	(S1+1,S1)÷(S2+1,S2) ⟶ (D+1,D) Quotient (D+3,D +2)	4	
	DDIVBP	DDIVBP S1 S2 D			

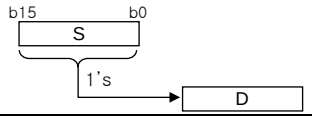
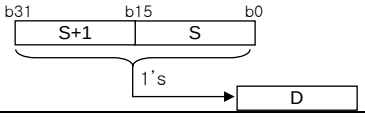
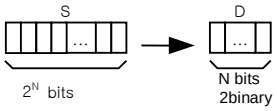
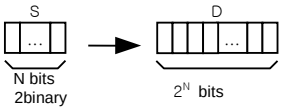
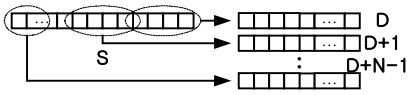
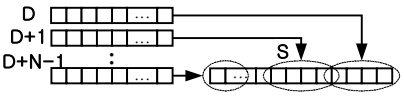
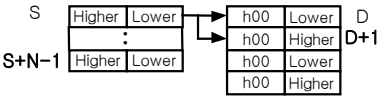
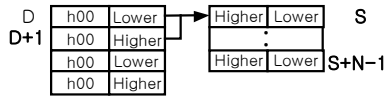
3.4.11 Logic operation instruction

Classification	Name	Symbol	Description	Basic steps	Note
Logic Multiplication	WAND	WAND S1 S2 D	Word AND (S1) & (S2) ⟶ (D)	4	
	WANDP	WANDP S1 S2 D			
	DWAND	DWAND S1 S2 D	DWord AND (S1+1,S1) & (S2+1,S2) ⟶ (D+1,D)	4	
	DWANDP	DWANDP S1 S2 D			
Logic Addition	WOR	WOR S1 S2 D	Word OR (S1) | (S2) ⟶ (D)	4	
	WORP	WORP S1 S2 D			
	DWOR	DWOR S1 S2 D	DWord OR (S1+1,S1) | (S2+1,S2) ⟶ (D+1,D)	4	
	DWORP	DWORP S1 S2 D			
Exclusive OR	WXOR	WXOR S1 S2 D	Word Exclusive OR (S1) ^ (S2) ⟶ (D)	4	
	WXORP	WXORP S1 S2 D			
	DWXOR	DWXOR S1 S2 D	DWord Exclusive OR (S1+1,S1) ^ (S2+1,S2) ⟶ (D+1,D)	4	
	DWXORP	DWXORP S1 S2 D			
Exclusive NOR	WXNR	WXNR S1 S2 D	Word Exclusive NOR $\overline{(S1) \wedge (S2)}$ ⟶ (D)	4	
	WXNRP	WXNRP S1 S2 D			
	DWXNR	DWXNR S1 S2 D	DWord Exclusive NOR $\overline{(S1+1,S1) \wedge (S2+1,S2)}$ ⟶ (D+1,D)	4	
	DWXNRP	DWXNRP S1 S2 D			
Group Logic Operation	GWAND	GWAND S1 S2 D N	(S1) & (S2) = (D) N	4	
	GWANDP	GWANDP S1 S2 D N		5	
	GWOR	GWOR S1 S2 D N	(S1) | (S2) = (D) N	4	
	GWORP	GWORP S1 S2 D N		5	
	GWXOR	GWXOR S1 S2 D N	(S1) ^ (S2) = (D) N	4	
	GWXORP	GWXORP S1 S2 D N		5	
	GWXNR	GWXNR S1 S2 D N	$\overline{(S1)}$ ^ (S2) = (D) N	4	
	GWXNRP	GWXNRP S1 S2 D N		5	

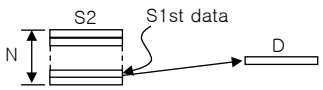
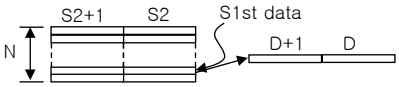
3.4.11 Logic operation instruction (Continued)

Classification	Name	Symbol	Description	Basic steps	Note
Byte Logic Multiplication	BAND	BAND S1 S2 D N	(S1) & (S2) = (D) N	6	
	BANDP	BANDP S1 S2 D N			
Byte Logic Addition	BOR	BOR S1 S2 D N	(S1) | (S2) = (D) N	6	
	BORP	BORP S1 S2 D N			
Byte Exclusive OR	BXOR	BXOR S1 S2 D N	(S1) ^ (S2) = D N	6	
	BXORP	BXORP S1 S2 D N			
Byte Exclusive NOR	BXNR	BXNR S1 S2 D N	$\overline{(S1)}$ ^ (S2) = (D) N	6	
	BXNRP	BXNRP S1 S2 D N			
Array Byte Logical Multiplication	ABAND	ABAND S D N	(S1) N & = (D)	5	
	ABANDP	ABANDP S D N			
Array Byte Logical Addition	ABOR	ABOR S D N	(S1) N | = (D)	5	
	ABORP	ABORP S D N			
Array Byte Exclusive OR	ABXOR	ABXOR S D N	(S1) N ^ = (D)	5	
	ABXORP	ABXORP S D N			
Array Byte Exclusive NOR	ABXNR	ABXNR S D N	$\overline{(S1)}$ N ^ = (D)	5	
	ABXNRP	ABXNRP S D N			

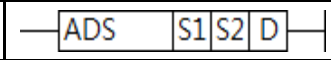
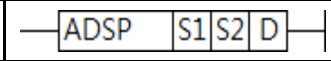
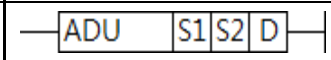
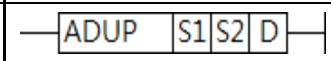
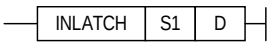
3.4.12 Data process instruction

Classification	Name	Symbol	Description	Basic steps	Note
Bit Check	BSUM	BSUM S D		2	
	BSUMP	BSUMP S D		3	
	DBSUM	DBSUM S D		2	
	DBSUMP	DBSUMP S D		3	
Bit Reset	BRST	BRST D N	Resets N Bits (starting from D) to 0.	2	
	BRSTP	BRSTP D N			
ENCODE	ENCO	ENCO S D N		4	
	ENCOP	ENCOP S D N			
DECODE	DECO	DECO S D N		4	
	DECOP	DECOP S D N			
Data Disconnect and Connect	DIS	DIS S D N		4	
	DISP	DISP S D N			
	UNI	UNI S D N		4	
	UNIP	UNIP S D N			
WORD/Byte Conversion	WTOB	WTOB S D N		4	
	WTOBP	WTOBP S D N			
	BTOW	BTOW S D N		4	
	BTOWP	BTOWP S D N			
I/O refresh	IORF	IORF S1 S2 S3	Right after masking I/O data (located on S1) with S2 and S3 data, perform process.	4	
	IORFP	IORFP S1 S2 S3		4	
Data Search	SCH	SCH S1 S2 D N	Finds S1 value within S2 ~ N range and saves the first identical valued position in D and S1's identical valued total number in D+1.	4	
	SCHP	SCHP S1 S2 D N		5	
	DSCH	DSCH S1 S2 D N		4	
	DSCHP	DSCHP S1 S2 D N		5	
Max. Value Search	MAX	MAX S D N	Saves the max value in D among N words starting from S.	4	
	MAXP	MAXP S D N			
	DMAX	DMAX S D N	Saves the max value in D among N Double word starting from S.	4	
	DMAXP	DMAXP S D N			

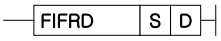
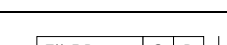
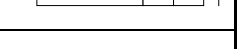
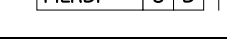
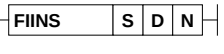
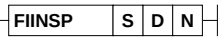
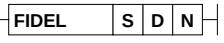
3.4.12 Data process Instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Min. Value Search	MIN	MIN S D N	Saves the Min value in D among N words starting from S.	4	
	MINP	MINP S D N			
	DMIN	DMIN S D N	Saves the Min value in D among N Double word starting from S.	4	
	DMINP	DMINP S D N			
Sum	SUM	SUM S D N	Adds up N words starting from S to save in D.	4	
	SUMP	SUMP S D N			
	DSUM	DSUM S D N	Adds up N Double word starting from S to save in D.	4	
	DSUMP	DSUMP S D N			
Average	AVE	AVE S D N	Averages N words starting from S to save in D.	4	
	AVEP	AVEP S D N			
	DAVE	DAVE S D N	Averages N Double word starting from S to save in D.	4	
	DAVEP	DAVEP S D N			
MUX	MUX	MUX S1 S2 D N		4	
	MUXP	MUXP S1 S2 D N		5	
	DMUX	DMUX S1 S2 D N		4	
	DMUXP	DMUXP S1 S2 D N		5	
Data Detect	DETECT	DETECT S1 S2 D N	Detects N data from S1, to save the first value larger than S2 in D, and the extra number in D+1.	4	
	DETECTP	DETECTP S1 S2 D N		5	
Ramp Signal Output	RAMP	RAMP N1 N2 D1 N3 D2	Saves linear-changed value in D1 during n3 scanning of initial value n1 to final n2 and present scanning number in D1+1, and changes D2 value to ON after completed.	5	
Data Align	SORT	SORT S N1 N2 D1 D2	S : Head Address of Sort Data n1 : Number of Words to sort n1+1 : Sorting Method n2: Operation number per Scan D1 : ON if complete D2 : Auxiliary Area	5	
	SORTP	SORTP S N1 N2 D1 D2			
Time-based ramp signal output	TRAMP	TRAMP N2 D1 N3 D2	During time N3 (s), saves data chaging linealy from initial value to last value in D, saves timer value in D+2, if completed, D become equal to N2.	4	
	RTRAMP	RTRAMP N2 D1 N3 D2		4	

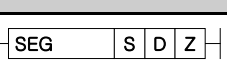
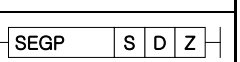
3.4.12 Data process Instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Data Separation / Unite	ADS		Save to D separately only bits that are saved to S2 each bit of data S1.	4	
	ADSP				
	ADU		Save to D unite data S1 only bits that are saved as S2.	4	
	ADUP				
Input Latch Data Save	INLATCH		Saves in D that input latch data.	4	

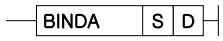
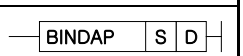
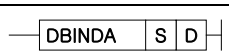
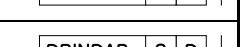
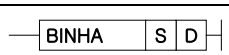
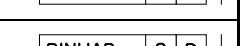
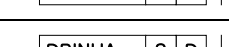
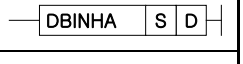
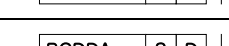
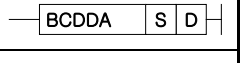
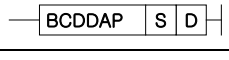
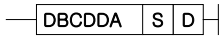
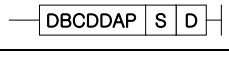
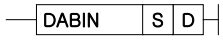
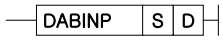
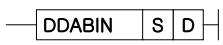
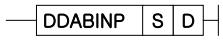
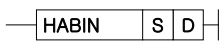
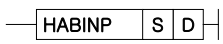
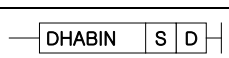
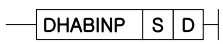
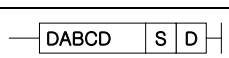
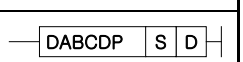
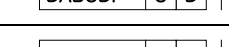
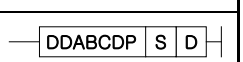
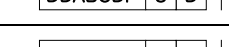
3.4.13 Data table process instruction

Classification	Name	Symbol	Description	Basic steps	Note
Data Write	FIWR		Adds S to the last of Data Table D ~ D+N, and increases Data Table Length(N) saved in D by 1.	2	
	FIWRP			3	
First-input Data Read	FIFRD		Moves first data, S+1 of Data Table S ~ S+N to D (pull 1 place after origin deleted) and decreases Data Table Length(N) saved in D by 1 S.	2	
	FIFRDP			3	
Last-Input Data Read	FILRD		Moves last data, S+N of Data Table S ~ S+N to D (origin deleted) and decreases Data Table Length(N) saved in D by 1 S.	2	
	FILRDP			3	
Data Insert	FIINS		Adds S to 'N'th place of Data Table D ~ D+N (origin data pulled by 1), and increases Data Table Length(N) saved in D by 1.	4	
	FIINSP				
Data Pull	FIDEL		Deletes 'N'th data of Data Table S ~ S+N (pull 1 place) and decreases Data Table Length(N) saved in D by 1.	4	
	FIDELP				

3.4.14 display instruction

Classification	Name	Symbol	Description	Basic steps	Note
7 Segment Display	SEG		Converts S Data to 7-Segment as adjusted in Z Format so to save in D.	4	
	SEGP				

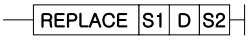
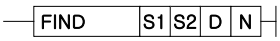
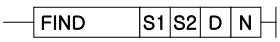
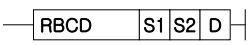
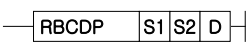
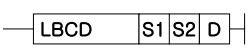
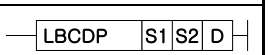
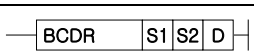
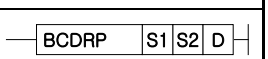
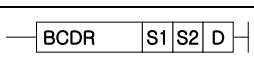
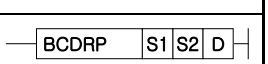
3.4.15 String process instruction

Classification	Name	Symbol	Description	Basic steps	Note
Convert to decimal ASCII Cord	BINDA		Converts S of 1-word BIN value to Decimal ASCII Cord to save in starting D.	2	
	BINDAP			3	
	DBINDA		Converts S of 2-word BIN value to Decimal ASCII Cord to save in starting D.	2	
	DBINDAP			3	
Convert to Hexadecimal ASCII Cord	BINHA		Converts S of 1-word BIN value to Hexadecimal ASCII Cord to save in starting D.	2	
	BINHAP			3	
	DBINHA		Converts S of 2-word BIN value to Hexadecimal ASCII Cord to save in starting D.	2	
	DBINHAP			3	
Convert BCD to decimal ASCII Cord	BCDDA		Converts S of 1-word BCD to ASCII Cord to save in starting D.	2	
	BCDDAP			3	
	DBCDDA		Converts S of 2-word BCD to ASCII Cord to save in starting D.	2	
	DBCDDAP			3	
Convert Decimal ASCII to BCD	DABIN		Converts S S+2,S+1,S's Decimal ASCII Cord to BIN to save in D.	2	
	DABINP			3	
	DDABIN		Converts S+5~S's Decimal ASCII Cord to BIN value to save in D+1 & D.	2	
	DDABINP			3	
Convert Hexadecimal ASCII to BIN	HABIN		Converts S+1,S's Hexadecimal ASCII Cord to BIN value to save in D.	2	
	HABINP			3	
	DHABIN		Converts S+3~S's Hexadecimal ASCII Cord to BIN value to save in D.	2	
	DHABINP			3	
Convert Decimal ASCII to BCD	DABCD		Converts S+1,S's Decimal ASCII Cord to BCD value to save in D.	2	
	DABCDP			3	
	DDABCD		Converts S+3~S's Decimal ASCII Cord to BCD value to save in D.	2	
	DDABCDP			3	
String Length Detect	LEN		Saves String Length with S starting in D.	2	
	LENP			3	

3.4.15 String process Instruction (continued)

Classification	Name	Symbol	Description	Basic steps	Note
Convert BIN16/32 to String	STR	STR S1 S2 D	Adjusts S2 saved word data to S1 saved place number to convert to String and save in D.	4	
	STRP	STRP S1 S2 D			
	DSTR	DSTR S1 S2 D	Adjusts S2 saved double word data to S1 saved place number to convert to String and save in D.	4	
	DSTRP	DSTRP S1 S2 D			
Convert String to BIN16/32	VAL	VAL S D1 D2	Adjusts S saved string to number to save in word D1 and saves the place number in D2.	4	
	VALP	VALP S D1 D2			
	DVAL	DVAL S D1 D2	Adjusts S saved string to number to save in Double word D1 and saves the place number in D2.	4	
	DVALP	DVALP S D1 D2			
Convert Real Number to String	RSTR	RSTR S1 S2 D	Adjusts Floating decimal point point Real Number Data (S1: number, S2: places) to String format to save in D.	4	
	RSTRP	RSTRP S1 S2 D			
	LSTR	LSTR S1 S2 D	Adjusts Floating decimal point point Double Real Number Data (S1:number, S2:places) to String format to save in D.	4	
	LSTRP	LSTRP S1 S2 D			
Convert String to Real Number	STRR	STRR S D	Converts String S to Floating decimal point point Real Number Data to save in D.	2	
	STRRP	STRRP S D			
	STRL	STRL S D	Converts String S to Floating decimal point point Double Real Number Data to save in D.	2	
	STRLP	STRLP S D			
ASCII Conversion	ASC	ASC S D cw	Converts BIN Data to ASCII in Nibble unit, based on cw's format from S to save in D.	4	
	ASCP	ASCP S D cw			
HEX Conversion	HEX	HEX S D N	Converts 2N ASCII saved in N words from S in byte unit to Nibble unit of Hexadecimal BIN so to save in D	4	
	HEXP	HEXP S D N			
String Extract from Right	RIGHT	RIGHT S D N	Extracts N string from S string's final letter to save in starting D.	4	
	RIGHTP	RIGHTP S D N			
String Extract from Left	LEFT	LEFT S D N	Extracts N string from S string's first letter to save in starting D.	4	
	LEFTP	LEFTP S D N			
String Random Extract	MID	MID S1 S2 D	Extracts string which conforms to S2 condition among S1 string to save in starting D.	4	
	MIDP	MIDP S1 S2 D			

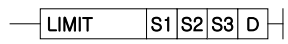
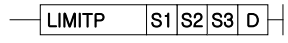
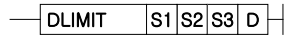
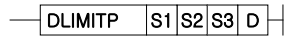
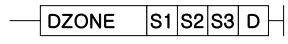
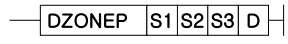
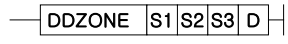
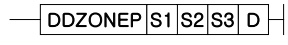
3.4.15 String process Instruction (continued)

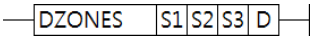
Classification	Name	Symbol	Description	Basic steps	Note
String Random Replace	REPLACE		Processes S1 String as applicable to S2 Condition to save in D String.	4	
	REPLACEP				
String Find	FIND		Finds identical String to S2 in S1 ~ N data to save the absolute position in D.	4	
	FINDP				
Parse Real Number to BCD	RBCD		Adjusts Floating decimal point point Real Number Data S1 to S2 place to convert to BCD, and then to save in D.	4	
	RBCDP				
	LBCD		Adjusts Floating decimal point point Double Real Number Data S1 to S2 place to convert to BCD, and then to save in D.	4	
	LBCDP				
Convert BCD Data to Real Number	BCDR		Adjusts BCD Data S1 to S2 place to convert to Floating decimal point point Real Number, and then to save in D.	4	
	BCDRP				
	BCDL		Adjusts BCD Data S1 to S2 place to convert to Floating decimal point point Double Real Number, and then to save in D.	4	
	BCDLP				

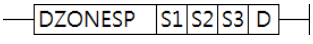
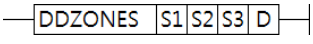
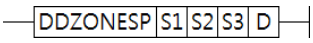
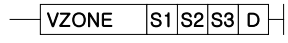
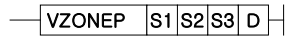
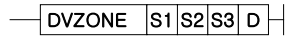
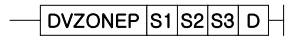
3.4.16 Special function instruction

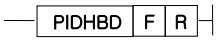
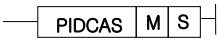
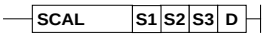
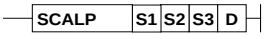
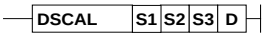
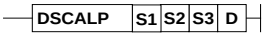
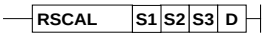
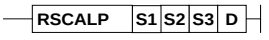
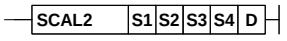
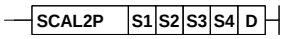
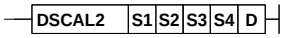
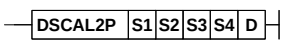
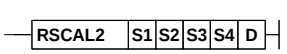
Classification	Name	Symbol	Description	Basic steps	Note
SIN Operation	SIN	SIN S D	SIN(S+1,S) ⟶ (D+1,D)	2	
	SINP	SINP S D		3	
ASIN Operation	ASIN	ASIN S D	ASIN(S+1,S) ⟶ (D+1,D)	2	
	ASINP	ASINP S D		3	
COS Operation	COS	COS S D	COS(S+1,S) ⟶ (D+1,D)	2	
	COSP	COSP S D		3	
ACOS Operation	ACOS	ACOS S D	ACOS(S+1,S) ⟶ (D+1,D)	2	
	ACOSP	ACOSP S D		3	
TAN Operation	TAN	TAN S D	TAN(S+1,S) ⟶ (D+1,D)	2	
	TANP	TANP S D		3	
ATAN Operation	ATAN	ATAN S D	ATAN(S+1,S) ⟶ (D+1,D)	2	
	ATANP	ATANP S D		3	
RAD Conversion	RAD	RAD S D	(S+1,S) ⟶ (D+1,D) Converts angle to radian.	2	
	RADP	RADP S D		3	
Angle Conversion	DEG	DEG S D	(S+1,S) ⟶ (D+1,D) Converts radian to angle.	2	
	DEGP	DEGP S D		3	
Square Root Operation	SQRT	SQR S D	$\sqrt{(S+1,S)}$ ⟶ (D+1,D)	2	
	SQRTP	SQRP S D		3	
	BSQRT	BSQRT S D	$\sqrt{S}$ ⟶ (D).(D + 1)	4	
	BSQRTP	BSQRTP S D		4	
	BDSQRT	BDSQRT S D	$\sqrt{(S+1)(S)}$ ⟶ (D).(D+1)	4	
	BDSQRTP	BDSQRTP S D		4	
Natural Logarithm Operation	LN	LN S D	ln(S+1,S) ⟶ (D+1,D)	2	
	LNP	LNP S D		3	
Common Logarithm Operation	LOG	LOG S D	$\log_{10}$ (S+1,S) ⟶ (D+1,D)	2	
	LOGP	LOGP S D		3	
Exponential Operation	EXP	EXP S D	$e^{(S+1,S)}$ ⟶ (D+1,D)	2	
	EXPP	EXPP S D		3	
	EXPT	EXPT S1 S2 D	$(S1+1,S1)^{(S2+1,S2)}$ ⟶ (D+1,D)	2	
	EXPTP	EXPTP S1 S2 D		3	

3.4.17 Data control instruction

Classification	Name	Symbol	Description	Basic steps	Note
Limit Control	LIMIT		If S1 < S2, then D = S2 If S2 < S1 < S3, then D = S1 If S3 < S1, then D = S3	4	
	LIMITP			5	
	DLIMIT			4	
	DLIMITP			5	
Dead-zone Control	DZONE		If S1 < -S2, then D = S1+S2-S2(S3/100) If –S2 < S1 < S2, then D = (S3/100)S1 If S1 < S2, then D = S1-S2+S2(S3/100)	4	
	DZONEP			5	
	DDZONE			4	
	DDZONEP			5	

	DZONES		If S2 > S1, then D = S1 – S2
			If S3 < S1, then D = S1 –S3
			If S2 <= S1 <= S3, then D = 0
			If (S2 == S3) < S1, then D = S1 –S3
			If (S2 == S3) > S1, then D = S1 –S3
				4	

	DZONESP			4	
	DDZONES			4	
	DDZONESP			4	
Vertical-zone Control	VZONE		If S1 < -S2(S3/100), then D = S1-S2+S2(S3/100) If –S2(S3/100) <S1< S2(S3/100), then D = (100/S3)S1 If S1 < S2(S3/100), then D = S1+S2-S2(S3/100)	4	
	VZONEP			5	
	DVZONE			4	
	DVZONEP			5	
PID Control	PIDRUN		Operates PID Loop N.	2	
	PIDPRMT		Changes PID Loop N's Parameter. (SV(word) / Ts(word) / Kp(real) / Ti(real) / Td(real))	2	
	PIDPAUSE		Stops PID Loop N momentarily.	2	

Classification	Name	Symbol	Description	Basic steps	Note
PID Control	PIDINIT		Initializes operation of all PID Loops.	2	
	PIDAT		Operates a saved parameter by user or a PID loop auto-tuning at K area.	2	
	PIDHBD		Operates a forward / reverse operation saved by user or a mixed operation connecting PID loop at K.	2	
	PIDCAS		Operates an internal / external loop parameter or a Cascade operation connecting PID loop at K area.	2	
	SCAL		Scales the input value S1 in the range of S2+1≤S1≤S2 into the output value D in the range of S3+1≤D≤S3.	4	
	SCALP			5	
	DSCAL			4	
	DSCALP			5	
	RSCAL			4	
	RSCALP			5	
	SCAL2		Scale the input value S1 into D through the linear function determined by S2, S3, S4.	5	
	SCAL2P			5	
	DSCAL2			5	
	DSCAL2P			5	
	RSCAL2			5	
	RSCAL2P			5	

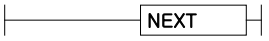
3.4.18 Time related instruction

Classification	Name	Symbol	Description	Basic steps	Note
Date/Time Data Read Read	DATERD	DATERD D	Reads PLC Time to save in D ~ D+6.(Yr/Mn/Dt/Hr/Mn/Sd/Day)	2	
	DATERDP	DATERDP D			
Date/Time Data Write	DATEWR	DATEWR S	Input S ~ S+6's Time Data in PLC (Yr/Mn/Dt/Hr/Mn/Sd/Day)	2	
	DATEWRP	DATEWRP S			
Time Data Increase	ADDCLK	ADDCLK S1 S2 D	Adds S1 ~ S1+2 & S2 ~ S2+2 Time Data to save in D ~ D+2 in Time Data format(Hr/Mn/Sd).	4	
	ADDCLKP	ADDCLKP S1 S2 D			
Time Data Decrement	SUBCLK	SUBCLK S1 S2 D	Extracts S2 ~ S2+2's Time Data from S1 ~ S1+2 to save in D ~ D+2 in Time Data format(Hr/Mn/Sd).	4	
	SUBCLKP	SUBCLKP S1 S2 D			
Time Data Format Conversion	SECOND	SECOND S D	Converts Time Data S ~ S+2 to seconds to save in double word D.	2	
	SECONDP	SECONDP S D		3	
	HOUR	HOUR S D	Converts the seconds saved in double word S to Hr/Mn/Sd to save in D ~ D+2.	2	
	HOURP	HOURP S D		3	

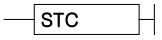
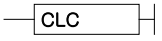
3.4. 19 Branch Instruction

Classification	Name	Symbol	Description	Basic steps	Note
Branch Instruction	JMP	JMP LABEL	Jumps to LABEL location	1	
	LABEL	LABEL ( )	Jumps and designates the location to move to.	5	
Subroutine Call Function	CALL	CALL LABEL	Calls Function applicable to LABEL.	1	
	CALLP	CALLP LABEL			
	SBRT	SBRT LABEL	Designates Function to be called by CALL	1	
	RET	RET	RETURN	1	

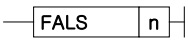
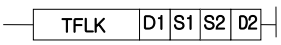
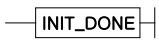
3.4.20 loop instruction

Classification	Name	Symbol	Description	Basic steps	Note
Loop Instruction	FOR		Operates FOR~NEXT section n times.	2	
	NEXT			1	
	BREAK		Escapes from FOR~NEXT section	1	

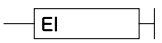
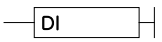
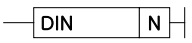
3.4.21 Flag instruction

Classification	Name	Symbol	Description	Basic steps	Note
Carry Flag Set, Reset	STC		Carry Flag(F0112) SET	1	
	CLC		Carry Flag(F0112) RESET	1	
Error Flag Clear	CLE		Error Latch Flag(F0115) RESET	1	

3.4.22 System instruction

Classification	Name	Symbol	Description	Basic steps	Note
Error Display	FALS		Self Diagnosis(Error Display)	2	
Scan Cluck	DUTY		On during n1 Scan, Off during n2 Scan	4	
Time Cluck	TFLK		On during S1 set time, Off during S2 set time.	5	
WDT Initialization	WDT		Watch Dog Timer Clear	1	
	WDTP				
Output Control	OUTOFF		All Output Off	1	
Operation Stop	STOP		Finishes applicable scan to end PLC Operation.	1	
Emergent Operation Stop	ESTOP		Ends PLC operation right after Instruction executed	1	
Initialization Task End	INIT_DONE		End of Initialization Task	1	

3.4.23 Interrupt related instruction

Classification	Name	Symbol	Description	Basic steps	Note
All Channels Interrupt Setting	EI		All Channels Interrupt allowed	1	
	DI		All Channel Interrupt prohibited	1	
Individual Channel Interrupt Setting	EIN		Individual Channel Interrupt allowed	2	
	DIN		Individual Channel Interrupt prohibited	2	

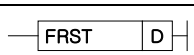
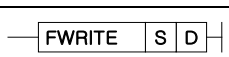
3.4.24 Sign reversion instruction

Classification	Name	Symbol	Description	Basic steps	Note
2's complement	NEG	NEG D	Saves D value again in D with 2's complement taken.	2	
	NEGP	NEGP D			
	DNEG	DNEG D	Saves (D+1,D) value again in (D+1,D) with 2's complement taken.	2	
	DNEGP	DNEGP D			
Real Number Data Sign Reverse	RNEG	RNEG D	Reverses D Real Number Sign then to save again.	2	
	RNEGP	RNEGP D			
	LNEG	LNEG D	Reverses D Double Real Number Sign then to save again.	2	
	LNEGP	LNEGP D			
Absolute Value Operation	ABS	ABS D	Converts D highest Bit to 0.	2	
	ABSP	ABSP D			
	DABS	DABS D	Converts (D+1,D) highest Bit to 0.	2	
	DABSP	DABSP D			

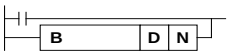
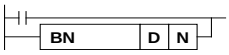
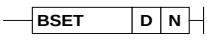
3.4.25 File related instruction

Classification	Name	Symbol	Description	Basic steps	Note
Block Conversion	RSET	RSET S	Changes Block Number of file register to S Number.	2	
	RSETP	RSETP S			
Flash Word Data Transfer	EMOV	EMOV S1 S2 D	Transfers S2 word data in S1 Block to D .	4	
	EMOVP	EMOVP S1 S2 D			
Flash Double Word Data Transfer	EDMOV	EDMOV S1 S2 D	Transfers S2+1, S2 double word data in S1 Block to D+1, D.	4	
	EDMOVP	EDMOVP S1 S2 D			
Block Read	EBREAD	EBREAD S1 S2	Reads Flash Memory Block	2	
Block Write	EBWRITE	EBWRITE S1 S2	Writes Flash Memory Block	2	
Block Compare	EBCMP	EBCMP S1 S2 D1 D2	Compares R Area's Bank with Flash Area's Block	4	
Block Error Clear	EERRST	EERRST	Initializes Setting and status of PID loop N.	1	

3.4.26 F area control instruction

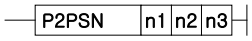
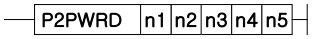
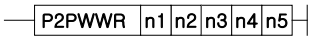
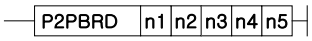
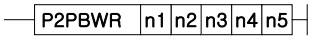
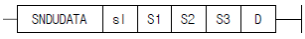
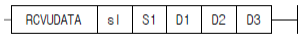
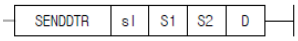
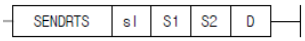
Classification	Name	Symbol	Description	Basic steps	Note
Loop Instruction	FSET		F area bit Set	2	
	FRST		F area bit Reset	2	
	FWRITE		F area data Write	2~3	

3.4.27 BIT control instruction in word area

Classification	Name	Symbol	Description	Basic steps	Note
Loop Instruction	LOADB		Make Nth bit at Device D area a present operation result.	2	
	LOADBN		Reverse Nth bit at Device D area and set it a present operation result.	2	
	ANDB		Perform AND Operation of Nth bit at Device D area and a present operation result.	2	
	ANDBN		Reverse Nth bit at Device D area and perform AND Operation of it and a present operation result.	2	
	ORB		Perform OR Operation of Nth bit at Device D area and a present operation result.	2	
	ORBN		Reverse Nth bit at Device D area and perform OR Operation of it and a present operation result.	2	
	BOUT		Output Nth bit at Device D area as a present operation result.	2	
	BSET		If it meets a condition, set Nth bit at Device D area.	2	
	BRESET		If it meets a condition, reset Nth bit at Device D area.	2	

3.5 Special/Communication Instruction

3.5.1 Communication module related instruction

Classification	Name	Symbol	Description	Basic steps	Note
Station No. setting	P2PSN		Sets destination station No. for P2P Communication . n1:P2P No., n2:Block, n3:Station	4	
Read Area Set(WORD)	P2PWRD		Sets word data Read Area n1:P2P No., n2:Block, n3:Variable sequence, n4:Variable Size,n5:Device	5	
Write Area Set(WORD)	P2PWWR		Sets word data Write Area n1:P2P No., n2:Block, n3:Variable sequence, n4:Variable Size,n5:Device	5	
Read Area Set(BIT)	P2PBRD		Sets bit data Read Area n1:P2P No., n2:Block, n3:Variable sequence, n4:Variable Size,n5:Device	5	
Write Area Set(BIT)	P2PBWR		Sets bit data Write Area n1:P2P No., n2:Block, n3:Variable sequence, n4:Variable Size,n5:Device	5	
User defined data (UDATA)	SNDUDATA		User defined data (UDATA) send sl:Slot, S1:Channel, S2:Device, S3:Size, D:Instruction area device	4~7	
	RCVUDATA		User defined data (UDATA) receive sl:Slot, S1:Channel, S2:Device, S3:Size, D:Instruction area device	4~7	
	SENDDTR		DTR (Data Terminal Ready) signal send sl:Slot, S1:Channel, S2:DTR, D:Instruction area device	4~7	
	SENDRTS		RTS (Request To Send) signal send sl:Slot, S1:Channel, S2:RTS, D:Instruction area device	4~7	

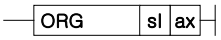
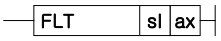
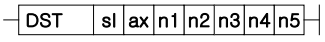
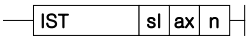
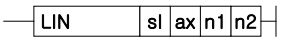
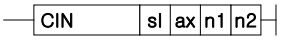
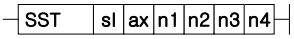
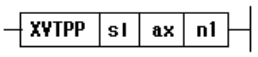
3.5.2 Special module related instruction

Classification	Name	Symbol	Description	Basic steps	Note
Special Module Read/Write	GET	GET sl S D N	Reads data of special module memory is installed on.	4	
	GETP	GETP sl S D N		5	
	GETE	GETE sl S M D N		5	Multi-channel RTD Module
	GETEP	GETEP sl S M D N		5	
	PUT	PUT sl S1 S2 N	Write data of special module memory is installed on.	4	
	PUTP	PUTP sl S1 S2 N		5	
	PUTE	PUTE sl S M D N		5	Multi-channel RTD Module
	PUTEP	PUTEP sl S M D N		5	

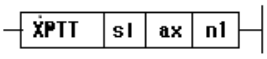
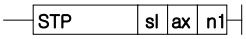
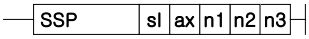
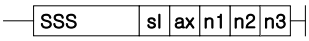
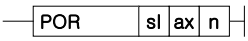
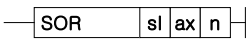
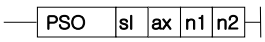
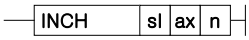
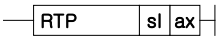
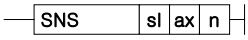
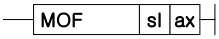
3.5.3 Motion control dedicated instruction

Classification	Name	Symbol	Description	Basic steps	Note
Motion Module Read/Write	GETM	GETM sl S D N	Reads N Double Word Data to D CPU Area from motion module's memory address (S) installed on s1 slot.	4	
	GETMP	GETMP sl S D N		5	
	PUTM	PUTM sl S1 S2 N	Writes N Double Word Data from S2 device on motion module's memory address (S1) installed on s1 slot.	4	
	PUTMP	PUTMP sl S1 S2 N		5	

3.5.4 Position control dedicated instruction(APM,XPM)

Classification	Name	Symbol	Description	Basic steps	Note
Return to Origin Point	ORG XORG		Instructions Positioning Module's ax axis installed on sl slot to return to Origin Point.	2	
Floating Origin Point	FLT XFLT		Instructions Positioning Module's ax axis installed on sl slot to set Floating Origin Point.	2	
Direct start	DST XDST		Instructions Positioning Module's ax axis installed on sl slot to start directly with Target Position(n1), Target Speed(n2), Dwell Time(n3), M Code(n4) & Control Word(n5).	8	
Indirect run	IST XIST		Instructions Positioning Module's ax axis installed on sl slot to start n step indirectly.	4	
Linear Interpolation	LIN		Instructions Positioning Module's ax axis installed on sl slot to let n2 axes operate n1 step by Linear Interpolation.	4	
Circular Interpolation	CIN		Instructions Positioning Module's ax axis installed on sl slot to let n2 axes operate n1 step by Circular Interpolation.	4	
Simultaneous Start	SST XSST		Instructions Positioning Module's ax axis installed on sl slot to let n4 axes operate n1(X), n2(Y), n3(Z) steps by Simultaneous Start.	5	
Speed/Position Control Switch	VTP XVTP		Instructions Positioning Module's ax axis installed on sl slot to switch Speed to Position Control.	2	
Position Specified Speed/Position Control Switch	XVTPP		Instructions Positioning Module's ax axis installed on sl slot to switch Speed to Position Control at n1 position.	5	
Position/Speed Control Switch	PTV XPTV		Instructions Positioning Module's ax axis installed on sl slot to switch Position to Speed Control.	2	

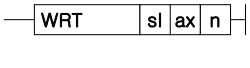
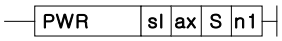
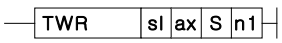
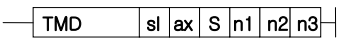
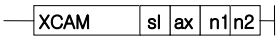
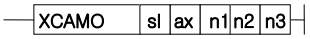
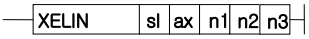
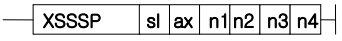
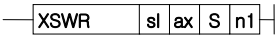
3.5.4 Position control dedicated instruction(APM,XPM)(continued)

Classification	Name	Symbol	Description	Basic steps	Note
Position/Torque control switch	XPTT		Instructions Positioning Module's ax axis installed on sl slot to switch Position to Torque Control with n1 torque.	4	
Deceleration stop	STP XSTP		Instructions Positioning Module's ax axis installed on sl slot to stop as deceleration.	2	
Skip	SKP XSKP		Instructions Positioning Module's ax axis installed on sl slot to skip.	2	
Position Synchronization	SSP XSSP		Instructions Positioning Module's ax axis installed on sl slot to do Position Sync with main axis of n3, n1 sync-positioned and n2 step operated.	5	
Speed synchronous	SSS XSSS		Instructions Positioning Module's ax axis installed on sl slot to do Speed Sync with main axis of n3, n1 master and n2 slave	5	
Position override	POR XPOR		Instructions Positioning Module's ax axis installed on sl slot to override Position to change the target position to n.	4	
Speed override	SOR XSOR		Instructions Positioning Module's ax axis installed on sl slot to override Speed to change the target speed to n.	4	
Position specified Speed Override	PSO XPSO		Instructions Positioning Module's ax axis installed on sl slot to override position specified speed to change the target speed to n2 from n1 position.	4	
Continuous Operation	NMV XNMV		Instructions Positioning Module's ax axis installed on sl slot to operate continuously to n step.	2	
Inching	INCH XINCH		Instructions Positioning Module's ax axis installed on sl slot to inch to n position.	4	
Return to Position Previous to Manual	RTP XRTP		Instructions Positioning Module's ax axis installed on sl slot to return to position previous to manual operation.	2	
Operation Step Change	SNS XSNS		Instructions Positioning Module's ax axis installed on sl slot to change operation step to n.	4	
Repeated Operation Step Chang	SRS XSRS		Instructions Positioning Module's ax axis installed on sl slot to change repeated operation step to n.	4	
M Code Off	MOF XMOF		Instructions Positioning Module's ax axis installed on sl slot to make M code off.	2	

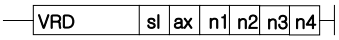
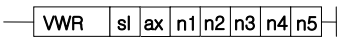
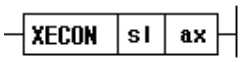
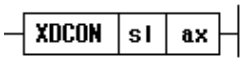
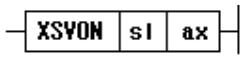
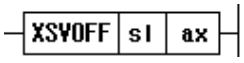
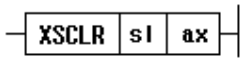
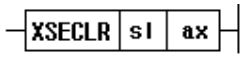
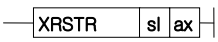
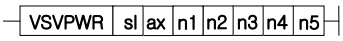
3.5.4 Position control dedicated instruction(APM,XPM)(continued)

Classification	Name	Symbol	Description	Basic steps	Note
Present Position Change	PRS XPRS	PRS sl ax n	Instructions Positioning Module's ax axis to change present position to n.	4	
Zone Allowed	ZOE	ZOE sl ax	Allows zone output of Positioning Module installed on sl slot.	2	
Zone Prohibited	ZOD	ZOD sl ax	Prohibits zone output of Positioning Module installed on sl slot.	2	
Encoder Value Change	EPRS XEPRS	EPRS sl ax n	Changes Encoder Value of Positioning Module installed on sl slot to n.	4	
Teaching	TEA	TEA sl ax n1 n2 n3 n4	Changes n1 step's target position or speed of Positioning Module's ax axis installed on sl slot.	5	
Teaching Array	TEAA XTEAA	TEAA sl ax n1 n2 n3 n4	Changes multiple target positions or speed of Positioning Module's ax axis installed on sl slot.	5	
Emergency stop	EMG XEMG	EMG sl ax	Instructions Positioning Module installed on sl slot to perform Emergent Stop.	2	
Error Reset	CLR XCLR	CLR sl ax n	Resets Error originated from Positioning Module's ax axis installed on sl slot.	4	
Error history reset	ECLR XECLR	ECLR sl ax	Deletes Error History originated from Positioning Module's ax axis installed on sl slot.	2	
Point Operation	PST XPST	PST sl ax n	Performs Point Operation of Positioning Module's ax axis installed on sl slot.	4	
Basic Parameter Teaching	TBP XSBP	TBP sl ax n1 n2	Changes n2 to n1 among basic parameters of Positioning Module's ax axis installed on sl slot.	4	
Extended Parameter Teaching	TEP XSEP	TEP sl ax n1 n2	Changes n2 to n1 among extended parameters of Positioning Module's ax axis installed on sl slot.	4	
Return to Origin Point Parameter Teaching	THP XSHP	THP sl ax n1 n2	Changes n2 to n1 among returned parameters to origin point of Positioning Module's ax axis installed on sl slot.	4	
Manual Operation Parameter Teaching	TMP XSMP	TMP sl ax n1 n2	Changes n2 to n1 among manual operation parameters of Positioning Module's ax axis installed on sl slot.	4	
Input Signal Parameter Teaching	TSP XSES	TSP sl ax n	Changes input signal parameter of Positioning Module's ax axis installed on sl slot to the value set in n1.	4	
Common Parameter Teaching	TCP XSCP	TCP sl ax n1 n2	Changes n2 to n1 among common parameters of Positioning Module installed on sl slot.	4	

3.5.4 Position control dedicated instruction(APM,XPM)(continued)

Classification	Name	Symbol	Description	Basic steps	Note
Parameter Save	WRT XWRT		Instructions Positioning Module's ax axis installed on sl slot to save present parameter of n axis in flash ROM.	4	
Present State Read	SRD XSRD		Reads and saves present state of Positioning Module's ax axis installed on sl slot in D area of CPU.	4	
Point Operation Step Write	PWR XPWR		Writes n1 value of S area of CPU on point operation step area of Positioning Module's ax axis installed on sl slot in.	4	
Plural Teaching Data Write	TWR XTWR		Writes n1 value of S area of CPU on plural teaching data area of Positioning Module's ax axis installed on sl slot in.	4	
Operation data write	TMD XSMD		Convert n2 value of n3 step of operation data to n1 value on Positioning Module's ax axis installed on sl slot in.	4	
CAM Operation Command	XCAM		Instructs Positioning Module's ax axis installed on sl slot to execute CAM operation with CAM data of n2 with n1 designated as main axis.	4	
Main axis offset-specified CAM operation	XCAMO		Instructs Positioning Module's ax axis installed on sl slot to execute CAM operation with CAM data of n2 with n1 designated as main axis as soon as the main axis reaches the position of n3.	4	
Ellipse interpolation	XELIN		Instructs Positioning Module's ax axis installed on sl slot to execute Ellipse interpolation with n1 step, n2 rate and n3 angle.	4	
Position specified speed synchronization	XSSSP		Instructs Positioning Module's ax axis installed on sl slot to execute speed synchronization where n3 is main axis and main axis ratio is n1, sub axis ratio is n2.	4	
Setting step data	XSWR		Instructs Positioning Module's ax axis installed on sl slot to move the simultaneous start operation steps starting from S in CPU to position module. The number of steps is n1.	4	

3.5.4 Position control dedicated instruction(APM,XPM)(continued)

Classification	Name	Symbol	Description	Basic steps	Note
Variable data reading	VRD XVRD		Reads internal memory data such as parameter, operation data, CAM data starting from OP3 and writes them in CPU by WORD unit. The number of data is OP5.	4	
Variable data writing	VWR XVWR		Writes the data designated by OP3 in internal memory address starting from OP4. The number of data is OP6.	4	
Connecting EtherCAT communication	XECON		Instructs Positioning Module's ax axis installed on sl slot to connect EtherCAT communication . (XGF-PN8A)	3	
Disconnecting EtherCAT communication	XDCON		Instructs Positioning Module's ax axis installed on sl slot to disconnect EtherCAT communication. (XGF-PN8A)	3	
Servo On	XSVON		Gives Positioning Module's ax axis installed on sl slot Serve on command. (XGF-PN8A)	3	
Servo Off	XSVOFF		Gives Positioning Module's ax axis installed on sl slot Serve off command. (XGF-PN8A)	3	
Servo Error Reset	XSCLR		Gives Positioning Module's ax axis installed on sl slot Serve Error Reset command. (XGF-PN8A)	3	
Servo Error History Reset	XSECLR		Gives Positioning Module's ax axis installed on sl slot Serve Error History Reset command. (XGF-PN8A)	3	
Restart	XRSTR		Gives Positioning Module's ax axis installed on sl slot Restart command.	3	
Servo parameter write	XSVPWR		Gives Positioning Module's ax axis installed on sl slot Change command Object n1, n2, n3 to n4(XGF-PN8B).	4	

3.5.4 Position control dedicated instruction(APM,XPM)(continued)

Classification	Name	Symbol	Description	Basic steps	Note
Servo parameter save	XSVSAVE	XSVSAVE sl ax n1	Gives Positioning Module's n1 axis installed on sl slot Save command servo parameter to EEPROM(XGF-PN8B).	4	
Torque control	XTRQ	XTRQ sl ax n1 n2	Gives Positioning Module's ax axis installed on sl slot Torque Control command with n1, n2(Torque value)(XGF-PN8A,PN8B).	4	
Latch position data read	XLRD	XLRD sl ax n1	After reading Latch data of Positioning Module's ax axis installed on sl slot, saves data to n1 device. (XGF-PN8A, PN8B)	4	
Latch reset	XLCLR	XLCLR sl ax n1	Gives Positioning Module's ax axis installed on sl slot Latch Reset command with n1. (XGF-PN8A, PN8B)	4	
Latch setting	XLSET	XLSET sl ax n1 n2	Gives Positioning Module's ax axis installed on sl slot Latch Set command with n1, n2(XGF-PN8B).	4	
Torque Synchronization	XSTC	XSTC sl ax n1 n2 n3 n4	Gives Positioning Module's ax axis installed on sl slot Torque synchronization command(XGF-PN8A/B).	6	
Phase compensation	XPHASING	XPHASING sl ax n1 n2 n3 n4	Allows the axis specified by ax of the positioning module specified by sl slot to perform phase compensation. (XGFPN8A/B).	6	
32bit Speed Synchronous	XSSSD	XSSSD sl ax n1 n2 n3	The axis designated by ax of the positioning module designated by sl slot executes the 32-bit velocity synchronous command.(XGFPN8A/B).	6	
32bit Position specified speed synchronous	XSSSPD	XSSSPD sl ax n1 n2 n3	The axis designated by ax of the positioning module designated by sl slot executes the 32-bit positioning speed synchronization command. (XGFPN8A/B)	6	
Speed/Acceleration/Deceleration Override	XSETOVR	XSETOVR sl ax n1 n2 n3 n4	Real time speed override command is executed to the axis designated by ax of positioning module designated by sl slot.(XGF-PN8A/B). (XGF-PN8A/B)	6	
Absolute Position CAM Run	XCAMA	XCAMA sl ax n1 n2 n3 n4	position cam operation command on the axis designated by ax of the positioning module specified by sl slot. (XGF-PN8A/B)	6	

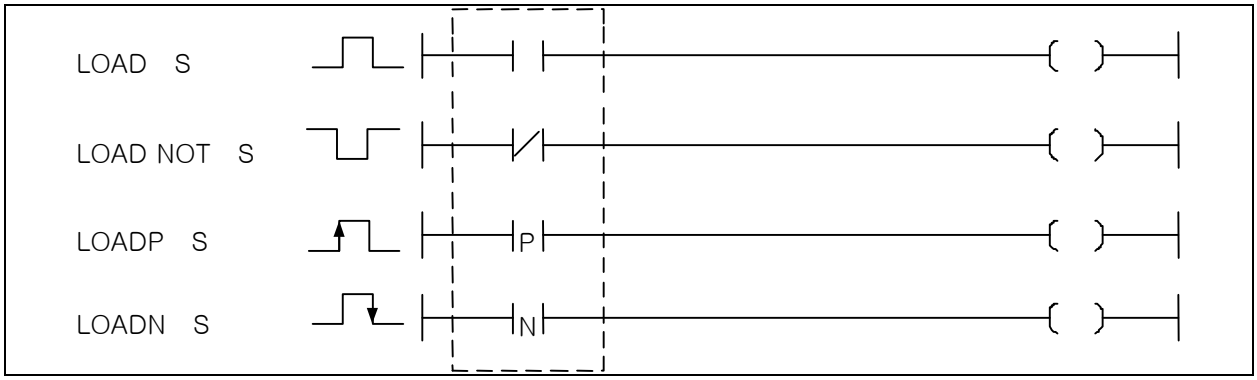
Chapter 4 Details of Instructions

4.1 Contact Point Instruction

4.1.1 LOAD, LOAD NOT, LOADP, LOADN

[Applicable Product:XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOAD LOAD NOT	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	1~2	-	-	-
LOADP LOADN	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	2			



[Area setting]

Operand	Description	Data type
S	Bit device's contact / Word device's bit contact	BIT

1) LOAD, LOAD NOT
   (1) LOAD means a circuit's A contact Operation Start, LOAD NOT means B contact Operation Start.
   (2) On/Off information of specified contact (S) is regarded operation result. At this moment, applicable bit value (0 or 1) is regarded operation result for D area's bit specified.

2) LOADP, LOADN
   (1) LOADP is Operation Start Instruction at Rising edge of pulse. Operation result is On when specified contact changes Off to On (Rising edge of pulse), and only when applicable bit value changes 0 to 1 in case of D area bit specified
   (2) LOADN is Operation Start Instruction at Falling edge of pulse. Operation result is On when specified contact changes On to Off (Falling edge of pulse), and only when applicable bit value changes 1 to 0 in case of D area bit specified.

Notes

D area's bit specified is displayed in Hexadecimal. Namely,Dxxxxx.0 ~ Dxxxxx.F available.
For example,D00010.A means the tenth bit of the word corresponding to D10.

(1)The LOAD / AND / OR command allows index formulas for operands.
- LOAD P1[Z2] stands for LOAD P (1+[Z2] value) and LOAD D10[Z1].5 for LOAD D (10+[Z1] value).5. - What is different is that index formula is added to bit value since P device is of bit, while index formula is added to word value since D device is of word.

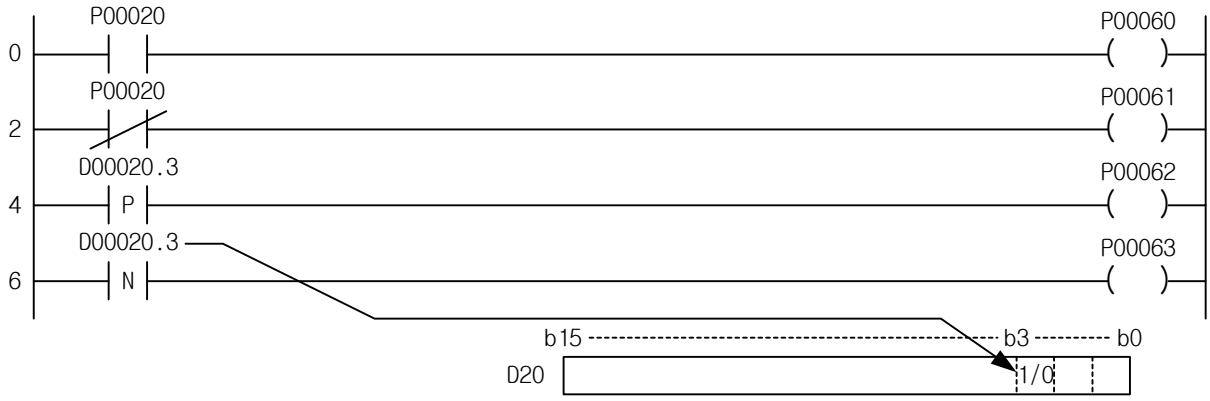
(3) When the LOAD / LOAD NOT command uses an index formula, the number of steps increases by 1 and becomes 2 steps.

(4) It influences Error flag (F110) when Index formula is used in contact instruction.

3) Example

(1) When input condition P00020 is On, P00060 output is On and at the same time P00061 output is Off. And while D00020.3 changes 0→1 for 1 scan, P00062 Output will be On, and while D00020.3 changes 1→0 for 1 scan, P00063 Output will be On.

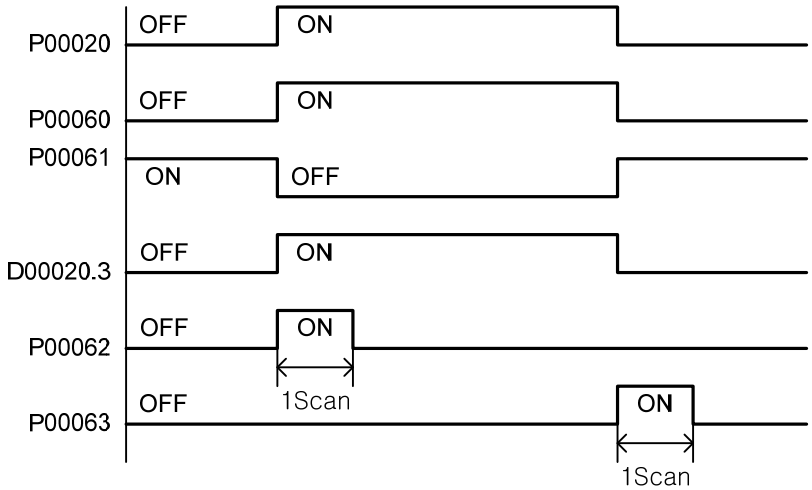
[Ladder Program]



[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	OUT	P00060
2	LOAD NOT	P00020
3	OUT	P00061
4	LOADP	D00020.3
5	OUT	P00062
6	LOADN	D00020.3
7	OUT	P00063

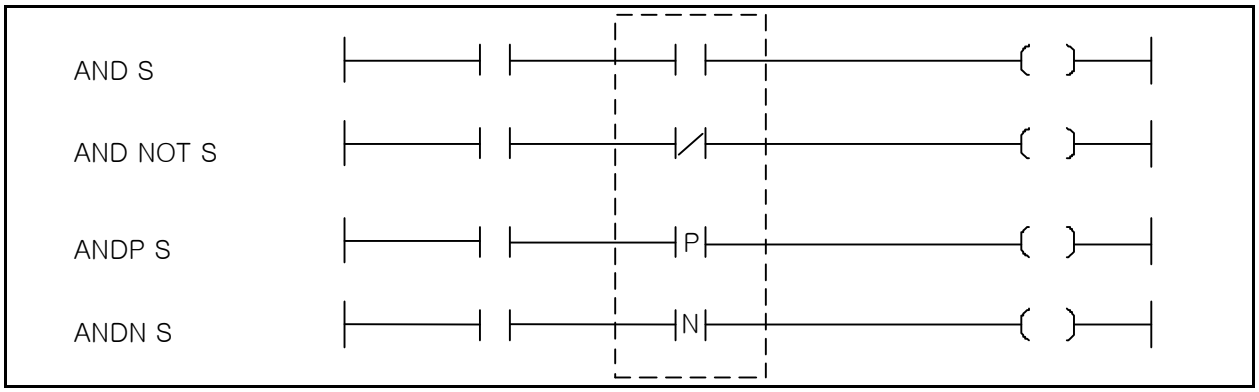
[Time Chart]



4.1.2 AND, AND NOT, ANDP, ANDN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AND AND NOT	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	1~2	-	-	-
ANDP ANDN	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	2			



[Area setting]

Operand	Description	Data type
S	Bit device's contact / Word device's bit contact	BIT

1) AND, AND NOT

(1) AND is A contact series-Connected instruction, and AND NOT is B contact series-connected instruction.

(2) AND or AND NOT operation is performed between the operation result before the designated contact point (S) and the designated contact point to make it the calculation result.

2) ANDP, ANDN

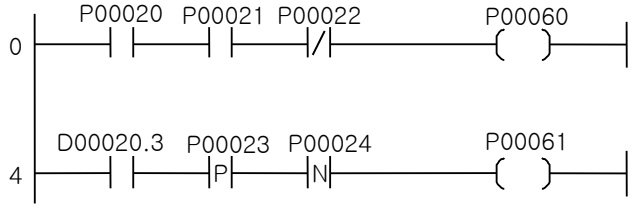
(1) ANDP is A contact series-connected instruction at Rising Pulse, and ANDN is B contact series-connected instruction at Falling Pulse.

(2) When applicable contact changes, in other words, when ANDP is at Rising Pulse and ANDN is at Falling Pulse, AND or AND NOT operation of previous operation result and specified contact(S) is regarded as its result.

3) Example

(1) AND operation of input condition P00020 value and P00021 value, AND NOT operation of the result value and P00022 value, and outputs the result to P00060.
D00020.3 value and P00023 is ANDP operated, whose result and P00024 is ANDN operated to output its result in P00061.

[Ladder program]



[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	AND	P00021
2	AND NOT	P00022
3	OUT	P00060
4	LOAD	P00020.3
5	ANDP	P00023
6	ANDN	P00024
7	OUT	P00061

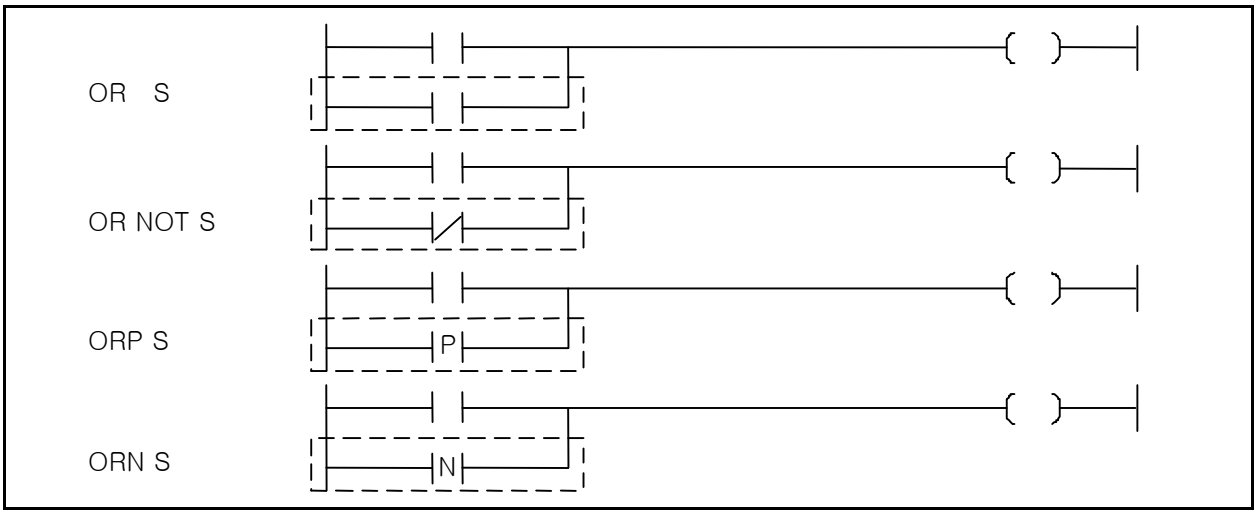
Notes

(1) The AND / AND NOT instruction increases the number of steps by 1 when an index formula is used.

4.1.3 OR, OR NOT, ORP, ORN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OR OR NOT	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	1~2	-	-	-
ORP ORN	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	2	-	-	-



[Area setting]

Operand	Description	Data type
S	Bit device's contact / Word device's bit contact	BIT

1) OR, OR NOT

(1) OR is 1 contact's A contact parallel-connected instruction, and OR NOT is B contact parallel-connected instruction

OR or OR NOT is performed on the front of the designated contact (S) and the designated contact (S) to make it the calculation result.

2) ORP, ORN

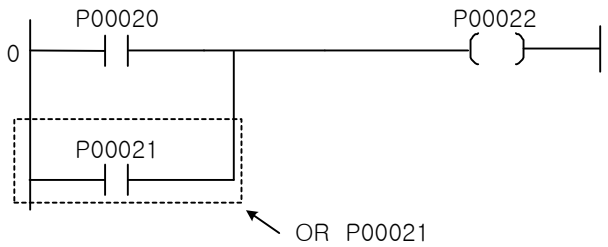
(1) ORP is A contact parallel-connected instruction at rising pulse, and ORN is B contact parallel-connected instruction at falling pulse.

(2) When applicable contact changes, in other words, when ORP is at rising pulse and ORN is at falling pulse, OR operation of previous operation result and specified contact(S) is regarded as its result.

3) Example

OR operation of input condition P00020 value and P00021 value, and outputs the result to P00022.

[Ladder program]



[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	OR	P00021
2	OUT	P00022

Notes

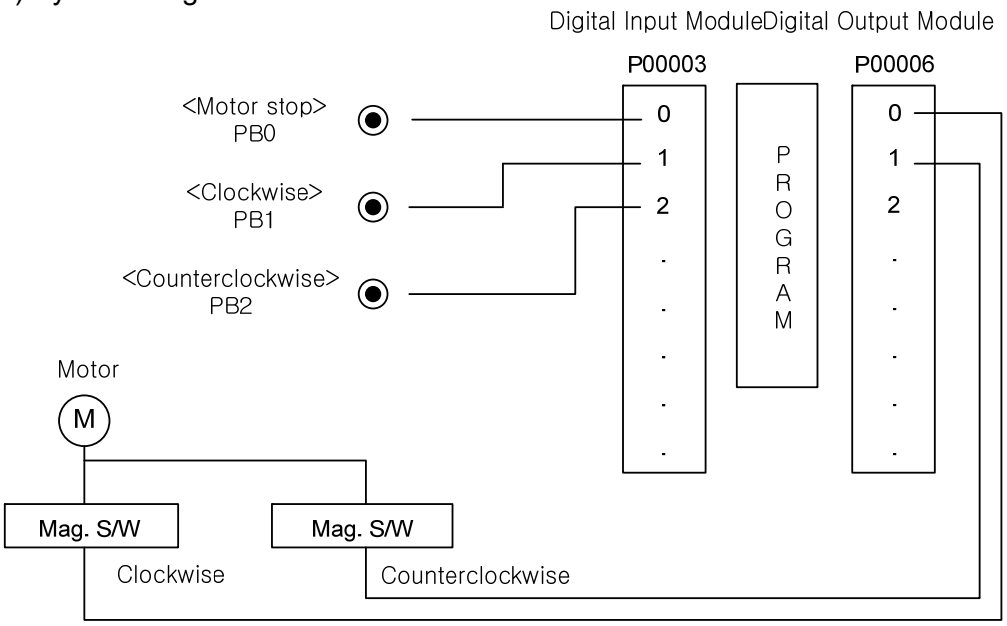
(1) The OR / OR NOT instruction increases the number of steps by 1 when an index formula is used..

[Example 4-1] Forward/Reverse Operation of Motor [LOAD, AND, OR, OUT]

1) Operation

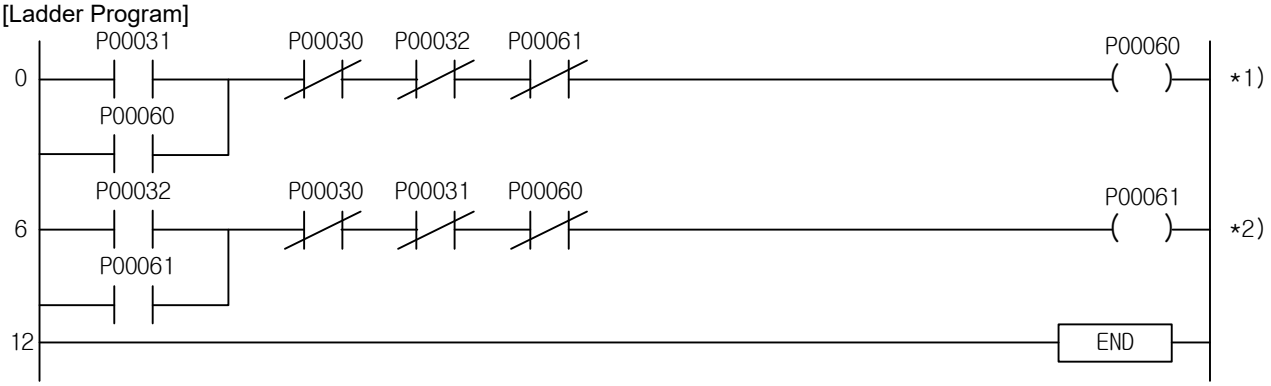
Press instant contact push button PB1 to rotate motor clockwise, or PB2 to rotate motor counterclockwise. Rotation direction can be changed even if the motor is not stopped. Press instant contact push button PB0 to stop the motor.

2) System Diagram



3) Example

[Ladder Program]

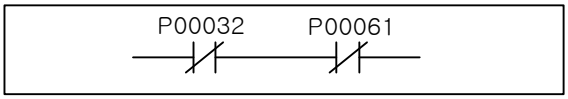


[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00031
1	OR	P00060
2	AND NOT	P00030
3	AND NOT	P00032
4	AND NOT	P00061
5	OUT	P00060
6	LOAD	P00032
7	OR	P00061
8	AND NOT	P00030
9	AND NOT	P00031
10	AND NOT	P00060
11	OUT	P00061
12	END	

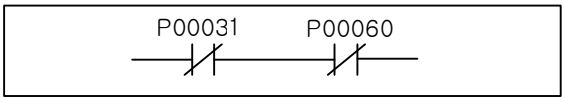
*1) Clockwise Motor Operation

Clockwise motor operation and interlock ‘P00032 and P00061’ setting.



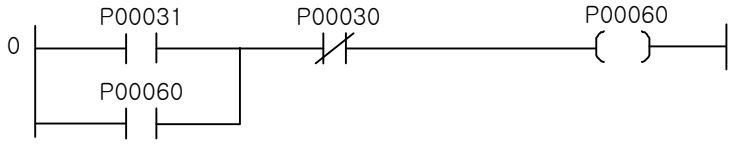
*2) Counterclockwise Motor Operation

Counterclockwise motor operation and interlock ‘P00031 and P00060’ setting



Notes

< Self-holding circuit >

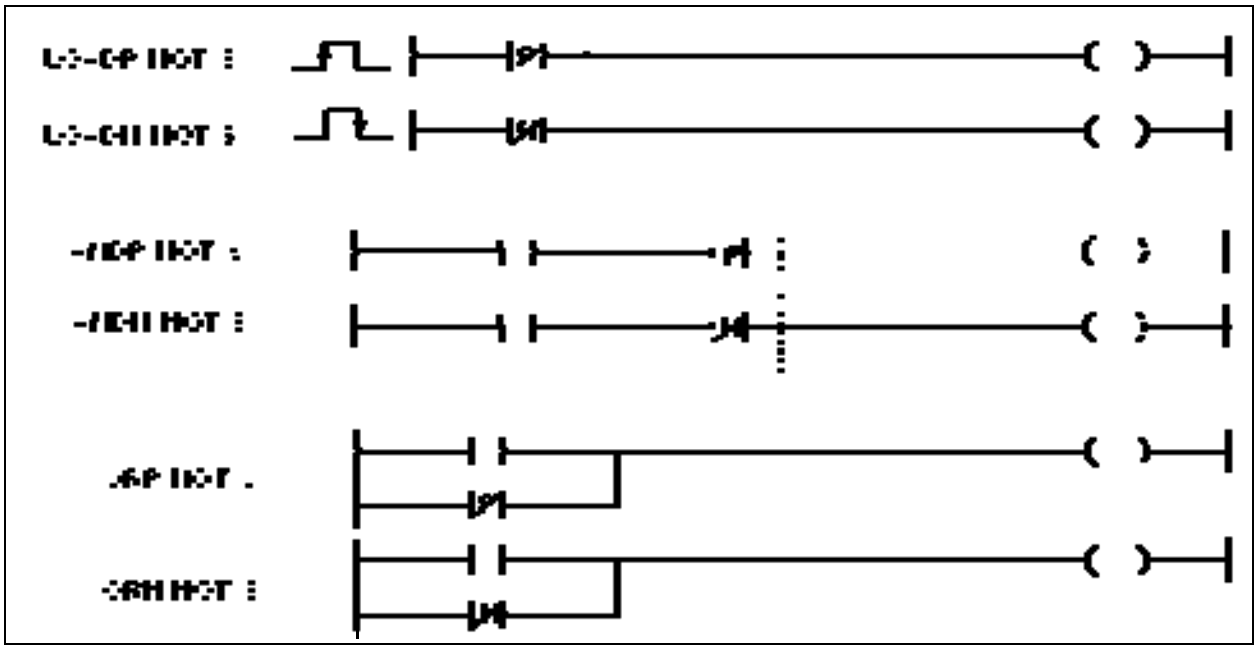


(1) When P00031 is turned on for more than one scan, the output P00060 is turned on, and this turns on the input a contact P00060 using itself again, so that it remains on until the P00030 signal is received. Such a circuit is called Self-holding Circuit

4.1.4 LOADP NOT, LOADN NOT, ANDP NOT, ANDN NOT, ORP NOT, ORN NOT

[Applicable Product:XGK-N(V1.60)]

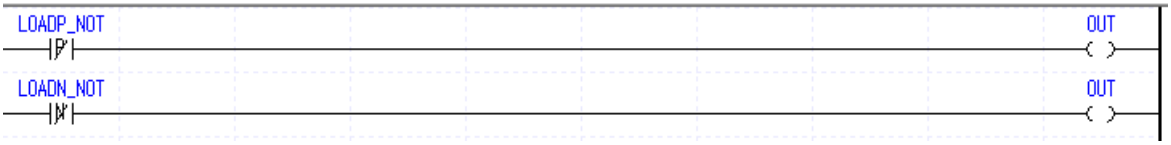
Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOADP NOT LOADN NOT	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	2	-	-	-
ANDP NOT ANDN NOT	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	2			
ORP NOT ORN NOT	S	O	O	O	O	O	O	-	O	O	-	O	-	-	-	2			



[Area setting]

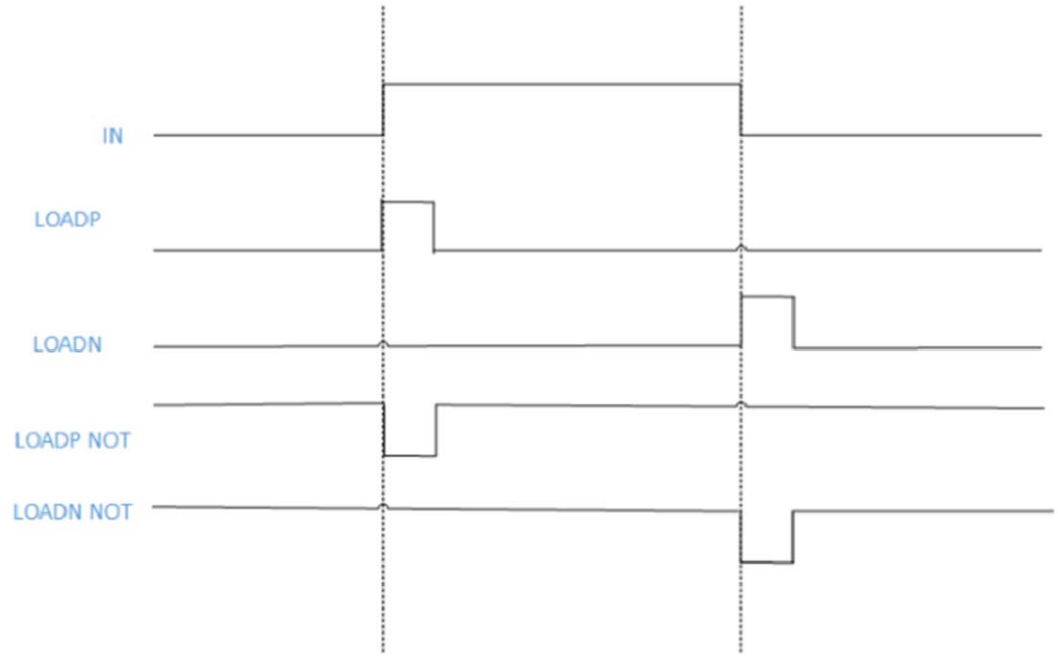
Operand	Description	Data type
S	Bit device's contact / Word device's bit contact	BIT

1) LOAD, LOAD NOT



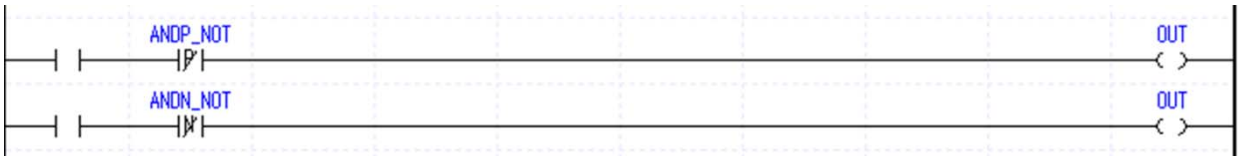
(1) LOADP NOT is a B contact positive conversion detection contact.
When the designated contact point changes from Off to On (rising pulse), 1 scan becomes Off, and then the output is maintained on..

(2) LOADN NOT is the B contact negative conversion detection contact.
When the designated contact point changes from On to Off (falling pulse), 1 scan becomes Off, and then the output is maintained on..



- LOADP NOT keeps output except when input is False -> True
- LOADN NOT keeps output except when input is True -> False

2) ANDP NOT, ANDN NOT



(1) ANDP NOT is a serial connection command for B contact positive conversion detection contact, ANDN NOT is a serial B contact negative conversion detection contact command.
(2) ANDP NOT is when the corresponding contact value changes, that is, when it is a rising pulse, ANDN NOT is when it is a falling pulse, and the operation result of the previous step of the designated contact and the designated contact (S) are ANDed and used as the operation result..

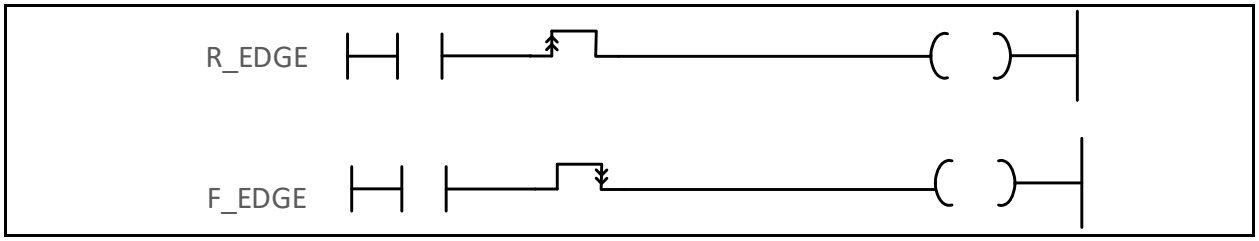
3) ORP NOT, ORN NOT

(1) ORP NOT is a parallel command for B contact positive conversion detection contact, and ORN NOT is a parallel command for B contact negative conversion detection contact.
(2) When ORP NOT is a rising pulse, the operation result of the previous step of the designated contact point and the designated contact point (S) are calculated as'OR' and it is used as the operation result. When ORN NOT is a falling pulse, the operation result of the previous step of the designated contact point and the designated contact point (S) are calculated as'OR' and it is used as the operation result.

4.1.5 R_EDGE, F_EDGE

[Applicable Product:XGK-N(V1.60)]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
R_EDGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-
F_EDGE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5			

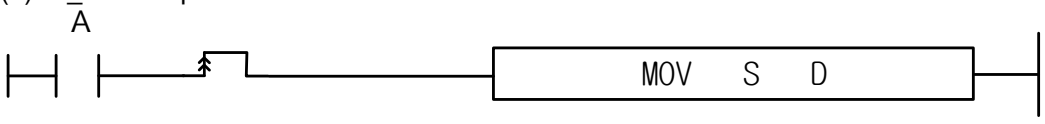


1) R_EDGE
   (1) R_EDGE positive conversion detection function.
   (2) If the operation result before R_EDGE was Off in the previous scan, it turns On in the current scan, and the state of the right line turns On during the current scan, only when the state of the left line is On.

2) F_EDGE
   (1) F_EDGE negative conversion detection function.
   (2) Only when the operation result before F_EDGE was On in the previous scan is Off in the current scan and the state of the left line is Off, the state of the right line is On during the current scan.

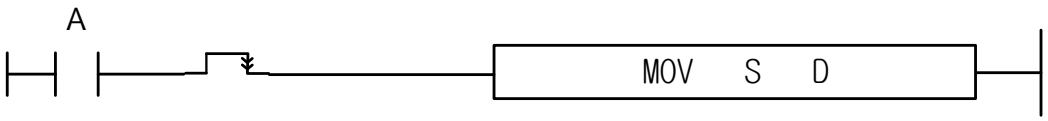
3) Example
   This is an example of outputting the result of MOVE command through the operation of R_EDGE and F_EDGE.

   (1) R_EDGE operation



- Write the program as above.
- Set contact A to operate.
- Set the desired device for S and D. If you input S value, D will be changed equally.
- If you further change the value of S, the value of D remains at its previous value.

   (2) F_EDGE operation



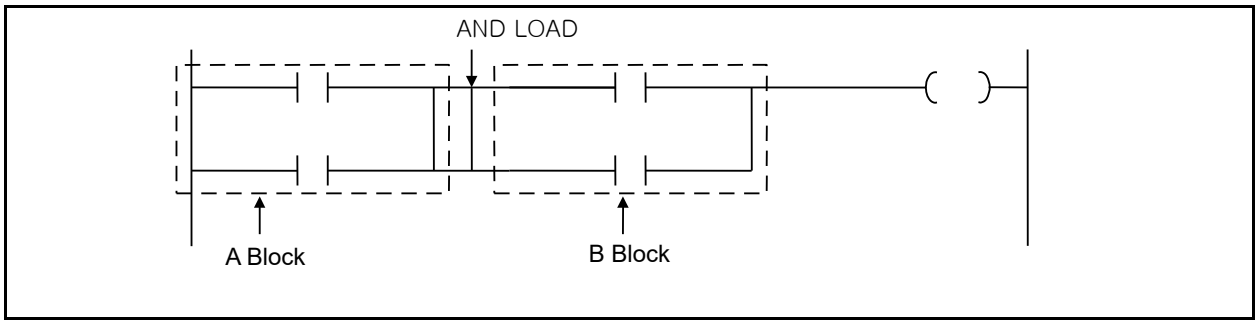
- Write the program as above.
- Set contact A to operate.
- Set the desired device in S and D. Enter the S value.
- Clear contact A. At this time, D is changed equal to the set value of S.
- If you further change the value of S, the value of D remains at its previous value.

4.2 Unite Instruction

4.2.1 AND LOAD

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AND LOAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) Function

(1) It performs AND Operation of A Block and B Block. That is, calculation is possible only when both A block and B block are on.

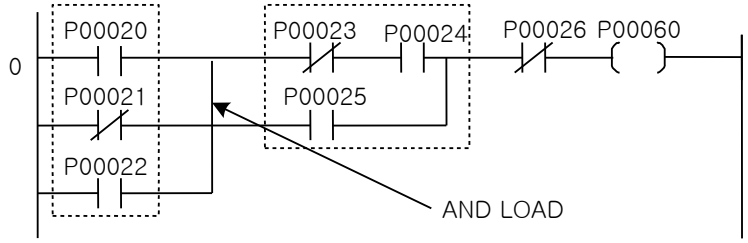
(2) If AND LOAD is continuously used, normal operation is not available when the max. usable number is exceeded.

(3) Up to 15 times (16 blocks) available if continuously used.

2) Example

Where Input Condition P00020, P00024 or P00020, P00025 or P00022, P00026 is On, P00060 is Output.

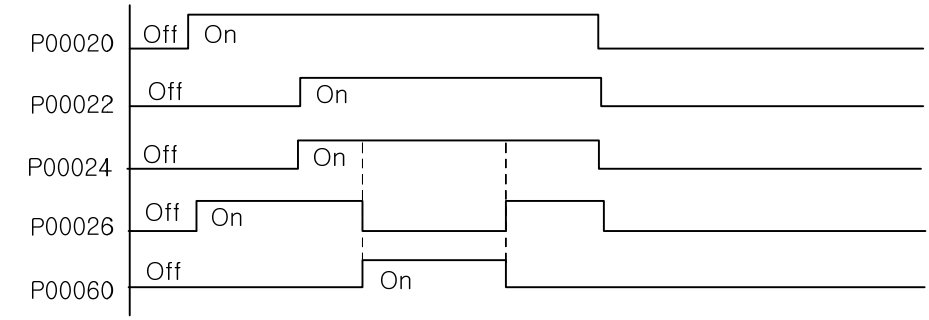
[Ladder program]



[Mnemonic Program]

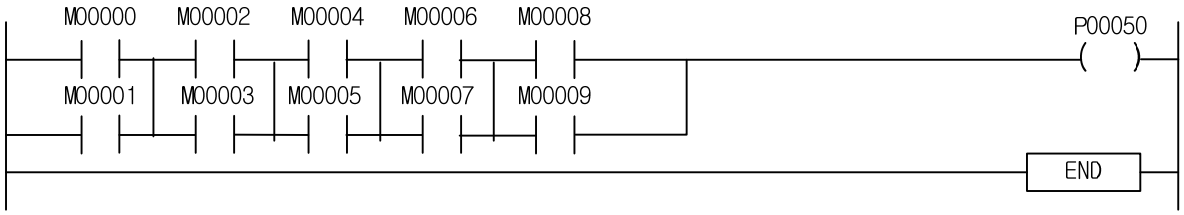
Step	Mnemonic	Operand
0	LOAD	P00020
1	OR NOT	P00021
2	OR	P00022
3	LOAD NOT	P00023
4	AND	P00024
5	OR	P00025
6	AND LOAD	
7	AND NOT	P00026
8	OUT	P00060

[Time Chart]



3) References

In case Circuit Block is series-connected continuously, program input is of 2 types as follows.



Programs with unlimited number of AND LOADs

```
LOAD    M00000
OR      M00001
LOAD    M00002
OR      M00003
AND LOAD
LOAD    M00004
OR      M00005
AND LOAD
LOAD    M00006
OR      M00007
AND LOAD
LOAD    M00008
OR      M00009
AND LOAD
OUT     P00060
END
```

Limited to 30 circuits: (Contact + coil)up to 32 available.

Programs with limited number of AND LOADs

```
LOAD    M00000
OR      M00001
LOAD    M00002
OR      M00003
LOAD    M00004
OR      M00005
LOAD    M00006
OR      M00007
LOAD    M00008
OR      M00009
AND LOAD
AND LOAD
AND LOAD
AND LOAD
OUT     P00060
END
```

If used continuously, up to 15 instructions (16 blocks) available.

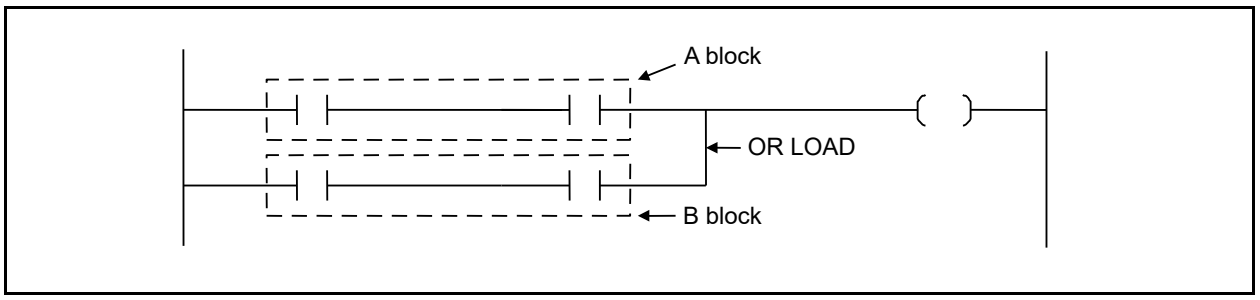
Notes

(1) In XG5000, the program above if made by Ladder and displayed by Mnemonic will be of unlimited application times of AND LOAD.

4.2.2 OR LOAD

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OR LOAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) OR LOAD

(1) Performs OR operation of A Block and B Block to get the result.

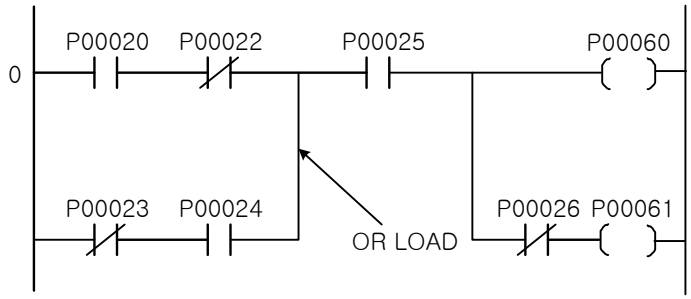
(2) If OR LOAD is continuously used, normal operation is not available when the maximum usable number is exceeded.

(3) Up to 15 times (16 blocks) available if continuously used.

2) Example

(1) Where Input condition P00020, P00025 or P00024, P00025 is On, P00060 and P00061 is output

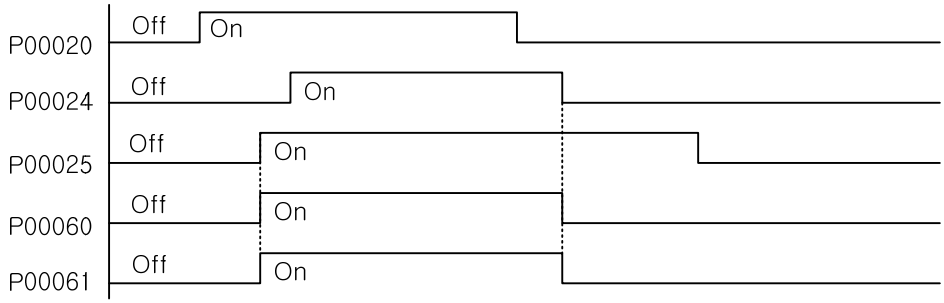
[Ladder program]



[Mnemonic Program]

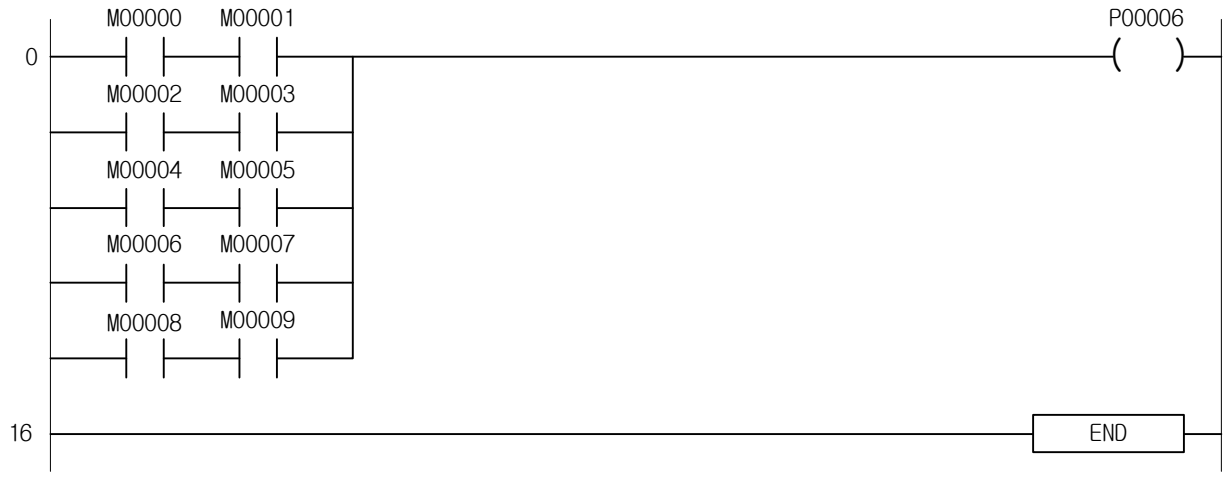
Step	Mnemonic	Operand
0	LOAD	P00020
1	AND NOT	P00022
2	OR NOT	P00023
3	AND	P00024
4	OR LOAD	
5	AND	P00025
6	OUT	P00060
7	AND NOT	P00026
8	OUT	P00061

[Time Chart]



3) References

In case Circuit Block is series-connected continuously, program input is of 2 types as follows.



Programs with unlimited number of OR LOADs	
LOAD	M00000
AND	M00001
LOAD	M00002
AND	M00003
OR LOAD	
LOAD	M00004
AND	M00005
OR LOAD	
LOAD	M00006
AND	M00007
OR LOAD	
LOAD	M00008
AND	M00009
OR LOAD	
OUT	P00060
END	

There is no limit to the number of OR LOADs.

Programs with limited number of OR LOADs	
LOAD	M00000
AND	M00001
LOAD	M00002
AND	M00003
LOAD	M00004
AND	M00005
LOAD	M00006
AND	M00007
LOAD	M00008
AND	M00009
OR LOAD	
OR LOAD	
OR LOAD	
OR LOAD	
OUT	P00060
END	

If used continuously, up to 15 instructions (16 blocks) available.

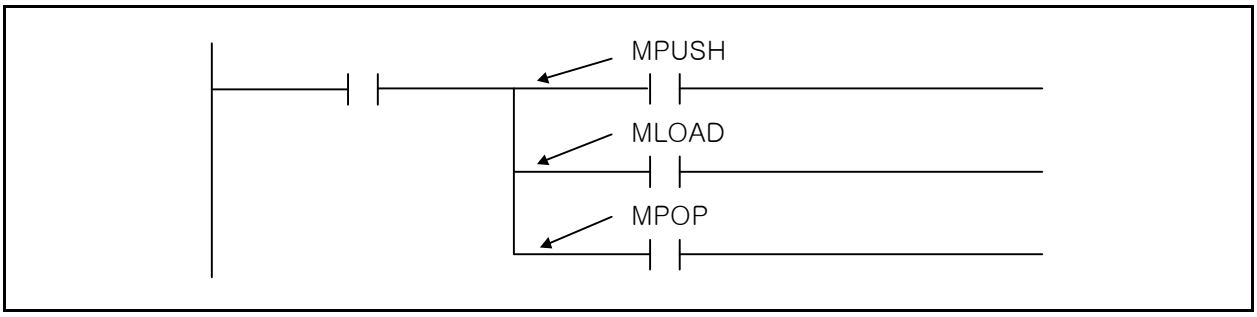
Notes

(1) In XG5000, the program above if made by Ladder and displayed by Mnemonic be of unlimited application times of OR LOAD.

4.2.3 MPUSH, MLOAD, MPOP

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MPUSH MLOAD MPOP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) MPUSH, MLOAD, MPOP

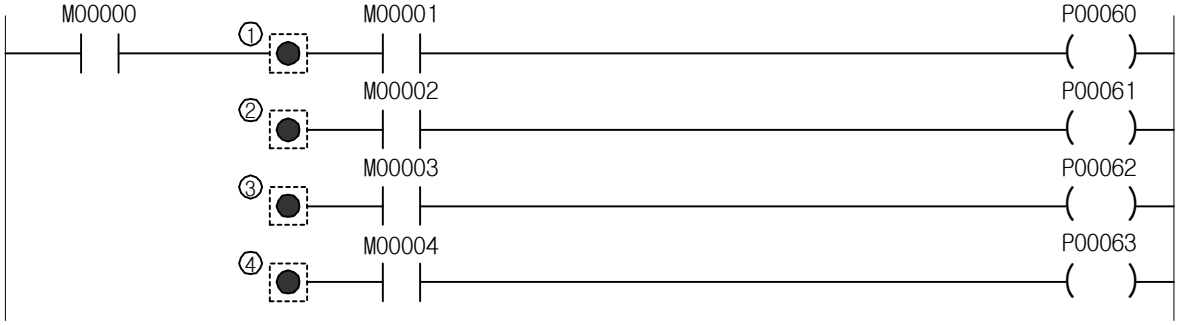
(1) Makes Ladder's multiple branch available.

(2) For MPUSH and MPOP, XGK is 16-step and XGB is 8-step.

(3) MPUSH: saves result operated up to present.

(4) MLOAD: only reads previous operation result for next operation with specified area value not changed.

(5) MPOP: After reading the previous calculation result saved at the branch point, the previous saved result is erased.



① MPUSH: saves M00000 state in PLC's internal memory. Used as first branch.

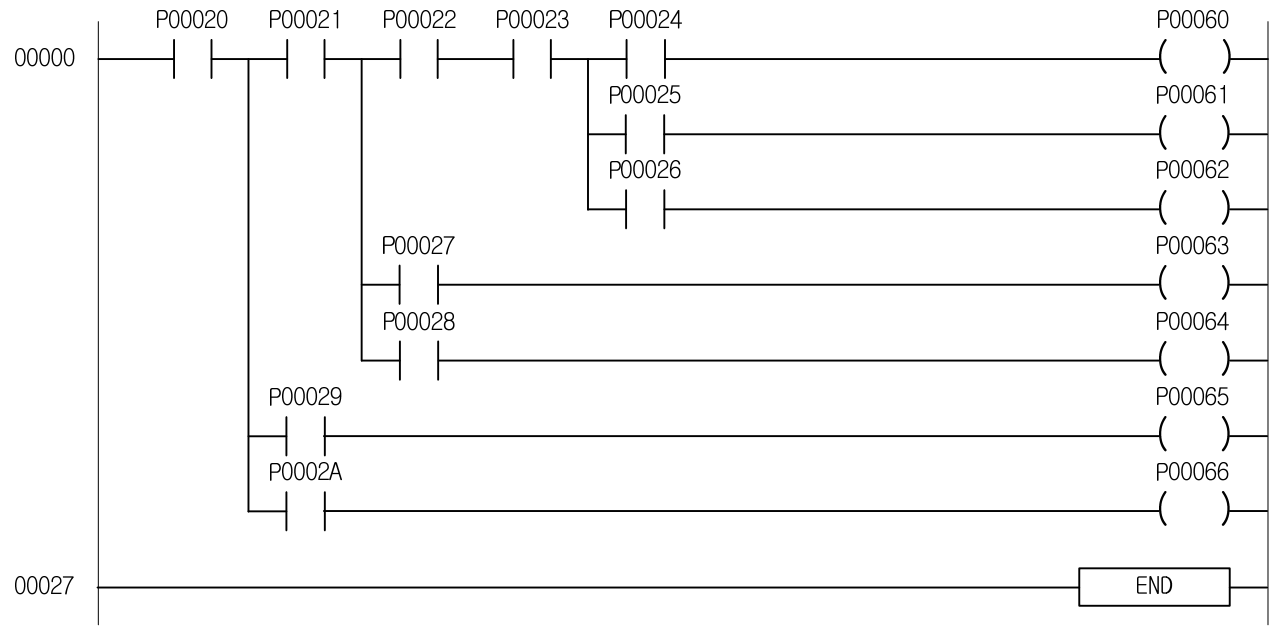
② MLOAD: reads saved M00000 state and performs next operation. Used as branch relay.

③ MLOAD: reads saved M00000 state and performs next operation.

④ MPOP: reads saved M00000 in PLC's internal memory and performs operation and resetting.Used as divergence end.

2) References

[Ladder Program]



[Mnemonic Program]

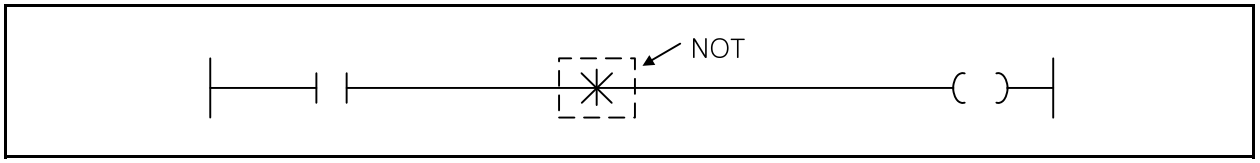
Step	Mnemonic	Operand
0000	LOAD	P00200
0001	MPUSH	
0002	AND	P00021
0003	MPUSH	
0004	AND	P00022
0005	AND	P00023
0006	MPUSH	
0007	AND	P00024
0008	OUT	P00060
0009	MLOAD	
0010	AND	P00025
0011	OUT	P00061
0012	MPOP	
0013	AND	P00026
0014	OUT	P00062
0015	MLOAD	
0016	AND	P00027
0017	OUT	P00063
0018	MPOP	
0019	AND	P00028
0020	OUT	P00064
0021	MLOAD	
0022	AND	P00029
0023	OUT	P00065
0024	MPOP	
0025	AND	P0002A
0026	OUT	P00066
0027	END	

4.3 Reversion Instruction

4.3. 1 NOT

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
NOT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) NOT

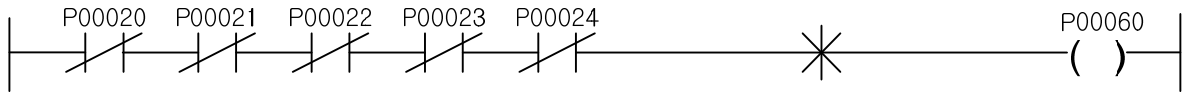
(1) NOT reverses the previous result.

(2) If Reverse Instruction(NOT) is used, A contact circuit is reversed to B contact circuit, B contact circuit to A contact circuit, and series-connected circuit is reversed to parallel-connected circuit, parallel-connected circuit to series-connected circuit for the left circuit of Reverse Instruction.

2) Example

Program ① and ② outputs the same result.

Program ①



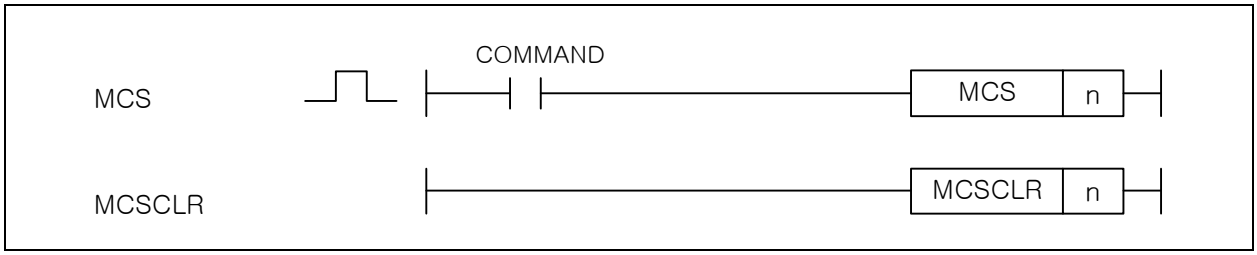
Program ②

4.4 Master Control Instruction

4.4.1 MCS, MCSCLR

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
MCS MCSCLR	n	-	-	-	-	-	-	-	-	-	O	-	-	-	-	1	-	-	-



[Area setting]

Operand	Description	Data type
n	Integer. n(Nesting) setting is available from 0 to 15 for XGK and 0 to 7 for XGB.	WORD(0~15)

1) MCS, MCSCLR

(1) If the input condition of MCS is On, up to MCSCLR equal to the MCS number is executed, and if the input condition is Off, it is not executed.

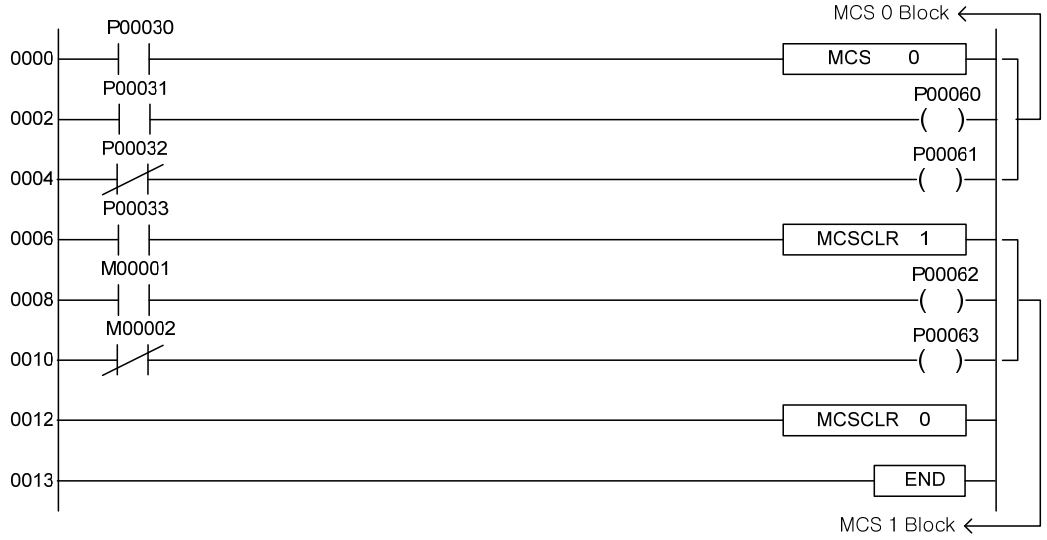
(2) The priority of MCS number 0 is the highest and 15 (XGK) / 7 (XGB) is the lowest, so use it in the order of highest priority and release it in reverse order.

(3) When MCSCLR releases high priority, low priority MCS blocks are also released.

(4) MCS or MCSCLR should be used sequentially in order of priority.

2) Example

Where 2 MCS Instructions are used and “0” with high priority is used for MCSCLR Instruction.



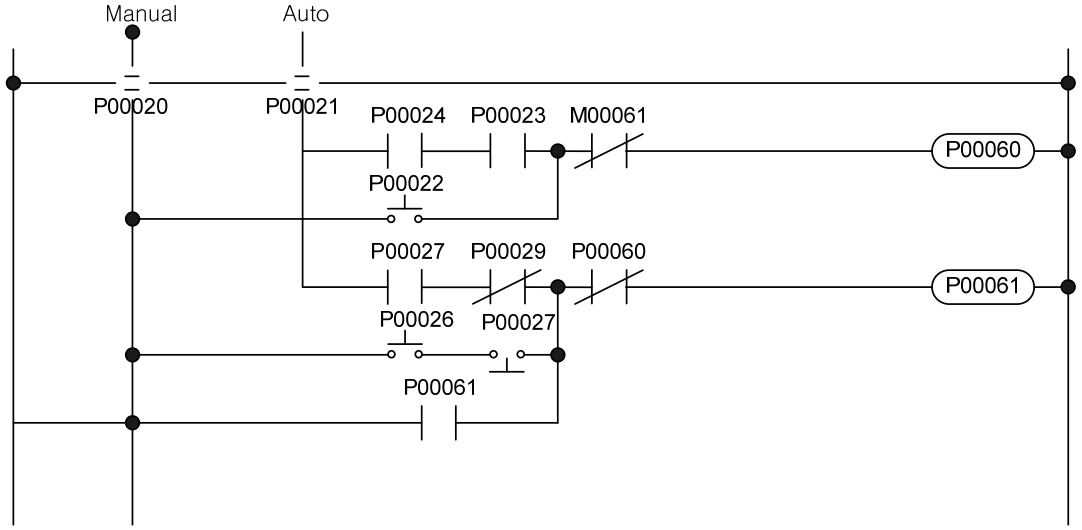
Notes

(1) If MCS’s On/Off Instruction is Off, MCS ~ MCSCLR’s operation result will as follows; Be careful when using MCS (MCSCLR) Instruction.
- · Timer Instruction: Not Processed. Identical Process to contact Off
- · Counter Instruction: Not Processed (Present value kept)
- · OUT Instruction: Not Processed. Identical Process to contact Off
- · SET, RST Instruction: Result Kept

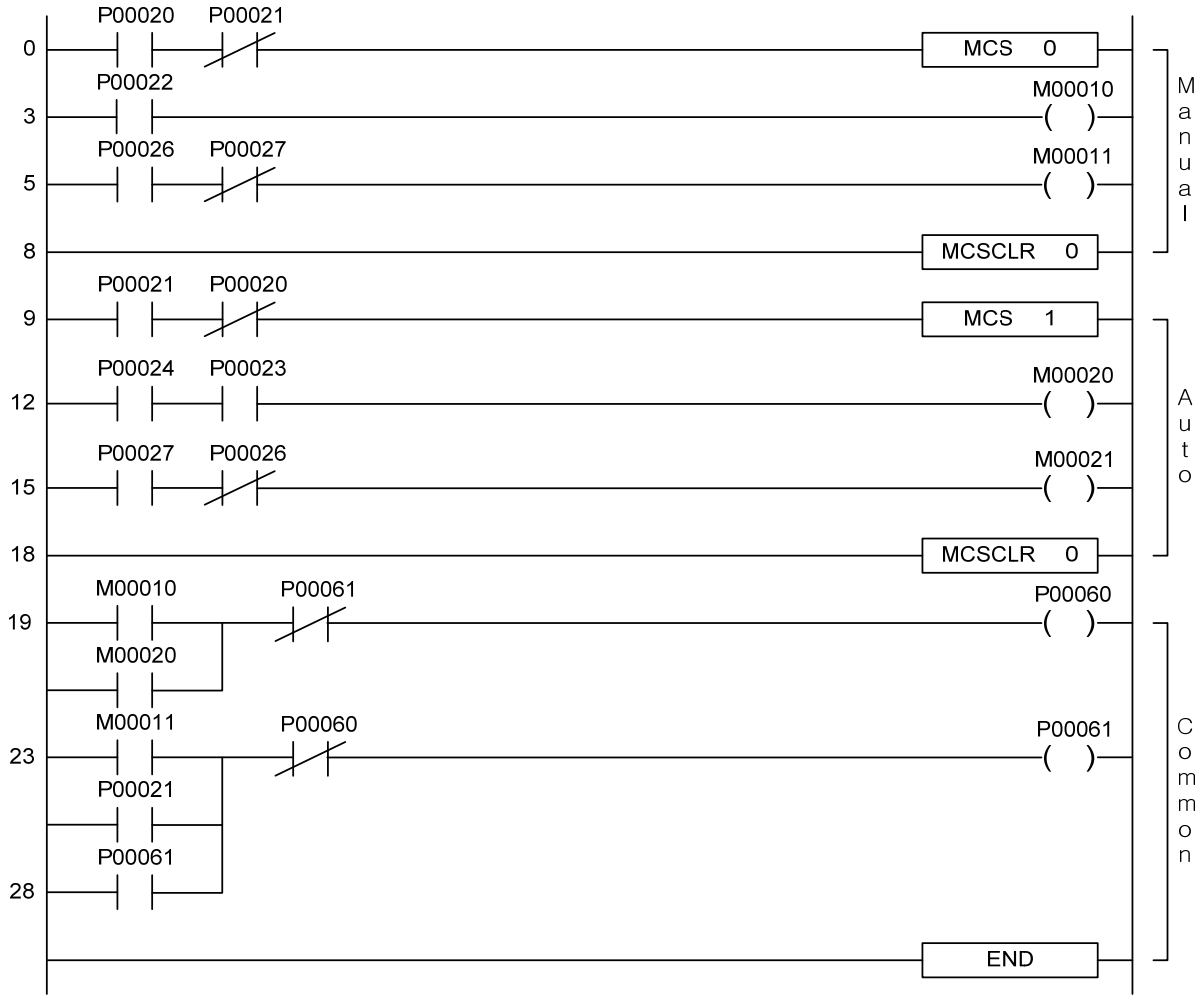
[Example 4.2] Circuit with Common LINE [MCS, MCSCLR]

As the circuit state shown below does not become the PLC program, program it using the master control (MCS, MCSCLR) instructions.

[Relay Circuit]



[Master control used]

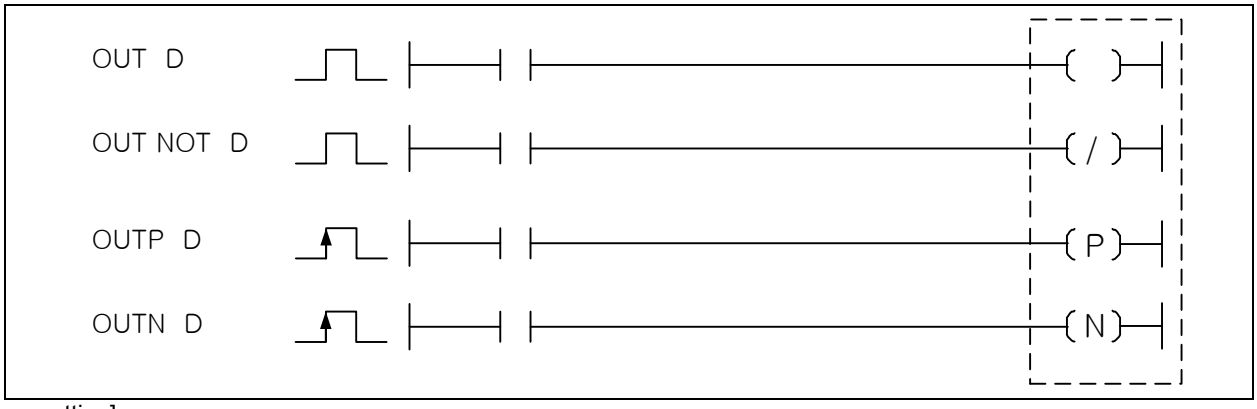


4.5 Output Instruction

4.5.1 OUT, OUT NOT, OUTP, OUTN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OUT OUT NOT	D	O	-	O	-	-	O	-	O	O	-	O	-	-	-	1~2	-	-	-
OUTP OUTN	D	O	-	O	-	-	O	-	O	O	-	O	-	-	-	2	-	-	-



[Area setting]

Operand	Description	Data type
D	Bit device's contact / Word device's bit contact	BIT

1) OUT, OUT NOT

(1) OUT is used to output operation result of OUT Instruction as it is in specified device.

(2) OUT NOT is used to output reversed operation result of OUT NOT Instruction in specified device.

(3) Refer to 4.6 Subsequent Input Sequence Preferred Instruction for details on OUT Sxx.yy.

2) OUTP, OUTN

(1) OUTP turns ON the specified contact only for 1 scan when the operation result up to the OUTP instruction goes from Off to On and turns off otherwise. If the designated contact is a bit contact of the word device, the corresponding bit becomes 1 only for 1 scan and 0 otherwise.

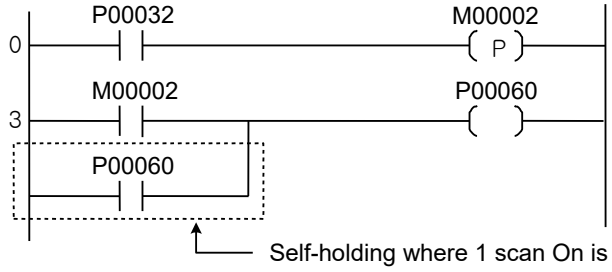
(2) OUTP turns ON the specified contact only for 1 scan when the operation result up to the OUTP instruction goes from On → Off and turns off otherwise. If the designated contact is a bit contact of the word device, the corresponding bit becomes 1 only for 1 scan and 0 otherwise.

(3) Master-K's D, D NOT Instruction is the Instruction changed.

3) Example

OUTP Example: performs OUTP Instruction when input contact P00032 changes Off to On.

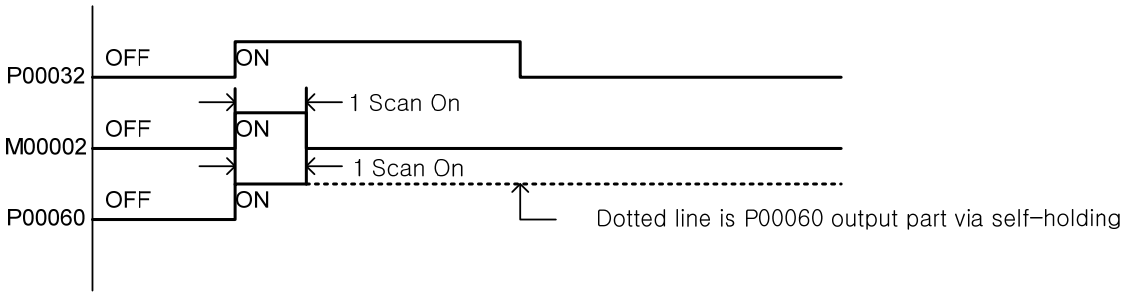
[Ladder program]



[Mnemonic Program]

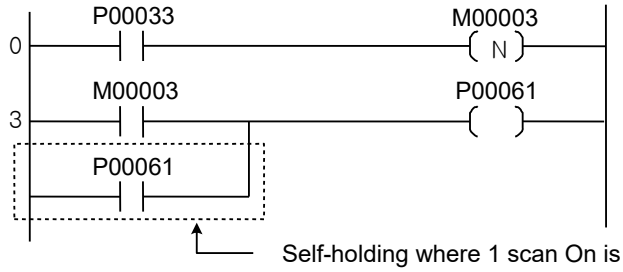
Step	Nnemonic	Operand
0	LOAD	P00032
1	OUTP	M00002
2	LOAD	M00002
3	OR	P00060
4	OUT	P00060

[Time Chart]



OUTN Example: performs OUTN Instruction when input contact P00033 changes On to Off.

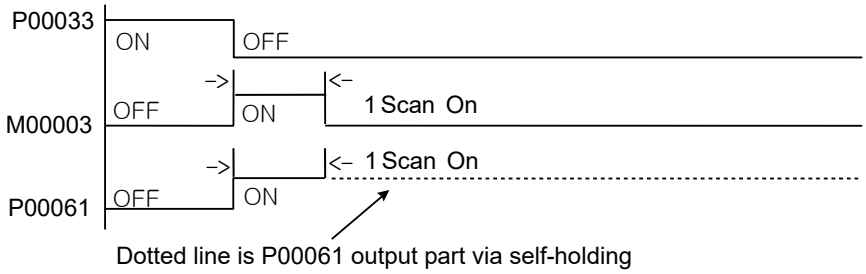
[Ladder program]



[Mnemonic Program]

Step	Nnemonic	Operand
0	LOAD	P00033
1	OUTN	M00003
2	LOAD	M00003
3	OR	P00061
4	OUT	P00061

[Time Chart]



Notes

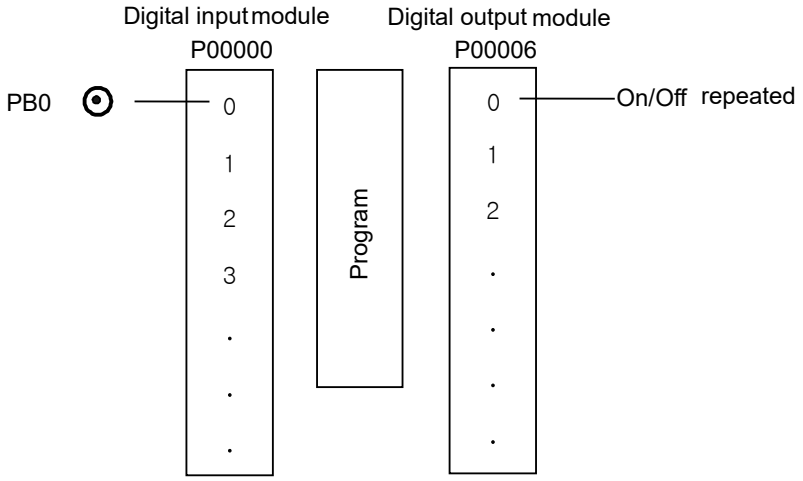
(1) Since OUTP, OUTN Instructions are On only for1 scan based on applicable input condition, Output to P area needs careful attention.

[Example 4.3] Output On/Off Operation [OUTP/OUTN]

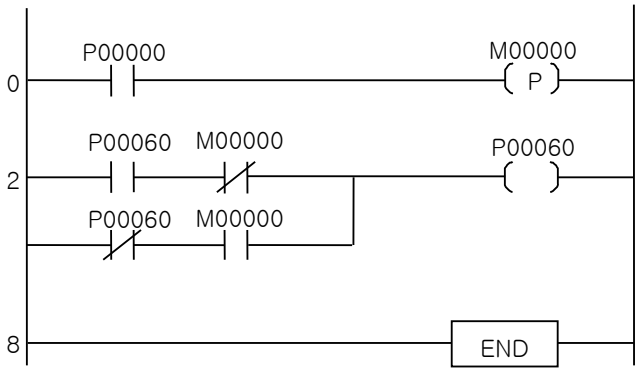
(1) Operation

Press instant contact push button PB0 to make Output On first, and press again to make Output Off.
Whenever PB0 is pressed, Output is repeatedly On and Off.

(2) System Diagram



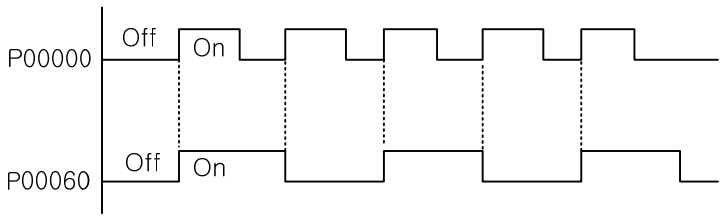
[Ladder program]



[Mnemonic Program]

Ste	Mnem	Operan
0	LOAD	P00000
1	OUTP	M00000
2	LOAD	P00060
3	AND NOT	M00000
4	LOAD NOT	P00060
5	AND	M00000
6	OR LOAD	
7	OUT	P00060
8	END	

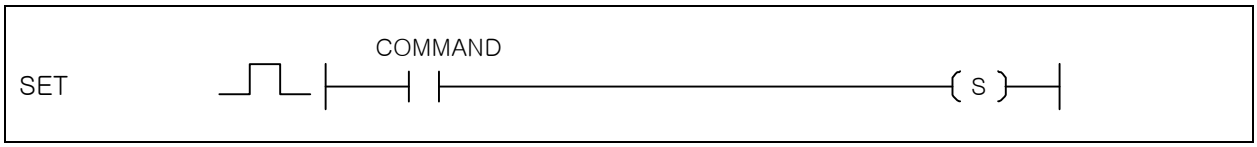
[Time Chart]



4.5.2 SET

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
Set	D	O	-	O	-	-	O	-	O	O	-	O	-	-	-	1	-	-	-



[Area setting]

Operand	Description	Data type
D	Contact to keep On state / Word device's bit contact	BIT

1) SET

(1) When the input condition is On, the designated output contact is kept on and the output remains on even if the input is off. If specified output contact is of Word device's bit contact, its applicable bit should be 1.

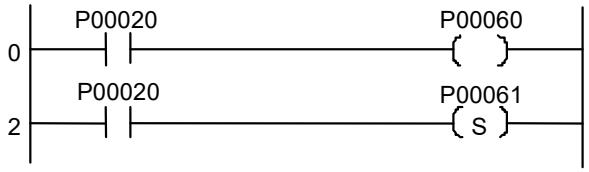
(2) Contact if On by SET Instruction can be Off by RST Instruction.

(3) Refer to 4.6.1 Subsequent Input Sequence Preferred Instruction for details on when SET Syy.xx.

2) Example

Where the state of P00060 & P00061 is checked when input contact P00020 changes Off → On.

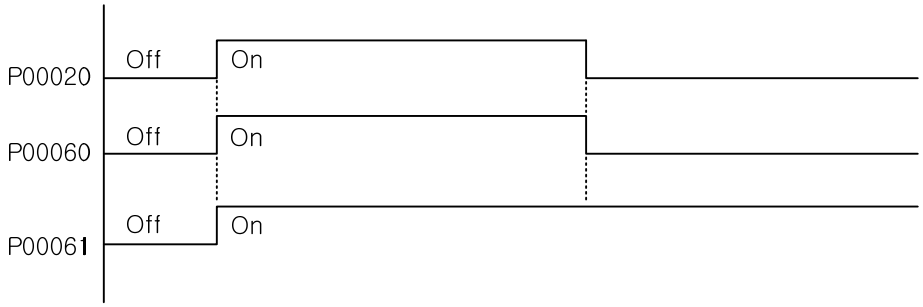
[Ladder program]



[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	OUT	P00060
2	LOAD	P00020
3	SET	P00061

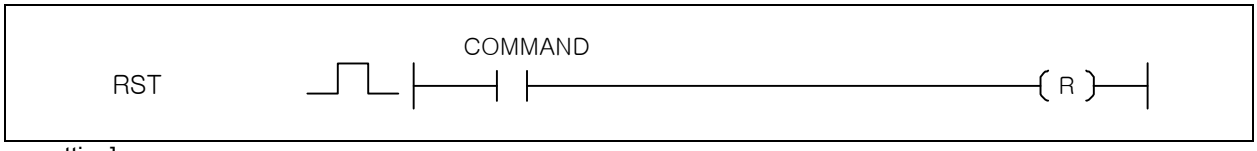
[Time Chart]



4.5. 3 RST

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RST	D	O	-	O	O	O	O	-	O	O	-	O	-	-	-	1	-	-	-



[Area setting]

Operand	Description	Data type
D	Contact to keep Off state / Word device's bit contact	BIT

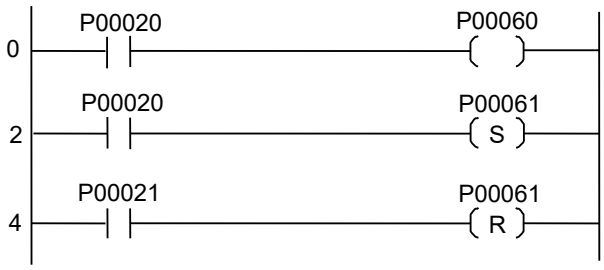
1) RST

(1) When the input condition is On, the designated output contact is kept on and the output remains off even if the input is off. If specified output contact is of Word device's bit contact, its applicable bit should be 0.

2) Example

(1) Where the output state of P00060 & P00061 is checked and P00061 output is made Off when input condition P00020 changes On → Off.

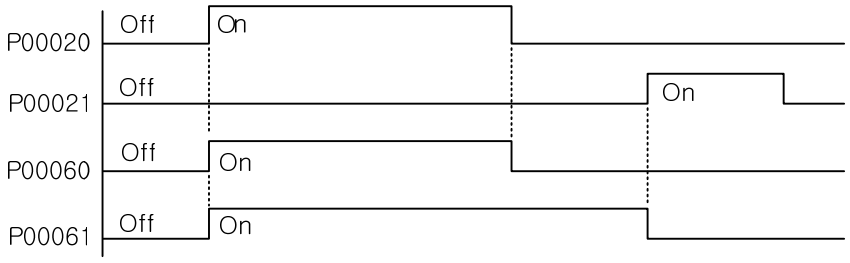
[Ladder program]



[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	OUT	P00060
2	LOAD	P00020
3	SET	P00061
4	LOAD	P00021
5	RST	P00061

[Time Chart]

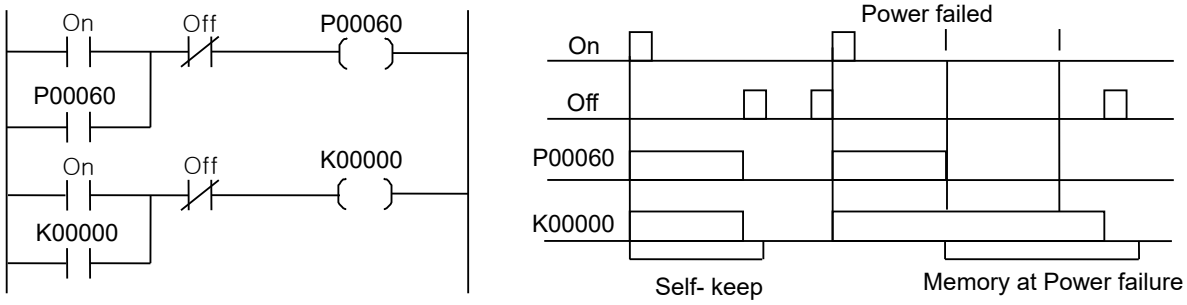


[Example 4.4] About power fail measures

About differences between P and K areas ,Set/Reset Operation

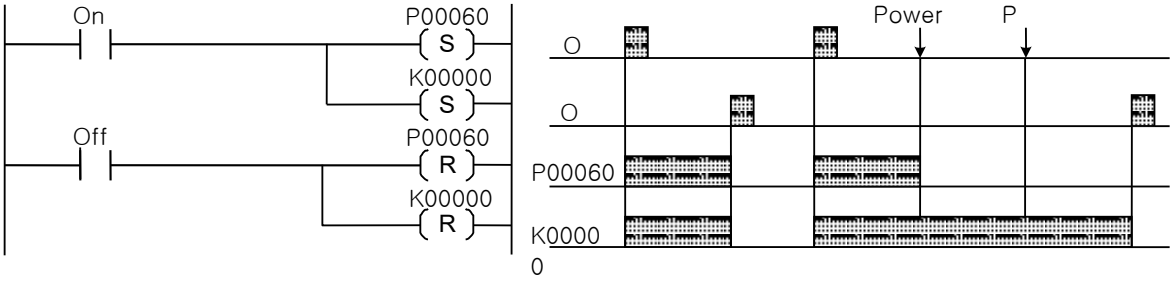
(1) Differences between Input/Output Relay(P) and Keep Relay(K)

All the following sequences are of self-keep circuit with the same operation. However, if Output is cut off during On and then powered again, its output state will be different.



(2) Differences in operation between Input/Output Relay(P) and Keep Relay(K) areas at SET/RST Instruction

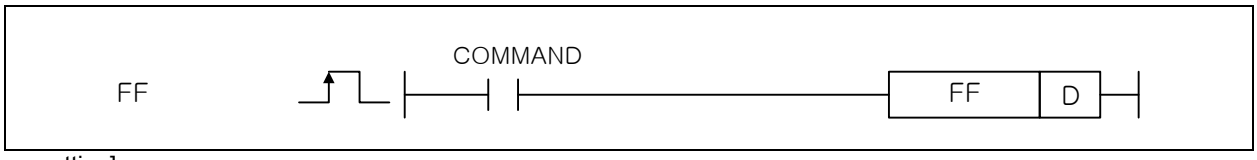
Set/Reset Instructions have Self-Keep function to keep the state once when Output is set (On) till “Off” input comes in. However, because of differences between Input/Output Relay(P) Area and Keep Relay(K) Area, the operation after power recovered will be different.



4.5. 4 FF

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FF	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	1	-	-	-



[Area setting]

Operand	Description	Data type
D	Bit device's contact / Word device's bit contact	BIT

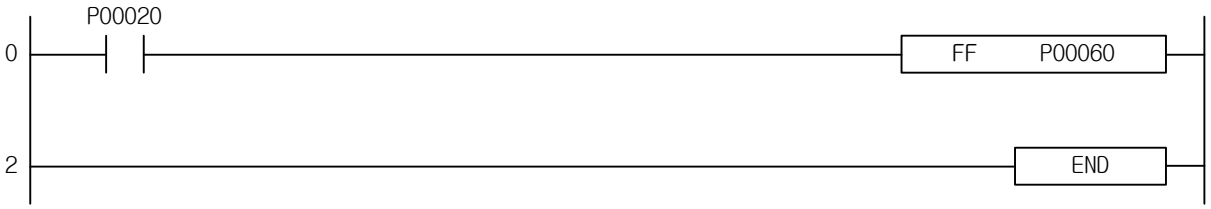
1) FF

(1) Reverses specified device's state when input contact changes Off → On by Bit Output Reverse Instruction.

2) Example

(1) Where P0060 state is reversed when input contact P0020 is changed from Off to On.

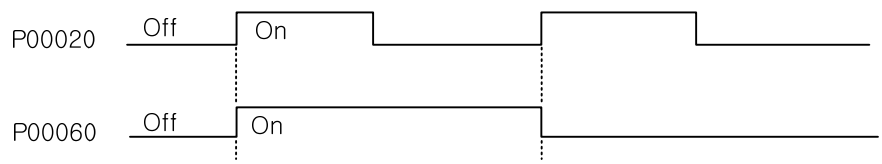
[Ladder Program]



[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	FF	P00060
2	END	

[Time Chart]

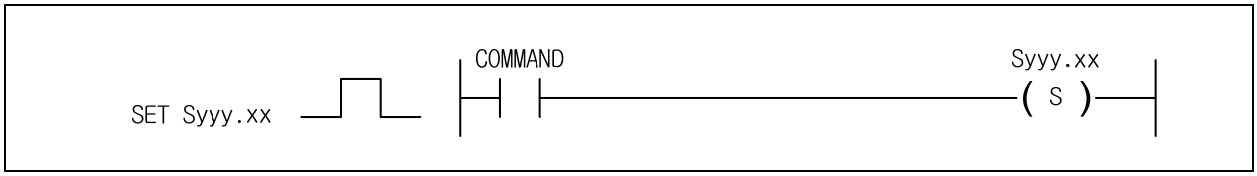


4.6 Last-In First-Out Preferred Instruction

4.6.1 SET Syyy.xx

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
Set	S	-	-	-	-	-	O	-	-	-	-	-	-	-	-	1	-	-	-



[Area setting]

Operand	Description	Data type
Syyy.xx	S device contact, where yyy represents the group number and xx represents the step number. Group Number is available 0~127, and step number 0~99	BIT

1) SET Syy.xx(Sequence Control)

(1) In the same group with previous step number On, if present step number's input condition contact state is On, present step number will be On and the previous step number will be Off.

(2) If Present step number is On,it will be self-holding to keep On state although input contact is Off.

(3) Even if input condition contacts are On at a time, only one step number will be On in a group.

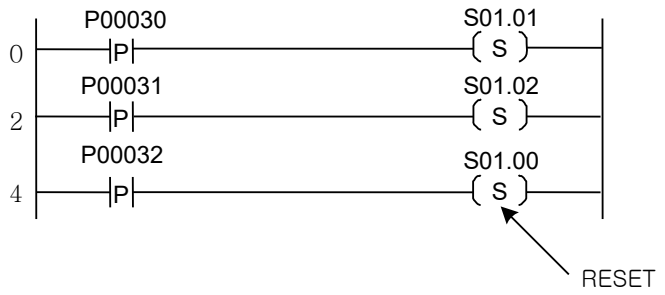
(4) At initial Run, Syy.00 is On

(5) SET Syy.xx Instruction will be cleared if Syy.00's input contact is On.

2) Example

(1) Sequence Control Program with S01.xx group used

[Ladder program]

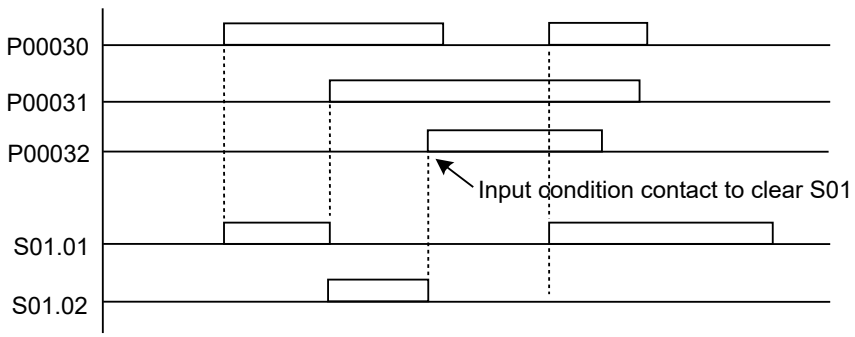


[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00030
1	SET	S01.01
2	LOAD	P00031
3	SET	S01.02
4	LOAD	P00032
5	SET	S01.00

(2) Sequence Control will be output if the previous step is On and its own condition contact is On.

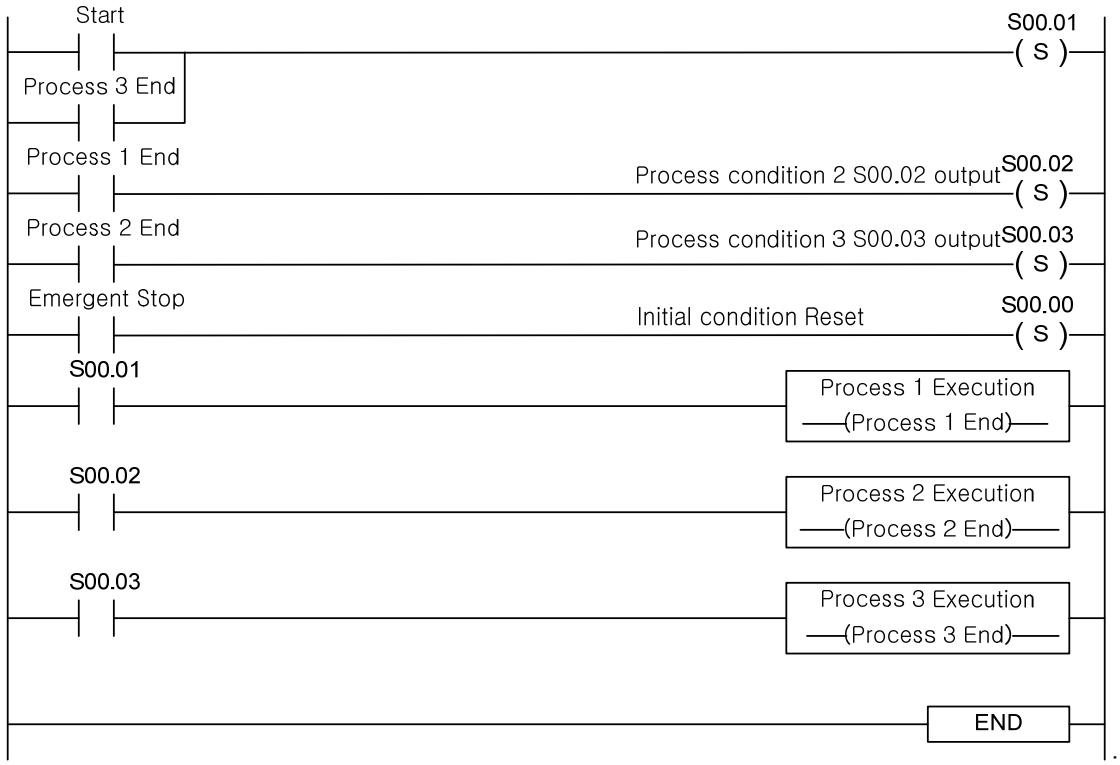
[Time Chart]



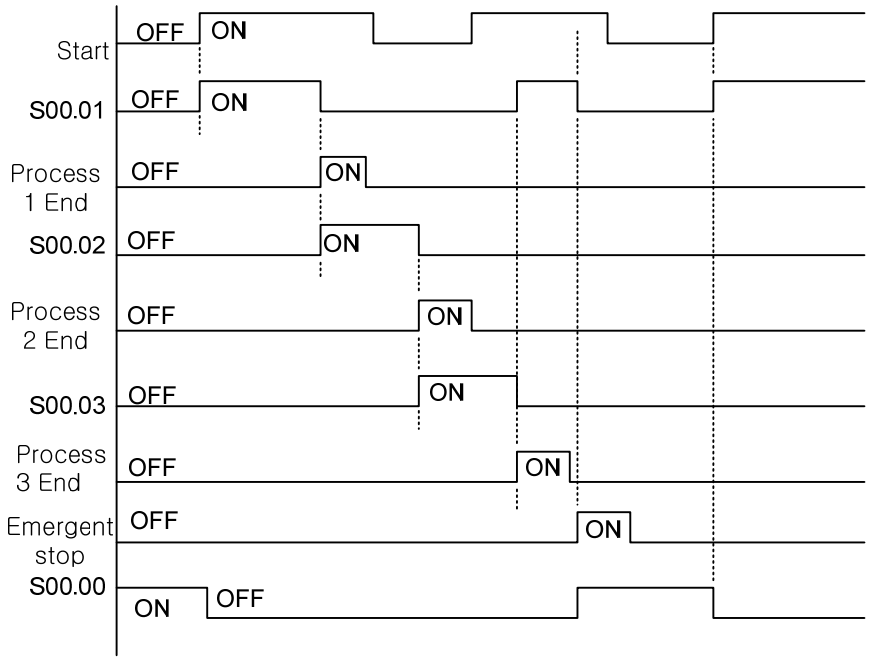
[Example 4.5] Sequential Control [Example of SET S]

In the program below, Process 2 is executed only when Process 1 is over, and Process 3 is completed when Process 1 is completed.

[Ladder Program]



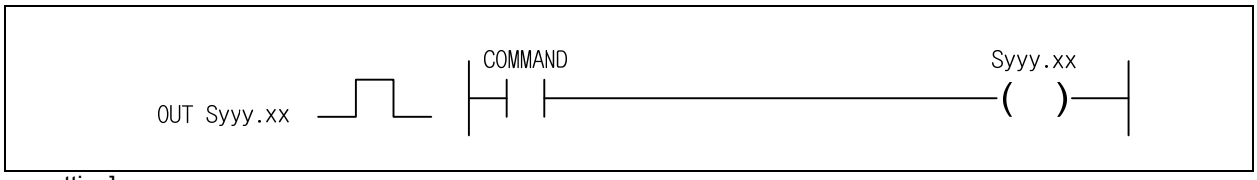
[Time Chart]



4.6.2 OUT Syyy.xx

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
OUT	S	-	-	-	-	-	O	-	-	-	-	-	-	-	-	1	-	-	-



[Area setting]

Operand	Description	Data type
Syyy.xx	S device contact, where yyy represents the group number and xx represents the step number. Group Number is available 0~127, and step number 0~99	BIT

1) OUT Syyy.xx(Subsequent Input Preferred)

(1) Differently from SET Syy.xx, applicable step operates if input condition contact is On regardless of step sequence.

(2) Only one step number will be On in the same group even if lots of input condition contacts are On. Finally program is on priority.

(3) If Present step number is On,it will be self-holding to keep On state although input condition is Off.

(4) OUT Syy.xx Instruction will be cleared if Syy.00's input contact is On.

2) Example

Subsequent Input preferred control program with S02 group used

[Ladder program]

[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	OUT	S02.01
2	LOAD	P00021
3	OUT	S02.23
4	LOAD	P00022
5	OUT	S02.99
6	LOAD	P00023
7	OUT	S02.00

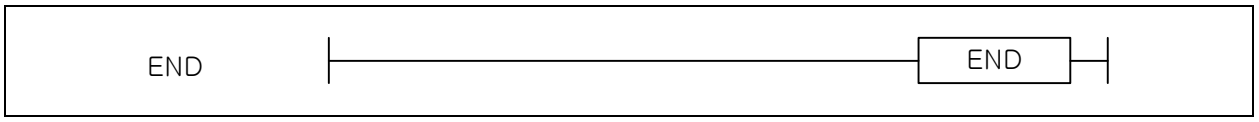
No	P00020	P00021	P00022	P00023	S002.01	S002.23	S002.98	S002.00
1	On	Off	Off	Off	On			
2	On	On	Off	Off		On		
3	On	On	On	Off			On	
4	On	On	On	On				On

4.7 End Instruction

4.7.1 END

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
END	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

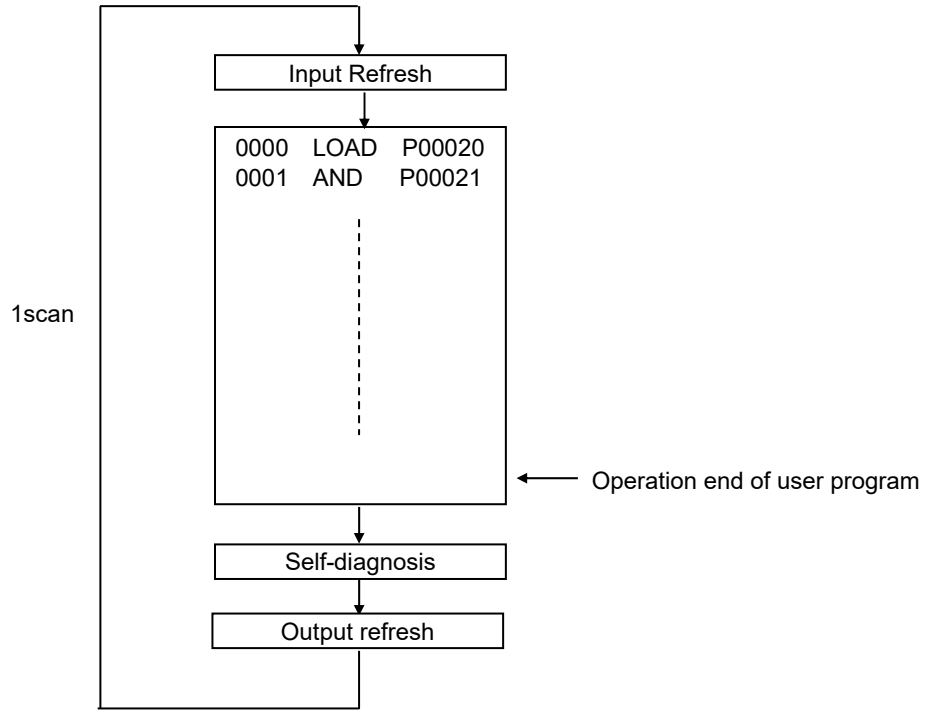


1) END
   (1) Displays Program End
   (2) Returns to 0000 Step to process after END Instruction is processed.
   (3) END Instruction should be surely input last in program. If not input, 'Error E4000: END instruction does not exist. An error occurs.

Notes

What is 1 scan?

As shown below; A cycle of Input Refresh → User Program Executed → Self Diagnosis → Output Refresh is 1 scan



4.8 Non-Process Instruction

4.8. 1 NOP

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
NOP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

No Ladder Symbol. (used only in Mnemonic)

1) NOP

(1) It means No Operation Instruction which has no effect on operation result of applicable circuit till then.
(2) Only used in Mnemonic Program.
(3) NOP is used to debug sequence program and to clear instruction while keeping the number of steps temporarily.

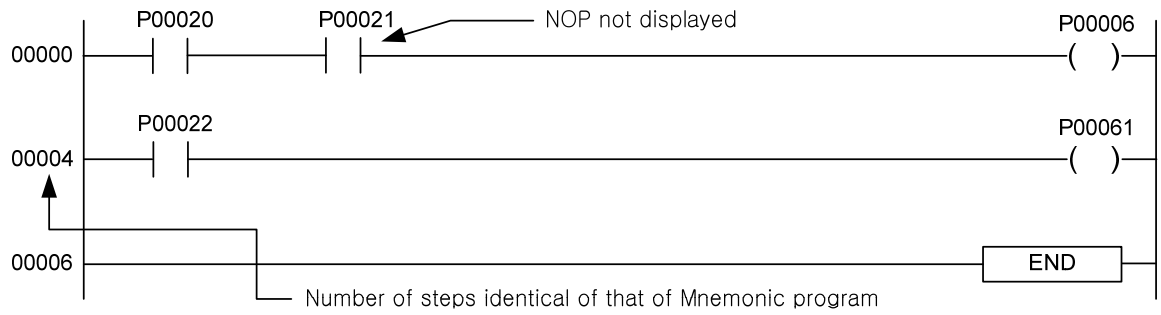
2) Example

(1) This example shows that the number of steps increases when the mnemonic program using the NOP instruction is changed to a ladder program.

[Mnemonic Program]

Step	Mnemonic	Operand
0	LOAD	P00020
1	AND	P00021
2	NOP	
3	OUT	P00006
4	LOAD	P00022
5	OUT	P00061
6	END	

[Ladder Program]



Notes

(1) The processing time of the NOP command varies depending on the model, but it takes time to process, so deleting it can shorten the user program processing time (Scan time).
(2) NOP Instruction can not be input from Ladder, and NOP registered in Mnemonic will not be displayed on the Ladder screen but the number of steps displayed as included.

4.9 Timer Instruction

4.9.1 Characteristics of Timer

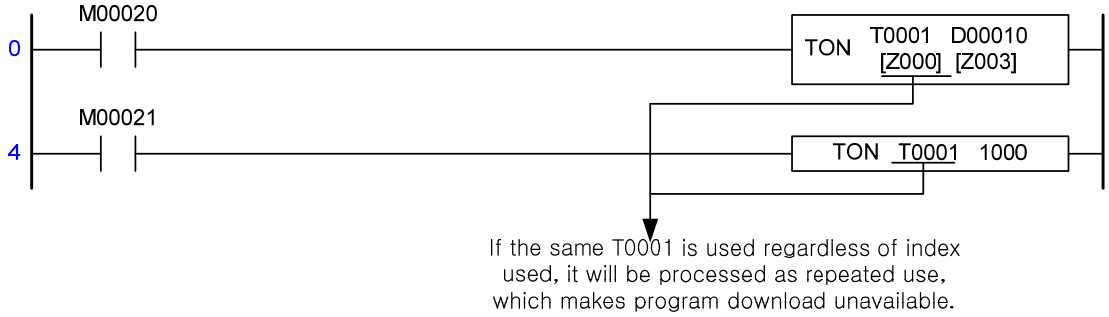
1) Basic Characteristics

(1) 4 types (100ms, 10ms, 1ms, 0.1ms) of Timers are available. In Basic Parameter, according to each timer number, time setting is available.

(2) 5 Instructions for timer are available based on operational characteristics as follows.

Command	Name	Operation characteristics
TON	On Timer	If input condition is On, Timer Contact Output Off. When Timer's present value reaches setting value, Timer Contact Output will be On.
TOFF	OFF Timer	If input condition is On, present value will be setting value and Timer Contact output On. If present value decreases to 0, Timer Contact Output Off.
TMR	Accumulated Timer	Even if input condition is Off, present value is kept If accumulated timer value reaches setting value, Timer Contact Output On
TMON	Monostable Timer	If input condition is On, present value will be setting value and Timer Contact output On. Even if input condition is Off and present value still decreases to 0, contact Output OFF
TRTG	Retrigger Timer	Same function as Monostable Timer. If input condition is again ON when present value decreases, the present value will be again setting value to start operation.

(3)Up to 2,048 for XGK, up to 256 for XGB Timers can be used regardless of its type, and the setting value range available is 0~65,535. Repeated use of the same timer number is impossible Repeated use of the same timer number is impossible. If the same timer number is used repeatedly regardless of index used, it will be processed as repeated use, which makes Program Download unavailable.

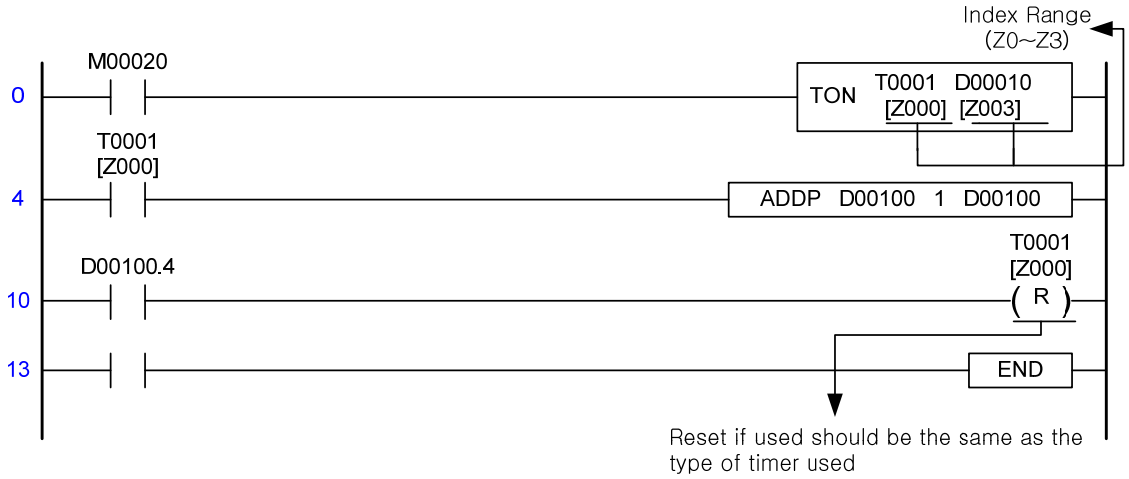


(4)Timer value setting available device (Operand available) is integers of P, M, K, U, D, R, etc. with index functions available. However, at this moment available index range is Z0 ~ Z3.

(5)In order to reset Timer, turn input contact Off or use reset coil. While reset coil is On, Timer dose not operate.

(6)If Reset Instruction is used to reset Timer, be sure to input in the same format as used in Timer format as shown below. If TON T0001[Z000] D00010[Z003] is used, Timer format used in reset coil should be T0001[Z000], or program error will occur in XG5000 to make Program Download unavailable.

(7)Timer makes present value updated and contact On/Off after END Instruction executed. Thus, Timer Instruction may make operational error. Refer to Appendix 2. Measurement and Precision of Timer for details.



Notes

(1) Due to index function, timers with different characteristics if operated at a time will be executed individually to produce abnormal operation. If index function is to be used, pay attention to this.

4.9.2 TON

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TON	T	-	-	-	O	-	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	t	O	-	-	-	-	-	-	-	-	O	O	-	O	O				

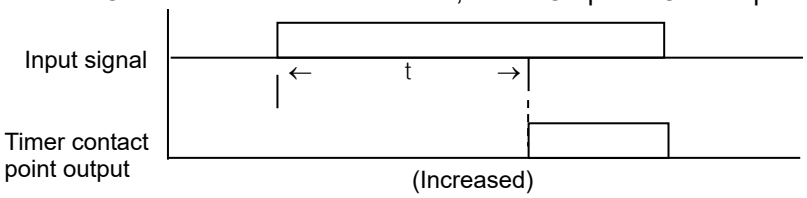
[Area setting]

Operand	Description	Data type
T	Timer Contact to use	WORD
t	Stands for Timer's setting value. Integer or word device available Setting Time = Basic cycle (100ms, 10ms, 1ms or 0.1ms: XGB is not supported) x setting value (t))	WORD

1) TON (On Timer)

(1)The moment input condition is On, present value increases and Timer Contact will be On if setting time (t) is reached.

(2)If input condition is Off or meets Reset Instruction, Timer Output is Off and present value "0".

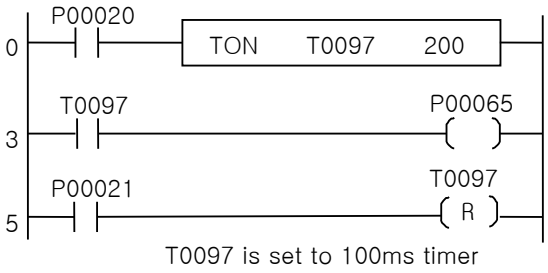


2) Example

(1)In 20 sec after P00020 is On, when Timer's present value is the same as setting, T0097 will be On, and P00065 is On.

(2)If input condition is Off before present value reaches setting value, present value will be "0". If P00021 is On, T0097 will be Off and present value "0".

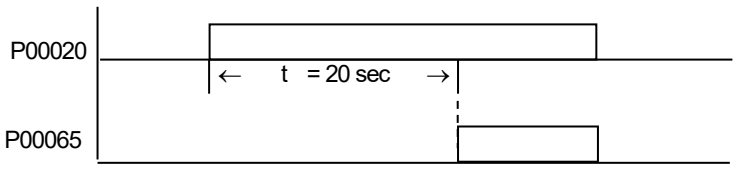
[Ladder program]



[Mnemonic Program]

Step	Mnemonic	Operand	
0	LOAD	P00020	
1	TON	T0097	200
3	LOAD	T0097	
4	OUT	P00065	
5	LOAD	P00021	
6	RST	T0097	

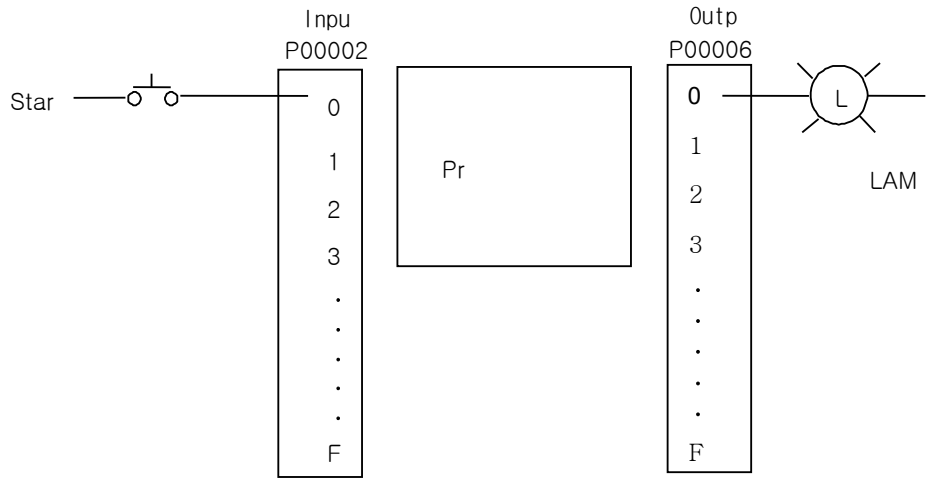
[Time Chart]



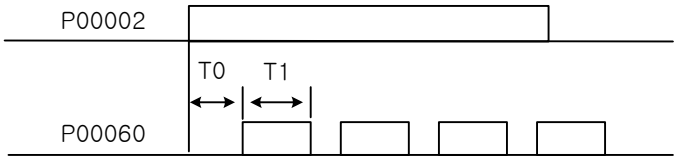
[Example 4.6] Flicker Circuit [TON]

Operation: uses 2 timers to flicker Output.

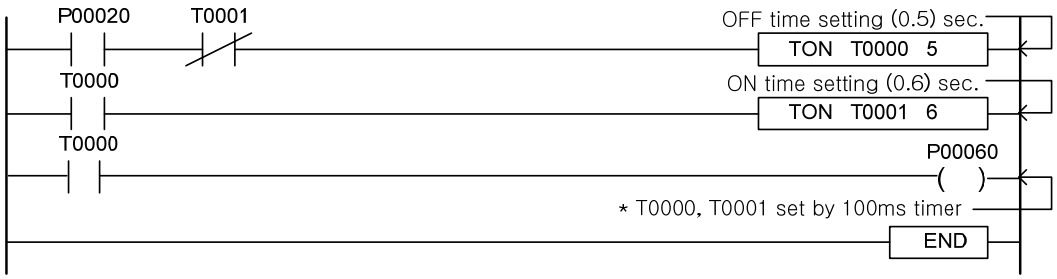
[System Diagram]



[Time Chart]



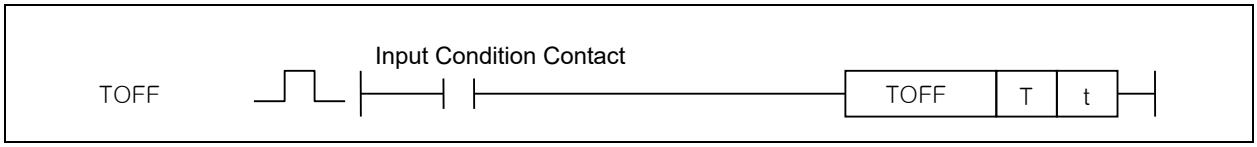
[Program]



4.9.3 TOFF

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TOFF	T	-	-	-	O	-	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	t	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



[Area setting]

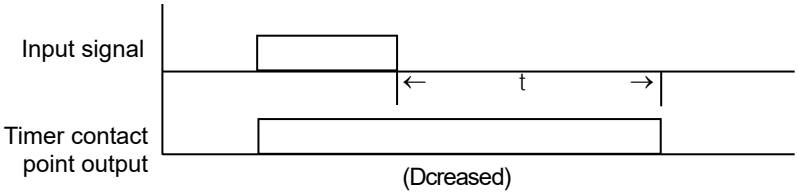
Operand	Description	Data type
T	Timer Contact to use	WORD
t	Stands for Timer's setting value. Integer or word device available Setting Time = Basic cycle (100ms, 10ms, 1ms or 0.1ms: XGB is not supported) x setting value (t))	WORD

1) TOFF (Off Timer)

(1)The moment input condition is On, timer present value will be setting value and Output On.

(2)If input condition is Off, timer present value decreases from setting value and the moment present value is "0", output will be Off.

(3)When the reset command is executed, the timer output is off and the current value is 0.



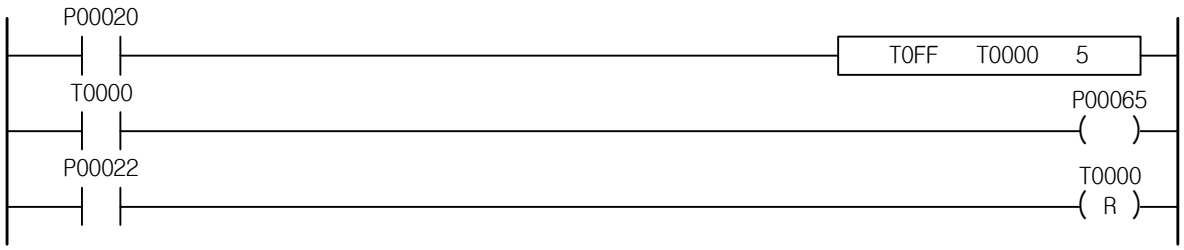
2) Example

(1)If input P00020 contact is On, T0000 contact is On at the same time and Output P00065 is On.

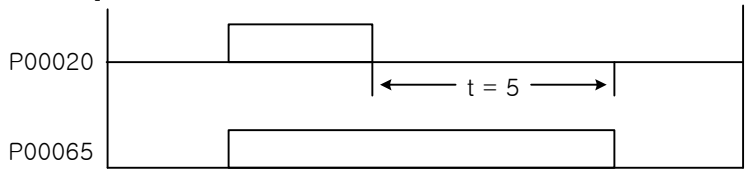
(2)After input P00020 is off, the timer is subtracted for the set time (t), and if the current value becomes 0, the timer contact is off.

(3)If P00022 is On, present value will be "0".

[Ladder Program]



[Time Chart]

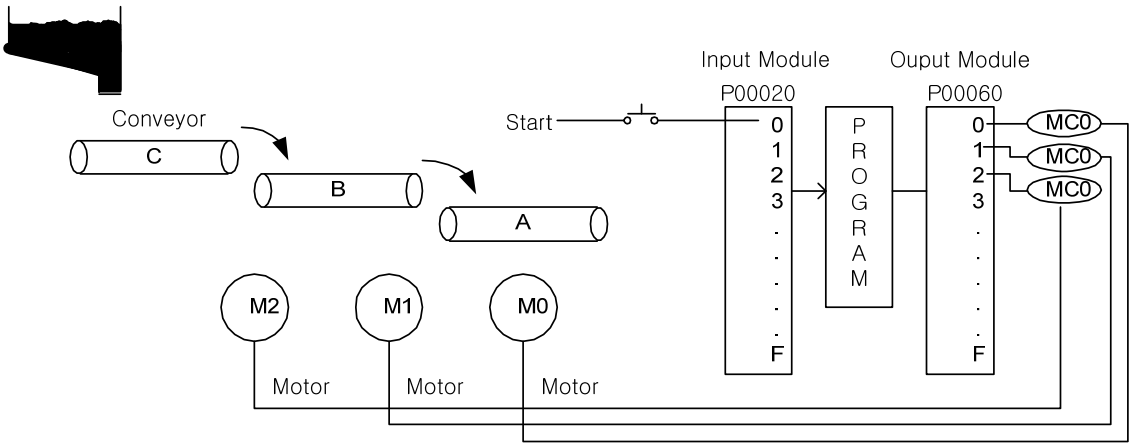


[Example 4.7] Conveyor Control [TON, TOFF]

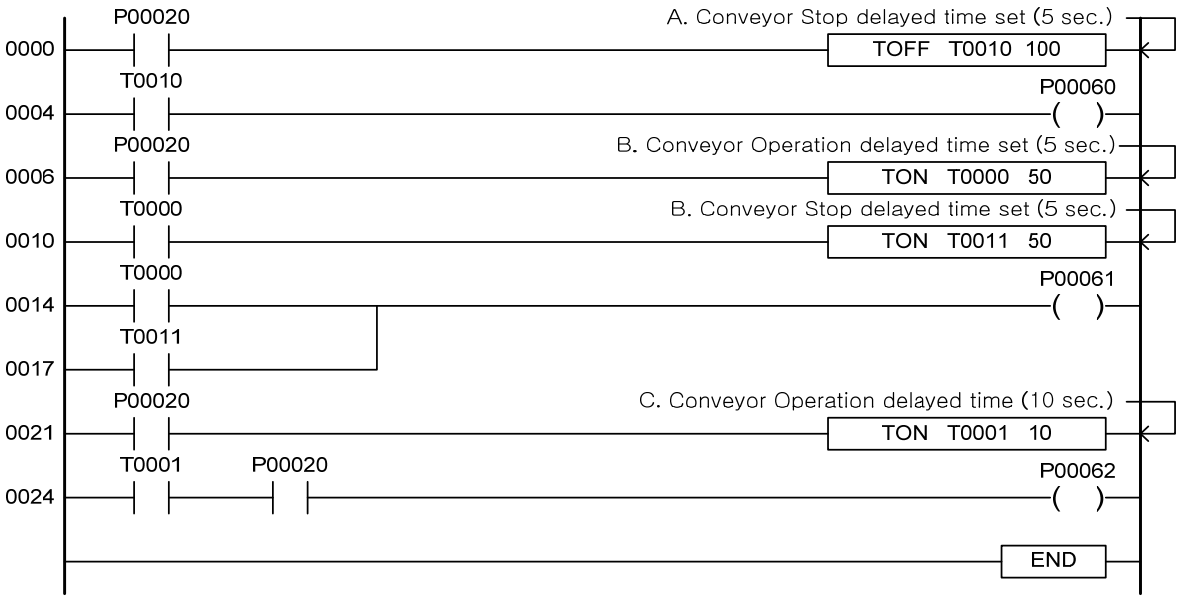
(1)Operation

It makes several conveyors operate (A → B → C) and stop (C → B → A) in applicable sequence.

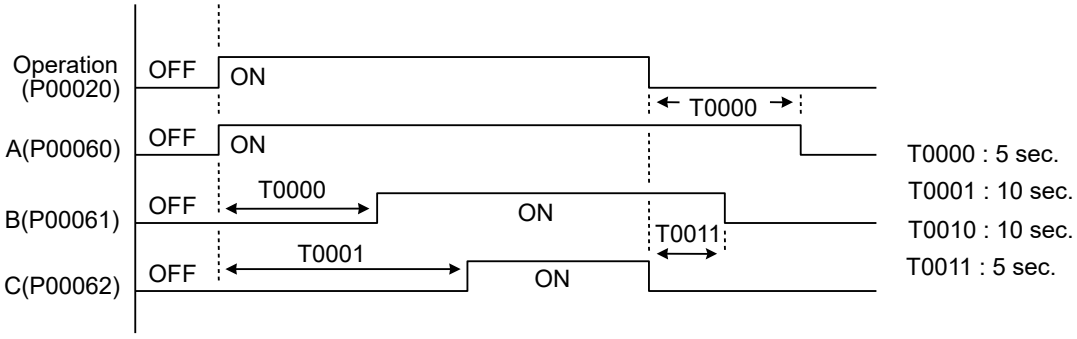
(2) System Diagram



[Program]



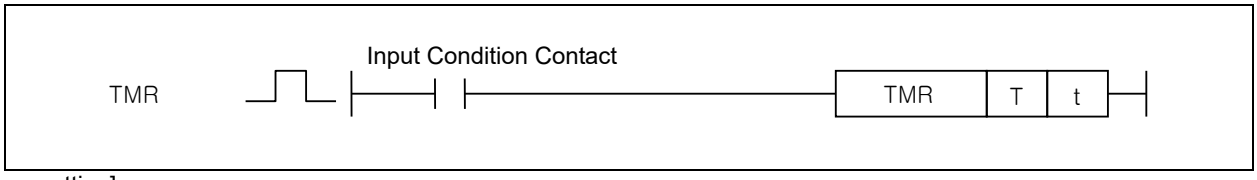
[Time Chart]



4.9.4 TMR

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TMR	T	-	-	-	O	-	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	t	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



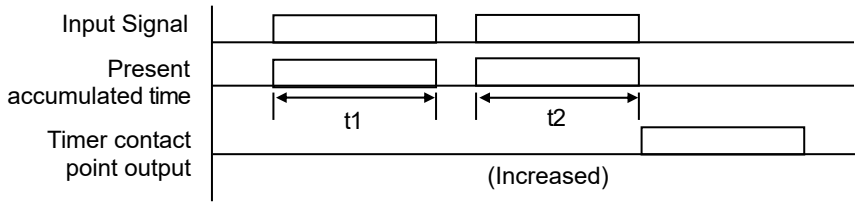
[Area setting]

Operand	Description	Data type
T	Timer Contact to use	WORD
t	Stands for Timer's setting value. Integer or word device available Setting Time = Basic cycle (100ms, 10ms, 1ms or 0.1ms: XGB is not supported) x setting value (t))	WORD

1) TMR (accumulated timer)

(1) If present value increases while input condition is allowed and its accumulated value reaches timer's setting value, Timer Contact will be ON. Since accumulating timer keeps timer value even if power cut off, there will be no problem in case of PLC power failure at night. (If used in non-volatile area)

(2) If Reset input condition is allowed, Timer Contact will be Off and present value "0".



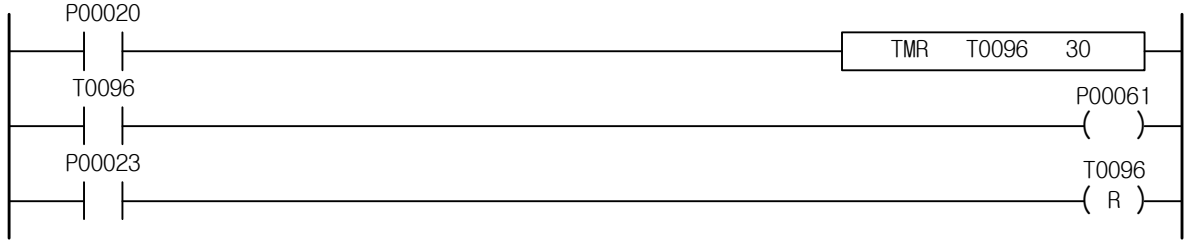
Setting time (t) = t1 + t2

2) Example

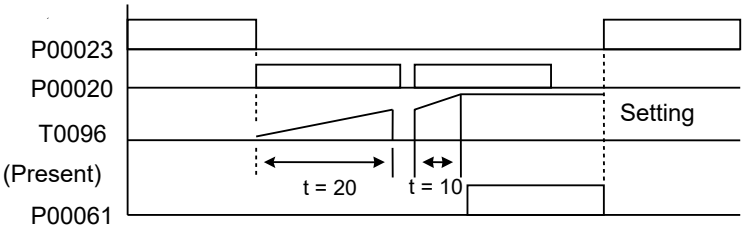
(1) Where contact P0020 is repeatedly On, Off and On then to make T0096 On and Output contact P0061 On (t1 + t2 = 30sec).

(2) If Reset Signal P0023 is On, present value will be "0" and P0061 Off.

[Program]



[Time Chart]

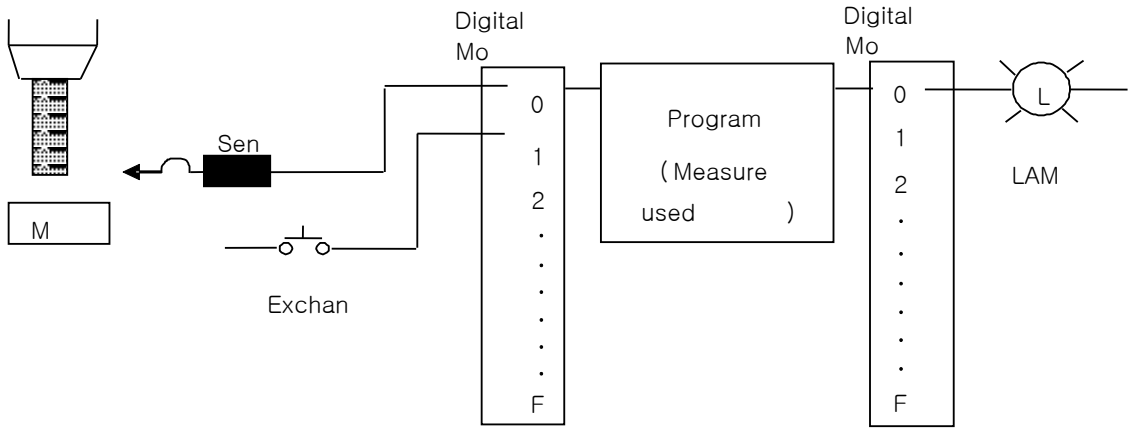


[Example 4.8] Tools's Life Alarm Circuit [TMR]

(1)Operation

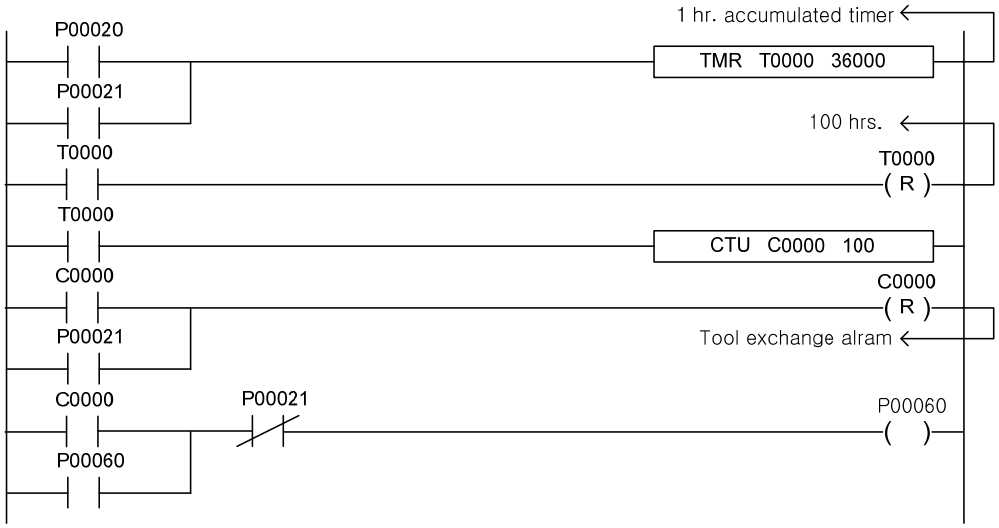
It measures application time of tool such as machining center and outputs alarm to exchange tools.

(2) System Diagram



Address	Description
P00020	Drill Downward Detected
P00021	Drill Exchange Compete
P00060	Tools's Life Alarm
T0000	Tools's Life Setting Timer

[Program]

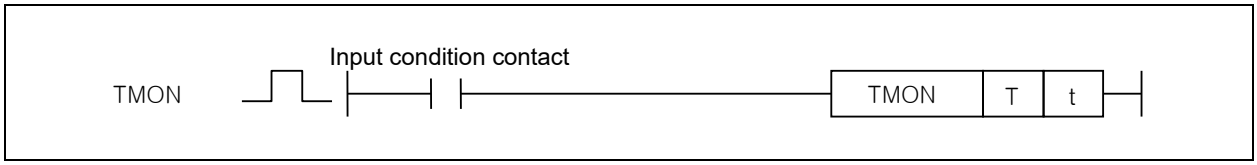


The Accumulating Timer shown above is recommended to be of the type in non-volatile area.
(Timer used here is in volatile area)

4.9.5 TMON

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TMON	T	-	-	-	O	-	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	t	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



[Area setting]

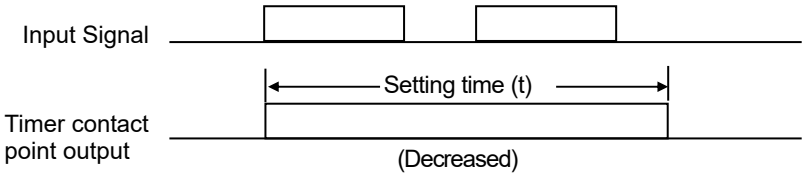
Operand	Description	Data type
T	Timer Contact to use	WORD
t	Stands for Timer's setting value. Integer or word device available Setting Time = Basic cycle (100ms, 10ms, 1ms or 0.1ms: XGB is not supported) x setting value (t))	WORD

1) TMON (Monostable Timer)

(1) The moment input condition is On, Timer Output is On and if Timer's present value start to decrease from setting value to "0", Timer Output will be Off.

(2) After Timer Output is On, it disregards the change of input condition On and Off.

(3) If Reset input condition is allowed, Timer Contact will be Off and present value "0".



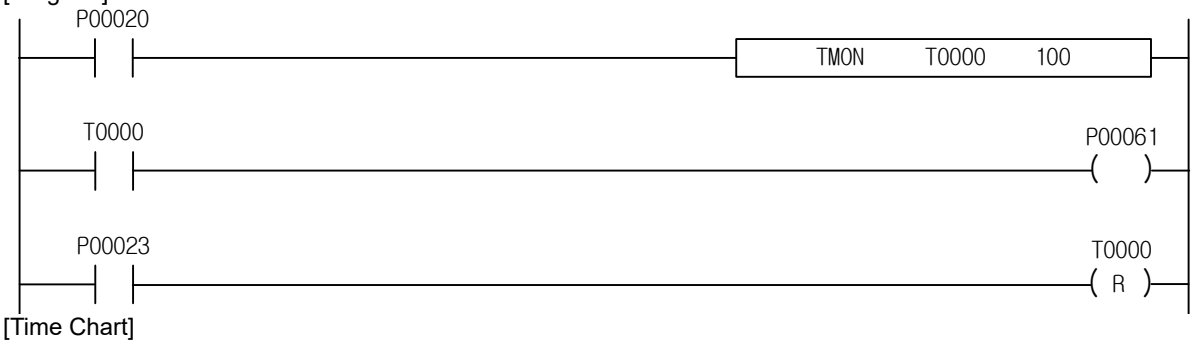
2) Example

(1) If P00020 is On, contact T0000 will be promptly On and Timer decreases.

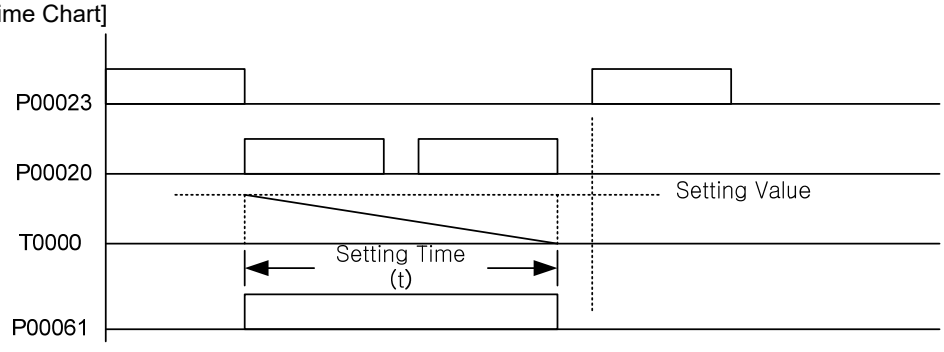
(2) While P00020 is repeatedly On and Off it will keep decreasing.

(3) If Reset Signal P00023 is On, present value will be "0" and Output Off.

[Program]



[Time Chart]

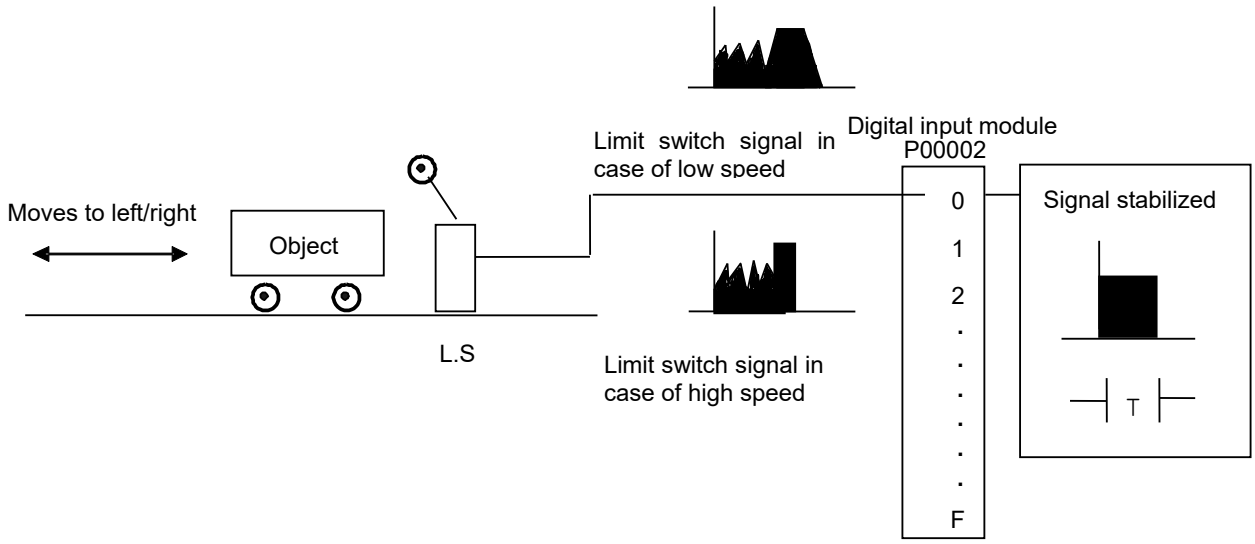


[Example 4.9] Signal Vibration-Proof Circuit [TMON]

(1)Operation

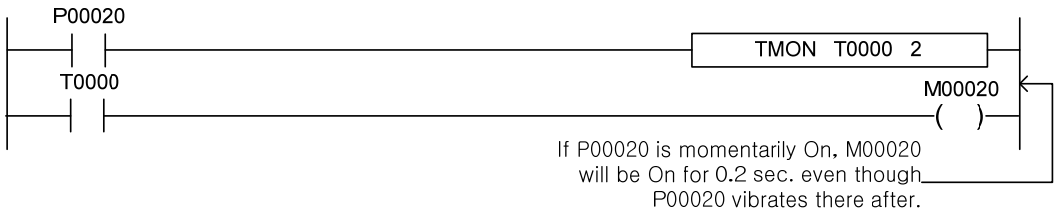
It keeps from vibration of passing signal of object with irregular speed (limit switch) so to get stable signal.

(2) System Diagram



Address	Description
P00020	Limit switch used to detect position
M00020	Specific Time Output Relay
T0000	Vibration-proof Timer

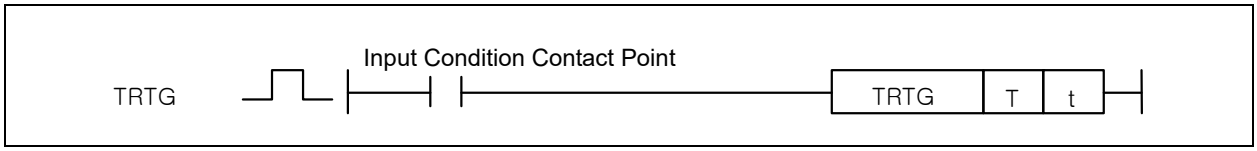
(3) Program



4.9.6 TRTG

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TRTG	T	-	-	-	O	-	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	t	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



[Area setting]

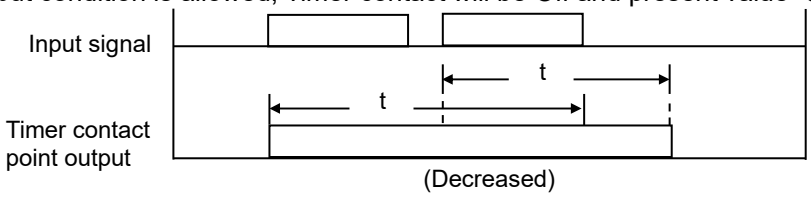
Operand	Description	Data type
T	Timer Contact to use	WORD
t	Stands for Timer's setting value. Integer or word device available Setting Time = Basic cycle (100ms, 10ms, 1ms or 0.1ms: XGB is not supported) x setting value (t))	WORD

1) TRTG (Retriggerable Timer)

(1) The moment input condition is On, Timer Output is On and if Timer's present value start to decrease from setting value to "0", Timer Output will be Off.

(2) If input condition changes Off → On again before Timer's present value is "0", Timer's present value will be reset to setting value.

(3) If reset input condition is allowed, Timer contact will be Off and present value "0".



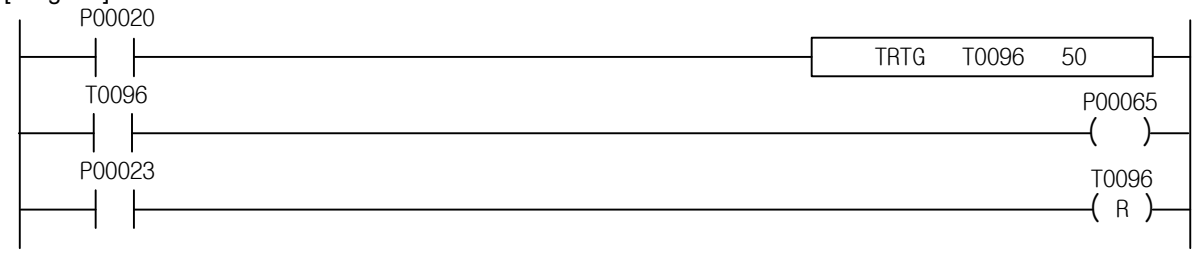
2) Example

(1) If P00020 is On, contact T0096 is On at the same time, and if Timer decreases to "0", P00065 is Off.

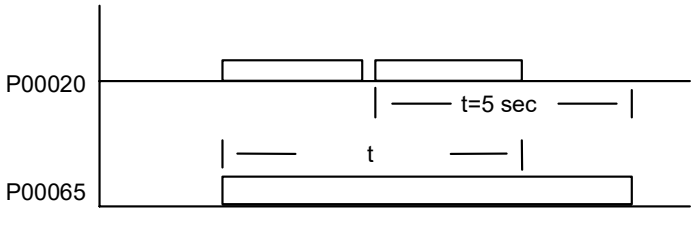
(2) If P00020 input condition is allowed before "0" is reached, present value will be setting value and will decrease again.

(3) If reset signal P00023 is On, present value will be "0" and output Off.

[Program]



[Time Chart]

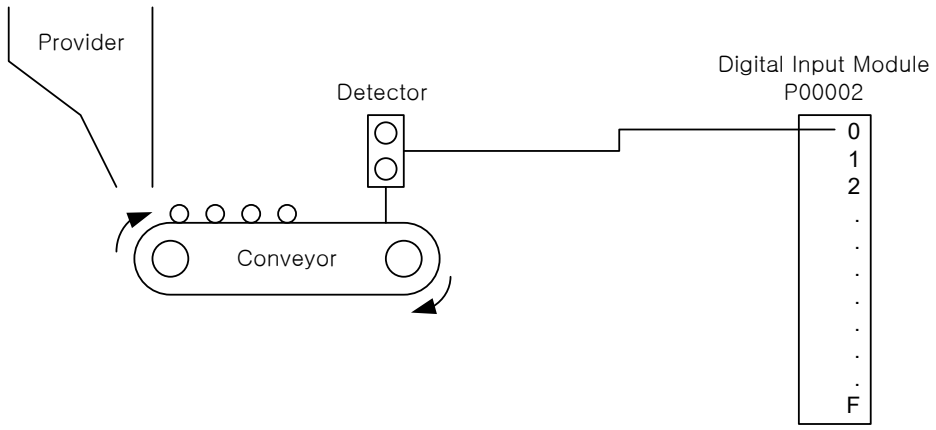


[Example 4.10] Error Detect Circuit of Returning Equipment [TRTG]

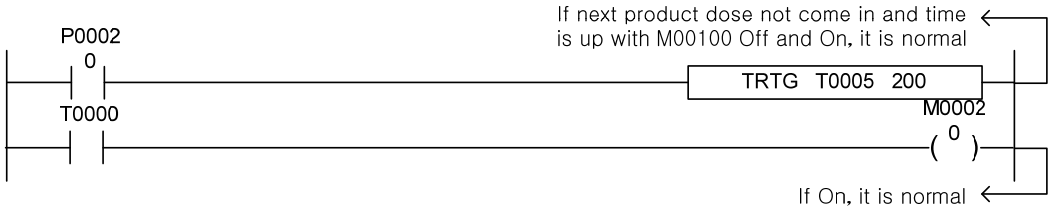
(1)Operation

It detects error of returning equipment with product provided at regular intervals.

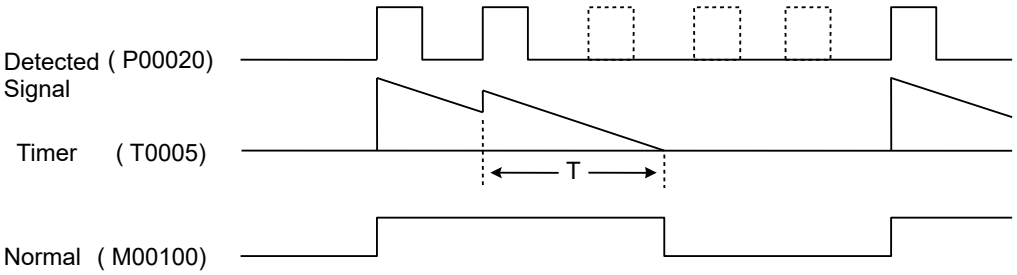
(2) System Diagram



(3) Program



(4) Timer chart



4.10 Counter Instruction

4.10.1 Characteristics of counter

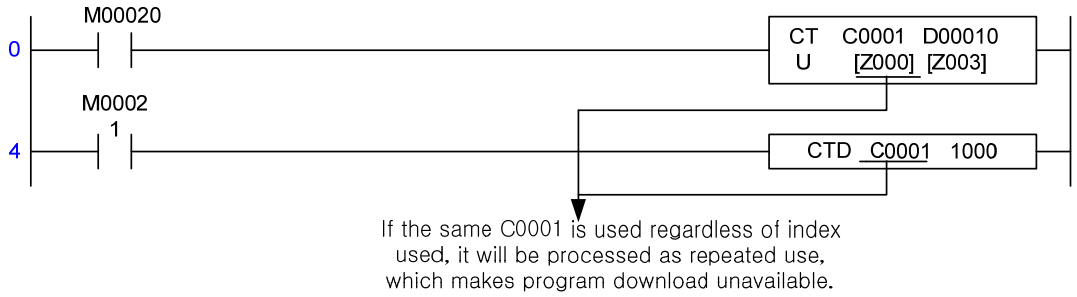
1) Basic Characteristics

(1) Counter increases/decreases present value whenever rising edge of pulse is input. And if setting value is reached, it makes output On.

(2) 4 Instructions for counter are available based on operational characteristics as follows.

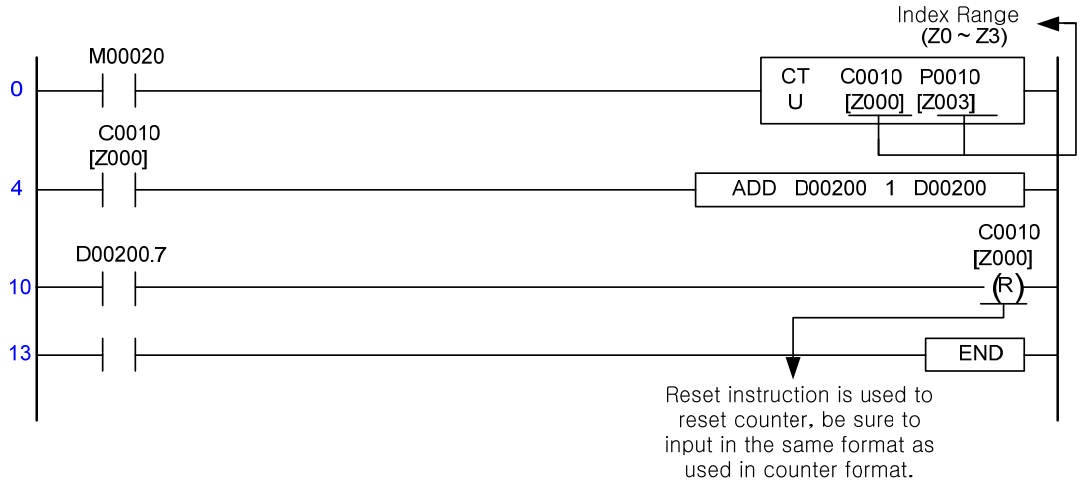
Command	Name	Operation characteristics
CTD	Down Counter	If counter decreases from setting value by 1 and reaches 0 whenever pulse is input, Output is On.
CTU	Up Counter	If counter increases setting value by 1 and exceeds setting value whenever pulse is input, Output is On.
CTUD	Up-Down Counter	If pulse is input in Up terminal, counter increases by 1. If present value reaches setting value, Output is On. And if pulse is again input, present value is On.
CTR	Ring Counter	If counter increases setting value by 1 and reaches setting value whenever pulse is input, Output is On. And if pulse is again input, present value is On.

(3)Up to 2,048 for XGK, up to 256 for XGB Counter can be used regardless of its type, and the setting value range available is 0~65,535. Repeated use of the same counter number is impossible Repeated use of the same counter number is impossible. If the same counter number is used repeatedly regardless of index used, it will be processed as repeated use, which makes Program Download unavailable.



(4) Counter value setting available device (Operand available) is integers of P, M, K, U, D, R, etc. with index functions available. However, at this moment available index range is Z0 ~ Z3.

(5)If Reset Instruction is used to reset Counter, be sure to input in the same format as used in Timer format as shown below. If CTU C0010[Z000] P0010[Z003] is used, Counter format used in reset coil should be C0010[Z000], or program error will occur in XG5000 to make Program Download unavailable.



(6) As for CTUD Instruction, input contact shall be off in other than reset coil in order to reset counter.
(7) As for CTU & CTUD Instructions, even if setting value is exceeded, counter value will keep increasing with UP counter pulse continuously input. However, no more than 65535 will be increased. Thus, use RST Instruction to initialize CTU & CTUD Instructions' value to 0.

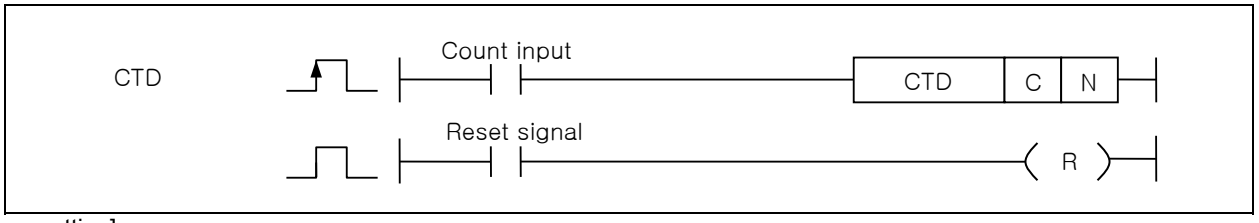
Notes

(1) Due to index function, counter with different characteristics if operated at a time will be executed individually to produce abnormal operation. If index function is to be used, pay attention to this.

4.10.2 CTD

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CTD	C	-	-	-	-	O	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	N	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



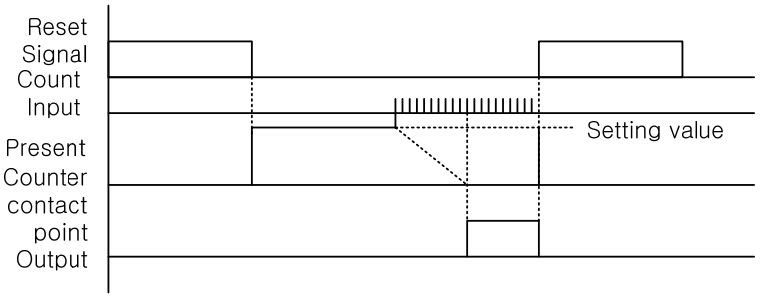
[Area setting]

Operand	Description	Data type
C	Counter contact to use	WORD
N	Set Value (0 ~ 65,535)	WORD

1) Function

(1) If counter decreases from setting value by 1 and reaches 0 whenever pulse is input, equal to set On.
(2) If Reset Signal is On, Output will be Off and present value will be setting value.

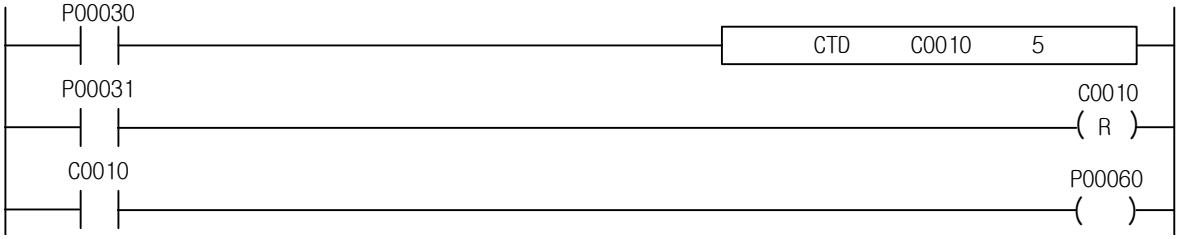
[Time Chart]



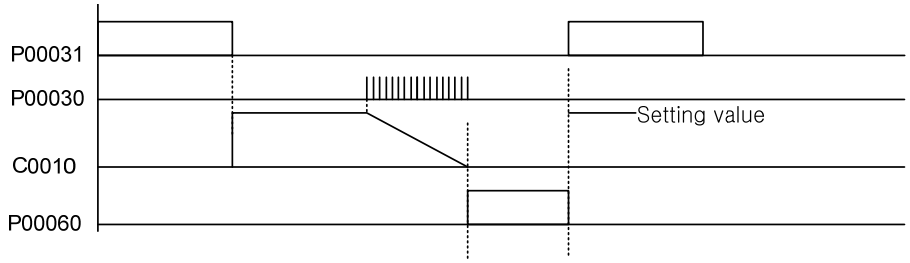
2) Example

(1) If P00030 contact is On 5 times, P00060 Output will be On when present value is counted down to “0”.
(2) If P00031 contact is On, Output will be Off and present value will be setting value.

[Program]



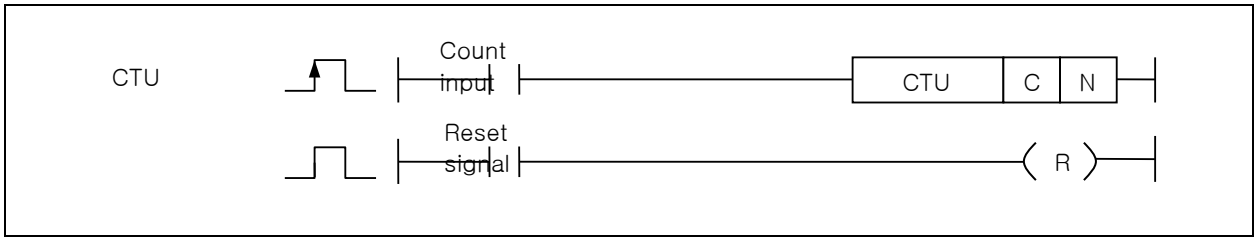
[Time Chart]



4.10.3 CTU

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CTU	C	-	-	-	-	O	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	N	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



[Area setting]

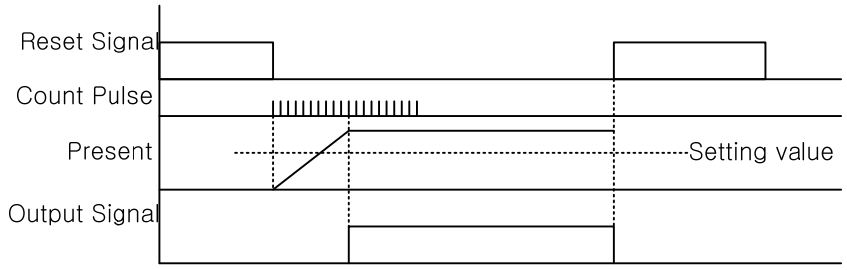
Operand	Description	Data type
C	Counter contact to use	WORD
N	Set Value (0 ~ 65,535)	WORD

1) Function

It increases present value by 1 whenever Rising edge of the pulse is input. And if present value exceeds setting value, Output will be On and maximum counter (65,535) will be counted.

(2) If Reset Signal is On, Output will be Off and present value will be and 0.

[Time Chart]

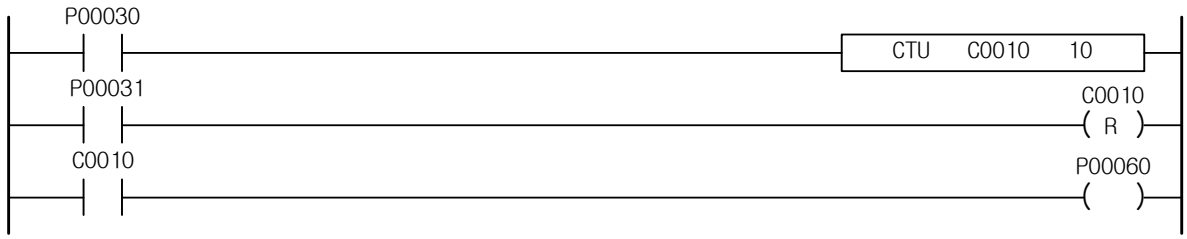


2) Example

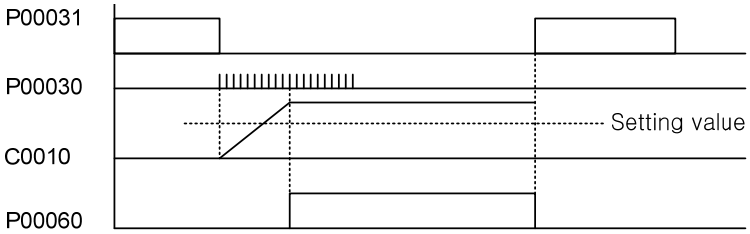
(1) If counted up to P00030 contact with present value identical to setting value, P00060 Output will be On.

(2) If P00031 contact is On, Output will be Off and present value will be initialized to “0”.

[Program]



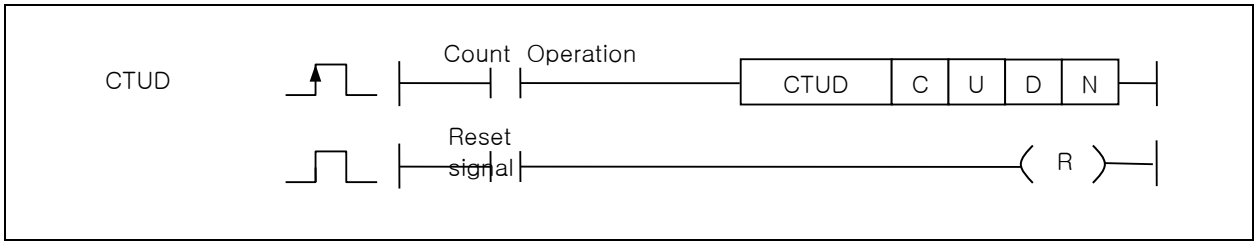
[Time Chart]



4.10.4 CTUD

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CTUD	C	-	-	-	-	O	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	U	O	O	O	O	O	-	-	O	-	-	O	-	-	-				
	D	O	O	O	O	O	-	-	O	-	-	O	-	-	-				
	N	O	-	-	-	-	-	-	-	-	O	O	-	O	-				



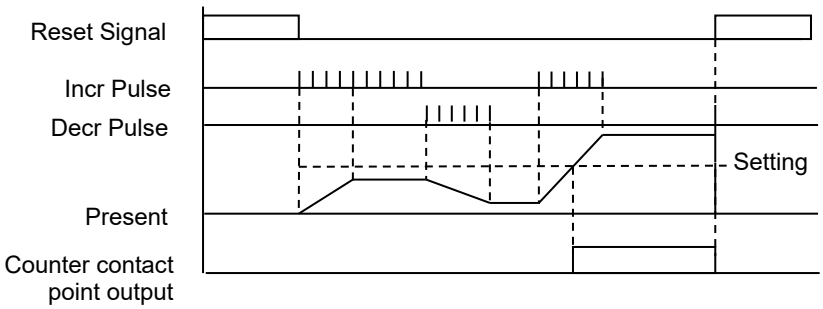
[Area setting]

Operand	Description	Data type
C	Counter contact to use	WORD
U	Increases present value by 1 (+1)	BIT
D	Increases present value by -1 (+1)	BIT
N	Set Value (0 ~ 65,535)	WORD

1) Function

(1) It increases present value by 1 whenever Rising edge of the pulse is input in U device. And if present value exceeds setting value, Output will be On and maximum counter (65,535) will be counted.
(2) It decreases present value by 1 whenever Rising edge of the pulse is input in D device.
(3) If Reset Signal is On, present value will be “0”.
(4) If U , D device’s pulse are On at the same time, present value will not change.
(5) Up-Down Counter operates when Count Input Signal remained On status.

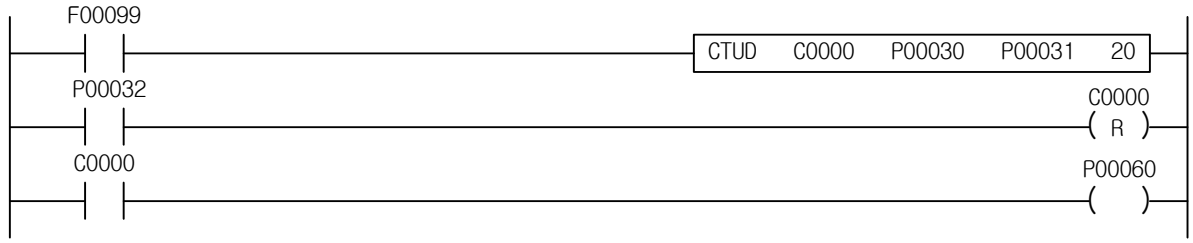
[Time Chart]



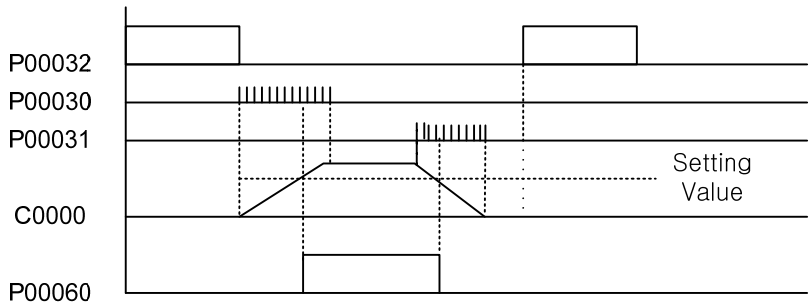
2) Example

(1) If counted up to P00030 contact with present value identical to setting value, P00060 Output will be On.
(2) It will be counted Down due to P00031 contact's Rising edge of the pulse.
(3) If Reset Condition is met, Output will be Off and counter's present value "0".
(4) Increment and Decrement Counter is possible by F00099 (Always On status) of Counter Enabled signal.

[Program]



[Time Chart]

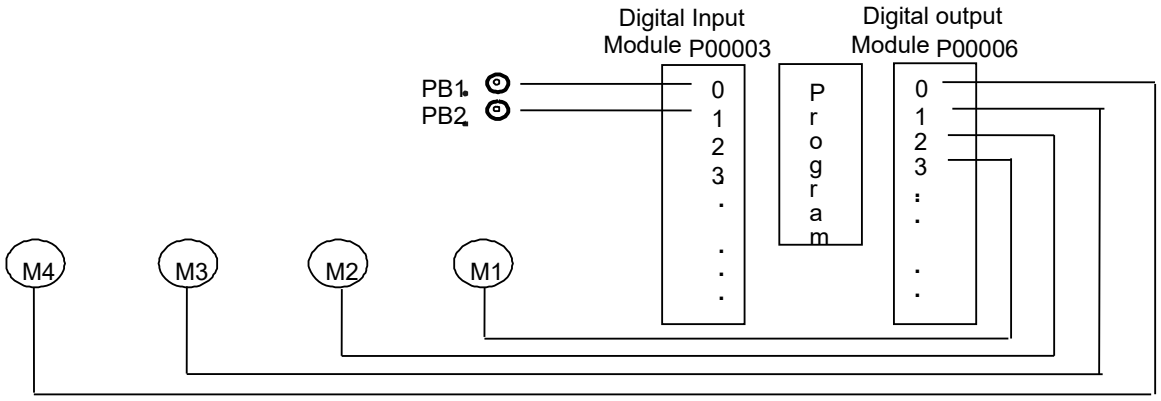


[Example 4.11] Adjustment Control of the Number of Motor Operation [CTUD]

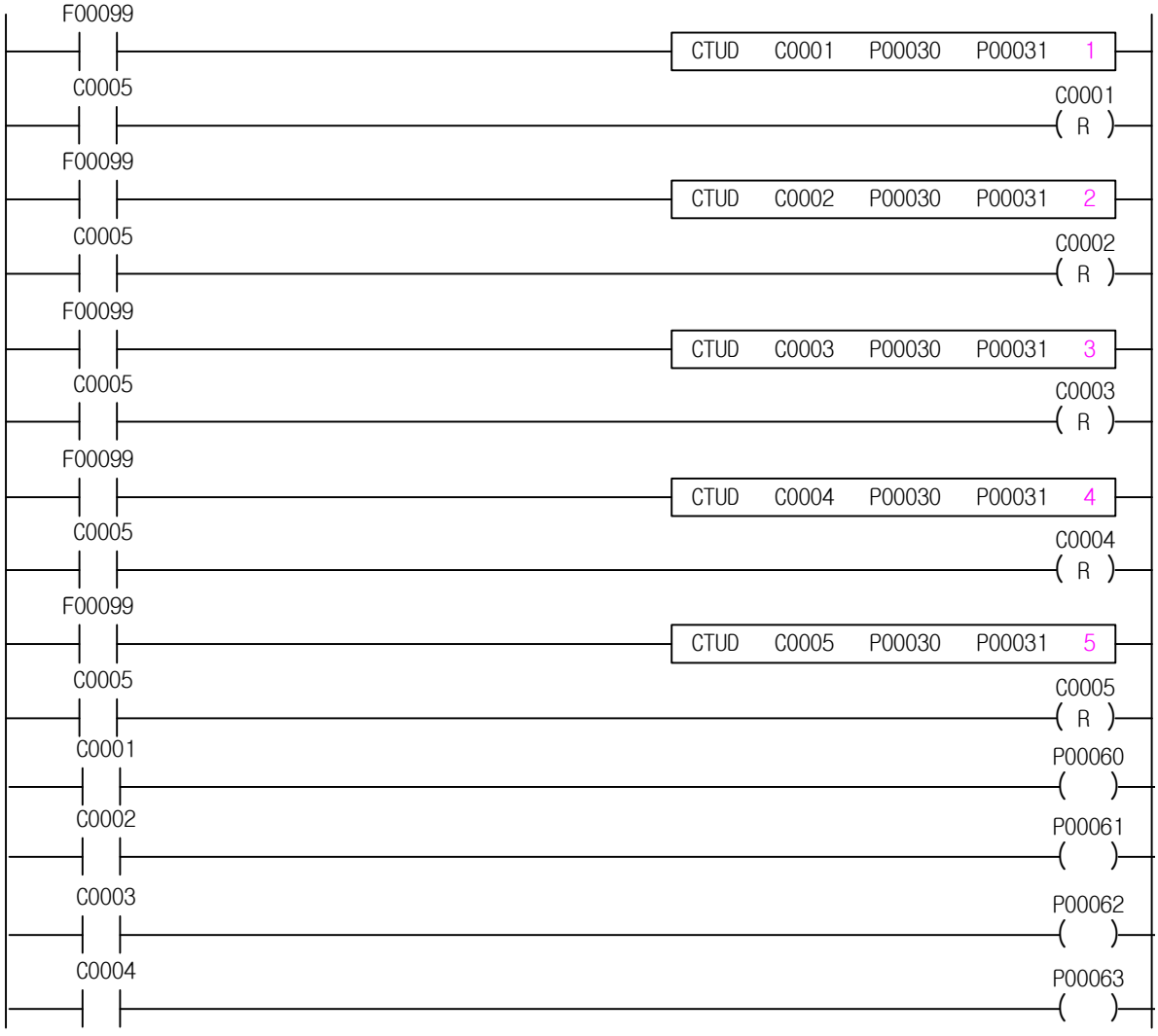
1) Operation

As for 4 motors to be controlled, press instant contact push button PB1 to increase operation motor number by 1, and press PB2 to decrease by 1. When 4 motors are operated, press PB1 to stop all the motors. When 1 motor is operated, press PB2 to make no motor operate.

2) System Diagram



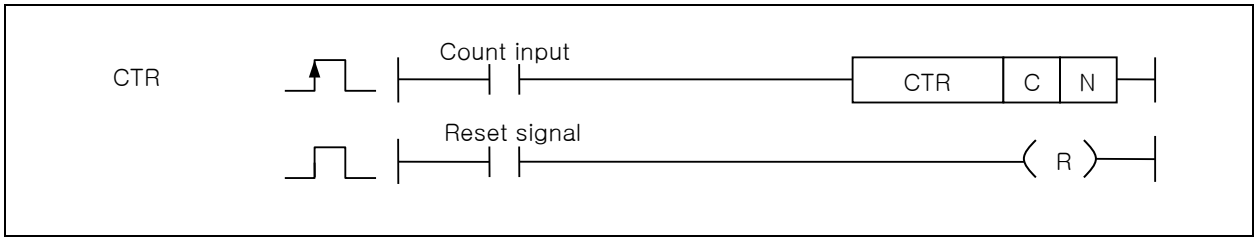
3) Program



4.10.5 CTR

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CTR	C	-	-	-	-	O	-	-	-	-	-	-	-	-	-	2~3	-	-	-
	N	O	-	-	-	-	-	-	-	-	O	O	-	O	O				



[Area setting]

Operand	Description	Data type
C	Counter contact to use	WORD
N	Set Value (0 ~ 65,535)	WORD

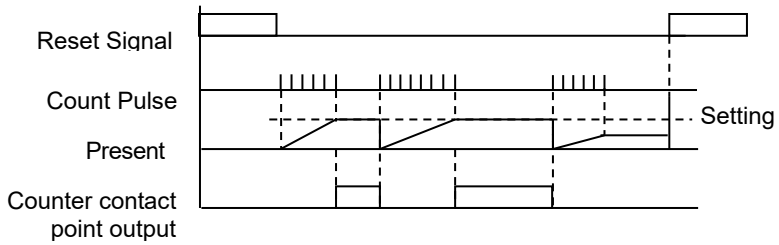
1) Function

(1) It increases present value by 1 whenever rising edge of the pulse is input. And if present value reaches setting value and then input signal changes Off→On, present value will be On.

(2) If present value reaches setting value, Output will be On.

(3) If present value is lower than setting value or reset condition is On, Output will be Off.

[Time Chart]

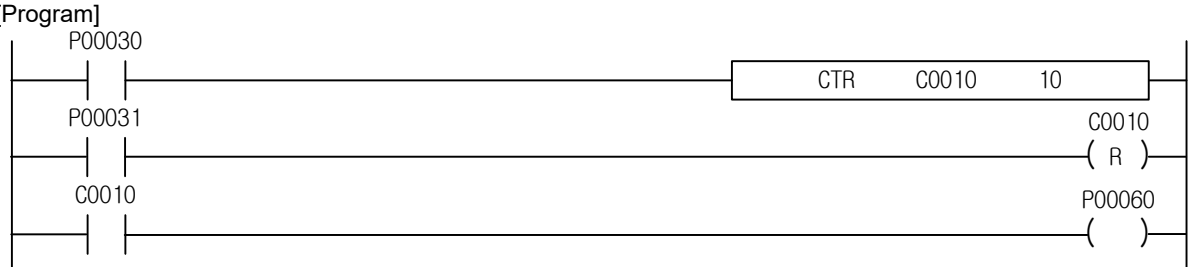


2) Example

(1) If present value is the same as setting value due to count up by rising edge of the pulse of P00030 contact, P00060 Output will be On.

(2) If P00030 contact is On at 11th time, P00060 Output will be Off and present value will be reset to 0.

[Program]



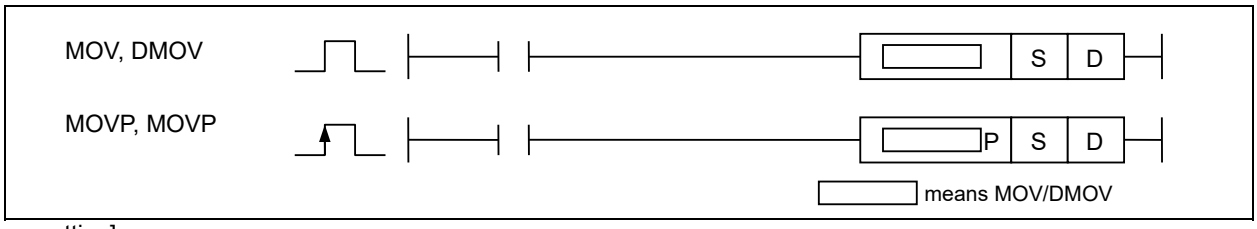
[Time Chart]

4.11 Data Transfer Instruction

4.11.1 MOV, MOVP, DMOV, DMOVP

[Applicable Product: XGK, XGB]

Command		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	Step	Flag: error (F110)	Flag: Zero (F111)	Flag: Carry(F112)
MOV(P) DMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~5	-	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

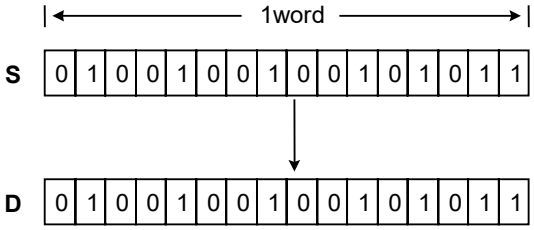


[Area setting]

Operand	Description	Data type
S	Data to transfer or device number data is saved in	WORD/DWORD
D	Device number to save data transferred	WORD/DWORD

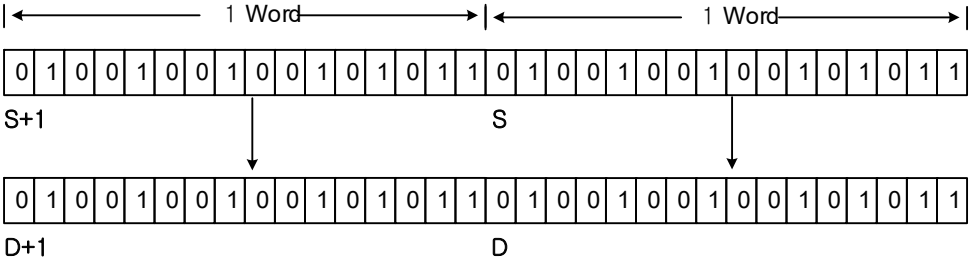
1) MOV(Move)

It transfers specified S device's word data to D.



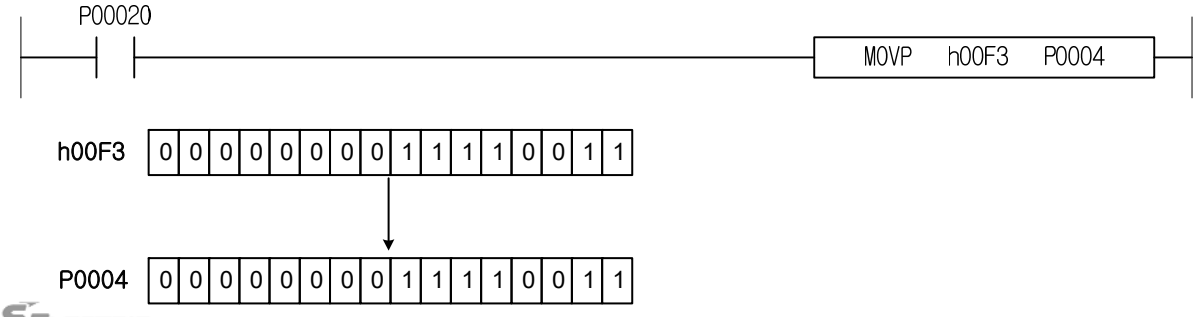
2) DMOV(Double Move)

It transfers specified S+1,S device's double word data to D+1,D.

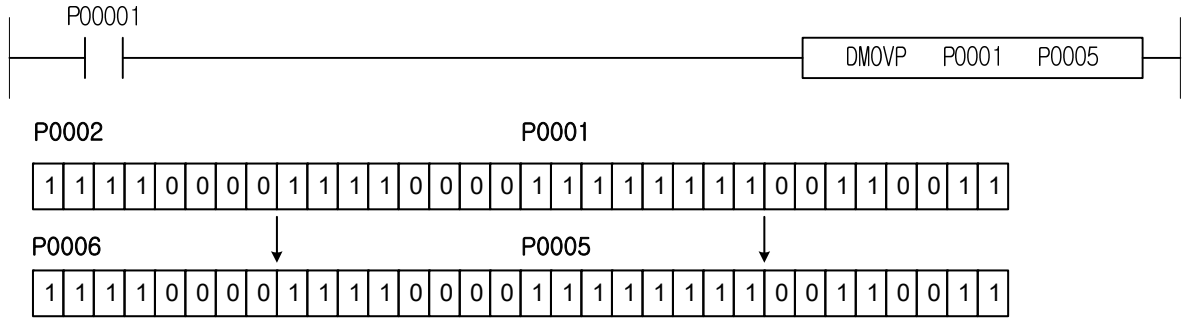


3) Example

(1) Whenever P00020 is on, h00F3 data is moved to P0004 word by MOVP instruction



(2) Whenever P00001 is on, data (hF0F0 FF33) of P0002, P0001 is moved to P0006, P0005 double word by MOVP instruction.



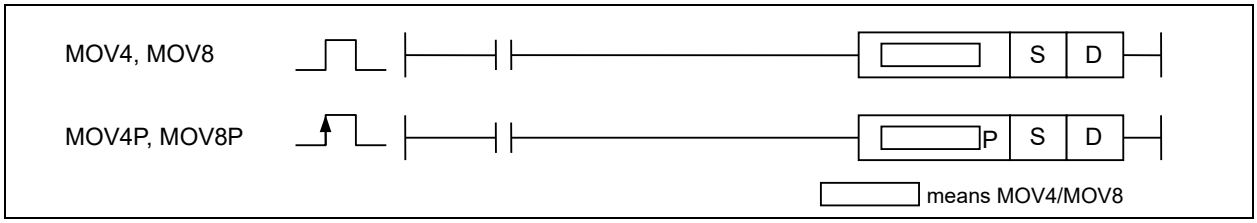
Notes

(1) If Timer or Counter is used by MOV instruction's operand, applicable timer or counter's present value (1 word) can be read or changed.

4.11.2 MOV4, MOV4P, MOV8, MOV8P

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MOV4(P) MOV8(P)	S	O	-	O	-	-	-	-	O	O	O	O	-	-	-	3~5	-	-	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				



[Area setting]

Operand	Description	Data type
S	Data to transfer or bit position of device number data is saved in bit position.	NIBBLE/BYTE
D	Bit position of device number to save data transferred.	NIBBLE/BYTE

1) MOV4, MOV8 (MOV4 : Move Nibble / MOV8 : Move Byte)

(1) Function

It transfers 4-bit or 8-bit data S to D.

MOV4(P) transfers higher 4-bit data from specified S bit to applicable area to higher 4-bit data from D.

MOV8(P) transfers higher 8-bit data from specified S bit to applicable area to higher 8-bit data from D.As for integers to transfer, only the data as big as applicable instruction will be transferred with the other disregarded.

(2) Precautions

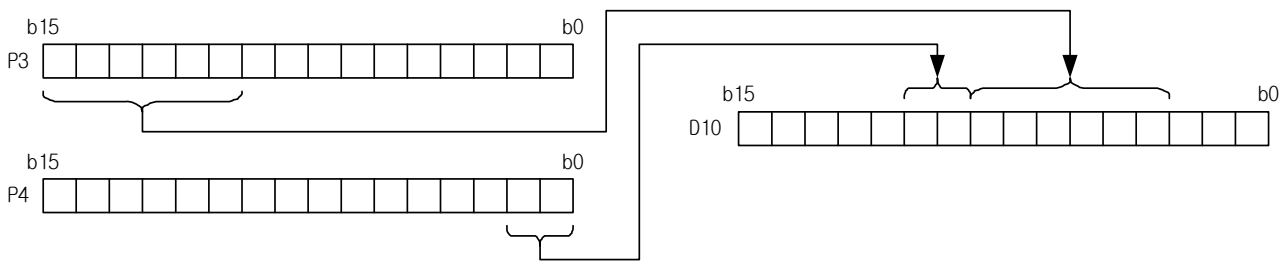
According to devices of Bit (P, M, L, K) and Word (D, R, U), Data will be differently processed.

Bit device takes other bits from the next word if Source S is out of word range during Instruction executed. If Destination D's area for saving exceeds the word, other bits will be saved also in the next word. If bit device's last word has been specified and instruction is to be executed including the next word, the process should be as described in word device.

Word device if out of word range when Sourced S follows instruction, will fill the area exceeded with 0. And if Destination D exceeds word, the exceeded data will not be processed.

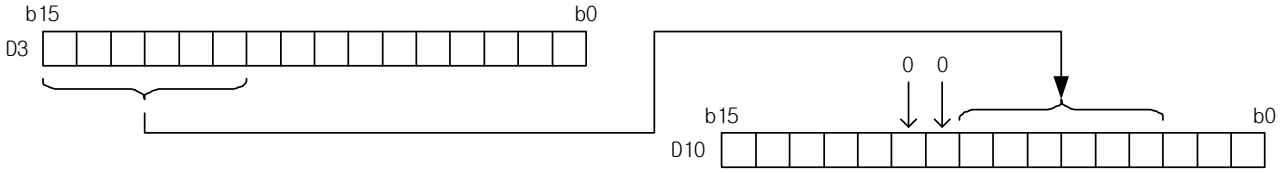
2) MOV8 P0003A D10.3

If Source Device is of bit, and data to transfer is out of the specified word range, it will be transferred to the next area's bit value.



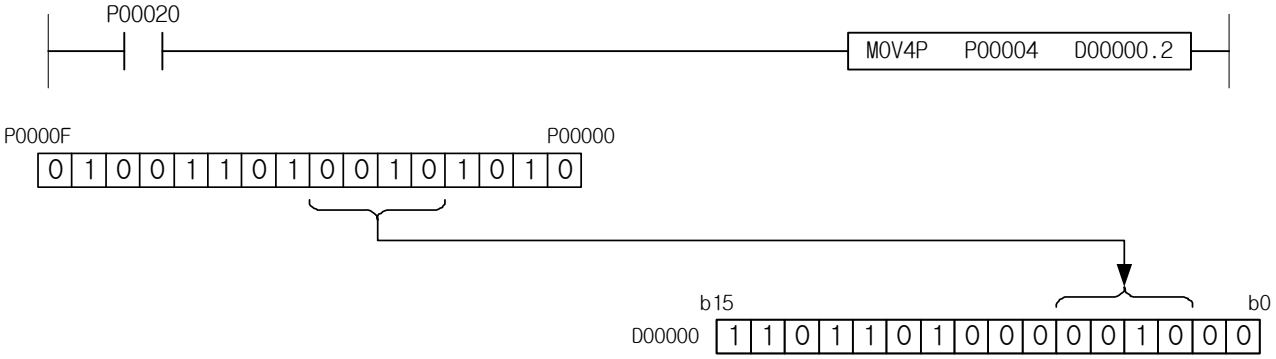
3) MOV8 D00003.A D10.3

If Source Device is of word, and data to transfer is out of the specified word range, the range exceeded will be disregarded and filled with 0 in Destination.



4) Example

Where 4-Bit Data from P00004 is transferred to D0.2 ~ D0.5 by MOV4P Instruction whenever Input Signal P00020 is On.



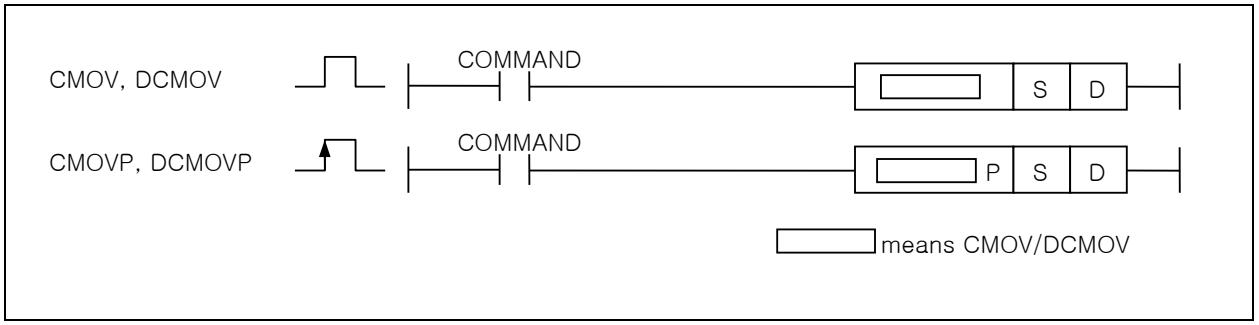
Notes

(1) Dxxx.x Rxxx.x Uxx.xx.x areas are not transferred to D+1 area but disregarded if MOV4, MOV8 instruction results exceed the area.

4.11.3 CMOV, CMOVP, DCMOV, DCMOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	-	-	-
DCMOV(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

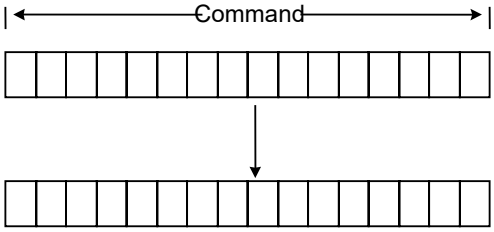


[Area setting]

Operand	Description	Data type
S	Data to transfer or device number data is saved in	WORD/DWORD
D	Device number to save data transferred	WORD/DWORD

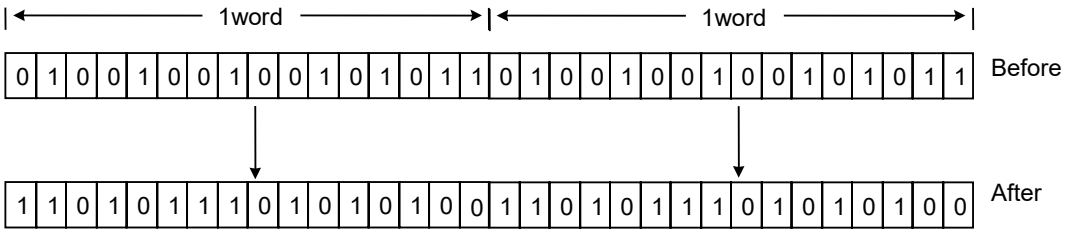
1) CMOV (Complement Move)

It takes 1's complement in word data S to transfer its result to D.



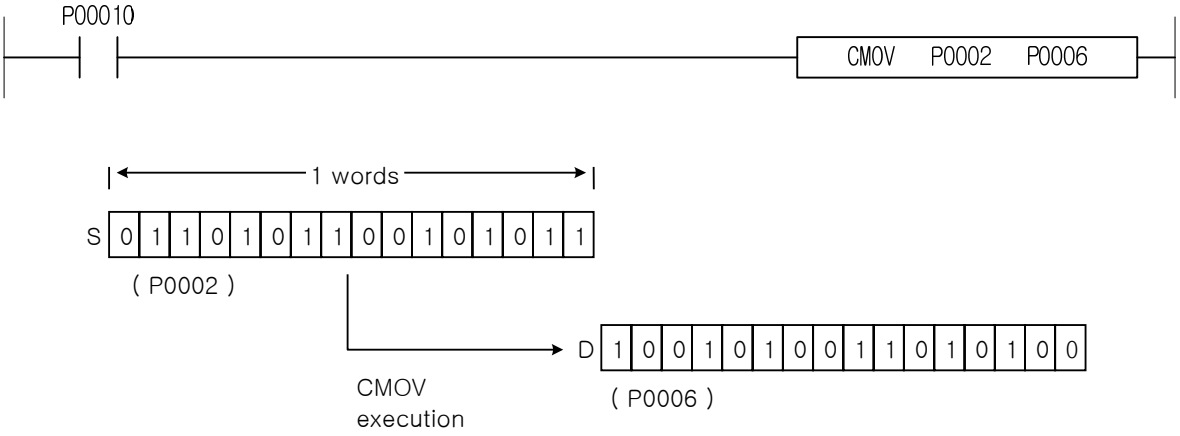
2) DCMOV (Double Complement Move)

DCMOV(P) Instruction takes 1's complement to transfer twice CMOV(P) Instruction data. (Double word transfer)



3) Example

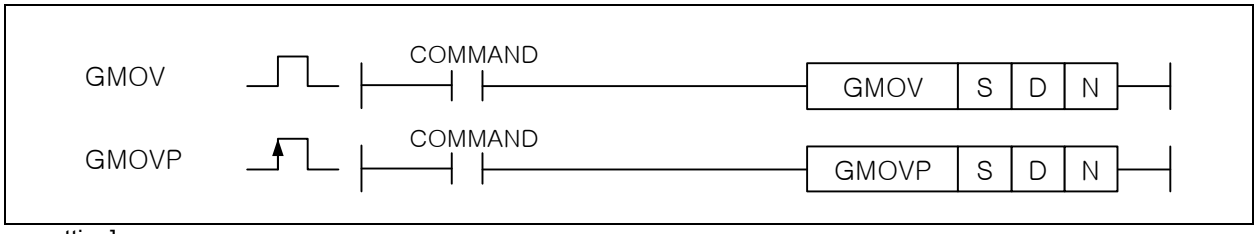
If Input P00020 is On, it takes P00002 word data's 1's complement to transfer to P0006.



4.11.4 GMOV, GMOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	-	-	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Data to transfer or device number data is saved in	WORD
D	Device number to save data transferred	WORD
N	Number to transfer in group (0 ~ 65536)	WORD

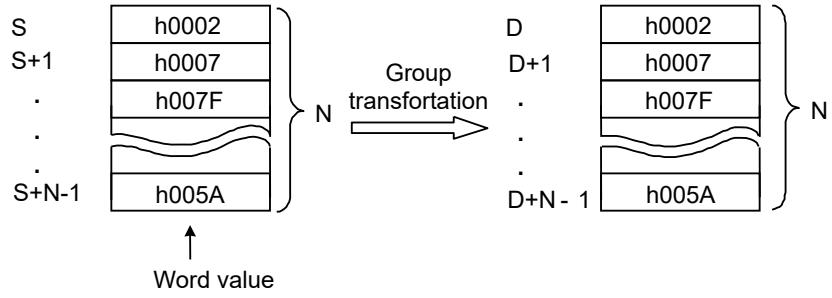
[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area. Applicable instruction result is not processed.	F110

1) GMOV (Group Move)

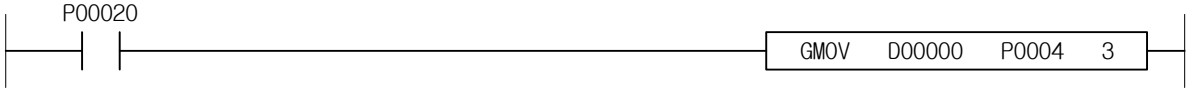
(1) It transfers N word data from S to D.

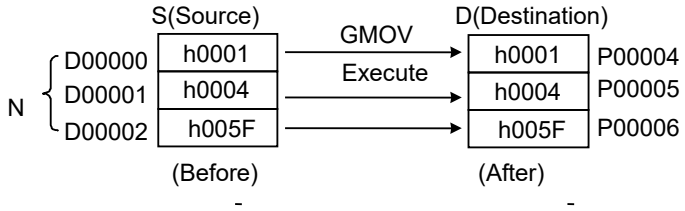
(2) MOV Instruction transfers word 1: 1, and GMOV Instruction transfers word N: N.



2) Example

(1) If Input Signal P00020 is On, D00000, D00001, D00002 word data is saved in P00004, P00005, P00006.

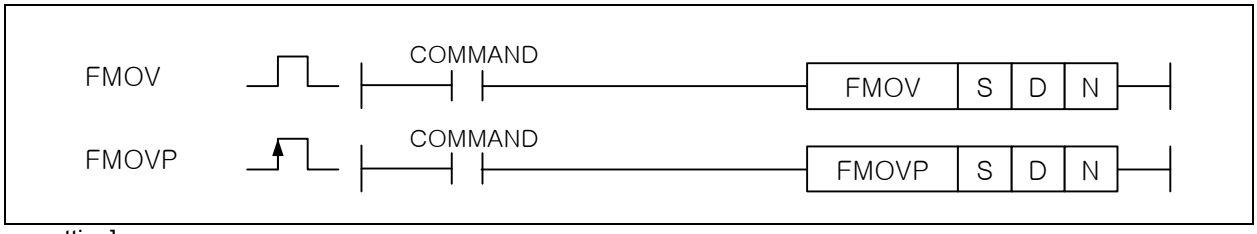



S(Source)
D(Destination)
GMOV
Execute
N
D00000
D00001
D00002
h0001
h0004
h005F
h0001
h0004
h005F
P00004
P00005
P00006
(Before)
(After)

4.11.5 FMOV, FMOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	-	-	-	O	-	-	O	O	O	O	O				



[Area setting]

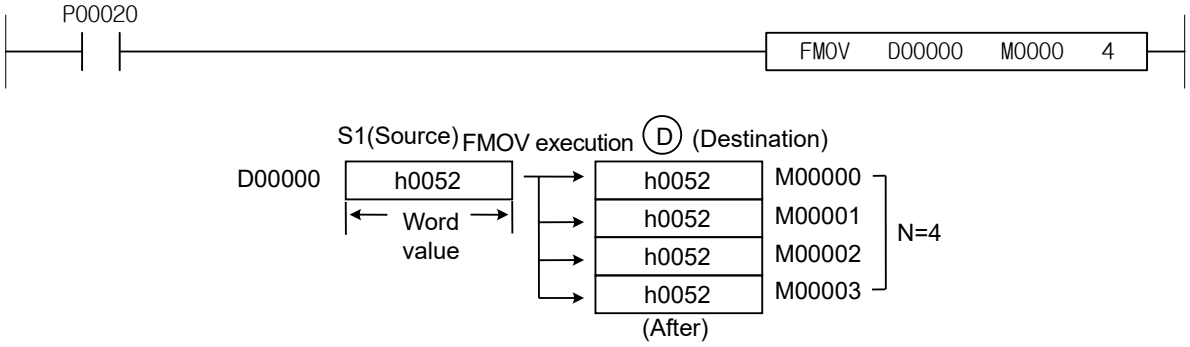
Operand	Description	Data type
S	Data to transfer or device number data is saved in	WORD
D	Device number to save data transferred	WORD
N	Word number to transfer in group (0 ~ 65536)	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area. Applicable instruction result is not processed.	F110

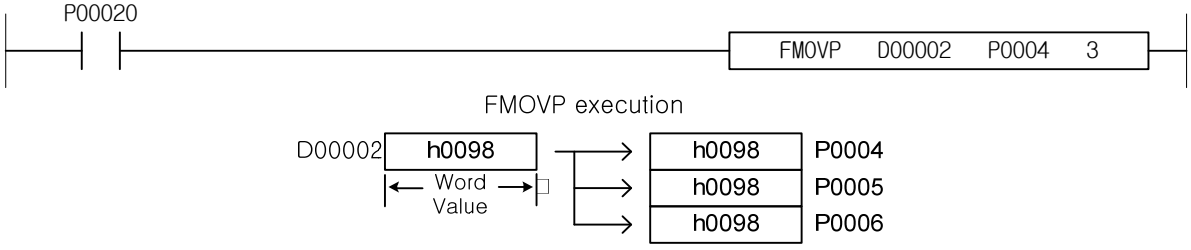
1) FMOV (File Move)

(1) It transfers Word data S for N Word from D in regular order.
(2) It is mainly used to initialize data's specific area.
(3) If N's range exceeds specified area, Error Flag (F110) will be set but not processed.



2) Example

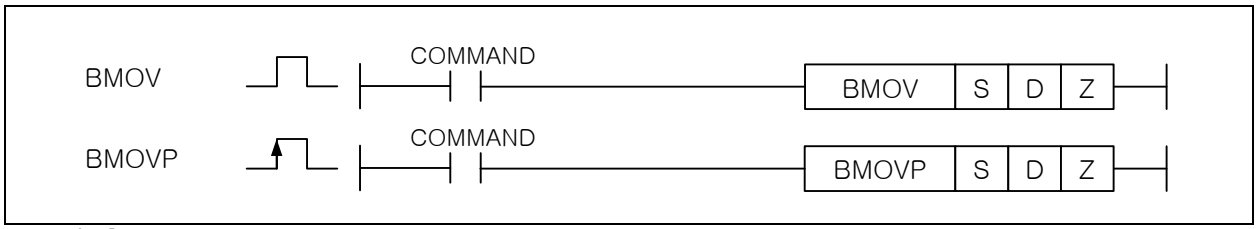
Whenever Input Signal P00020 is On, D00002 word data is saved in P0004, P0005, P0006.



4.11.6 BMOV, BMOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	Z	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

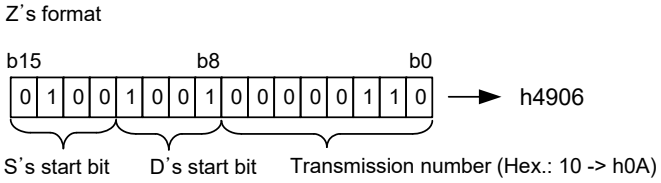
Operand	Description	Data type
S	Area Number data is saved in	WORD
D	Destination Area Number	WORD
Z	Format to execute BMOV(P)	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if Z's range exceeds specified area. Applicable instruction result is not processed.	F110

1) BMOV (Bit Move)

(1) By the format set in Z, specified number of bits will be transferred to D from word data S.

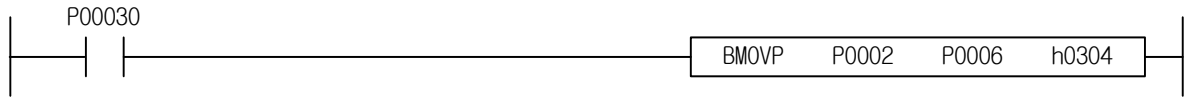


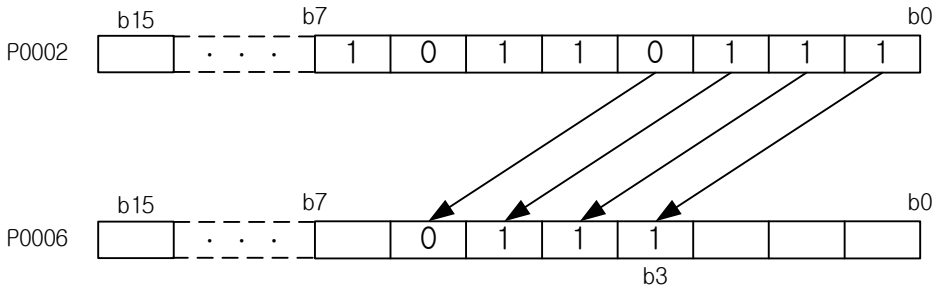
(2) Z's transferred bits: up to h00 ~ h10 available.

(3) Error Flag(F110) will be set but the result will be not processed if D+Z's result range is exceeded.

2) Example

(1) Whenever Input Signal P00030 is On, 4-bit from the 0th bit in P0002 area will be saved in P0006 starting from P0063 bit.

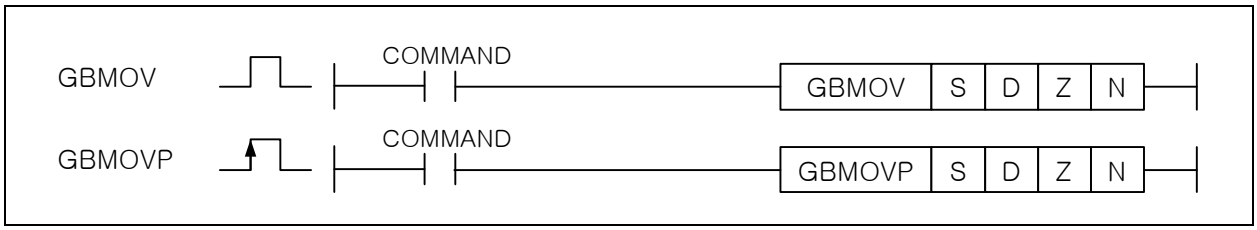



b15
b7
b0
P0002
1 0 1 1 0 1 1 1
b15
b7
b0
P0006
0 1 1 1
b3

4.11.7 GBMOV, GBMOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GBMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~7	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	Z	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N	O	O	O	-	-	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Area Number data is saved in	WORD
D	Destination Area Number	WORD
Z	Format to execute GBMOV(P)	WORD
N	Number to execute GBMOV(P) (0 ~ 32,767)	WORD

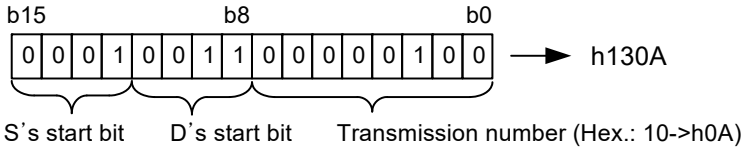
[Flag Set]

Flag	Content	Device number
error	To be set, if Z's range exceeds specified area. Applicable instruction result is not processed. To be set, if N's range exceeds specified area.	F110

1) GBMOV (Group Bit Move)

(1) It transmits N words from S's data to starting D in regular order in group by Z's format.

[Z's format]



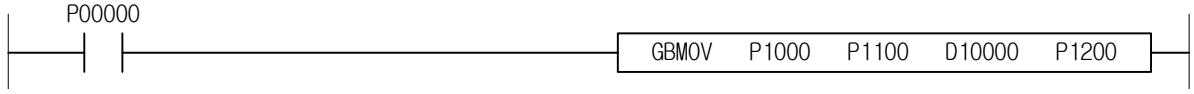
(2) If Z is h130A, it transmits S's 10-bit data from the No.1 bit will be moved to D's No.3 bit in regular order in group.

(3) If area exceeded while executed, set Error Flag.

2) Example

(1) In case of D10000=h2408 and P1200=4 which is saved , If Input contact P00000 is on, GBMOV instruction will be executed.

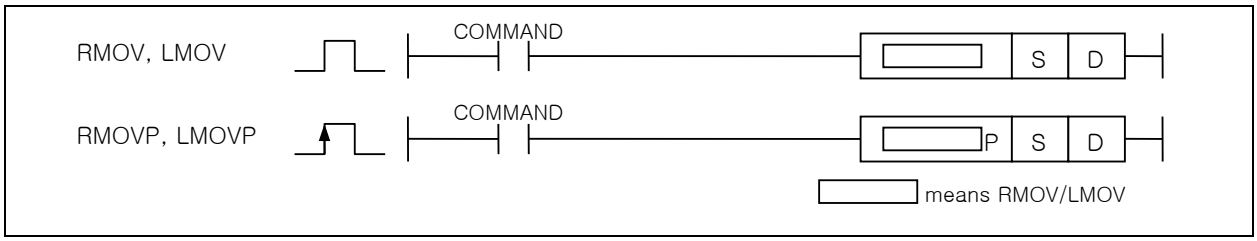
(2) This example shows the group bit transmission. The transmitted data are sequentially saved in the 8-bit data area of P1100 and bit 4 of P1100 receives bit 2 (b02) of P1000 first. 4 word data in the range of P1000 to P1003 are moved to the range of P1100 to P1103 area in the same method.



4.11.8 RMOV, RMOVP, LMOV, LMOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RMOV(P) LMOV(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~5	-	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



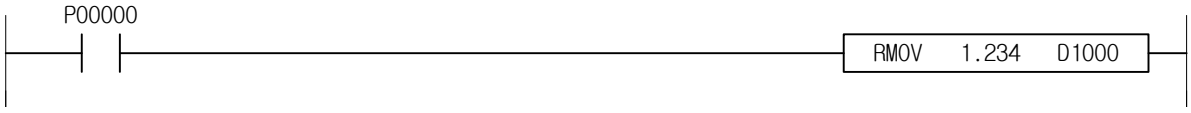
[Area setting]

Operand	Description	Data type
S	Data to transfer or device number data is saved in	REAL/LREAL
D	Device number to save data transferred	REAL/LREAL

1) RMOV (Real Move)
   (1) It transfers specified S+1,S device's Real data D+1,D.
   (2) If input a constant in S, decimal input type can be input. Hexadecimal input type is not permitted.

2) LMOV (Long Real Move)
   (1) It transfers S+3,S+2,S+1,S's Long Real Data to (D+3,D+2,D+1,D).
   (2) If input a constant in S, decimal input type can be input. Hexadecimal input type is not permitted.

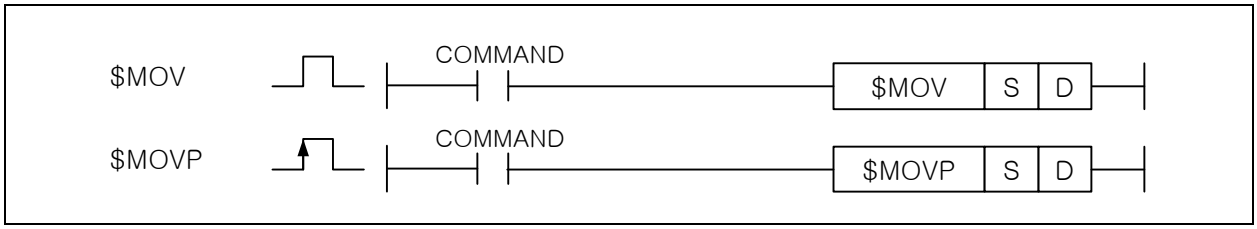
3) Example
   (1) If input contact point P00000 is On, Long Real data 1.234 is saved in D1000 by Long Real data.



4.11.9 $MOV, $MOVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	String	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
$MOV(P)	S	O	-	O	O	O	-	O	-	-	O	O	O	O	O	2~18	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

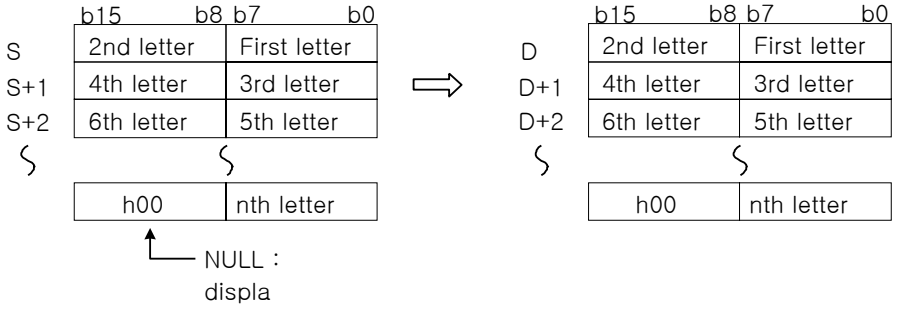
Operand	Description	Data size
S	String to transfer or device's head number string is saved in	STRING
D	Device's head number to save string transferred	STRING

[Flag Set]

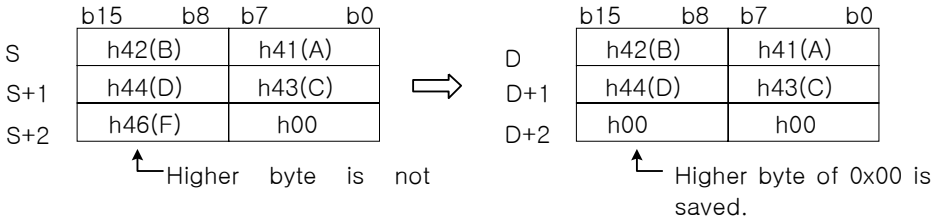
Flag	Content	Device number
error	If out of S or D device's range.	F110

1) $MOV (Character String Move)

(1) It transfers string starting with S to device starting with D.



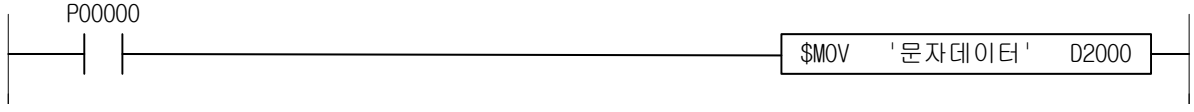
(2) If NULL is saved in S+n's lower byte, 0x00 will be saved in D+n's higher byte.



(3) Up to 31 letters is available for string to transfer.

2) Example

(1) If input contact point P00000 is On, 'string Data' is saved in D2000.

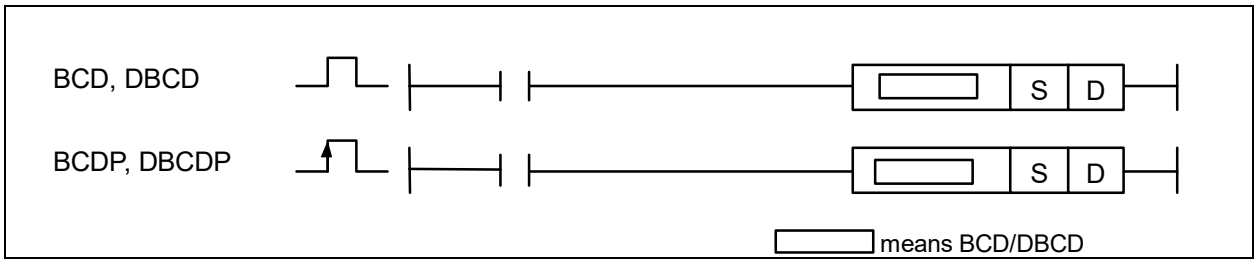


4.12 Code Conversion Instruction

4.12.1 BCD, BCDP, DBCD, DBCDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BCD(P) DBCD(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Area Number data is saved in	WORD/DWORD
D	Device number of Destination area	WORD/DWORD

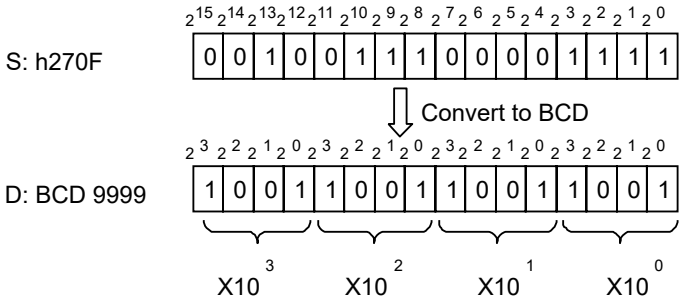
[Flag Set]

Flag	Content	Device number
error	As for BCD(P) when S' value is other than 0~9999 (h270F). As for DBCD(P) when S+1,S's value is other than 0~99999999 (h5F5E0FF)	F110

1) BCD (Binary Coded Decimal)

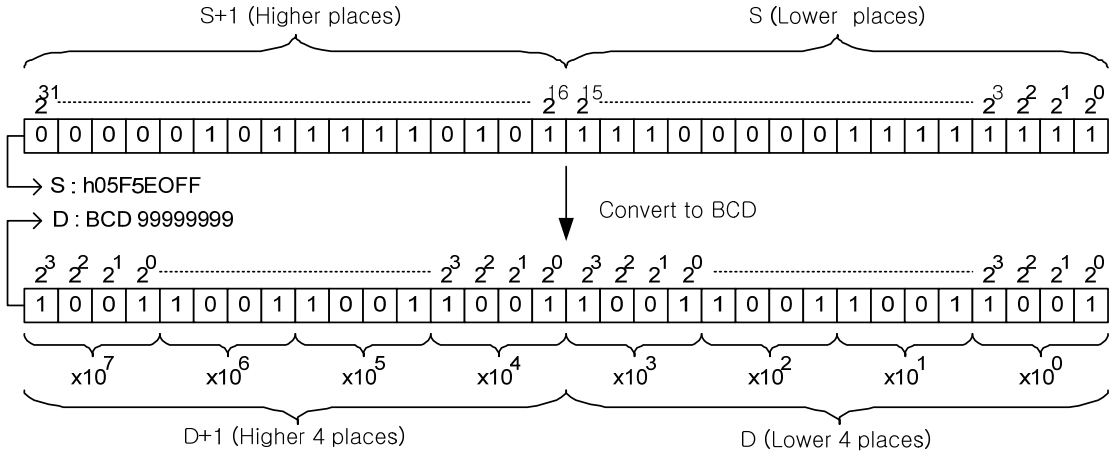
(1) It converts specified S device's BIN data (0~h270F) to BCD so to save in D.

Command	Data size	BIN Formatting	BCD Formatting
BCP(P)	16 bit	0 ~ h270F (0~9999)	h0 ~ h9999
DBCD(P)	32 bit	0 ~ h05F5E0FF (0 ~ 99999999)	h0 ~ h99999999



2) DBCD (Double Binary Coded Decimal)

(1) It converts specified (S+1,S) device's BIN Data (0~h05F5E0FF) to BCD so to save in D+1 and D respectively.

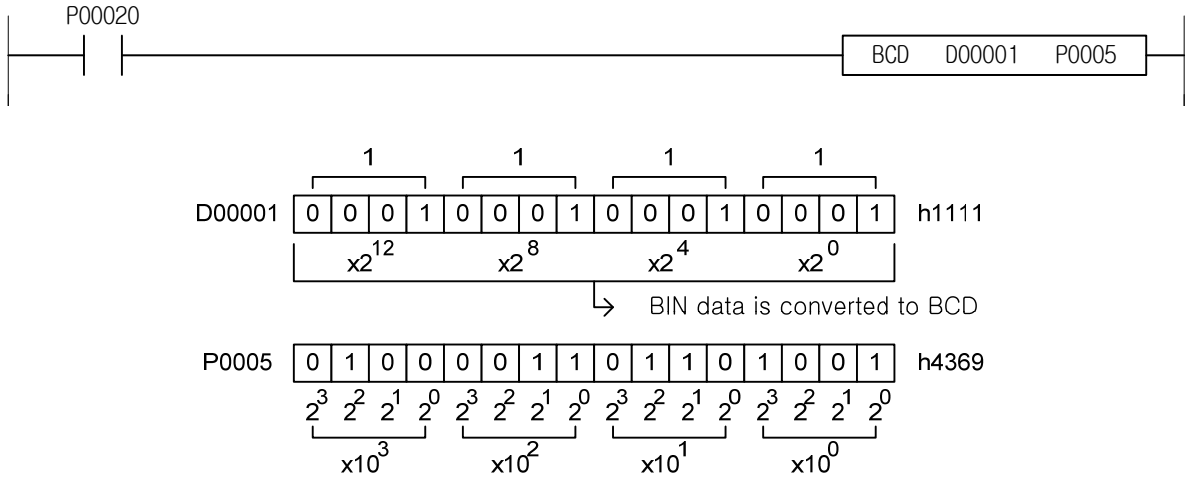


3) Error

(1) If BIN Data after converted to BCD exceeds the range displayed, it sets Error Flag(F110).

4) Example

(1) Where 'h1111' data which is saved in D00001 after converted to BCD is output to P0005 if Input Signal P00020 is On.

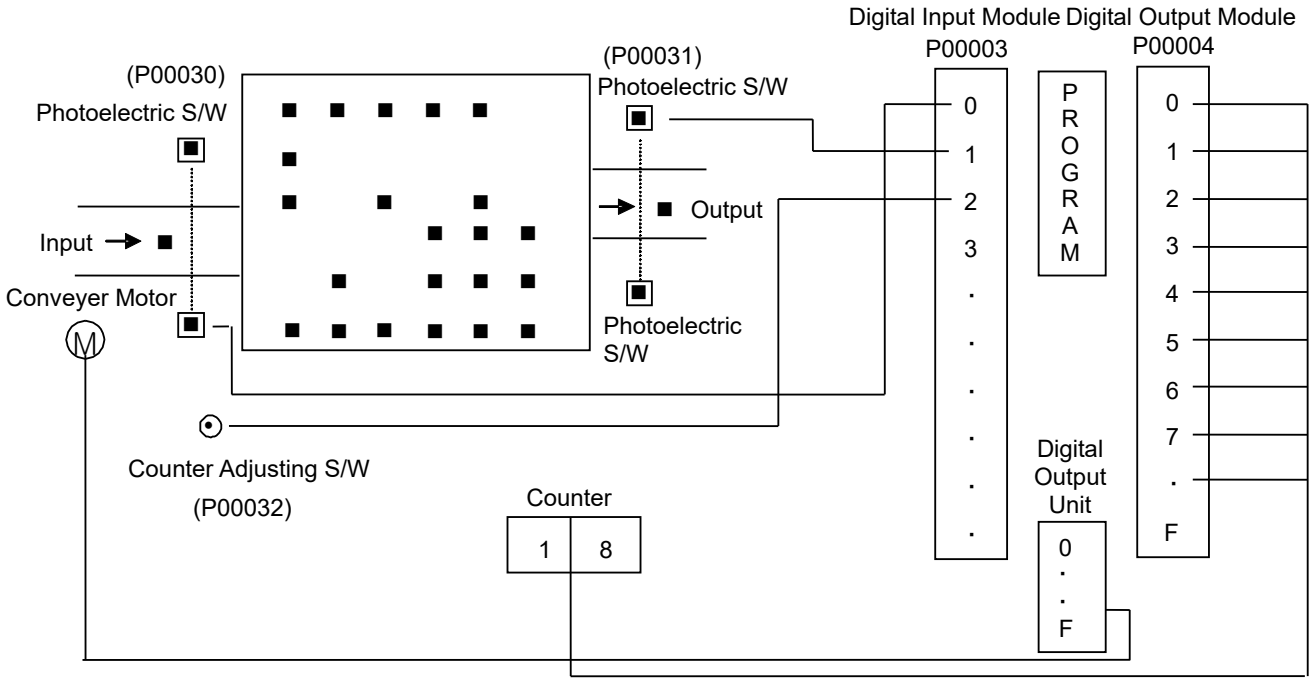


[Example 4.12] Counter's (Timer) External Output of Present Value [BCD, BMOV]

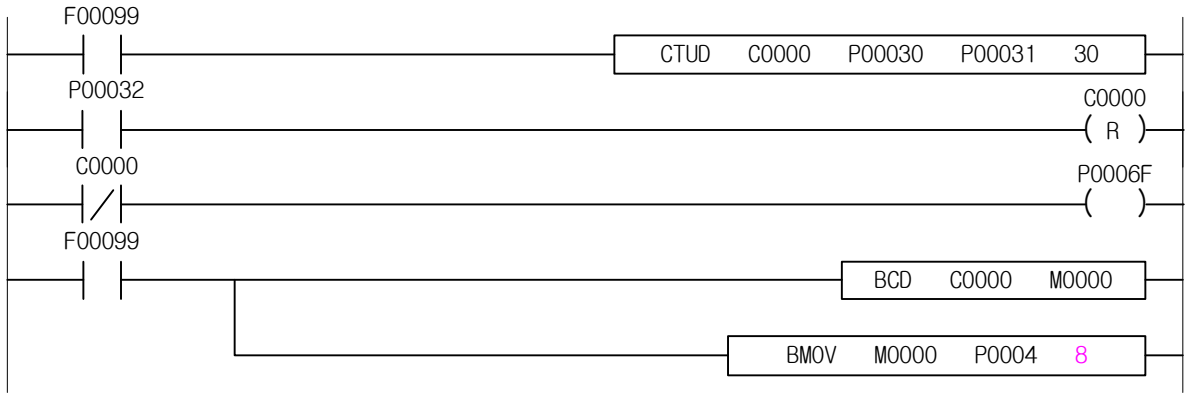
(1) Operation

If the warehouse keeps 30 products in stock, conveyor will stop and the number kept in stock will be displayed out.

(2) System Diagram



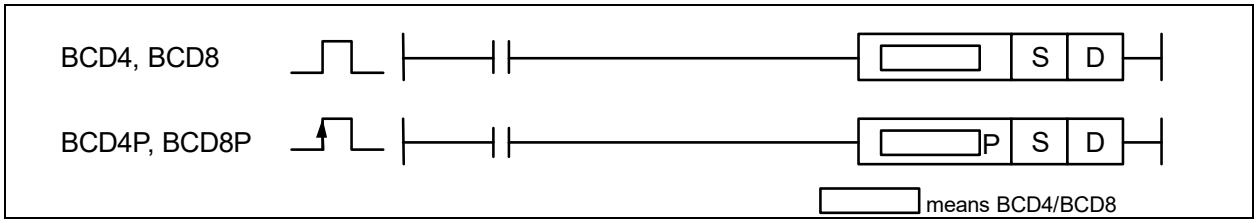
(3) Program



4.12.2 BCD4, BCD4P, BCD8, BCD8P

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BCD4(P) BCD8(P)	S	O	-	O	-	-	-	-	O	O	O	O	-	-	-	3~5	O	-	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				



[Area setting]

Operand	Description	Data type
S	Data to convert to BCD or bit position of device number data is saved in	NIBBLE/BYTE
D	Bit position of device number to save data converted	NIBBLE/BYTE

[Flag Set]

Flag	Content	Device number
error	As for BCD4 when S's value is other than 0~9. As for BCD8 when S's value is other than 0~99.	F110

1) BCD4

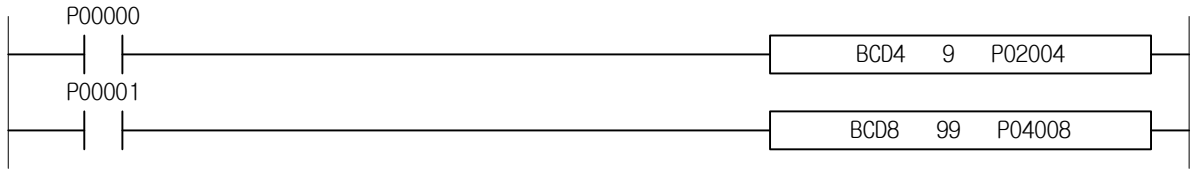
(1) It converts specified S device's 4-bit BIN data to (0~9) BCD4 and saves in specified D device area.
(2) Error Flag (F110) will be set if S value is other than (0~9).

2) BCD8

(1) It converts specified S device's 8-bit BIN data to (0~99) BCD8 and saves in specified D device area.
(2) Error Flag (F110) will be set if S value is other than (0~99).

3) Example

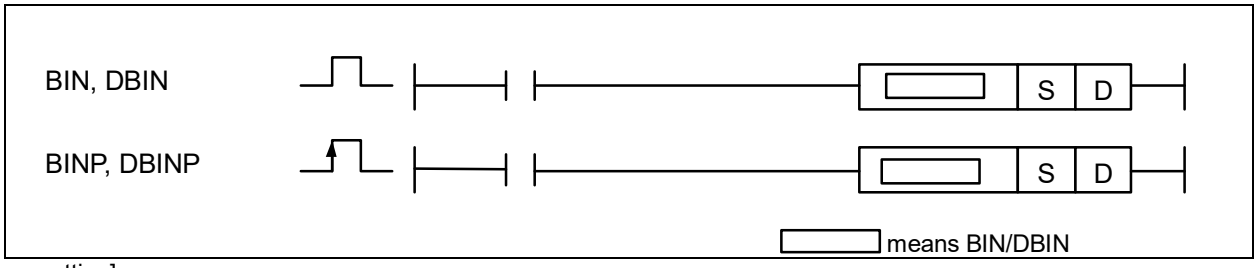
(1) If P00000 is On, '9's Nibble data will be BCD converted to 'h9' from P0200's No. 4 bit.
(2) If P00001 is On, '99's Nibble data will be BCD converted to 'h99' from P0400's No. 8 bit.



4.12.3 BIN, BINP, DBIN, DBINP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BIN(P) DBIN(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Area Number or BCD Data BCD Data is saved in	WORD/DWORD
D	Area data converted to BIN is saved in	WORD/DWORD

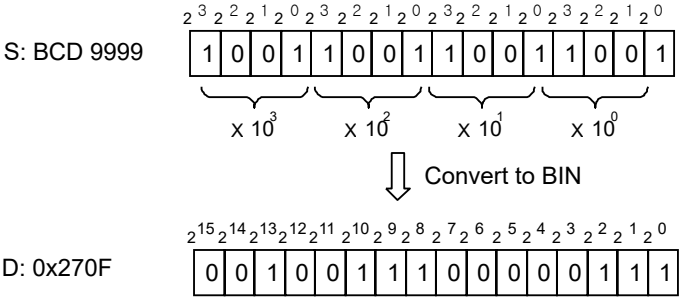
[Flag Set]

Flag	Content	Device number
error	As for BIN(P), S's data is other than BCD format (0~9999) As for DBIN(P), S+1,S's data is other than BCD format (0~99999999)	F110

1) BIN (Binary)

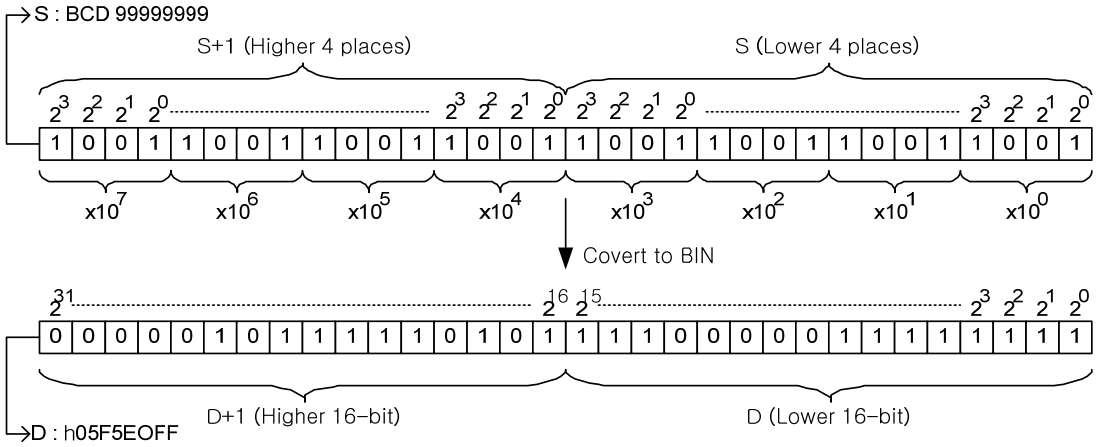
(1) It converts specified S device's BCD data (0~9999) to BIN data and it is saved in D.

Command	Data size	BCD Formatting	BIN Formatting
BIN(P)	16 bit	h0 ~ h9999	0 ~ h270F (0 ~ 9999)
DBIN(P)	32 bit	h0 ~ h99999999	0 ~ h05F5E0FF (0 ~ 99999999)



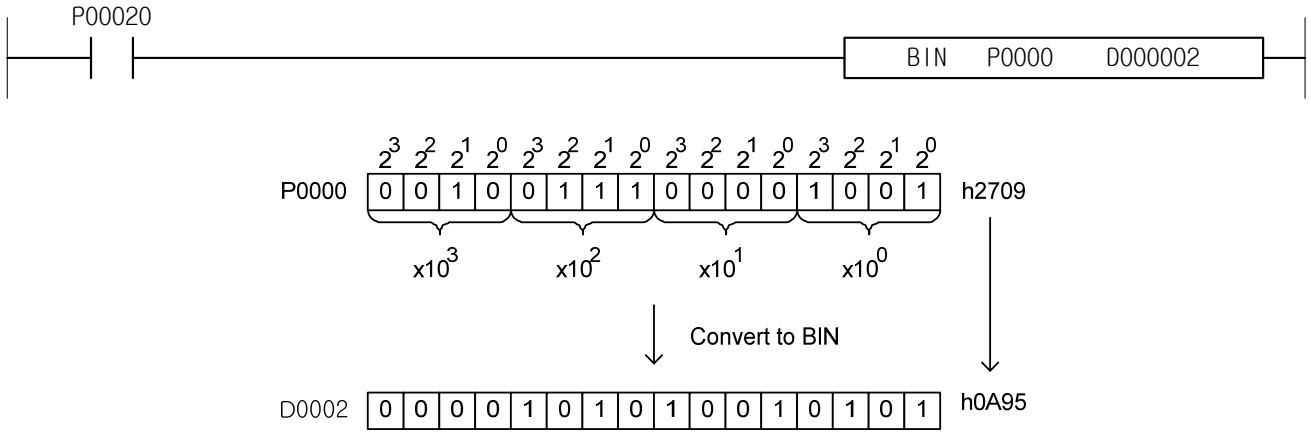
2) DBIN (Double Binary)

(1) It converts specified S+1,S device's BCD data(0~99999999) to BIN data and it is saved in D+1,D.



3) Example

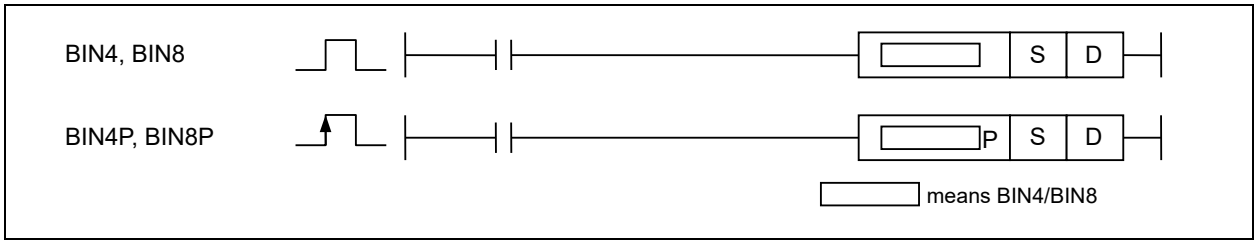
(1) Where P0000 BCD data after converted to BIN data is saved in D0002 if Input Signal P00020 is On.



4.12.4 BIN4, BIN4P, BIN8, BIN8P

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BIN4(P) BIN8(P)	S	O	-	O	-	-	-	-	O	O	O	O	-	-	-	3~5	O	-	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				



[Area setting]

Operand	Description	Data type
S	Data to convert or bit position of device number data is saved in	NIBBLE/BYTE
D	Bit position of device number to save data converted	NIBBLE/BYTE

[Flag Set]

Flag	Content	Device number
error	As for BIN4(P), S's device value is other than BCD format (h0~h9). As for BIN8(P), S's device value is other than BCD format (h0~h99).	F110

1) BIN4

(1) It converts specified S device's 4-bit BCD data (h0~h9) to BIN4 and saves in D.

(2) Error SET (F110) will be set if S value is other than (h0~ h9).

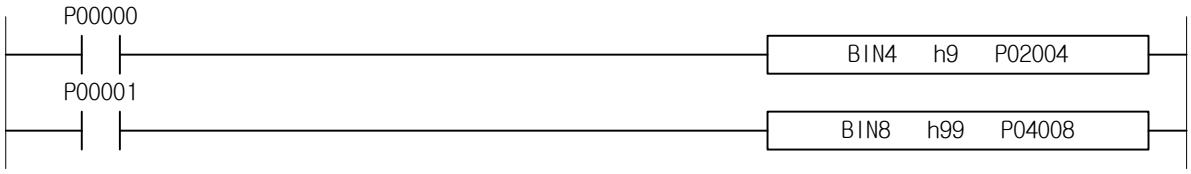
2) BIN8

(1) It converts specified S device's 8-bit BCD data (h0~h99) to BIN8 and saves in D.

(2) Error SET (F110) will be set if S value is other than (h0~ h99).

3) Example

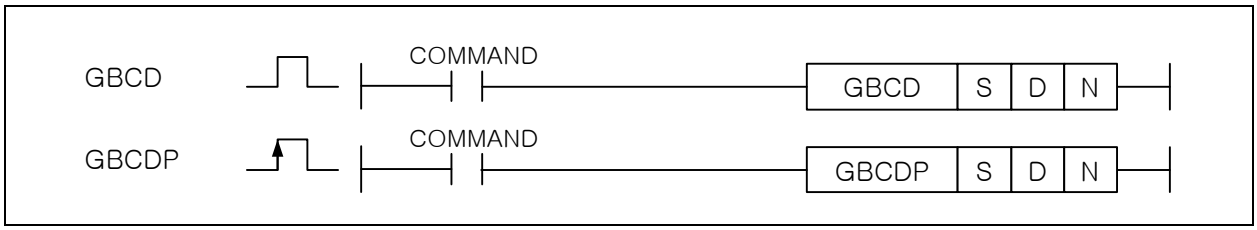
(1) If Input signal P00000 is On, BCD data is converted and saved from P0200's No.4 bit.
If Input signal P00001 is On, BCD data is converted and saved from P0400's No.8 bit.



4.12.5 GBCD, GBCDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GBCD(P)	S	O	-	O	O	O	-	-	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Data to convert to BCD or Device number data is saved in	WORD
D	Device number to save BCD data converted.	WORD
N	Total number of data to convert to BCD	WORD

[Flag Set]

Flag	Content	Device number
error	If one value among N data is other than 0~9999(h270F) To be set, if N's range exceeds specified area.	F110

1) GBCD (Group Binary Coded Decimal)

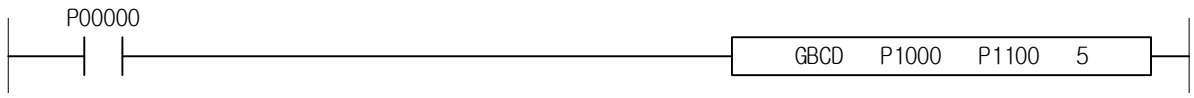
(1) It converts specified S word data of N BIN value to BCD and saves respectively in starting D in regular order.

(2) It converts N BIN data '0~9999' from specified S device to GBCD and saves in starting D 1:1.

(3) Error Flag (F110) will be set if specified D's N value from S is other than "0~9999".

2) Example

(1) If Input signal P00000 is On, 5 word data from P1000~P1004 is Group BCD converted respectively and saved in P1100~P1104 area.



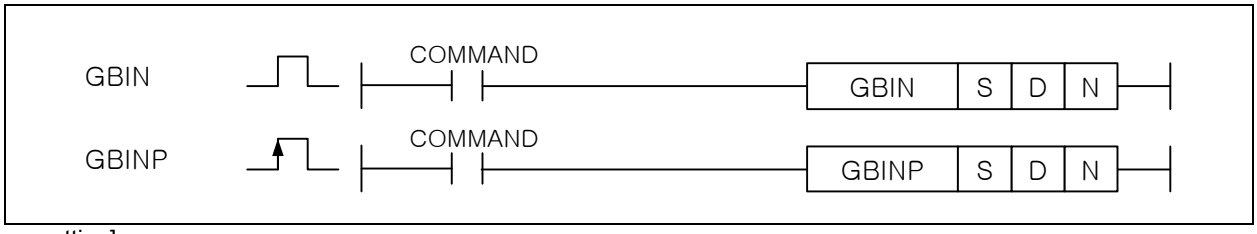
Notes

(1) In Basic Parameter with 'Continue running when an arithmetic error occurs', if 1 value among N data is other than 0~9999, other data will not be converted to BCD nor operated.

4.12.6 GBIN, GBINP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GBIN(P)	S	O	-	O	O	O	-	-	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	BCD Data to convert to BIN or Device number data is saved in	WORD
D	Device number to save BIN data converted.	WORD
N	Total number of data to convert to BCD	WORD

[Flag Set]

Flag	Content	Device number
error	If one value among N data is other than BCD(h0~h9999) To be set, if N's range exceeds specified area.	F110

1) GBIN (Group Binary)

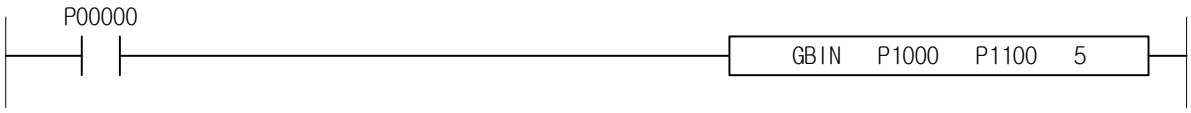
(1) It converts specified S word data of N BCD value to BIN data and saves respectively in starting D in regular order.

(2) It converts specified S device's BCD data (h0~h9999) to GBIN as many as specified N and saves in D.

3) Error Flag (F110) will be set if OP1's value is other than BCD format (h0~h9999).

2) Example

(1) If Input signal P00000 is On, 5 word BCD data from P1000 to P1004 is Group BCD respectively converted and saved in from P1100 to P1104 area.



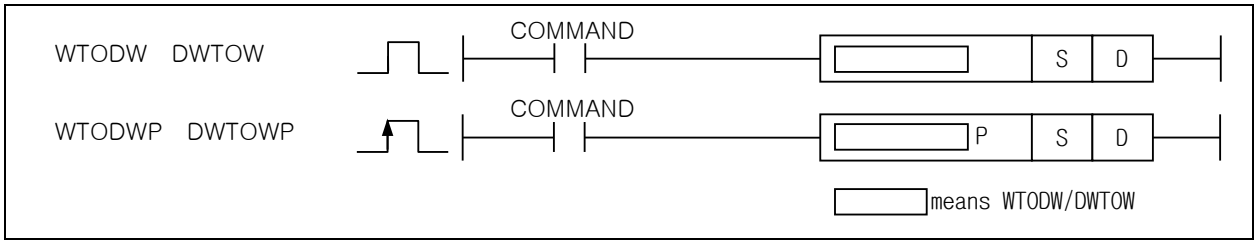
Notes

(1) In Basic Parameter with 'Continue running when an arithmetic error occurs', if any value among specified S's N datas is other than BCD format, all the n datas will not be operated.

4.12.7 WTODW, WTODWP, DWTOW, DWTOWP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WTODW(P) DWTOW(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	D	O	-	-	-	-	-	-	-	-	-	-	-	O	O				



[Area setting]

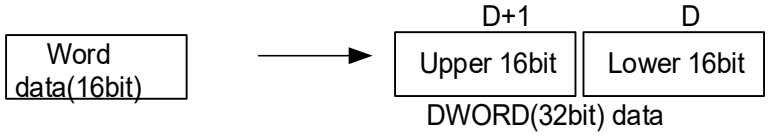
Operand	Description	Data type
S	16bit(WORD) / 32bit(DWORD) Data to convert	WORD/DWORD
D	Device number to save 16bit(WORD) / 32bit(DWORD) data converted.	DWORD/WORD

[Flag Set]

Flag	Content	Device number
error	If the value of the data specified in S+1, S from DWTOW(P) is outside the range of -32768 to 32767.	F110

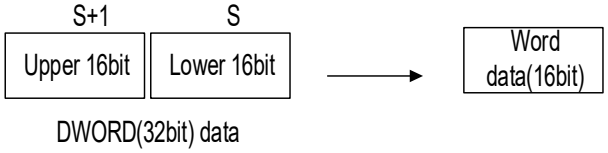
1) WTODW, WTODWP(Word to DWord)

(1) It is a command to be stored in the D by converting the data signed 32Bit of (DWORD value) the data that is specified in the S.



2) DWTOW, DWTOWP(DWord to Word)

(1) It is a command to be stored in the D by converting the data signed 16Bit of (WORD value) the data that is specified in the S.

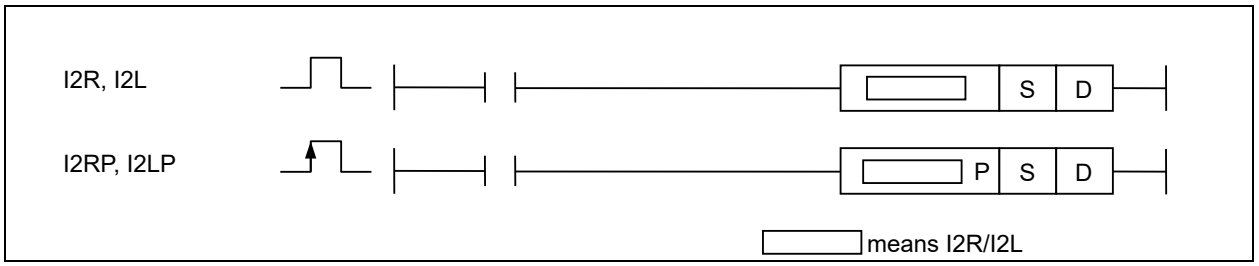


4.13 Real Number Conversion Instruction

4.13.1 I2R, I2RP, I2L, I2LP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
I2R(P) I2L(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				

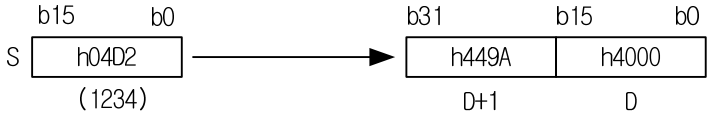


[Area setting]

Operand	Description	Data type
S	Area Number where Integer Data is saved, or Integer Data	INT
D	Device Position to save data converted to Real Data Format.	REAL/LREAL

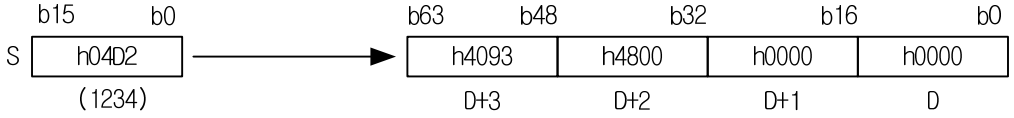
1) I2R (Integer to Real)

(1) It converts specified S 16-Bit Integer data to Single Real (32-Bit) and saves in D+1, D.



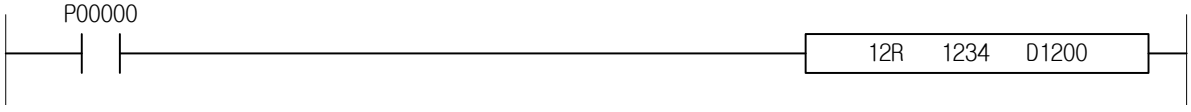
2) I2L (Integer to Long real)

(1) It converts specified S 16-Bit Integer data to Long Real (64-Bit) and saves in D+3,D+2,D+1,D.



3) Example

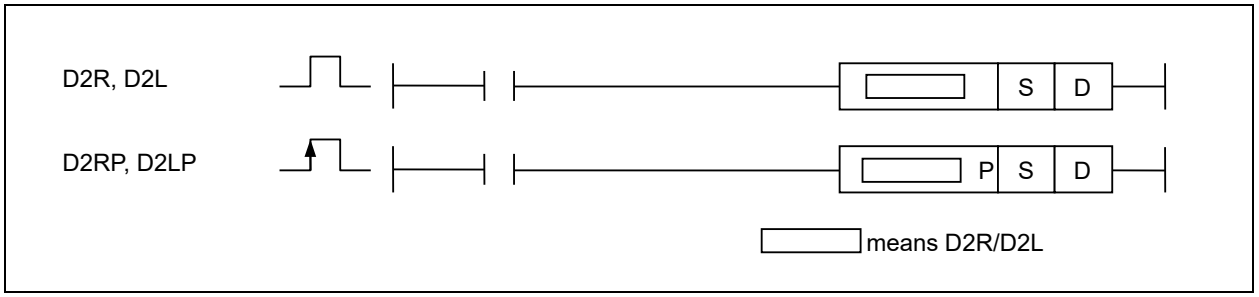
(1) If Input signal P0000 is On, It converts Integer '1234' to Real and save in 2 word data area from D1200 to D1201.



4.13.2 D2R, D2RP, D2L, D2LP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
D2R(P) D2L(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



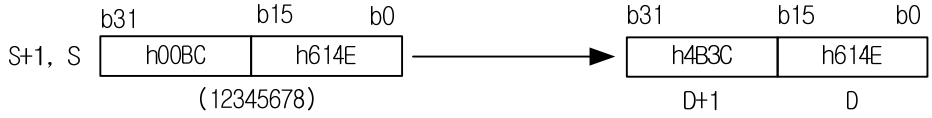
[Area setting]

Operand	Description	Data type
S	Area Number where Double Integer Data is saved, or Double Integer Data.	DINT
D	Device Position to save data converted to Real Data Format.	REAL/LREAL

1) D2R (Double Integer to Real)

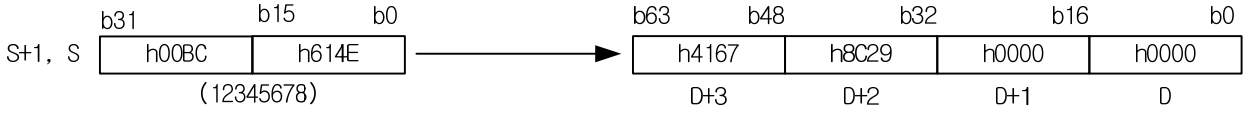
(1) D2R(P) converts S+1,S specified 32-Bit Double Integer data to Real Number(32-Bit) to save in D+1, D.

(2) If 32-bit Integer data value exceeds valid range (24-bit) of Floating point Real data, accuracy become lower and then inaccuracy error flag (F0057A) is set.But PLC operation status does not change.



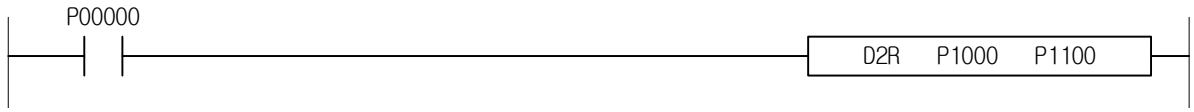
2) D2L (Double Integer to Long real)

(1) D2L(P) converts S+1,S specified 32-Bit Double Integer data to Long Real number (64-Bit) to save in D+3,D+2,D+1,D.



3) Example

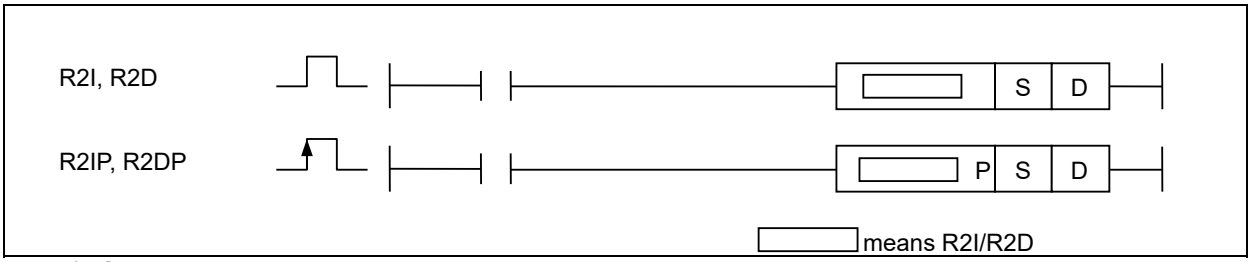
(1) In case of Double Integer data '812121' is saved in 2 Word data area from P1000 to P1001, If Input signal P00000 is On, Double Integer data '812121' is converted to Real data in 2 Word area from P1100 to P1101.



4.13.3 R2I, R2IP, R2D, R2DP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
R2I(P) R2D(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



[Area setting]

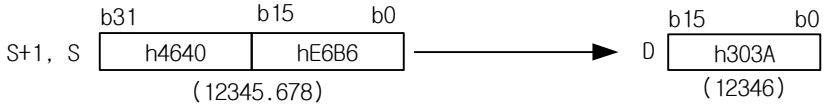
Operand	Description	Data type
S	Area Number where real number data is saved, or real number data	REAL
D	Device position to save data converted to real data format.	INT/DINT

[Flag Set]

Flag	Content	Device number
error	When R2I Instruction used and S specified Single Real Number is out of -32,768~32,767 range. When R2D Instruction used and S specified Single Real Number is out of -2,147,483,648~2,147,483,647 range.	F110

1) R2I (Real to Integer)

(1) R2I converts S+1,S specified Real Number(32-bit) to 16-bit Integer data to save in D.

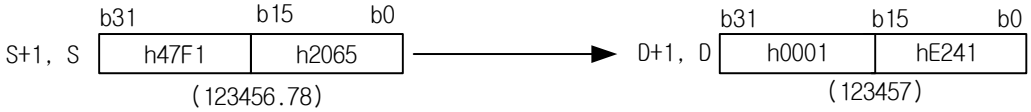


(2) If S+1,S specified Real Number value exceeds -32,768~32,767 range, operation error occurs.At this moment, the result of 32,767 will be saved if input value is bigger than 32,767, and -32,768 will be saved if input value is smaller than -32,768.

(3) Value of below decimals is will be omitted after rounding off the nearest integer.

2) R2D (Real to Double Integer)

(1) R2D converts S+1,S specified 32-bit Integer data to Long Real Number(32-bit) and saves in D+1,D.



(2) If S+1,S specified Real Number value exceeds -2,147,483,648~2,147,483,647 range, operation error operation occurs. At this moment, the result of 2,147,483,647 will be saved if real value is bigger than 2,147,483,647, and -2,147,483,648 will be saved if real value is smaller than -2,147,483,648.

(3) Value of below decimals is will be omitted after rounding off the nearest integer.

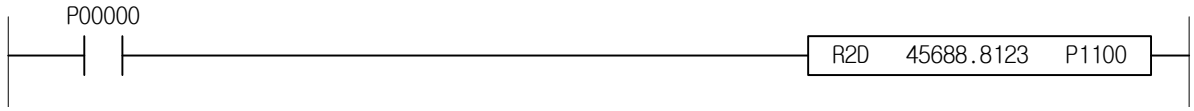
3) Error

(1) When R2I Instruction used and S specified Single Real Number is out of -32,768~32,767 range, operation error (F110)occurs.

(2) When R2D Instruction used and S specified Single Real Number is out of -2,147,483,648~2,147,483,647 range, operation error (F110)occurs.

4) Example

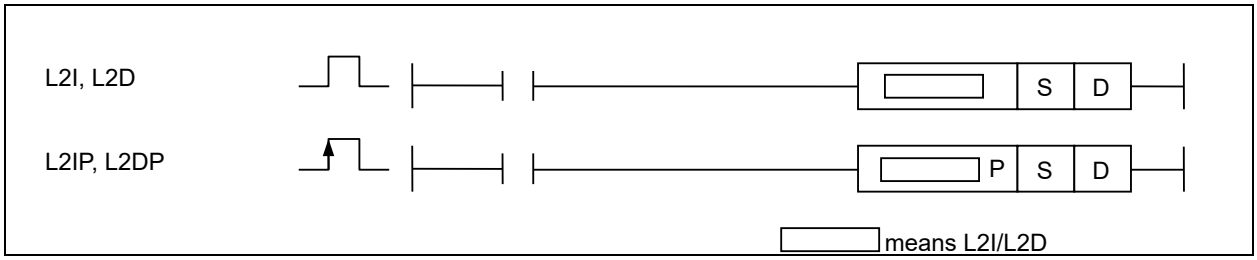
(1) If Input signal P00000 is On, Real data '45688.8123' is converted to Integer data of '45689' in 2 Word from P1100 to P1101.



4.13.4 L2I, L2IP, L2D, L2DP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
L2I(P) L2D(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



[Area setting]

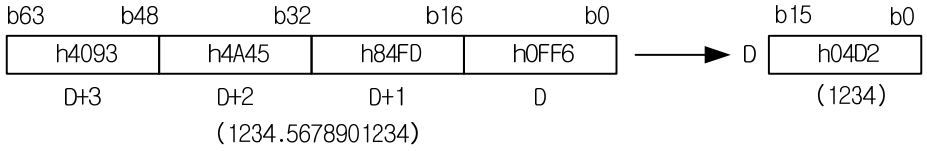
Operand	Description	Data type
S	Area Number where Long Real Data is saved, or Long Real Data	LREAL
D	Device number to save data converted to integer data format.	INT/DINT

[Flag Set]

Flag	Content	Device number
error	When L2I Instruction used and S specified long real number is out of -32,768~32,767 range. When L2D Instruction used and S specified long real number is out of -2,147,483,648~2,147,483,647 range.	F110

1) L2I (Long real to Integer)

(1) L2I(P) converts S+3,S+2,S+1,S specified long real number to Integer (16-bit) to save in D.

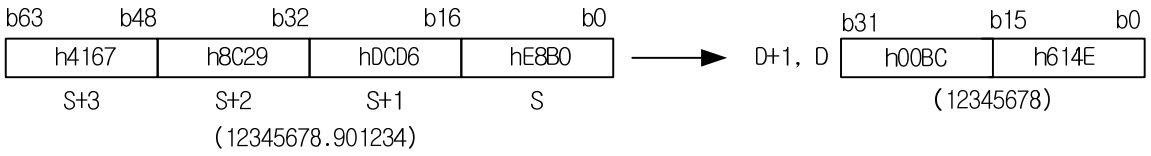


(2) If S+3,S+2,S+1,S specified long real number's value exceeds -32,768 ~ 32,767 range, operation error occurs. At this moment, the result of 32,767 will be saved if input value is bigger than 32,767, and -32,768 will be saved if input value is smaller than -32,768.

(3) Value of below decimals is will be omitted after rounding off the nearest integer.

2) L2D (Long real to Double Integer)

(1) L2D(P) converts S+3,S+2,S+1,S specified long real number to double Integer (32-bit) to save in D+1, D.

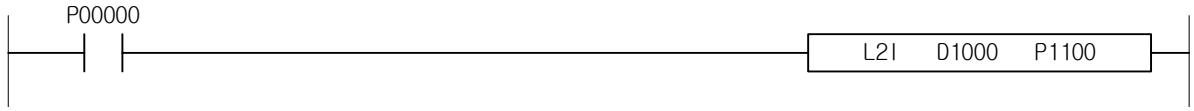


(2) If S+3,S+2,S+1,S specified long real number's value exceeds -2,147,483,648 ~ 2,147,483,647 range, operation error occurs.
At this moment, the result of 2,147,483,647 will be saved if long real value is bigger than 2,147,483,647, and -2,147,483,648 will be saved if long real value is smaller than -2,147,483,648.

(3) Value of below decimals is will be omitted after rounding off the nearest integer.

3) Example

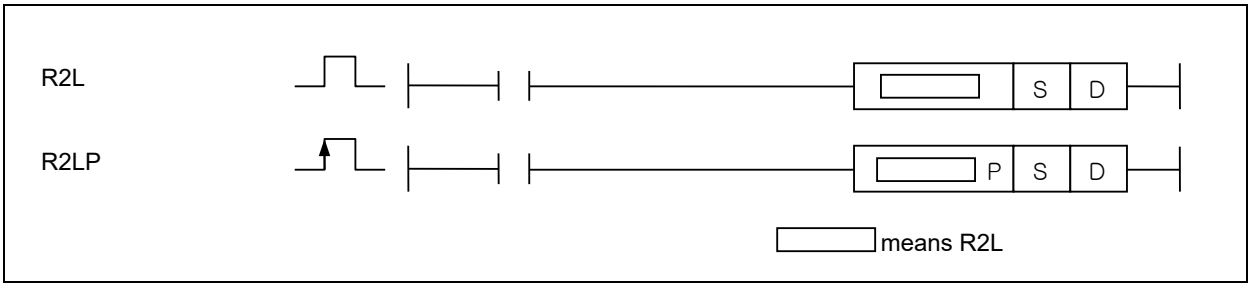
(1) In case of long real data from D1000~D1003=13456.6 is saved, If Input signal P00000 is On, Integer data of 13457 is converted and it is saved in P1100.



4.13.5 R2L, R2LP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
R2L(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



[Area setting]

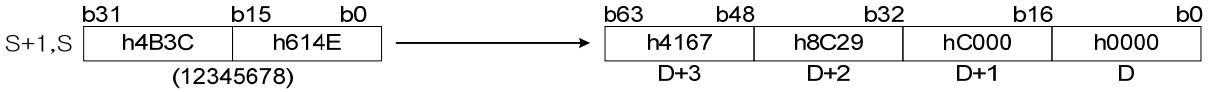
Operand	Description	Data type
S	Area number where short real data is saved, or long real data	REAL
D	Area Number where long real data is saved, or long real data	LREAL

[Flag Set]

Flag	Content	Device number
error	To be set, in case of FPU operation error flag F0057E, F0057C, F0057B, F0057A are Set.	F110

1) R2L (Real to Long real)

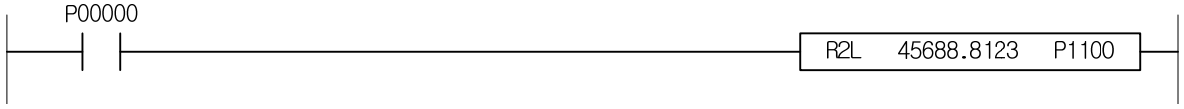
(1) R2L converts S+1,S specified short real number (32-bit) to long real (64-bit) to save in D+3, D+2, D+1, D.



2) Error

It doesn't occur operation errors except input data is not real number.

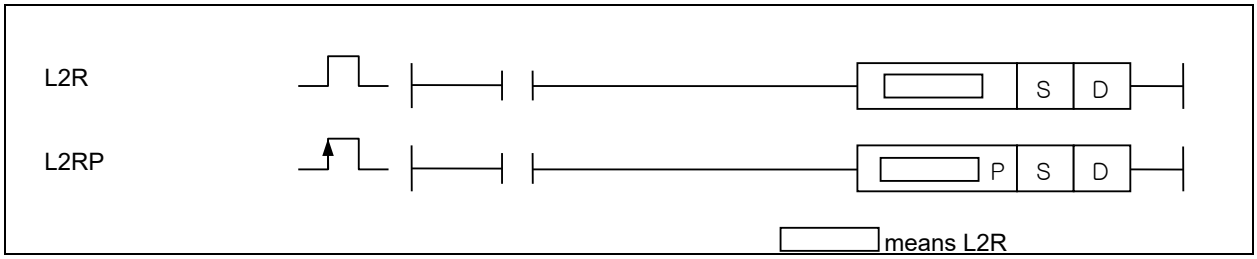
3) Example



4.13.6 L2R, L2RP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
L2R(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



[Area setting]

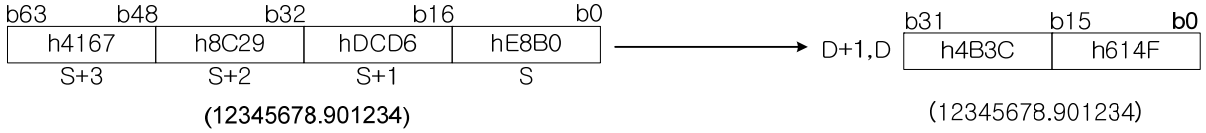
Operand	Description	Data type
S	Area Number where long real data is saved, or long real data	LREAL
D	Area number where short real data is saved, or long real data	REAL

[Flag Set]

Flag	Content	Device number
error	To be set, in case of FPU operation error flag F0057E, F0057C, F0057B, F0057A are Set.	F110

1) L2R (Long real to Real)

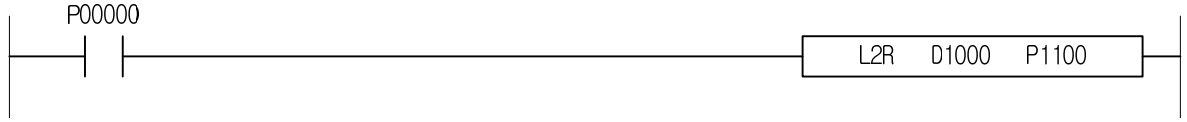
(1) L2D(P) converts S+3,S+2,S+1,S specified long real number to short real (32-bit) to save in D+1, D.



(2) If S+3,S+2,S+1,S specified long real number's value exceeds short real's range, operation error occurs. Long real number's range is | 2^{-1022} to 2^{1023}| ,short real number's range is| 2^{-126} to 2^{127}|.

2) Example

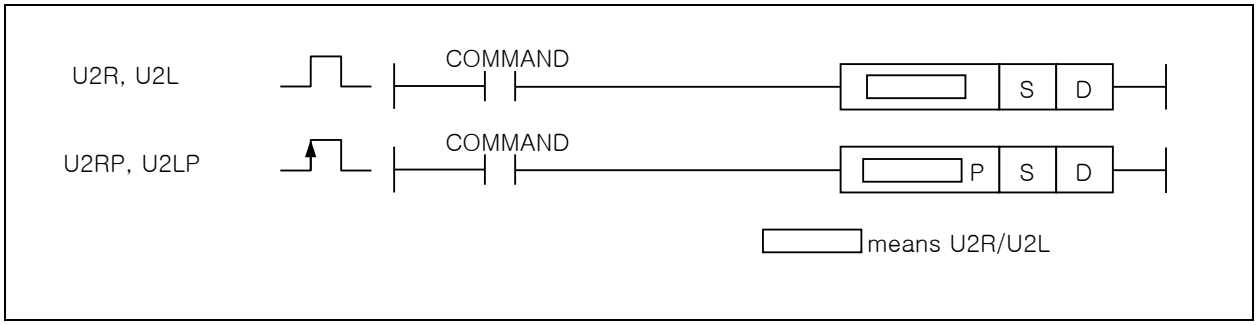
In case of long real data from D1000~D1003=13456.6 is saved, If Input signal P0000 is On, short real data of 13456.6 is converted and it is saved in P1100.



4.13.7 U2R, U2RP, U2L, U2LP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
U2R(P) U2L(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				

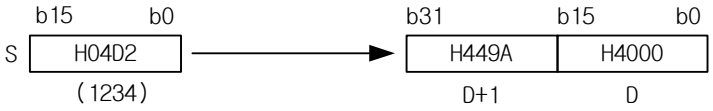


[Area setting]

Operand	Description	Data type
S	Area number where unsigned integer data is saved, or inter data	UINT
D	Device Position to save data converted to Real Data Format.	REAL/LREAL

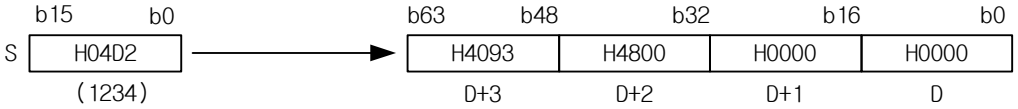
1) U2R (Unsigned Integer to Real)

(1) It converts specified S 16-Bit unsigned integer data to short real(32-Bit) and saves in D+1, D.



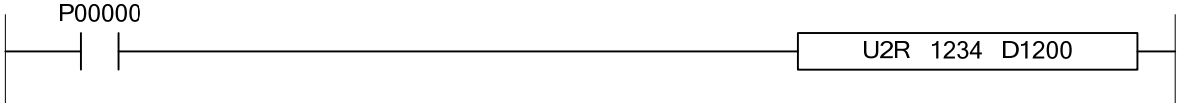
2) U2L (Unsigned Integer to long real)

(1) It converts specified S 16-Bit unsigned integer data to long real number(64-Bit) and saves in D+3,D+2,D+1,D.



3) Example

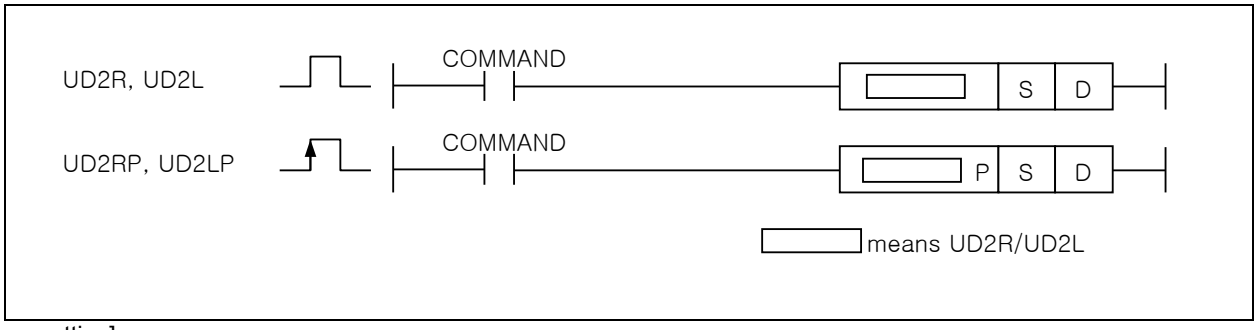
If Input signal P0000 is On, It converts Integer '1234' to Real and save in 2 word data area from D1200 to D1201.



4.13.8 UD2R, UD2RP, UD2L, UD2LP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
UD2R(P) UD2L(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



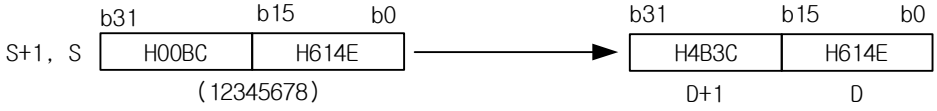
[Area setting]

Operand	Description	Data type
S	Area Number where double unsigned integer data is saved, or double integer data.	UDINT
D	Device Position to save data converted to Real Data Format.	REAL/LREAL

1) UD2R (Double Unsigned Integer to Real)

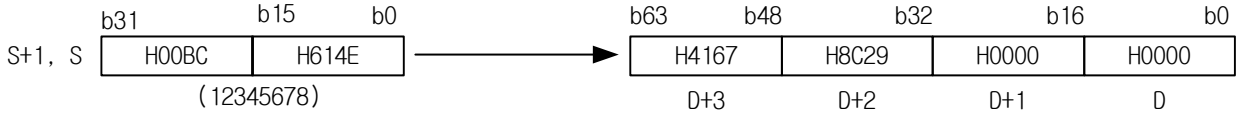
(3) D2R(P) converts S+1,S specified 32-Bit double unsigned integer data to short real number(32-Bit) to save in D+1, D.

(4) If 32-bit unsigned integer data exceeds valid range (24-bit) of short floating point real data, accuracy is removed and inaccuracy error flag (F0057A) is set. Tough inaccuracy error flag is set, there is no changed in PLC operation.



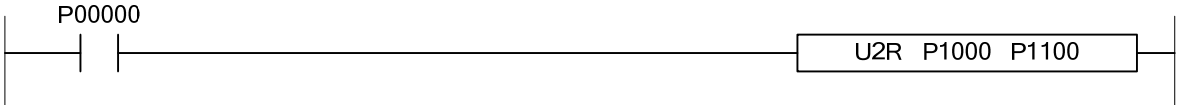
2) UD2L (Double Unsigned Integer to Long real)

(4) UD2L(P) converts S+1,S specified 32-Bit double unsigned integer data to long real number (64-Bit) to save in D+3,D+2,D+1,D.



3) Example

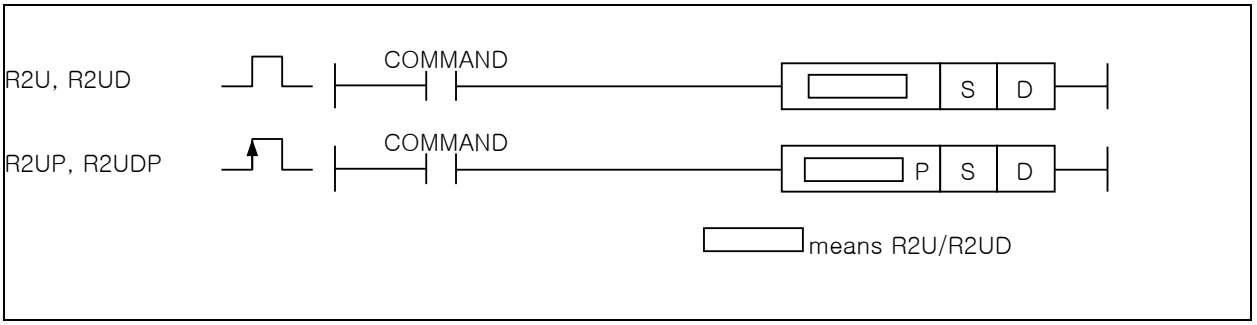
In case '812121' is saved in P1000~P1001, if input signal P0000 is on, converted real data is saved in P1100~P1101.



4.13.9 R2U, R2UP, R2UD, R2UDP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
R2U(P) R2UD(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



[Area setting]

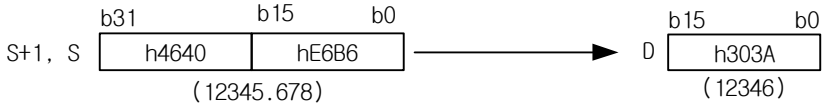
Operand	Description	Data type
S	Area Number where real number data is saved, or real number data	REAL
D	Area number where converted unsigned integer data is saved	UINT/UDINT

[Flag Set]

Flag	Content	Device number
error	When R2U Instruction used and S specified Single Real Number is out of 0~65,535 range. When R2UD Instruction used and S specified Single Real Number is out of 0~4,294,967,295 range.	F110

1) R2U (Real to Unsigned Integer)

(1) R2I converts S+1,S specified short real number(32-bit) to 16-bit Integer data to save in D.

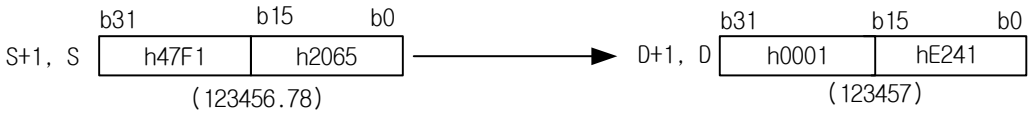


(2) If S+1,S specified short real number value exceeds 0~65,535 range, operation error occurs.At this moment, the result of 65,535 will be saved if input value is bigger than 65,535, and 0 will be saved if input value is smaller than 0.

(3) The value under decimal point is ignored

2) R2UD (Real to Double Unsigned Integer)

(1) R2UD converts S+1,S specified short real(32-bit)data to long unsigned integer(32-bit) and saves in D+1,D.



(2) If S+1,S specified short real value exceeds 0~4,294,967,295 range, operation error operation occurs. At this moment, the result of 4,294,967,295 will be saved if real value is bigger than 4,294,967,295, and 0 will be saved if real value is smaller than 0.

(3) The value under decimal point is ignored

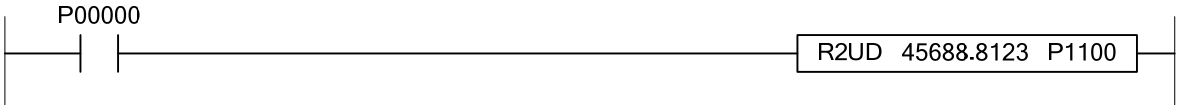
3) Error

(1) When R2U Instruction used and S specified Single Real Number is out of 0~65,535 range, operation error (F110)occurs.

(2) When R2UD Instruction used and S specified Single Real Number is out of 0~4,294,967,295 range, operation error (F110)occurs.

4) Example

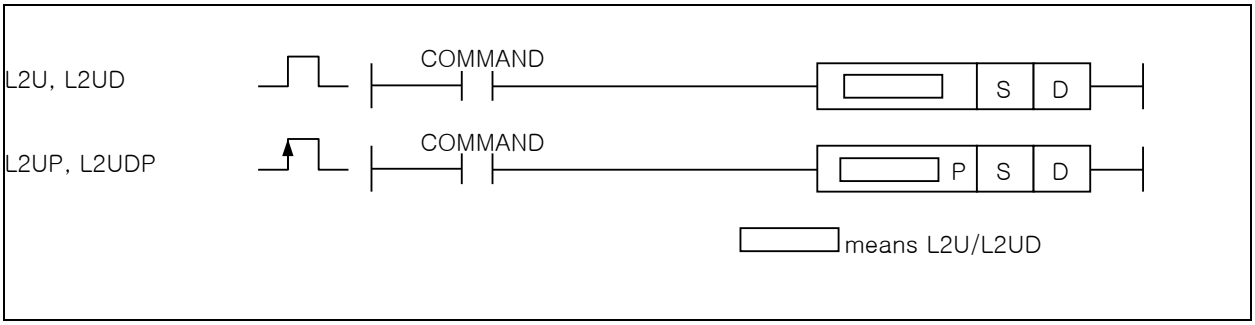
If Input signal P00000 is On, Real data ‘45688.8123’ is converted to Integer data of ‘45689’ in 2 Word from P1100 to P1101.



4.13.10 L2U, L2UP, L2UD, L2UDP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
L2U(P) L2UD(P)	S	O	O	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Area Number where long real data is saved, or long real data	LREAL
D	Area number where converted unsigned data is saved	UINT/UDINT

[Flag Set]

Flag	Content	Device number
error	When L2U Instruction used and S specified long real number is out of 0~65,535 range. When L2UD Instruction used and S specified long real number is out of 0~4,294,967,295 range.	F110

1) L2U (Long real to Unsigned Integer)

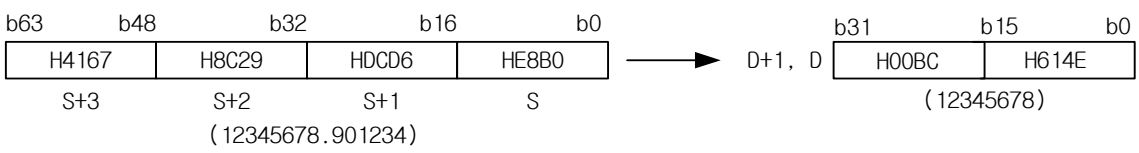
(1) L2I(P) converts S+3,S+2,S+1,S specified long real number to unsigned Integer (16-bit) to save in D.

(2) If S+3,S+2,S+1,S specified long real number's value exceeds 0 ~ 65,535 range, operation error occurs. At this moment, the result of 65,535 will be saved if input value is bigger than 65,535, and 0 will be saved if input value is smaller than 0.

(3) The value under decimal point is ignored

2) L2UD (Long real to Double Unsigned Integer)

(4) L2D(P) converts S+3,S+2,S+1,S specified long real number to double unsigned integer (32-bit) to save in D+1, D.



(5) If S+3,S+2,S+1,S specified long real number's value exceeds 0 ~ 4,294,967,295 range, operation error occurs.
At this moment, the result of 4,294,967,295 will be saved if long real value is bigger than 4,294,967,295, and 0 will be saved if long real value is smaller than 0.

(6) The value under decimal point is ignored

3) Example

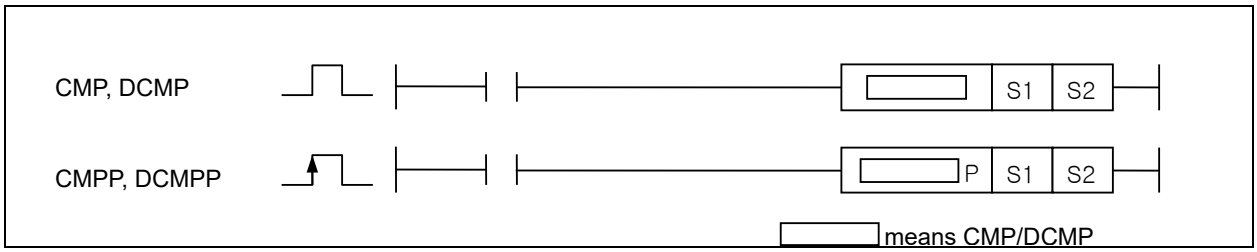
In case of long real data from D1000~D1003=13456.6 is saved, If Input signal P0000 is On, Integer data of 13457 is converted and it is saved in P1100.

4.14 Output Compare Instruction (Unsigned)

4.14.1 CMP, CMPP, DCMP, DCMPP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CMP(P) DCMP(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



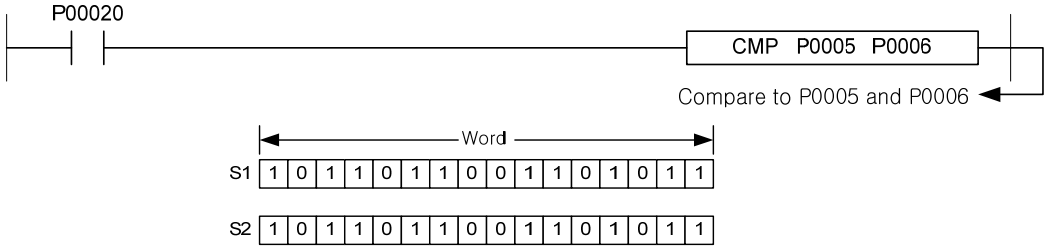
[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	WORD/DWORD
S2	Data or Data address to compare with S1	WORD/DWORD

1) CMP (Compare)

(1) It compares S1 with S2 in size to set applicable flag of 6 special relays as its result. (Unsigned Operation)

Flag	F120	F121	F122	F123	F124	F125
SET basis	<	≤	=	>	≥	≠
S1> S2	0	0	0	1	1	1
S1< S2	1	1	0	0	0	1
S1= S2	0	1	1	0	1	0



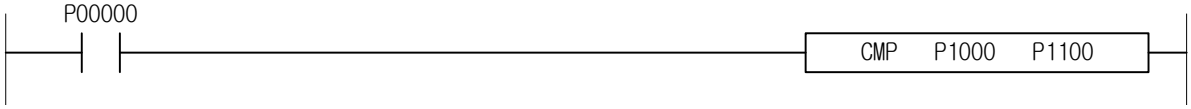
(2) If S1 and S2 is compared, operation result (S1=S2) is set to special flag.

(3) In the program, 6 special relays display the result of compare instruction previously used.

(4) 6 special relays can be used unlimitedly.

2) Example

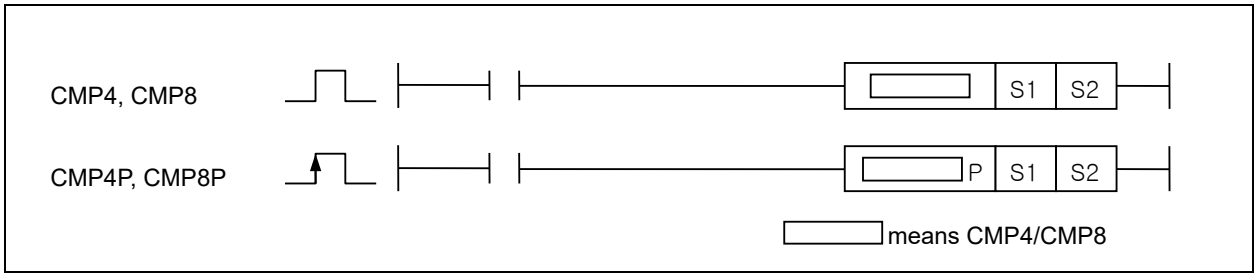
(1) In case of P1000=100 and P1100=10, If Input signal P00000 is On, F123 is set because P1000 is bigger than P1100 (P1000>P1100).



4.14.2 CMP4, CMP4P, CMP8, CMP8P

[Applicable Product: XGK,XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CMP4(P)	S1	O	-	O	-	-	-	-	O	O	O	O	-	-	-	2~4	-	-	-
CMP8(P)	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				



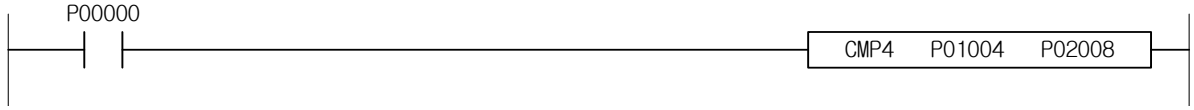
[Area setting]

Operand	Description	Data type
S1	Data to compare or device's start bit to compare	NIBBLE/BYTE
S2	Data to compare or device's start bit to compare	NIBBLE/BYTE

1) CMP4 (Compare Nibble)
   (1) It compares OP1's specified 4-bit with OP2's specified 4-bit data to set applicable flag. (4.14.1 Flag Reference)
   (2) It compares OP1 with OP2 in size to set applicable flag(F120~F125) of 6 special relays as its result. (Unsigned Operation).
   (3) 6 special relays display the result of compare instruction previously used.
   (4) 6 special relays (F120~F125) can be used unlimitedly.

2) CMP8 (Compare Byte)
   (1) It compares OP1's specified 8-bit with OP2's specified 8-bit data to set applicable flag. (4.14.1 Flag Reference)
   (2) It compares OP1 with OP2 in size to set applicable flag(F120~F125) of 6 special relays as its result.(Unsigned Operation).
   (3) 6 special relays display the result of compare instruction previously used.
   (4) 6 special relays (F120~F125) can be used unlimitedly.

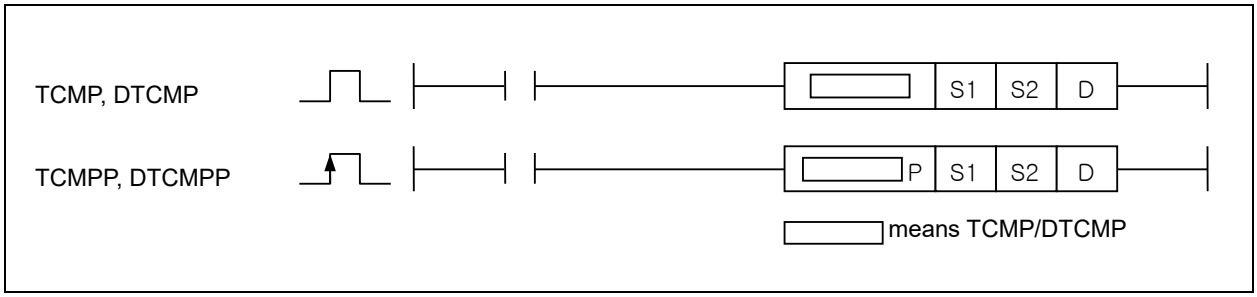
3) Example
   (1) In case of P01004=10 and P02008=15, If Input signal P00000 is On, F120 is set because P01004 is smaller than P02008 (P01004<P02008).
   (2) Range possible to compare is a unit of Nibble, so Setting is available from 0 to 15.
   (3) It is only compare the value which is saved from No. 4 bit of P0100 to the value which is saved from No. 8 of P0200.



4.14.3 TCMP, TCMPP, DTCMP, DTCMPP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TCMP(P) DTCMP(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	S2	O	O	O	O	O	-	O	-	-	-	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	WORD/DWORD
S2	Data or Data address to compare with S1	WORD/DWORD
D	Area (1 Word) to save the result of compared S1 and S2	WORD/DWORD

[Flag Set]

Flag	Content	Device number
error	The value of 'S2 area + 15 (WORD/DWORD)' is exceeded range of applicable device.	F110

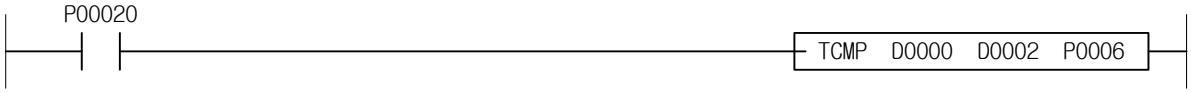
1) TCMP(Table Compare)

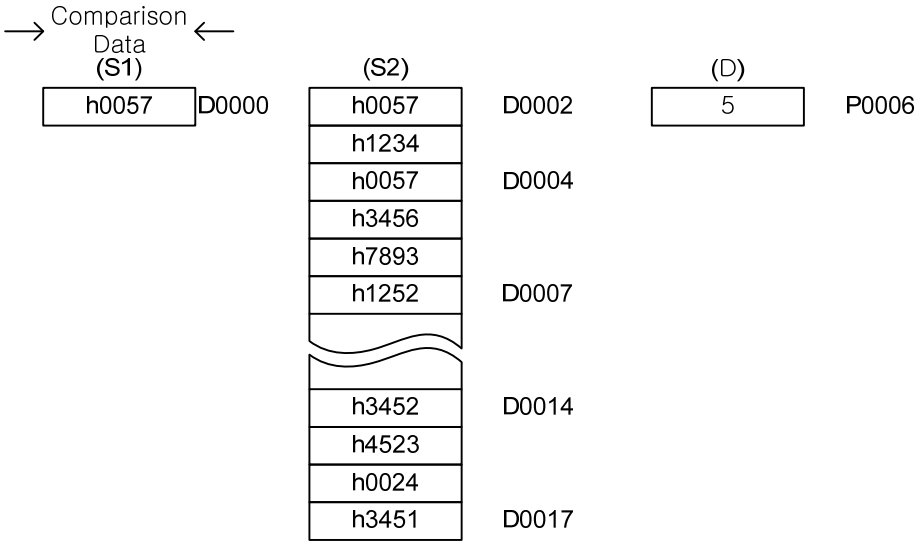
(1) It compares specified Compare Data S1 with 16-word data starting S2 to output to specified D area's 16 bits ('1' if identical, '0' if different).

(2) S1 sets word data or data address, and S2 sets table head area address.

2) Example

(1) If Input Signal P00020 is On, It is compare Data 'h0057' saved in D0000 to 16-word data from D0002. And compared result '5' is saved in P0006.

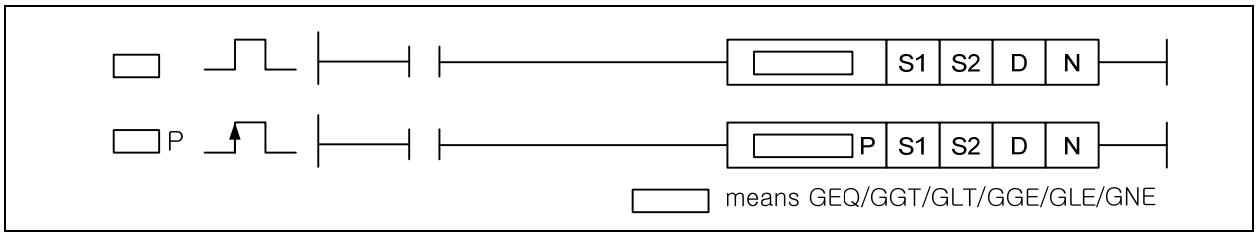




4.14.4 GEQ, GEQP, GGT, GGTP, GLT, GLTP, GGE, GGEP, GLE, GLEP, GNE, GNEP, GDEQ, GDEQP, GDGT, GDGTP, GDLT, GDLTP, GDGE, GDGEP, GDLE, GDLEP, GDNE, GDNEP

[Applicable Product: XGK,XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	D	R		error (F110)	Zero (F111)	Carry (F112)
G X(P) GD X(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	4~6	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	WORD
S2	Data or Data address to compare with S1	WORD
D	Device area to save the result (1 word)	WORD
N	Number to execute Compare Instruction (0 ~ 16)	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area.	F110

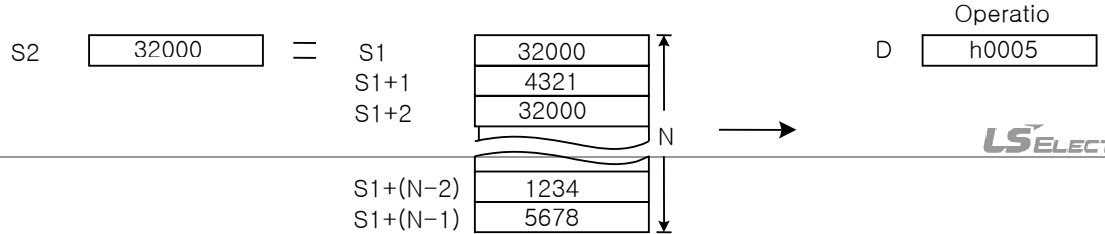
1) Word Data Group Compare Instruction

(1) It compares specified Compare Data S1 with N word data starting S2 1:1 to save in specified D number's lower bit up to Nth Bit.

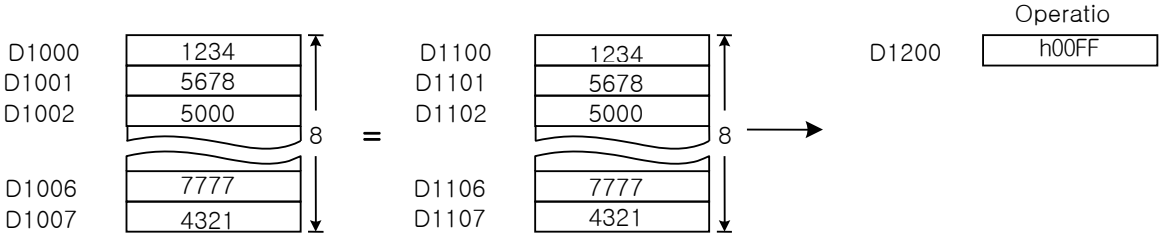
(2) If Compare Condition is met, 1 will be saved in D.

(3) If Compare not satisfied is met, 0 will be saved in D.

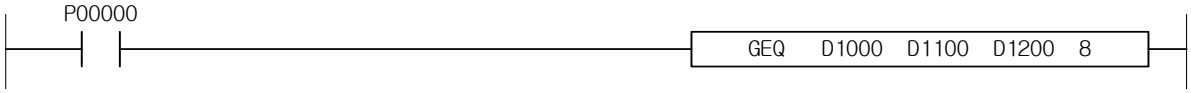
(4) It can input constant value from 0 to 65,535 in S1. At command will as follows.



2) Example



(1) If Input signal P0000 is On, it compare 8-word data and compared result h00FF is saved in D1200.

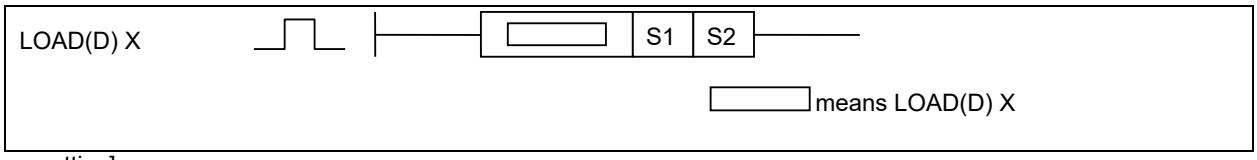


4.15 Input Comparison Instruction

4.15.1 LOAD X, LOADD X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOAD X LOADD X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~3	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	INT/DINT
S2	Data or Data address to compare with S1	INT/DINT

1) LOAD X (=, >, <, >=, <=, < >)

(1) It compares S1 with S2. And if identical to X Condition, present operation result will be On. And the other operation results will be Off.

X Condition	Condition	Operation of instruction is as shown below.
=	S1= S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by Signed Operation.
Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

2) LOADD X (D=, D>, D<, D>=, D<=, D< >)

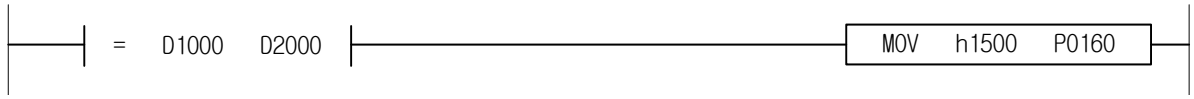
(1) It compares S1 with S2. And if identical to X Condition, present operation result will be On. And the other operation results will be Off.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by Signed Operation.
Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFF(-1) < 0 ~ h7FFFFFFF(2147483647) .

3) Example

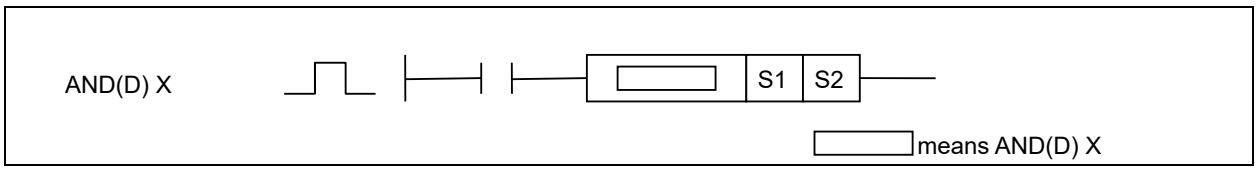
(1) (1) In case of D1000=10 and D2000=10, Compare Input Signal is On and then h1500 is saved in P0160 area.



4.15.2 AND X, ANDD X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AND X ANDD X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~3	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	INT/DINT
S2	Data or Data address to compare with S1	INT/DINT

1) AND X (=, >, <, >=, <=, < >)

(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

2) ANDD X (D=, D>, D<, D>=, D<=, D<>)

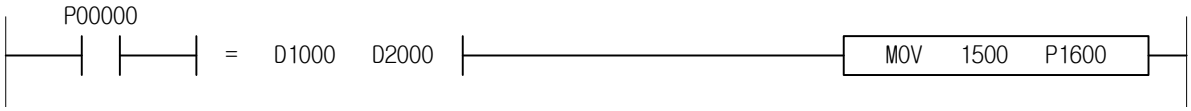
(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

3) Example

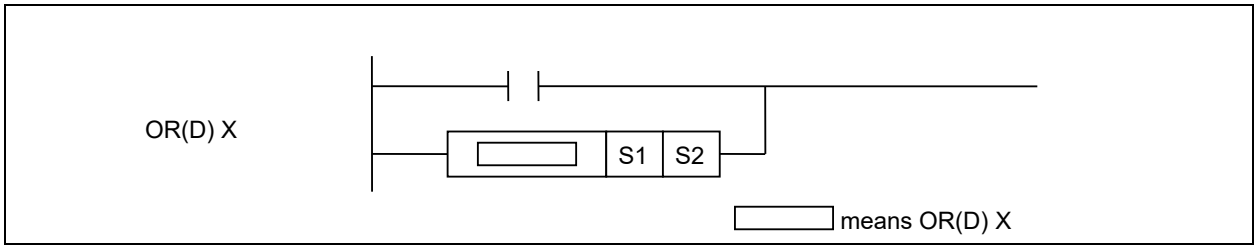
(1) In case of D1000=10 and D2000=10, If Input Signal P00000 is On, AND logic operation will be operated with the compared result of 'On' status of Compare Input Signal and then '1500' is saved in P1600 area.



4.15.3 OR X, ORD X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OR X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~3	-	-	-
ORD X	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	INT/DINT
S2	Data or Data address to compare with S1	INT/DINT

1) OR X (=, >, <, >=, <=, <>)

(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
<>	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

2) ORD X (D=, D>, D<, D>=, D<=, D<>)

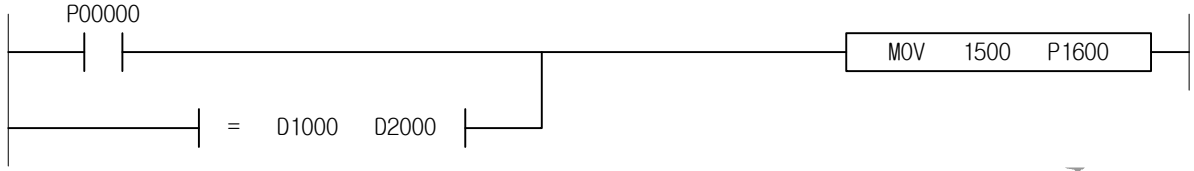
(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).
In other cases, it is On and Off according to the current operation result.

3) Example

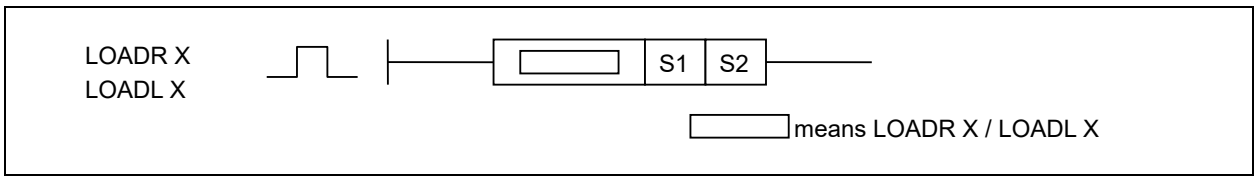
(1) If Input Signal P00000 becomes On or '=' Compare Input Signal becomes On because D1000=10 and D2000=10, 1500 is saved in P1600.



4.15.4 LOADR X, LOADL X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMKL	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOADR X LOADL X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~5	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Real number data to compare or device number to specify real number data	REAL/LREAL
S2	Real number data to compare or device number to specify real number data	REAL/LREAL

1) LOADR X (R=, R<, R>, R<=, R>=, R<>)

(1) It compares S1 with S2. And if identical to X Condition, present operation result will be On.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) S1 and S2 as floating decimal real number will be compared for operation based on X Condition.

(3) Be sure that X Condition R= used The value of floating decimal real number depends on accuracy.

2) LOADL X (L=, L<, L>, L<=, L>=, L<>)

(1) It compares S1 with S2. And if identical to X Condition, present operation result will be On.

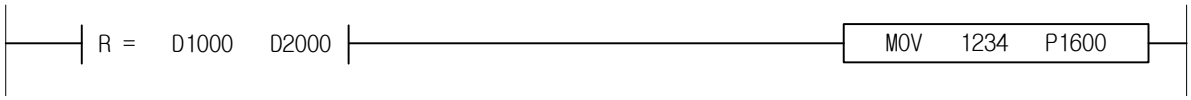
X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) S1 and S2 as floating decimal long real number will be compared for operation based on X Condition.

(3) Be sure that X Condition R= used. The value of floating decimal real number depends on accuracy.

3) Example

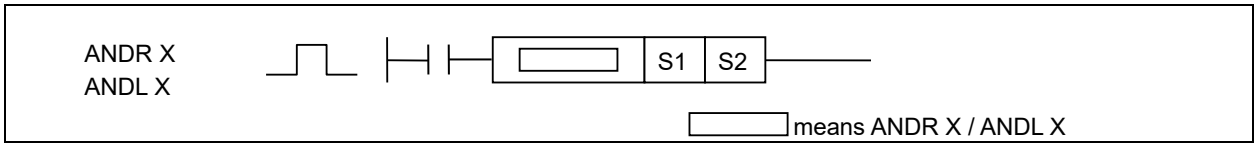
(1) In case of D1000=1.5 and D2000=1.5, Real '=' Compare Input Signal is On and then 1234 is saved in P1600.



4.15.5 ANDR X, ANDL X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ANDR X ANDL X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~5	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Real number data to compare or device number to specify real number data	REAL/LREAL
S2	Real number data to compare or device number to specify real number data	REAL/LREAL

1) ANDR X (R=, R>, R<, R>=, R<=, R<>)

(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) S1 and S2 as floating decimal real number will be compared for operation based on X Condition.

2) ANDL X (L=, L>, L<, L>=, L<=, L<>)

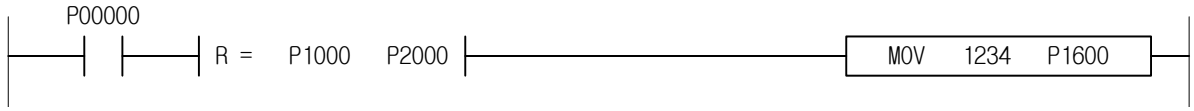
(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) S1 and S2 as floating decimal long real number will be compared for operation based on X Condition.

3) Example

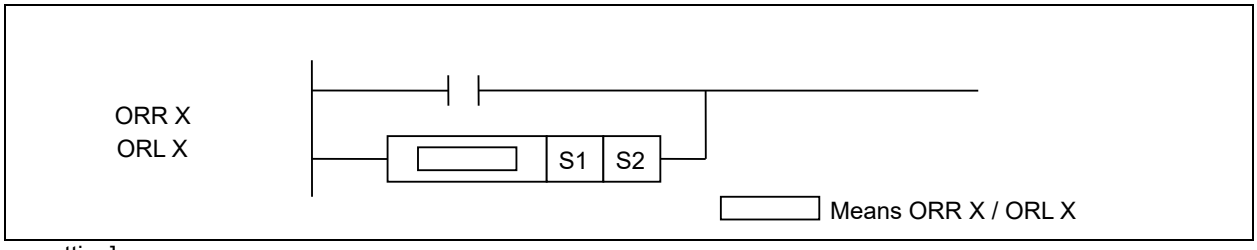
(1) If Real '=' Compare Input Signal is On since Input signal P00000 becomes On and D1000=1.5 and D2000=1.5, the result of AND operation becomes On and then 1234 is saved in P1600.



4.15.6 ORR X, ORL X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ORR X ORL X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~5	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Real number data to compare or device number to specify real number data	REAL/LREAL
S2	Real number data to compare or device number to specify real number data	REAL/LREAL

1) ORR X (R=, R>, R<, R>=, R<=, R<>)

(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) S1 and S2 as floating decimal real number will be compared for operation based on X Condition.

2) ORL X (L=, L>, L<, L>=, L<=, L<>)

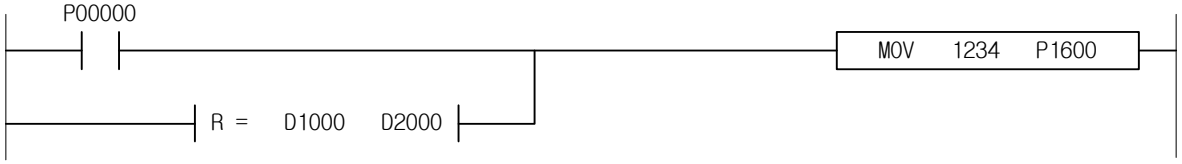
(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) S1 and S2 as floating decimal long real number will be compared for operation based on X Condition.

3) Example

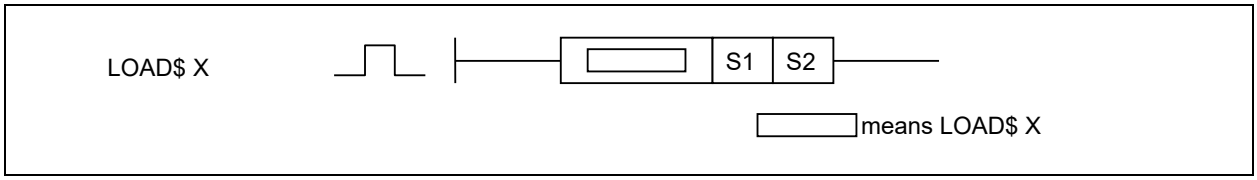
(1) If Real '=' Compare Input Signal is On since Input signal P00000 becomes On and D1000=1.21 and D2000=1.21, 1234 is saved in P1600.



4.15.7 LOAD$ X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	String	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOAD$ X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~17	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	String to compare or Device Number string is saved in	STRING
S2	String to compare or Device Number string is saved in	STRING

1) LOAD$ X ($=, $<, $>, $<=, $>=, $<>)

(1) Refer to below table, The compare results becomes On when character code is identical.

X Condition	Condition	Compared results
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
<>	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

	b15------b8	b7------b0
S1	42H (B)	41H (A)
S1+1	44H (D)	43H (C)
S1+2	00H	45H (E)

"ABCDE"

=

	b15------b8	b7------b0
S2	42H (B)	41H (A)
S2+1	44H (D)	43H (C)
S2+2	00H	45H (E)

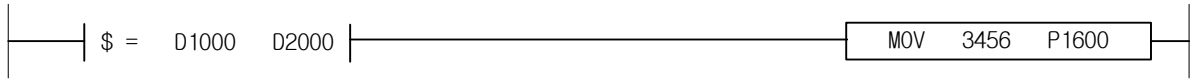
"ABCDE"

(2) Character code is compared with Hexadecimal number. According to the compared result, the status will be changed On or Off.

(However, front place of string and length is preferred potentially)

2) Example

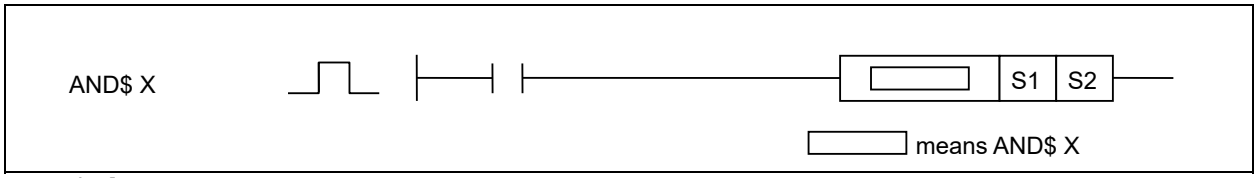
(1) In case of the string which is respectively saved D1000='English' and D2000='English', string Compare Input Signal becomes On, '3456' is saved in P1600.



4.15.8 AND$ X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AND$ X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~17	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	String to compare or Device Number string is saved in	STRING
S2	String to compare or Device Number string is saved in	STRING

1) AND$ X ($=,$>,$<,$>=,$<=,$<>)

(1) Refer to below table, The compare results becomes On when character code is identical.

X Condition	Condition	Compared results
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

	b15------b8	b7------b0
S1	42H (B)	41H (A)
S1+1	44H (D)	43H (C)
S1+2	00H	45H (E)

"ABCDE"

=

	b15------b8	b7------b0
S2	42H (B)	41H (A)
S2+1	44H (D)	43H (C)
S2+2	00H	45H (E)

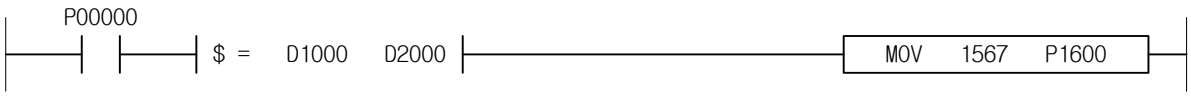
"ABCDE"

(2) Character code is compared with Hexadecimal number. According to the compared result, the status will be changed On or Off.
(However, front place of string and length is preferred potentially)

(3) And its result and present operation result will be AND operated to lead to a new operation result.

2) Example

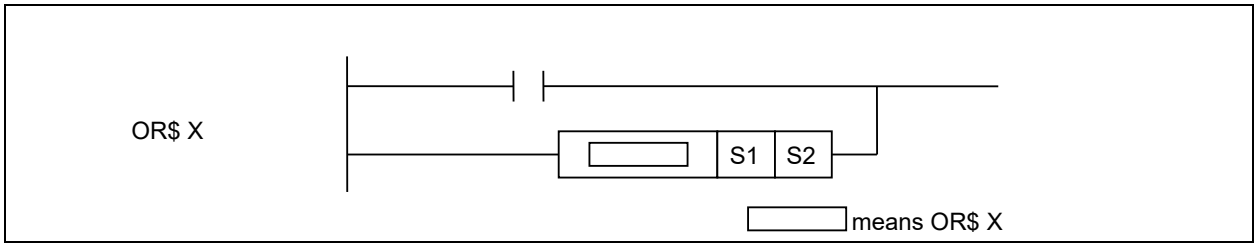
(1) In case of P00000 becomes On and saved string is respectively D1000='English' and D2000='English', string Compare Input Signal becomes On and AND operation calculates and then 1567 is saved in P1600.



4.15.9 OR$ X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OR$ X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~17	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	String to compare or Device Number string is saved in	STRING
S2	String to compare or Device Number string is saved in	STRING

1) OR$ X ($=,$>,$<,$>=,$<=,$<>)

(1) Refer to below table, The compare results becomes On when character code is identical.

X Condition	Condition	Compared results
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

	b15------b8	b7------b0
S1	42H (B)	41H (A)
S1+1	44H (D)	43H (C)
S1+2	00H	45H (E)
	"ABCDE"	

=

	b15------b8	b7------b0
S2	42H (B)	41H (A)
S2+1	44H (D)	43H (C)
S2+2	00H	45H (E)
	"ABCDE"	

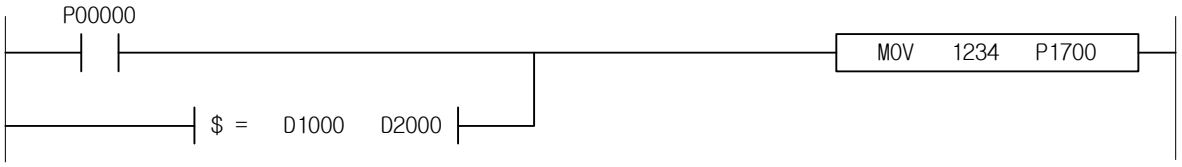
(2) Character code is compared with Hexadecimal number. According to the compared result, the status will be changed On or Off.

(However, front place of string and length is preferred potentially)

(3) And its result and present operation result will be OR operated to lead to a new operation result.

2) Example

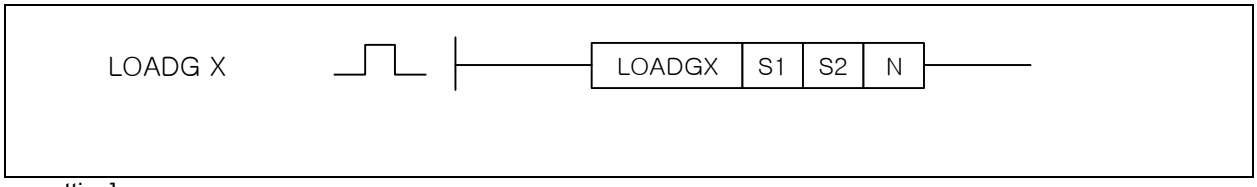
(1) Input Signal P00000 becomes On or saved string becomes respectively D1000='English2' and D2000='English2' string Compare Input Signal becomes On and then '1234' is saved in P1700.



4.15.10 LOADG X, LOADDG X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOADG X LOADDG X	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~5	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

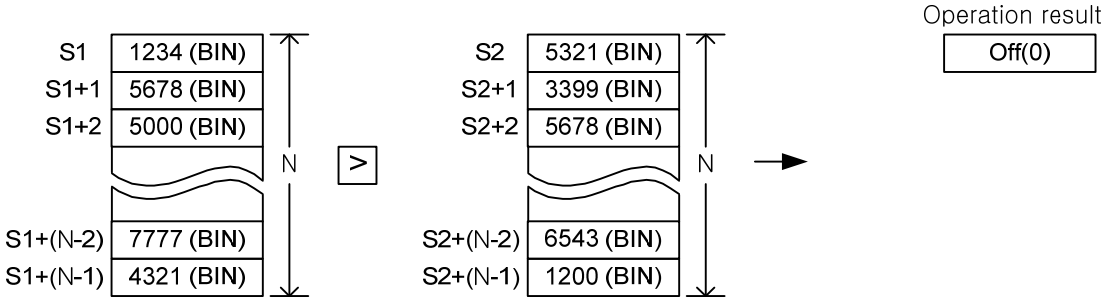
Operand	Description	Data type
S1	Data or Data address to compare with S2	INT/DINT
S2	Data or Data address to compare with S1	INT/DINT
N	Number of groups to compare	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area.	F110

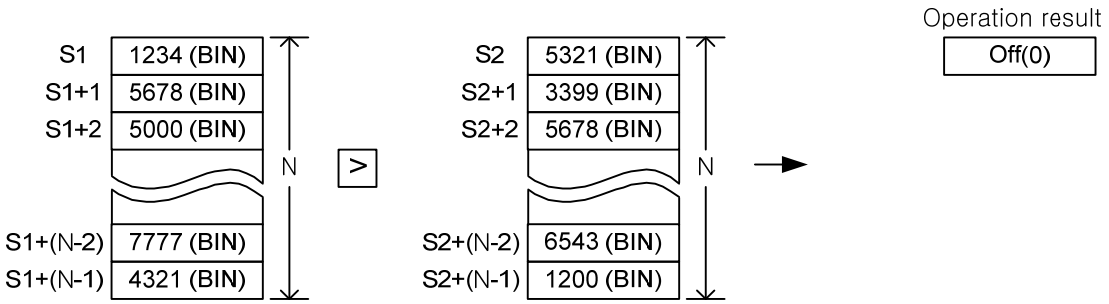
1) LOADG X (G=, G>, G<, G>=, G<=, G<>)

(1)) It compares S1 with S2 for the number of N. And if all identical to X Condition, present operation result will be On. Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .



2) LOADDG X (DG=, DG>, DG<, DG>=, DG<=, DG<>)

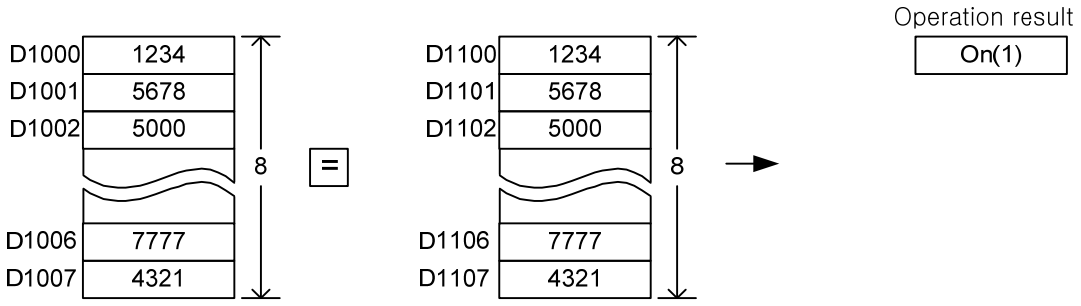
(1)) It compares S1 with S2 for the number of N. And if all identical to X Condition, present operation result will be On. Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

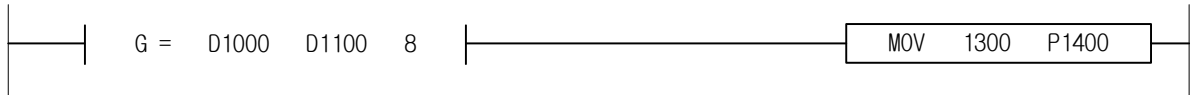


3) Example

(1) It compares the 8-word data from D1000 to D1007 with 8-word data from D1100 to D1107 in the group. And if identical to operation result, Compare Input Signal becomes On and the 1300 is saved in P1400.

(2) In case of comparison of group, If only one is not identical in operation result, Compare Input Signal will not become On.

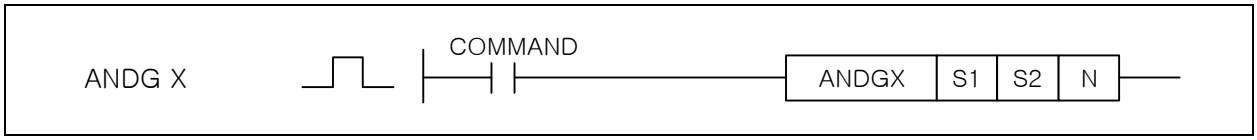




4.15.11 ANDG X, ANDDG X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ANDG X ANDDG X	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~5	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

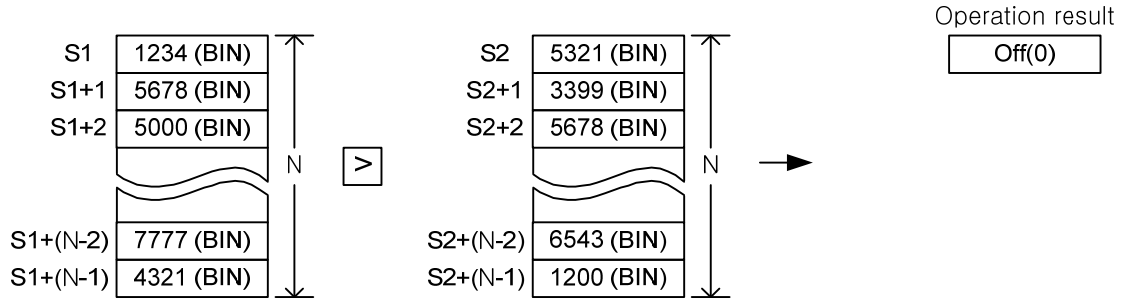
Operand	Description	Data type
S1	Data or Data address to compare with S2	INT
S2	Data or Data address to compare with S1	INT
N	Number of groups to compare	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area.	F110

1) ANDG X (G=, G>, G<, G>=, G<=, G<>)

(1) It compares S1 with S2 for the number of N. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result. Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

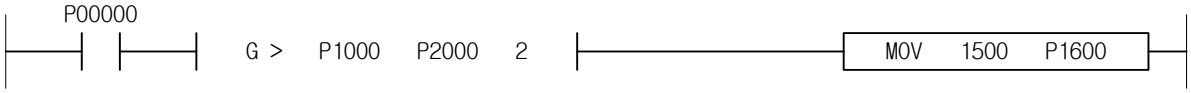


2) ANDDG X (DG=, DG>, DG<, DG>=, DG<=, DG<>)

(1) It compares S1 with S2 for the number of N. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result. Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

3) Example

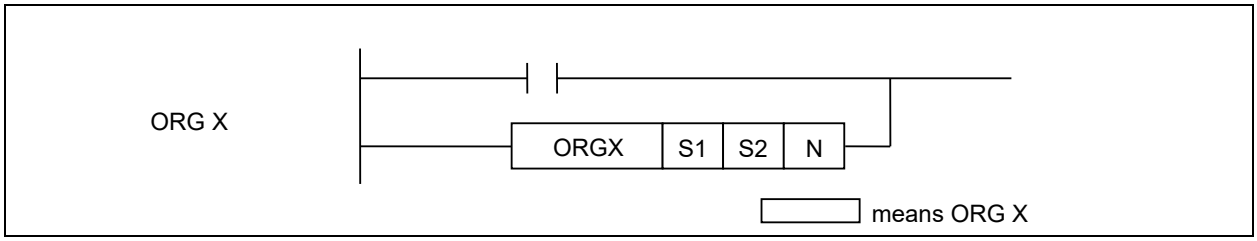
(1) Input Signal becomes On and then P1000=10,P1001=20, P2000=5 and P2001=10, It compares 2-word data by group and if result of comparison is On, 1500 saved in P1600.



4.15.12 ORG X, ORDG X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ORG X ORDG X	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~5	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

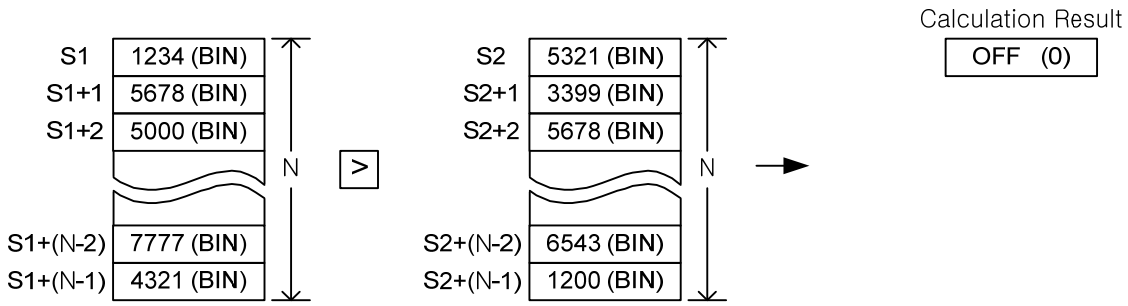
Operand	Description	Data type
S1	Data or Data address to compare with S2	INT
S2	Data or Data address to compare with S1	INT
N	Number of groups to compare	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area.	F110

1) ORG X (G=, G>, G<, G>=, G<=, G<>)

(1) It compares S1 with S2 for the number of N. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be OR operated to lead to a new operation result. Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

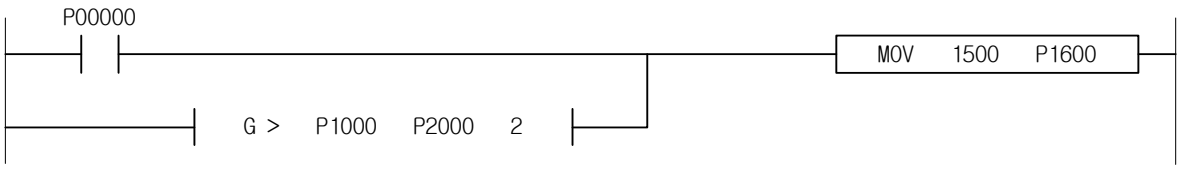


2) ORDG X (DG=, DG>, DG<, DG>=, DG<=, DG<>)

(1) It compares S1 with S2 for the number of N. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be OR operated to lead to a new operation result. Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

3) Example

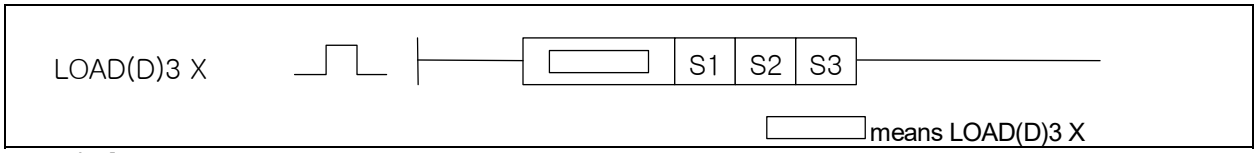
(1) Input Signal becomes On and then P0000=10,P10001=20, P2000=5 and P2001=10, It compares 2-word data by group and if result of comparison is On, 1500 saved in P1600.



4.15.13 LOAD3 X, LOADD3 X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOAD3 X LOADD3 X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~5	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to compare or Device Number to specify Data to compare	INT
S2	Data to compare or Device Number to specify Data to compare	INT
S3	Data to compare or Device Number to specify Data to compare	INT

1) LOAD3 X (=3, >3, <3, >=3, <=3, <>3)

(1) It compares 3 specified word data of S1, S2, S3 to compare based on X Condition. And if identical to X, Condition, result will be On, if not identical, it will be Off, so to result in a new operation result.

(2) In case of size comparison condition, operation result will be ON if condition is met in the following order of S1, S2, S3. However, in case of condition <>, operation result will be ON if S1, S2, S3 is all different from each other. That is to say, if S1≠S2≠S3 and S1=S3, operation result will be OFF.

(3) Comparison of S1 and S2 is executed by Signed Operation.

(4) Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

2) LOADD3 X (D=3, D>3, D<3, D>=3, D<=3, D<>3)

(1) It compares 3 specified double word data of (S1+1,S1), (S2+1,S2), (S3+1,S3) to compare based on X. Condition. And if identical to X Condition, result will be On, if not identical, it will be Off, so to result in a new operation result.

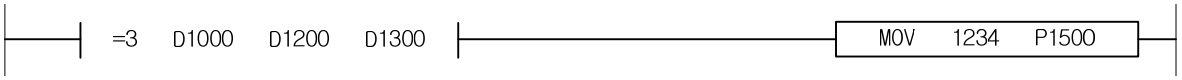
(2) In case of size comparison condition, operation result will be ON if condition is met in the following order of (S1+1,S1), (S2+1,S2), (S3+1,S3). However, in case of condition <>, operation result will be ON if S1, S2, S3 is all different from each other. That is to say, if (S1+1,S1)≠(S2+1,S2)≠(S3+1,S3) and (S1+1,S1)=(S3+1,S3), operation result will be OFF.

(3) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

3) Example

(1) In case of D1000=100, _D1200=100 and _D1300=100, All three data of word data is identical so

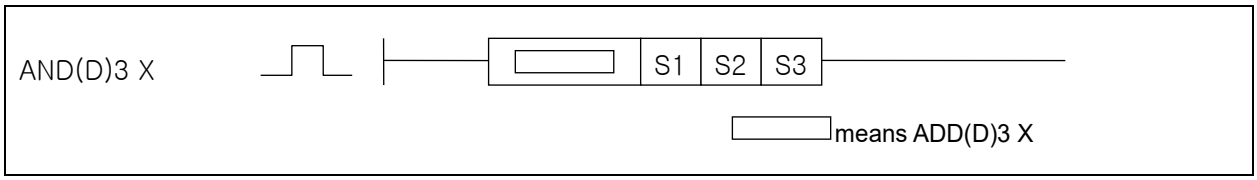
Compare Input Signal becomes On and then 1,234 is saved in P1500.



4.15.14 AND3 X, ANDD3 X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AND3 X ANDD3 X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~5	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to compare or Device Number to specify Data to compare	INT
S2	Data to compare or Device Number to specify Data to compare	INT
S3	Data to compare or Device Number to specify Data to compare	INT

1) AND3 X (=3, >3, <3, >=3, <=3, <>3)

(1) It compares 3 specified word data of S1, S2, S3 to compare based on X Condition. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be AND operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

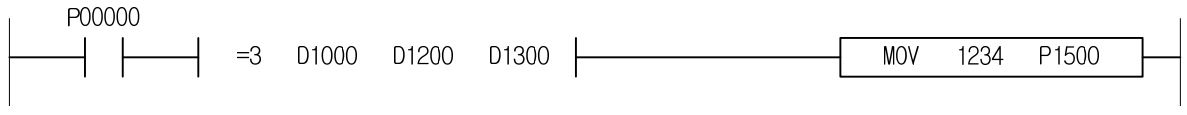
2) ANDD3 X (D=3, D>3, D<3, D>=3, D<=3, D<>3)

(1) It compares 3 specified double word data of (S1+1,S1), (S2+1,S2), (S3+1,S3) to compare based on X Condition. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be AND operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

3) Example

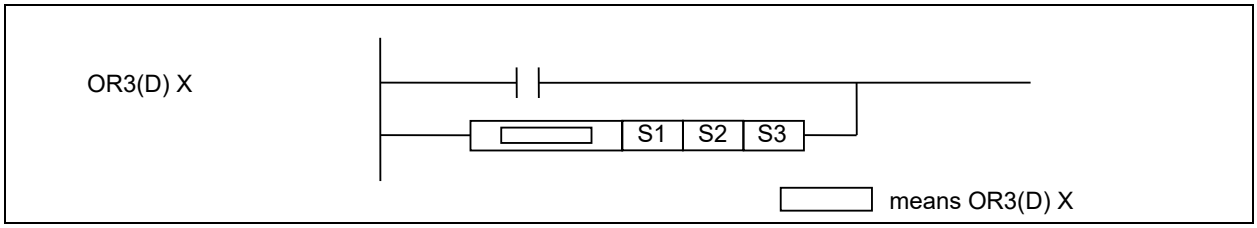
(1) Input Signal P00000 becomes On and D1000=100, _D1200=100 and _D1300=100, three data of word data is identical so Compare Input Signal becomes On and then 1,234 is saved in P1500.



4.15.15 OR3 X, ORD3 X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OR3 X ORD3 X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~5	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to compare or Device Number to specify Data to compare	INT
S2	Data to compare or Device Number to specify Data to compare	INT
S3	Data to compare or Device Number to specify Data to compare	INT

1) OR3 (=3, <3, >3, <=3, >=3, <>3)

(1) It compares 3 specified word data of S1, S2, S3 to compare based on X Condition. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be OR operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h8000(-32768) ~ hFFFF(-1) < 0 ~ h7FFF(32767) .

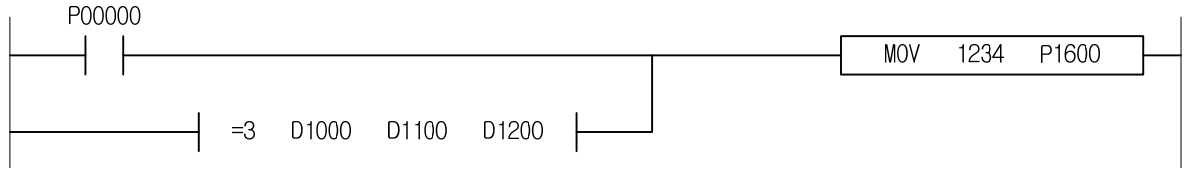
2) ORD3 (D=3, D<3, D>3, D<=3, D>=3, D<>3)

(1) It compares 3 specified double word data of (S1+1,S1), (S2+1,S2), (S3+1,S3) to compare based on X Condition. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be OR operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by Signed Operation. Thus, the result will be as follows; h80000000(-2147483648) ~ hFFFFFFFF(-1) < 0 ~ h7FFFFFFF(2147483647).

3) Example

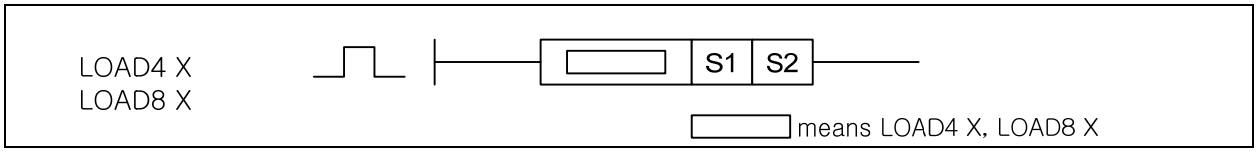
(1) Input Signal P00000 becomes On and D1000=100, _D1200=100 and _D1300=100, three data of word data is identical so Compare Input Signal becomes On and then 1,234 is saved in P1600.



4.15.16 LOAD4 X, LOAD8 X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOAD4 X LOAD8 X	S1	O	-	O	-	-	-	-	O	O	O	O	-	-	-	3~4	-	-	-
	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	NIBBLE/BYTE
S2	Data or Data address to compare with S1	NIBBLE/BYTE

1) LOAD4 X (=, >, <, >=, <=, <>)

(1) It compares S1 with S2 with NIBBLE unit and if identical to X Condition, present operation result will be On. And the other operation results will be Off.

(2) Comparison of S1 and S2 is executed by unsigned operation.

2) LOAD8 X (=, >, <, >=, <=, <>)

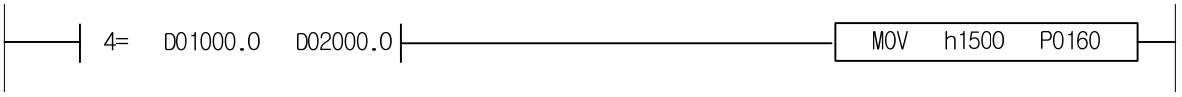
(1) It compares S1 with S2 with Byte unit and if identical to X Condition, present operation result will be On. And the other operation results will be Off.

(2) Comparison of S1 and S2 is executed by unsigned operation.

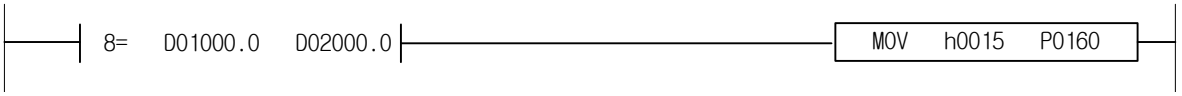
X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
<>	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

3) Example

(1) In case of D01000.0=10 and D02000.0=10, Compare Input Signal is On and then h1500 is saved in P0160 area..



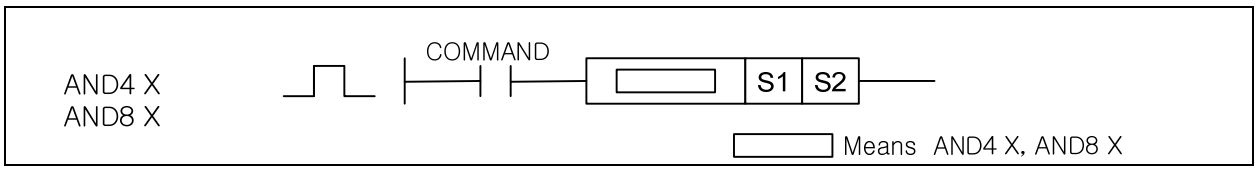
(2) In case of D01000.0=255 and D02000.0=255, Compare Input Signal is On and then h0015 is saved in P0160 area..



4.15.17 AND4 X, AND8 X

[Applicable Product: XGK,XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AND4 X	S1	O	-	O	-	-	-	-	O	O	O	O	-	-	-	3~4	-	-	-
AND8 X	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	NIBBLE/BYTE
S2	Data or Data address to compare with S1	NIBBLE/BYTE

1) AND4 X (=, >, <, >=, <=, <>)

(1) It compares S1 and S2 with Nibble unit . And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by unsigned operation.

2) AND8 X (=, >, <, >=, <=, <>)

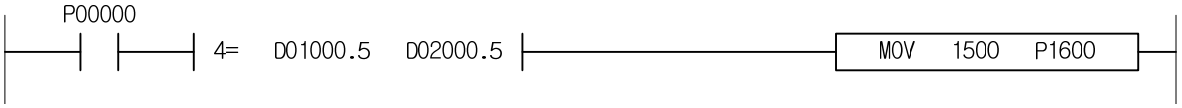
(1) It compares S1 and S2 with byte unit . And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by unsigned operation.

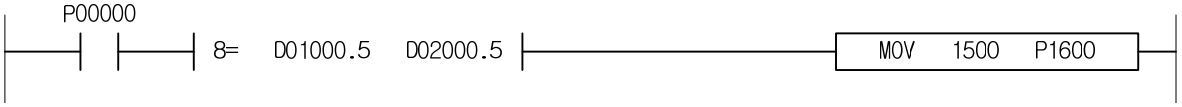
X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
<>	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

3) Example

(1) In case of D01000.5=10 and D02000.5=10, If Input Signal P00000 is On, AND logic operation will be operated with the compared result of 'On' status of Compare Input Signal and then '1500' is saved in P1600 area.



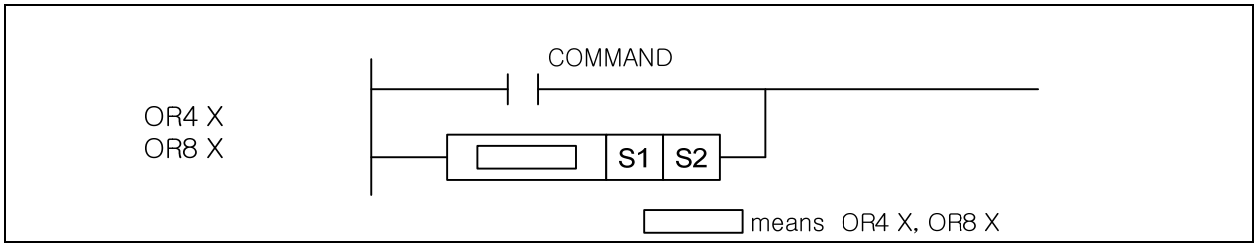
(2) In case of D01000.5=255 and D02000.5=255, If Input Signal P00000 is On, AND logic operation will be operated with the compared result of 'On' status of Compare Input Signal and then '1500' is saved in P1600 area.



4.15.18 OR4 X, OR8 X

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OR4 X OR8 X	S1	O	-	O	-	-	-	-	O	O	O	O	-	-	-	3~4	-	-	-
	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	NIBBLE/BYTE
S2	Data or Data address to compare with S1	NIBBLE/BYTE

1) OR4 X (=, >, <, >=, <=, <>)

(1) It compares S1 and S2 with Nibble unit . And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by unsigned operation.

2) OR8 X (=, >, <, >=, <=, <>)

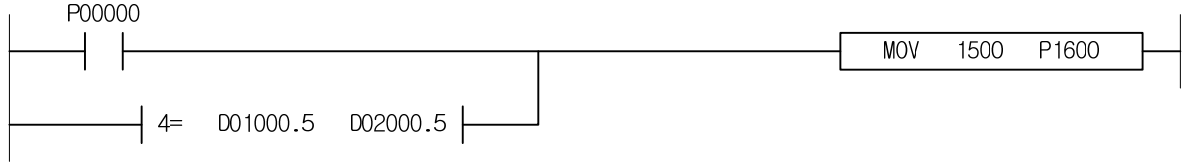
(1) It compares S1 and S2 with byte unit . And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

(2) Comparison of S1 and S2 is executed by unsigned operation.

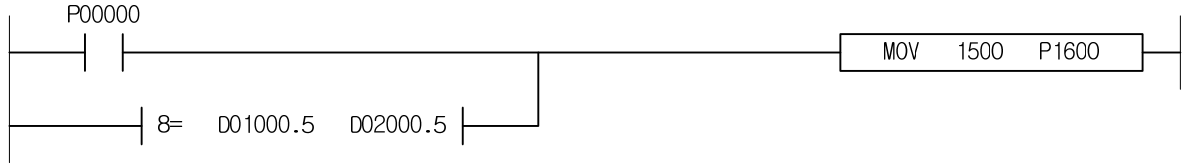
X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
<>	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

3) Example

(1) In case of D01000.5=10 and D02000.5=10, If Input Signal P00000 is On, OR logic operation will be operated with the compared result of 'On' status of Compare Input Signal and then '1500' is saved in P1600 area.



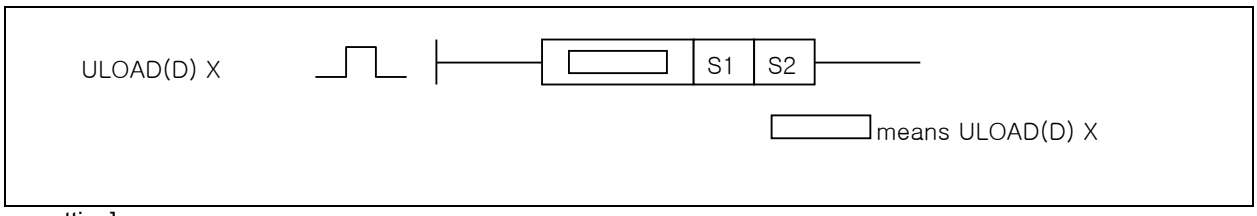
(2) In case of D01000.5=255 and D02000.5=255, If Input Signal P00000 is On, OR logic operation will be operated with the compared result of 'On' status of Compare Input Signal and then '1500' is saved in P1600 area.



4.15.19 ULOAD X, ULOADD X

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ULOAD X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~3	-	-	-
ULOADD X	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	UINT/UDINT
S2	Data or Data address to compare with S1	UINT/UDINT

1) ULOAD X (=, >, <, >=, <=, < >)

(1) It compares S1 with S2. And if identical to X Condition, present operation result will be On. And the other operation results will be Off.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by unsigned operation.

2) ULOADD X (D=, D>, D<, D>=, D<=, D< >)

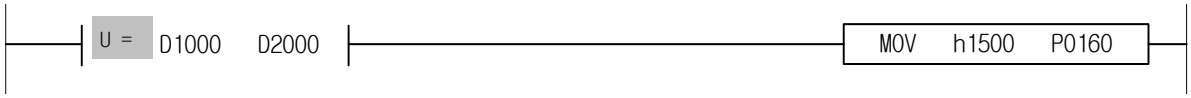
(1) It compares S1 with S2. And if identical to X Condition, present operation result will be On. And the other operation results will be Off.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by unsigned operation.

3) Example

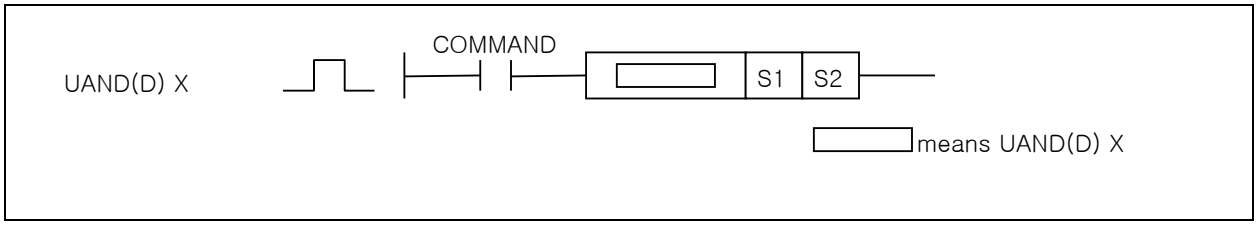
(1) In case of D1000=10 and D2000=10, Compare Input Signal is On and then h1500 is saved in P0160 area.



4.15.20 UAND X, UANDD X

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
UAND X UANDD X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~3	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	UINT/UDINT
S2	Data or Data address to compare with S1	UINT/UDINT

1) UAND X (=, >, <, >=, <=, < >)

(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1 = S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by unsigned operation.

2) UANDD X (D=, D>, D<, D>=, D<=, D< >)

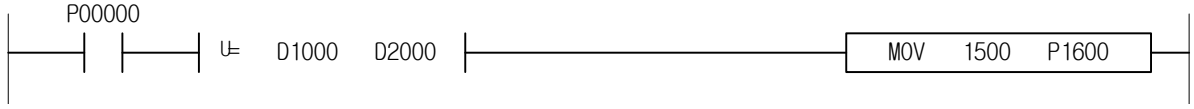
(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present BR value will be AND operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1= S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by unsigned operation.

3) Example

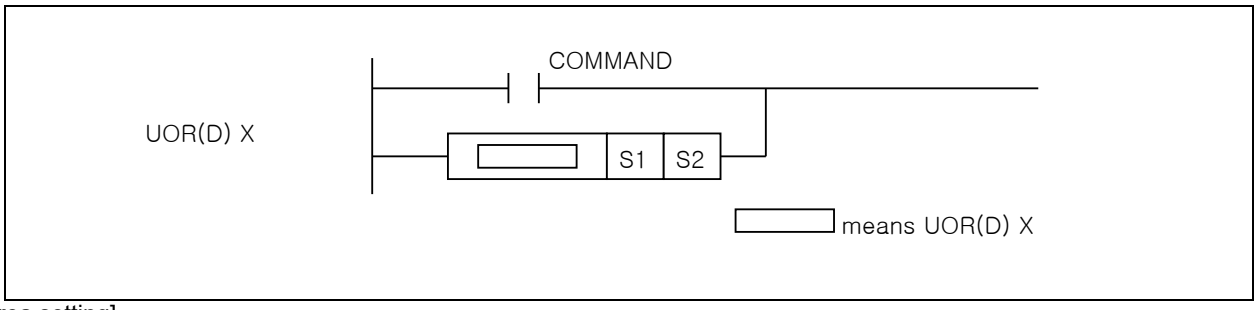
In case of D1000=10 and D2000=10, If Input Signal P00000 is On, AND logic operation will be operated with the compared result of 'On' status of Compare Input Signal and then '1500' is saved in P0160 area.



4.15.21 UOR X, UORD X

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
UOR X	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~3	-	-	-
UORD X	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data or Data address to compare with S2	UINT/UDINT
S2	Data or Data address to compare with S1	UINT/UDINT

1) UOR X (=, >, <, >=, <=, < >)

(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be OR operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1= S2	On
<=	S1 ≤ S2	On
>=	S1 ≥ S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by unsigned operation.

2) UORD X (D=, D>, D<, D>=, D<=, D< >)

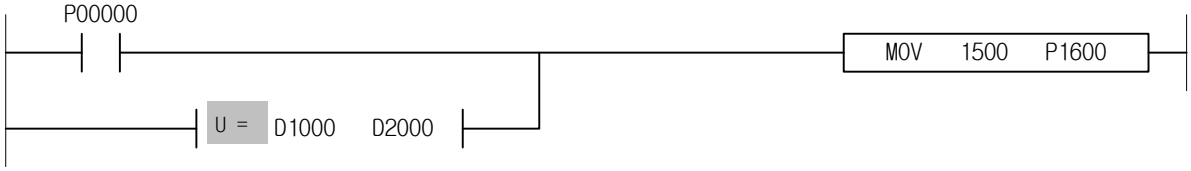
(1) It compares S1 with S2. And if identical to X Condition, result will be On, if not identical, it will be Off, and its result and present operation result will be OR operated to lead to a new operation result.

X Condition	Condition	Operation result
=	S1= S2	On
<=	S1 ≤ S2	On
>=	S1 ≥S2	On
< >	S1 ≠ S2	On
<	S1 < S2	On
>	S1 > S2	On

(2) Comparison of S1 and S2 is executed by unsigned operation.

3) Example

If Input Signal P00000 becomes On or "=' Compare Input Signal becomes On because D1000=10 and D2000=10, 1500 is saved in P1600.

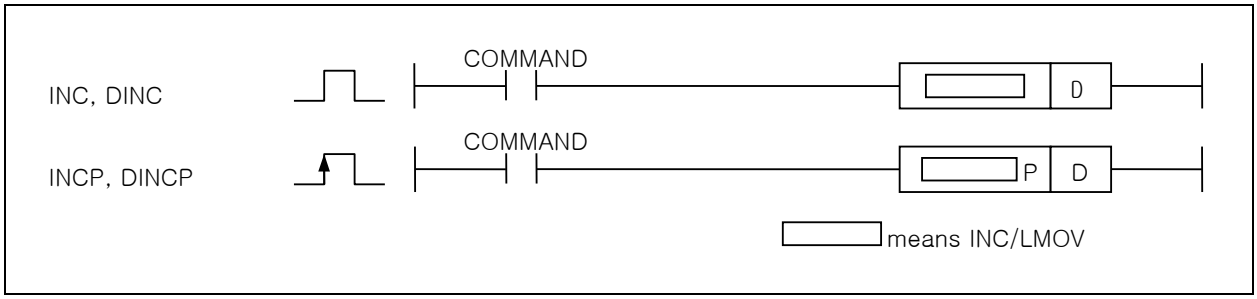


4.16 Increase/Decrease Instruction

4.16.1 INC, INCP, DINC, DINCP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
INC(P) DINC(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~3	-	-	-



[Area setting]

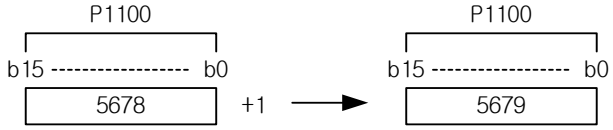
Operand	Description	Data type
D	Data address to perform operation.	INT

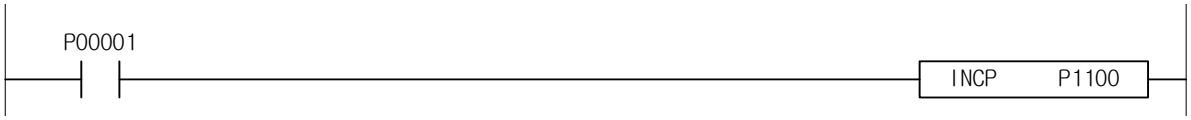
1) INC(Increment)
   (1) It saves the result of D plus 1 again in D.
   (2) It performs Signed Operation.

2) DINC(Double Increment)
   (1) It saves the result of D+1,D plus 1 again in D+1,D.

3) Flag Handling
   (1) As for INC/DINC Instruction, no flag will be processed by operation result. Therefore, carry flag (F112) is not generated when the value increases by 1 at the maximum value.

4) Example
   (1) If Input Signal P00001 Off status is changed to On status, 5678 adds 1 and then 5679 which is added result saved in P1100. When P00001 is repeated Off and On status, the value saved in P1100 is increased one. (5678 -> 5679 -> 5680 -> 5681, ...)

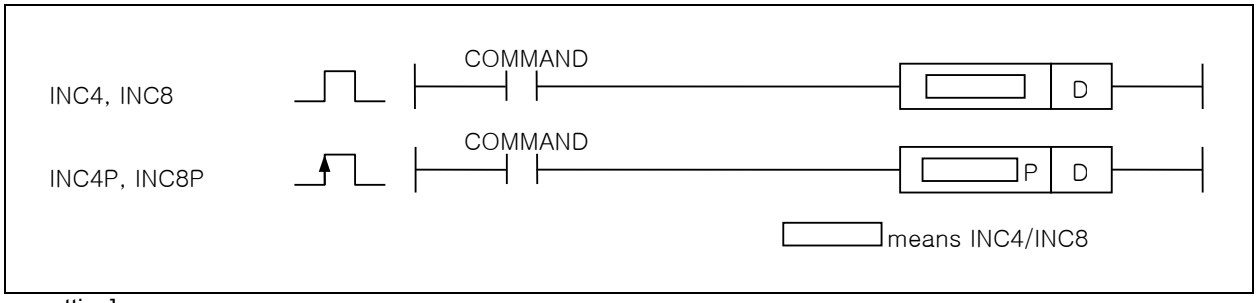




4.16.2 INC4, INC4P, INC8, INC8P

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
INC4(P) INC8(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	2~3	-	-	-



[Area setting]

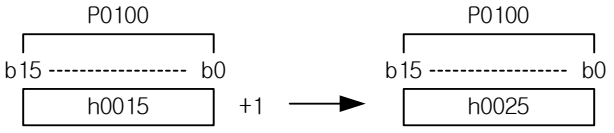
Operand	Description	Data type
D	Data address to perform operation.	NIBBLE/BYTE

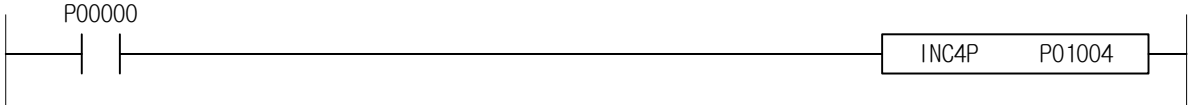
1) INC4(Nibble Increment)
   (1) It saves the result of D plus 1 again in D within nibble data size range
   (2) It performs Signed Operation.

2) INC8(Byte Increment)
   (1) It saves the result of D plus 1 again in D within Byte data size range
   (2) It performs Signed Operation.

3) Flag Handling
   (1) As for INC/DINC Instruction, no flag will be processed by operation result. Therefore, carry flag (F112) is not generated when the value increases by 1 at the maximum value.

4) Example
   (1) If Input Signal P00000 is changed On from Off status, the result 2 which is the saved value 1 from No. 4 Bit of P0100 plus 1 is saved in No.4 Bit of P0100 by Nibble unit. When P00001 is repeated On from Off status the value which is saved in P0100 is increased 1 (h0015 -> h0025 -> h0035 -> h0045).

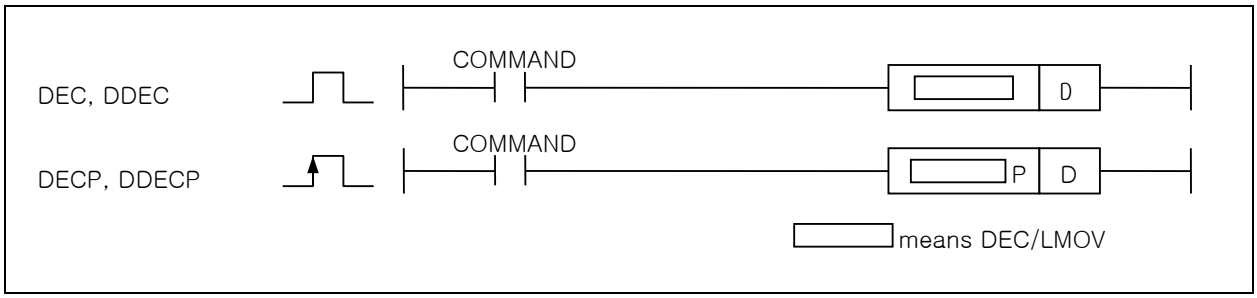




4.16.3 DEC, DECP, DDEC, DDECP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DEC(P) DDEC(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~3	-	-	-



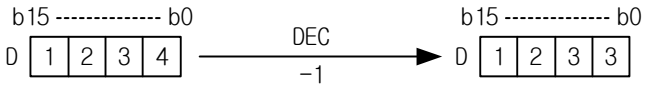
[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	INT

1) DEC(Decrement)

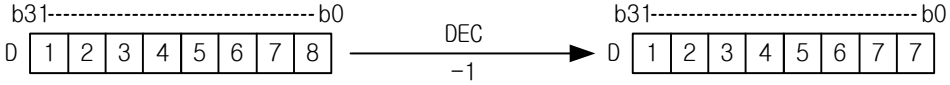
(1) It saves the result of D minus 1 again in D.

(2) D is processed as Signed Integer.



2) DDEC(Double Decrement)

(1) It saves the result of D+1,D minus 1 again in D+1, D.

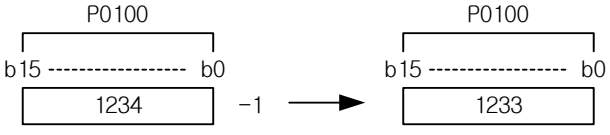


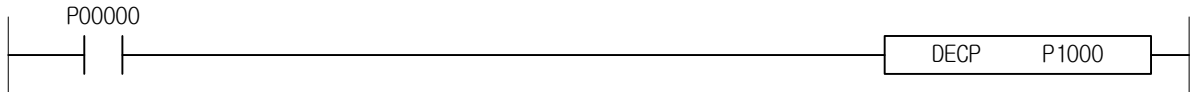
3) Flag Handling

(1) As for INC/DINC Instruction, no flag will be processed by operation result. Therefore, carry flag (F112) is not generated when the value decreased by 1 at the minimum value.

4) Example

(1) If Input Signal P00000 is changed to On from Off status, the result 1233 of 1234 minus 1 is saved in P1000. When P00000 is repeated On from Off status the value which is saved in P1000 is decreased 1 (1234->1233->1232->1231->1230…..).

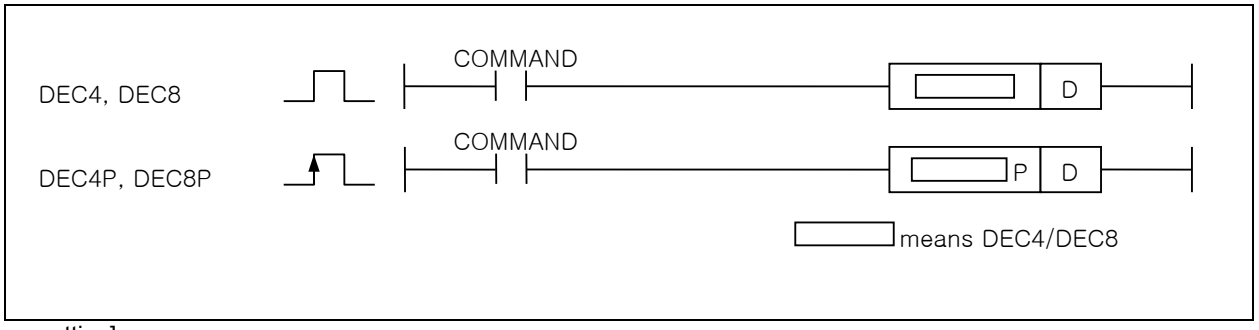




4.16.4 DEC4, DEC4P, DEC8, DEC8P

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DEC4(P) DEC8(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	2~3	-	-	-



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	NIBBLE/BYTE

s

(1) It saves the result of D plus 1 again in D within nibble data size range
(2) It performs Signed Operation.

2) DEC8(Byte Decrement)

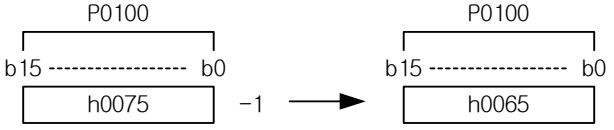
(1) It saves the result of D plus 1 again in D within Byte data size range
(2) It performs Signed Operation.

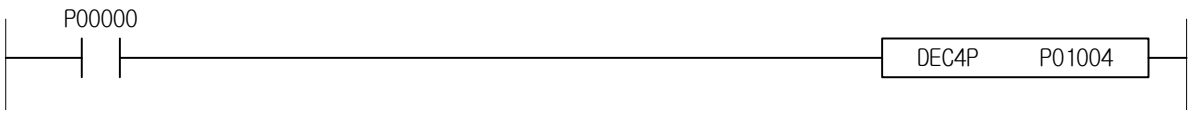
3) Flag Handling

(1) As for INC/DINC Instruction, no flag will be processed by operation result. Therefore, carry flag (F112) is not generated when the value decreased by 1 at the minimum value.

4) Example

(1) If Input Signal P00000 is changed On from Off status, the result 6 of the value 7 which is saved from No. 4Bit in P0100 minus 1 is saved from No.4 Bit in P0100. When P00000 is repeated On from Off status the value which is saved in P1000 is decreased 1. (h0075 -> h0065 -> h0055 -> h0045 -> h0035…).

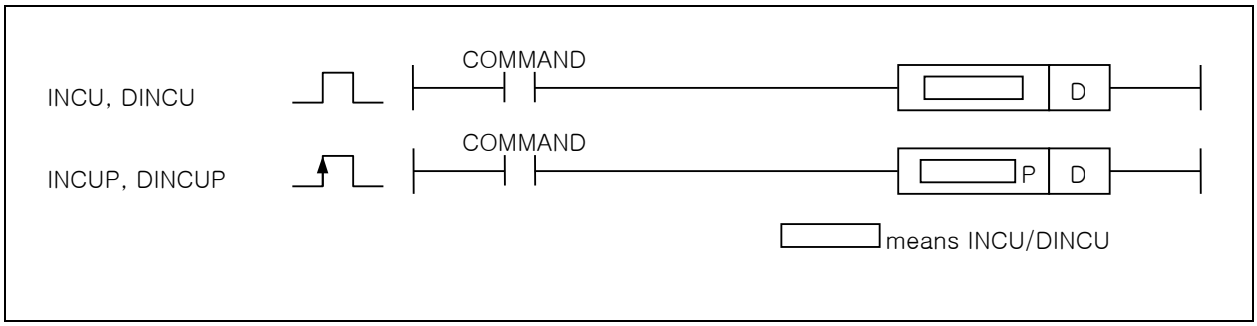




4.16.5 INCU, INCUP, DINCU, DINCUP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
INCU(P) DINCU(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~3	-	O	O



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	WORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if (D)INCU(P) is executed when D is –1(FFFF or FFFFFFFF).	F111
Carry	To be set if (D)INCU(P) is executed when D is –1(FFFF or FFFFFFFF).	F112

1) INCU(Increment)

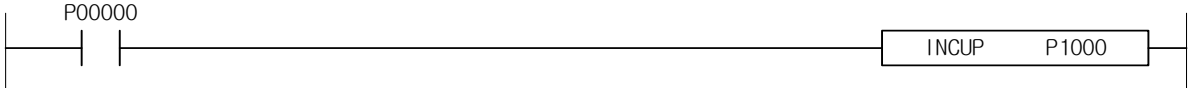
(1) It saves the result of D plus 1 again in D.
(2) It performs unsigned operation.
(3) If INCU(P) is executed when D's value is 65,535 (h7FFF), 0(h0000) will be output and Zero Flag and Carry Flag will be set.

2) DINCU(Double Increment)

(1) It saves the result of D+1,D plus 1 again in D+1,D.
(2) It performs unsigned operation.
(3) If DINCU(P) is executed when D+1,D's value is 4,294,967,295(hFFFFFFFF), 0 (h00000000) will be output and Zero Flag and Carry Flag will be set.

3) Example

(1) In case of P1000=100, When Input Signal P00000 is changed to On from Off status, the value saved in P1000 is increased 1.



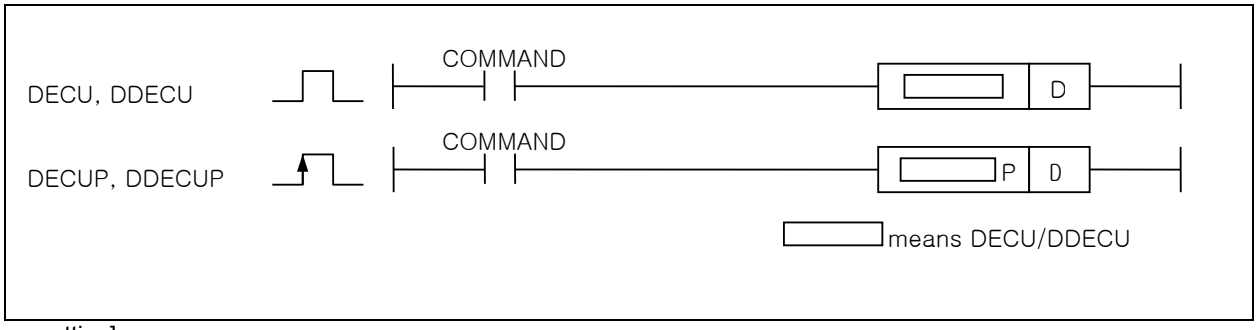
Notes

(1) INC(P), DINC(P), DEC(P), DDEC(P) Instructions used in MK series to perform Unsigned Operation have been changed in XGK as shown below. If Increase/Decrease Instructions have been used in previous program version of XGK, see below to modify the data.
INC(P) → INCU(P) DEC(P) → DECU(P)
DINC(P) → DINCU(P) DDEC(P) → DDECU(P)

4.16.6 DECU, DECUP, DDECU, DDECUP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DECU(P) DDECU(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~3	-	O	O



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	WORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if (D)DEC(P) is executed when D is 1.	F111
Carry	To be set when D is 0 ~ hFFFF.	F112

1) DECU(Decrement)

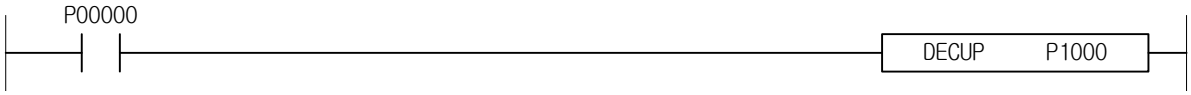
(1) It saves the result of D minus 1 again in D.
(2) D is processed as Unsigned operation.
(3) If DECU(P) is executed when D is 0(h0000), 65,535(hFFFF) will be output and Carry Flag will be set.
(4) If (D)DECU(P) is executed when D is 1, 0 will be output and Zero Flag will be set

2) DDECU(Double Decrement)

(1) It saves the result of D+1,D minus 1 again in D+1,D.
(2) D+1 ,D is processed as Unsigned operation.
(3) If (D)DECU(P) is executed when D, D+1 is 1, 0 will be output and Zero Flag will be set.
(4) If DDECU(P) is executed when D, D+1 is 0(h00000000), 4,294,967,295(hFFFFFFFF) will be output and Carry Flag will be set.

3) Example

(1) In case of P1000=100, When Input Signal P00000 is changed to On from Off status, the value saved in P1000 is decreased 1.

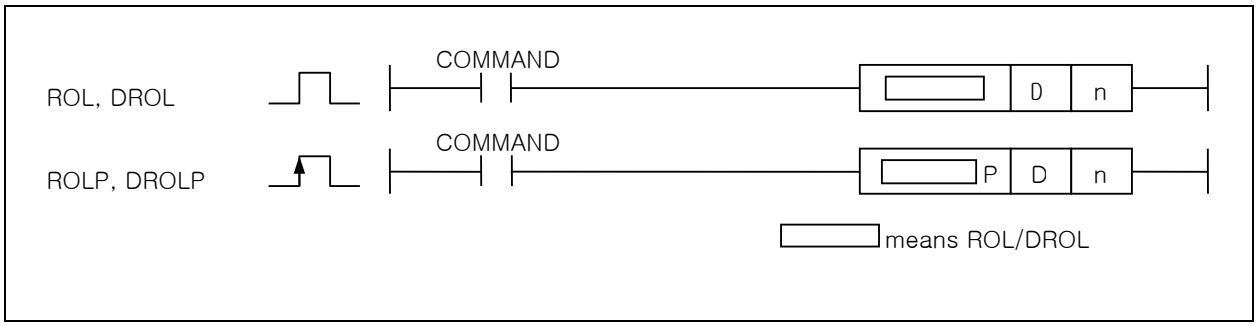


4.17 Rotation Instruction

4.17.1 ROL, ROLP, DROL, DROLP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ROL(P) DROL(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~4	-	-	O
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	WORD/DWORD
n	Number of bits to rotate to the left.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

1) ROL(Rotate Left)

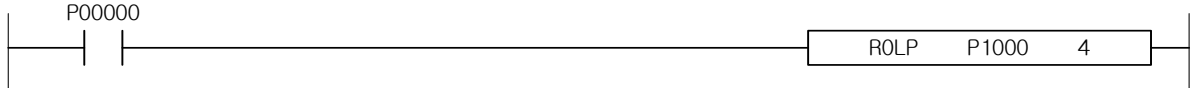
(1) It rotates D's 16 Bits for the number of bits specified to the left bit by bit, and the highest bit will rotate to Carry Flag (F112) and the lowest bit. (Rotation within 1 word)

2) DROL (Double Rotate Left)

(1) It rotates D and D+1's 32 Bits data for n bits to the left, not including Carry Flag.

3) Example

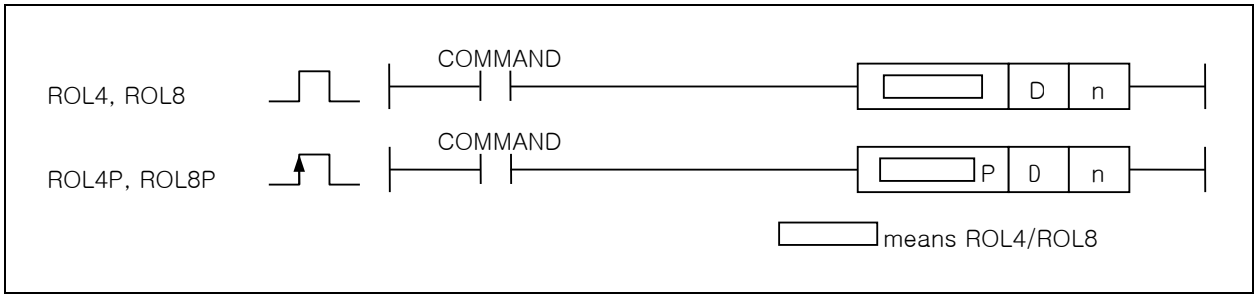
(1) In case of P1000=h1234, when Input signal P00000 is changed to On from Off status, It rotates 4 bits to the left bit by bit and then h2341 will be saved in P1000.



4.17.2 ROL4, ROL4P, ROL8, ROL8P

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ROL4(P) ROL8(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	2~4	-	-	O
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	NIBBLE/BYTE
n	Number of bits to rotate to the left.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

1) ROL4(Rotate Left)

(1) It rotates D's 4 bits for the number of n bits specified to the left bit by bit, and the highest bit among 4 bits will rotate to Carry Flag and the lowest bit. (Rotation within 4 bits)

(2) If Carry is caused during rotation, Carry Flag will be SET.

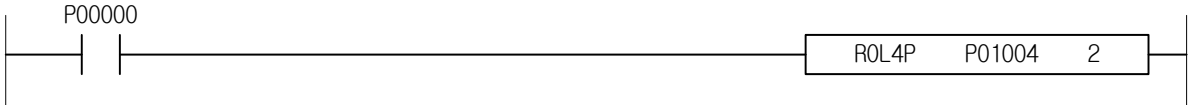
2) ROL8 (Double Rotate Left)

(1) It rotates D's 8 bits for the number of n bits specified to the left bit by bit, and the highest bit among 8 bits will rotate to Carry Flag and the lowest bit. (Rotation within 8 bits)

(2) If Carry is caused during rotation, Carry Flag will be SET.

3) Example

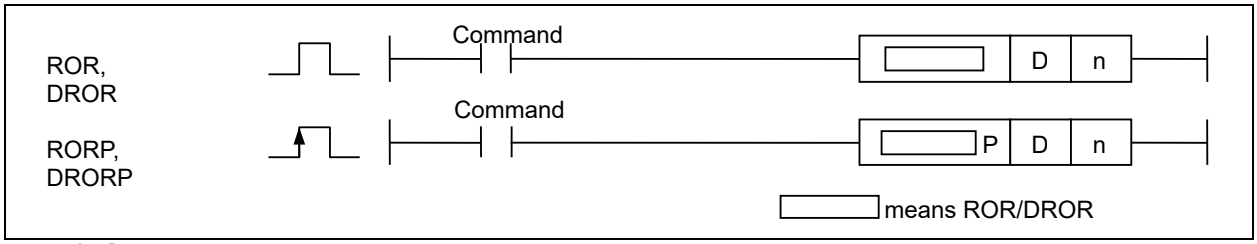
(1) In case of P01004~P01007=h3, when Input Signal P00000 is changed to On from Off status, It rotates 2 bits to the left bit by bit, and then 'hc' will be saved in P01004~P01007.



4.17.3 ROR, RORP, DROR, DRORP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ROR(P) DROR(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~4	-	-	O
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

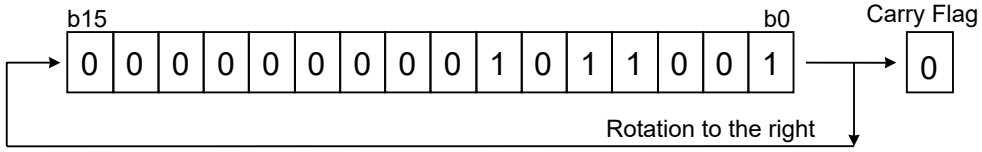
Operand	Description	Data type
D	Data address to perform operation.	WORD/DWORD
n	Number of bits to rotate to the left.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

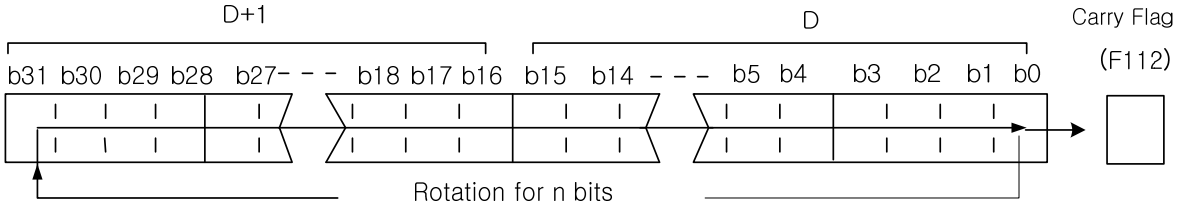
1) ROR (Rotate Right)

(1) It rotates D's 16 bits for the number of bits specified to the right bit by bit, and the lowest bit will rotate to Carry Flag (F112) and the highest bit. (Rotation within 1 word)



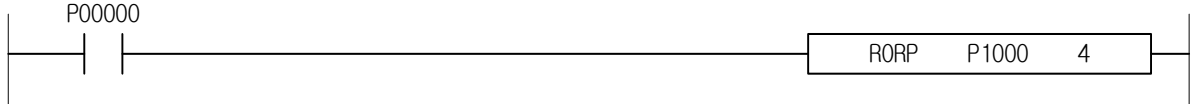
2) DROR (Double Rotate Right)

(1) It rotates D and D+1's 32 bits data for n bits to the right side, not including Carry Flag.



3) Example

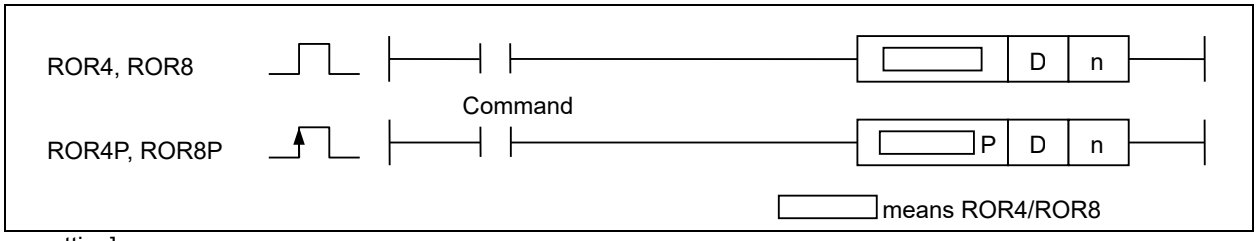
(1) In case of P1000=h1234, when Input signal P00000 is changed to On from Off status, It rotates 4 bits to the right side bit by bit and then h4123 will be saved in P1000.



4.17.4 ROR4, ROR4P, ROR8, ROR8P

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ROR4(P) ROR8(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	2~4	-	-	O
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	NIBBLE/BYTE
n	Number of bits to rotate to the left.	WORD

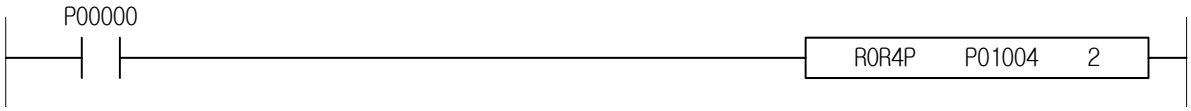
[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

1) ROR4 (Nibble Rotate Right)
   (1) It rotates D's 4 bits for the number of n bits specified to the right bit by bit, and the lowest bit among 4 bits will rotate to Carry Flag and the highest bit. (Rotation within 4 bits)
   (2) If Carry is caused during rotation, Carry Flag will be SET.

2) ROR8 (Byte Rotate Right)
   (1) It rotates D's 8 bits for the number of n bits specified to the right bit by bit, and the lowest bit among 8 bits will rotate to Carry Flag and the highest bit. (Rotation within 8 bits)
   (2) If Carry is caused during rotation, Carry Flag will be SET.

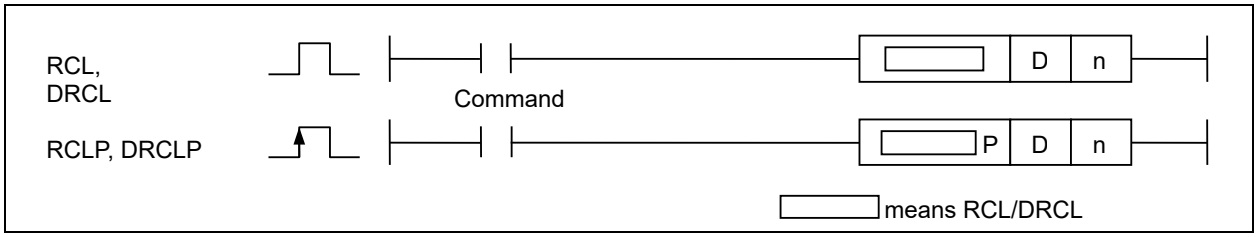
3) Example
   (1) In case of P01004~P01007=h3, when Input Signal P00000 is changed to On from Off status, It rotates 2 bits to the right side bit by bit, and then 'hc' will be saved in P01004~P01007.



4.17.5 RCL, RCLP, DRCL, DRCLP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RCL(P) DRCL(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~4	-	-	O
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

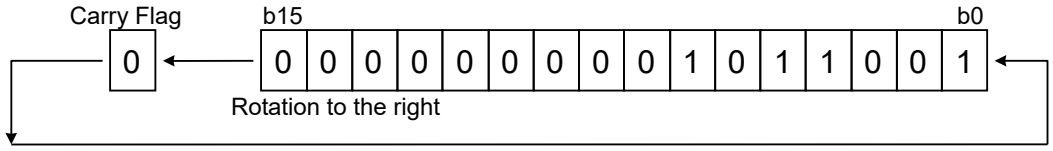
Operand	Description	Data type
D	Data address to perform operation.	WORD/DWORD
n	Number of bits to rotate to the left.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

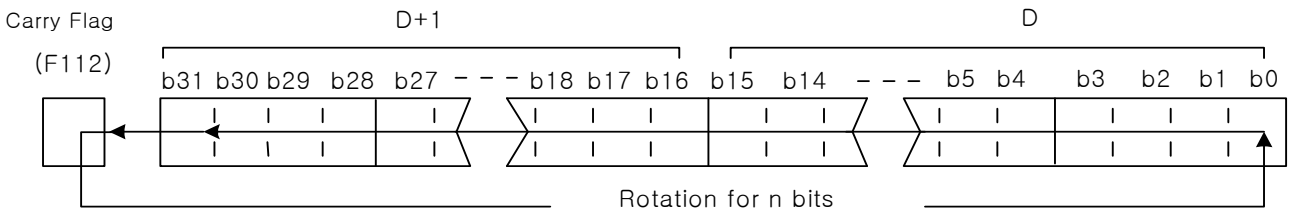
1) RCL (Rotate Left with Carry)

(1) It rotates word data D's individual bit for the number of N to the left bit by bit, and the highest bit data moves to Carry Flag (F112) and the original Carry Flag (F112) moves to the lowest bit. (Rotation within 1 word)



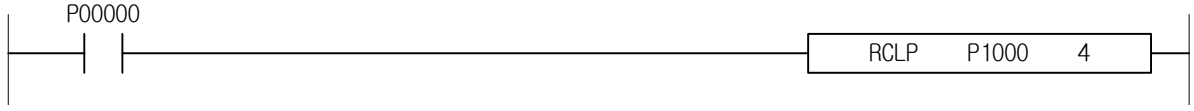
2) DRCL (Double Rotate Left with Carry)

(1) It rotates D between D+1's 32 bits data for n bits to the left side, not including Carry Flag.



3) Example

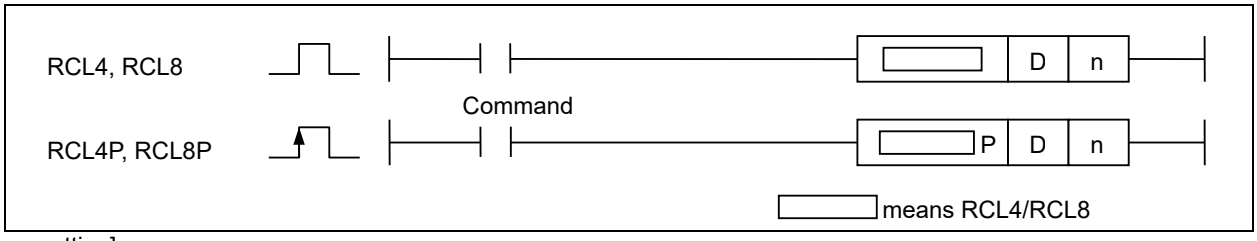
(1) In case of P1000=hF000, when Input Signal is changed to On from Off status, It rotates 4 bits to the left bit by bit and then hE00 is saved in P1000 and Carry Flag will be set.



4.17.6 RCL4, RCL4P, RCL8, RCL8P

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RCL4(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	2~4	-	-	O
RCL8(P)	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	NIBBLE/BYTE
n	Number of bits to rotate to the left.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

1) RCL4 (Nibble Rotate Left with Carry)

It rotates D's 4 bits for the number of n bits specified to the left bit by bit, and the highest bit among 4 bits moves to Carry Flag and the original Carry Flag moves to the lowest bit. (Rotation within 4 bits)

(2) If Carry is caused during rotation, Carry Flag will be SET.

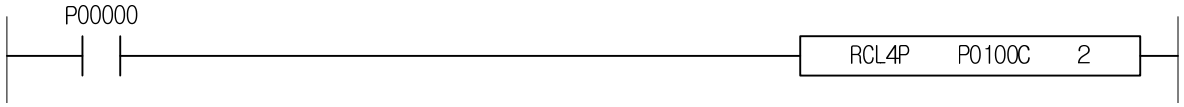
2) RCL8 (Byte Rotate Left with Carry)

(1) It rotates D's 8 bits for the number of n bits specified to the left bit by bit, and the highest bit among 8 bits moves to Carry Flag and the original Carry Flag moves to the lowest bit. (Rotation within 8 bits)

(2) If Carry is caused during rotation, Carry Flag will be SET.

3) Example

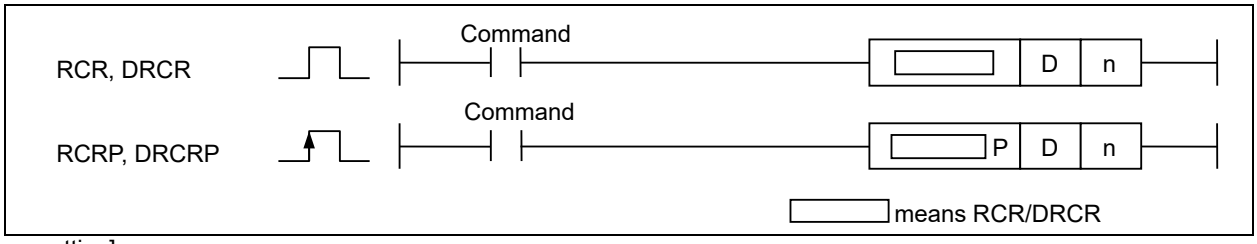
(1) In case of P0100c~P0100F='hF', Input Signal P00000 is changed to On from Off status, It rotates 4 bits to the left. hE000 will be saved in P0100 and Carry Flag will be set.



4.17.7 RCR, RCRP, DRCR, DRCRP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RCR(P) DRCR(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~4	-	-	O
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

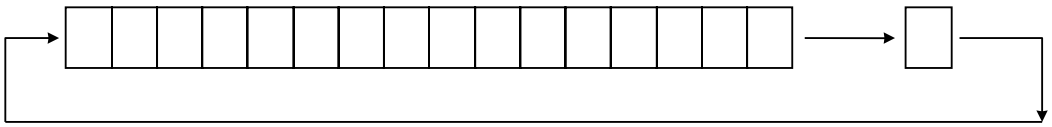
Operand	Description	Data type
D	Data address to perform operation.	WORD/DWORD
n	Number of bits to rotate to the right side.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

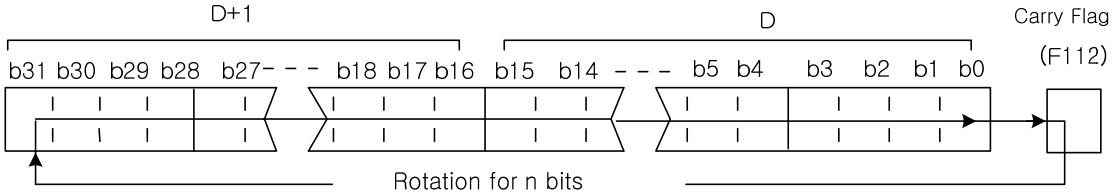
1) RCR (Rotate Right with carry)

(1) It rotates word data D's individual bit for the number of N to the right bit by bit, and the highest bit data moves to Carry Flag (F112) and the original Carry Flag (F112) moves to the lowest bit. (Rotation within 1 word)



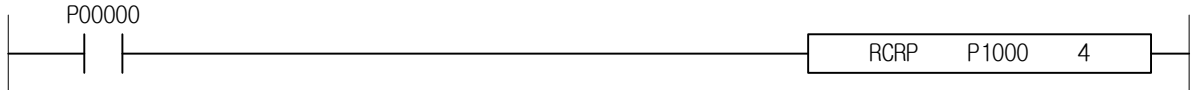
2) DRCR (Double Rotate Right with carry)

(1) It rotates D and D+1's 32 bits data for n bits to the right side, including Carry Flag.



3) Example

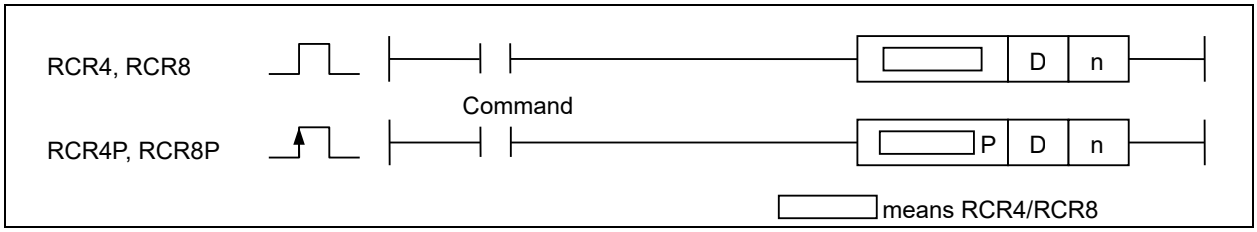
(1) In case of P1000=hF, When Input Signal P00000 is changed to On from Off status, It rotates 4 bits to the right bit by bit and then h0000 will be saved in P1000 and Carry Flag will be set.



4.17.8 RCR4, RCR4P, RCR8, RCR8P

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RCR4(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	2~4	-	-	O
RCR8(P)	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Data address to perform operation.	NIBBLE/BYTE
n	Number of bits to rotate to the right side.	WORD

[Flag Set]

Flag	Content	Device number
Carry	If Carry is caused during rotation, Carry Flag will be set.	F112

1) RCR4 (Nibble Rotate Right with carry)

It rotates D's 4 bits for the number of n bits specified to the right side bit by bit, and the lowest bit among 4 bits moves to Carry Flag and the original Carry Flag moves to the highest bit. (Rotation within 4 bits)

(2) If Carry is caused during rotation, Carry Flag will be SET.

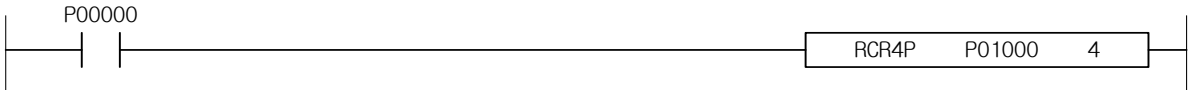
2) RCR8 (Byte Rotate Right with carry)

It rotates D's 8 bits for the number of n bits specified to the right side bit by bit, and the lowest bit among 8 bits moves to Carry Flag and the original Carry Flag moves to the highest bit. (Rotation within 8 bits)

(2) If Carry is caused during rotation, Carry Flag will be SET.

3) Example

(1) In case of P01000~P01003=hF, When Input Signal P00000 is changed to On from Off status, It rotates 4 bits to the right and then h000E will be saved in P01000 and Carry Flat will be set.

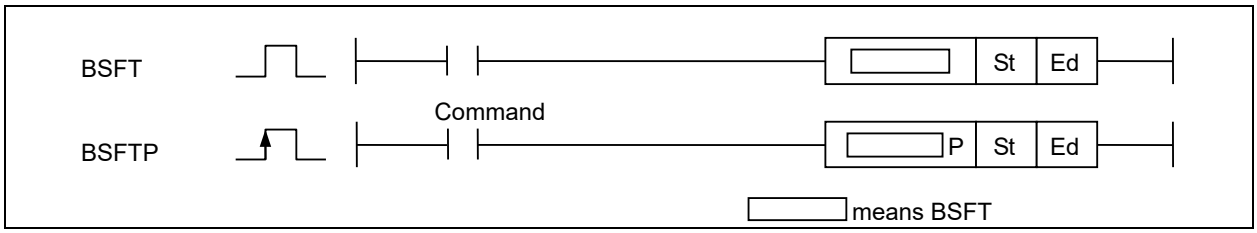


4.18 Move Instruction

4.18.1 BSFT, BSFTP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSFT(P)	St	O	-	O	-	-	-	-	O	O	-	-	-	-	-	3~4	-	-	-
	Ed	O	-	O	-	-	-	-	O	O	-	-	-	-	-				



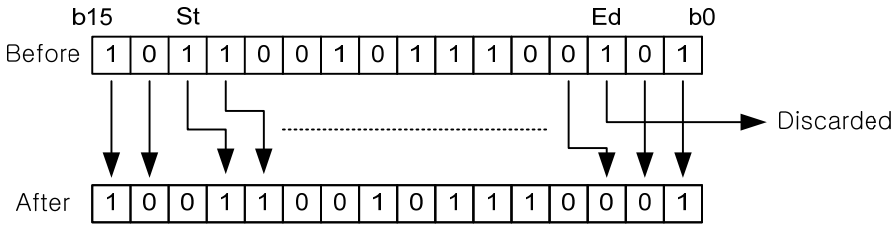
[Area setting]

Operand	Description	Data type
St	Start bit of BSFT Operation	BIT
Ed	End bit of BSFT Operation	BIT

1) BSFT (Bit Shift)

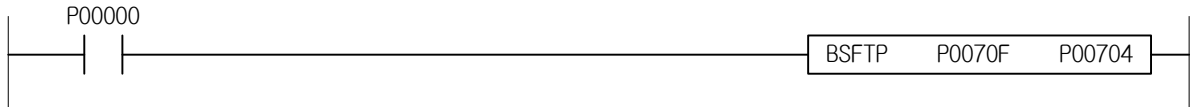
(1) It shifts bits data from Start Bit (St) to End Bit (Ed) bit by bit.

(2) Bit shift direction
- St < Ed : left shift
- St > Ed : right shift



2) Example

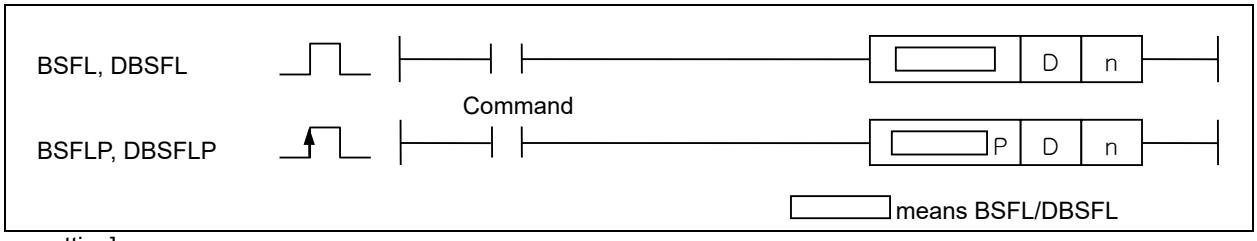
(1) In case of P0070=h8000, when Input Signal P00000 is changed to On from Off status, It shifts to the right from Start bit P0070F to End bit P00704 bit by bit because P0070F is larger than P00704 (P0070F > P00704).



4.18.2 BSFL, BSFLP, DBSFL, DBSFLP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSFL(P) DBSFL(P)	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O	2~4	-	-	O
	n	O	O	O	O	O	-	-	-	-	O	O	O	O	O				



[Area setting]

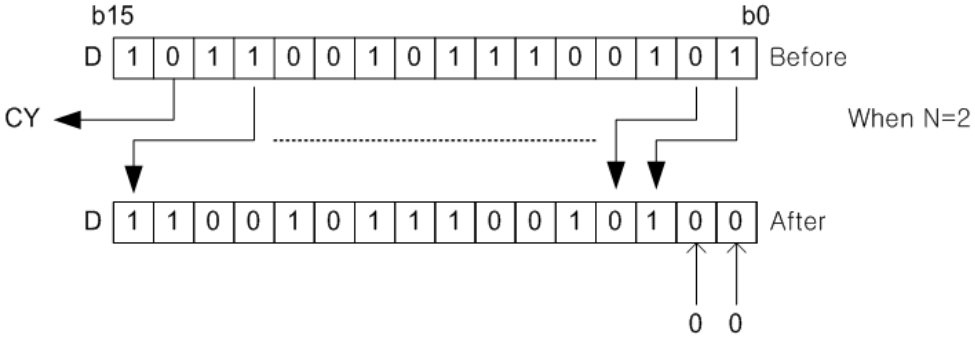
Operand	Description	Data type
D	Device Number to shift bits.	WORD/DWORD
n	Number of times to shift word data S to the left bit by bit	WORD

[Flag Set]

Flag	Content	Device number
Carry	Carry Flag will be On/Off based on the bit cut away last.	F112

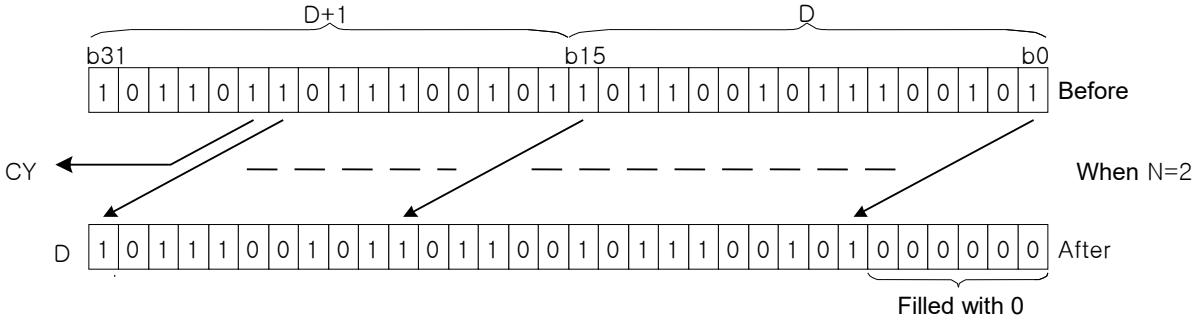
1) BSFL (Bit Shift Left)

(1) It shifts D's word data's individual bit to the left for the number of N bit by bit.



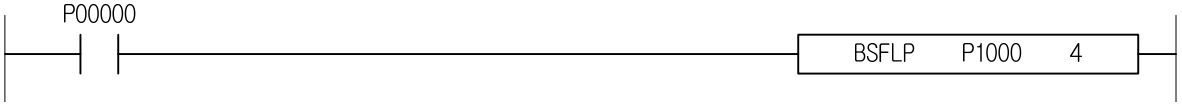
2) DBSFL (Double Bit Shift Left)

(1) It shifts D+1, D's double word data's individual bit to the left for the number of N bit by bit.



3) Example

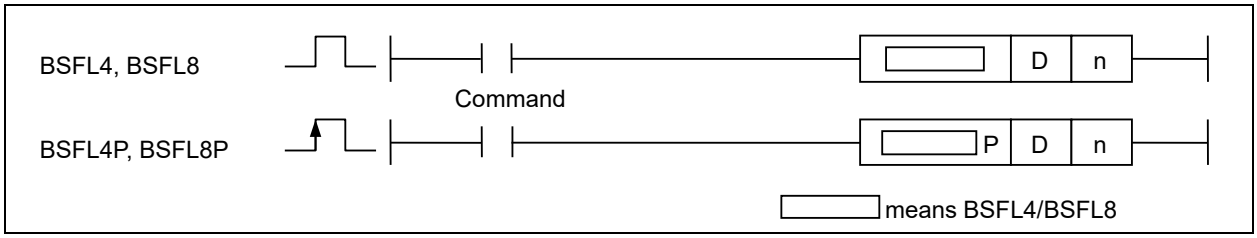
(1) In case of P1000='h000F', When P00000 is changed to On from Off status, it rotates 4 bit to the left bit by bit and 'h00F0' is saved in P1000'.



4.18.3 BSFL4, BSFL4P, BSFL8, BSFL8P

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSFL4(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	3~5	-	-	O
BSFL8(P)	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

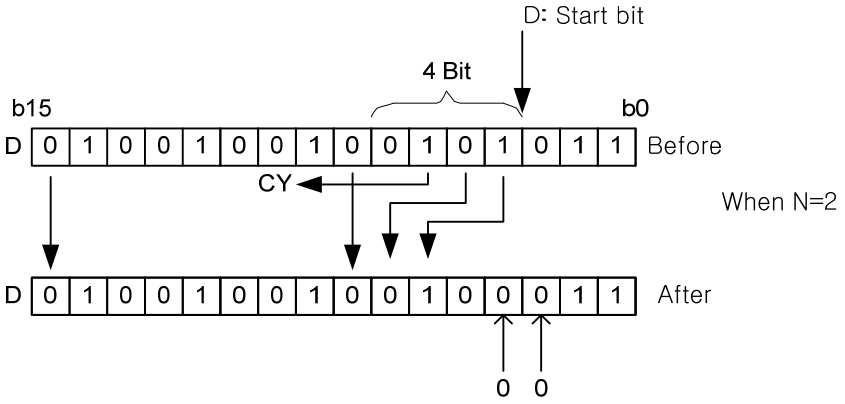
Operand	Description	Data type
D	Start bit position of BSFL Operation	NIBBLE/BYTE
n	Number of bits among 4/8 bits to shift to the left from specified D bit position.	WORD

[Flag Set]

Flag	Content	Device number
Carry	Carry Flag will be On/Off based on the bit cut away last.	F112

1) BSFL4 (Nibble Bit Shift Left)

(1) It shifts n bits among 4 bits to the left from specified D bit position.



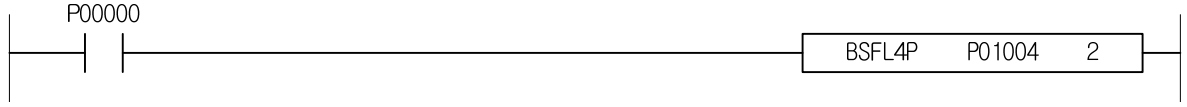
2) BSFL8 (Byte Bit Shift Left)

(1) It shifts D's 8-bit data's individual bit to the left for the number of specified n bits bit by bit.

(2) Carry Flag will be On/Off based on the bit cut away last.

3) Example

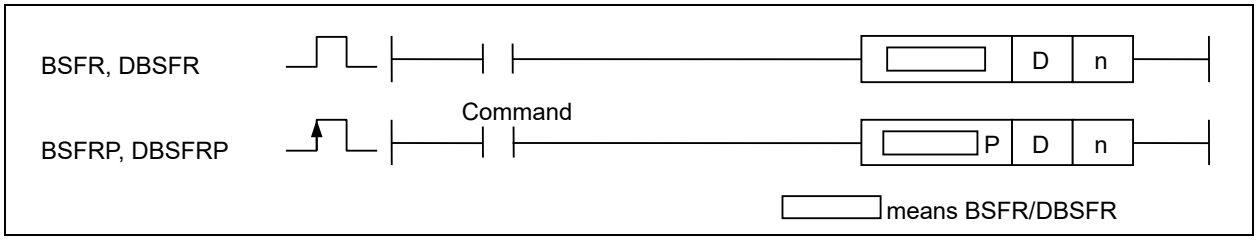
(1) In case of P0100='h00F0', it shifts 4 bits from No. 4 bit to the left and 'h03C0' will be saved in P0100.



4.18.4 BSFR, BSFRP, DBSFR, DBSFRP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSFR(P) DBSFR(P)	D	O	-	O	O	O	-	-	-	-	-	O	O	O	O	2~4	-	-	O
	n	O	O	O	O	O	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Device Number to shift bits.	WORD/DWORD
n	Number of times to shift word data S to right bit by bit	WORD

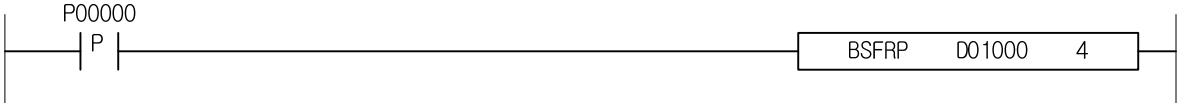
[Flag Set]

Flag	Content	Device number
Carry	Carry Flag will be Set/Reset based on the bit cut away last.	F112

1) BSFR (Bit Shift Right)
   (1) It shifts D's word data's individual bit to the right for the number of specified D's bits bit by bit.
   (2) Carry Flag will be On/Off based on the bit cut away last.

2) DBSFR (Double Bit Shift Right)
   (1) It shifts D+1, D's double word data's individual bit to the right for the number of N bit by bit.
   (2) Carry Flag will be On/Off based on the bit cut away last.

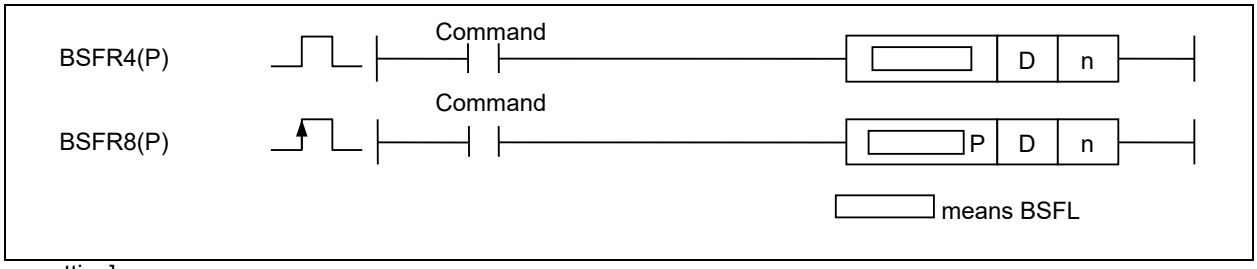
3) Example
   (1) In case of D01000='h001F', if Input Signal P00000 is changed to On from Off status, it rotates bits to the right for 4 times and then 'h0001' will be saved in D01000 and Carry Flag will be set.



4.18.5 BSFR4, BSFR4P, BSFR8, BSFR8P

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSFR4(P)	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-	3~4	-	-	O
BSFR8(P)	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D	Start bit position of BSFL Operation	NIBBLE/BYTE
n	Number of bits among 4/8 bits to shift to the left from specified D bit position.	WORD

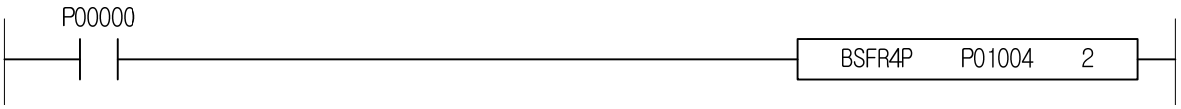
[Flag Set]

Flag	Content	Device number
Carry	Carry Flag will be Set/Reset based on the bit cut away last.	F112

1) BSFR4 (Nibble Bit Shift Right)
   (1) It shifts D's 4 bit data's individual bit to the right for the number of specified D's bits bit by bit.
   (2) Carry Flag will be Set/Reset based on the bit cut away last.

2) BSFR8 (Byte Bit Shift Right)
   (1) It shifts D's 8 bit data's individual bit to the right for the number of specified D's bits bit by bit.
   (2) Carry Flag will be Set/Reset based on the bit cut away last.

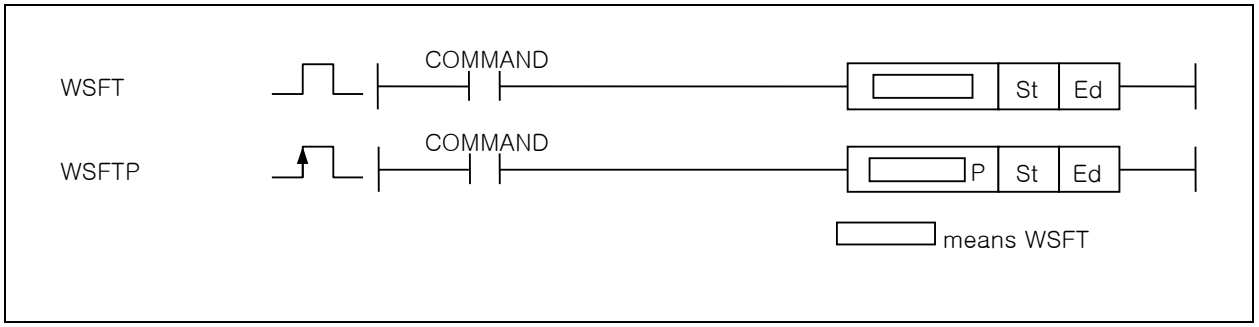
3) Example
   (1) In case of P0100='h00F0', If Input Signal is changed to On from Off status, it rotates bits to the right from No.4 bit by bit for 2 times and then 'h0030' will be saved in P0100.



4.18.6 WSFT, WSFTP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WSFT(P)	S	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

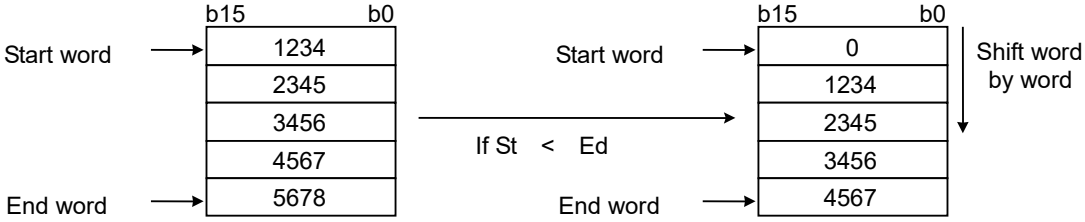


[Area setting]

Operand	Description	Data type
St	Address of Start word data of WSFT Operation	WORD
Ed	Address of End word data of WSFT Operation	WORD

1) WSFT (Word Shift)

(1) It shifts words data from Start Word (St) to End Word (Ed) word by word.

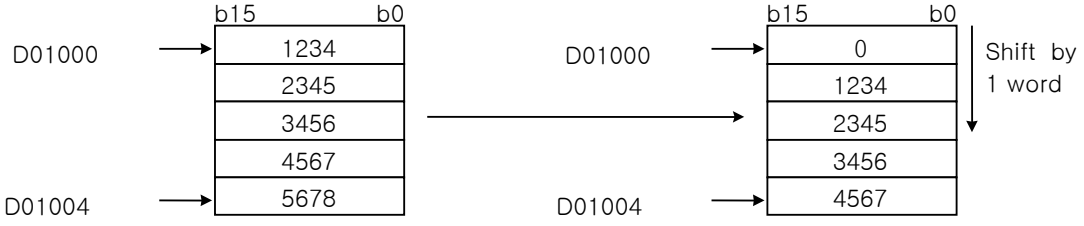


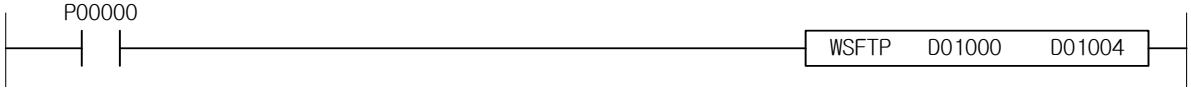
(2) WORD shift direction

- S1 < S2 (예 : WSFT D0000 D0003) → downward
- S1 > S2 (예 : WSFT D0003 D0000) → upward

2) Example

(1) If Input Signal P00000 is changed to On from Off status, '1234' saved in D01000 will be downward by 1 word and saved in D01001.

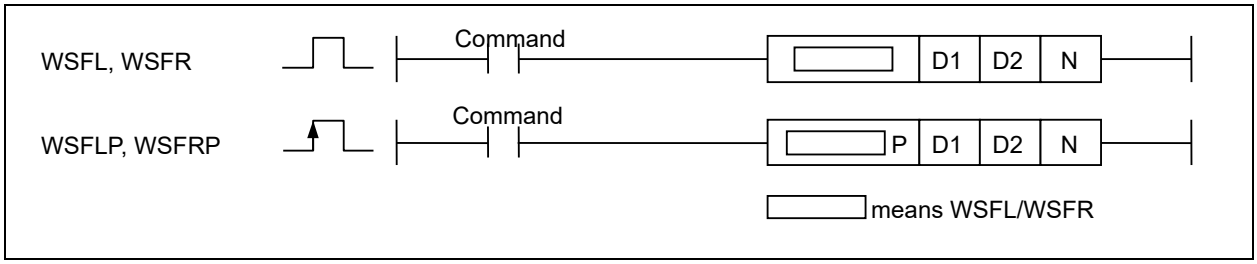




4.18.7 WSFL, WSFLP, WSFR, WSFRP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WSFL(P) WSFR(P)	D1	O	-	O	O	O	-	O	-	-	-	O	O	O	O	4~6	-	-	-
	D2	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
D1	Device Number of the section to shift words.	WORD
D2	Device Number of the section to shift words.	WORD
N	Number of words to shift at a time	WORD

1) WSFL (Word Shift Left)

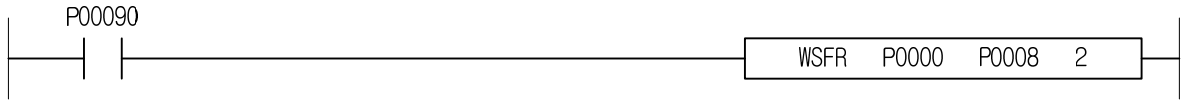
(1) It shifts words between D1 and D2 toward the upper word of number N. And 0s as many as the lower words shifted at this moment, will be saved in the replaced position.

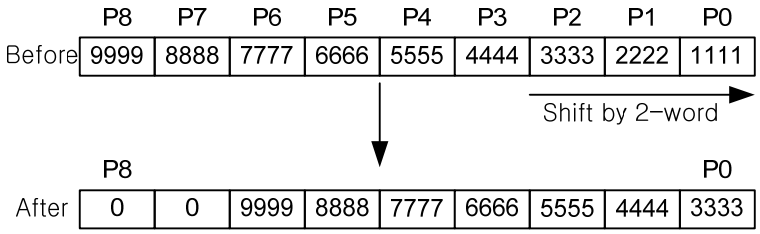
2) WSFR (Word Shift Right)

(1) It shifts words between D1 and D2 toward the lower word of number N. And 0s as many as the upper words shifted at this moment, will be saved in the replaced position.

3) Example

(1) If Input Signal P00020 is changed to On from Off status, 9-word data from P0000 to P0008 will be shifted to the right by 2-word and 0 will be saved in P0007,P0008.

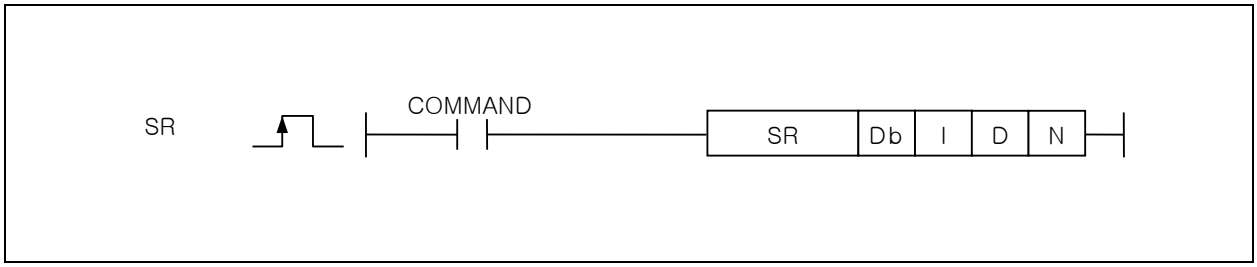




4.18.8 SR

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SR	Db	O	-	O	-	-	-	-	O	O	-	O	-	-	-	3	O	-	-
	I	O	O	O	O	O	-	-	O	O	-	O	-	-	-				
	D	O	O	O	O	O	-	-	O	O	-	O	-	-	-				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

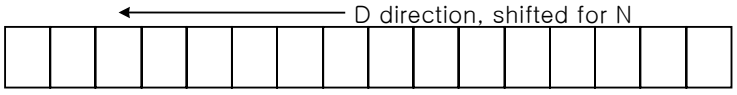
Operand	Description	Data type
Db	Start bit of area to shift in bit unit	End bit of BSFT Operation
I	Data of input to shift in bit unit	
D	Shift direction in bit unit	
N	Number of bits to shift	WORD

[Flag Set]

Flag	Content	Device number
error	Error Flag will be set if N value exceeds maximum 'Db' area when SR instruction is executed.	F110

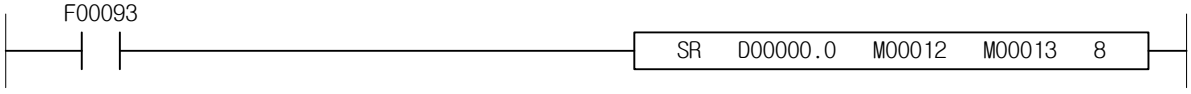
1) SR

(1) It shifts N data from Shift Start Bit Db when Input Signal which is execution condition of SR instruction is changed to On from Off status.
(2) It shifts bits to the right if input direction bit is On, and to the left if off.
(3) The bits empty after data shifted will be filled with input data bit's value.



2) Example

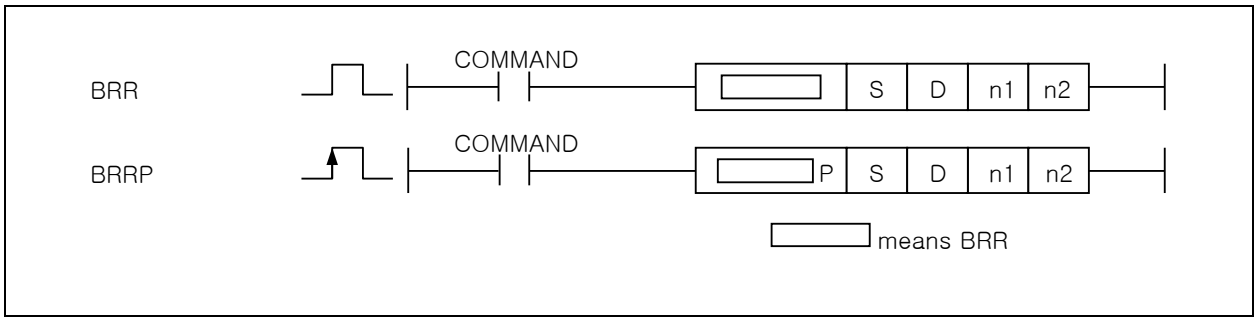
(1) In case of M00012=0 and M00013=0, when 1 initial Clock of Input Signal F00093 is changed to On from Off status, it shifts 8-bit data to the left from D0000's No. 0 bit and empty bit of input data is changed to 0.
(2) If Input bit data M00012=1, empty bit is charged '1'
(3) If shift direction bit M00013=1, direction of bit data is changed to the right and Bit Shift is executed with 1 second cycle.



4.18.9 BRR, BRRP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BRR(P)	S1	O	O	O	O	O	O	-	O	O	-	O	-	-	-	5~8	-	-	-
	S2	O	O	O	O	O	O	-	O	O	-	O	-	-	-				
	D	O	O	O	O	O	O	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

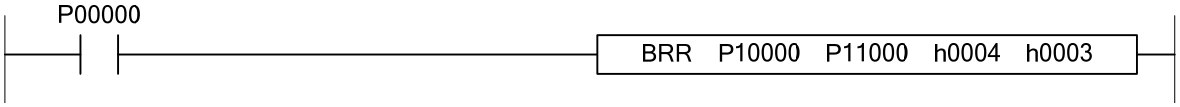
Operand	Description	Data type
S	Data address to perform operation.	BYTE
D	Address to save operation result	BYTE
n1	The number of byte to rotate right	WORD
n2	Number of bits to rotate to the right side.	WORD

1) BRR (Byte Rotate Right)

(1) rotates data of S[0]~S[n1-1] byte n2 times with byte unit right and save result in D[0]~D[n1-1].
(2) In case n1 is 0, operation is not executed.

2) Example

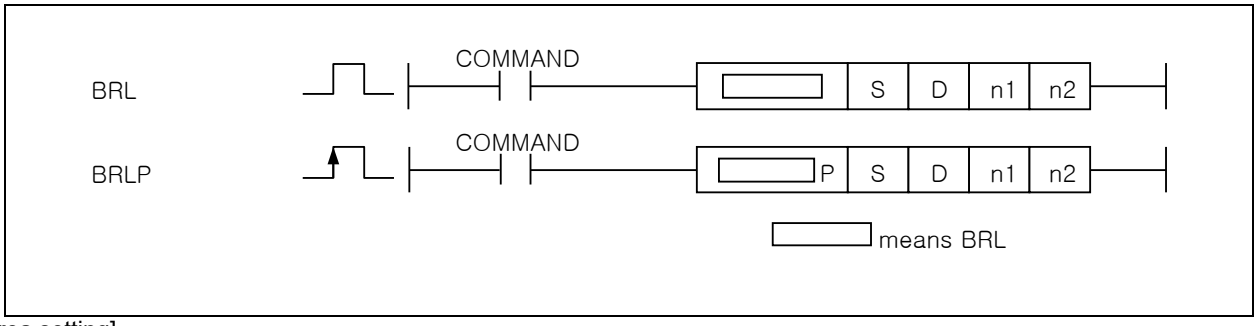
If input signal P00000 is Off -> On, rotates 4 byte data starting from S[0]~S[n-1] 3 byte unit right and save result in P11000.



4.18.10 BRL, BRLP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BRL (P)	S1	O	O	O	-	-	-	-	O	O	-	O	-	-	-	5~8	-	-	-
	S2	O	O	O	O	O	O	-	O	O	-	O	-	-	-				
	D	O	O	O	O	O	O	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Data address to perform operation.	BYTE
D	Address to save operation result	BYTE
n1	The number of byte to rotate left	WORD
n2	Number of bits to rotate to the left.	WORD

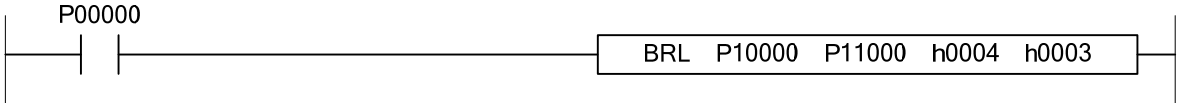
1) BRL (Byte Rotate Left)

(1) rotates data of S[0]~S[n1-1] byte n2 times with byte unit left and save result in D[0]~D[n1-1].

(2) In case n1 is 0, operation is not executed.

2) Example

If input signal P00000 is Off -> On, rotates 4 byte data starting from S[0]~S[n-1] 3 byte unit left and save result in P11000.



4.19 Exchange Instruction

4.19.1 XCHG, XCHGP, DXCHG, DXCHGP

[Applicable Product: XGK,XGB]

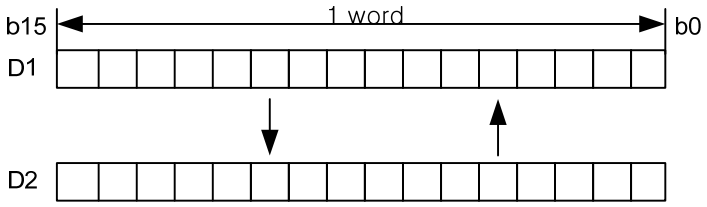
Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XCHG(P) DXCHG(P)	D1	O	-	O	O	O	-	O	-	-	-	O	O	O	O	2~4	-	-	-
	D2	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

[Area setting]

Operand	Description	Data type
D1	Device Number of data to exchange	WORD/DWORD
D2	Device Number of data to exchange	WORD/DWORD

1) XCHG (Exchange)

(1) It exchanges word data of specified D1 and D2

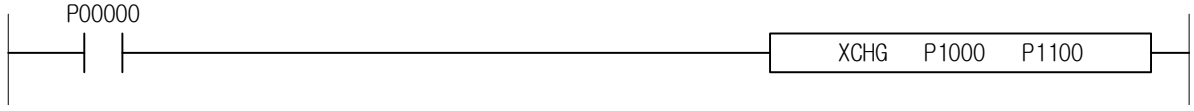


2) DXCHG (Double Exchange)

(1) It exchanges word data of specified D1+1,D1 and D2+1,D2

3) Example

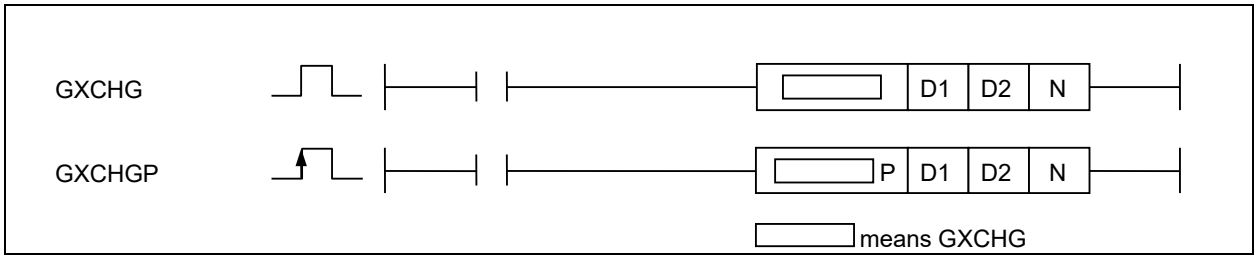
(1) In case of P1000='h1234' and P1100='5678', Input Signal P00000 is changed from Off to On status, '5678' is saved in P10000 and then 'h1234' is saved in P1100.



4.19.2 GXCHG, GXCHGP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GXCHG(P)	D1	O	-	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D2	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

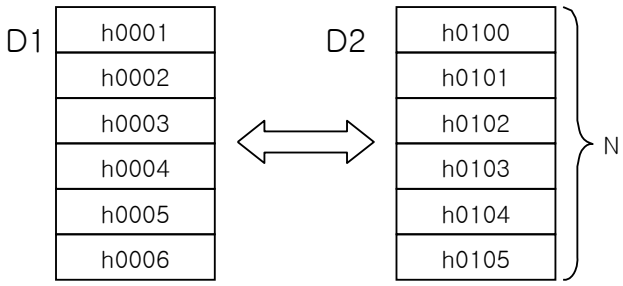
Operand	Description	Data type
D1	Start address of area to exchange data with D2 in word unit	WORD
D2	Start address of area to exchange data with D1 in word unit	WORD
N	Number of data to exchange in word unit	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area.	F110

1) GXCHG

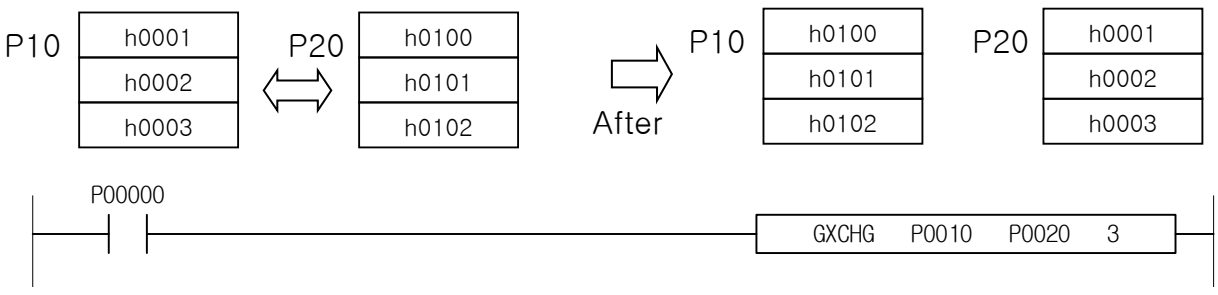
(1) It exchanges N word data starting from D1 and D2.



(2) It exchanges N data while increasing based on the value of D1 and D2. If D1 and D2 are overlapped, unintentional result will be caused.

2) Example

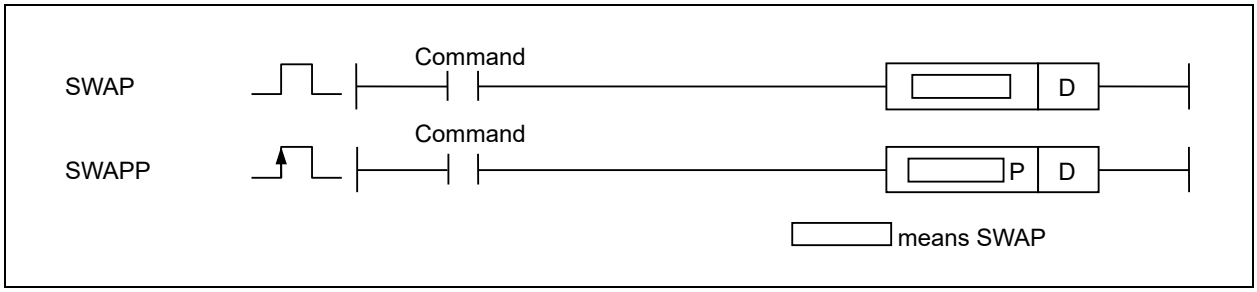
(1) Input Signal P00000 is changed from Off to On status, it exchanges 3-word data of P0010~P0012 and P0020~P0022.



4.19.3 SWAP, SWAPP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SWAP(P)	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O	2	-	-	-

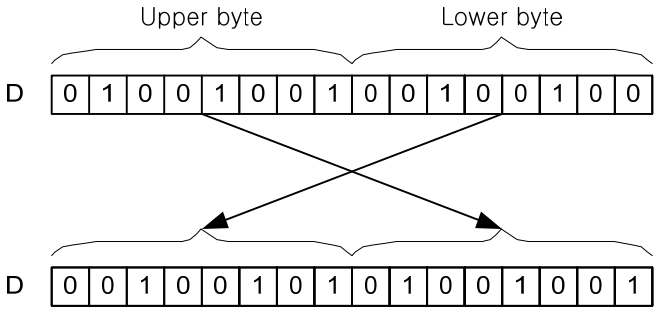


[Area setting]

Operand	Description	Data type
D	Word address of data to exchange byte upper and lower	WORD

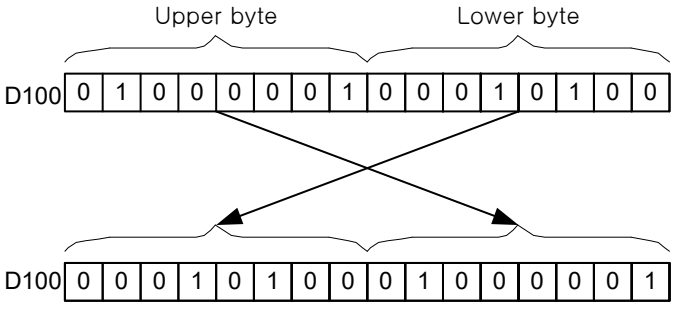
1) SWAP

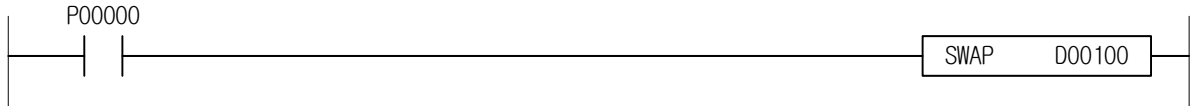
(1) It exchanges byte upper and lower in a word



2) Example

(1) If Input Signal P00000 is changed from Off to On, 1-word data in D00100's upper byte and lower byte is exchanged and then saved in P00100 again.

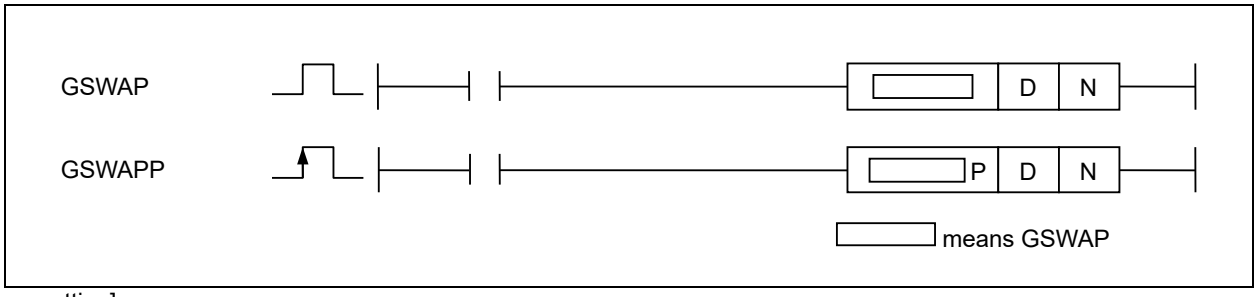




4.19.4 GSWAP, GSWAPP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GSWAP(P)	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O	2~4	O	-	-
	N	O	-	O	-	-	-	O	-	-	O	O	O	O	O				



[Area setting]

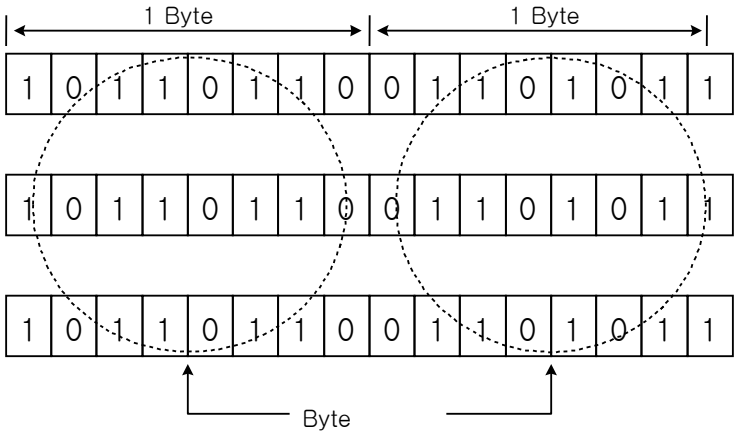
Operand	Description	Data type
D	First Device Number of data to exchange byte upper and lower	WORD
N	Number of word data to exchange byte upper and lower	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area.	F110

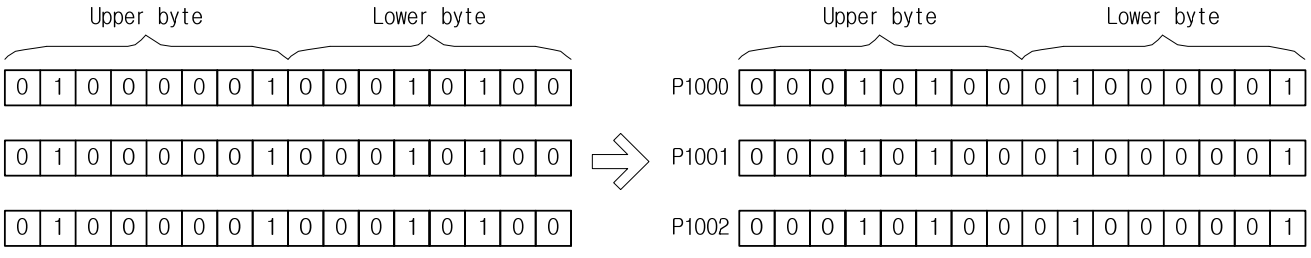
1) GSWAP (Group SWAP)

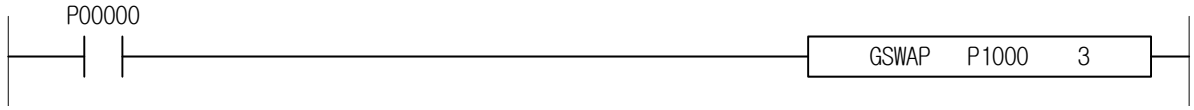
(1) If N's range exceeds the specified area.



2) Example

(1) If Input signal P00000 is changed from Off too On, 3-word data of P1000~P1002's upper byte and lower byte is exchanged.

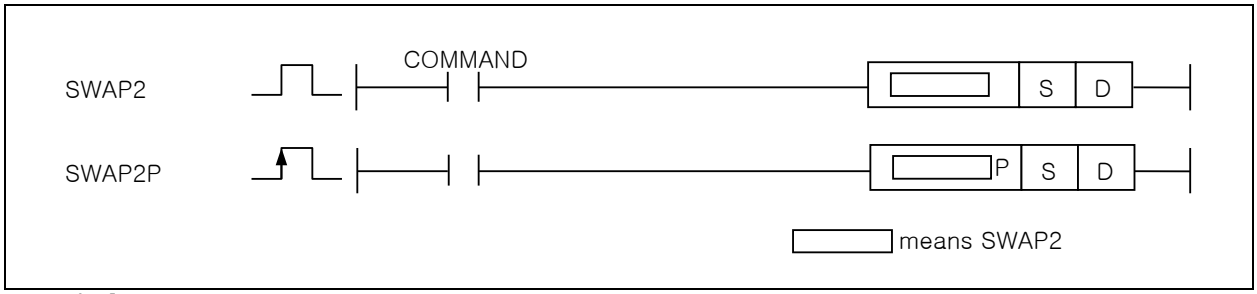



P00000
GSWAP P1000 3

4.19.5 SWAP2, SWAP2P

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SWAP2(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

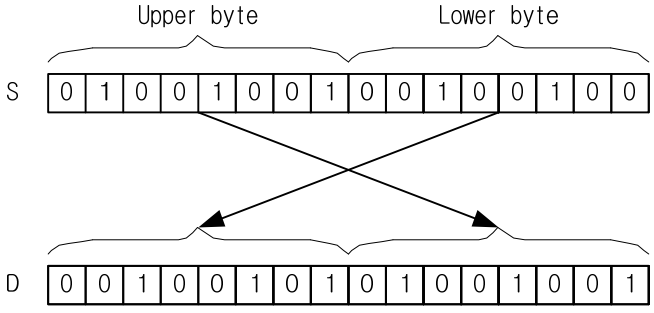


[Area setting]

Operand	Description	Data type
S	Device Number of data or data to exchange byte upper and lower	WORD
D	Address to save result of SWAP2 operation	WORD

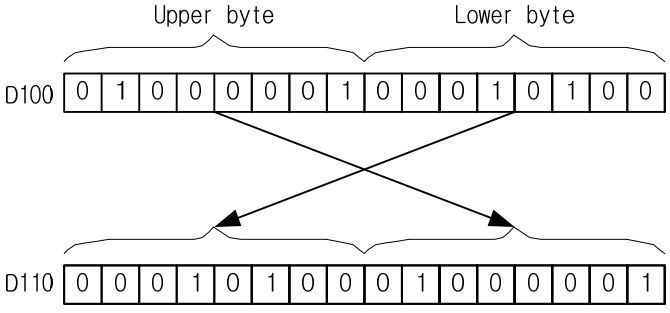
1) SWAP2

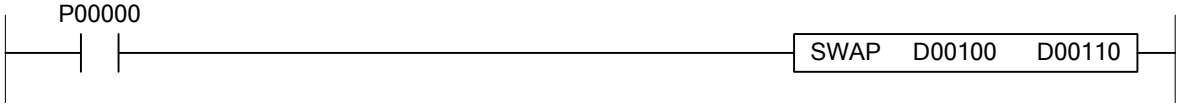
(1) Exchanes byte upper and lower for device set by S and saves it in D



2) Example

If Input Signal P00000 is changed from Off to On, 1-word data in D00100's upper byte and lower byte is exchanged and then saved in P01100.

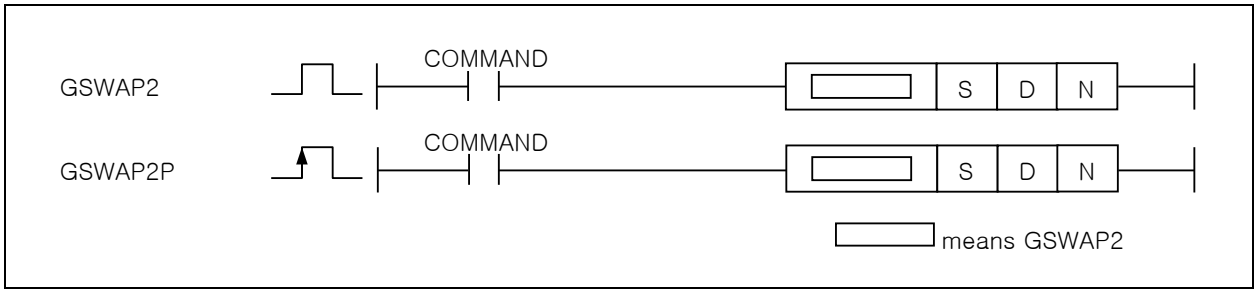




4.19.6 GSWAP2, GSWAP2P

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GSWAP2(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	5~7	O	O	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

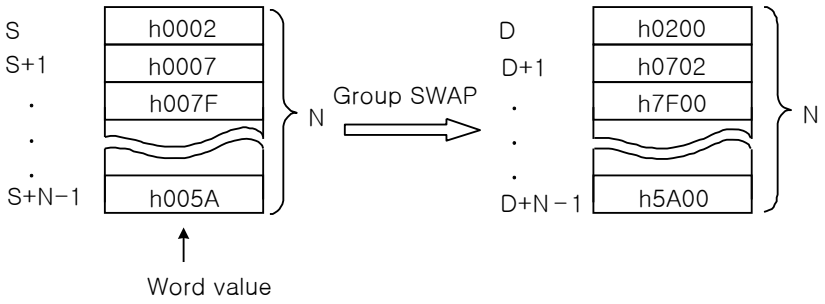
Operand	Description	Data type
S	Device Number of data or data to exchange byte upper and lower	WORD
D	Address to save result of GSWAP2 operation	WORD
N	Number to transfer in group (0 ~ 65536)	WORD

[Flag Set]

Flag	Content	Device number
error	To be set, if N's range exceeds specified area. Applicable instruction result is not processed.	F110

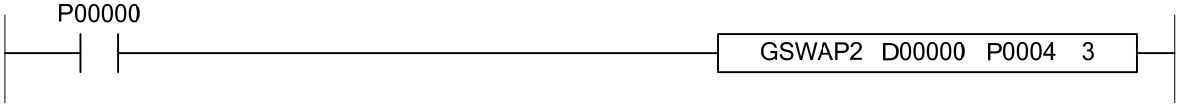
1) GSWAP2 (Group SWAP)

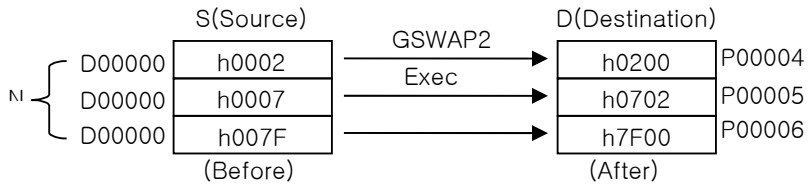
(1) If N's range exceeds the specified area.



2) Example

If input signal P00000 is Off -> On, exchanges upper byte and lower byte of 3 word data and saves result in P0004~P0006.



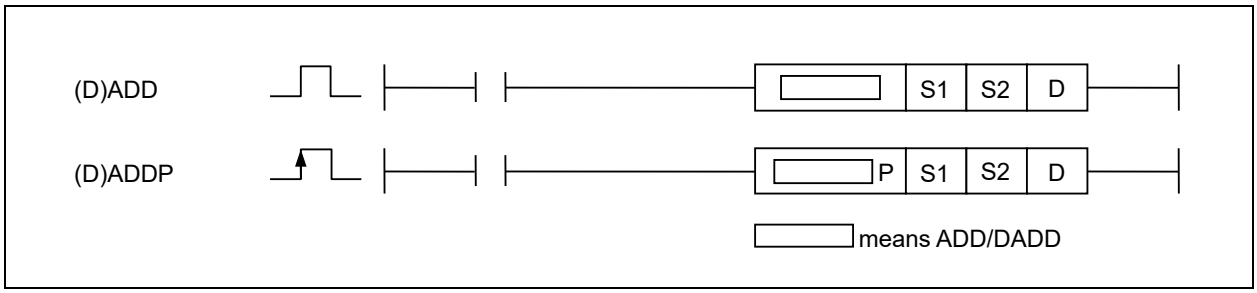


4.20 BIN Arithmetic Operations Instruction

4.20.1 ADD, ADDP, DADD, DADDP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ADD(P) DADD(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



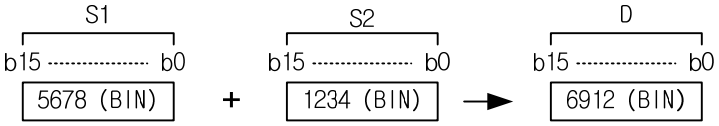
[Area setting]

Operand	Description	Data type
S1	Data to be added to S2	INT/DINT
S2	Data to be added to S1	INT/DINT
D	Address to save operation result	INT/DINT

1) ADD (Signed Binary Add)

(1) It saves the result of word data S1 and S2 added up in D.

At this moment, it performs Signed Operation. If operation result is over 32,767(h7FFF) or below -32,768 (hFFFF), Carry Flag will not be set.

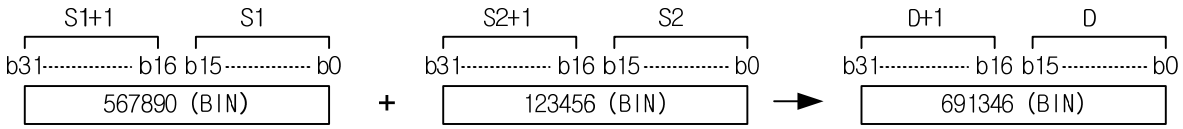


2) DADD (Signed Binary Double Add)

(1) It saves the result of word data (S1 +1,S1) and (S2+1,S2) added up in (D+1,D).

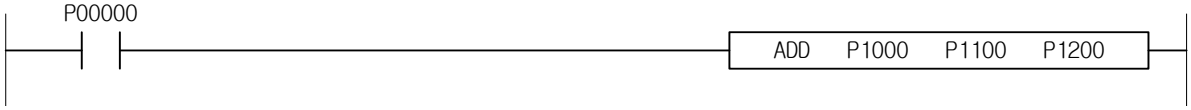
(2) At this moment, it performs Signed Operation.

(3) If operation result is over 2,147,483,647 (h7FFFFFFF) or below -2,147,483,648(hFFFFFFFF), Carry Flag will not be set.



3) Example

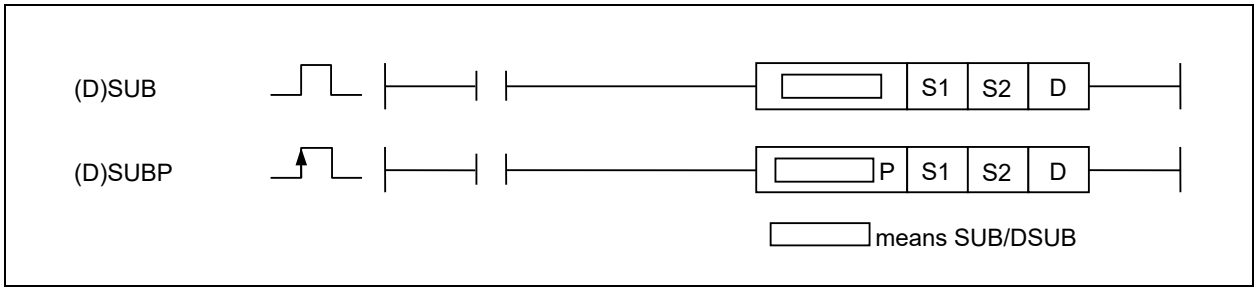
(1) In case of P1000='1234' , P1100='1111', Input Signal P00000 is changed from Off to On status, the added result of '2345' is saved In P1200.



4.20.2 SUB, SUBP, DSUB, DSUBP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SUB(P) DSUB(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

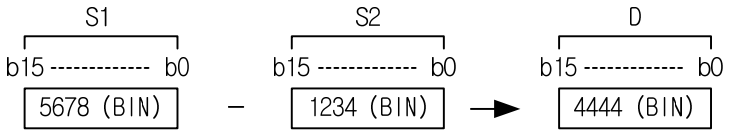


[Area setting]

Operand	Description	Data type
S1	Data to be subtracted from S2	INT/DINT
S2	Data to be subtracted from S1	INT/DINT
D	Address to save operation result	INT/DINT

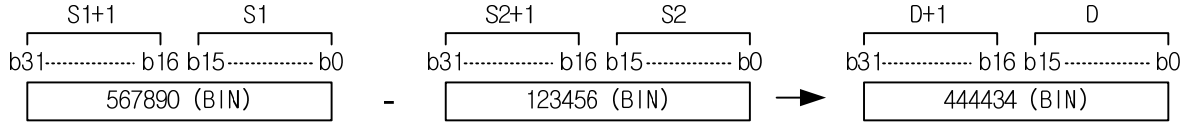
1) SUB (Signed Binary Subtract)

(1) It saves the result of word data S1 minus S2 in D (16-bit).
At this moment, it performs Signed Operation.
(3) If operation result is over 32,767 (h7FFF) in the below -32,768(hFFFF), Carry Flag will not be set.



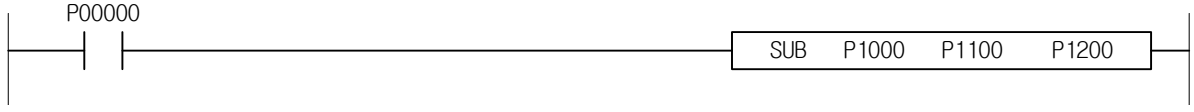
2) DSUB (Signed Binary Double Subtract)

(1) It saves the result of double word data (S1 +1,S1) minus (S2+1,S2) in (D+1,D).
At this moment, it performs Signed Operation.
(3) If operation result is over 2,147,483,647 (h7FFFFFFF) or below -2,147,483,648(hFFFFFFFF), Carry Flag will not be set.



3) Example

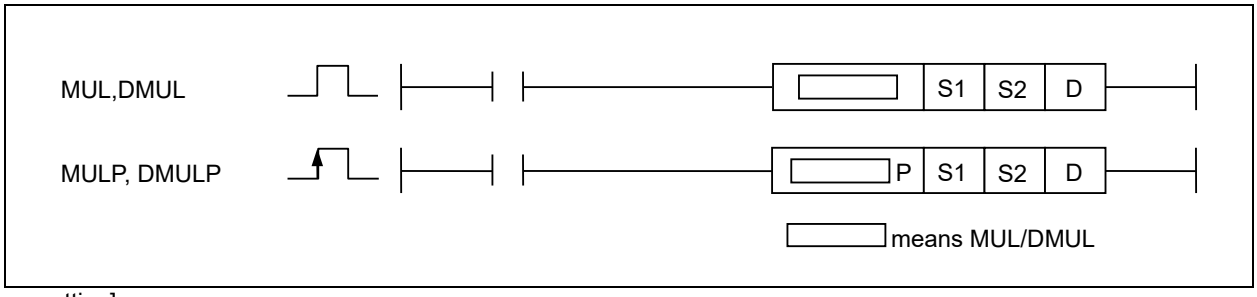
(1) In case of P1000='200' , P1100='100', Input Signal P00000 is changed from Off to On status, the minus result of '100' At this moment saved In P1200.



4.20.3 MUL, MULP, DMUL, DMULP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MUL(P) DMUL(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



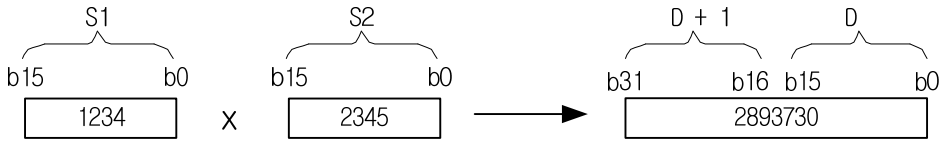
[Area setting]

Operand	Description	Data type
S1	Data to be multiplied by S2	INT/DINT
S2	Data to be multiplied by S1	INT/DINT
D	Address to save operation result	DINT/LINT

1) MUL (Signed Binary Multiply)

(1) It saves the result of word data S1 multiplied by S2 in D+1,D (32-bit).

(2) At this moment, it performs Signed Operation.



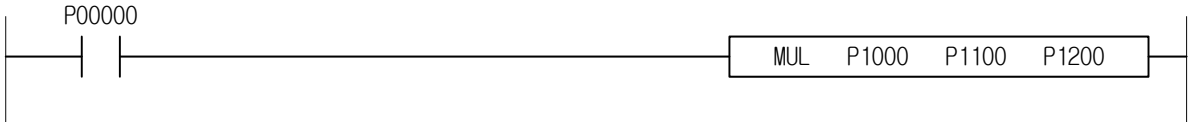
2) DMUL (Signed Binary Double Multiply)

(1) It saves the result of double word data (S1+1,S1) multiplied by (S2+1,S2) in D+3,D+2,D+1,D(64-bit).

(2) At this moment, it performs Signed Operation.

3) Example

(1) In case of P1000=’100 and P1100=’20’, Input Signal P00000 is changed from Off to On status, the result of multiplied ‘2000’ is saved in P1200~P1201.



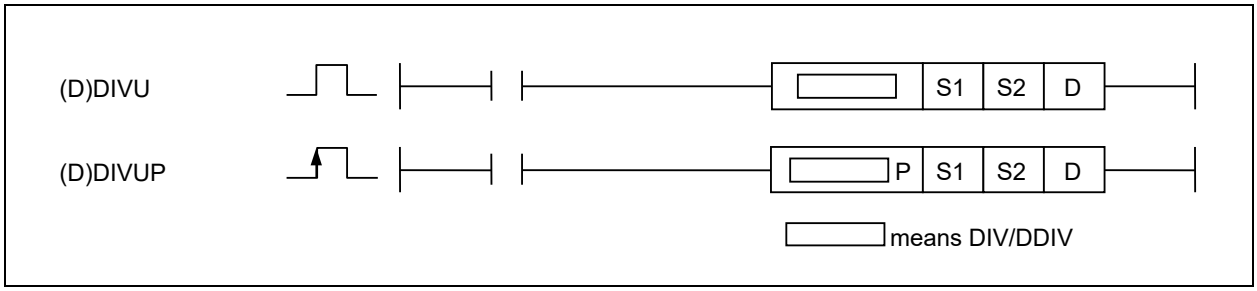
Notes

(1) Among MKS Instructions, the names of instructions of MULS, DIV, etc. have been changed in XGK as shown below.
However, their functions are the same as before.
MULS(P) → MUL(P) DMULS(P) → DMUL(P)
DIV(P) → DIVU(P) DDIV(P) → DDIVU(P)

4.20.4 DIV, DIVP, DDIV, DDIVP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DIV(P) DDIV(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be divided by S2	INT/DINT
S2	Data to be divided by S1	INT/DINT
D	Address to save operation result	INT/DINT

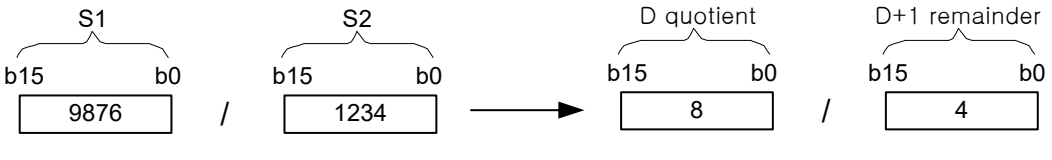
[Flag Set]

Flag	Content	Device number
error	To be set if S2's value is 0	F110

1) DIV (Signed Binary Divide)

(1) It saves the result of word data S1 divided by S2, the quotient in D (16-bit), the remainder in D+1.

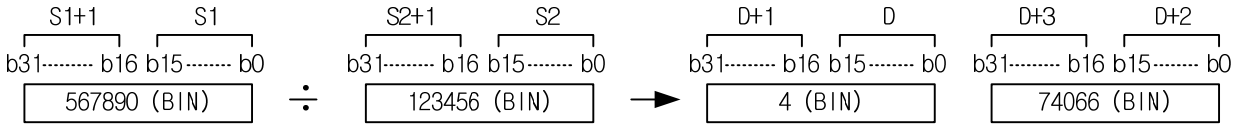
(2) At this moment, it performs Signed Operation.



2) DDIV (Signed Binary Double Divide)

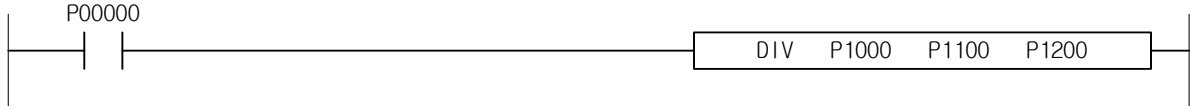
(1) It saves the result of double word data (S1+1,S1) divided by (S2+1,S2) ,the quotient in (D+1,D), the remainder in (D+3,D+2).

(2) At this moment, it performs Signed Operation.



3) Example

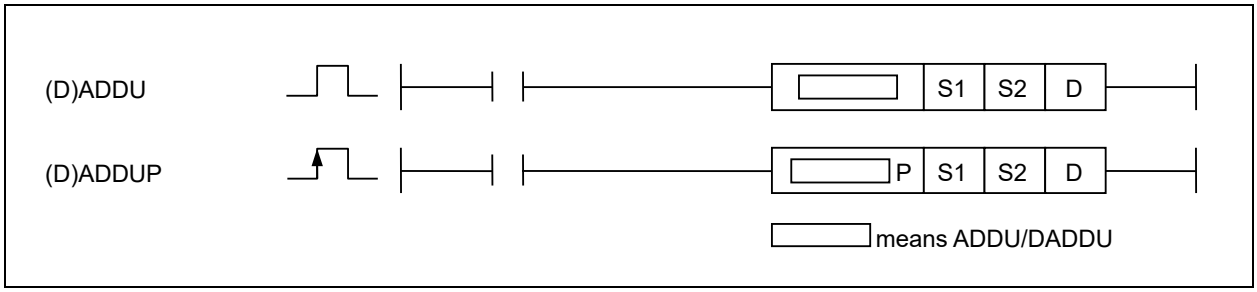
(1) In case of P1000='5577' and P1100='5', Input Signal P00000 is changed from Off to On, the quotient '1111' is saved in P1200 and then the remainder '2' is saved in P1201.



4.20.5 ADDU, ADDUP, DADDU, DADDUP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ADDU(P) DADDU(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	O
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be added to S2	WORD/DWORD
S2	Data to be added to S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111
Carry	To be set if operation result is Overflow	F112

1) ADDU (Unsigned Binary Add)

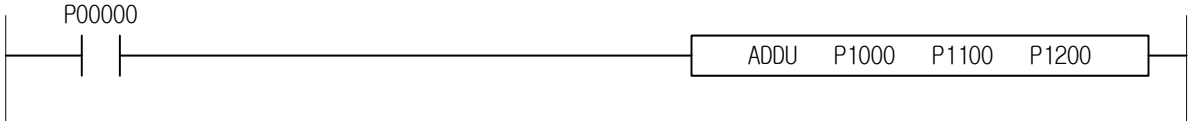
(1) It saves the result of word data S1 and S2 added up in D.
(2) At this moment, it performs Unsigned Operation.
(3) If operation result is over 65,535(hFFFF), Carry Flag will be set.

2) DADDU (Unsigned Binary Double Add)

(1) It saves the result of double word data (S1+1,S1) and (S2+1,S2) added up in (D+1,D).
(2) At this moment, it performs Unsigned Operation.
(3) If operation result is over 4,294,967,295(hFFFFFFFF), Carry Flag will be set.

3) Example

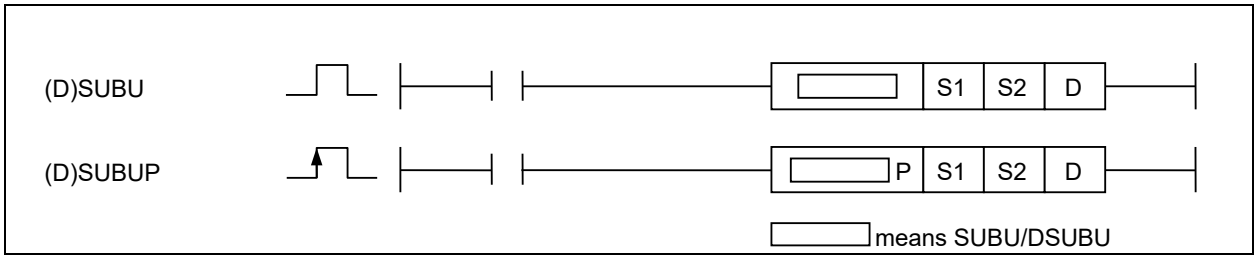
(1) In case of P1000='1234 and if' , P1100='5', Input Signal P00000 is changed from Off to On status, the Unsigned added result of '1239' is saved In P1200.



4.20.6 SUBU, SUBUP, DSUBU, DSUBUP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SUBU(P) DSUBU(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	O
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be subtracted from S2	WORD/DWORD
S2	Data to be subtracted from S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111
Carry	To be set if operation result is Overflow	F112

1) SUBU (Unsigned Binary Subtract)

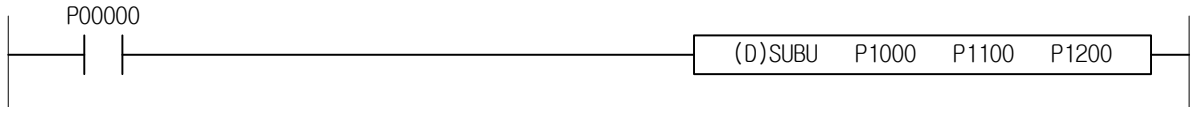
(1) It saves the result after word data S1 minus S2 in D (16-bit).
(2) At this moment, it performs Unsigned Operation.
(3) If operation result is below 0, Carry Flag will be set.

2) DSUBU (Unsigned Binary Double Subtract)

(1) It saves the result of double word data (S1+1,S1) minus (S2+1,S2) in (D+1,D).
(2) At this moment, it performs Unsigned Operation.
(3) If operation result is below 0, Carry Flag will be set.

3) Example

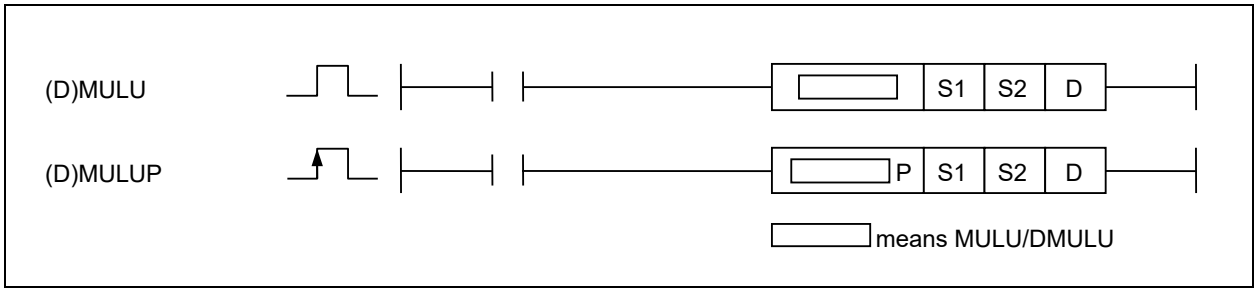
(1) In case of P1000='1234' and P1100='5', Input Signal P00000 is changed from Off to On status, the result of subtraction '1229' is saved in P1200.



4.20.7 MULU, MULUP, DMULU, DMULUP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MULU(P) DMULU(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be multiplied by S2	WORD/DWORD
S2	Data to be multiplied by S1	WORD/DWORD
D	Address to save operation result	DWORD/LWORD

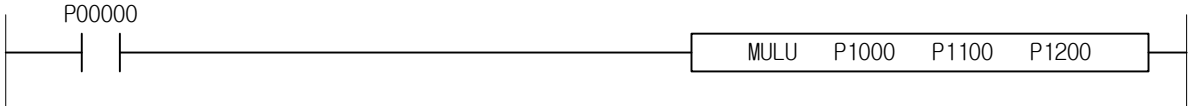
[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111

1) MULU (Unsigned Binary Multiply)
   (1) It saves the result of word data S1 multiplied by S2 in D+1,D (32-bit).
   (2) At this moment, it performs Unsigned Operation.

2) DMULU (Unsigned Binary Double Multiply)
   (1) It saves the result of double word data (S1+1,S1) multiplied by (S2+1,S2) in (D+3,D+2,D+1,D)(64-bit).
   (2) At this moment, it performs Unsigned Operation.

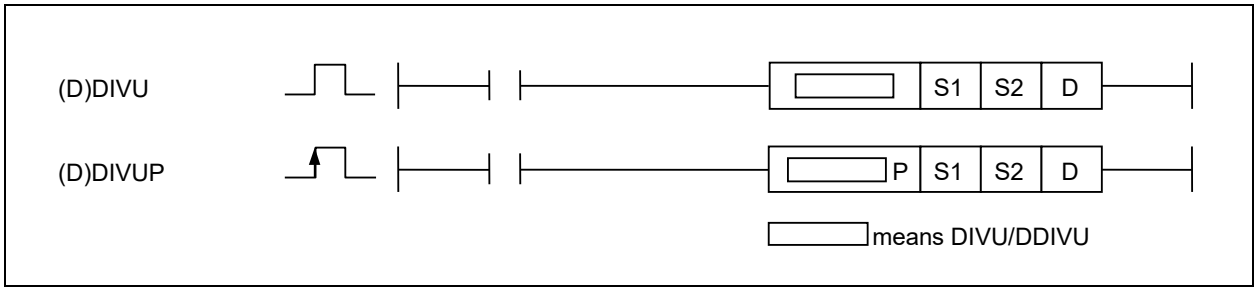
3) Example
   (1) In case of P1000='1234 and P1100='2', Input Signal P00000 is changed from Off to On status, the result of Unsigned multiplied '2468' is saved in P1200~P1201.



4.20.8 DIVU, DIVUP, DDIVU, DDIVUP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DIVU(P) DDIVU(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be divided by S2	WORD/DWORD
S2	Data to be divided by S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
error	To be set if S2's value is 0	F110
Zero	To be set if operation result is Zero.	F111

1) DIVU (Unsigned Binary Divide)

(1) It saves the result of word data S1 divided by S2, the quotient in D (16-bit), the remainder in D+1.

(2) At this moment, it performs unsigned operation.

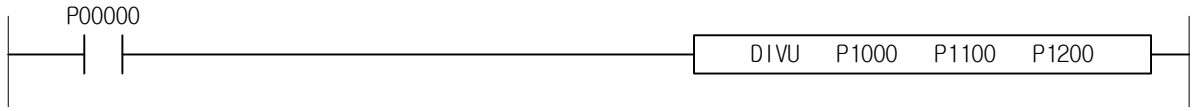
2) DDIVU (Unsigned Binary Double Divide)

(1) It saves the result of double word data (S1+1,S1) divided by (S2+1,S2) ,the quotient in (D+1,D), the remainder in (D+3,D+2).

(2) At this moment, it performs unsigned operation.

3) Example

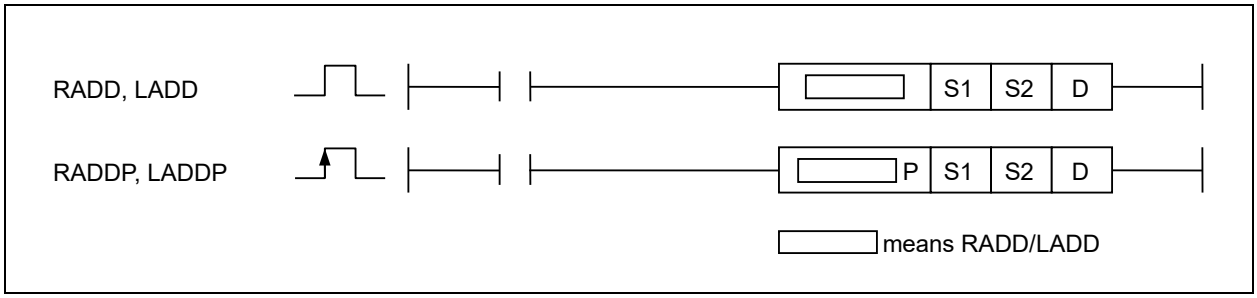
(1) In case of P1000='5559' and P1100='5', Input Signal is changed from Off to On status, the quotient of Unsigned division '1111' is saved in P1200 and the remainder '4' is saved in P1201.



4.20.9 RADD, RADDP, LADD, LADDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RADD(P) LADD(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~8	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be added to S2	REAL/LREAL
S2	Data to be added to S1	REAL/LREAL
D	Address to save operation result	REAL/LREAL

[Flag Set]

Flag	Content	Device number
error	To be set, in case of FPU operation error flag F0057E, F0057C, F0057B, F0057A are Set(XGB not available)	F110

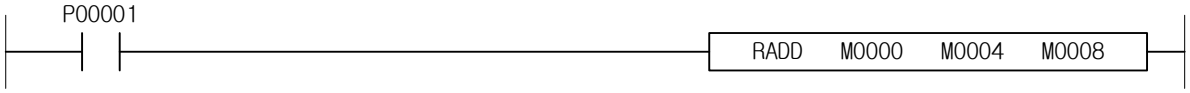
1) RADD (Real Add)

(1) It saves the result of specified real number S1 and S2 added up in D area in short real number. (short real number is occupied in 2-word)

(2) The range of operand's value is as follows;

$\pm 2^{-126} \leq |\text{Operand}| < \pm 2^{128}$

※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



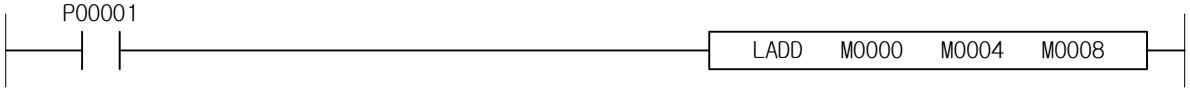
2) LADD (Long Real Add)

(1) It saves the result of specified long real number S1 and S2 added up in D area in long real number. (long real number is occupied in 4-word)

(2) The range of operand's value is as follows;

$\pm 2^{-1022} \leq |\text{Operand}| < \pm 2^{1024}$

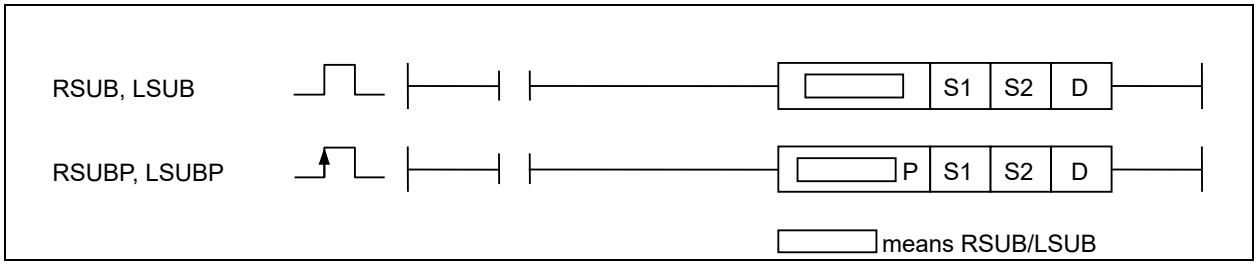
※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



4.20.10 RSUB, RSUBP, LSUB, LSUBP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RSUB(P) LSUB(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~8	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be subtracted from S2	REAL/LREAL
S2	Data to be subtracted from S1	REAL/LREAL
D	Address to save operation result	REAL/LREAL

[Flag Set]

Flag	Content	Device number
error	To be set, in case of FPU operation error flag F0057E, F0057C, F0057B, F0057A are Set(XGB not available)	F110

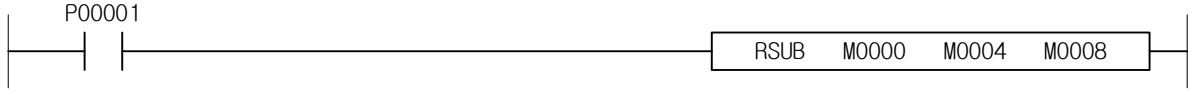
1) RSUB (Real Subtract)

(1) It saves the result of specified real number S1 minus S2 in D area in short real number. (short real number is occupied in 2-word)

(2) The range of operand's value is as follows;

$\pm 2^{-126} \leq |\text{Operand}| < \pm 2^{128}$

※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



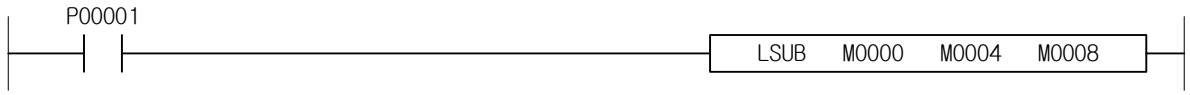
2) LSUB (Long Real Subtract)

(1) It saves the result of specified long real number S1 minus S2 in D area in long real number. (Long real number is occupied in 4-word)

(2) The range of operand's value is as follows;

$\pm 2^{-1022} \leq |\text{Operand}| < \pm 2^{1024}$

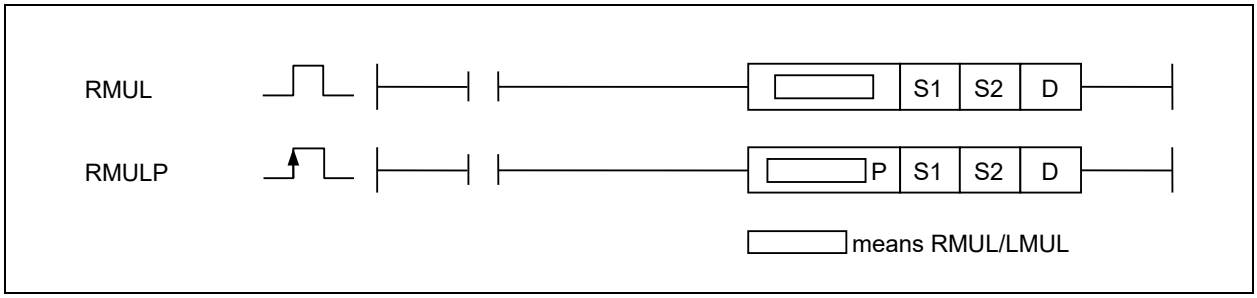
※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



4.20.11 RMUL, RMULP, LMUL, LMULP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RMUL(P) LMOV(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~8	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be multiplied by S2	REAL/LREAL
S2	Data to be multiplied by S1	REAL/LREAL
D	Address to save operation result	REAL/LREAL

[Flag Set]

Flag	Content	Device number
error	To be set, in case of FPU operation error flag F0057E, F0057C, F0057B, F0057A are Set(XGB not available)	F110

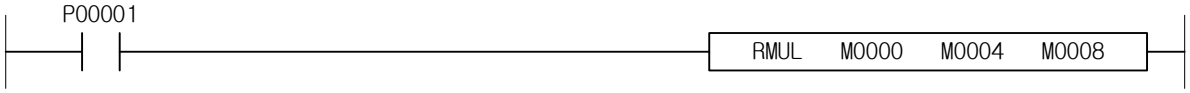
1) RMUL (Real Multiply)

(1) It saves the result of specified real number S1 multiplied by S2 in D area in real number. (short real number is occupied in 2-word)

(2) The range of operand's value is as follows;

$\pm 2^{-126} \leq |\text{Operand}| < \pm 2^{128}$

※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



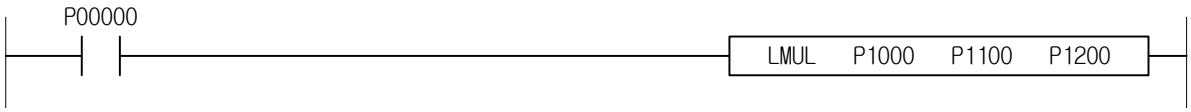
2) LMUL (Long Real Multiply)

(1) It saves the result of specified long real number S1 multiplied by S2 in D area in long real number. (Long real number is occupied in 4-word)

(2) The range of operand's value is as follows;

$\pm 2^{-1022} \leq |\text{Operand}| < \pm 2^{1024}$

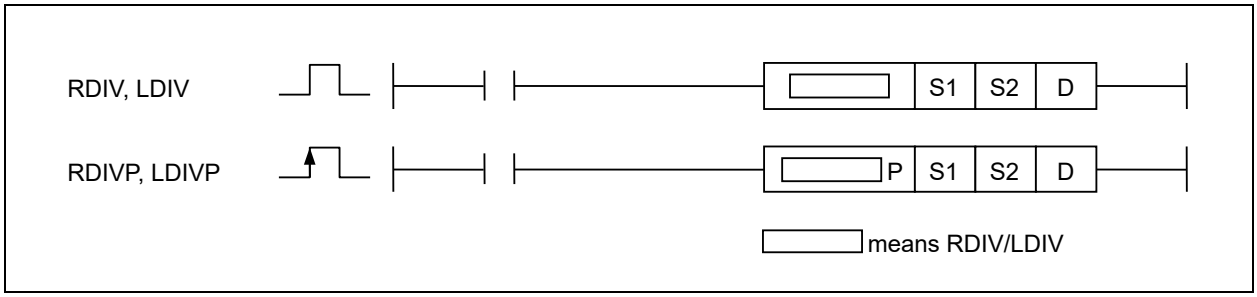
※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



4.20.12 RDIV, RDIVP, LDIV, LDIVP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RDIV(P) LDIV(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~8	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data to be divided by S2	REAL/LREAL
S2	Data to be divided by S1	REAL/LREAL
D	Address to save operation result	REAL/LREAL

[Flag Set]

Flag	Content	Device number
error	To be set, in case of FPU operation error flag F0057E, F0057C, F0057B, F0057A are Set.	F110

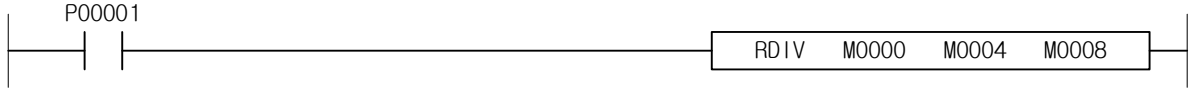
1) RDIV (Real Divide)

(1) It saves the result of specified real number S1 divided by S2 in D area in real number. (short real number is occupied in 2-word)

(2) The range of operand's value is as follows;

$\pm 2^{-126} \leq |\text{Operand}| < \pm 2^{128}$

※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



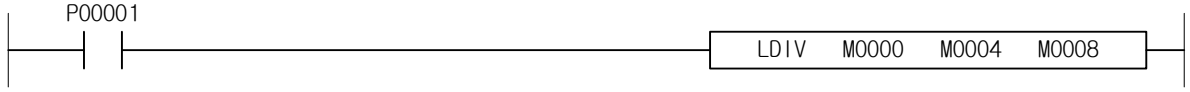
2) LDIV (Long Real Divide)

(1) It saves the result of specified long real number S1 divided by S2 in D area in long real number. (Long real number is occupied in 4-word)

(2) The range of operand's value is as follows;

$\pm 2^{-1022} \leq |\text{Operand}| < \pm 2^{1024}$

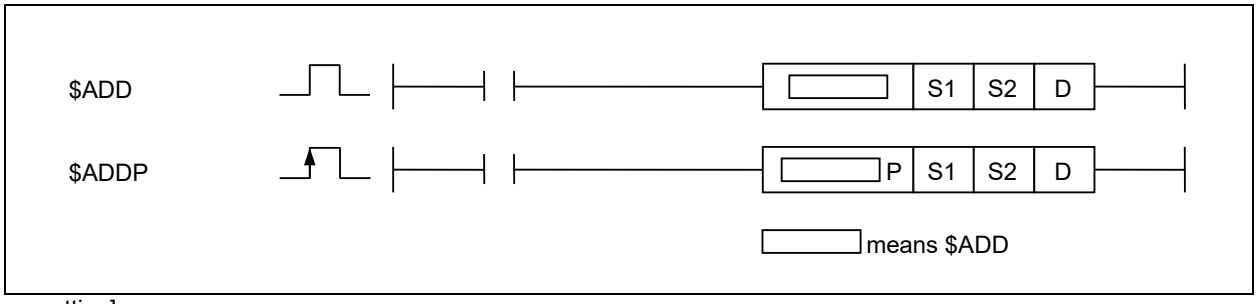
※ If the result of operand's value exceeds the range, operation error will occur. However, specific value may be assigned thereto to keep continuous operation.



4.20.13 $ADD, $ADDP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	String	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
$ADD(P)	S1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~18	-	-	-
	S2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



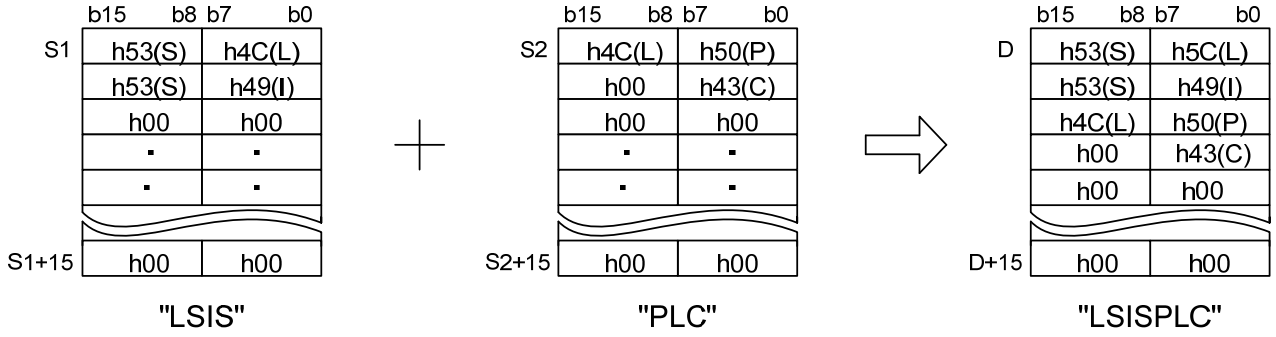
[Area setting]

Operand	Description	Data type
S1	String or Device Number String data is saved in	STRING
S2	String or Device Number String data is saved in	STRING
D	Address to save operation result	STRING

[

1) $ADD (String Add)

(1) It saves specified string data S1 as connected with S2 in D. At this moment, the string to be saved in D area will not exceed 31 letters in English which is the size of string data.



(2) Even if the length of S1 string plus S2 string exceeds the size of string data, error will not occur. In this case, the value to be saved in D will be as big as the size of string data starting from S1 value.

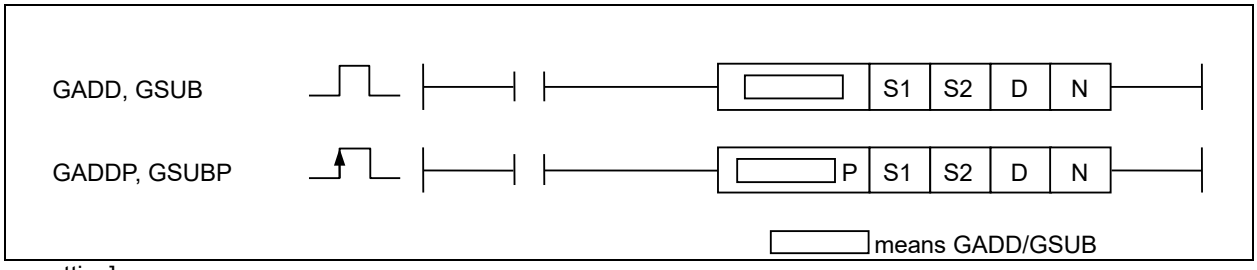
Notes

(1) String data will be processed in 16-word data regardless of the string length. Thus, string-related instruction if used shall designate a device which is allowed to use 16-word space.

4.20.14 GADD, GADDP, GSUB, GSUBP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GADD(P) GSUB(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

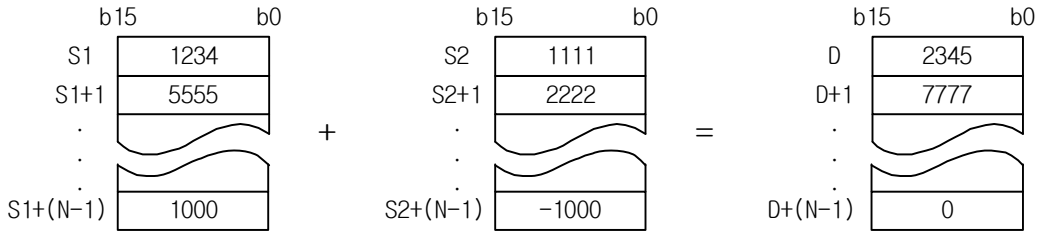
Operand	Description	Data type
S1	Data address to be added to S2	INT
S2	Data address to be added to S1	INT
D	Address to save operation result	INT
N	Number of words to add	WORD

[Flag Set]

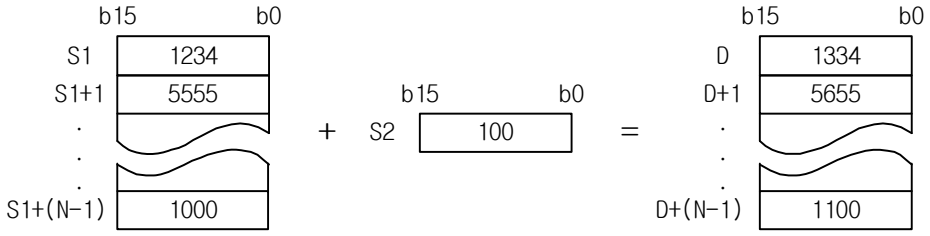
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110

1) GADD (Group Add)

(1) It saves the result of N word data from specified device S1 and N word data from S2 respectively added up in N word data from specified device D.



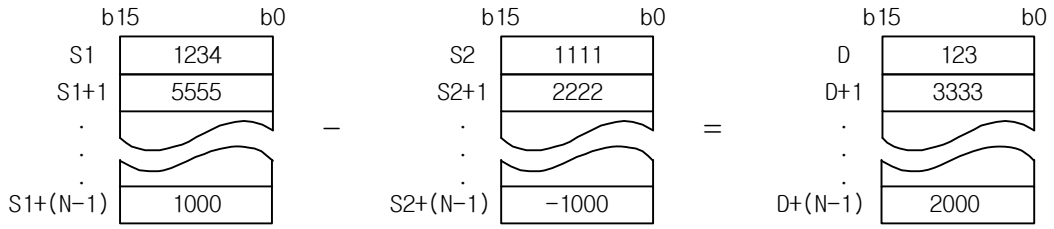
(2) A constant can be used for S2



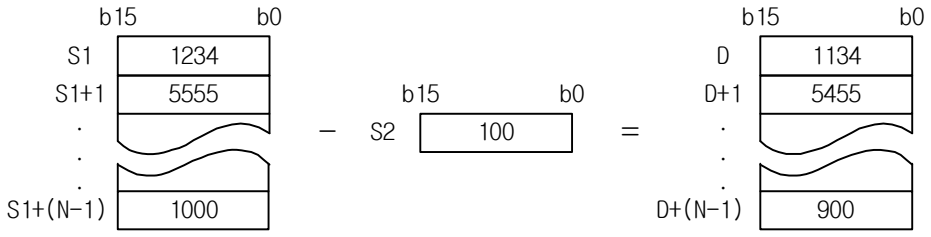
(3) If specified device's area is exceeded due to N value, error will occur.

2) GSUB (Group Subtract)

(1) It saves the result of N word data from specified device S1 minus N word data from S2 respectively in N word data from specified device D.



(2) A constant can be used for S2



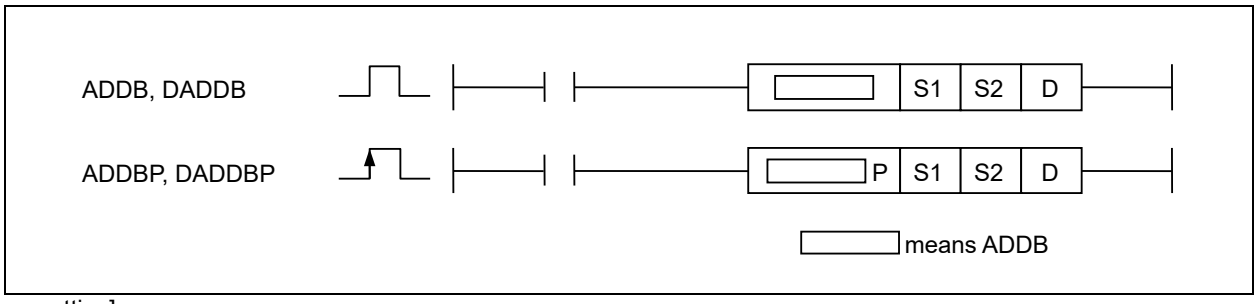
(3) If specified device's area is exceeded due to N value, error will occur.

4.21 BCD Arithmetic Operations Instruction

4.21.1 ADDB, ADDBP, DADDB, DADDBP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ADDB(P) DADDU(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	O	O
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	BCD data to be added to S2	WORD/DWORD
S2	BCD data to be added to S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

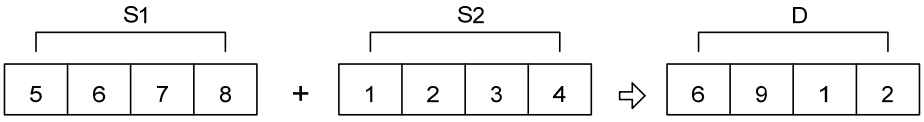
[Flag Set]

Flag	Content	Device number
error	If the value of S1 and S2 is not of BCD format.	F110
Zero	To be set if operation result is Zero..	F111
Carry	To be set if operation result is Overflow.	F112

1) ADDB (BCD ADD)

(1) It saves the result of BCD data S1 and S2 added up in D.

(2) Based on operation result, Error(F110), Zero(F111) or Carry(F112) Flag will be set.

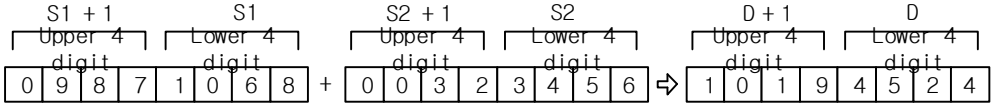


2) DADDB (BCD Double ADD)

(1) It saves the result of BCD data (S1 +1,S1) and (S2+1,S2) added up in (D+1,D).

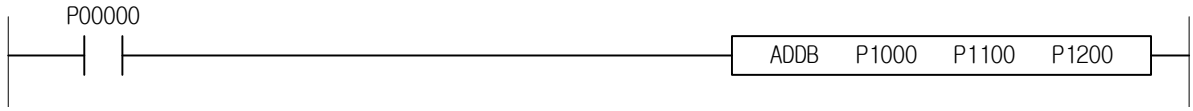
(2) 0~99,999,999 (BCD 8-digit) is available for S1 and S2.

(3) If 99,999,999 is exceeded, rounding off will be disregarded. In this case, Carry Flag will not be Set.



3) Example

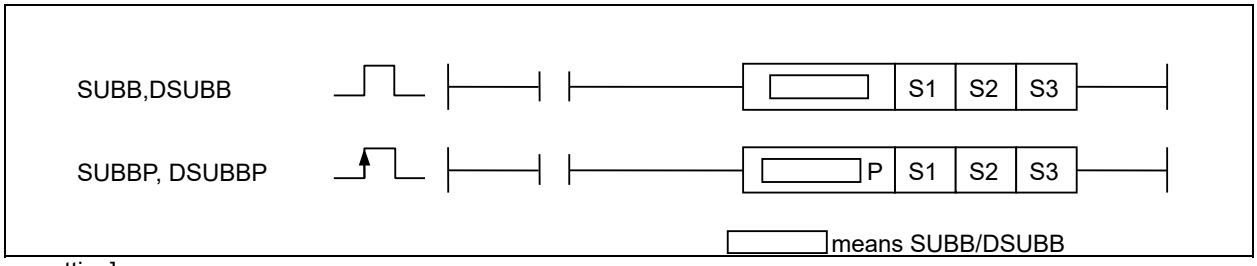
(1) In case of P1000=’100’ and P1100=’200’, If Input Signal P00000 is changed from Off to On, BCD data ‘j300’ is saved in P1200.



4.21.2 SUBB, SUBBP, DSUBB, DSUBBP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SUBB(P) DSUBB(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	O	O
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

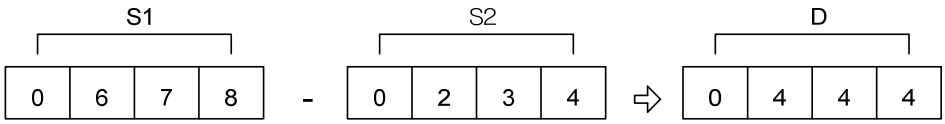
Operand	Description	Data type
S1	BCD data to be subtracted from S2	WORD/DWORD
S2	BCD data to be subtracted and the S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
error	If the value of S1 and S2 is not of BCD format.	F110
Zero	To be set if operation result is Zero..	F111
Carry	To be set if operation result is Set	F112

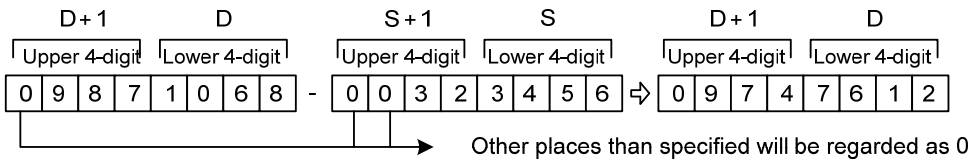
1) SUBB (BCD Subtract)

(1) It saves the result of BCD data S1 minus S2 in D.
(2) Based on operation result, Error(F110), Zero(F111) or Carry(F112) Flag will be set.
(3) If its result is Underflow, Carry Flag will be set



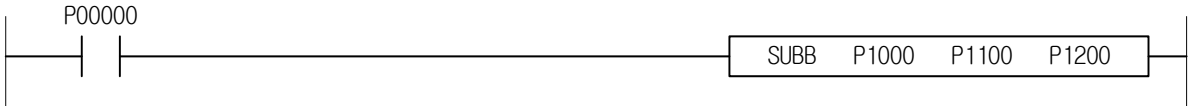
2) DSUBB (BCD Double Subtract)

(1) It saves the result of BCD data (S1 +1,S1) minus (S2+1,S2) in (D+1,D).
(2) 0~99,999,999 (BCD 8-digit) is available for S1 and S2.
(3) If its result is Underflow, Carry Flag will be set



3) Example

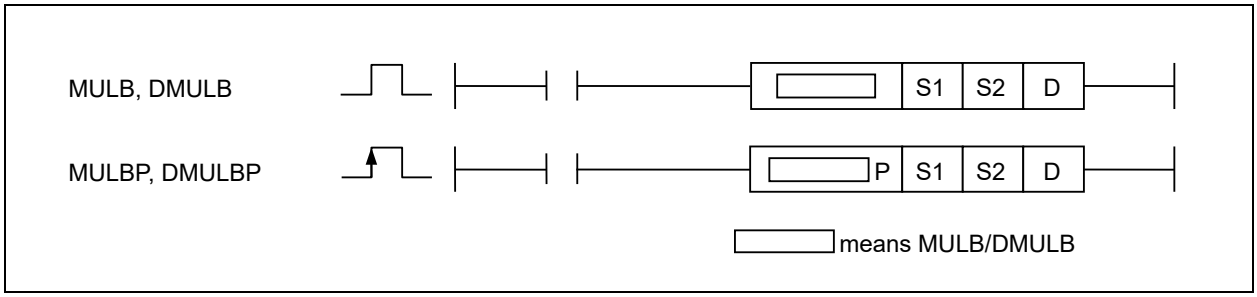
(1) In case of P1000='200' and P1100='100', Input Signal P00000 is changed from Off to On, BCD data '100' is saved in P1200.



4.21.3 MULB, MULBP, DMULB, DMULBP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MULB (P) DMULB(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	BCD data to be multiplied by S2	WORD/DWORD
S2	BCD data to be multiplied by S1	WORD/DWORD
D	Address to save operation result	DWORD/LWORD

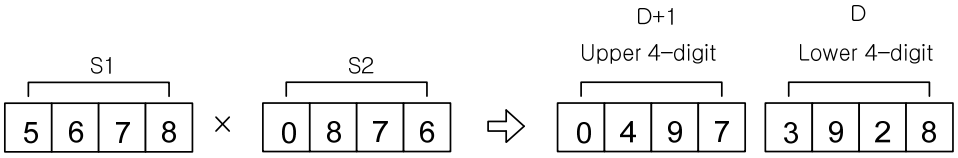
[Flag Set]

Flag	Content	Device number
error	If the value of S1 and S2 is not of BCD format.	F110
Zero	To be set if operation result is Zero..	F111

1) MULB (BCD Multiply)

(1) It saves the result of BCD data S1 multiplied by S2 in D+1,D (32-bit).

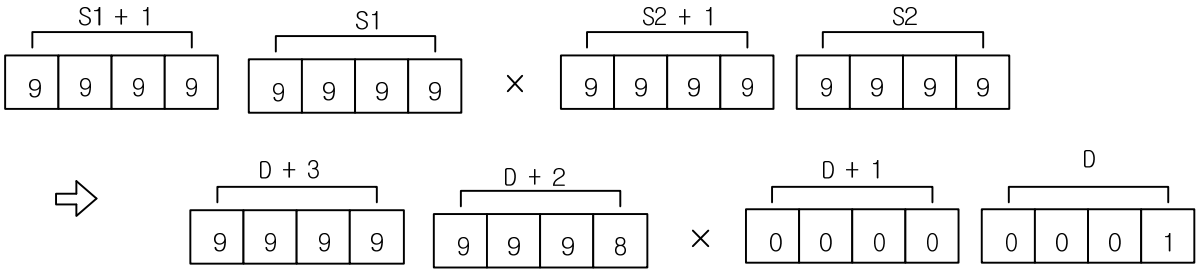
(2) Based on operation result, Error(F110), Zero(F111) Flag will be set.



2) DMULB (BCD Double Multiply)

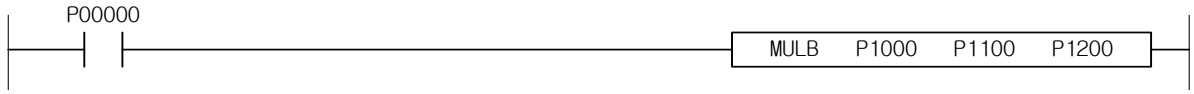
(1) It saves the result of BCD data (S1, S1+1) multiplied by (S2, S2+1) in (D, D+1, D+2, D+4).

(2) Based on operation result, Error(F110), Zero(F111) Flag will be set.



3) Example

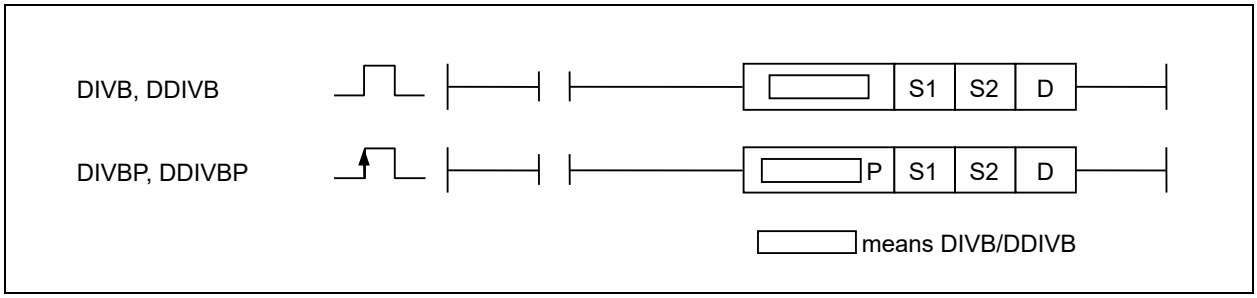
(1) In case of P1000='100' and P1100='10', If Input Signal P00000 is changed from Off to On status, BCD data '1000' is saved in P1200 and P1201, 2-word area.



4.21.4 DIVB, DIVBP, DDIVB, DDIVBP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DIVB(P) DDIVB(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-		O	O	O	O				



[Area setting]

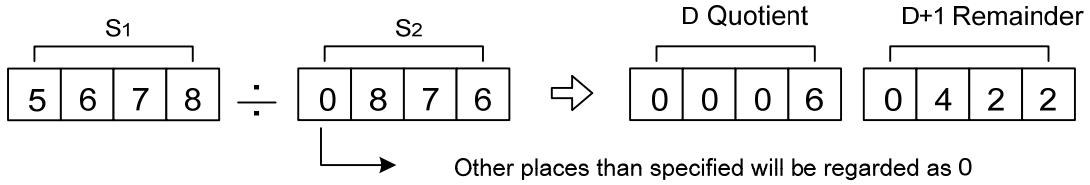
Operand	Description	Data type
S1	BCD data to be divided by S2	WORD/DWORD
S2	BCD data to be divided by S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
error	If the value of S1 and S2 is not of BCD format, if the value of S2 is 0	F110
Zero	To be set if operation result is Zero..	F111

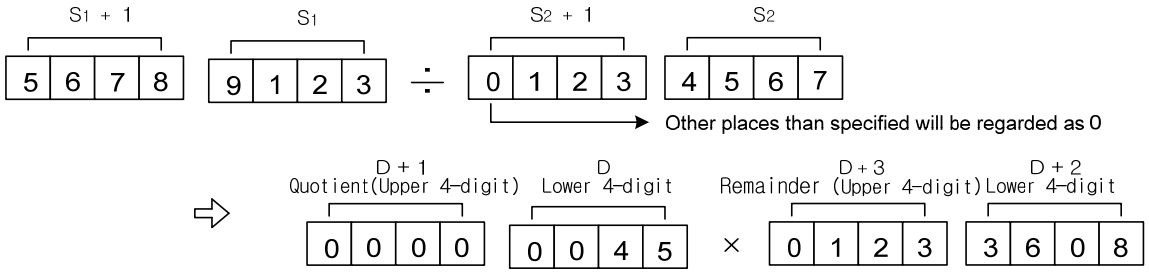
1) DIVB (BCD Divide)

(1) It saves the quotient of BCD data S1 divided by S2 in D,
(2) It saves the remainder of BCD data S1 divided by S2 in D+1,
(3) Based on operation result, Error(F110), Zero(F111) Flag will be set.



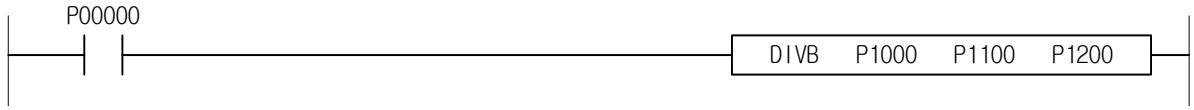
2) DDIVB (BCD Double Divide)

(1) It saves the quotient of BCD data (S1, S1+1) divided by (S2, S2+1), in (D, D+1).
(2) It saves the remainder of BCD data (S1, S1+1) divided by (S2, S2+1), (D+2, D+3).
(3) Based on operation result, Error(F110), Zero(F111) Flag will be set.



3) Example

(1) In case of P1000='105' and P1100='10', If Input Signal is changed from Off to On, P1000 is divided by P1100. In BCD division result, the quotient '10' is saved in P1200 and the remainder '5' is saved in P1201.

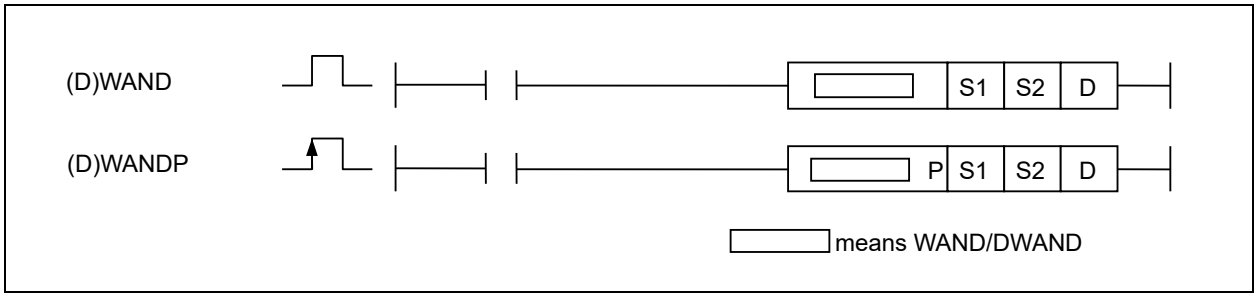

P00000
DIVB P1000 P1100 P1200

4.22 Logic Operation Instruction

4.22.1 WAND, WANDP, DWAND, DWANDP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WAND(P) DWAND(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

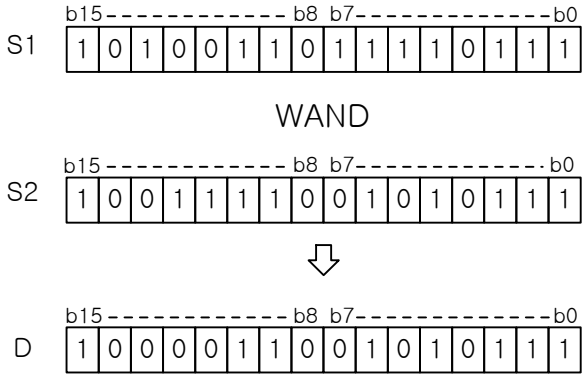
Operand	Description	Data type
S1	Data to execute (D)WAND operation with S2	WORD/DWORD
S2	Data to execute (D) WAND operation with S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111

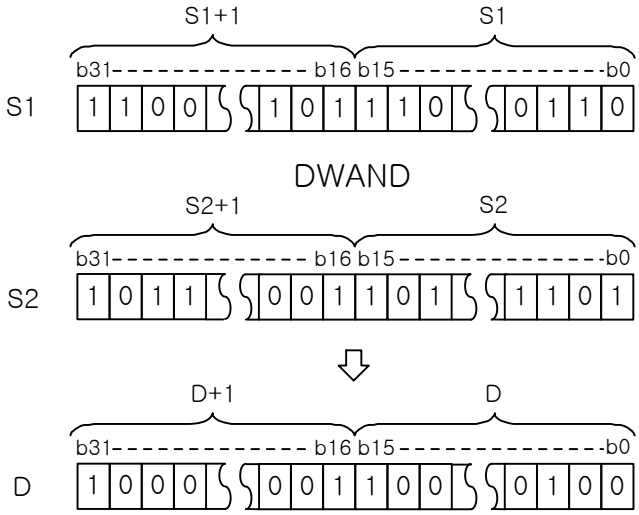
1) WAND(Word AND)

(1) It saves the result of word data (16-bit) S1 and S2 operated in Logic AND for each bit in D.



2) DWAND(Double Word AND)

(1) It saves the result of double word data (32-bit) (S1+1,S1) and (S2+1,S2) operated in Logic AND for each bit in (D+1, D).

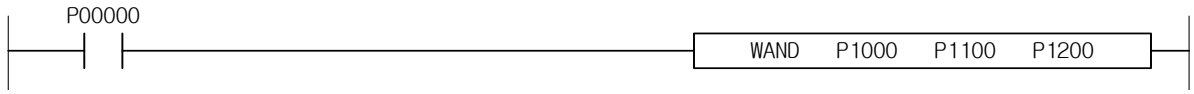


3) Logic Operation Table

Category	Contents of process	Operation Formula	Yes		
			A	B	Y
AND	It will be 1 only if input A & B are all 1 (other than that, it will be 0).	Y=A•B	0	0	0
			0	1	0
			1	0	0
			1	1	1
OR	It will be 0 only if input A & B are all 0 (other than that, it will be 1).	Y=A+B	0	0	0
			0	1	1
			1	0	1
			1	1	1
XOR	It will be 0 if input A and B are identical (if not, it will be 1).	$Y=\overline{A}\cdot B+A\cdot\overline{B}$	0	0	0
			0	1	1
			1	0	1
			1	1	0
XNR	It will be 1 if input A and B are identical (if not, it will be 0).	$Y=(\overline{A}+B)(A+\overline{B})$	0	0	1
			0	1	0
			1	0	0
			1	1	1

4) Example

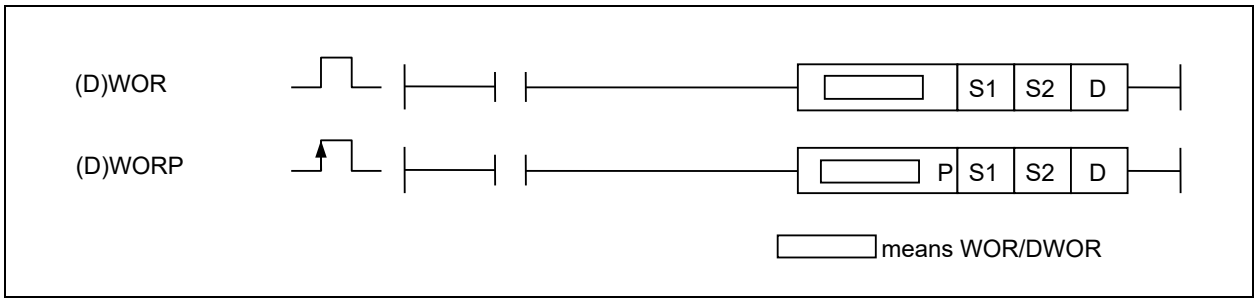
(1) In case of P1000='h1111', P1100='h3333', If Input Signal P00000 is changed from Off to On, the result WAND executed 'h3333' is saved in P1200.



4.22.2 WOR, WORP, DWOR, DWORP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WOR(P) DWOR(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

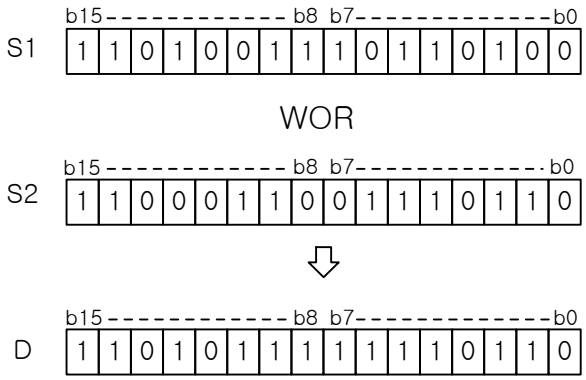
Operand	Description	Data type
S1	Data to execute (D)WOR operation with S2	WORD/DWORD
S2	Data to execute (D) WOR operation with S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111

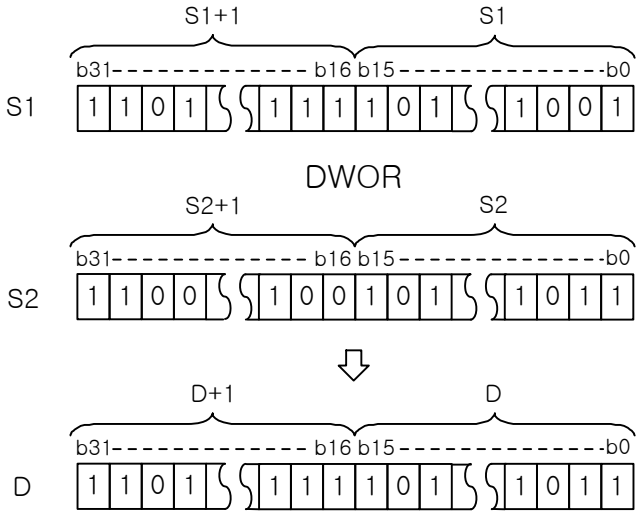
1) WOR(Word OR)

(1) It saves the priority interrupt result of word data (16-bit) S1 and S2 operated in Logic OR for each bit in D.



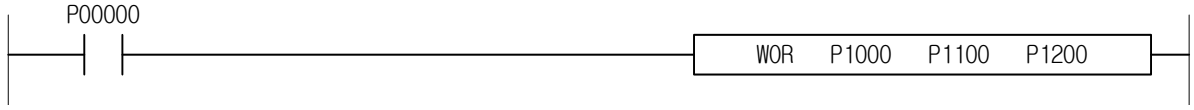
2) DWOR(Double Word OR)

(1) It saves the priority interrupt result of double word data (32-bit) (S1 +1, S1) and (S2 +1, S2) operated in Logic OR for each bit in in (D+1,D).



3) Example

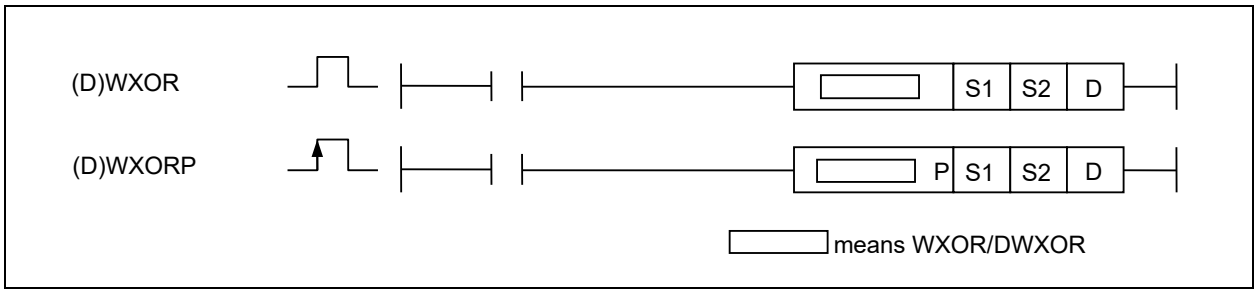
(1) In case of P1000='h1111' and P1100='h2222' , If Input Signal P00000 is changed from Off to On, the result WOR operation 'h3333' is saved in P1200.



4.22.3 WXOR, WXORP, DWXOR, DWXORP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMKL	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WXOR(P) DWXOR(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

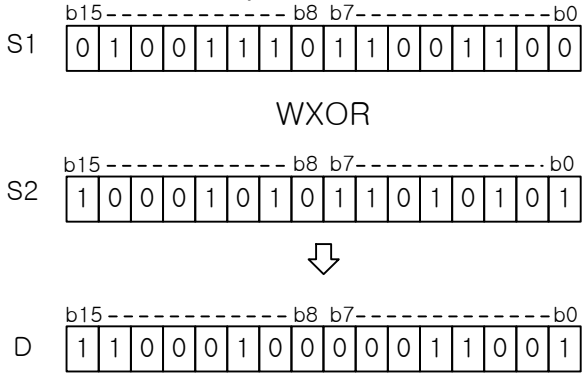
Operand	Description	Data type
S1	Data to execute (D)WXOR operation with S2	WORD/DWORD
S2	Data to execute (D) WXOR operation with S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111

1) WXOR(Word Exclusive OR)

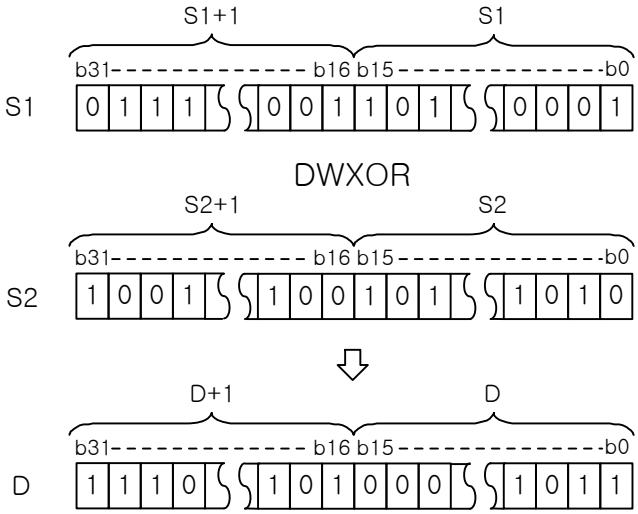
(1) It saves the result of word data S1 and S2 operated in Exclusive OR for each bit in D.



(2) Exclusive OR: If one bit is 0 and the other bit is 1, the corresponding result bit is set to 1 in D. Otherwise, the corresponding result bit is set to 0 in D.

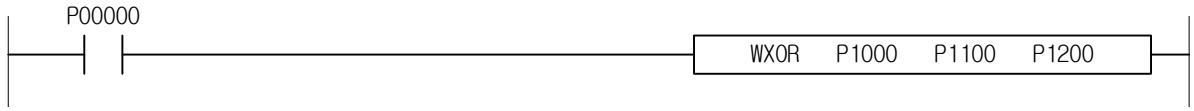
2) DWXOR(Double Word Exclusive OR)

(1) It saves the result of double word data S1+1,S1 and S2+1,S2 operated in Exclusive OR for each bit in D+1, D.



3) Example

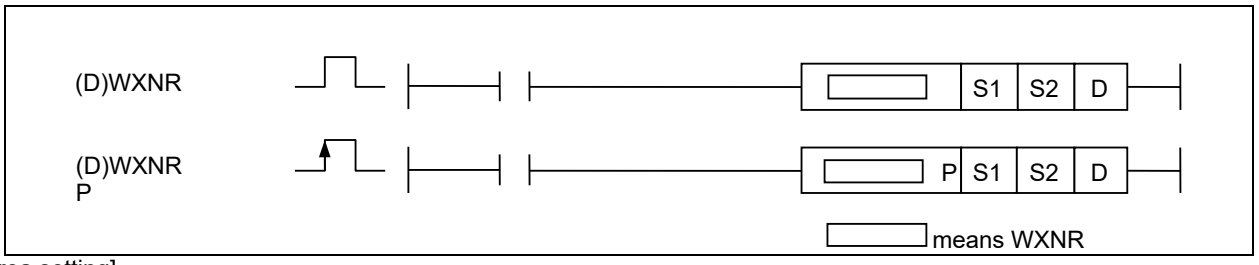
(1) In case of P1000='h1111' and P1100='h2222', Input Signal is changed from Off to On, the WOR operation result of 'h3333' is saved in P1200.



4.22.4 WXNR, WXNRP, DWXNR, DWXNRP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WXNR(P) DWXNR(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	-	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

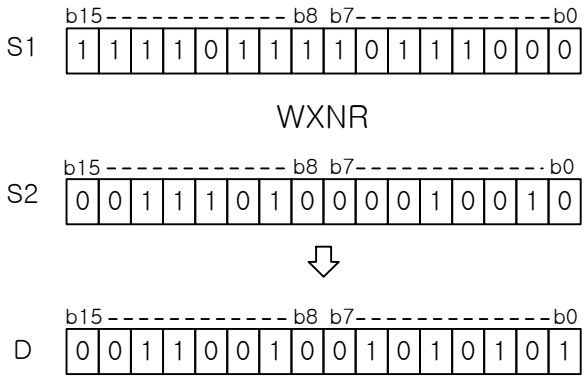
Operand	Description	Data type
S1	Data to execute (D)WXNR operation with S2	WORD/DWORD
S2	Data to execute (D) WXNR operation with S1	WORD/DWORD
D	Address to save operation result	WORD/DWORD

[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111

1) WXNR(Word Exclusive NOR)

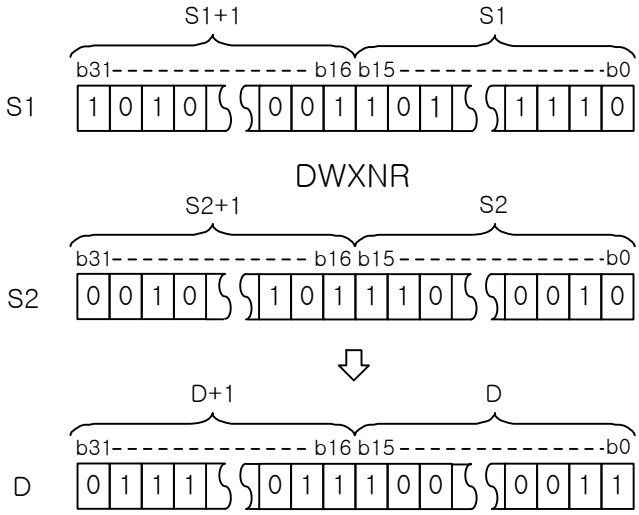
(1) It saves the result of word data S1 and S2 with Exclusive NOR for each bit in D.



(2) Exclusive NOR: If S1 and S2 bit is different from each ather, the operated result is 0. If S1 and S2 bit is same, the operated result is 1. The operated result is saved in applicable bit.

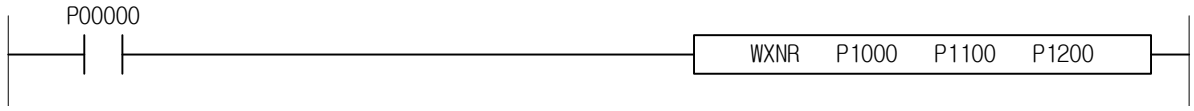
2) DWXNR(Double Word Exclusive NOR)

(1) It saves the result of Double word data (S1+1,S1) and (S2+1,S2) operated in Exclusive NOR for each bit in Double word area of (D+1, D).



3) Example

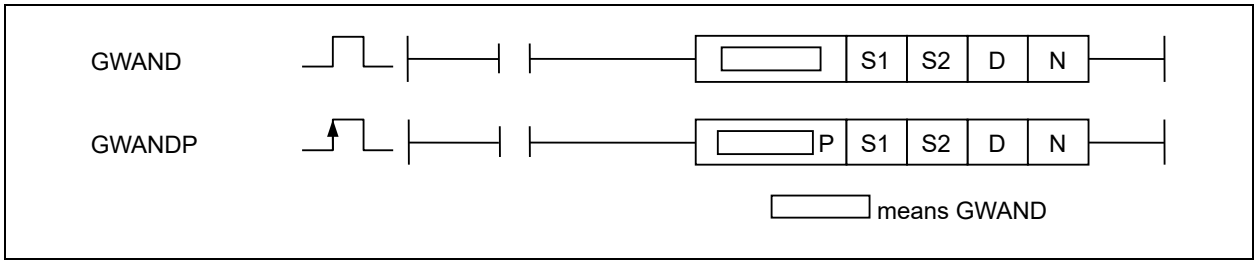
(1) In case of P1000='h1111' and P1100='h2222', If Input Signal P00000 is changed from Off to On, the Exclusive NOR (WXNR) result 'hCCCC' is saved in P1200.



4.22.5 GWAND, GWANDP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GWAND(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

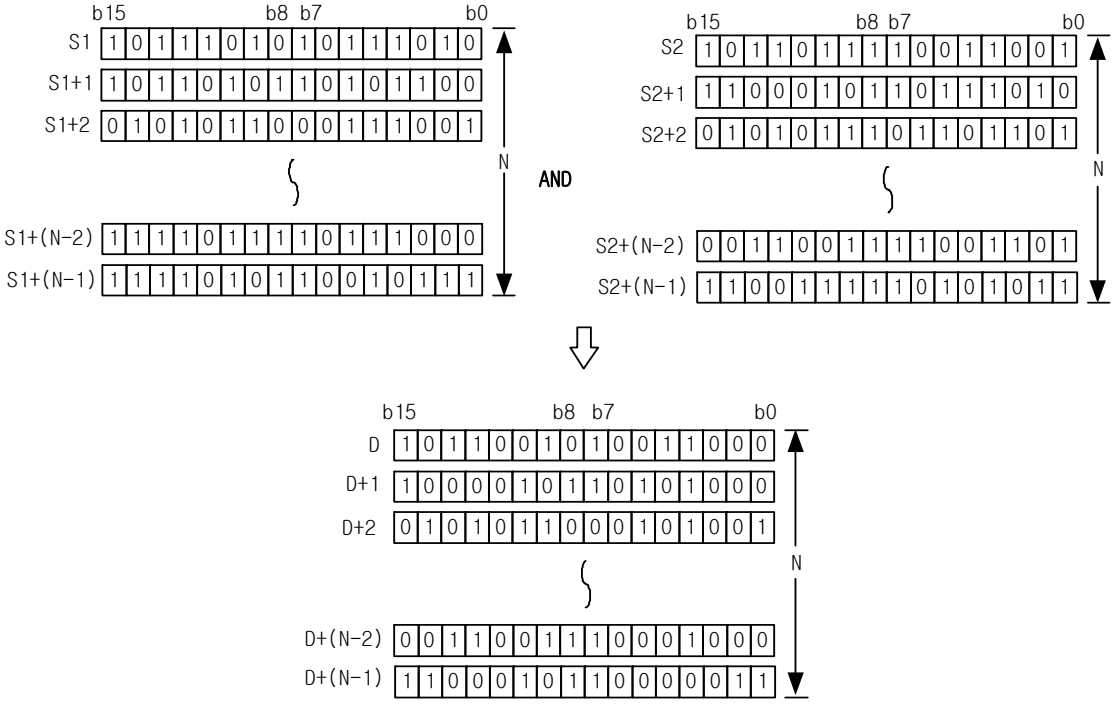
Operand	Description	Data type
S1	Address of data to start GWAND operation with S2	WORD
S2	Address of data to start GWAND operation with S1	WORD
D	Address to save operation result	WORD
N	Number of data to execute WAND operation between words	WORD

[Flag Set]

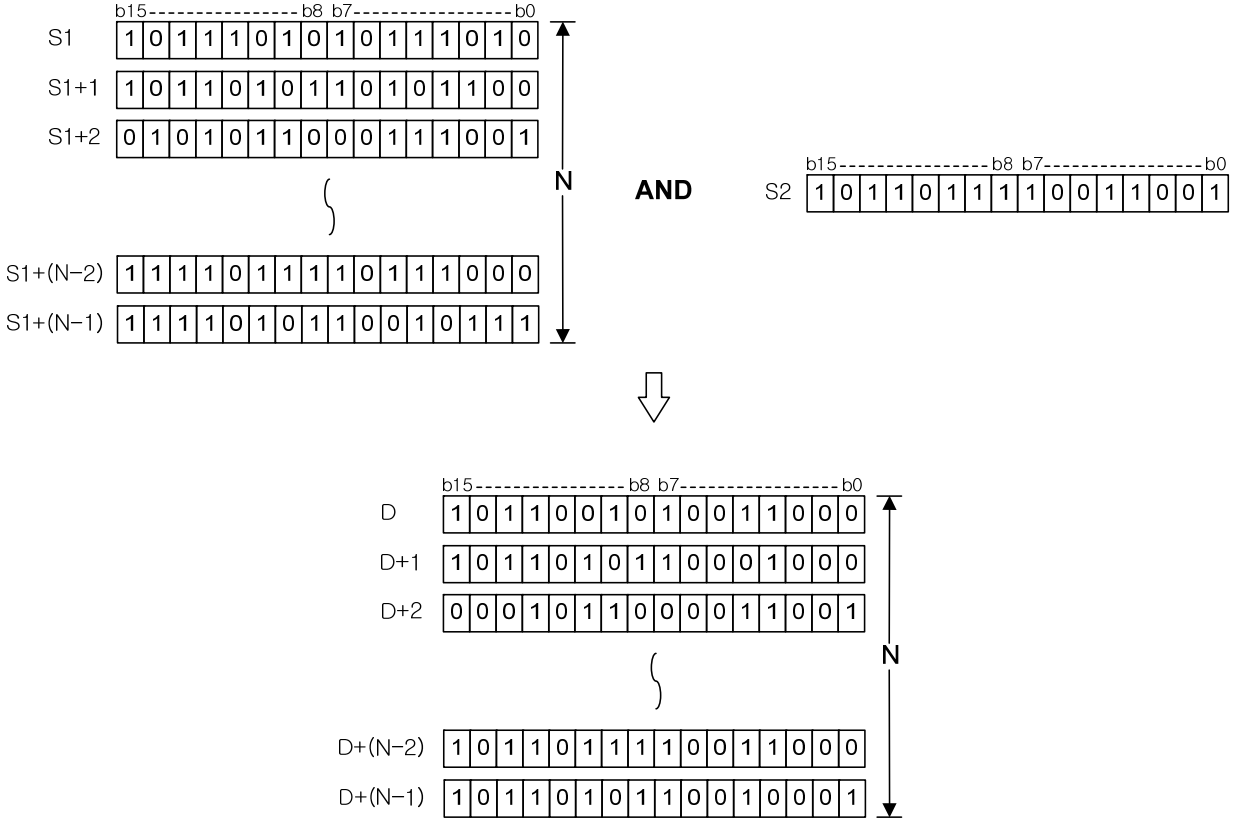
Flag	Content	Device number
error	If N value exceeds applicable device's area.	F110

1) GWAND(Group Word AND)

(1) It saves the results of word data from S1 and S2 operated in Logic WAND for N times in word unit in D in regular order.

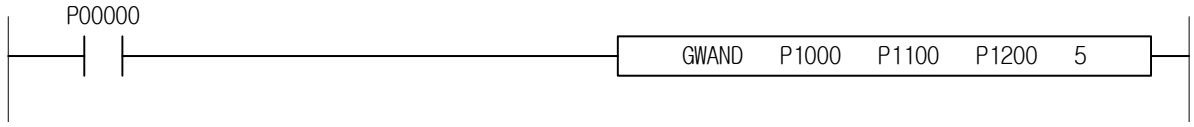


(2) h0000 ~ hFFFF((BIN 16-bit) of integer is available for S2.



2) Example

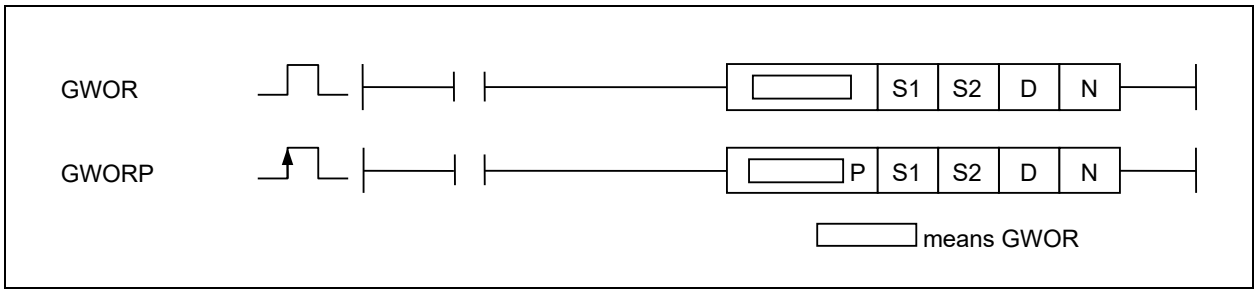
(1) If Input Signal P00000 is changed from Off to ON status, It saves the result of GWAND operation 5-word data from P1000~P1004 with 5-word data from P1100~P1104 in 5-word of P1200~1204 respectively.



4.22.6 GWOR, GWORP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GWOR(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

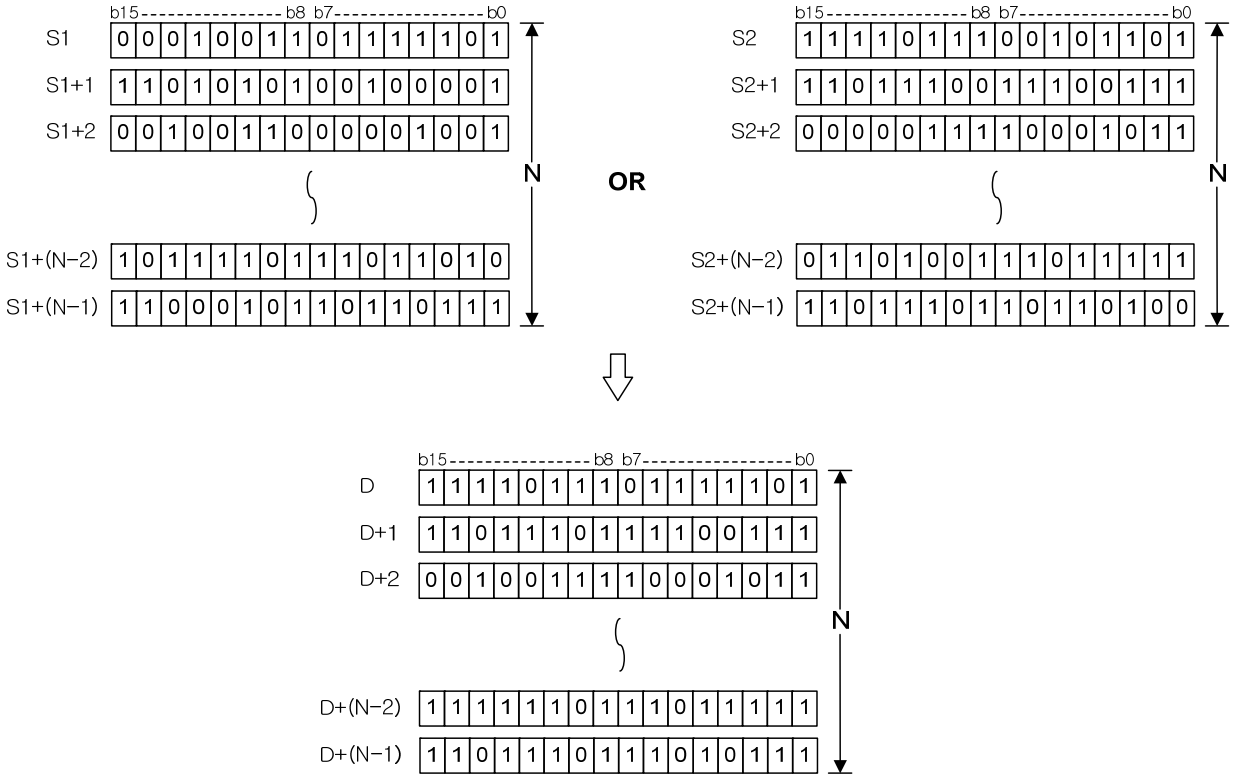
Operand	Description	Data type
S1	Address of data to start GWOR operation with S2	WORD
S2	Address of data to start GWOR operation with S1	WORD
D	Address to save operation result	WORD
N	Number of data to execute WOR operation	WORD

[Flag Set]

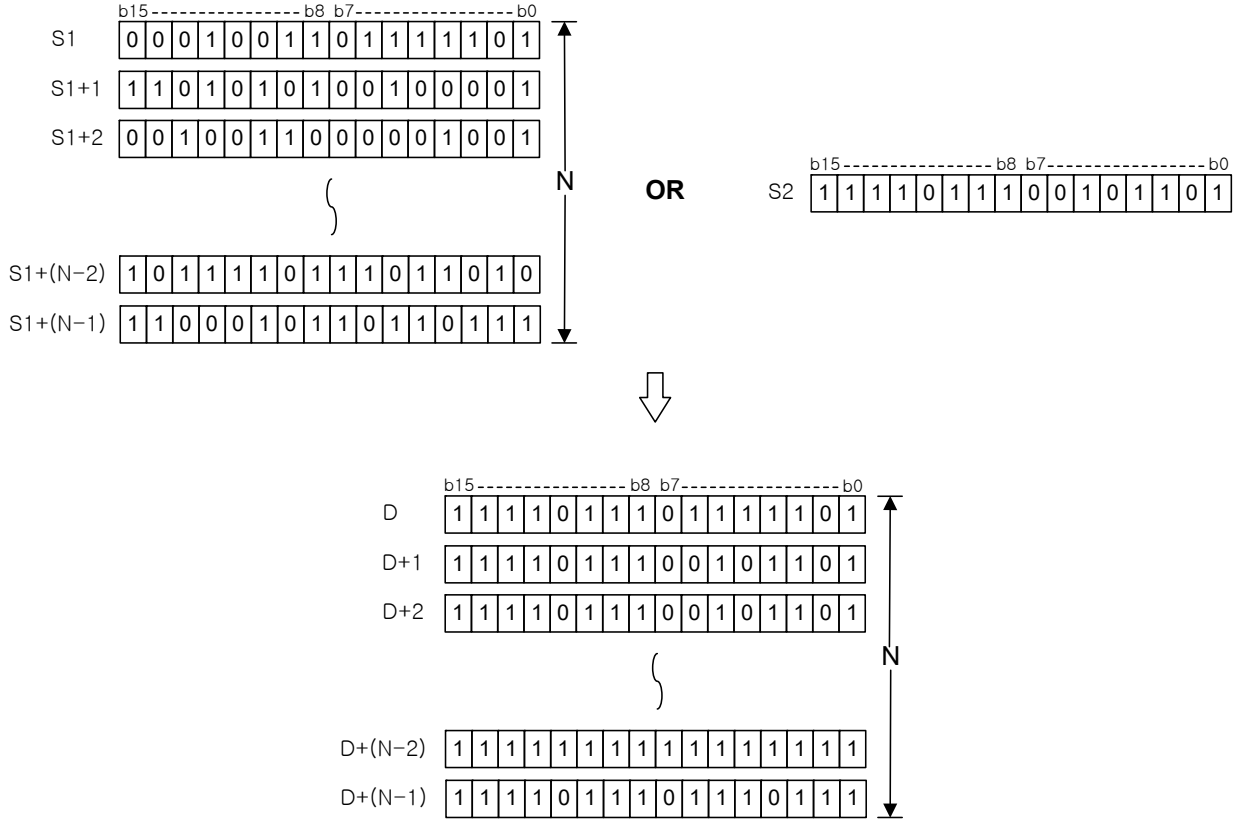
Flag	Content	Device number
error	If N value exceeds applicable device's area.	F110

1) GWOR(Group Word OR)

(1) It saves the results of word data from S1 and S2 operated in Logic WOR for N times in word unit in D in regular order.

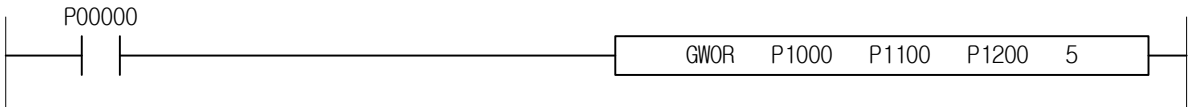

b15 b8 b7 b0
S1
S1+1
S1+2
S1+(N-2)
S1+(N-1)
N
OR
S2
S2+1
S2+2
S2+(N-2)
S2+(N-1)
N
D
D+1
D+2
D+(N-2)
D+(N-1)
N

(2) h0000 ~ hFFFF((BIN 16-bit) of integer is available for S2.



2) Example

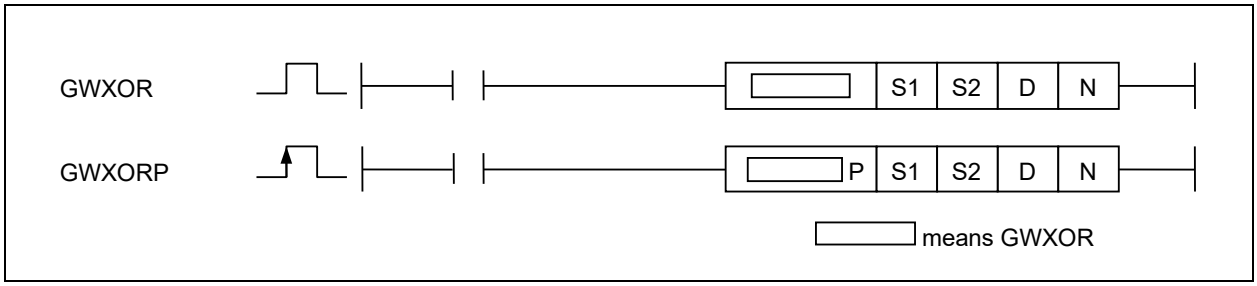
(1) If Input Signal P00000 is changed from Off to On, It saves the result of GWOR operation 5-word data from P1000~P1004 with 5-word data from P1100~P1104 in 5-word data of P1200~P1204 respectively.



4.22.7 GWXOR, GWXORP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GWXOR(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

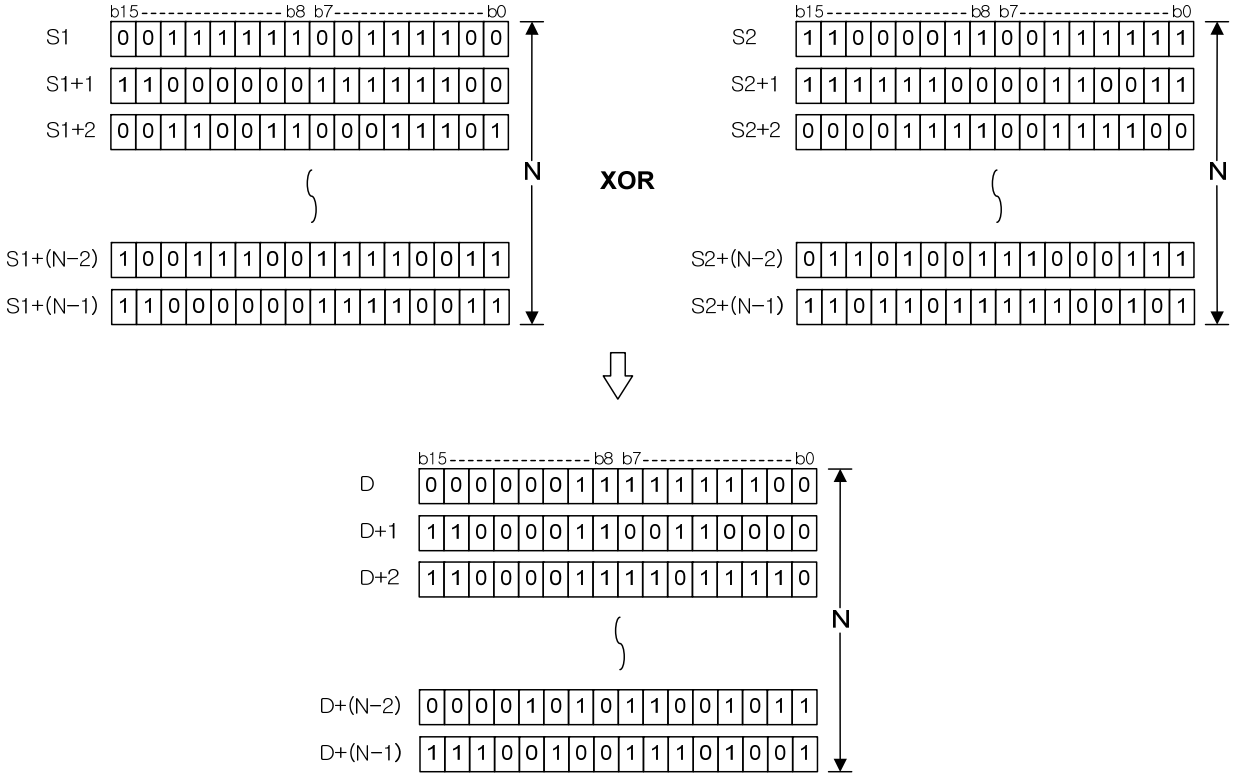
Operand	Description	Data type
S1	Address of data to start GWXOR operation with S2	WORD
S2	Address of data to start GWXOR operation with S1	WORD
D	Address to save operation result	WORD
N	Number of data to execute WXOR operation	WORD

[Flag Set]

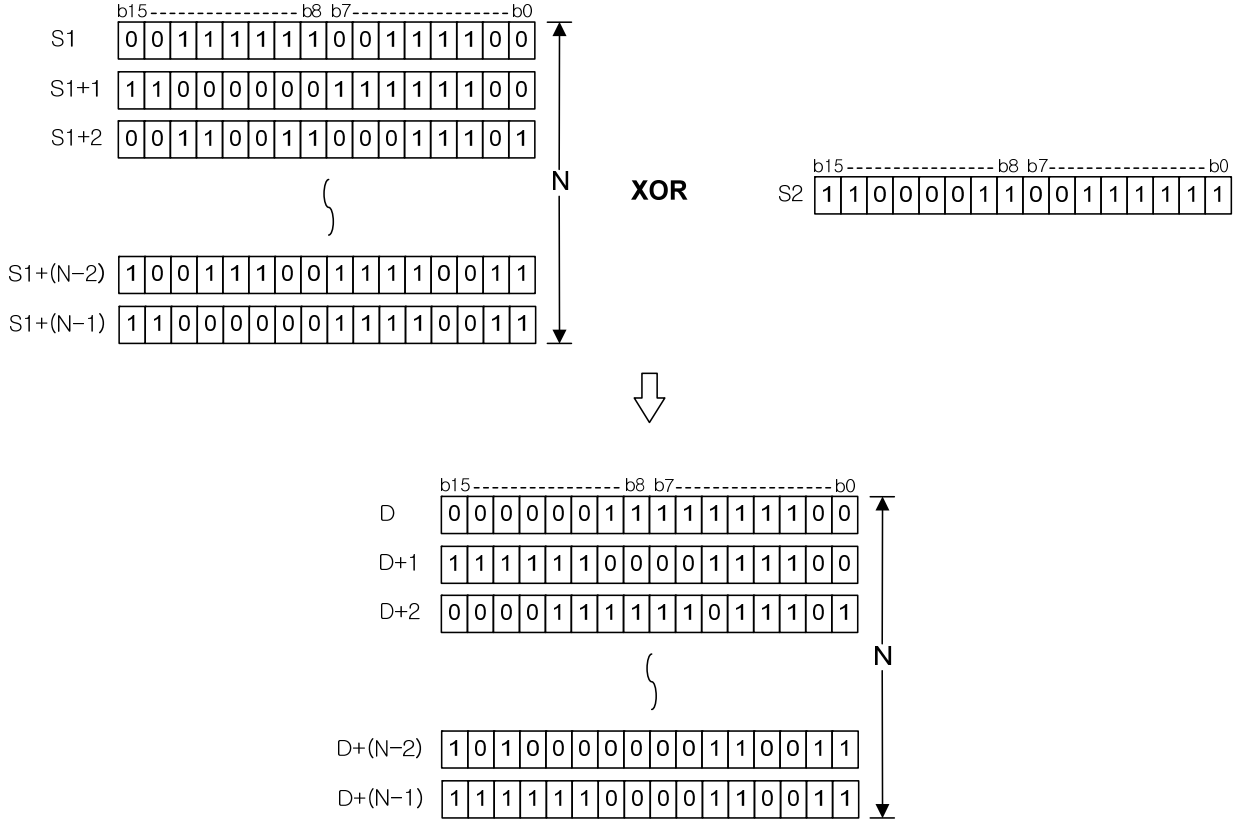
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110

1) GWXOR(Group Word XOR)

(1) It saves the results of word data from S1 and S2 operated in Logic WXOR for N times in word unit in D in regular order.

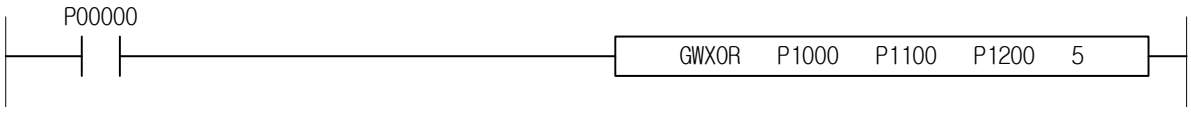


(2) h0000 ~ hFFFF((BIN 16-bit) of integer is available for S2.



2) Example

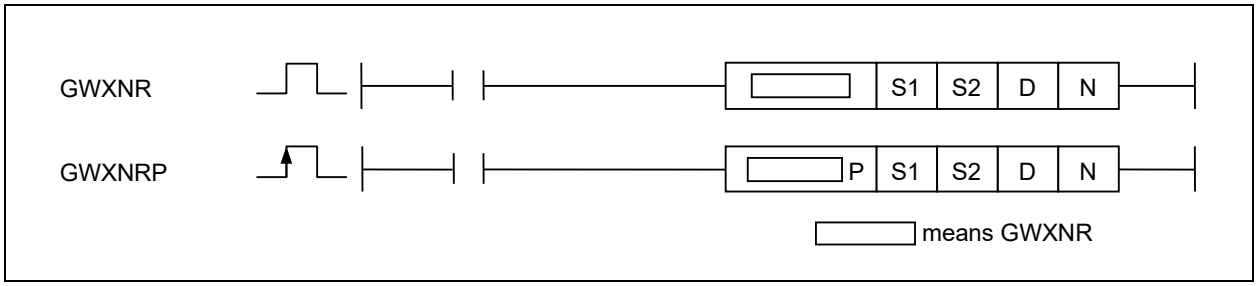
(1) If Input Signal P00000 is changed from Off to On status, It saves the result of GWXOR operation 5-word data from P1000~P1004 with 5-word data from P1100~P1104 in 5-word data of P1200~P1204 respectively.



4.22.8 GWXNR, GWXNRP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GWXNR(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

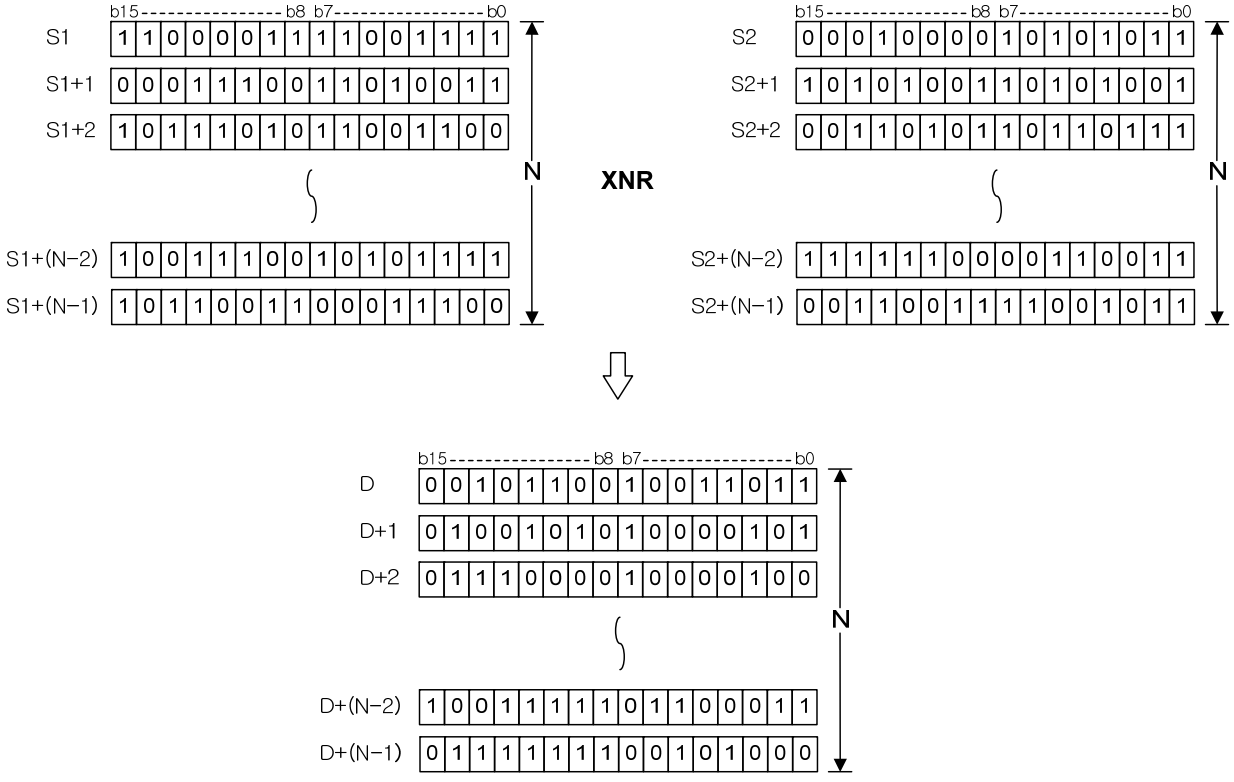
Operand	Description	Data type
S1	Address of data to start GWXNR operation with S2	WORD
S2	Address of data to start GWXNR operation with S1	WORD
D	Address to save operation result	WORD
N	Number of data to execute WXNR operation	WORD

[Flag Set]

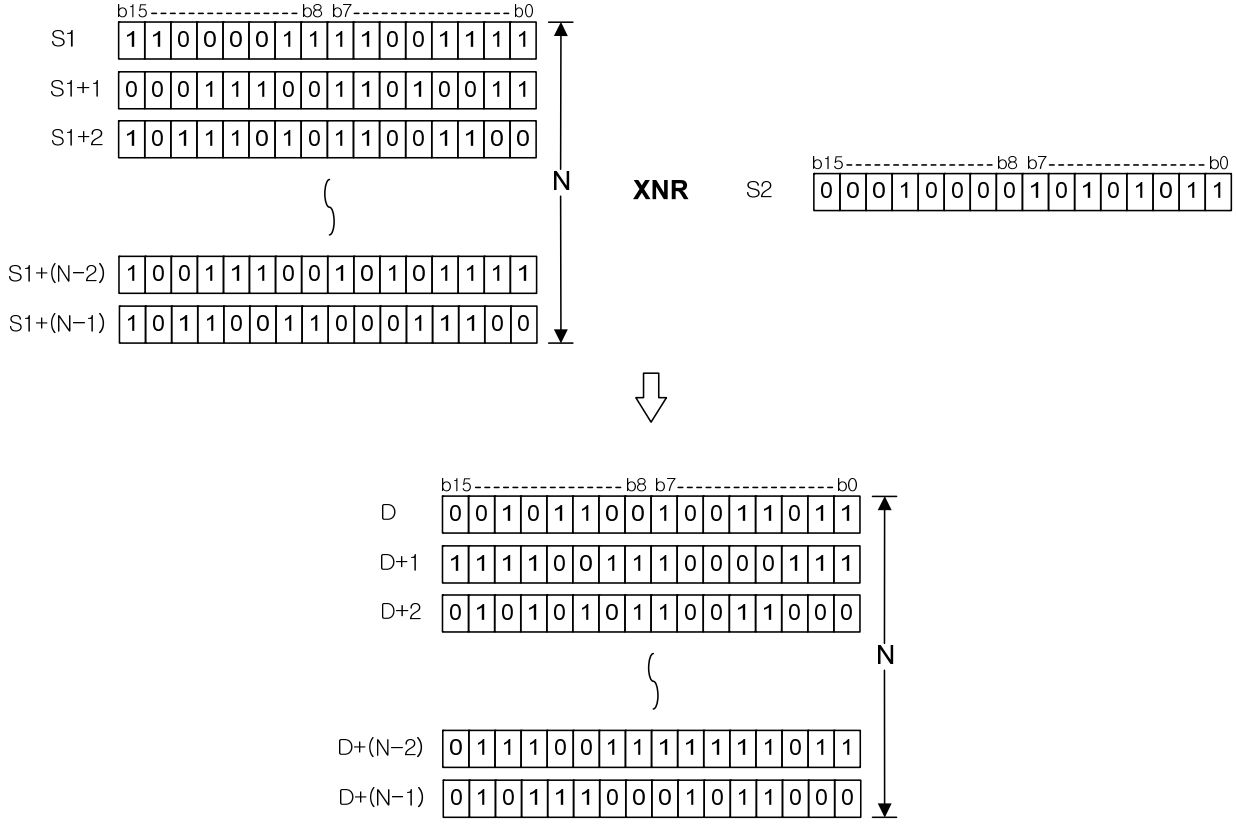
Flag	Content	Device number
error	If N value exceeds applicable device's area.	F110

1) GWXNR(Group Word XNR)

(1)) It saves the results of word data from S1 and S2 operated in Logic WXNR for N times in word unit in D in regular order

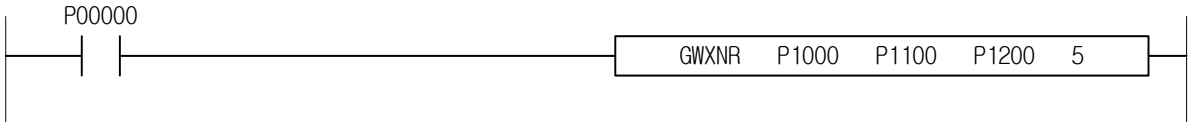


(2) h0000 ~ hFFFF((BIN 16-bit) of integer is available for S2.



2) Example

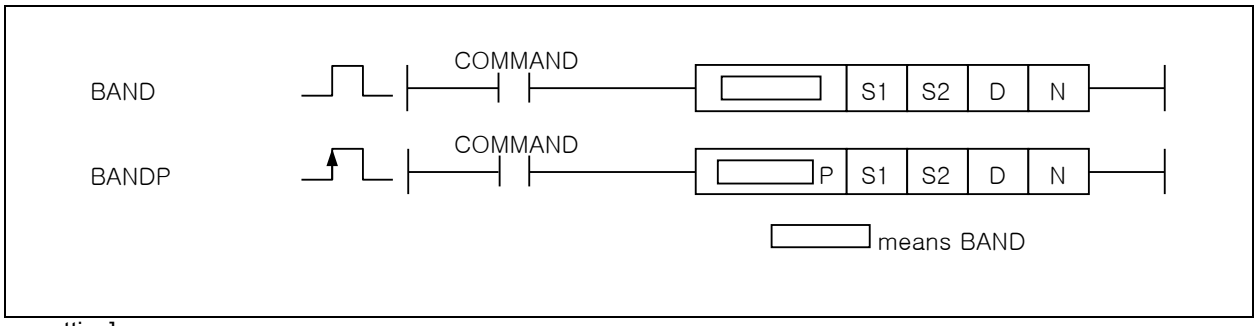
(1) If Input Signal P00000 is changed from Off to On status, It saves the result of GWXNR operation 5-word data from P1000~P1004 with 5-word data from P1100~P1104 in 5-word data of P1200~P1204 respectively.



4.22.9 BAND, BANDP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BAND(P)	S1	O	-	O	-	-	-	-	O	O	-	O	-	-	-	6~8	O	-	-
	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

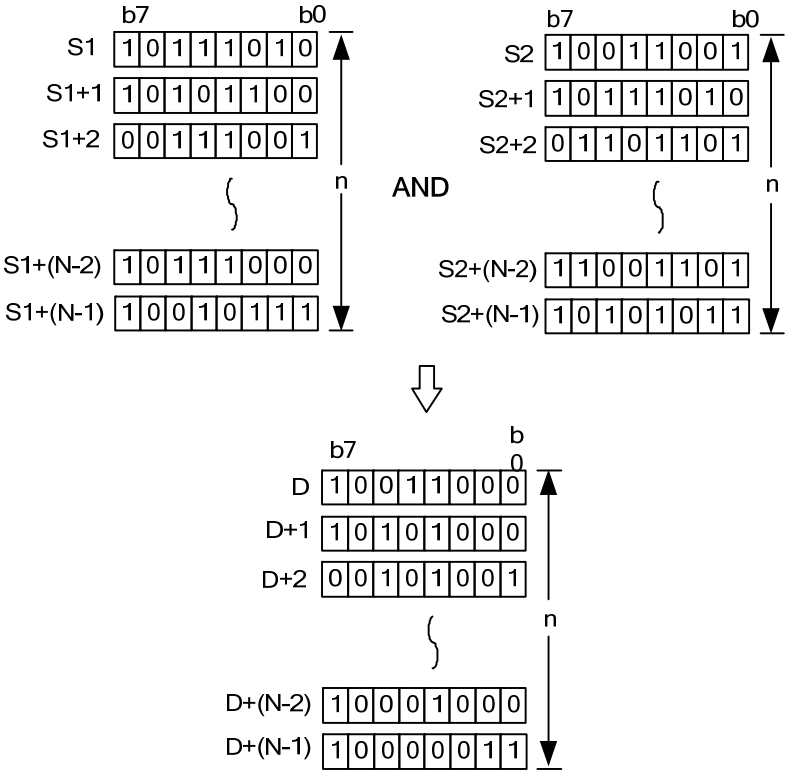
Operand	Description	Data type
S1	Address of data to start BAND operation with S2	BYTE
S2	Address of data to start BAND operation with S1	BYTE
D	Address to save BAND operation result in	BYTE
N	Number of byte data to execute AND operation	WORD

[Flag Set]

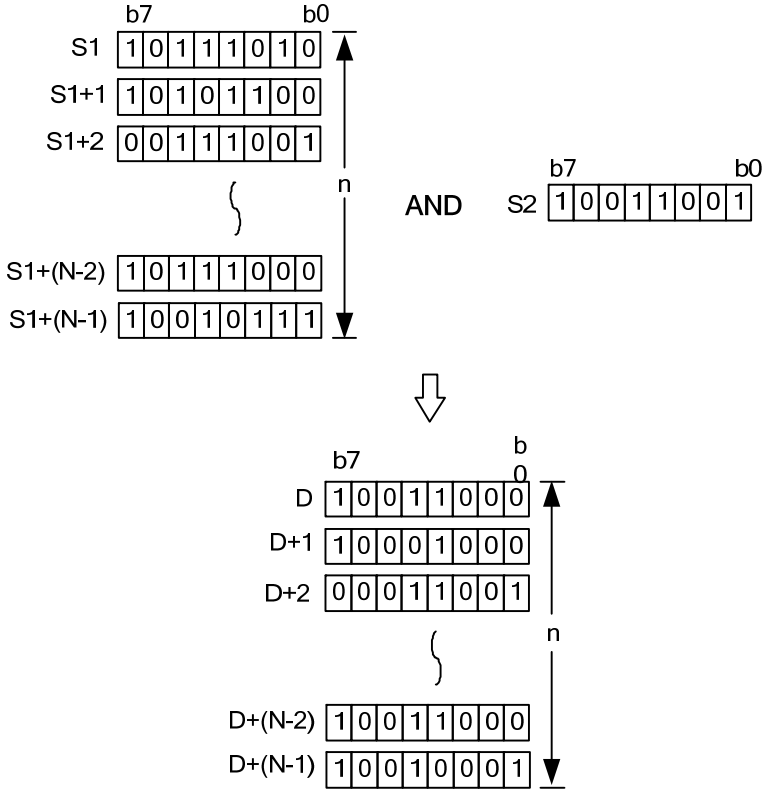
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110

1) BAND(Group Byte AND)

(1) It saves the results of word data from S1 and S2 operated in Logic AND for N times in byte unit in D in regular order.

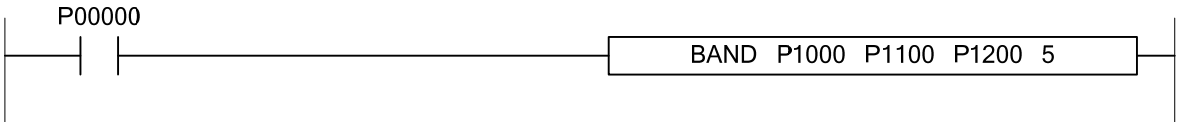

b7
b0
S1
1 0 1 1 1 0 1 0
S1+1
1 0 1 0 1 1 0 0
S1+2
0 0 1 1 1 0 0 1
n
S1+(N-2)
1 0 1 1 1 0 0 0
S1+(N-1)
1 0 0 1 0 1 1 1
AND
b7
b0
S2
1 0 0 1 1 0 0 1
S2+1
1 0 1 1 1 0 1 0
S2+2
0 1 1 0 1 1 0 1
n
S2+(N-2)
1 1 0 0 1 1 0 1
S2+(N-1)
1 0 1 0 1 0 1 1
b7
b
0
D
1 0 0 1 1 0 0 0
D+1
1 0 1 0 1 0 0 0
D+2
0 0 1 0 1 0 0 1
n
D+(N-2)
1 0 0 0 1 0 0 0
D+(N-1)
1 0 0 0 0 0 1 1

(2) -128 ~ 127((BIN 8-bit) of integer is available for S2.



2) Example

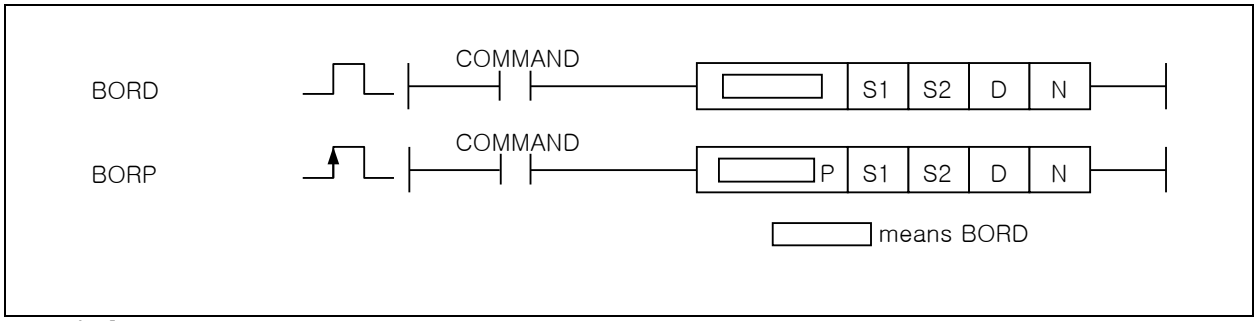
If input signal P00000 is Off -> On, executes AND operation for 5 byte data of P1000~P1004 and 5 byte data of P1100~P1104 and saves result in 5 byte data area of P1200~P1204.



4.22.10 BOR, BORP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BOR(P)	S1	O	-	O	-	-	-	-	O	O	-	O	-	-	-	6~8	O	-	-
	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

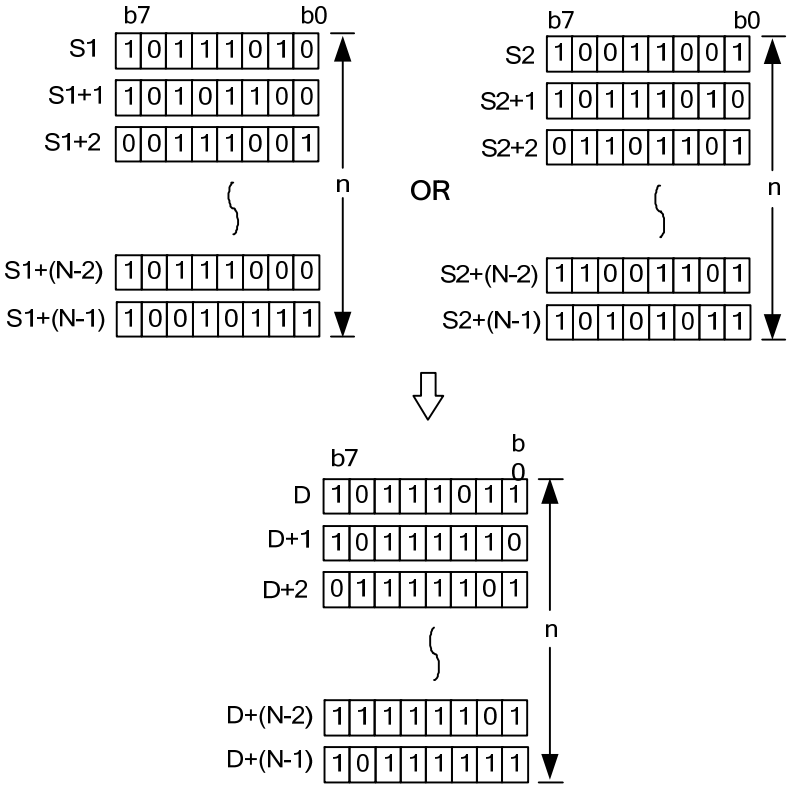
Operand	Description	Data type
S1	Address of data to start BOR operation with S2	BYTE
S2	Address of data to start BOR operation with S1	BYTE
D	Address to save BOR operation result	BYTE
N	Number of byte data to execute AND operation	WORD

[Flag Set]

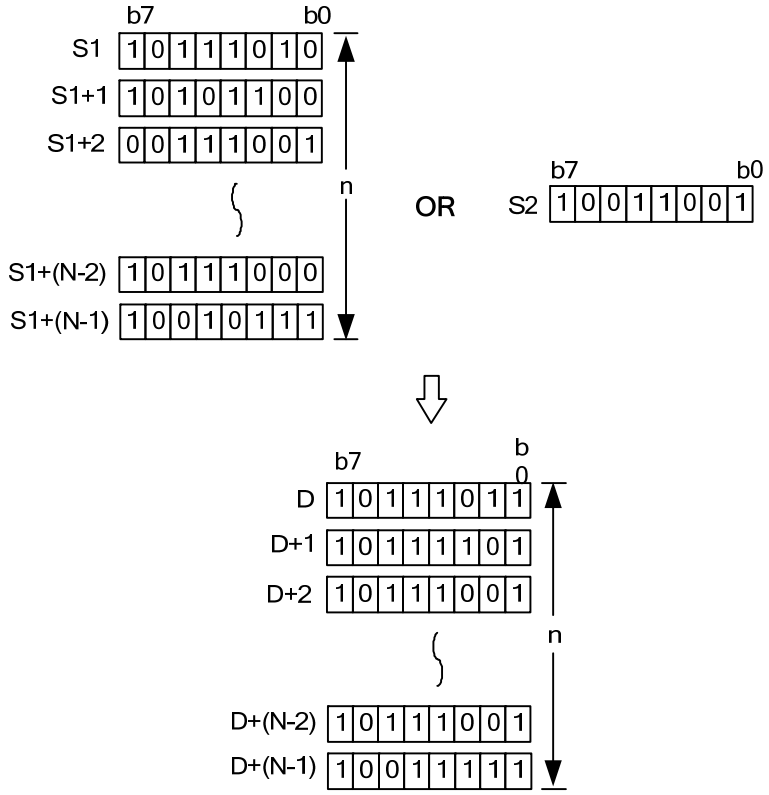
Flag	Content	Device number
error	To be set, if N's range exceeds specified area. Applicable instruction result is not processed.	F110

1) BOR(Group Byte OR)

(1) It saves the results of word data from S1 and S2 operated in Logic OR for N times in byte unit in D in regular order.

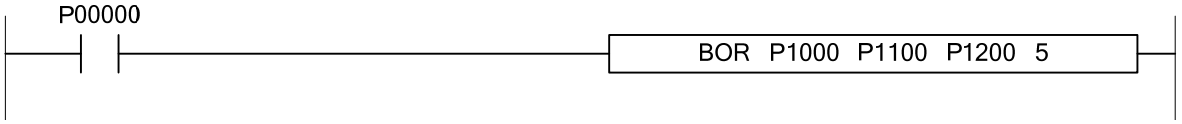

b7
b0
S1
1 0 1 1 1 0 1 0
S1+1
1 0 1 0 1 1 0 0
S1+2
0 0 1 1 1 0 0 1
n
S1+(N-2)
1 0 1 1 1 0 0 0
S1+(N-1)
1 0 0 1 0 1 1 1
OR
b7
b0
S2
1 0 0 1 1 0 0 1
S2+1
1 0 1 1 1 0 1 0
S2+2
0 1 1 0 1 1 0 1
n
S2+(N-2)
1 1 0 0 1 1 0 1
S2+(N-1)
1 0 1 0 1 0 1 1
b7
b0
D
1 0 1 1 1 0 1 1
D+1
1 0 1 1 1 1 1 0
D+2
0 1 1 1 1 1 0 1
n
D+(N-2)
1 1 1 1 1 1 0 1
D+(N-1)
1 0 1 1 1 1 1 1

(2) -128 ~ 127((BIN 8-bit) of integer is available for S2.



2) Example

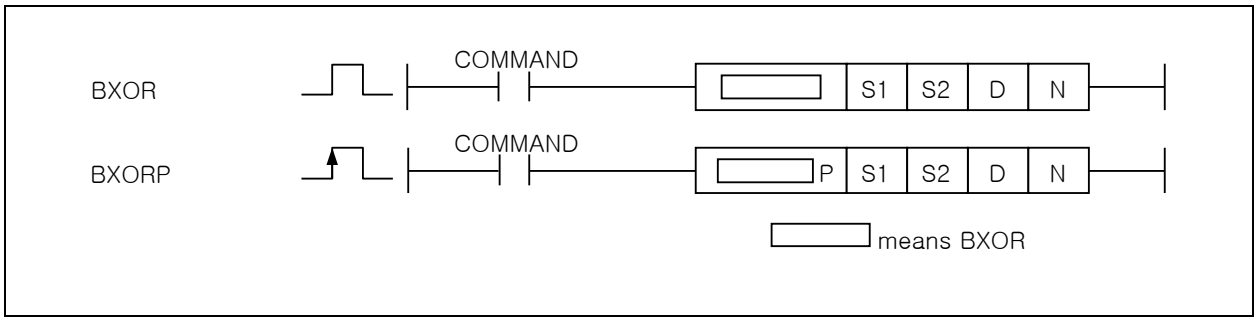
If input signal P00000 is Off -> On, executes OR operation for 5 byte data of P1000~P1004 and 5 byte data of P1100~P1104 and saves result in 5 byte data area of P1200~P1204.



4.22.11 BXOR, BXORP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BXOR(P)	S1	O	-	O	-	-	-	-	O	O	-	O	-	-	-	6~8	O	-	-
	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

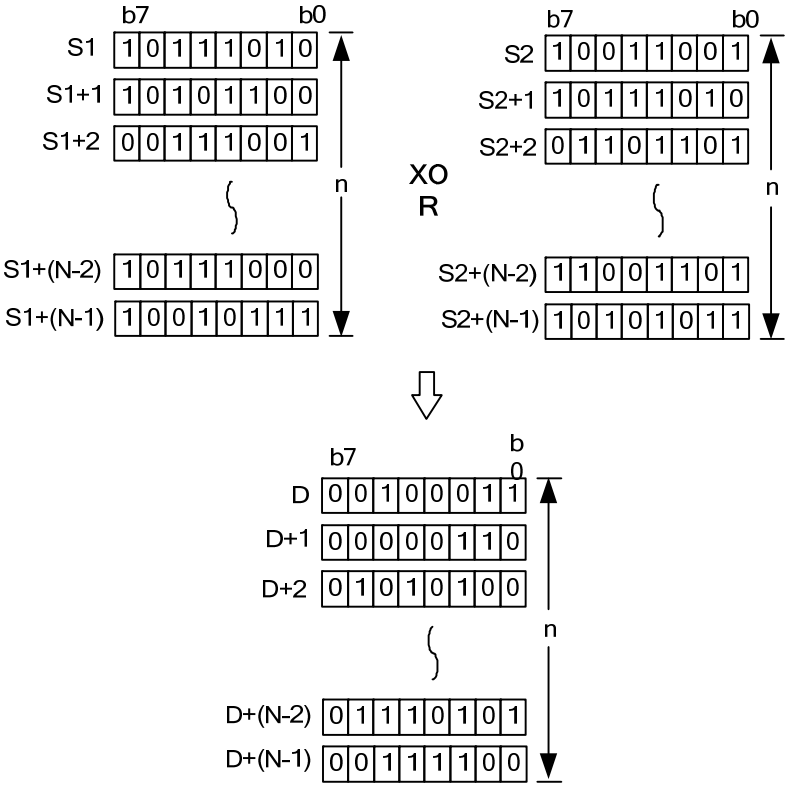
Operand	Description	Data type
S1	Address of data to start BXOR operation with S2	BYTE
S2	Address of data to start BXOR operation with S1	BYTE
D	Address to save BXOR operation result in	BYTE
N	Number of byte data to execute AND operation	WORD

[Flag Set]

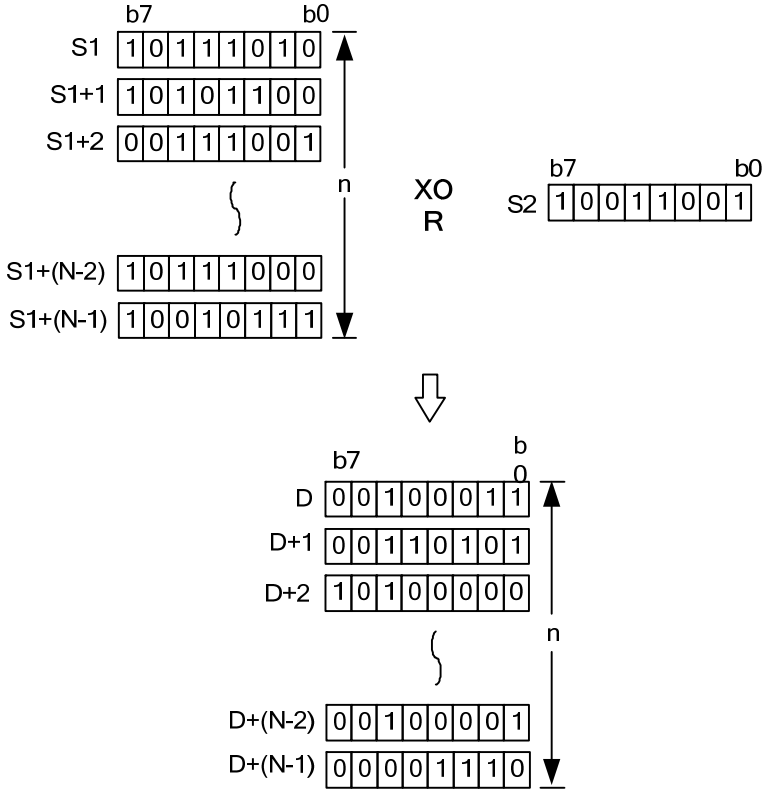
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110

1) BXOR(Group Byte XOR)

(1) It saves the results of word data from S1 and S2 operated in Exclusive OR for N times in byte unit in D in regular order.

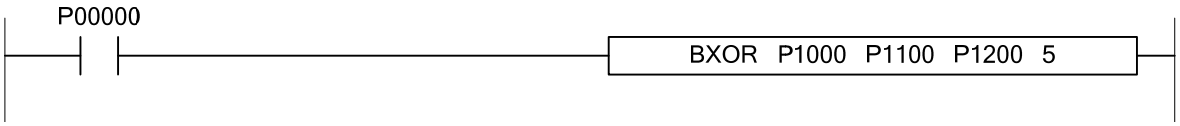

b7
b0
S1
1 0 1 1 1 0 1 0
S1+1
1 0 1 0 1 1 0 0
S1+2
0 0 1 1 1 0 0 1
n
S1+(N-2)
1 0 1 1 1 0 0 0
S1+(N-1)
1 0 0 1 0 1 1 1
XOR
b7
b0
S2
1 0 0 1 1 0 0 1
S2+1
1 0 1 1 1 0 1 0
S2+2
0 1 1 0 1 1 0 1
n
S2+(N-2)
1 1 0 0 1 1 0 1
S2+(N-1)
1 0 1 0 1 0 1 1
b7
b0
D
0 0 1 0 0 0 1 1
D+1
0 0 0 0 0 1 1 0
D+2
0 1 0 1 0 1 0 0
n
D+(N-2)
0 1 1 1 0 1 0 1
D+(N-1)
0 0 1 1 1 1 0 0

(2) -128 ~ 127((BIN 8-bit) of integer is available for S2.



2) Example

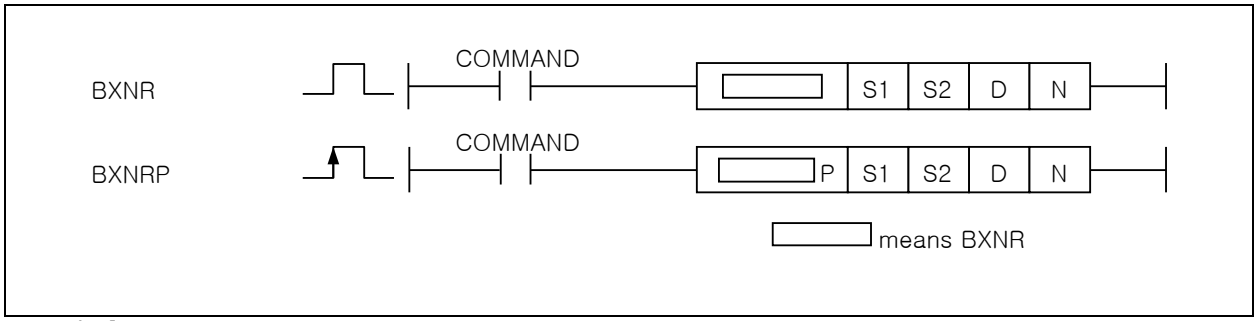
If input signal P00000 is Off -> On, executes XOR operation for 5 byte data of P1000~P1004 and 5 byte data of P1100~P1104 and saves result in 5 byte data area of P1200~P1204.



4.22.12 BXNR, BXNRP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BXNR (P)	S1	O	-	O	-	-	-	-	O	O	-	O	-	-	-	6~8	O	-	-
	S2	O	-	O	-	-	-	-	O	O	O	O	-	-	-				
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

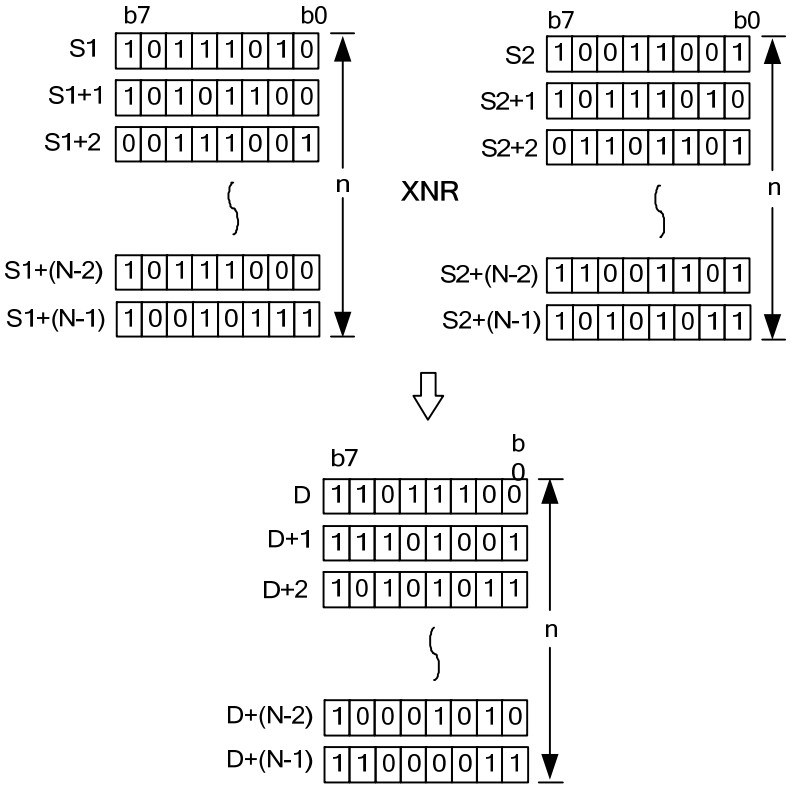
Operand	Description	Data type
S1	Address of data to start BXNR operation with S2	BYTE
S2	Address of data to start BXNR operation with S1	BYTE
D	Address to save BXNR operation result in	BYTE
N	Number of byte data to execute XNR operation	WORD

[Flag Set]

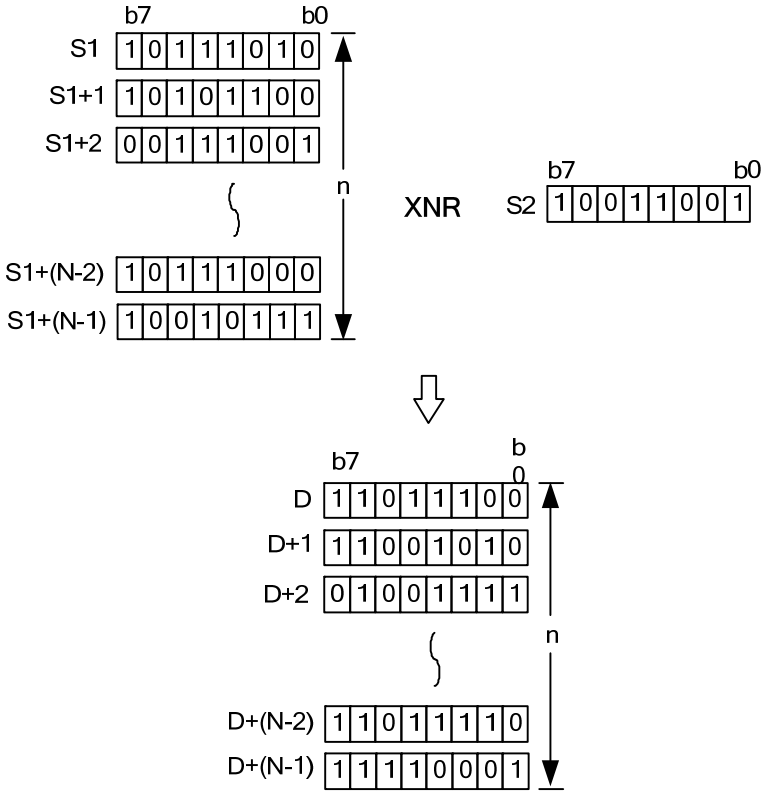
Flag	Content	Device number
error	To be set, if N's range exceeds specified area. Applicable instruction result is not processed.	F110

1) BXNR(Group Byte XNR)

(1) Executes XNR operation for S1 and S2 N times with byte unit and save result in D in order must

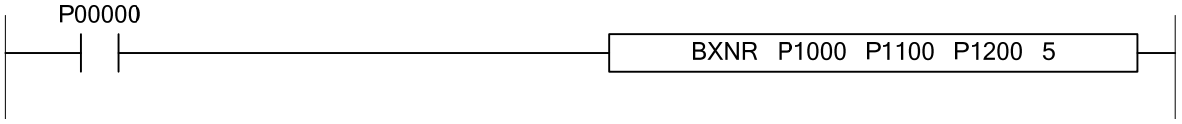

b7
b0
S1
S1+1
S1+2
S1+(N-2)
S1+(N-1)
n
XNR
S2
S2+1
S2+2
S2+(N-2)
S2+(N-1)
D
D+1
D+2
D+(N-2)
D+(N-1)

(2) -128 ~ 127((BIN 8-bit) of integer is available for S2.



2) Example

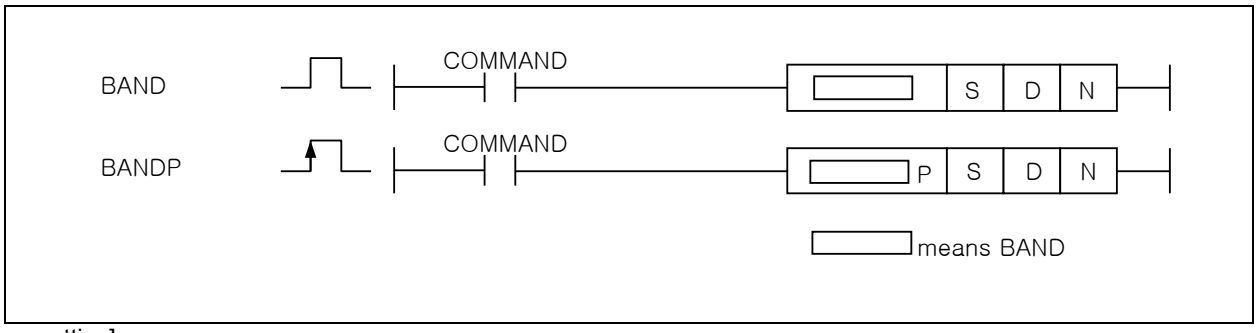
If input signal P00000 is Off -> On, executes XNR operation for 5 byte data of P1000~P1004 and 5 byte data of P1100~P1104 and saves result in 5 byte data area of P1200~P1204



4.22.13 ABAND, ABANDP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ABAND(P)	S	O	-	O	-	-	-	-	O	O	-	O	-	-	-	5~7	O	O	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Address of data to start ABAND operation	BYTE
D	Address to save ABAND operation result in	BYTE
N	Number of byte data to execute AND operation	WORD

[Flag Set]

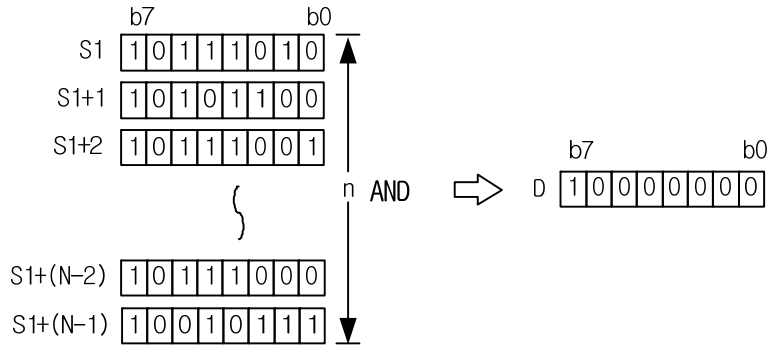
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110
Zero	To be set if operation result is Zero..	F111

1) ABAND(Array Byte AND)

(1) Executes AND for S[0]~ S[n-1] byte data (8 bit) each other and save result in D

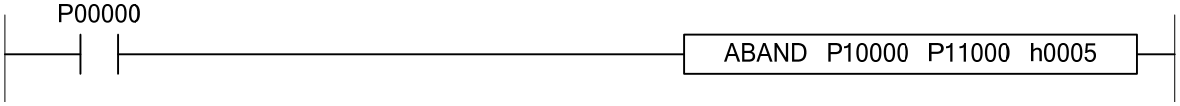
(2) When N is 1, data of S[0] is copied and saved in D. Though data of S[0] is 0, zero flag is not set

(3) When N is 0, operation is not executed.



2) Example

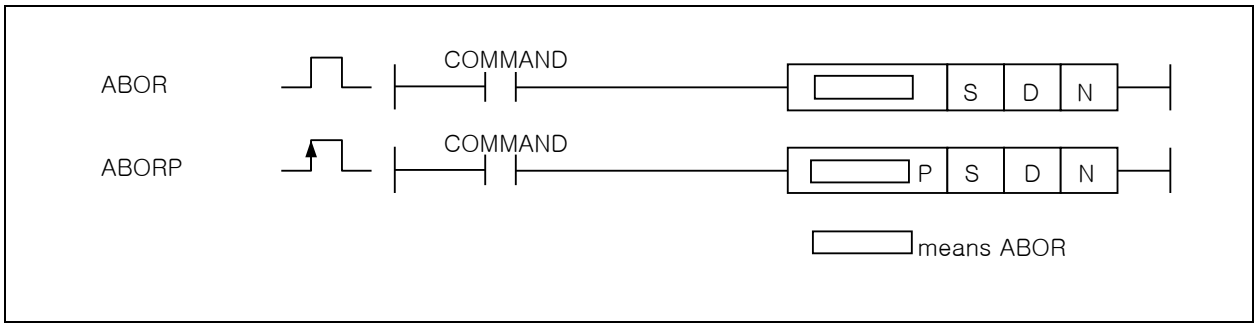
If input signal P00000 is Off -> On, executes AND operation for 5 byte data starting from P10000 and saves result in P11000.



4.22.14 ABOR, ABORP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ABOR(P)	S	O	-	O	-	-	-	-	O	O	-	O	-	-	-	5~7	O	O	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Address of data to start ABOR operation	BYTE
D	Address to save ABOR operation result in	BYTE
N	Number of byte data to execute OR	WORD

[Flag Set]

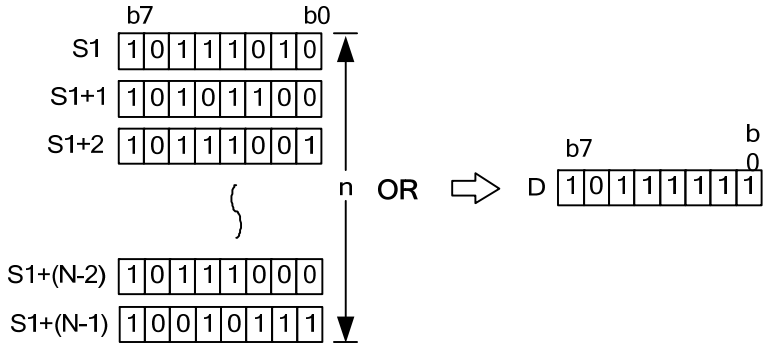
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110
Zero	To be set if operation result is Zero..	F111

1) ABOR(Array Byte OR)

(1) Executes OR for S[0]~ S[n-1] byte data (8 bit) each other and save result in D.

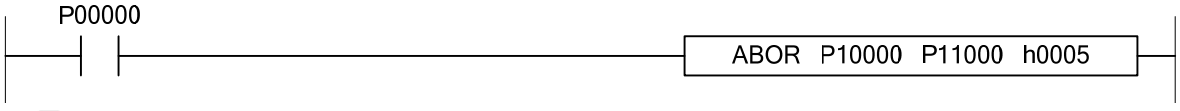
(2) When N is 1, data of S[0] is copied and saved in D. Though data of S[0] is 0, zero flag is not set

(3) When N is 0, operation is not executed.



2) Example

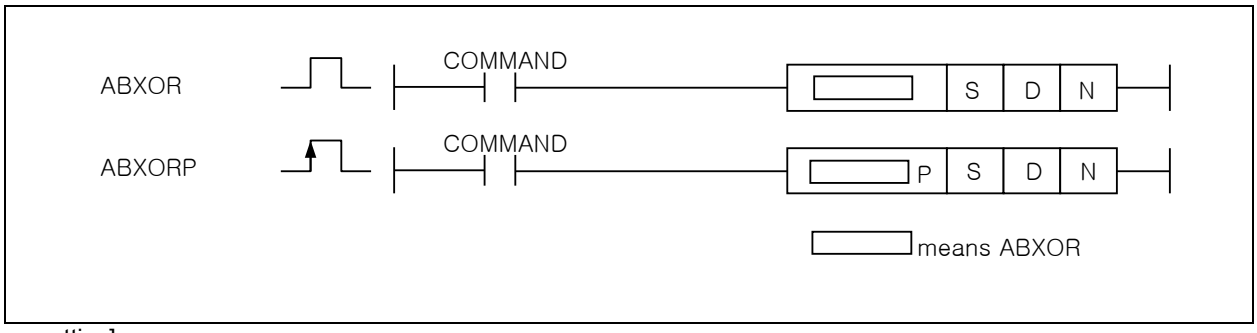
If input signal P00000 is Off -> On, executes OR operation for 5 byte data starting from P10000 and saves result in P11000.



4.22.15 ABXOR, ABXORP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ABXOR(P)	S	O	-	O	-	-	-	-	O	O	-	O	-	-	-	5~7	O	O	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Address of data to start ABXOR operation	BYTE
D	Address to save ABXOR operation result in	BYTE
N	Number of byte data to execute XOR	WORD

[Flag Set]

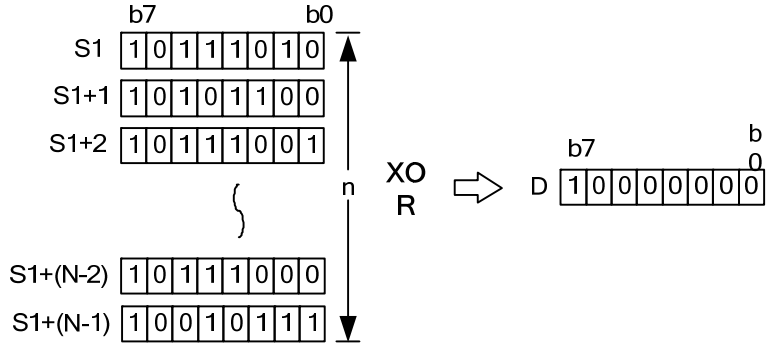
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110
Zero	To be set if operation result is Zero..	F111

1) ABXOR(Array Byte XOR)

(1) Executes XOR for S[0]~ S[n-1] byte data (8 bit) each other and save result in D.

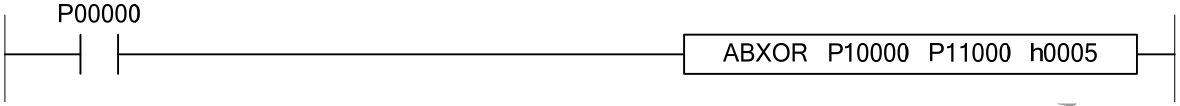
(2) When N is 1, data of S[0] is copied and saved in D. Though data of S[0] is 0, zero flag is not set

(3) When N is 0, operation is not executed.



2) Example

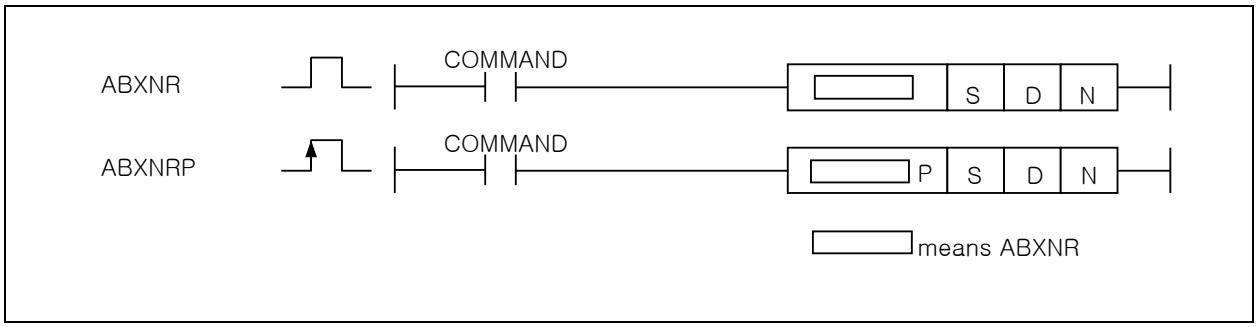
If input signal P00000 is Off -> On, executes XOR operation for 5 byte data starting from P10000 and saves result in P11000.



4.22.16 ABXNR, ABXNRP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ABXNR(P)	S	O	-	O	-	-	-	-	O	O	-	O	-	-	-	5~7	O	O	-
	D	O	-	O	-	-	-	-	O	O	-	O	-	-	-				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Address of data to start ABXOR operation	BYTE
D	Address to save ABXOR operation result in	BYTE
N	Number of byte data to execute XOR	WORD

[Flag Set]

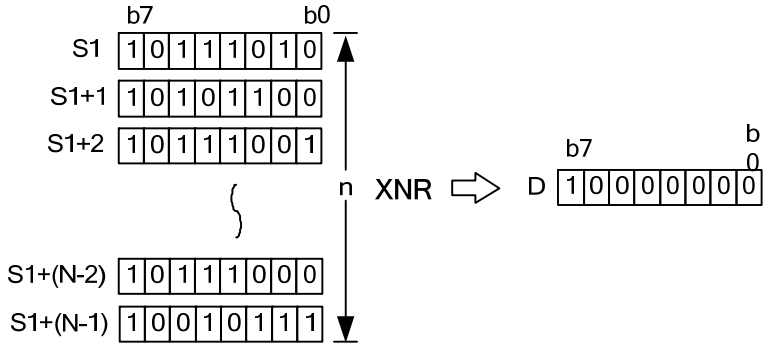
Flag	Content	Device number
error	To be set when N's value exceeds specified area.	F110
Zero	To be set if operation result is Zero..	F111

1) ABXNR(Array Byte XNR)

(1) Executes XNR for S[0]~ S[n-1] byte data (8 bit) each other and save result in D.

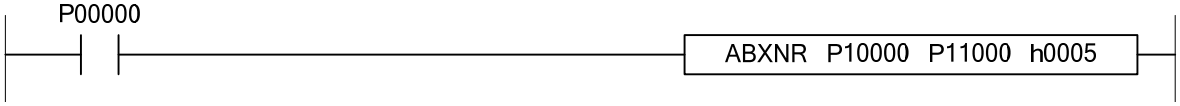
(2) When N is 1, data of S[0] is copied and saved in D. Though data of S[0] is 0, zero flag is not set

(3) When N is 0, operation is not executed.



2) Example

If input signal P00000 is Off -> On, executes XNR operation for 5 byte data starting from P10000 and saves result in P11000.

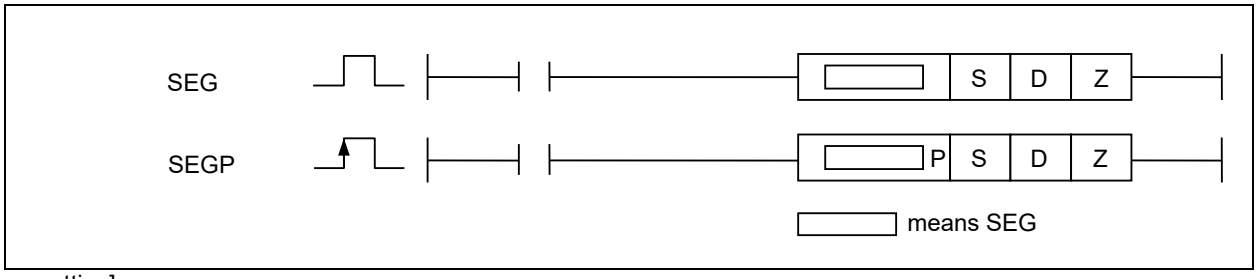


4.23 Display Instruction

4.23.1 SEG, SEGP

[Applicable Product: XGK,XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SEG(P)	S	O	O	-	O	O	-	O	-	-	O	O	O	O	O	4	O	-	-
	D	O	-	-	O	O	-	O	-	-		O	O	O	O				
	Z	O	-	-	-	-	-	O	-	-	O	O	O	O	O				



[Area setting]

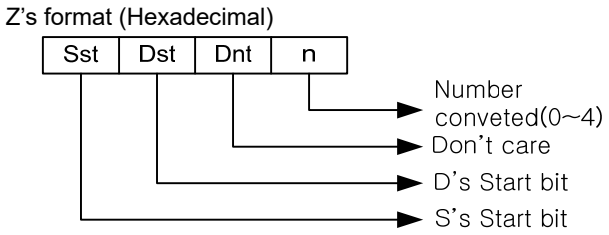
Operand	Description	Data type
S	Address where data to decode in 7 segments is saved.	BIN 32
D	Address to save data decoded	BIN 32
Z	Format to display	BIN 16

[Flag Set]

Flag	Content	Device number
error	To be set if Z's format regulation is incorrect	F110

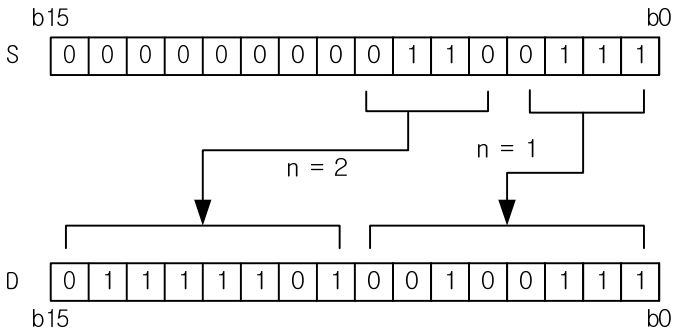
1) SEG(7 Segment)

(1) It saves 7 segments of N digits decoded from S by Z's specified format in D.

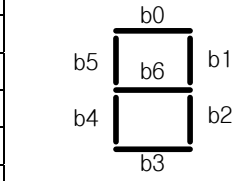


(2) Where n means the number of digits to be converted in 4-bit unit

(3) If n is 0, there will be no conversion.

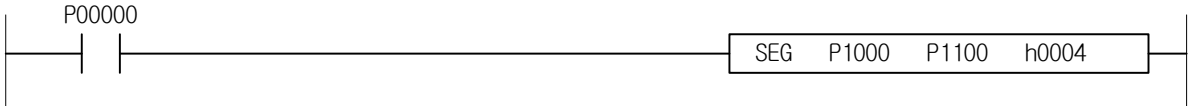


2) Formation of Segments

S1		Formation of 7 Segments									Data displayed
Hexadecimal	Bit		b7	b6	b5	b4	b3	b2	b1	b0	
0	0000		0	0	1	1	1	1	1	1	0
1	0001		0	0	0	0	0	1	1	0	1
2	0010		0	1	0	1	1	0	1	1	2
3	0011		0	1	0	0	1	1	1	1	3
4	0100		0	1	1	0	0	1	1	0	4
5	0101		0	1	1	0	1	1	0	1	5
6	0110		0	1	1	1	1	1	0	1	6
7	0111		0	0	1	0	0	1	1	1	7
8	1000		0	1	1	1	1	1	1	1	8
9	1001		0	1	1	0	1	1	1	1	9
A	1010		0	1	1	1	0	1	1	1	A
B	1011		0	1	1	1	1	1	0	0	B
C	1100		0	0	1	1	1	0	0	1	C
D	1101		0	1	0	1	1	1	1	0	D
E	1110		0	1	1	1	1	0	0	1	E
F	1111		0	1	1	1	0	0	0	1	F

3) Example

(1) If Input Signal P00000 is changed from Off to On status, It displays for 4 digits that it is decoded from No.0 bit of P1000 to No.0 of P1100 to 4 digits by 7 segments decoding format ‘h0004’ is saved in 2-word area of P1100~P1101.



4.24 Data Process Instruction

4.24.1 BSUM, BSUMP, DBSUM, DBSUMP

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSUM(P) DBSUM(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	-	O	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

[Area setting]

Operand	Description	Data type
S	Address of word data to count the number of 1s	WORD/DWORD
D	Address to save the counting result	WORD

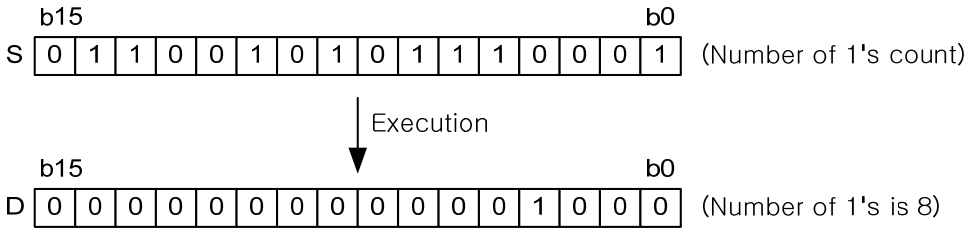
[Flag Set]

Flag	Content	Device number
Zero	To be set if operation result is Zero.	F111

1) BSUM(Bit Summary)

(1) It saves the result of the counted bit number of 1s among specified word data S1 in D in Hexadecimal.

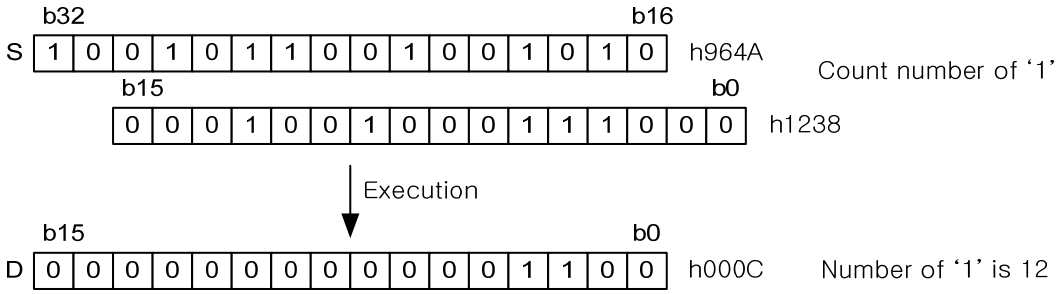
(2) When operation result is 0, Zero Flag will be set.



2) DBSUM(Double Bit Summary)

(1) It saves the result of the counted bit number of 1s among specified double word data S1 in D in Hexadecimal.

(2) When operation result is 0, Zero Flag will be set.



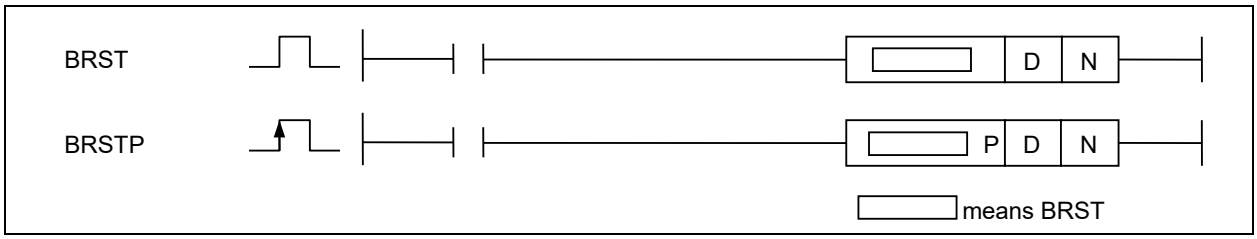
3) Example

(1) In case of D1000=h3333, If Input Signal P00000 is changed from Off to On status, It saves 8 in D1100.

4.24.2 BRST, BRSTP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BRST(P)	D	O	-	O	-	-	-	-	O	-	-	O	-	-	-	4~6	O	-	-
	N	O	-	O	-	-	-	O	-	-	O	O	-	O	-				



[Area setting]

Operand	Description	Data type
D	Device Number to display Reset Start Position	BIT
N	Number of bits to Reset	WORD

[Flag Set]

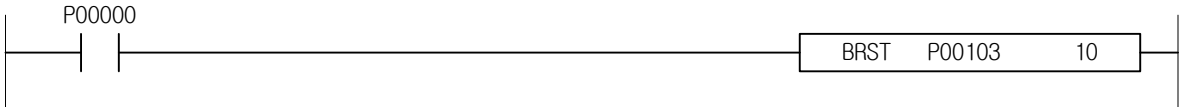
Flag	Content	Device number
error	If N's value is set to exceed specified D device's maximum area.	F110

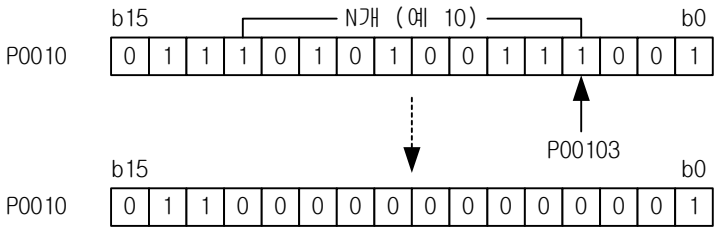
1) BRST (BIT RESET)

(1) It turns N bits Off from specified D bit position.
(2) If N's value is set to exceed specified bit contact point, the Error Flag will be On.
(3) When used as an SR command, it can easily Reset the area of SR instruction used.

2) Example

(1) If Input signal P00000 becomes On, It is Reset to 0 from 10-bit in P00103.





4.24.3 ENCO, ENCOP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ENCO(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	O	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

Operand	Description	Data type
S	Data or address to perform ENCO operation	WORD
D	Address to save operation result in	WORD
N	Available multipliers of bits to encode are 1 ~ 8	WORD

[Flag Set]

Flag	Content	Device number
error	If effective number of bits N is other than 0 ~ 8 If effective number of bits starting from S exceeds device area	F110
Zero	If effective 2N data is Zero.	F111

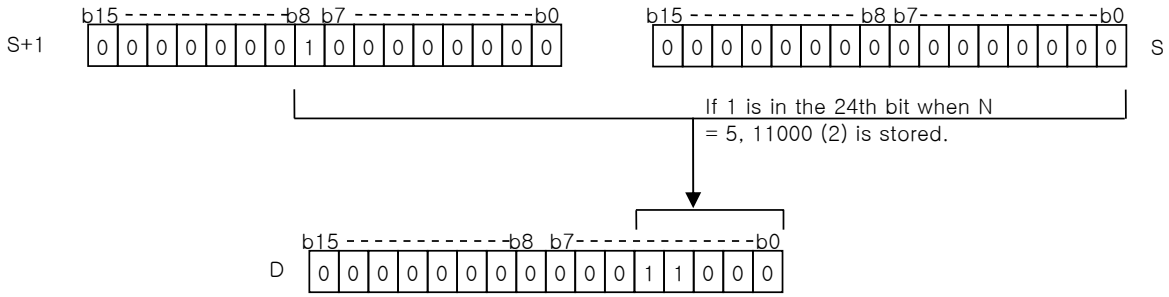
1) ENCO (Encode)

(1) It saves the result of the highest position of 1 made Hexadecimal among effective 2N data saved in S Device, in specified device D.

(2) S if input with constant will be encoded in the input variable area although N's value exceeds 4 (Searched number of bits is 16).

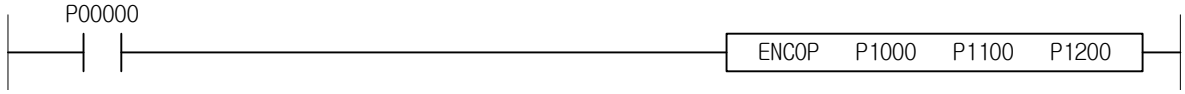
(3) If N is 0, D will not be changed in details.

(4) It saves the result of the highest contact point position of 1 made Hexadecimal in 2^N area, in D.



2) Example

(1) In case of P1000=h4321 and P1200=h0004, If Input Signal is changed from Off to On status, h000E is saved in P1100.



4.24.4 DECO, DECOP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DECO(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

Operand	Description	Data type
S	Data address to perform DECO operation	WORD
D	Address to save operation result in	WORD
N	Available multipliers of bits to decode	WORD

[Flag Set]

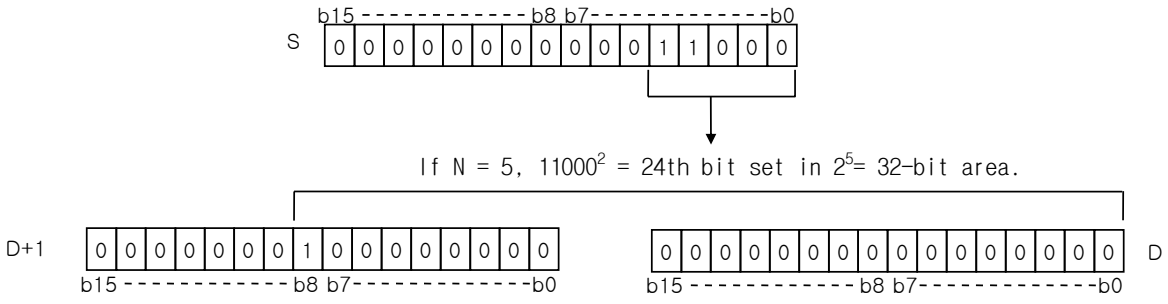
Flag	Content	Device number
error	If effective number of bits N is other than 0 ~ 8 Number of effective 2N which is started D is exceeds the device area.	F110

1) DECO (Decode)

(1) It decodes the lower N bits among saved data in specified S, and then the result saved in specified D device for 2^N bits.
(8 bit is decoded to 256 bit)

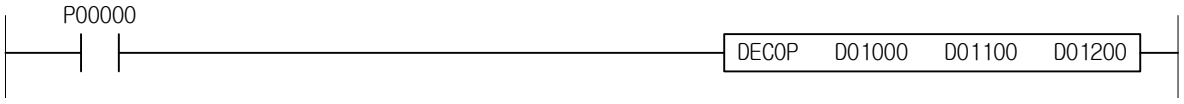
(2) 1~8 is available for N

(3) If N is 0, D will not be changed in details.



2) Example

(1) In case of D1000=h1234 and D1200=h0005, If Input Signal is changed from Off to On status, It saves D1101=h0010 and D1100=h0000.



4.24.5 DIS, DISP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DIS(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

Operand	Description	Data type
S	Data address to perform DIS operation	WORD
D	Address to save operation result in	WORD
N	Number of 4-bit data to be saved in starting D	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds 4. If number of N's range from D exceeds specified device area.	F110

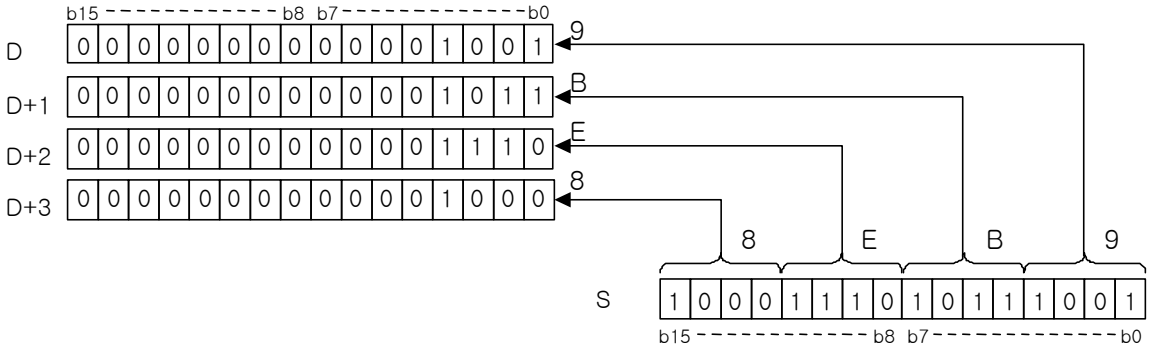
1) DIS (Distribute)

(1) It saves the result of specified S device's data divided into N nibbles (4-bit) in specified device D starting, in regular order for the number of N.

(2) If N=0, the instruction will not be executed.

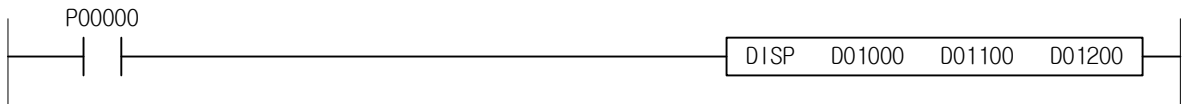
(3) Starting from device D, D+1, … ,the lower 1 nibble will be filled with divided data, and the upper bits left with 0s.

(4) If N exceeds 4, Error Flag will be set.



2) Example

(1) In case of D1000=h1234 and D1200=h0003, If Input Signal P00000 is changed from Off to On status, It saves D1100=h0004, D1101=h0003 and D1102=h0002.



4.24.6 UNI, UNIP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
UNI(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

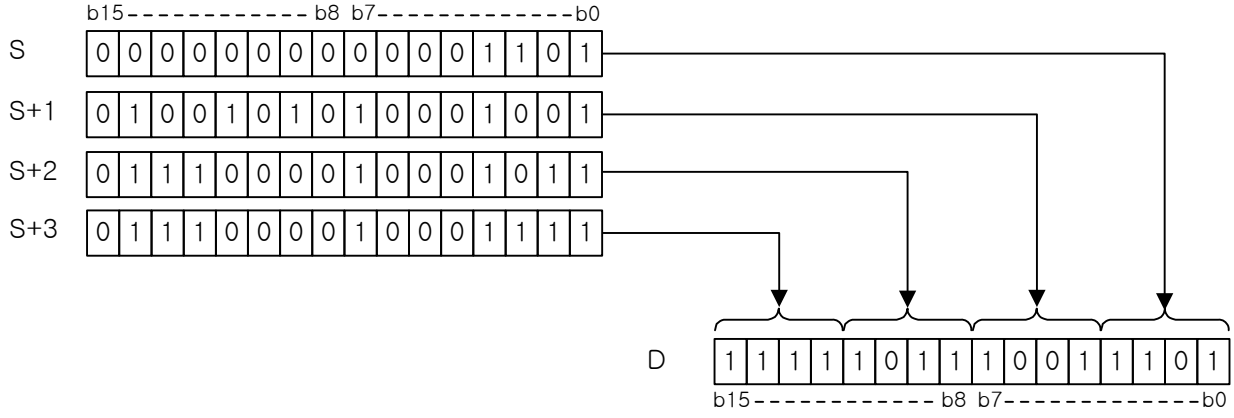
Operand	Description	Data type
S	Data address to perform UNI operation	WORD
D	Address to save operation result in	WORD
N	Number of 4-bit data to be united from S	WORD

[Flag Set]

Flag	Content	Device number
error	If number N's range from S exceeds specified device area. To be set if N exceeds 4.	F110

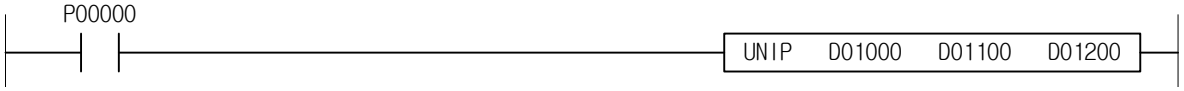
1) UNI(Unite)

(1) It saves the result of the united lower 4 bits in the N words starting from S, in word data D. At this moment the upper 12 bit ignored.
(2) Each 4-bit data will be united from the lower in regular order and saved in word data D.
(3) Except the lower N 4-bit data in word data D, all will be 0.
(4) If N exceeds 4, Error Flag will be set.



2) Example

(1) In case of D1000=h0004, D1001=h003,D1002=h0002 and D1200=h0003, In Input Signal P00000 is changed from Off to On status, It saves D1100=h0234.



4.24.7 WTOB, WTOBP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WTOB(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	-	O	O	O	O				

[Area setting]

Operand	Description	Data type
S	WORD data or Area Number where WORD data is saved.	WORD
D	Start Number of area to save data converted to Byte.	WORD
N	Number of converted Byte	WORD

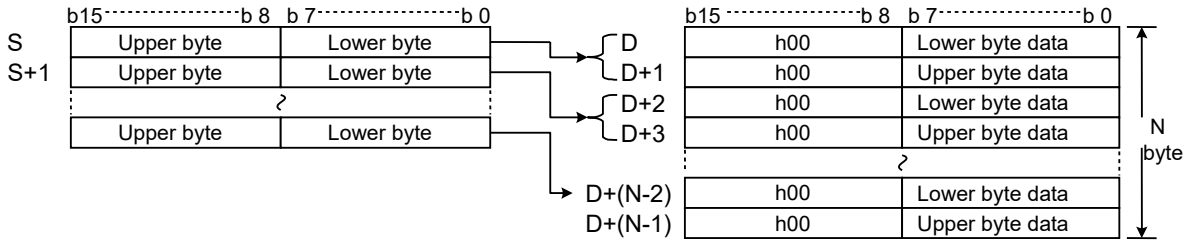
[Flag Set]

Flag	Content	Device number
error	If S or D is exceeds specified device's acceptable range.	F110

1) WTOB

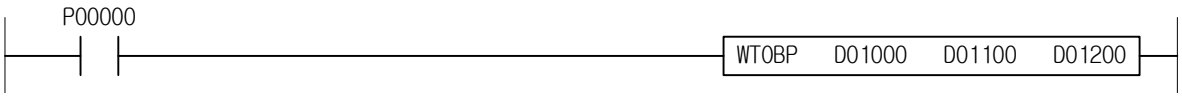
(1) It saves N bytes resulted from each word data divided into 2 bytes starting from S, in starting D. At this time, the upper byte will be filled with 0s, and the lower byte with byte value divided.

(2) In case N=0, instruction is not executed.



2) Example

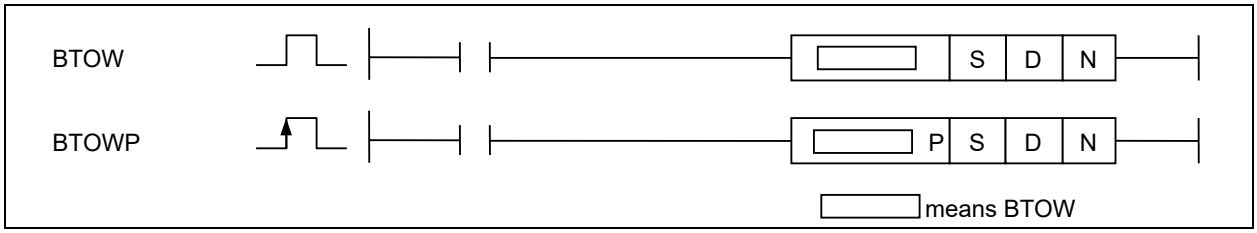
(1) In case of D01000=h1234, D01001=h5678,D01200=h0003, If Input Signal P00000 is changed from Off to On, It saves D01100=h0034, D01101=h0012 and D01102=h0078.



4.24.8 BTOW, BTOWP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BTOW(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Byte data or Area Number where Byte data is saved.	WORD
D	Area to save data converted to WORD	WORD
N	Number of bytes to unite	WORD

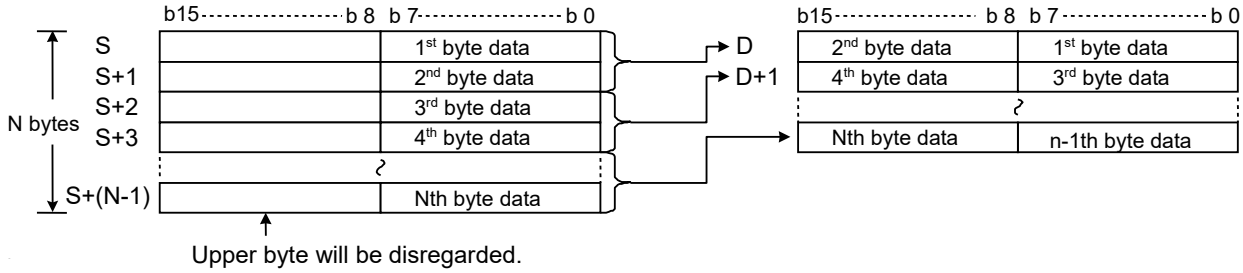
[Flag Set]

Flag	Content	Device number
error	If S or D is exceeds specified device's acceptable range.	F110

1) BTOW

(1) It saves the result of the lower N byte data united with word data starting from S, in starting D. At this time, if N is an odd number, the upper of device saved last will be filled with 0s.

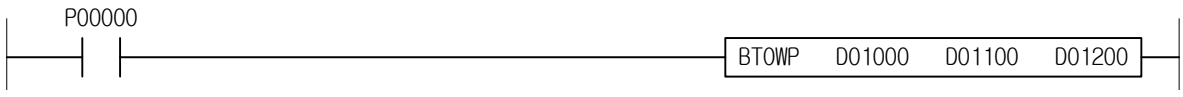
(2) In case N=0, instruction is not executed.



2) Example

(1) In case of D1000=h0012, D1001=h0034 and D1200=h0003, In Input Signal is changed from Off to On status, It saves D1100=h3412 and D1101=h0045.

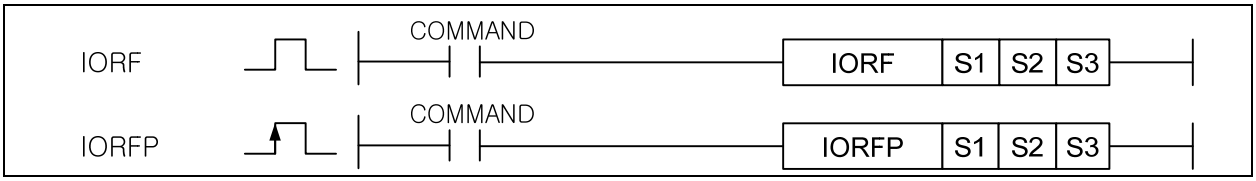
(2)



4.24.9 IORF, IORFP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
IORF(P)	S1	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~6	-	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Position (base + slot) I/O module to process immediately.	WORD
S2	Upper 32-bit data or Device Number to mask.	DWORD
S3	Lower 32-bit data or Device Number to mask.	DWORD

1) IORF (I/O Refresh)

(1) It performs AND process between specified S1's I/O module value and mask value input in S2/S3 immediately to process the data.

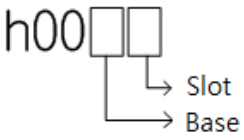
(2) It performs mask process as based on I/O points positioned in S1 specified For example, if the module to refresh I/O is 16 points, mask data of lower 16 bits only needs to be input.

(3) IORF will be used when the newest input information is needed during PLC operation, or operation result is at once to be output.

(4) If I/O module is not installed at specified module position, or different module is installed, there will be no operation.

2) Example

(1) 'h0001' means No.1 slot of No.0 base If I/O Fixed allocation is specified, applicable module address is P00040~P0007F in 64 points Input module.



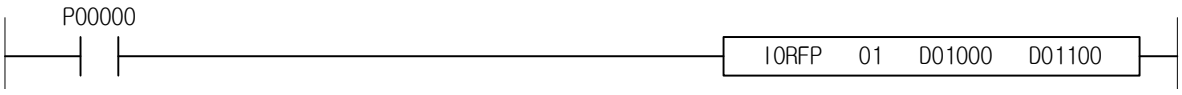
(2) In case of D01000=hFFFF, D01001=h0000, D01100=hFFFF and D01101=h0000, if Input signal is changed from Off to On

P0004 is refresh the input data since D01100 is masked as hFFFF

P0005 is not refresh the input data since D01101 is masked as h0000.

P0006 is refresh the input data since D01000 is masked as hFFFF

P0007 is not refresh the input data since D01001 is masked as h0000.



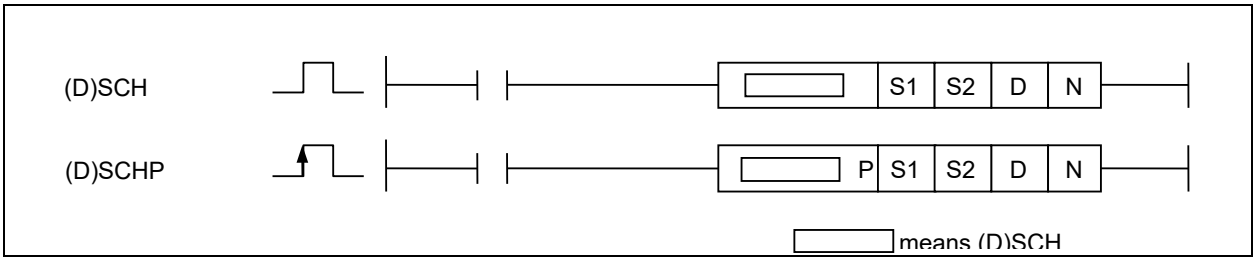
Notes

(1) In case of using hybrid module, S2 value is the output mask data, S3 value is the input mask data If it refreshes hybrid module with 16 points input and 16 points output, S3's data becomes the mask data of the input part, S2's data becomes the mask data of the output part.

4.24.10 SCH, SCHP, DSCH, DSCHP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SCH(P) DSCH(P)	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~7	O	O	-
	S2	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

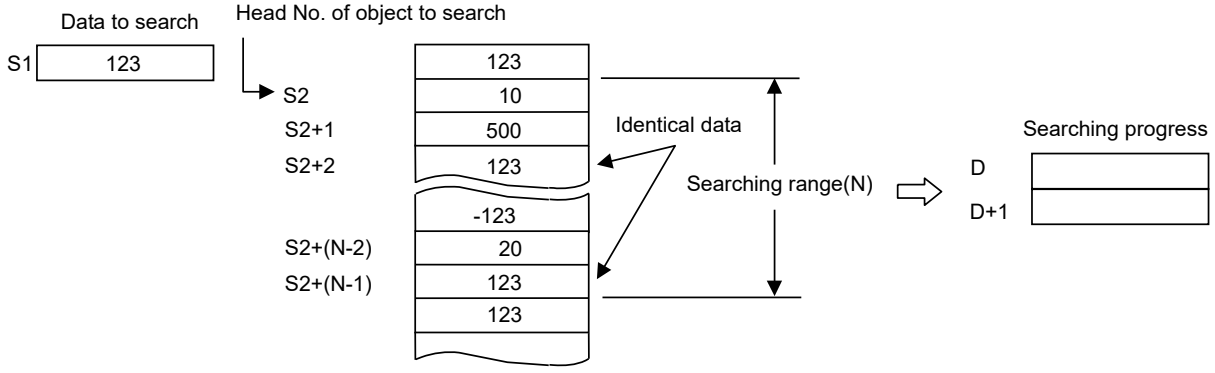
Operand	Description	Data type
S1	Data or address to searches for	WORD/DWORD
S2	Start address of the area to searches for	WORD/DWORD
D	Address to save the position and number identical	WORD
N	Searching range of SCH operation	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable S1 device's range	F110
Zero	To be set if no data is found identical.	F111

1) SCH (Word Search)

(1) It searches N word data in S2 for the value identical to word data S1 in regular order.
(2) It saves the first value's address in D, the total of the value identical to S1 in D + 1.
(3) If there is no value found, Zero Flag will be set.
(4) If N=0, the instruction will not be executed.

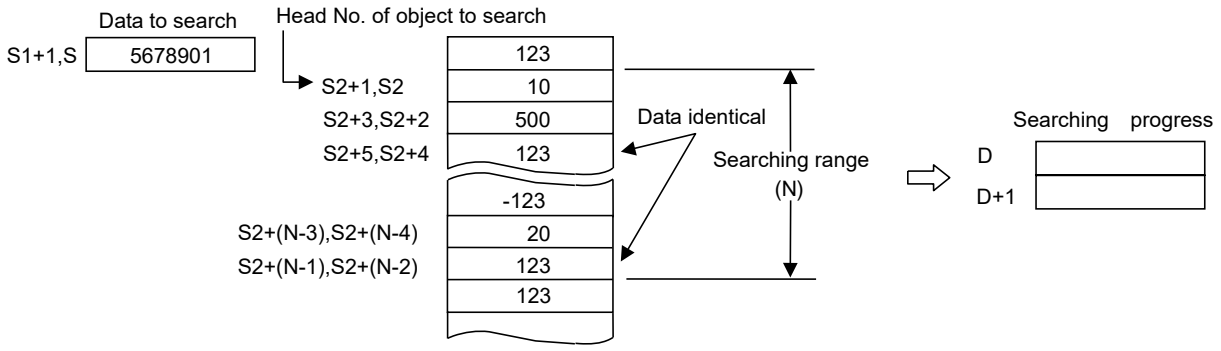


(5) As its result, specified D, D+1 device will be "0" if no identical data is found.

2) DSCH (Double Word Search)

(1) It searches specified S2 device for N points (WORD 2N points) in 32-bit unit with specified S1+1,S1 device's 32- bit data used as a key word.

(2) It saves the number identical to the key word in D+1, the position of the first identical data in specified device D.



(3) If N is 0, there will be no search and no change in result data.

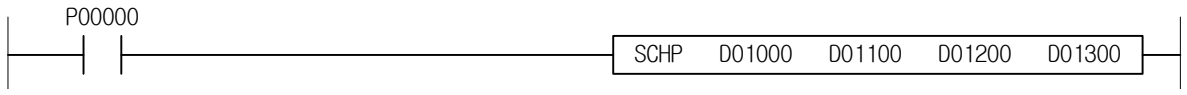
(4) As its result, specified D, D+1 device will be "0" if no identical data is found.

3) Example

(1) It searches in number of D01300 word data in D01100 for the value identical to word data D01000 in regular order.

(2) It saves the first value's address in D01200, the total of the value identical to D01000 in D01201.

(3) In case of D01000=h1234, D01100=h1111, D01101=h2222, D01102=h1234, D01103=h1234, D01104=h3333, If D01300=h0006, D01200=h0003 is for the position D01102 first united data. And D01202=h0002 is saved for 2 united number.



4.24.11 MAX, MAXP, DMAX, DMAXP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MAX(P) DMAX(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	O	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

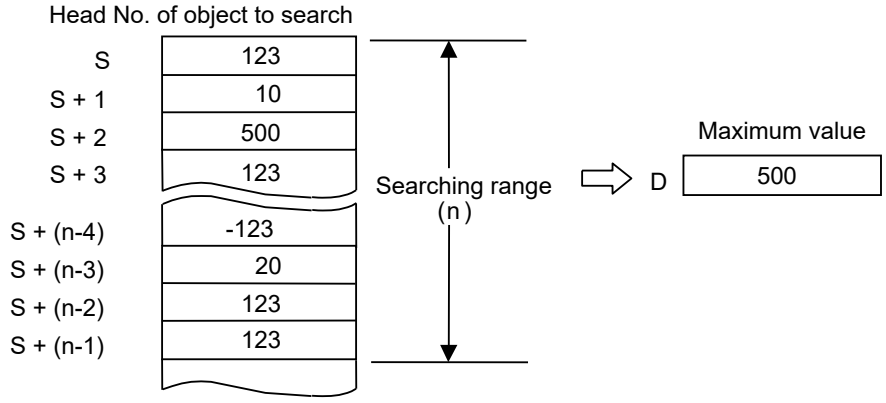
Operand	Description	Data type
S	Data address to start MAX operation	INT/DINT
D	Address to save operation result in	INT/DINT
N	Number of words to execute MAX operation starting from S	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable device's range.	F110
Zero	To be set if operation result is Zero.	F111

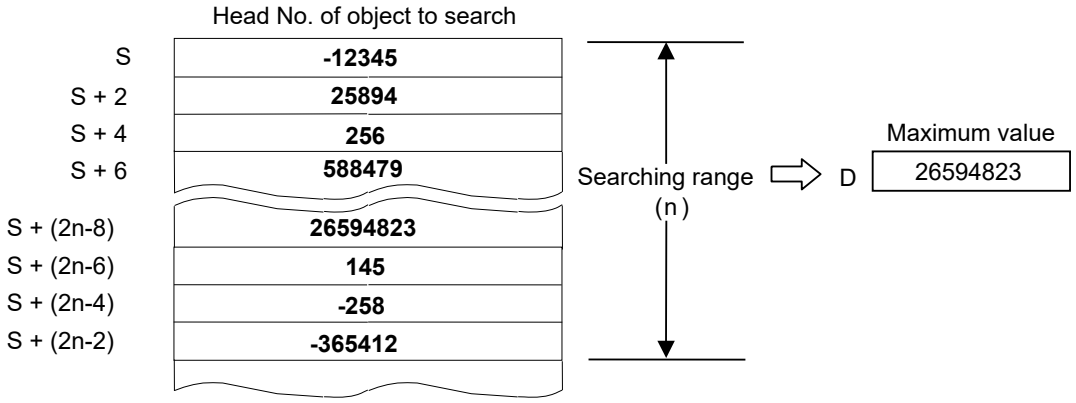
1) MAX (Maximum)

(1) It searches from word data S up to N range for the maximum value to save in D.
(2) Comparison in size will be performed by signed operation.
(3) If operation result is Zero, Zero Flag will be set
(4) If N=0, the instruction will not be executed.



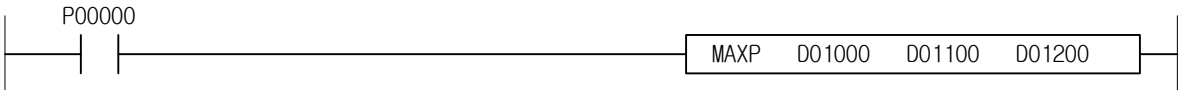
2) DMAX (Double Maximum)

(1) It searches from double word data S up to N range for the maximum value to save in D.
(2) Comparison in size will be performed by signed operation.
(3) If operation result is Zero, Zero Flag will be set
(4) If N=0, the instruction will not be executed.



3) Example

(1) In case of D01000=1111, D01001=3333, D01002=2222, If Input Signal P00000 is changed from Off to On status, It saves D01100=3333.



4.24.12 MIN, MINP, DMIN, DMINP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MIN(P) DMIN(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	O	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

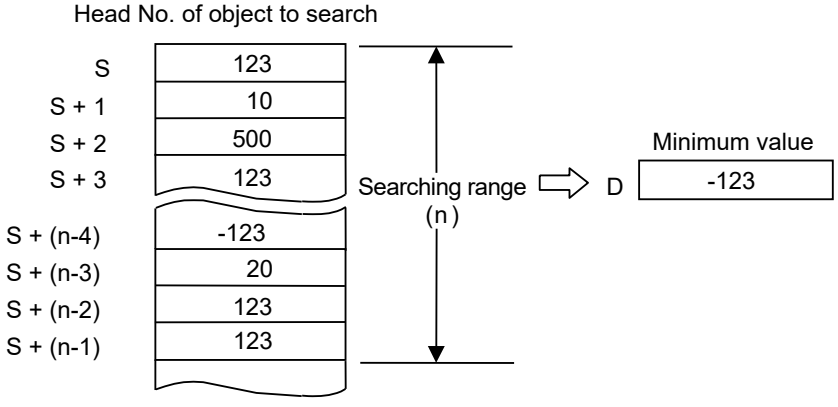
Operand	Description	Data type
S	Data address to start MIN operation	INT/DINT
D	Address to save operation result in	INT/DINT
N	Number of words to execute MIN operation starting from S	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable device's range.	F110
Zero	To be set if operation result is Zero.	F111

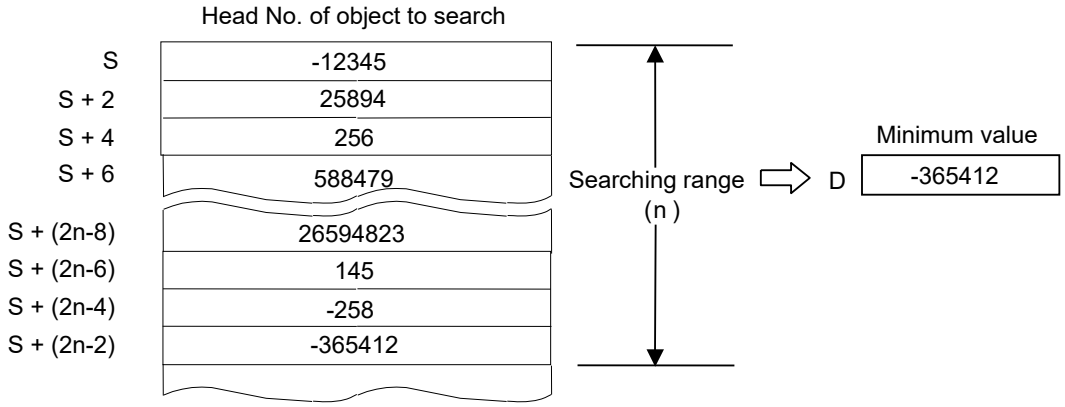
1) MIN (Minimum)

(1) It searches from word data S up to N range for the Min value to save in D.
(2) Comparison in size will be performed by signed operation.
(3) If operation result is Zero, Zero Flag will be set
(4) If N=0, the instruction will not be executed.



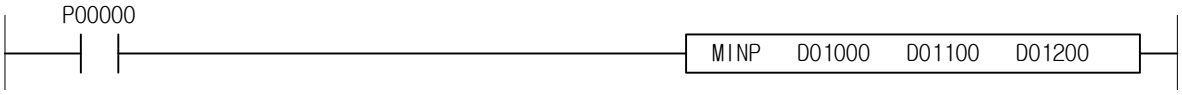
2) DMIN (Double Minimum)

(1) It searches from double word data S up to N range for the Min value to save in D.
(2) Comparison in size will be performed by signed operation.
(3) If operation result is Zero, Zero Flag will be set
(4) If N=0, the instruction will not be executed.



3) Example

(1) In case of D01000=1111, D01001=3333, D01002=2222, If Input Signal P00000 is changed from Off to On status, It saves D01100=1111.



4.24.13 SUM, SUMP, DSUM, DSUMP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SUM(P) DSUM(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	O	O
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

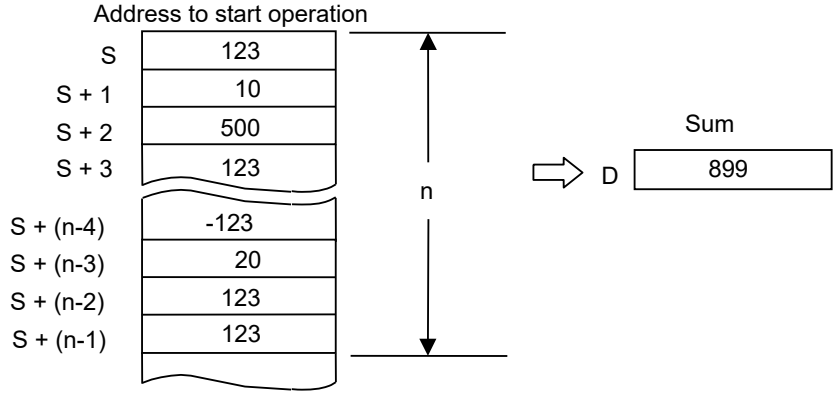
Operand	Description	Data type
S	Data address to start SUM operation	INT/DINT
D	Address to save operation result in	INT/DINT
N	Number of words to execute SUM operation starting from S	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable device's range, or overflow occurs during operation.	F110
Zero	To be set if operation result is Zero.	F111
Carry	To be set if overflow occurs during operation	F112

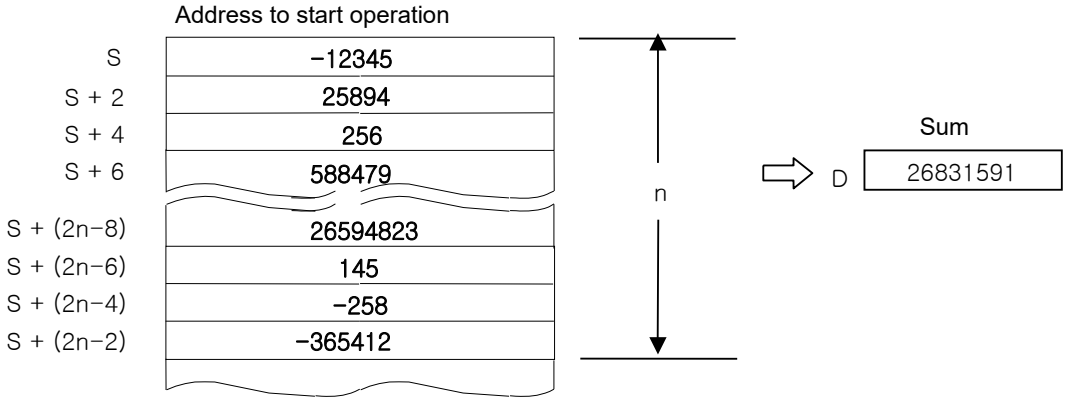
1) SUM(Word Summary)

(1) It saves the result of the sum up to N data starting from word data S in D.
(2) Sum will be performed by Signed operation.
(3) If operation result is Zero, Zero Flag will be set
(4) If overflow occurs during operation, Carry Flag and Error Flag will be set.
(5) The operated value will be saved in result despite the overflow. Thus, Carry Flag should be checked since unintentional value could be saved in result.
(6) If N=0, the instruction will not be executed.



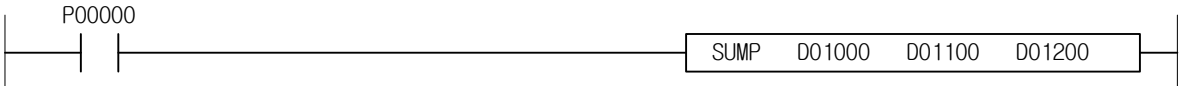
2) DSUM (Double Word Summary)

(1) It saves the result of the sum up to N data starting from double word data S in D.
(2) Sum will be performed by Signed operation.
(3) If operation result is Zero, Zero Flag will be set
(4) If overflow occurs during operation, Carry Flag and Error Flag will be set.
(5) The operated value will be saved in result despite the overflow. Thus, Carry Flag should be checked since unintentional value could be saved in result.
(6) If N=0, the instruction will not be executed.



3) Example

(1) In case of Dp1000=h1111, D01001=h3333, D01002=h2222, D01200=h0003, If Input Signal P00000 is changed from Off to On status, it saves D01100=h6666.



4.24.14 AVE, AVEP, DAVE, DAVEP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
AVE(P) DAVE(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	O	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				

[Area setting]

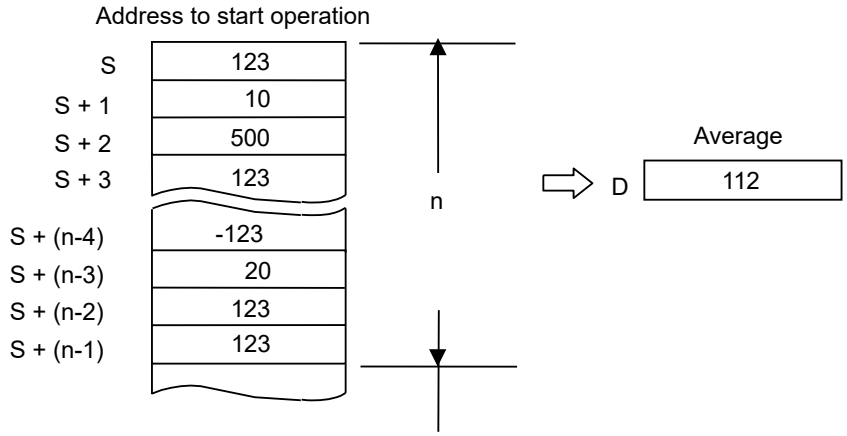
Operand	Description	Data type
S	Data address to start AVE operation	INT/DINT
D	Address to save AVE operation result	INT/DINT
N	Number of words to execute AVE operation starting from S	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable device's range.	F110
Zero	To be set if operation result is Zero.	F111

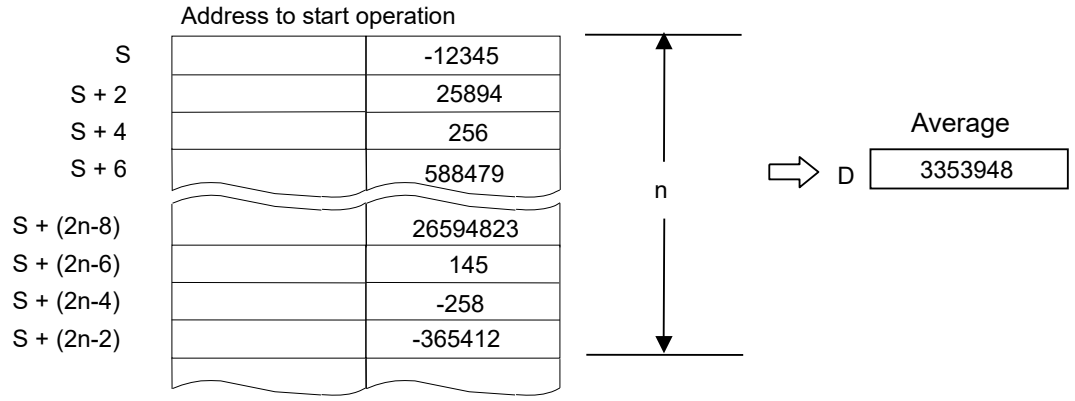
1) AVE (Word Average)

(1) It saves the average resulted from the sum up to N word data starting from S divided by N in D.
(2) Value to be saved in word data D is of INT.
(3) If operation result is Zero, Zero Flag will be set
(4) The decimals will be omitted if the sum of N data is not exactly divided by N.



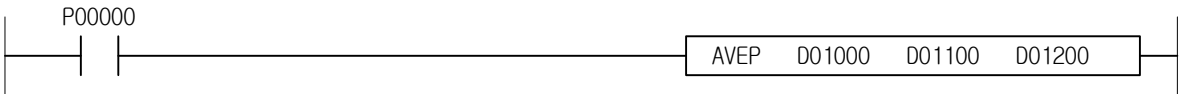
2) DAVE (Double Word Average)

(1) It saves the average resulted from the sum up to N double word data starting from S divided by N in D.
(2) Value to be saved in DWORD data D is of DINT.
(3) If operation result is Zero, Zero Flag will be set
(4) The decimals will be omitted if the sum of N data is not exactly divided by N.



3) Example

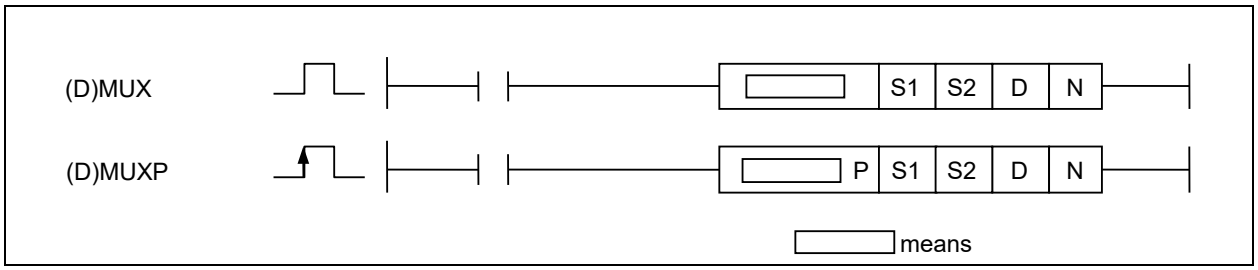
(1) In case of D01000=1111, D01001=3333, D01002=2222, If Input Signal P00000 is changed from Off to On status, It saves D01100=2222.



4.24.15 MUX, MUXP, DMUX, DMUXP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MUX(P) DMUX(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	O	O	O	O	-	O	-	-	-	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

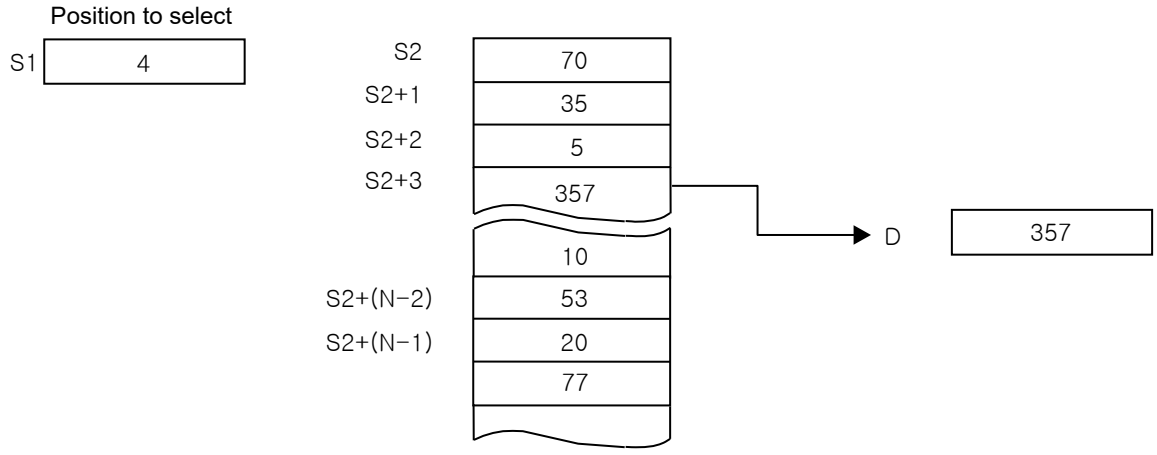
Operand	Description	Data type
S1	Position to select (0~N-1)	WORD/DWORD
S2	Head position of data to select	WORD/DWORD
D	Area where selected value will be saved	WORD/DWORD
N	Range of data to select	WORD

[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable device's range. Position to select data exceeds searching range	F110

1) MUX

(1) It transfers data applicable to S1st among N word data from S2 to D.

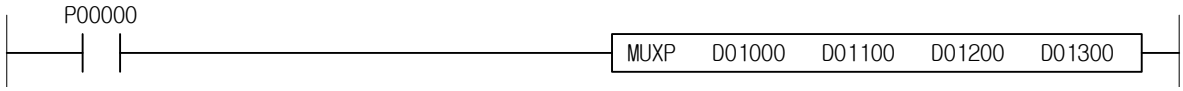


2) DMUX

(1) It transfers data applicable to S1st among N DWORD data from S2 to D.

3) Example

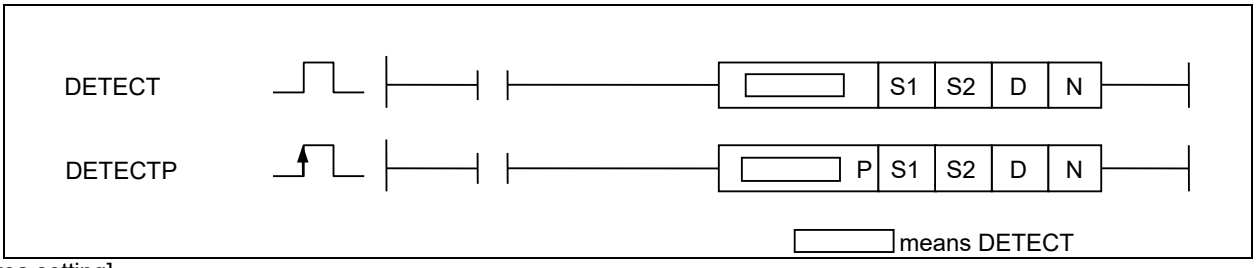
(1) In case of D01100=h1111, D01101=h3333, D01102=h2222, D01000=h0001, D01300=h0003, If Input Signal P00000 is changed from Off to On, it saves D01200=h3333.



4.24.16 DETECT, DETECTP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DETECT(P)	S1	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	O	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Start position of data to detect.	WORD
S2	Allowance	WORD
D	1st changed position & the number searched	WORD
N	Range	WORD

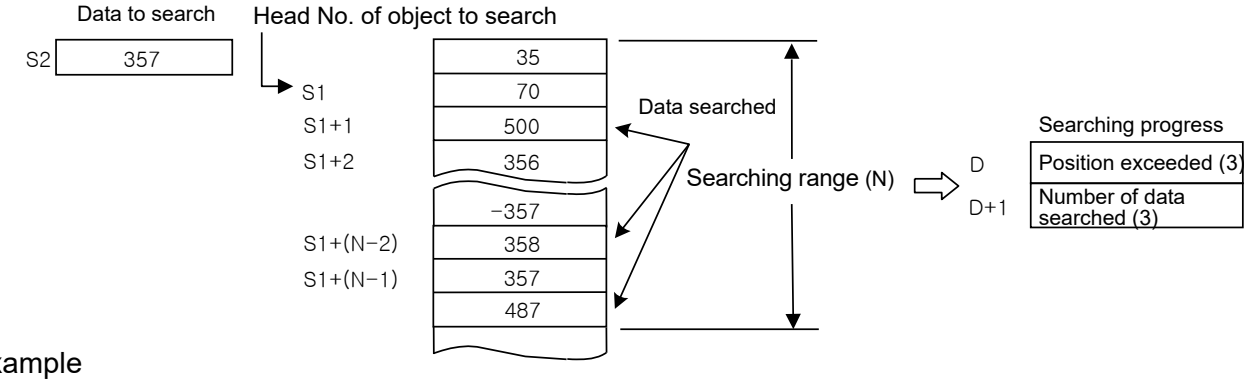
[Flag Set]

Flag	Content	Device number
error	To be set if N exceeds applicable device's range.	F110
Zero	To be set if no data exceeds the allowance specified in searching result S2.	F111

1) DETECT

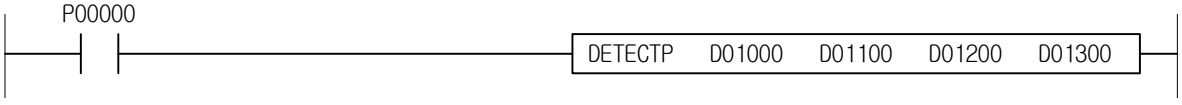
(1) It saves the position of the 1st value out of allowance in D if the value is larger than allowance (S1) among N data from S1 (signed operation, searching unavailable if identical to allowance), and the sum of the number of the data larger than S1 in D+1.

(2) If N=0, the instruction will not be executed



2) Example

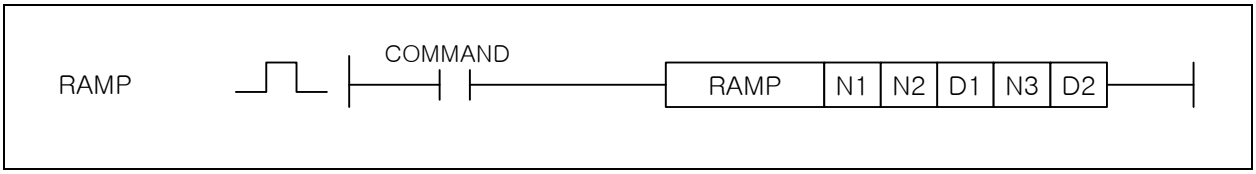
(1) In case of D01000=h1111, D01001=h3333,D01002=h2222, D01100=h3000, D01300=h0003, If Input Signal is P00000 is changed from Off to On status, it saves D01200=h0002, D01201=h0001.



4.24. 17 RAMP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RAMP	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~7	-	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D1	O	-	O	-	-	-	-	-	-	-	-	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D2	O	-	O	-	-	-	-	-	-	-	-	O	O	O				

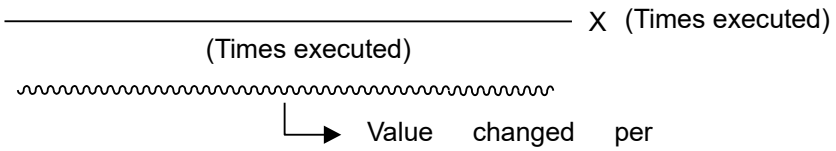


[Area setting]

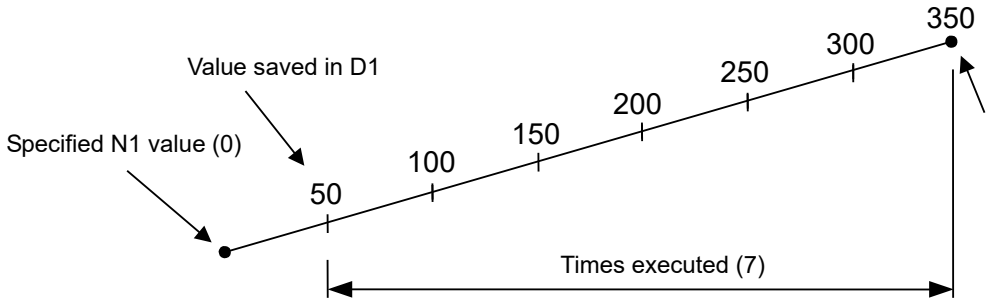
Operand	Description	Data type
N1	Initial value	WORD
N2	Final value	WORD
D1	Current Value	WORD
N3	Number of execution (the number of scan)	WORD
D2	Instruction completed address (1: complete, 0: in progress or in Off state)	WORD

1) RAMP

(1) It saves the value changed from the initial to the final value in the straight line during specified N3 number of scans in D1, and the number of times of scans executed presently in D1+1.
(2) If the instruction is completed, D2 value is made 1. (D2's No.0 bit device set)
(3) It saves the value changed from specified N1 value to N2 value in the straight line during specified N3 number of scans executed in D1 And the value saved in D1 should be operated per scan as follows



(4) The case that section of 0 ~ 350 is changed for 7 scans is as shown below;



(5) If the changed value operated per scan is not divided by an integer, let it corrected be specified N2 value from specified N3 number of times executed, which may make straight slope unavailable.
(6) It specifies the number of times of scans in N3 till executed from N1 to N2. If N3=0, there will be no operation.
(7) D1+1 used by system saves the times of executed instruction. Thus, an undesirable result may be caused if it is modified arbitrarily by user.
(8) If the instruction is completed up to the final value, specified D2 device completed is 1.
(9) Though the instruction is Off while the instruction is executed, details of D1 (present value) are not

changed.

(10)Set 1 to completed device to cancel the RAMP instruction in the middle

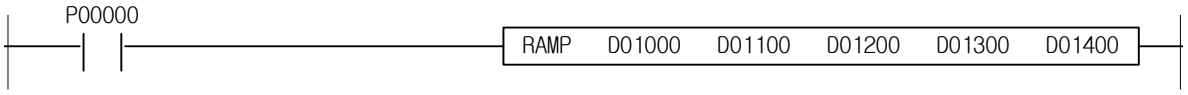
(11)Turn the instruction Off→On to restart completed RAMP instruction after initialized.

(12)Do not change specified N1 and N2 value before specified D2 device completed is On. Since value to be saved in D1+1 is operated with the identical formula per scan, the change of N1 or N2 will cause sudden effect.

2) Example

(1) In case of D01000=1000, D01100=2000, D01300=100, If Input Signal is changed from Off to On status, D01200 is increased by 10 per 1 scan and number of times of scans is saved in D01201.

(2) If the 100 scans is completed, D01400's No.0 bit will be set.



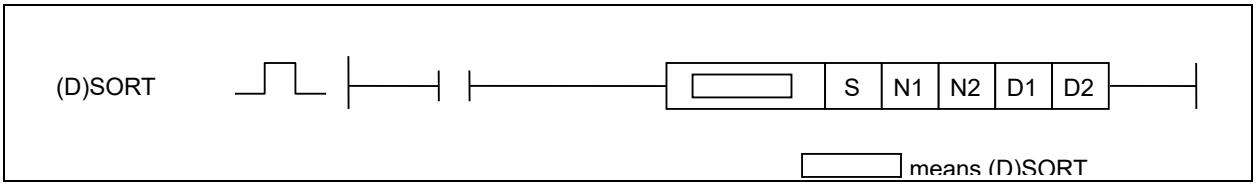
Precautions

(1) Be careful of using indirect designation (#) or index ([Z]) because the RAMP instruction has internal processing parts without contact point ON.
For example, an error occurs without contact point ON if you use M100[Z10] for one of the RAMP instruction operands and if Z10's value exceeds 1947 that can be outside the M area.

4.24.18 SORT, DSORT

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
(D)SORT	S	O	-	O	O	O	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	N1	O	-	O	O	O	-	O	-	-	-	O	O	O	O				
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D2	O	-	O	-	-	-	O	-	-	-	-	O	O	O				



[Area setting]

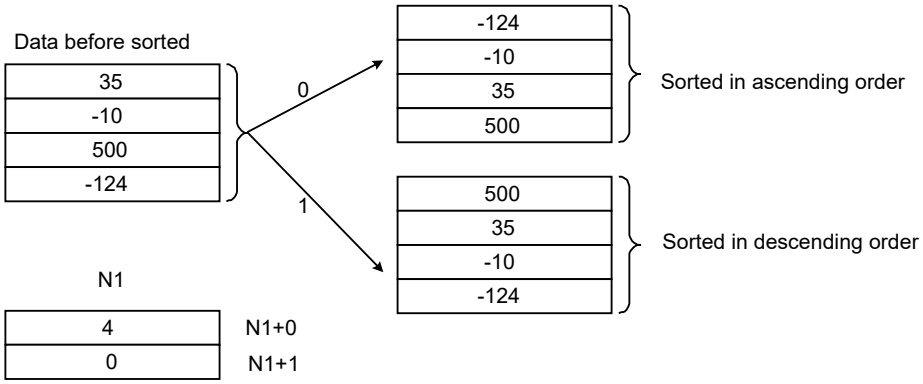
Operand	Description	Data type
S	Start position of data to align	WORD/DWORD
N1	Aligning range & order (in ascending/descending order)	WORD
N2	Execution range per time (< Aligning range)	WORD
D1	Instruction completed address (1: complete, 0: in progress or in Off state)	WORD
D2	Auxiliary area	WORD

[Flag Set]

Flag	Content	Device number
error	If the value of N1 goes outside the applicable range If specified N1+1 aligning order is other than 0 or 1	F110

1) SORT

(1) It sorts (aligns) N1-point Binary 16-bit data from S1 in ascending(0)/descending(1) order based on N1+1 value.



(2) Sorting by SORT instruction needs several scans. Scan times till instruction completed is the value divided by the number of data compared with the maximum execution times in specified N2's 1 time execution. (Decimals will be omitted). Increasing the value of N2 reduces the number of scans to complete the sort, but extends the scan time.

(3) If N2=0, the instruction will not be executed.

(4) Maximum execution times till sorting is completed shall be operated as follow; Maximum execution times till completed = (N1) * (N1 -1) ÷ 2 ÷ N2 [times] For example, if N1=10 and N2=1, 10 * (10-1) ÷ 2 ÷ 1=45(times). At this moment, if N2=2, 45 ÷ 2 = 22.5 → 23 [scans] will be taken to complete sorting.

(5) Specified D1 device (completed device) saves 1 if SORT Instruction completed. After sorted, turn input contact point (Instruction) OFF to make specified D1 device's value 0.

(6) On the device designated as D2, 4 words are used by the system at run time. Do not change the 4-

word word on the device specified by D2.

(7) If N has been changed while being sorted, let it sorted with the number of sorted data after changed.

2) Example

(1) In case of P1000=2222, P1001=3333, P1002=1111, P1100=3, P1101=3 P1200=1, If Input Signal is P00000 is changed from Off to On status, it sorted and completed address P1300=1 and save in descending order like P1000=3333, P1001=2222, P1002=1111.

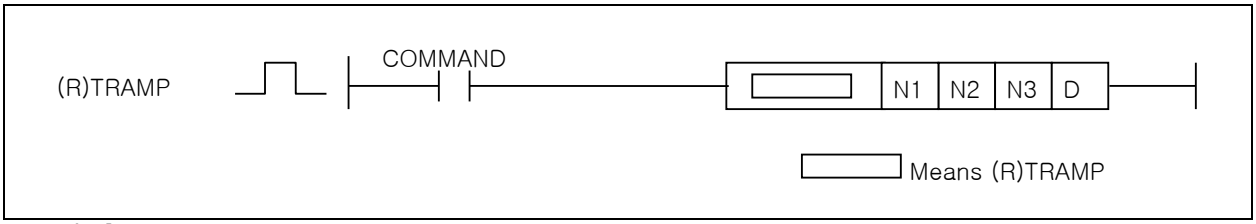
Precautions

(1) Be careful of using indirect designation (#) or index ([Z]) because the SORT/DSORT instruction has internal processing parts without contact point ON.
For example, an error occurs without contact point ON if you use M100 [Z10] for one of the SORT instruction operands and if Z10's value exceeds 1947 that can be outside the M area.

4.24.19 TRAMP, RTRAMP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
(R)TRAMP	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~7	-	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	-	-	-	-	-	O	O	O				



[Area setting]

Operand	Description	Data type
N1	Initial value	INT(REAL)
N2	Final value	INT(REAL)
N3	Time required (sec)	WORD
D	Current value	INT(REAL)

1) TRAMP

(1) During the time designated by N3, it saves value changes from initial value to last value linearly and saves a timer value in D+2 (DWORD type).
(2) After the time (N3), D becomes equal to N2.
(3) If execution condition is canceled, D keeps the last value, but internal time is initialized. So if you restart the instruction, a value changes from an initial value
(4) During operation, a result value (D) is calculated as follows

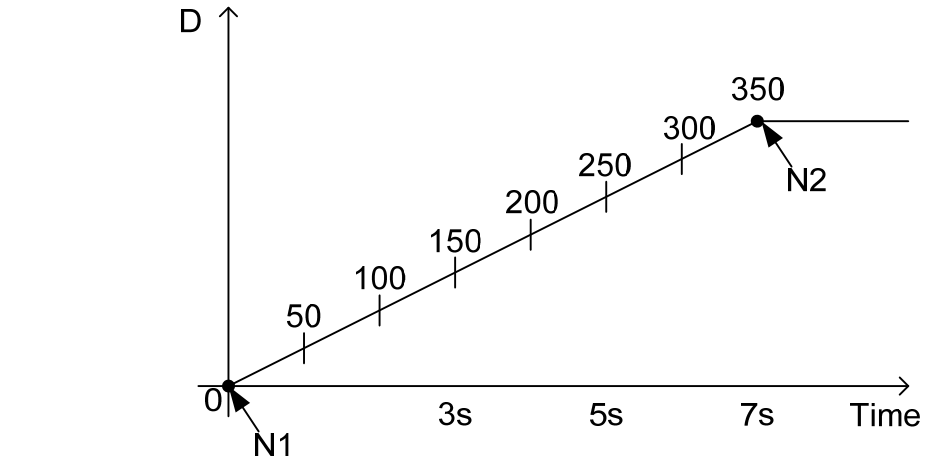
$$D = N1(\text{Initial}) + \frac{[N2(\text{Last}) - N1(\text{Initial})] \times t(\text{elapsed time})}{N3(\text{total required time})}$$

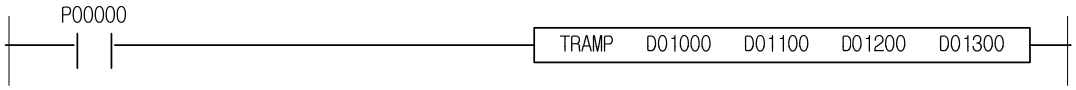
(5) If the value under decimal point occurs, error may occur when changing it to integer type.
(6) If the required time (N3) is 0, operation will not be done and a D value is always a N2 value
(7) Since the timer value for operation is saved in the D+2, if you change it, the undesired result may occur.
(8) After execution to the last value (N2) is completed, the last value (N2) is saved int the operation result (D).
(9) Though the instruction is Off while the instruction is executed, details of D value are not changed.
(10) If you restart the instruction →TRAMP instruction is executed from the initial value.
(11) RTRAMP operates with REAL type data.

2) Example

(1) In case D01000=0, D01100=350, D01200=7, if you turn on P00000, D01300 increases by a velocity of 50/sec every scan and a timer is saved in the D01302.

(2) After 7s, D01300 becomes equal to 350 and keeps its value.





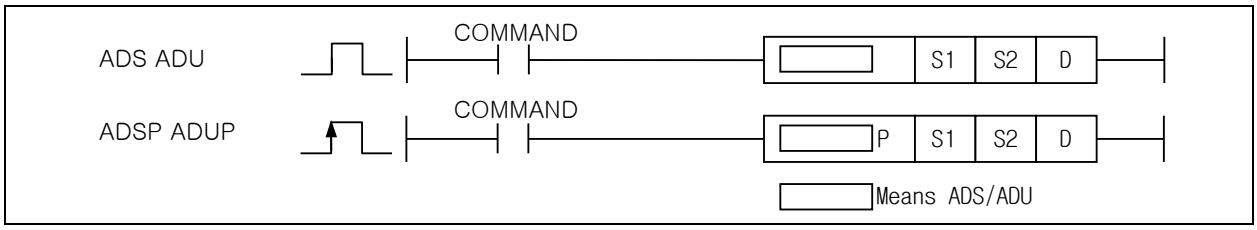
Precautions

(1) Be careful of using indirect designation (#) or index ([Z]) because the TRAMP instruction has internal processing parts without contact point ON.
For example, an error occurs without contact point ON if you use M100 [Z10] for one of the RAMP instruction operands and if Z10's value exceeds 1947 that can be outside the M area.

4.24.20 ADS, ADSP, ADU, ADUP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ADS(P) ADU(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D	O	-	-	-	-	-	-	-	-	-	-	-	O	O				



[Area setting]

Operand	Description	Data type
S1	Device number data to separate / combine is stored	WORD
S2	Device number that contains the unit to separate / combine	WORD
D	Device number that contains the data separated / combine.	WORD

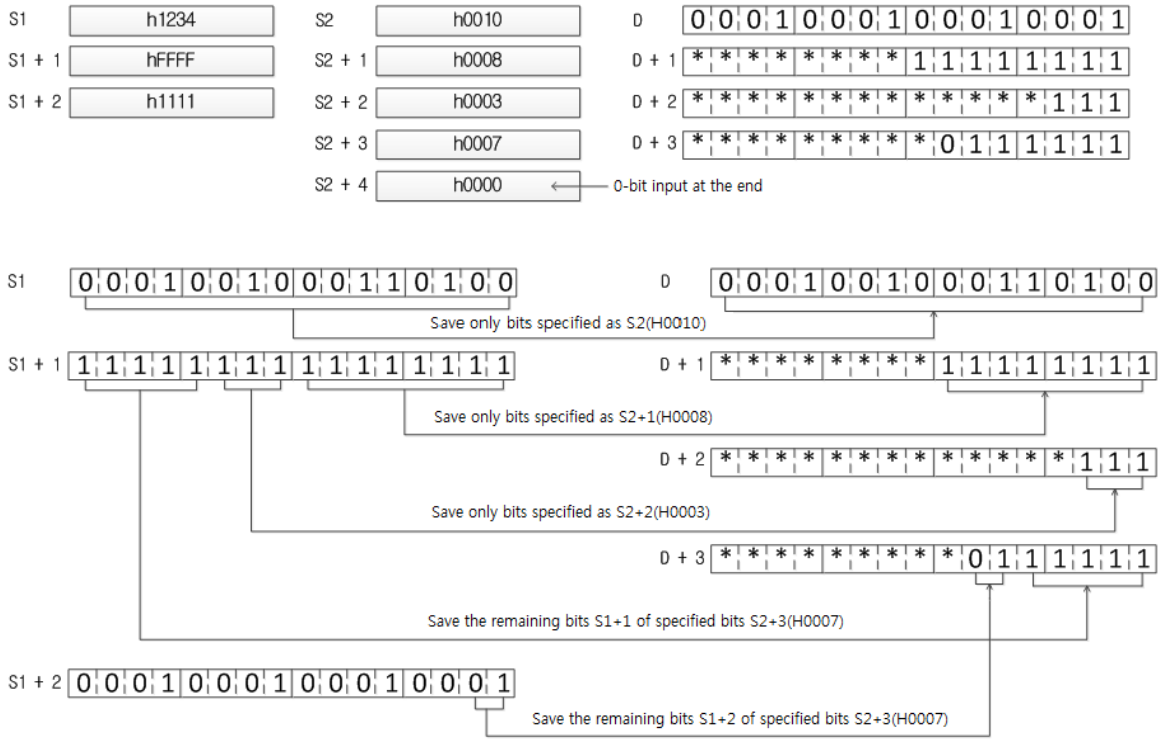
[Flag Set]

Flag	Content	Device number
error	1. If the unit for separating / combining has been set beyond the range of 1 to 16 2. If the memory capacity to store the data separated / combined is not sufficient	F110

1) ADS (Abnormal Data Segmentation)

(1) This command is to be saved after the device specified in the D bits stored in S2 each bit of data stored after the device specified in S1 each split.

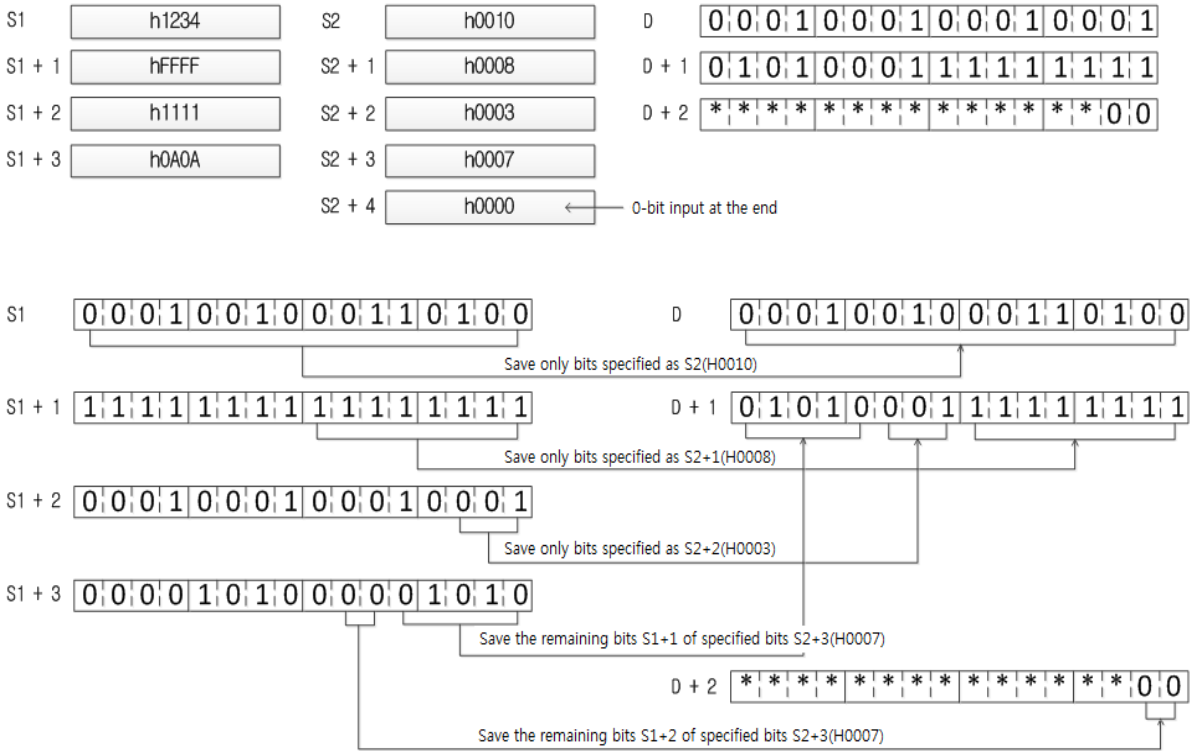
(2) S2 has a range of 1 ~ 16, and it separates until after the value of S2 is '0 '.



2) ADU (Abnormal Data Union)

(1) This command is to be saved after the device specified in the D bits stored in S2 each bit of data stored after the device specified in S1 each unite.

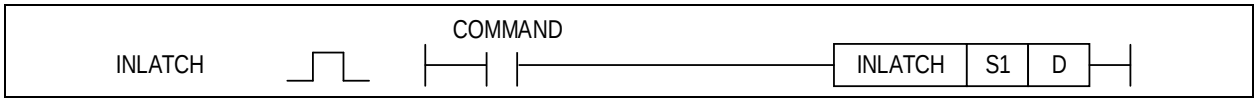
(2) S2 has a range of 1 ~ 16, and it combines until after the value of S2 is '0 '.



4.24.21 INLATCH

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
INLATCH	S1	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	-	-	-
	D	O	-	-	O	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Position(base + slot) where digital Input Module is mounted	WORD
D	Device number that contains input latch data	WORD

1) INLATCH (Input Latch)

(1) The latch area value of the input module at the position specified by S1 is saved as the position designated by D.
(Once a signal is input to the input module, it is latched to 1 until the INLATCH instruction is executed.)

(2) Once the command is executed, the latch area of the input module is reset to 0.

(3) If there is no XGI-D22A (16 point digital input module) in the designated module position or another module is mounted, the instruction does not work.

(4) Use the INLATCH command when it is necessary to detect an input signal shorter than the PLC scan time in the PLC operation.
However, it is possible to detect only the signal exceeding the input filter value set in the input module.
(Since the scan synchronous batch processing method batches input data reading and output data output after the end of the scan program, it is impossible to update the data input from the outside during 1 scan.)

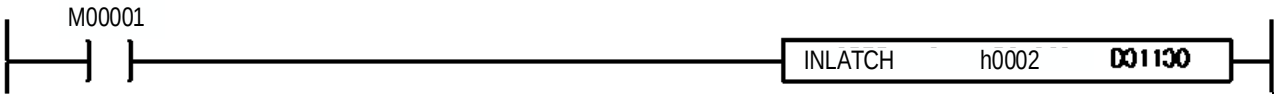
(5) The INLATCH command updates the corresponding input module latch value during program execution.

(6) This instruction is supported only by high performance XGK series and can be used only for XGI-D22A / B module (16 point digital input module).

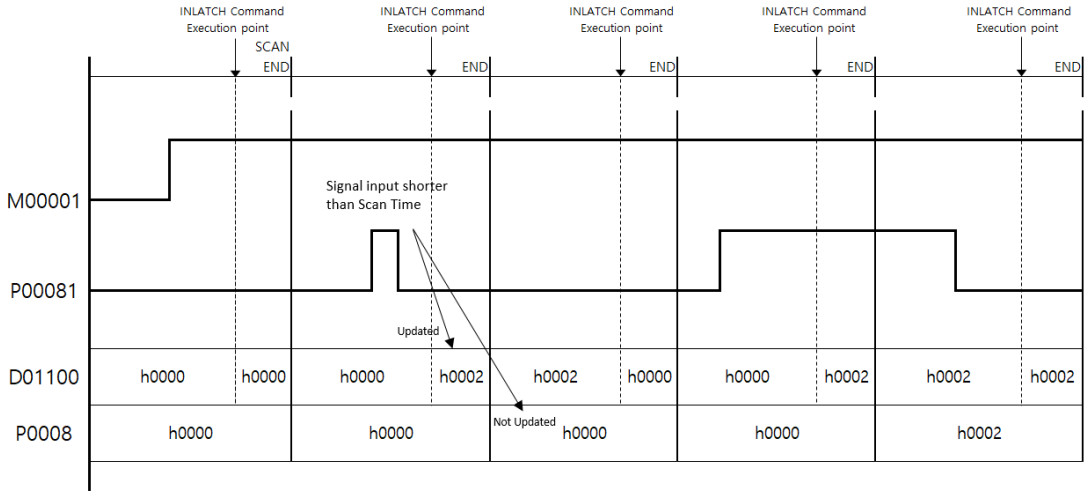
2) Example

(1) 'h002A' means NO.10 slot of NO.2 base.

(2) This is an example where XGI-D22A (address assignment to P0008) is installed in slot 2 of base 0 and the signal of P00081 is input shorter than 1 scan time. When M00001 is On and P00081 signal is input, D01100 becomes h0002 and P0008 becomes h0000. That is, the signal of short cycle is detected by the INLATCH command and is not detected by the P device.



[Time Chart]

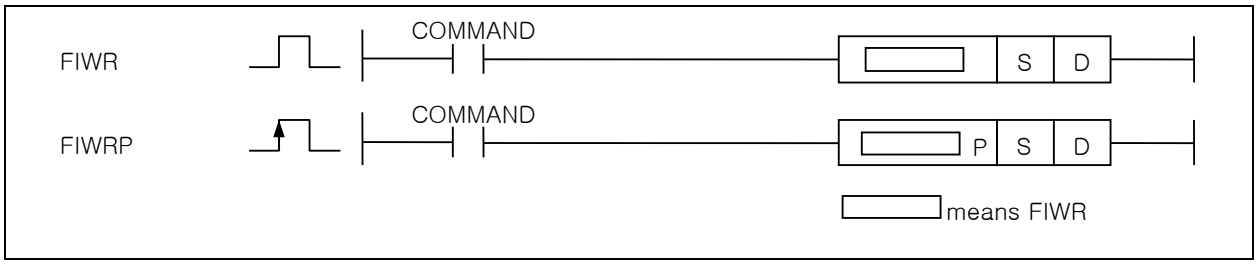

INLATCH Command Execution point
SCAN END
M00001
P00081
D01100
P0008
Signal input shorter than Scan Time
Updated
Not Updated
h0000
h0002

4.25 Data Table Process Instruction

4.25.1 FIWR, FIWRP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FIWR(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	-	O	O	O				



[Area setting]

Operand	Description	Data type
S	Data to input	WORD
D	Start position of table	WORD

[Flag Set]

Flag	Content	Device number
error	If data table's range after data is added exceeds applicable device's range.	F110

1) Structure of File Table

Table process instruction will be normally executed with the following table format.

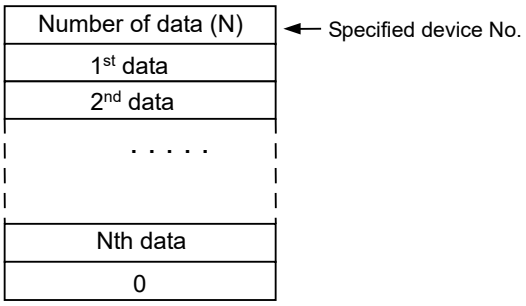
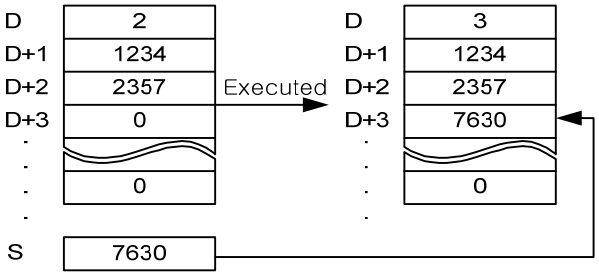


Table size depends on how to operate. In data table process related instructions, data table size is decided through the number of data saved in the device designated as start position of table. Thus, the table needs to be initialized before used. If table size exceeds applicable device's range, error will occur.
All the table process instructions attach '0' to the end of the table. However, how to identify the end of the table depends on the number of data only specified in table start address
All the data in the table will be identified in WORD format if you want to save INT or BYTE type of data in the table, device's data type shall be changed through MOVE Instruction, etc. In addition, Insert and Delete operation shall be repeatedly used to save DWORD data.
Data table size is unlimited. However, since the table can't exceed device area, its maximum size is the value resulted from device's size (where table is located) minus table start address.
All the table related instructions can change the number of data, whose error can not be detected, though. That is to say, even if user has changed the number of data arbitrarily, table process instruction not knowing this takes it for normal. Consequently, the user is recommended previously to secure table area and table size and inspect the area before using the table instruction.

2) FIWR (File Write)

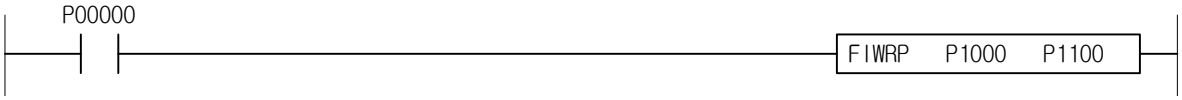
(1) It saves specified data S in specified data table D. At this moment, the data is saved in present number of data + 1 word position from the specified position D.

(2) The value specified by D is the number of valid data in the data table.



3) Example

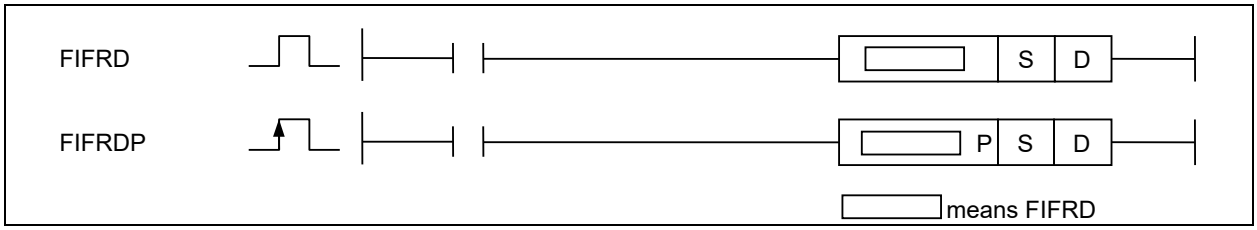
(1) In case P1000=3333, P1100=2, P1101=1111, P1102=2222, if input signal P00000 is off->on, 3333 is added at the end of table and the no. of table increase as 1, P1100=3, P1103=3333 is saved.



4.25.2 FIFRD, FIFRDP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FIFRD(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	2~4	O	0	-
	D	O	-	O	-	-	-	-	-	-	-	-	O	O	O				



[Area setting]

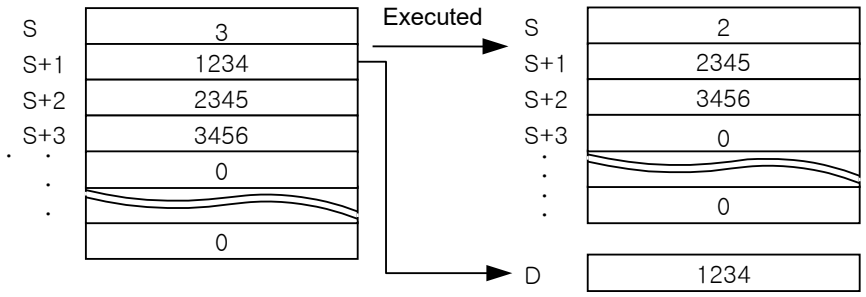
Operand	Description	Data type
S	Start position of data table	WORD
D	Position to save in the value read from data table.	WORD

[Flag Set]

Flag	Content	Device number
error	If data table's range exceeds applicable device's range	F110
Zero	If no data is available in data table.	F111

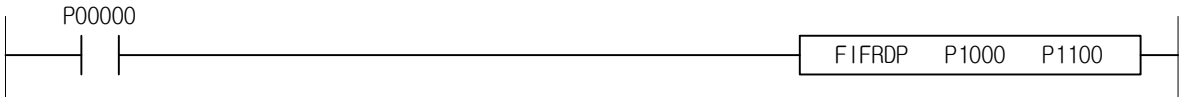
1) FIFRD (First File Read)

(1) It reads the 1st data from specified data table S to D. The number of data in table decreases by 1, and the other data is all moved to the device position with a decrease of 1.
(2) The specified S is number of effective data in data table.
(3) If number of data is decreased by 1, the value is filled by 0 in data table size +1.
(4) If the number of data is 0, 0 is saved at D, zero flag is set



2) Example

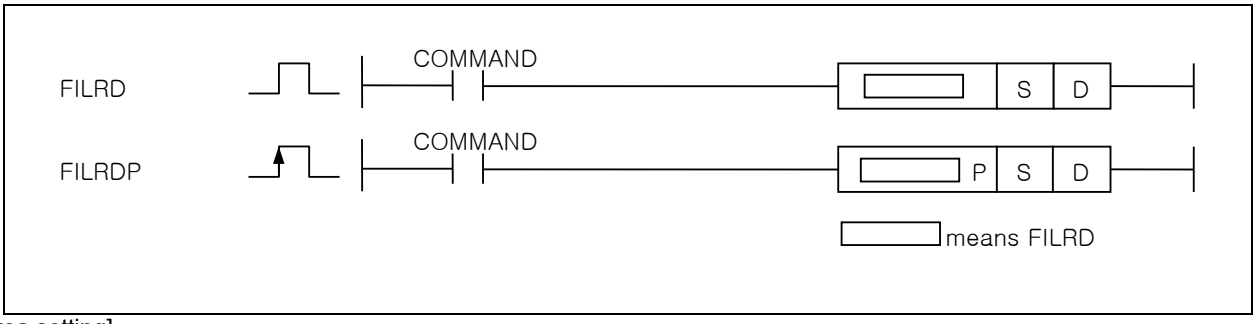
(1)) In case P1000=3, P1001=1111, P1002=2222, P1003=3333, if input signal P00000 is Off -> On, 1111, first data of data table, is saved P1100, and data table decrease as 1, P1000=2, P1001=2222, P1002=3333, P1003=0 is saved.



4.25.3 FILRD, FILRDP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FILRD(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	O	-
	D	O	-	O	-	-	-	-	-	-	-	-	O	O	O				



[Area setting]

Operand	Description	Data type
S	Start position of data table	WORD
D	Position to save in the value read from data table.	WORD

[Flag Set]

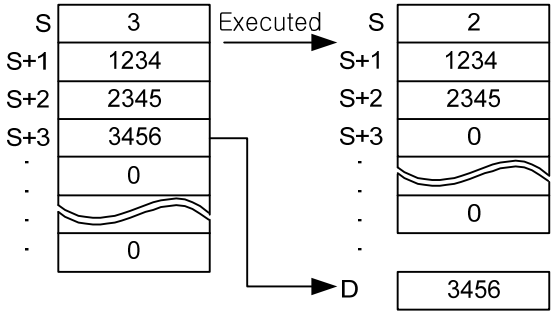
Flag	Content	Device number
error	If data table's range exceeds applicable device's range	F110
Zero	If no data is available in data table.	F111

1) FILRD (Last File Read)

(1) It reads the last data from specified data table S to D. The number of data in table decreases by 1, and the other data is the same as before.

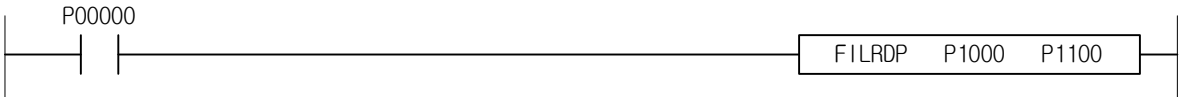
(2) The specified S is number of effective data in data table.

(3) If number of data is decreased by 1, the value is filled by 0 in data table size +1.



2) Example

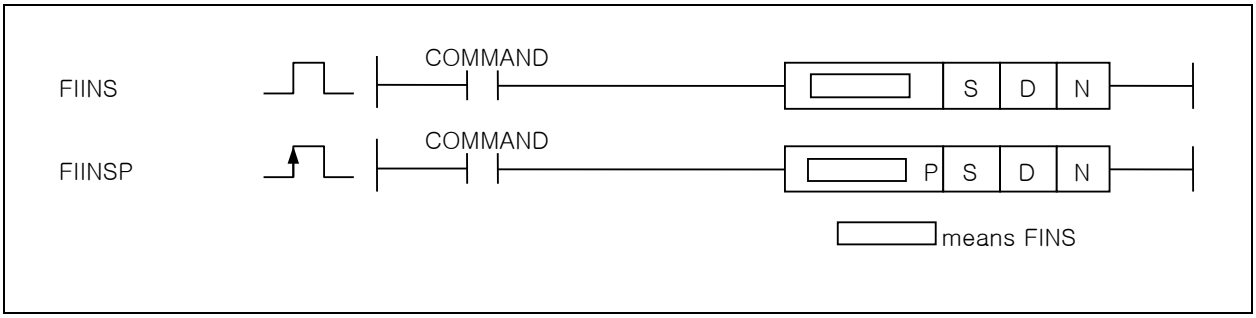
(1) In case P1000=3, P1001=1111, P1002=2222, P1003=3333, if input signal P00000 is Off-> On, 3333, the last data of data table, is saved at P1100, data table is decreased as 1, P1000=2, P1003=0 is saved.



4.25.4 FIINS, FIINSP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FIINS(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	-	O	O	O				
	N	O	-	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Data value to input	WORD
D	Start position of data table	WORD
N	Position to save the input value in	WORD

[Flag Set]

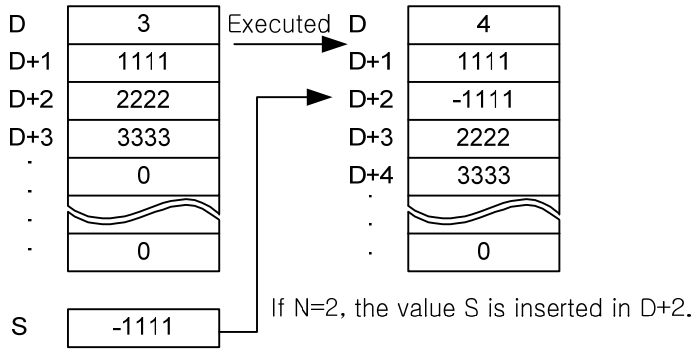
Flag	Content	Device number
error	If data table's range exceeds applicable device's range If N value is larger than the present data size (specified D) + 1 .	F110

1) FIINS (File Insert)

(1) It inserts specified value S in the Nth position of specified data table D. The data from the original Nth will be pushed out to the next device number.

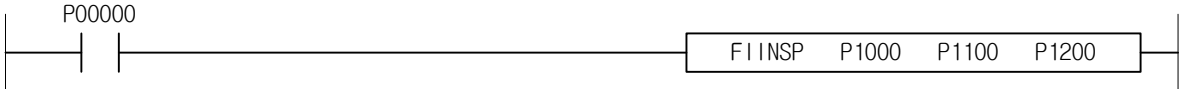
(2) The value of specified D is number of effective data in data table.

(3) If N=0, the instruction will not be executed.



2) Example

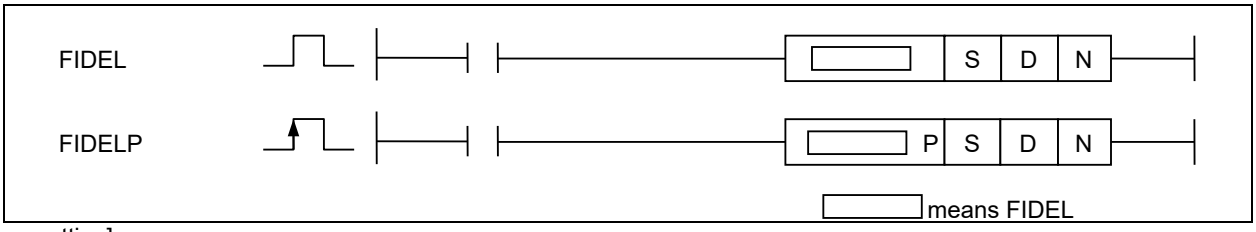
(1) In case P1000=1234, P1100=3, P1101=1111, P1102=2222, P1103=3333, P1200=3, if input signal P00000 is Off-> On, 1234 is inserted at the third position of data table, P1103=1234, P1104=3333 is saved and P1100, effective number within data table, is increased as1 and become 4.



4.25.5 FIDEL, FIDELP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FIDEL(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	-	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

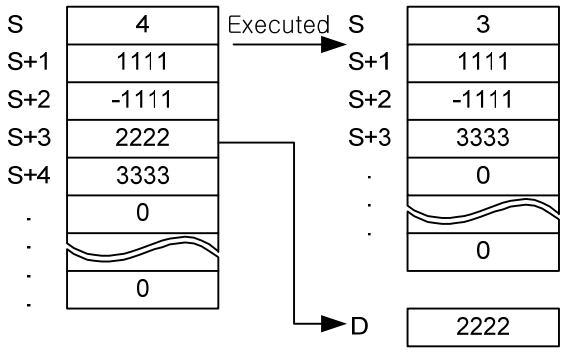
Operand	Description	Data type
S	Start position of data table	WORD
D	Data value deleted	WORD
N	Position of data to delete	WORD

[Flag Set]

Flag	Content	Device number
error	If data table's range exceeds applicable device's range If position of data to delete exceeds table data size.	F110

1) FIDEL (File Delete)

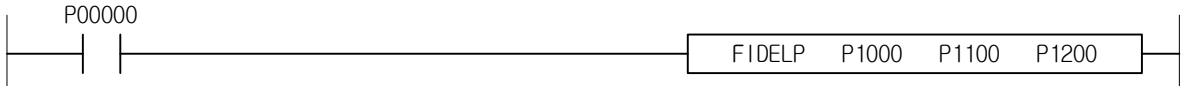
(1) It moves the Nth data of specified data table S to D. The data from the Nth will be pulled to the position where 1 is decreased from the original position.
(2) The value of specified D is number of effective data in data table.
(3) If N=0, the instruction will not be executed.
(4) If data is removed in table, the value is filled by 0 in data table size +1



If N=3, the value of S+3 position is moved to D.

2) Example

(1) In case P1000=4, P1001=1111, P1002=2222, P1003=3333, P1004=4444, P1200=1, if input signal P00000 is Off -> On, 1111, the first data of data table, is saved at P1100, and P1000, effective number in the data table, is decreased as 1, and become 3, and P1001=2222, P1002=3333, P1003=4444, P1004=0.



4.26 String Process Instruction

4.26.1 BINDA, BINDAP, DBINDA, DBINDAP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BINDA(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	-	-	-
DBINDA(P)	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

[Area setting]

Operand	Description	Data type
S	Data or address to convert to ASCII	INT/DINT
D	Address to save operation result in	STRING

1) BINDA (Binary to Decimal ASCII)

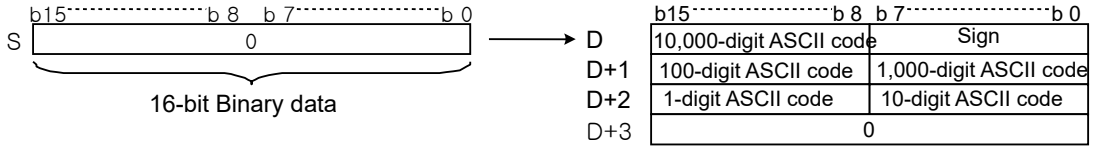
(1) It converts each digit to ASCII from the upper in regular order when input Binary 16-bit data is made in Decimal.

(2) The value converted to ASCII will be saved in starting D by 2 digits per word in regular order.

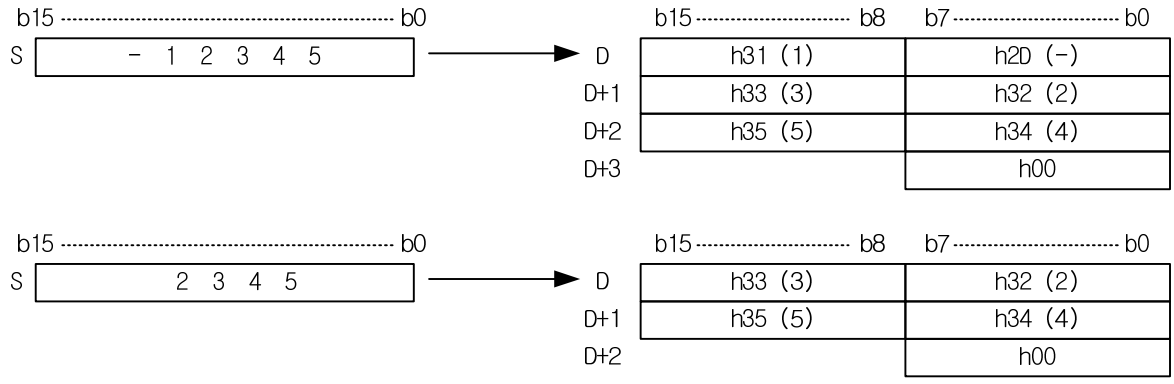
(3) If S is a negative number, sign value of –(h2D) will be first output to the first byte of D.

(4) Data S will be regarded as signed.

(5) In BINDA, its operation range is –32768(hFFFF) ~ 32767(h7FFF).



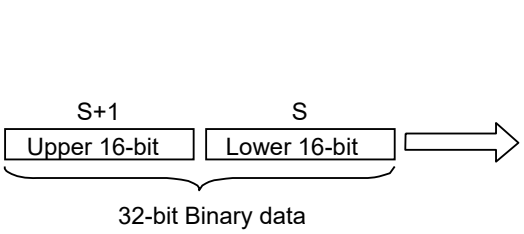
(6) For example, if –12345 is specified in S, the result after D will be saved as below.



2) DBINDA (Double Binary to Decimal ASCII)

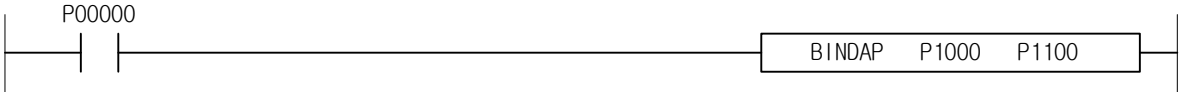
(1) It converts each digit to ASCII from the upper in regular order when input binary 32-bit data is made in decimal.

(2) The value converted to ASCII will be saved in starting D by 2 digits per word in regular order.
(3) If S is a negative number, sign value of "– "will be first output to the first byte of D.
(4) Data S will be regarded as signed.
(5) In DBINDA, its operation range is –2147483648(hFFFF) ~ 2147483647(h7FFFFFFF).



	b15 ---------- b8	b7 ---------- b0
D	1000000000-digit ASCII code	Sign data
D+1	10000000-digit ASCII code	100000000-digit ASCII code
D+2	100000-digit ASCII code	1000000-digit ASCII code
D+3	1000-digit ASCII code	10000-digit ASCII code
D+4	10-digit ASCII code	100-digit ASCII code
D+5	0	1-digit ASCII code

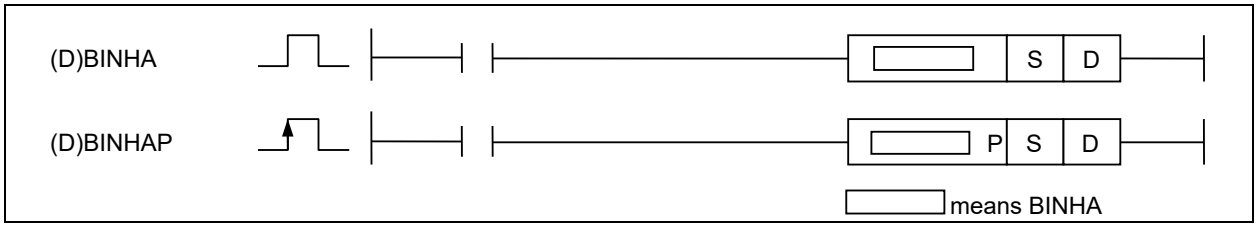
3) Example



4.26.2 BINHA, BINHAP, DBINHA, DBINHAP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BINHA(P) DBINHA(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

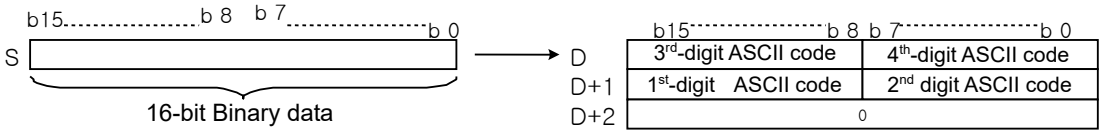


[Area setting]

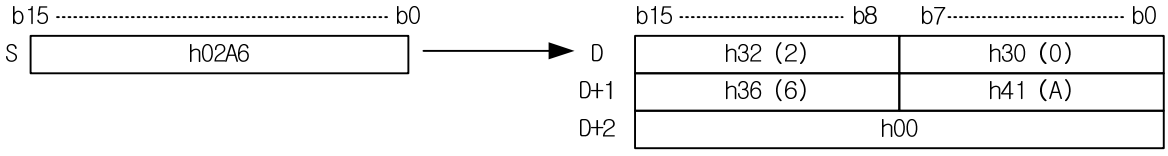
Operand	Description	Data type
S	Data or address to convert to ASCII	WORD/DWORD
D	Address to save operation result in	BIN32

1) BINHA (Binary to Hex ASCII)

(1) It converts each digit to ASCII from the upper in regular order when input binary 16-bit data is made in Hexadecimal.
(2) The value converted to ASCII will be saved in starting D by 2 digits per word in regular order.
(3) In BINHA, its operation range is h0000 ~ hFFFF.



(4) For example, if h02A6 is specified in S, the result after will be saved as below.

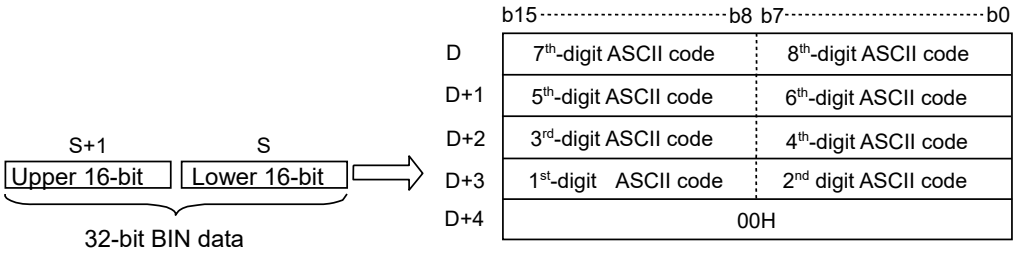


2) DBINHA (Double Binary to Hex ASCII)

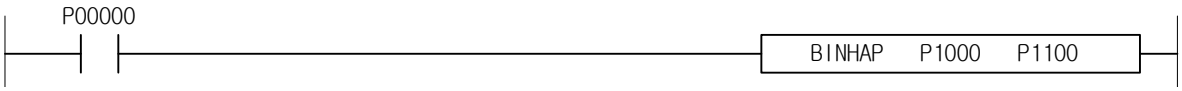
(1) It converts each digit to ASCII from the upper in regular order when input binary 32-bit data is made in hexadecimal.

(2) The value converted to ASCII will be saved in starting D by 2 digits per word in regular order.

(3) In DBINHA, its operation range is h00000000 ~ hFFFFFFFF.



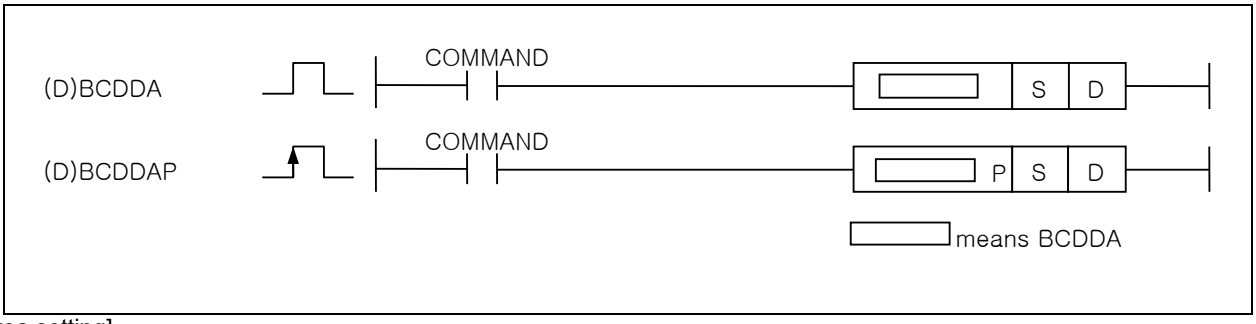
3) Example



4.26.3 BCDDA, BCDDAP, DBCDDA, DBCDDAP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BCDDA(P) DBCDDA(P)	S	O	O	O	O	O	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	BCD data or address to convert to ASCII	WORD/DWORD
D	Address to save operation result in	STRING

[Flag Set]

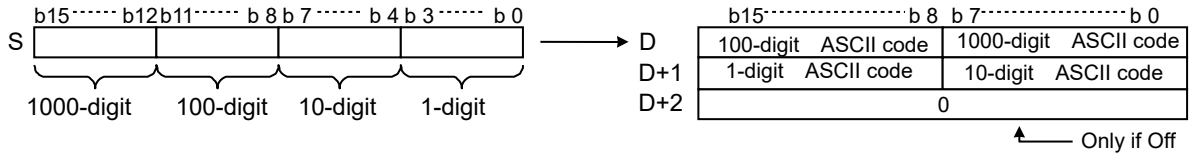
Flag	Content	Device number
error	If input BCD data exceeds operation range	F110

1) BCDDA (BCD to Decimal ASCII)

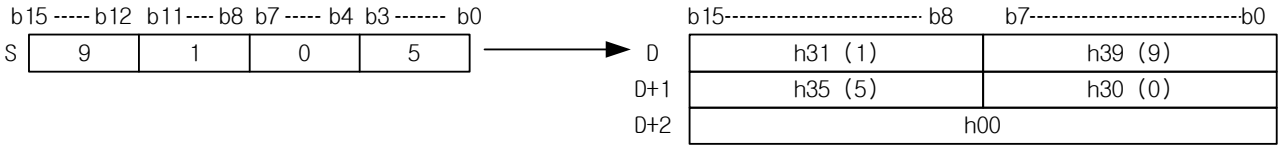
(1) It converts each digit to ASCII from the upper in regular order when input binary data is made in decimal.

(2) The value converted to ASCII will be saved in starting D by 2 digits per word in regular order.

(3) In BINHA, its operation range is h0000 ~ hFFFF. An error is set for values exceeding the BCD data range.



(4) For example, if h9105 is specified in S, the result after will be saved as below.

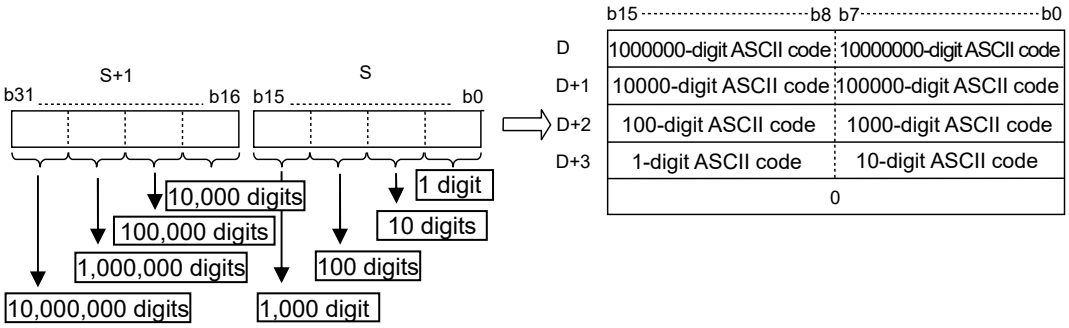


2) DBCDDA (Double BCD to Decimal ASCII)

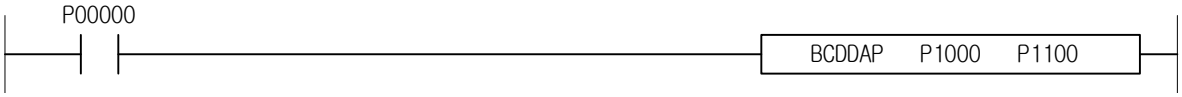
(1) It converts each digit to ASCII from the upper in regular order when input binary data is made in decimal.

(2) The value converted to ASCII will be saved in starting D by 2 digits per word in regular order.

(3) In BCDDA, its operation range is h0000 ~ h9999.



3) Example



4.26.4 DABIN, DABINP, DDABIN, DDABINP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DABIN(P) DDABIN(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

[Area setting]

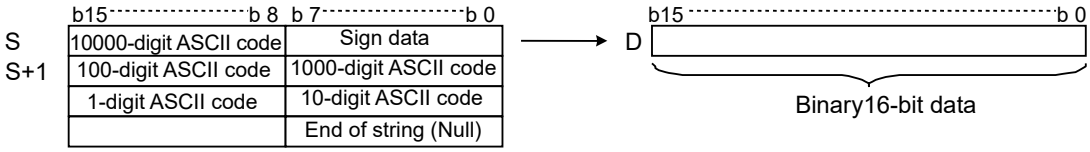
Operand	Description	Data type
S	Address where decimal ASCII data to convert to binary is saved	STRING
D	Address to save operation result in	INT/DINT

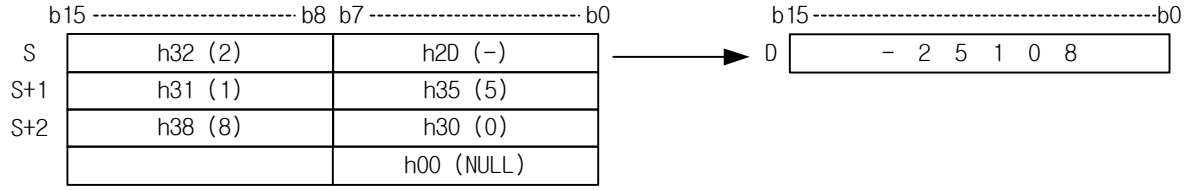
[Flag Set]

Flag	Content	Device number
error	To be set if input ASCII data exceeds operation range To be set if input ASCII string length exceeds the maximum string length(31) To be set if other string than sign and 0~9 is in input ASCII string	F110

1) DABIN (Decimal ASCII to Binary)

(1) It converts decimal value saved in ASCII to binary and saves in D.
(2) NULL is surely at the end of ASCII string.
(3) The lower byte of the 1st word in input ASCII value decides the sign of binary value.
(4) Sign will be of –(h2D) or +(h2B).
(5) Sign + (h2B) can be omitted.
(6) Data D will be saved as signed.
(7) In DABIN, its operation range is –32768(h8000) ~ 32767(h7FFF).
(8) ASCII string available to input is the value in ASCII applicable to Sign and 0~9. If any other value than those is input, Error will be set.

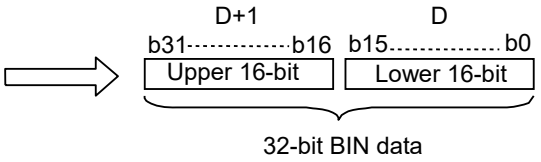




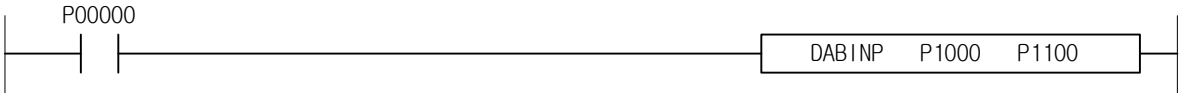
2) DDABIN (Double Decimal ASCII to Binary)

(1) It converts decimal value saved in ASCII to binary and saves in D.
(2) NULL is surely at the end of ASCII string.
(3) The lower byte of the 1st word in input ASCII value decides the sign of binary value.
(4) Sign will be of –(h2D) or +(h2B).
(5) Sign + (h2B) can be omitted.
(6) Data D will be saved as signed.
(7) In DDABIN, its operation range is –2147483648(h80000000) ~ 2147483647(h7FFFFFFF).
ASCII string available to input is the value in ASCII applicable to Sign and 0~9. If any other value than those is input,

	b15 ····· b8	b7 ····· b0
S	1000000000-digit ASCII code	Sign data
S+1	10000000-digit ASCII code	100000000-digit ASCII code
S+2	100000-digit ASCII code	1000000-digit ASCII code
S+3	1000-digit ASCII code	10000-digit ASCII code
S+4	10-digit ASCII code	100-digit ASCII code
S+5	End of string	1-digit ASCII code



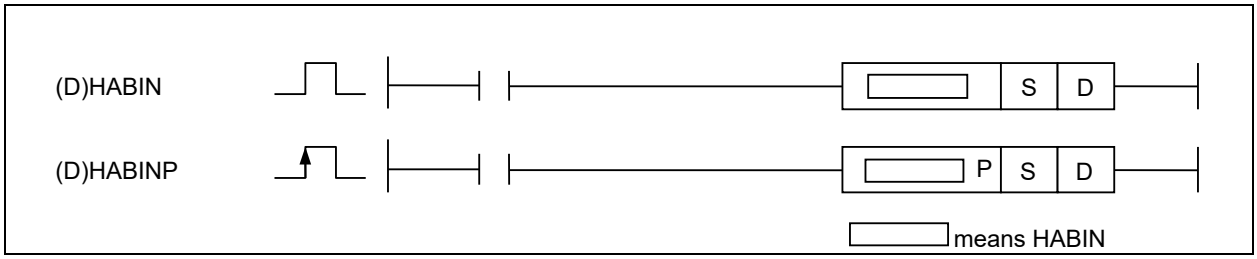
3) Example



4.26.5 HABIN, HABINP, DHABIN, DHABINP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
HABIN(P) DHABIN(P)	S	O	O	O	O	-	-	O	-	-	-	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	-	-	O	-	-	-	O	O	O	O				



[Area setting]

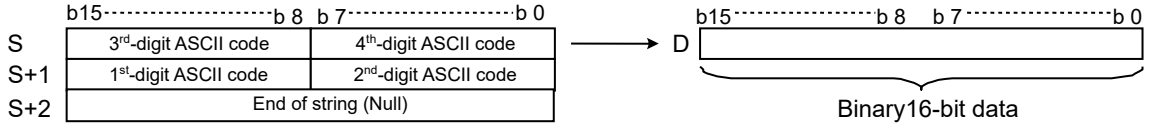
Operand	Description	Data type
S	Address where Hexadecimal ASCII data to convert to binary is saved.	STRING
D	Address to save operation result in	WORD/DWORD

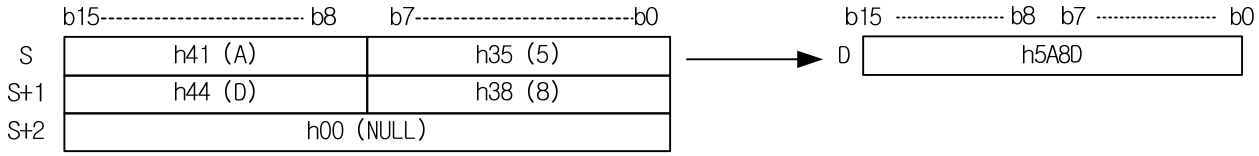
[Flag Set]

Flag	Content	Device number
error	To be set if string length exceeds the maximum string length To be set if input data exceeds operation range To be set if other string than 0~F is in string	F110

1) HABIN (Hex ASCII to Binary)

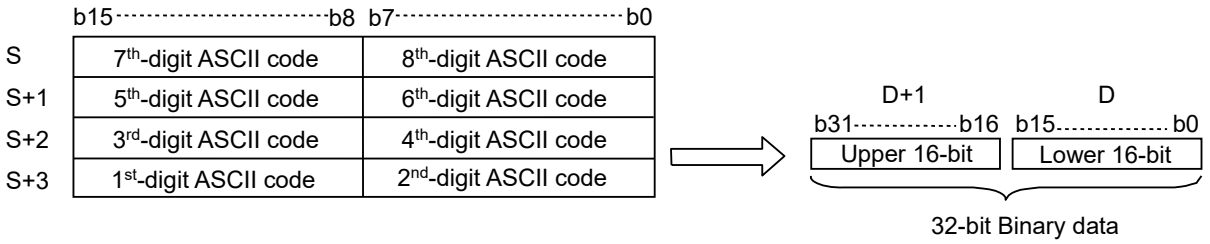
(1) It converts hexadecimal value saved in ASCII to binary and saves in D.
(2) The end of ASCII string can be identified with NULL.
(3) In HABIN, its operation range is h0000 ~ hFFFF.
(4) ASCII string available is the value applicable to 0~F. If any other value than those is input, Error will be set.
(5) As the first character displaying Hex,'h'or' H'is allowed.



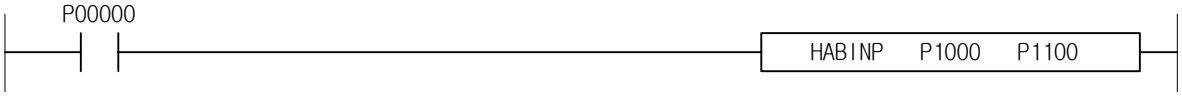


2) DHABIN (Double Hex ASCII to Binary)

(1) It converts hexadecimal value saved in ASCII to binary and saves in D.
(2) The end of ASCII string can be identified with NULL.
(3) ASCII string available is the value applicable to 0~F. If any other value than those is input, Error will be set.
(4) In DHABIN, its operation range is h00000000 ~ hFFFFFFFF.
(5) As the first character displaying Hex,'h'or 'H'is allowed.


b15 b8 b7 b0
S
S+1
S+2
S+3
7th-digit ASCII code
8th-digit ASCII code
5th-digit ASCII code
6th-digit ASCII code
3rd-digit ASCII code
4th-digit ASCII code
1st-digit ASCII code
2nd-digit ASCII code
D+1
D
b31 b16 b15 b0
Upper 16-bit
Lower 16-bit
32-bit Binary data

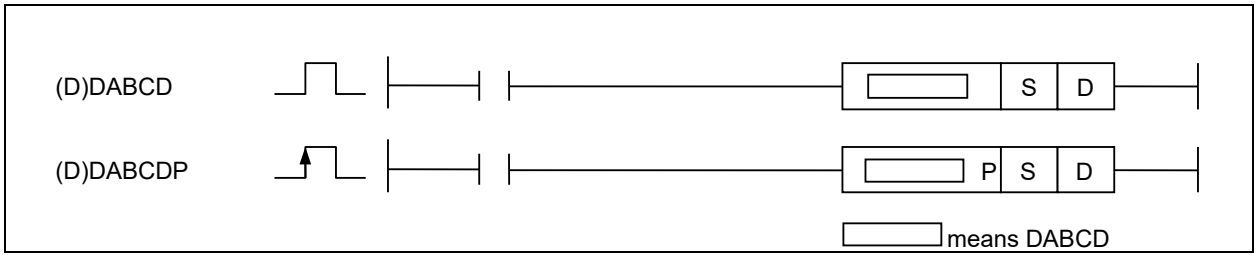
3) Example


P00000
HABINP P1000 P1100

4.26.6 DABCD, DABCDP, DDABCD, DDABCDP

[Applicable Product: XGK.XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DABCD(P) DDABCD(P)	S	O	O	O	O	O	-	O	-	-	-	O	O	O	O	2~4	O	-	-
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

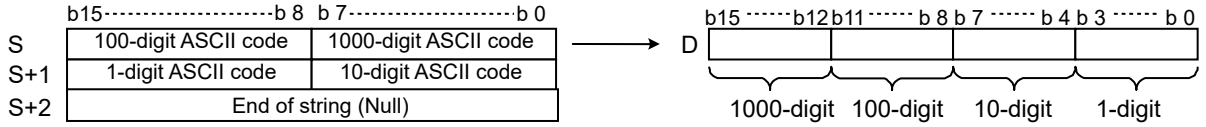
Operand	Description	Data type
S	Address where decimal ASCII data to convert to BCD is saved	STRING
D	Address to save operation result in	WORD/DWORD

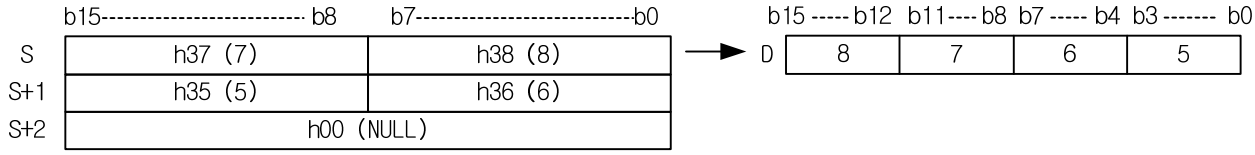
[Flag Set]

Flag	Content	Device number
error	ASCII string to be set if other string than 0~ 9 in string. If ASCII string length exceeds 4(DABCD)/8(DDABCD)	F110

1) DABCD (Decimal ASCII to BCD)

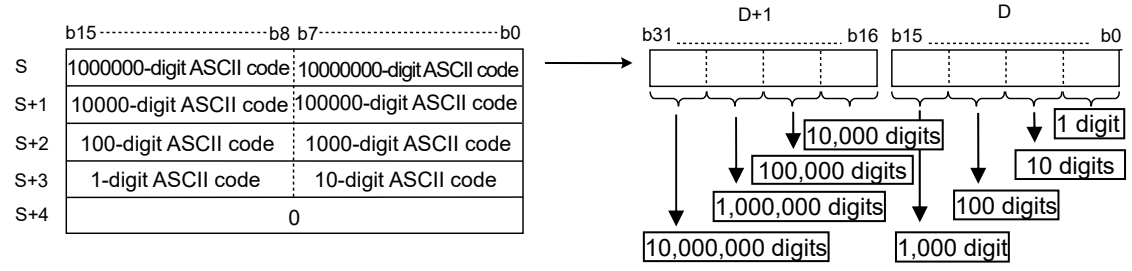
(1) It converts decimal value saved in ASCII to BCD and saves in D.
(2) Data D will be saved as unsigned.
(3) In DABCD, its operation range is h0000 ~ h9999.





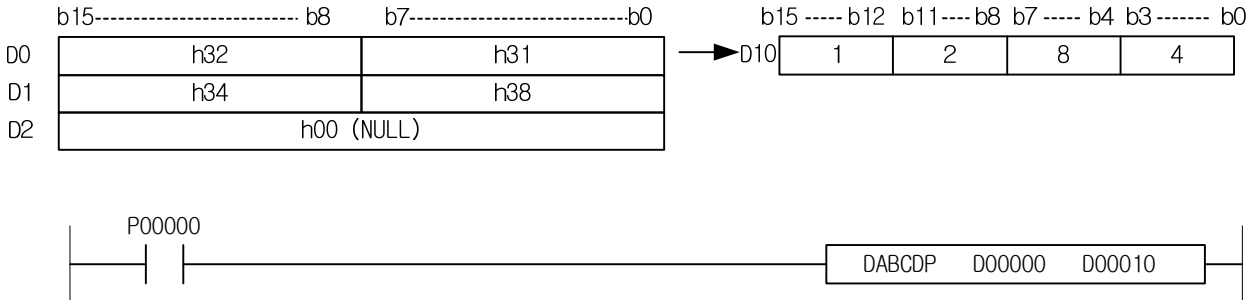
2) DDABCD (Double Decimal ASCII to BCD)

(1) It converts decimal value saved in ASCII to BCD and saves in D.
(2) Data D will be saved as unsigned.
(3) In DDABCD, its operation range is h00000000 ~ h99999999.



3) Example

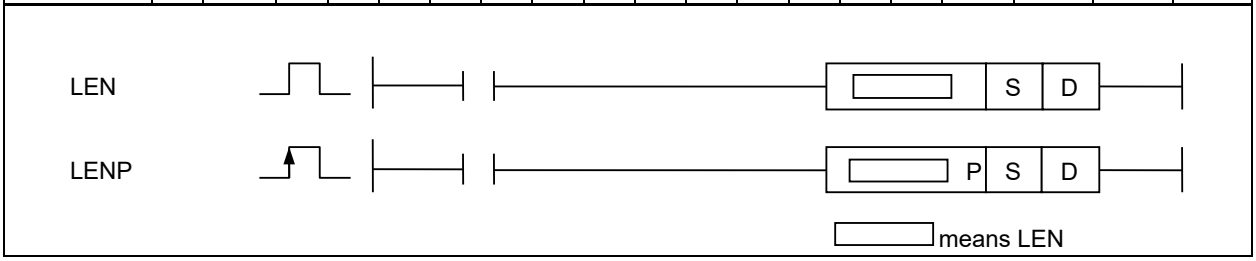
(1) If Input Signal P00000 is changed to On, It converts ASCII code saved in D00000~D00001 to BCD value and saved '1284' in D00010.



4.26.7 LEN, LENP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LEN(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



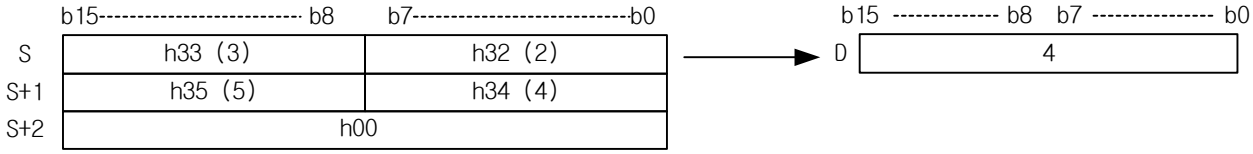
[Area setting]

Operand	Description	Data type
S	Start position of string	STRING
D	Position to save string length	WORD

1) LEN(Length)

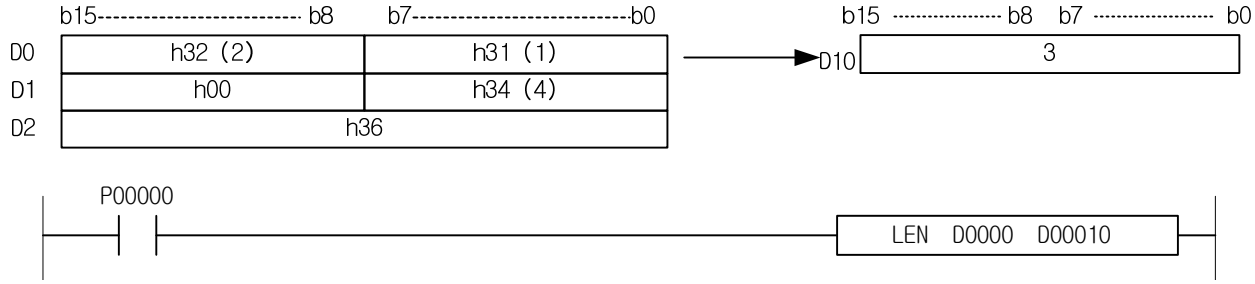
(1) It calculates the string length saved in ASCII starting from S to save in D by 2 digits per word.

(2) Even if specified string S exceeds 31 characters with no NULL code, it will return 31 characters without any error.



2) Example

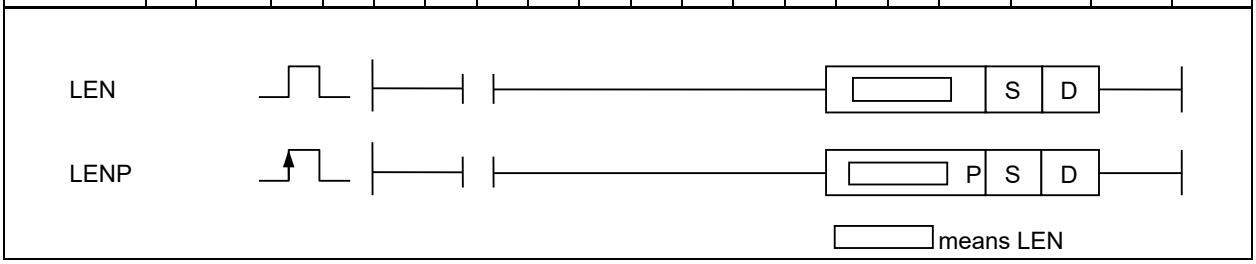
(1) If Input Signal P00000 is changed to On, the string size of '124' saved in D00000~D00001 is operated and '3' saved in D10.



4.26.8 STR, STRP, DSTR, DSTRP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
STR(P) DSTR(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	S2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

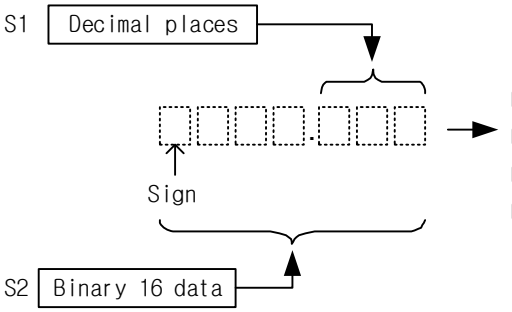
Operand	Description	Data type
S1	Data address (0~28) where S2' decimal places are saved	WORD
S2	Binary data to convert	INT/DINT
D	Address to save converted string in	STRING

[Flag Set]

Flag	Content	Device number
error	To be set if specified decimal places are other than 0~28	F110

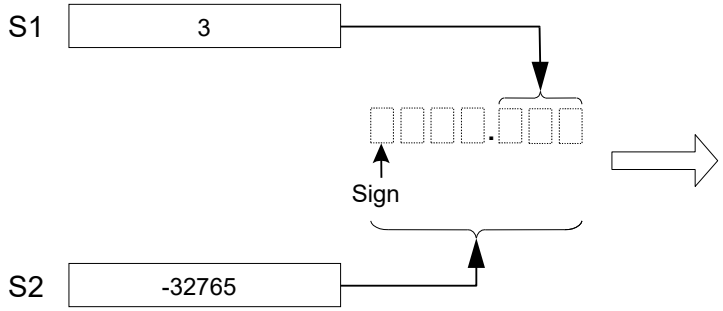
1) STR(String)

(1) It converts specified Binary 16-bit data S2 with decimal places added to specified position S1, to string to save in the next number to specified device D.



D	1 st string ASCII code value	ASCII code value of sign
D+1	3 rd string ASCII code value	2 nd string ASCII code value
D+2	5 th string ASCII code value	4 th string ASCII code value
D+3	7 th string ASCII code value	6 th string ASCII code value
D+4	h00 (NULL)	

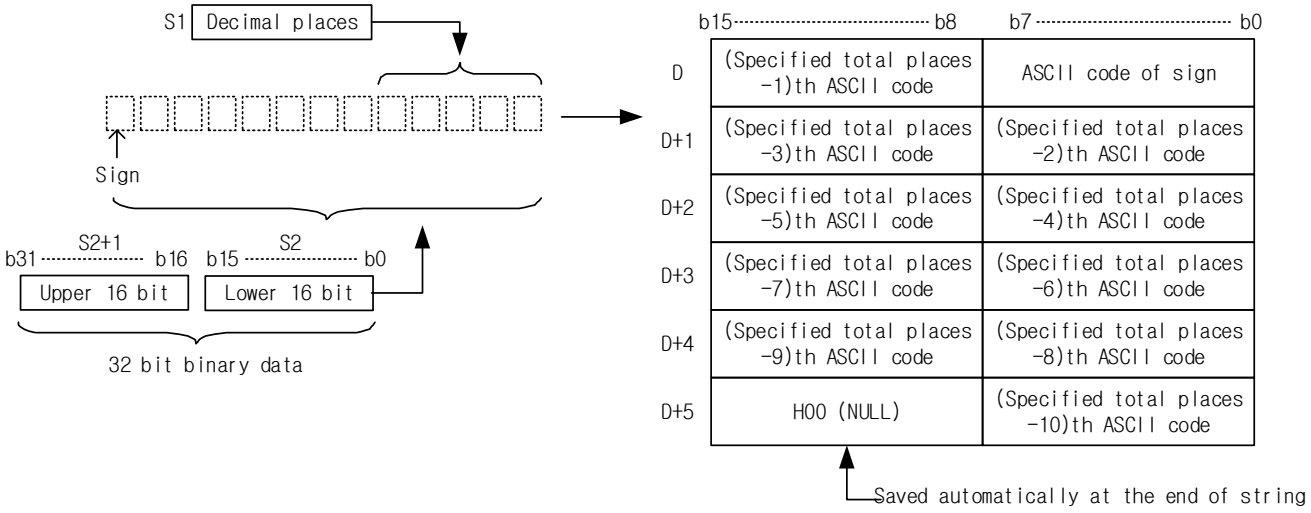
(2) S1 stands for decimal places.
(3) In STR, if S1 range is other than 0~28, Error Flag will be set.
(4) If decimal places more than Binary16 data are specified, the insufficient part will be filled with 0s.
(5) If input Binary 16-bit data is a negative number, attach '-'(h2D) to the front of the string.



D	h33 (3)	h2D (-)
D+1	h2E (.)	h32 (2)
D+2	h36 (6)	h37 (7)
D+3	h00 (NULL)	h35 (5)

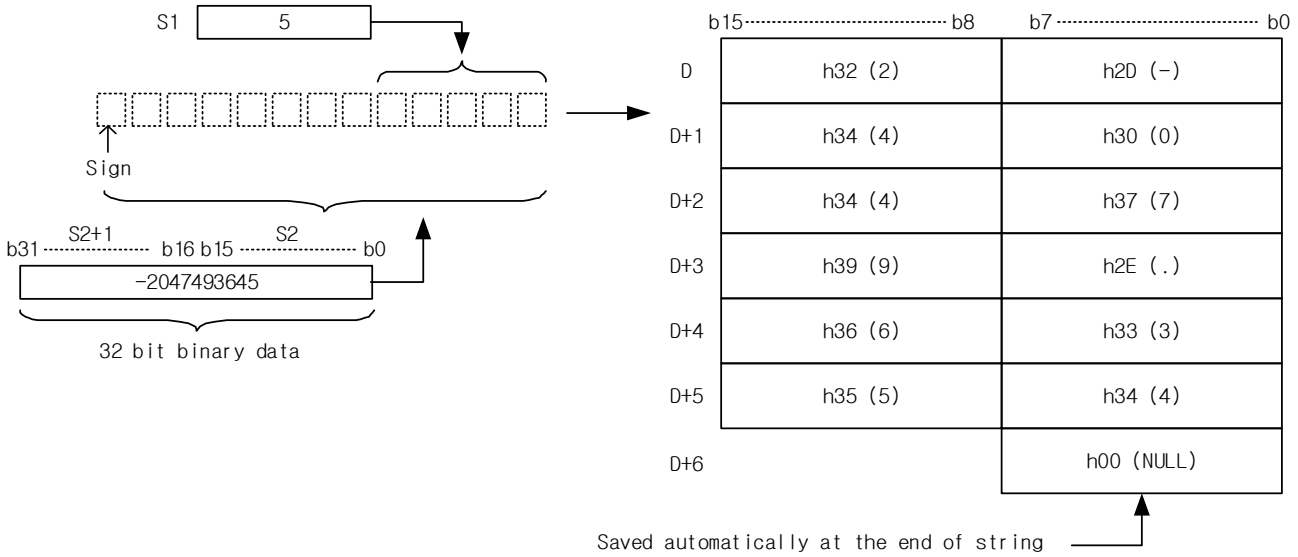
2) DSTR(Double String)

(1) It converts specified Binary 32-bit data S2 with decimal places added to specified position S1, to string to save in the next number to specified device D.

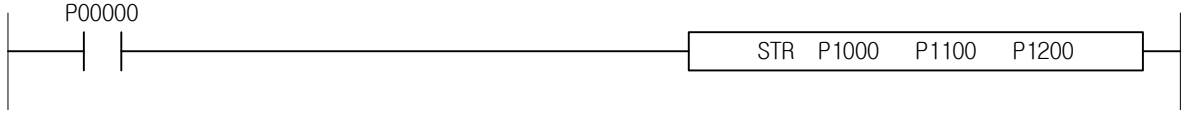


(2) S1 stands for decimal places.

(3) If S1 range is other than 0~28, Error Flag will be set.



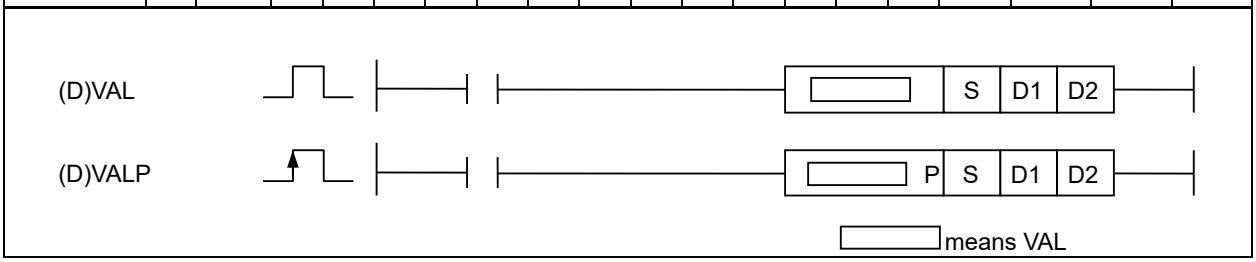
3) Example



4.26.9 VAL, VALP, DVAL, DVALP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
VAL(P) DVAL(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Start address of string to convert to Binary data	STRING
D1	Position to save Binary data's places after converted	WORD
D2	Position to save Binary data after converted	INT/DINT

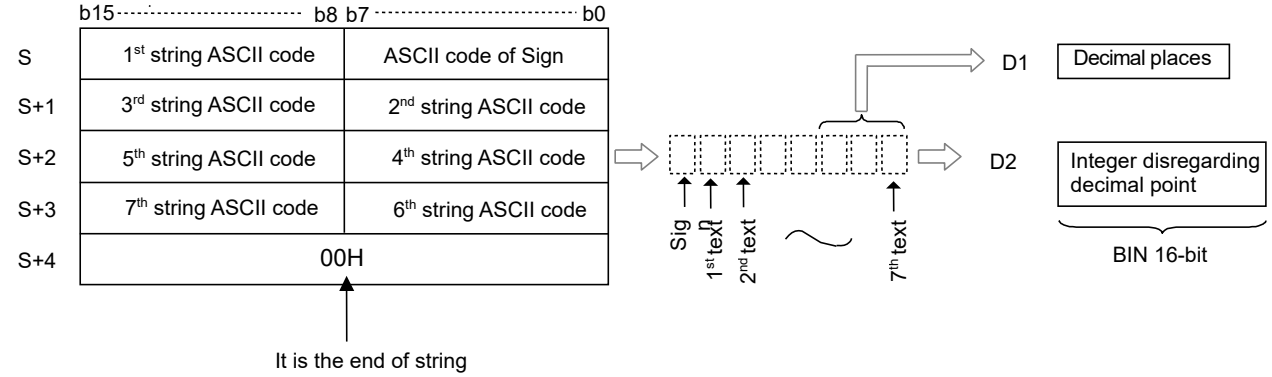
[Flag Set]

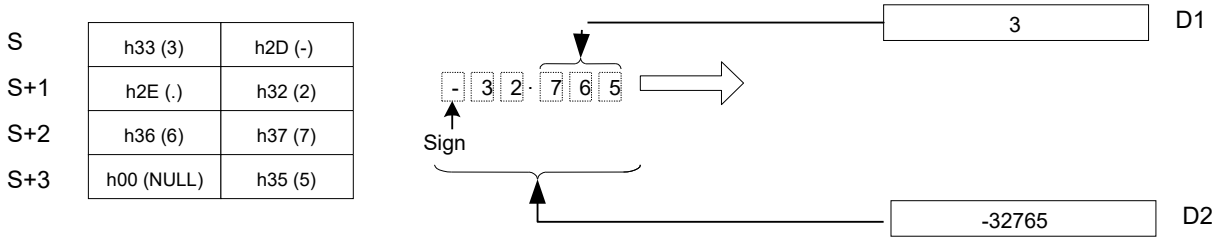
Flag	Content	Device number
error	If ASCII string value is other than 0x30~0x39, Sign(-, +) or decimal point If ASCII string length exceeds the maximum string length Dot, sign ('+', '-'), spaces only when a space comes after the numeric string (0x30~0x39)	F110

1) VAL(Value)

(1) It saves specified string S converted to Binary data in D1, and saves converted 16-bit Binary data in D2 omitting decimals.

(2) ASCII string range is h30 ~ h39, and Error Flag will be set for others than sign and decimal point. In VAL, convertible range of S is –32768 ~ 32767.

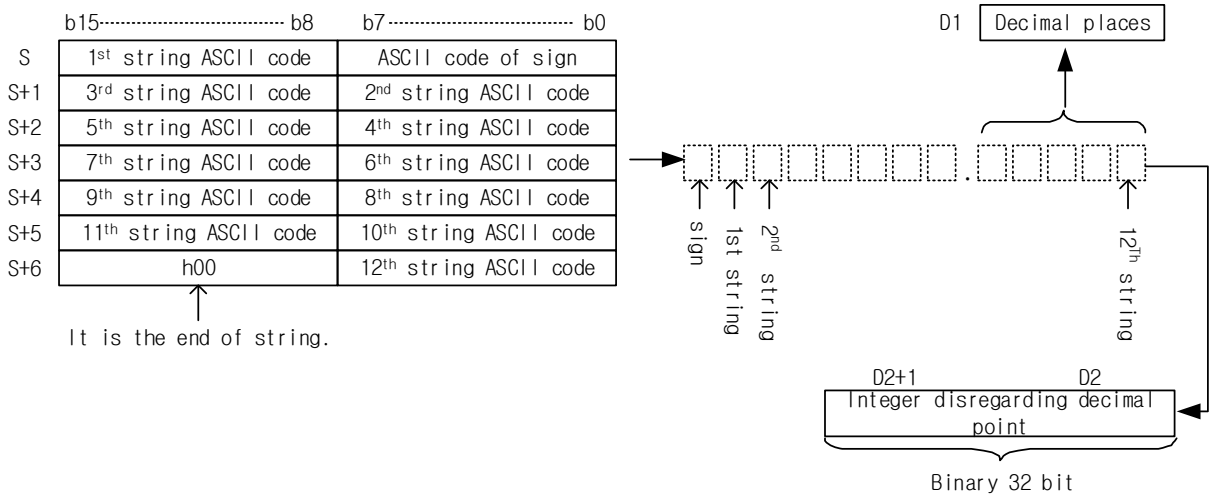




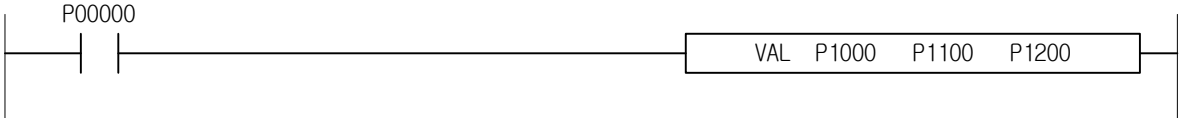
2) DVAL(Double Value)

(1) It saves specified string S converted to Binary data in D1, and saves converted data in D2.

(2) ASCII string range is h30 ~ h39, and Error Flag will be set for others than sign and decimal point. In DVAL, convertible range of S is –2147483648 ~ 2147483647.



3) Example



Notes

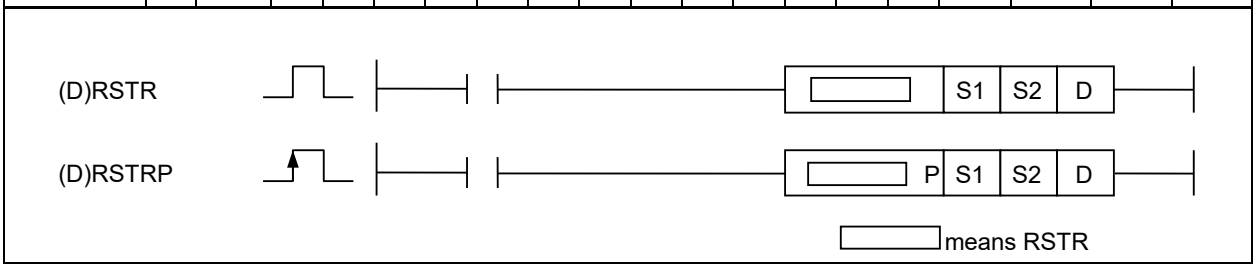
1.Only +, -, . (point), space, number are available for VAL's character string.
2.If there is space before number or point behind the character string starting with a sign (+, -), it works normally.
3.If there is space after the number, error appears. And if there is a point without the number, it is considered that there is 0 in front of the point.

4.If you use only point, sign (+, -) and space, error appears.
Example of permission) ___.123, __0.001, __+__1.33, -__.4 (_: means space)
Example of error) 1.24__, 1_23, +-0, __.__ and .(point), +, - and etc are used solely.

4.26.10 RSTR, RSTRP, LSTR, LSTRP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RSTR(P) LSTR(P)	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Floating point data to convert	REAL/LONG
S2	Effective decimal places (0~25)	WORD
D	Address to save converted string in	STRING

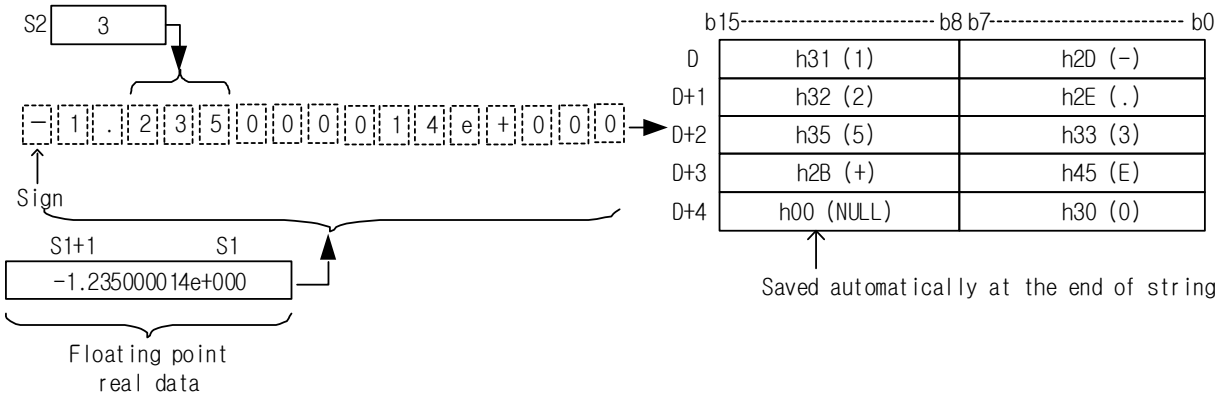
[Flag Set]

Flag	Content	Device number
error	If converted value exceeds specified area D If specified value S2 exceeds 0~25 range	F110

1) RSTR(Real to String)

(1) It converts floating point real data S1 to exponential ASCII string adjusting to decimal places specified in S2 to save in starting D by 2 per word in regular order.

(2) RSTR's operation range is -3.40282347e+038 ~ -1.17549435e-038 or 1.17549435e-038 ~ 3.40282347e +038. S2's range is 0 ~ 25.

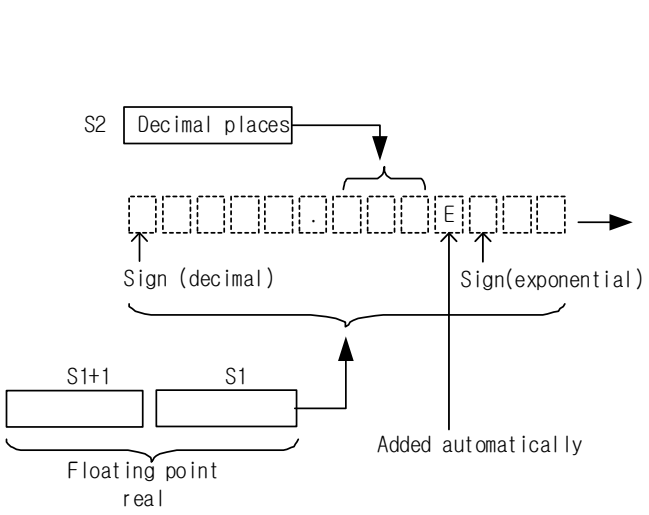


2) LSTR(Long Real to String)

(1) It converts floating point real data S1 to ASCII string based on saved format in S2 to save in starting D by 2 per word in regular order.

(2) STRL's operation range is -1.7976931348623157e+290 ~ -2.2250738585072014e-290 or 2.2250738585 072014e-290 ~ 1.7976931348623157e+290. Note) If input value exceeds operation range, 1.#INF000e+0 or -1.#QNAN0E+0 or 0 may appear with no error output.

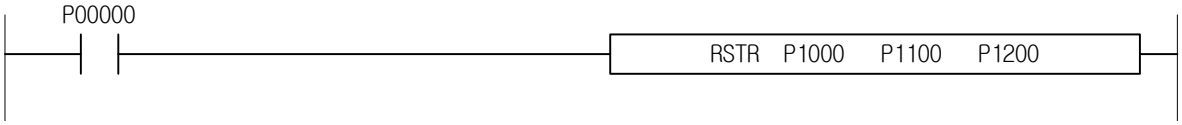
(3) Range of effective decimal places specified in S2 is 0~25.



	b15 ---------- b8	b7 ---------- b0
D	(Specified total places -1) th ASCII code	ASCII code of sign
D+1	ASCII code of decimal point(.)(h2E)	(Specified total places -2) th ASCII code(decimal)
D+2	(Specified total places -5) th ASCII code(decimal)	(Specified total places -4) th ASCII code(decimal)
D+3	(Specified total places -7) th ASCII code	(Specified total places -6) th ASCII code(decimal)
D+4	(Specified total places -9) th ASCII code(exponential)	ASCII code of 'E' (h45)
D+5	(Specified total places -11) th ASCII code(exponential)	Specified total places -10) th ASCII code(exponential)
D+6		h00

Saved automatically at the end of string

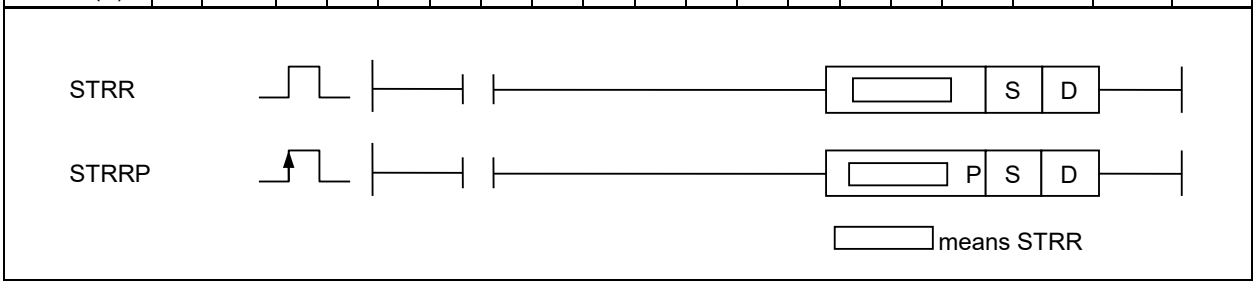
3) Example



4.26.11 STRR, STRRP, STRL, STRLP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
STRR(P) STRL(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	Address string to convert is saved in	STRING
D	Address to save in converted floating point data	REAL/LREAL

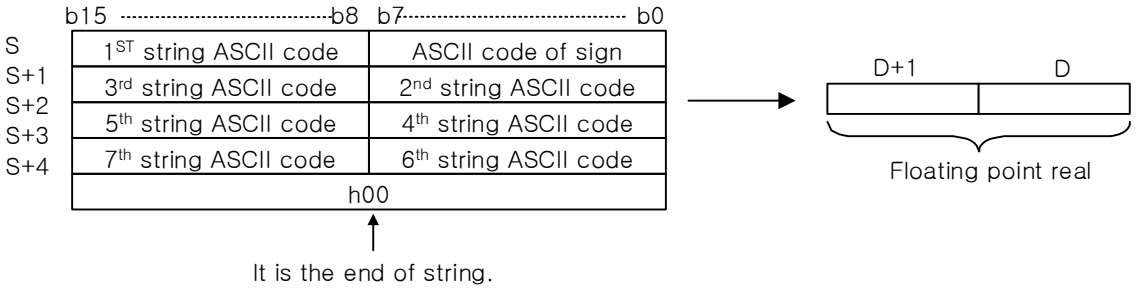
[Flag Set]

Flag	Content	Device number
error	1.If there is no NULL at the end of string, or ASCII data is other than 0x30~0x39, Sign, decimal, 'e' or 'E' 2. If string length exceeds the maximum size 3. If input string is not floating point data format 4. If input string data exceeds operation range (STRR, STRRP)	F110

1) STRR(String to Real)

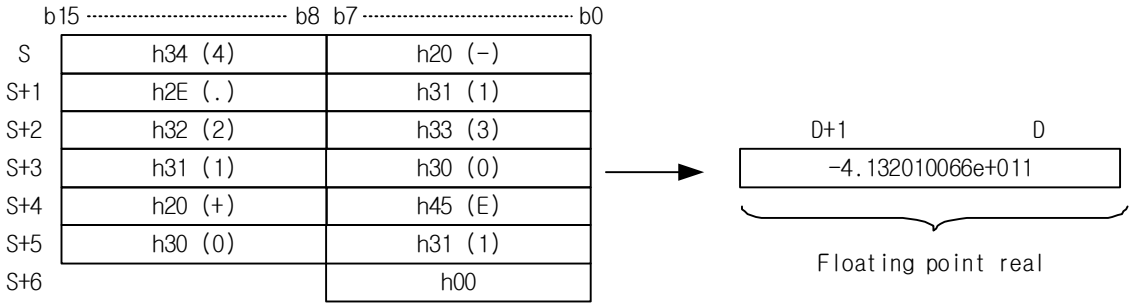
(1) It converts ASCII string S to short real data to save in D

(2) Specified string can be converted to decimal or exponential.



(3) Allowable string is as follows.

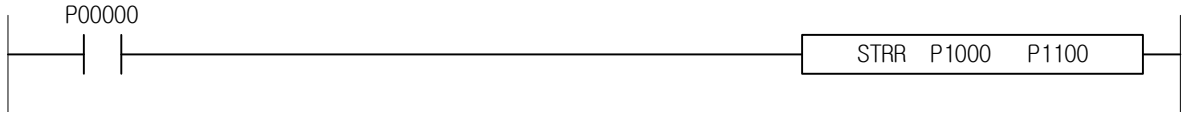
"-1.23e+25"	Normal
"-123e+25"	Normal
"12345678"	Normal
"12.345"	Normal
"+12.345e-62"	Normal
"-1.23e25"	Abnormal
" 1.23e+25"	Abnormal



(4) Error will be set if ASCII value in string is other than 0x30~0x39, sign, decimal, 'e' or E'.
(5) STRR's operation range is -3.40282347e+038 ~ -1.17549435e-038 or 1.17549435e-038 ~ 3.40282347e+038.
(6) In STRR(P), if input data exceeds operation range, Error will be set If the number of effective places of input data exceeds 17, succeeding input value will be ignored.

2) STRL(String to Long Real)
(1) It converts ASCII string S to double real data to save in D.
(2) STRL's operation range is -1.7976931348623157e+308 ~ -2.2250738585072014e-308 or 2.2250738585072014e-308 ~ 1.7976931348623157e+308.
(3) If input value exceeds operation range, 1.#INF000e+0 or -1.#QNAN0E+0 or 0 may appear with no error output.
(4) Allowable string of STRL(P) is as specified in STRR(P).
(5) If the number of effective places of input data exceeds 17, succeeding input value will be ignored

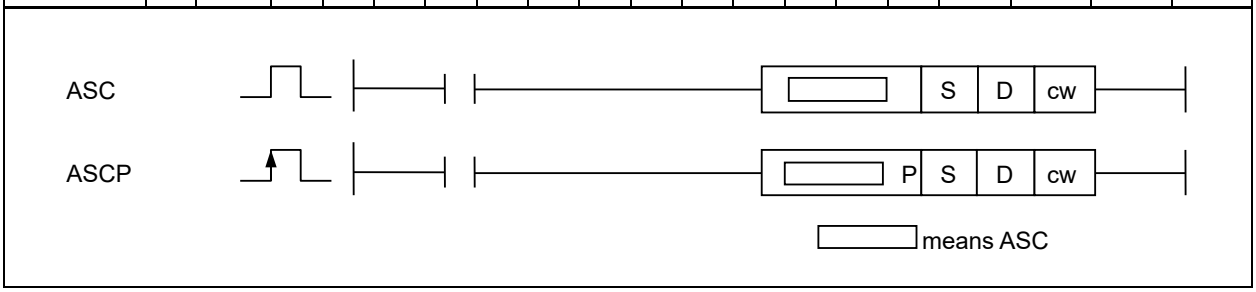
3) Example



4.26.12 ASC, ASCP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ASC(P)	S	O	-	O	-	-	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	cw	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

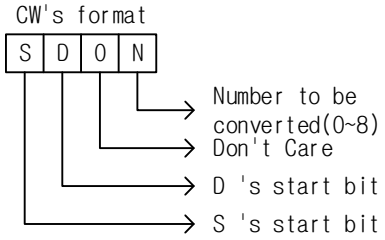
Operand	Description	Data type
S	Hexadecimal Binary	WORD
D	Position to save converted string in	STRING
N	Number of characters to convert.	WORD

[Flag Set]

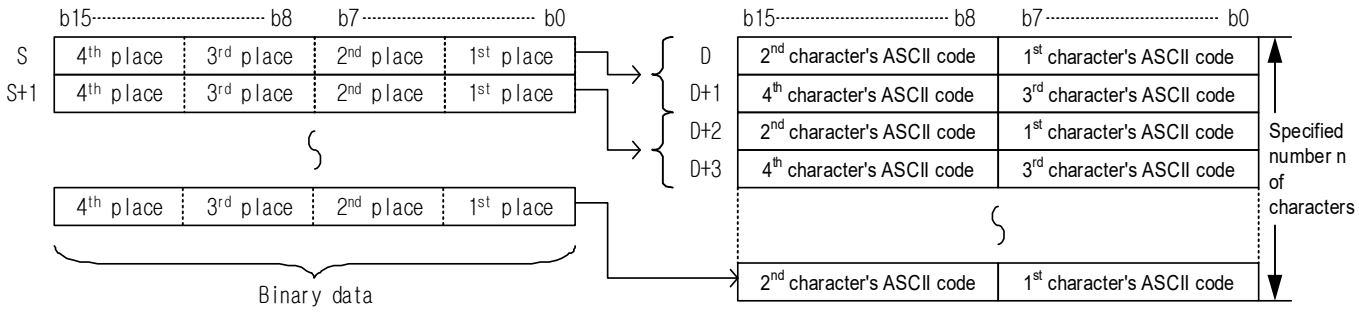
Flag	Content	Device number
error	If format regulation of cw is incorrect.	F110

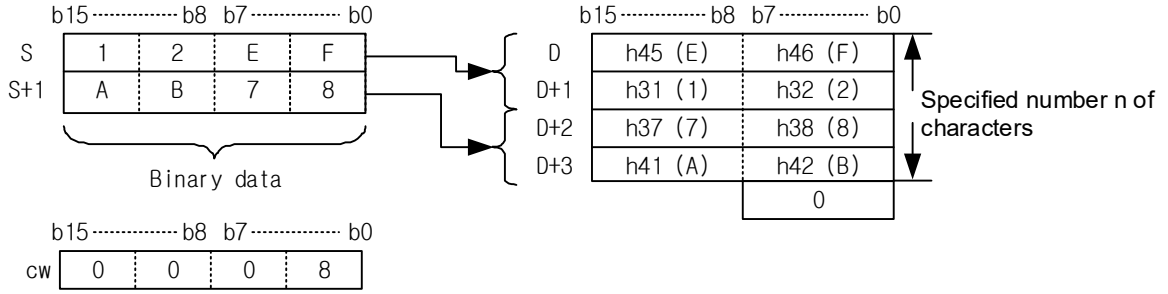
1) ASC(ASCII)

(1) It converts data in specified area S to ASCII value based on CW format to save in starting D specified.



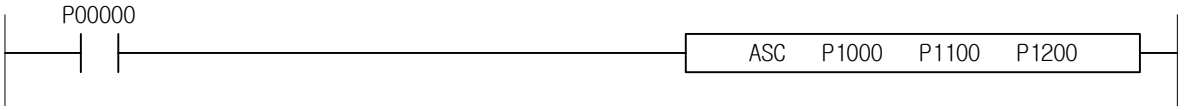
(2) It converts Binary 16-bit data as hexadecimal saved in position after specified device number S, to ASCII to save in the range of the specified characters number n after specified device number D.





(3) Setting the number of characters N will automatically set specified Binary data S's range and specified device D's range to save string in.
(4) Even if the device range where Binary data to convert is saved and the device range where converted ASCII data will be saved are duplicated, its process will be normal.
(5) If specified number of characters N is odd, "00H" will be saved automatically in the upper 8 bits of the last device number in the device range to save string in.
(6) If specified number of characters N is"0," no conversion will be executed.

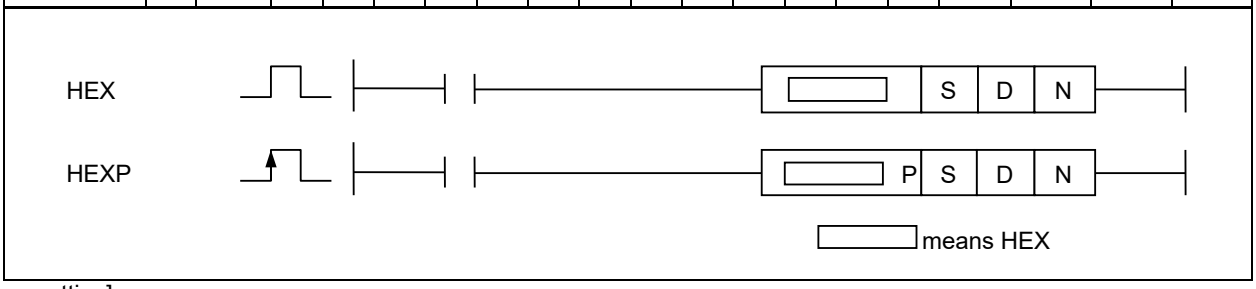
2) Example



4.26.13 HEX, HEXP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
HEX(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	String to convert to Binary data	STRING
D	Device address to save Binary data converted	WORD
N	Number of characters to convert.	WORD

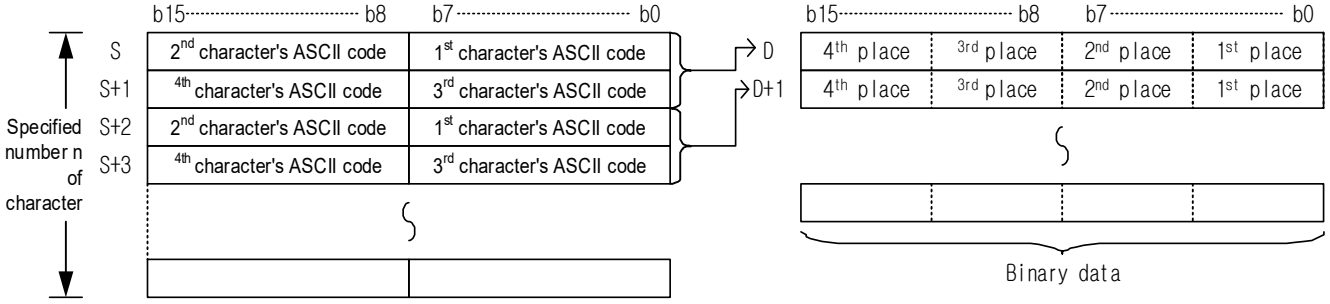
[Flag Set]

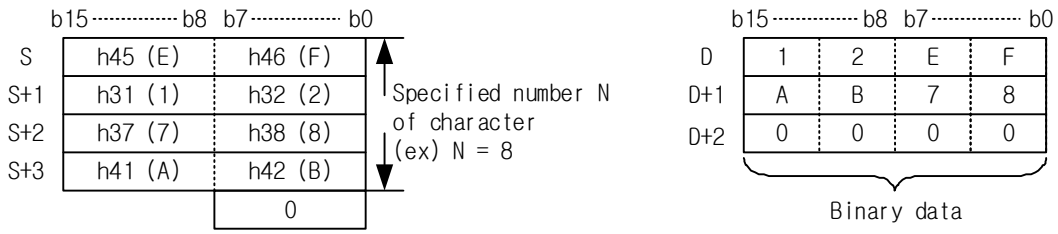
Flag	Content	Device number
error	The string value specified S exceeds Hexadecimal displaying range.	F110

1) HEX

(1) It converts N characters from specified character S to HEX format to save in starting D.

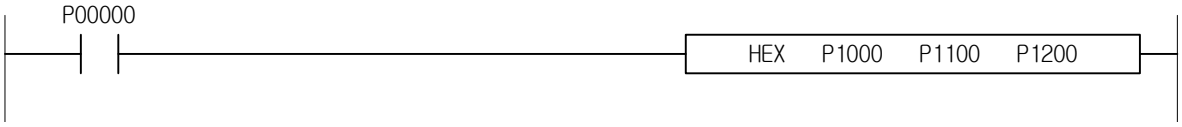
(2) It converts Hexadecimal ASCII data saved in specified characters number N after specified device number S to save in position after specified device number D.





(3) The specified number of characters N, specified string S's range and specified device D's range to save Binary data in will be automatically set.
(4) Even if the device range where ASCII data to convert is saved and the device range where converted Binary data will be saved are duplicated, its process will be normal.
(5) If specified number of characters N is not the multiple of 4, "0" will be saved automatically in the place after specified number of characters of the last device number in the device range to save converted Binary data in.
(6) If specified number of characters N is"0," no conversion will be executed.

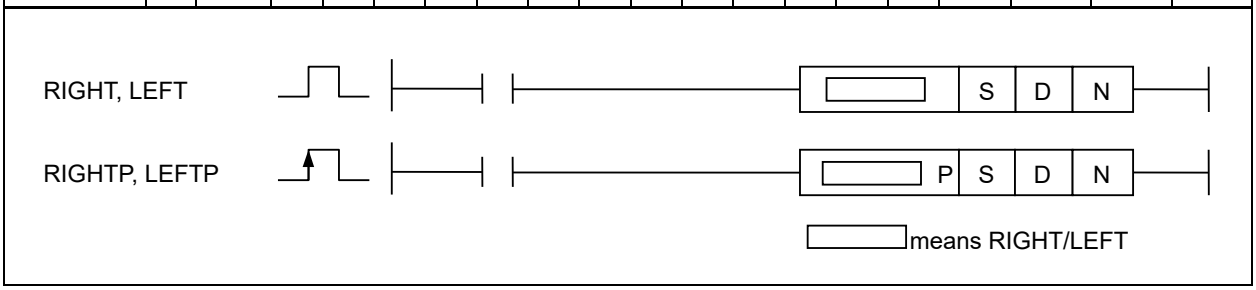
2) Example



4.26.14 RIGHT, RIGHTP, LEFT, LEFTP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RIGHT(P) LEFT(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
S	String	STRING
D	Position to save string extracted in	STRING
N	Number of characters to extract	WORD

[Flag Set]

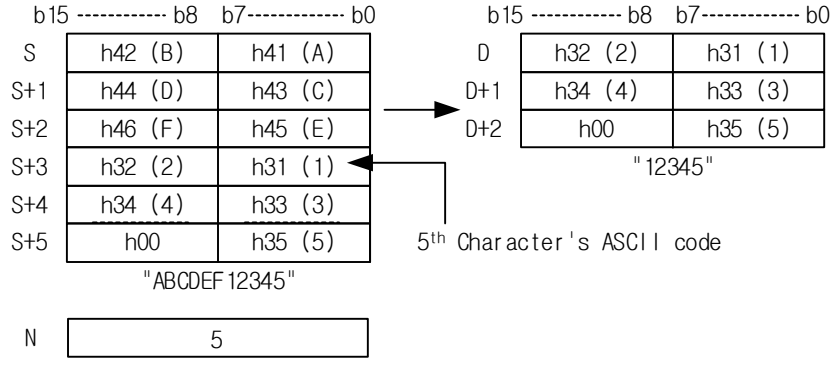
Flag	Content	Device number
error	If specified string length N exceeds the maximum string size	F110

1) RIGHT

(1) It saves the data of the number of characters n starting from the right (end of the string) of the string data saved in the place after specified device number S, in the place after specified device number D.

(2) If specified number of characters N is“0,” NULL code (h00) will be saved in D.

(3) If specified N value is larger than specified S’s string, all S string will be saved in D, with no error this time.

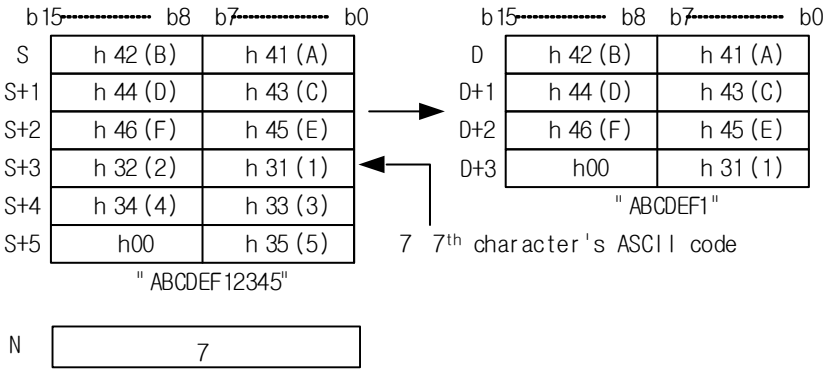


2) LEFT

(1) It saves the data of the number of characters n starting from the left (start of the string) of the string data saved in the place after specified device number S, in the place after specified device number D.

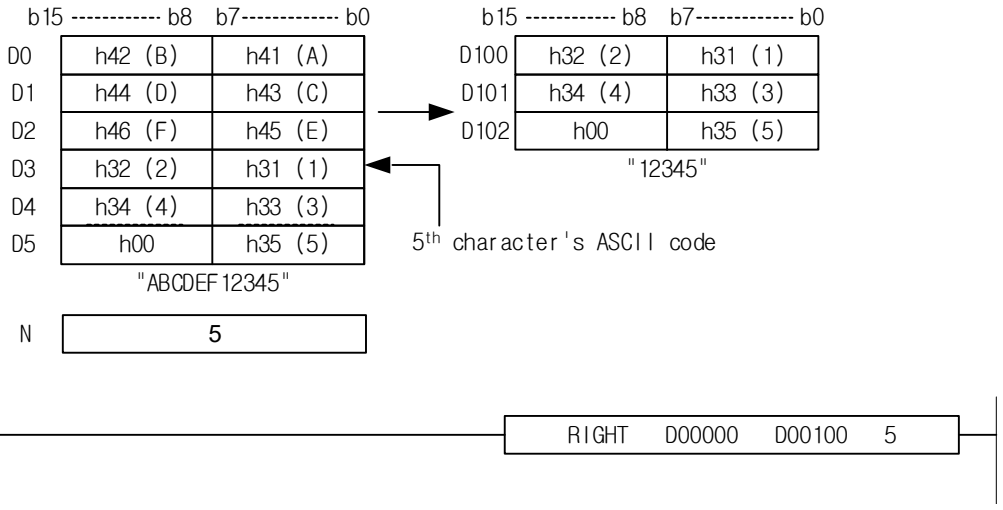
(2) If specified number of characters N is“0,” NULL code (h00) will be saved in D.

(3) If specified N value is larger than specified S’s string, all S string will be saved in D, with no error this time.



3) Example

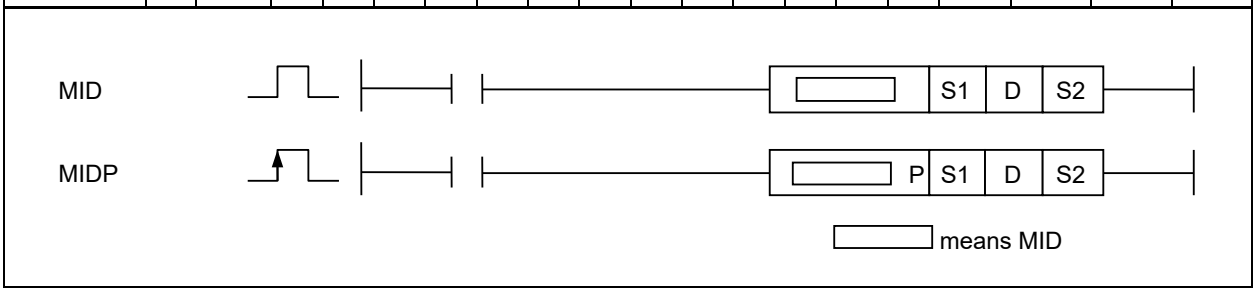
(1) If Input Signal P00000 is changed to On, It saves the data 5 strings starting from the right (end of the string) of the string among D00000~D00005 in the D00100~D00102.



4.26.15 MID, MIDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MID(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Start address of string	STRING
D	Address to save operation result of string	STRING
S2	Position of head character at S2+0,Number of characters to bring in S2+1	WORD

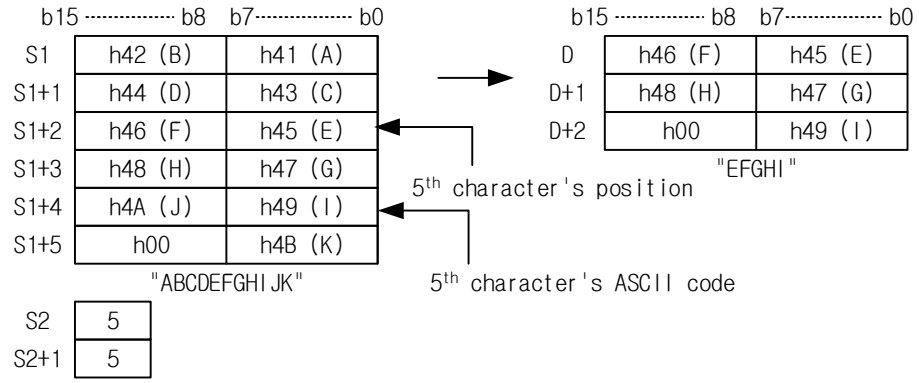
[Flag Set]

Flag	Content	Device number
error	1. If converted value exceeds specified area D 2. If S1 ‘s string length exceeds the maximum string size. When the number of characters specified in S2 + 1 is added to the character position specified in S2 + 0, and the length of the string in S1 is exceeded. 4. If the number of characters specified in S2+1 exceeds the maximum string size	F110

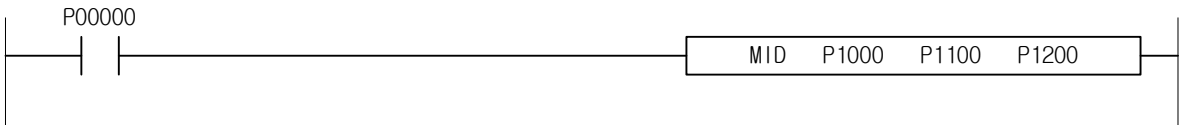
1) MID (Middle)

(1) It saves the data of the number of characters specified in S2+1 starting from S2, from the left of the string data saved in the place after specified device number S1, in the place after specified device number D.

(2) If specified S2+1’s length of string is“0”, NULL STRING(“”) will be saved in D.



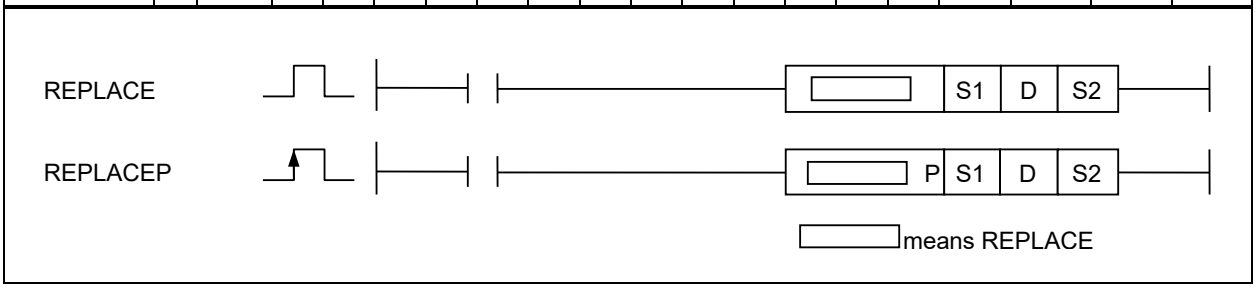
2) Example



4.26.16 REPLACE, REPLACEP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
REPLACE(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Start address of string to replace	STRING
D	Start address of string	STRING
S2	Position (S2+0) and replaced size (S2+1) of the string to be replaced in D	WORD

[Flag Set]

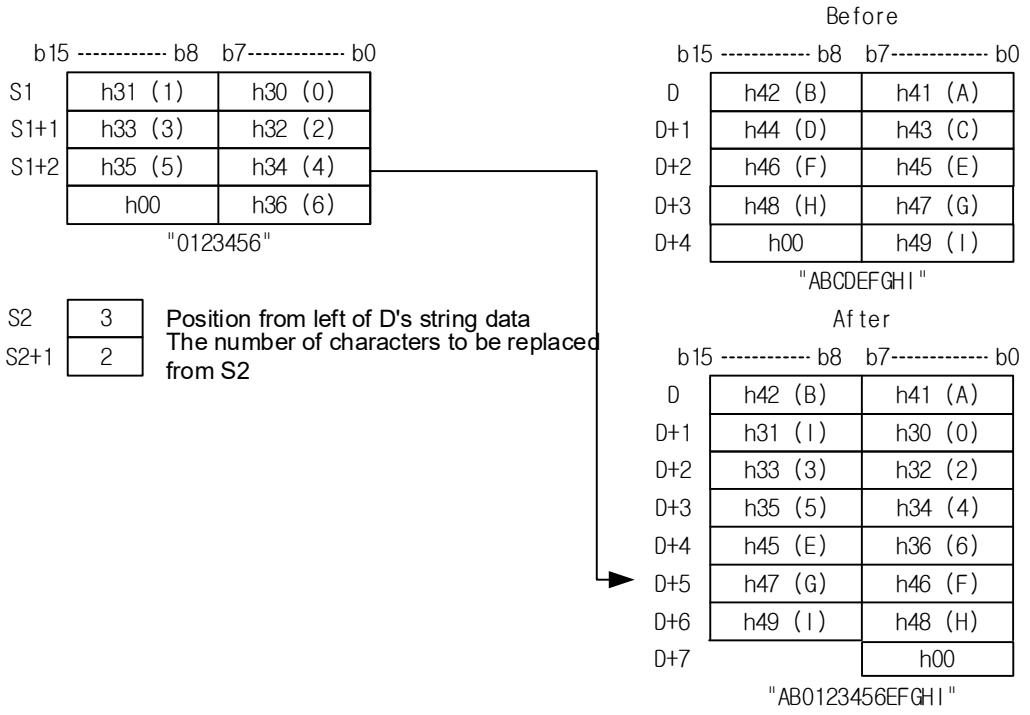
Flag	Content	Device number
error	1. If S2+1's value exceeds D's string length 2. If S2's value exceeds D's string length	F110

1) REPLACE

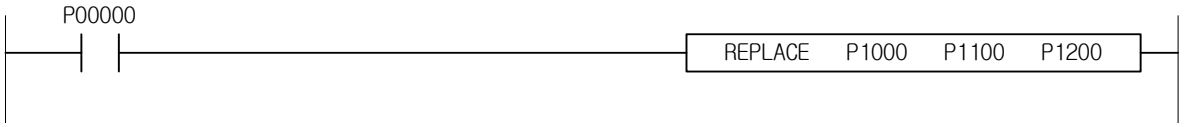
(1) It replaces string data (from the left) saved in the position from device number D including specified S2 and S2+1's number of characters data, with specified S1's string.

(2) If S2+1 is 0, S1 will be inserted in specified S2 position of string specified in D.

(3) If S1's string length is different from S2+1's string size, D's string may keep increasing or deceasing, which needs user's precaution.



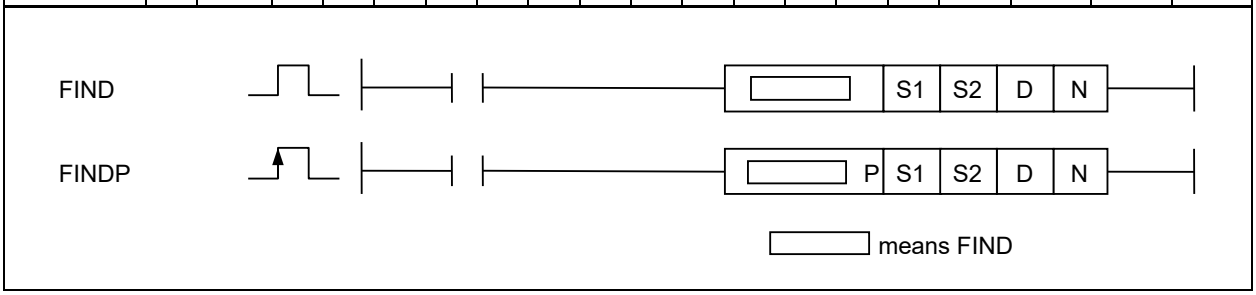
2) Example



4.26.17 FIND, FINDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FIND(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	N	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

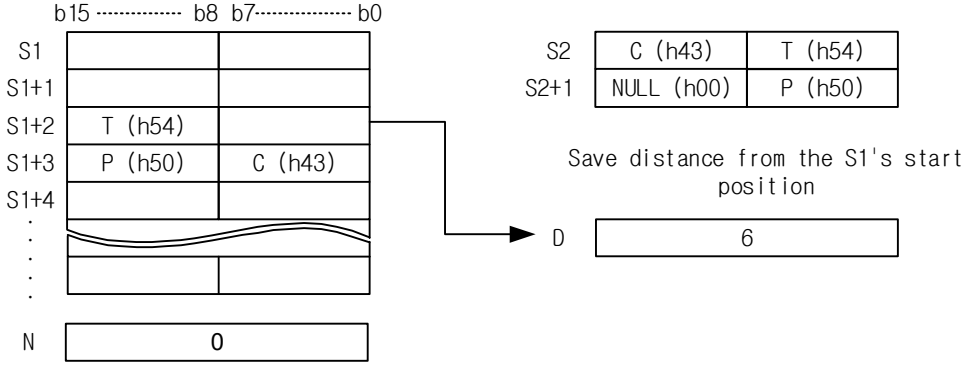
Operand	Description	Data type
S1	Start address of string to be searched for	STRING
S2	Start address of string to search for	STRING
D	Address to save result	WORD
N	Start position to search for string	WORD

[Flag Set]

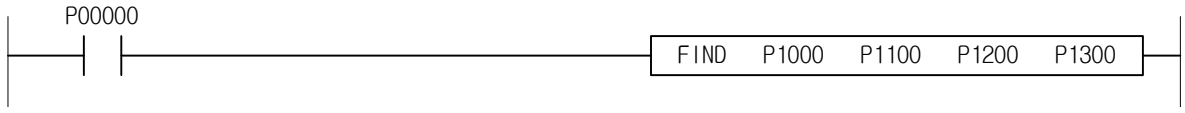
Flag	Content	Device number
error	1.If S1, S2's string length exceeds the maximum string size. 2.If start position to search specified in N is larger than string's length to be searched for, specified in S1.	F110

1) FIND

(1) It searches starting Nth character of specified string S1 for the string with starting S2 to save the first identical string's start position in D.



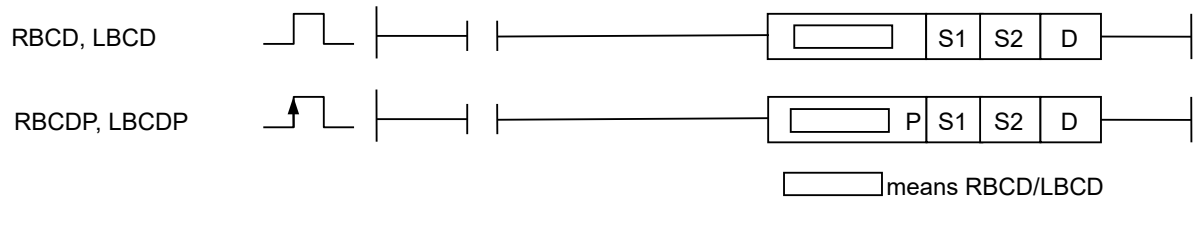
2) Example



4.26.18 RBCD, RBCDP, LBCD, LBCDP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RBCD(P) LBCD(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	S2	O	O	O	O	O	-	O	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Floating point Data	REAL/LREAL
S2	Decimal fraction digit (0~7)	WORD
D	Position to save in data decomposed to BCD	WORD

[Flag Set]

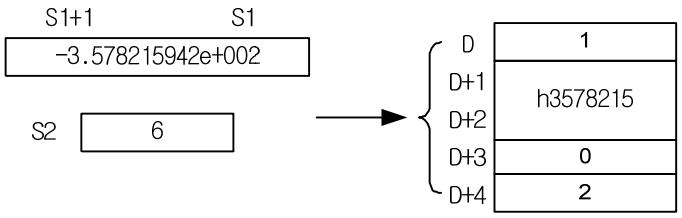
Flag	Content	Device number
error	1. If converted BCD value exceeds specified area D. 2. If decimal fraction digit exceeds 0~7 range 3. If the value of 3.S1 exceeds the applicable range	F110

1) RBCD(Real to BCD)

(1) It decomposes floating point real data saved in specified device S to BCD floating point format, to save in the place after specified device number D.

(2) The range of BCD format decimal places is 0 ~ 7. And if this area is exceeded, error will be set with D unchanged

(3) RBCD's operation range is -3.40282347e+038 ~ -1.17549435e-038 or 1.17549435e-038 ~ 3.40282347e+038.
If this area is exceeded, error will be set.



2) LBCD(Long Real to BCD)

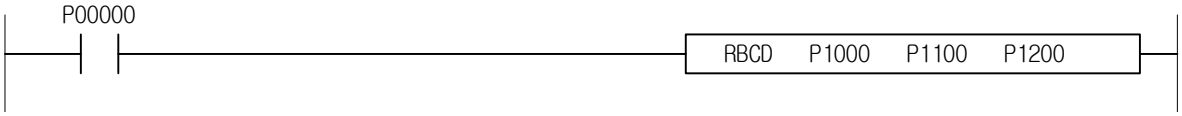
(1) It decomposes floating point long real data saved in specified device S to BCD floating decimal point format, to save in the place after specified device number D.

BCD format is as specified in RBCD

(3) LBCD's operation range is -1.7976931348623157e+308 ~ -2.2250738585072014e-308 or 2.2250738585072014e-308 ~ 1.7976931348623157e+308.

If input value exceeds operation range, error will be output.

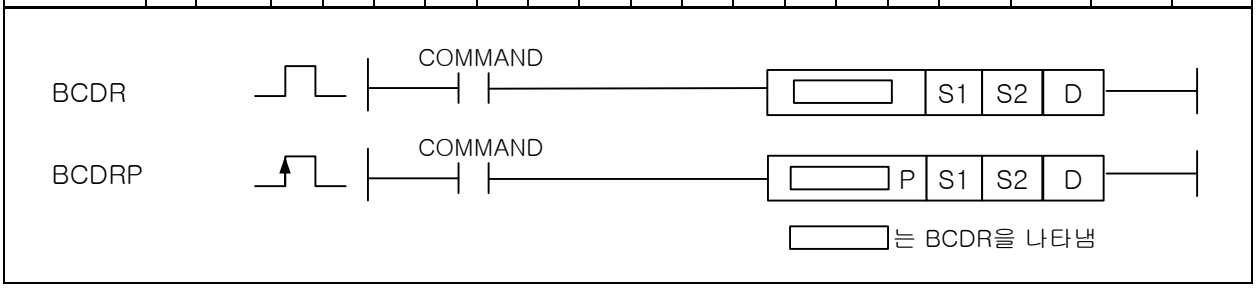
3) Example



4.26.19 BCDR, BCDRP, BCDL, BCDLP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BCDR(P) BCDL(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4	O	-	-
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Data with BCD floating decimal point format	WORD
S2	Decimal fraction of BCD floating decimal point	WORD
D	Device to save result in	REAL/LREAL

[Flag Set]

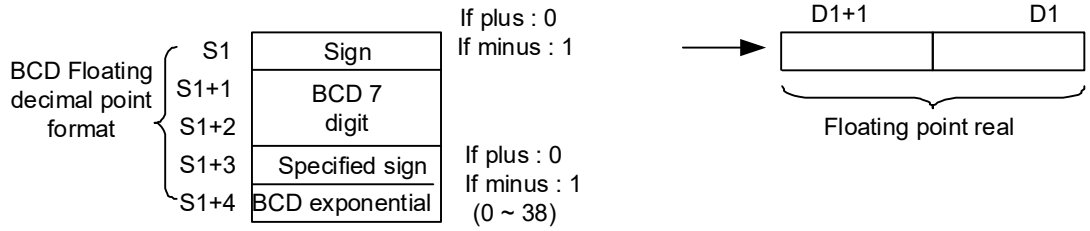
Flag	Content	Device number
error	1. If specified area S1's data format is not correct. 2. If area S1+4 exceeds applicable device's range. 3. If the number of decimal fraction digit specified in S2 exceeds 0~7 4. If BCD exponential exceeds allowable range(BCDR(P) : 38, BCDL(P) : 290)	F110

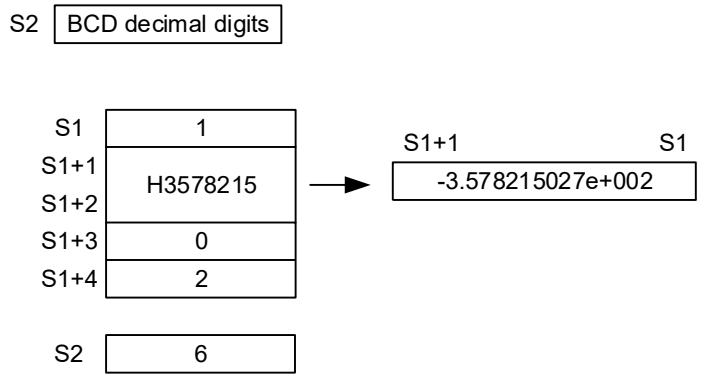
1) BCDR(BCD to Real)

(1) It converts BCD floating point data saved in specified device S1 to floating point real data, to save in the place after specified device number D.

(2) The range of BCD exponential specified in S1+4 is 0~38. If BCD floating point format's exponential area exceeds the allowable range, error will be set.

(3) The range of BCD floating point format's decimal places specified in S2 is 0~7.





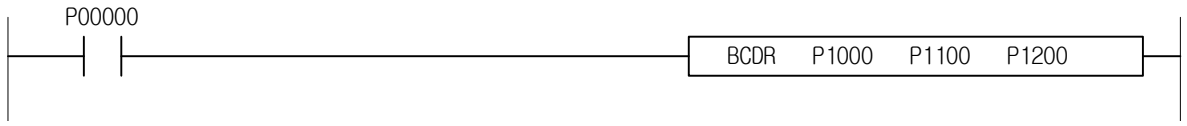
2) BCDL(BCD to Long Real)

(1) It converts BCD floating point data saved in specified device S1 to floating point double real data based on decimal places saved in specified device S2, to save in the place after specified device number D.

(2) The range of BCD long floating point format's exponential area specified in S1+4 is 0~290 If BCD floating point format's exponential area exceeds the allowable range, error will be set.

(3) The range of BCD floating point format's decimal places specified in S2 is 0~7.

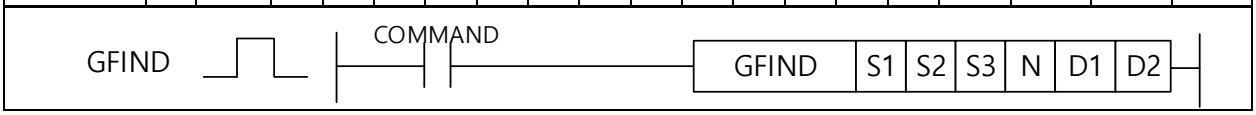
3) Example



4.26.20 GFIND

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GFIND	S1	O	-	O	-	-	-	-	O	O	-	-	-	-	-	-	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	S2	O	-	O	-	-	-	O	-	-	O	-	-	O	O				
	N	O	-	O	-	-		O			O	-	-	O	O				
	S1	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	D2	O	-	O	-	-	-	O	-	-	-	-	-	O	O				



[Area setting]

Operand	Description	Data type
S1	Start address of searching target	Byte
S2	String value for searching	STRING
S3	Length of search target(unit: Byte)	Word
N	Start position to search for string	Word
D1	Found string position	Word
D2	Status code	Word

[Flag Set]

Flag	Content	Device number
error	1. Start address of searching target+ whem the length exceeds the device range	F110

1) Function(XGK-CPUSN/CPUHN/CPUUN only)

(1) It searches starting Nth character of specified address S1 for the string with starting S2 to save the first identical string's start position in D.

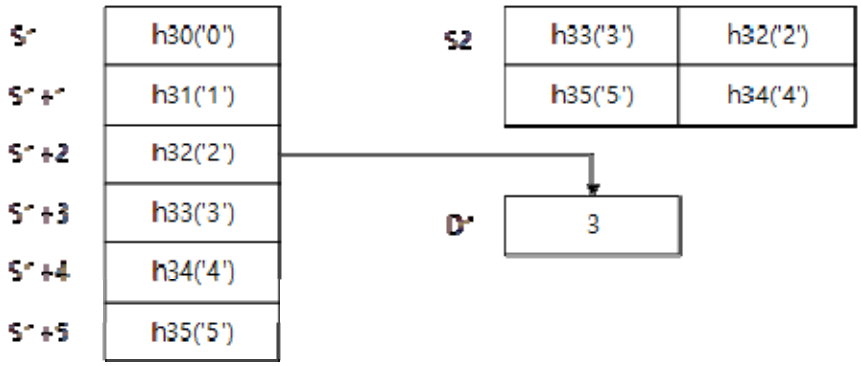
(2) S3 represents the length of the search target S1.
Ex) In case of R0.0 ~ R3.0, input total 8 bytes.

(3) N starts the search from the Nth from the search target S1.
Ex) In the case of R0.0 to R3.0, if you want to search from R0.0, enter N as 0, and if you want to search from R1.0, enter 2.

(4) Status Code

Status Code no.	Description
0	Initial status
1	Complete
2	When N 's value is is 0
3	When the search start position specified in N is greater than the length entered in S3. (For length 10, the value of N is from 0 to 9 or less.)
4.5	If there is no matching string
6	When the device address value of S1 does not match the byte size

Ex) When searching for a continuous string '2345' in a string of 6 bytes in length, which is S1~S1+5, 3 is stored in the position of D1.



2) Example

Data corresponding to ASCII code is generated from M00100.
Character data “1234567890” (h31 ~ h39) - Random byte unit data creation (total 10 byte length string)

M00100 Start position to search for string
M0200 String to find
M0300 Character string search size (specify 10 bytes from M00100)
M0400 String search offset
M0500 Found string position
M0600 status code

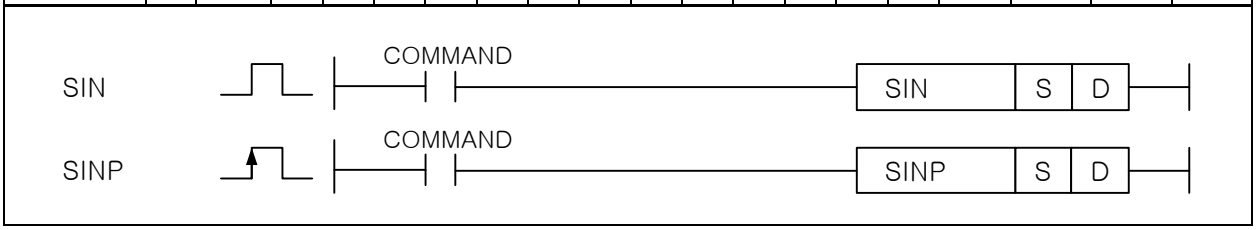
From the location of M00100, it searches as much as Size 10 (10 byte). Search size 10((10 byte) from the location of M00100. Starting from the 0th input in M0400, the position to start the search, search for the string 3 inputted in M0200, and output the position value in M0500.

4.27 Special Function Instruction

4.27.1 SIN, SINP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SIN(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input angle value (Radian) of Sine operation	LREAL
D	Device number to save operation result in	LREAL

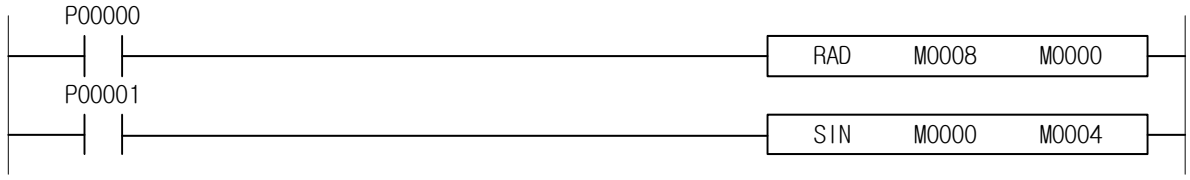
1) SIN (Sine)

(1) It performs SIN operation of data value in specified area S to save in D. At this moment, data type of S and D is of Double real, and internal operation will be processed after converted to Double real data.

(2) Input value is of radian. Refer to RAD for details on Conversion of angle to radian.

(3) If S's value is 1.047…(π/3 rad = 600), operation result is 0.8660… ($\sqrt{3}/2$).

2) Example



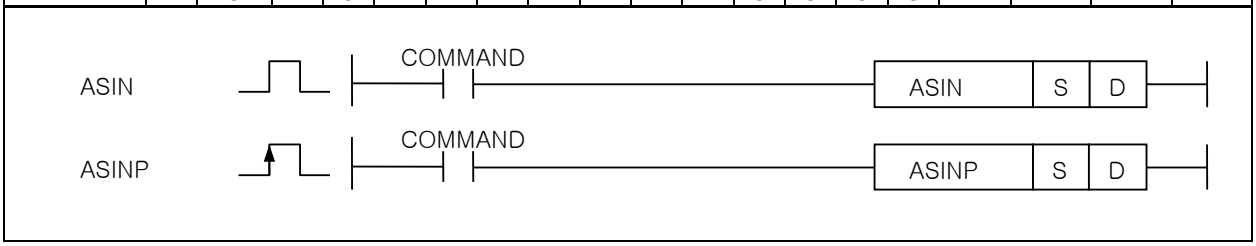
It performs ASIN operation of value in M0008, M0009 and saves them in the M0000, M0001.

And then it converts the Radian value in the M0000, M0001 into the Degree value and saves them in the M0004, M0005.

4.27.2 ASIN, ASINP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ASIN(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Device number where SIN value for Arc Sine operation is saved	LREAL
D	Device number to save operation result in	LREAL

[Flag Set]

Flag	Content	Device number
error	Set when S value is not in between -1.0 and 1.0	F110

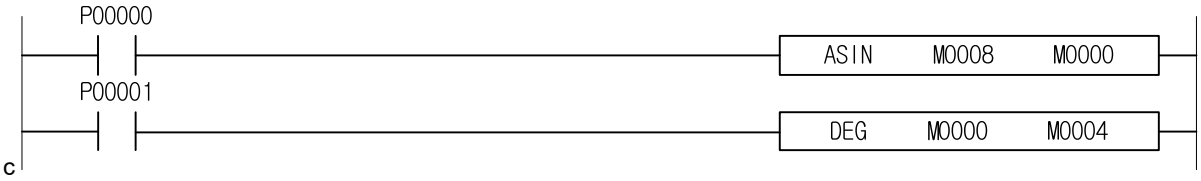
1) ASIN (Arc Sine)

(1) It performs Arc SIN operation of data value in specified area S to save in D. At this moment, data type of S and D is of Double real, and internal operation will be processed after converted to Double real data.

(2) Output value is of radian. Refer to DEG, for the conversion from radian to degree.

(3) If S's value is 0.8660…($\sqrt{3}/2$), operation result is. 1.0471... (π/3 rad = 60°).

2) Example



c

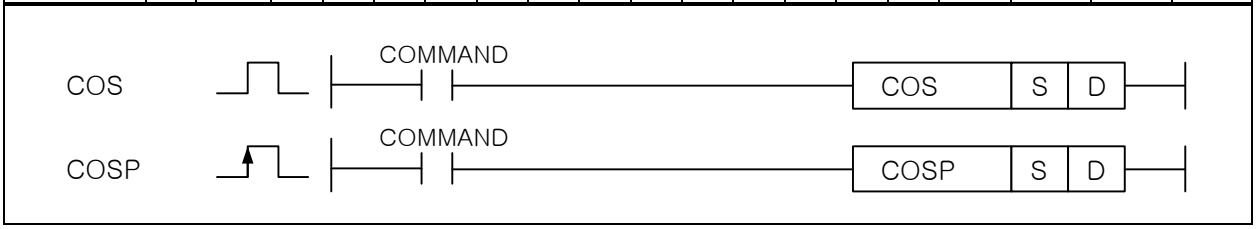
It performs ASIN operation of value in M0008, M0009 and saves them in the M0000, M0001.

And then it converts the Radian value in the M0000, M0001 into the Degree value and saves them in the M0004, M0005.

4.27.3 COS, COSP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
COS(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input angle value (Radian) of Cosine operation	LREAL
D	Device number to save operation result in	LREAL

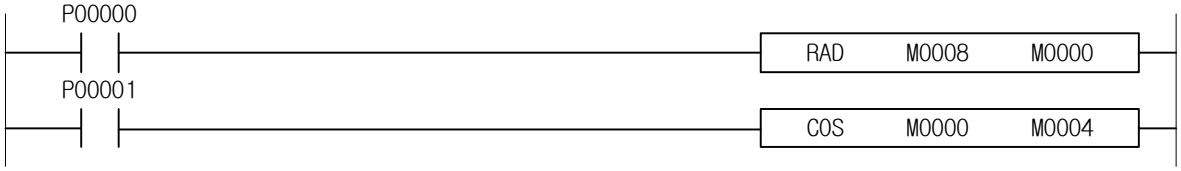
1) COS (Cosine)

(1) It performs COS operation of data value in specified area S to save in D. . At this moment, data type of S and D is of long real number.

(2) Input value is of radian. Refer to RAD for details on Conversion of angle to radian.

(3) If S's value is 0.5235…(π/6 rad = 300), operation result is 0.8660… ($\sqrt{3}/2$).

2) Example



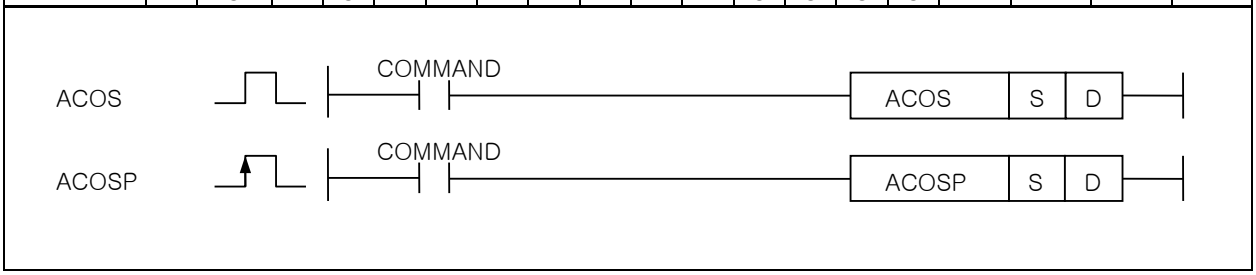
It performs COS operation of value in M0008, M0009 and saves them in the M0000, M0001.

And then it converts the Radian value in the M0000, M0001 into the Degree value and saves them in the M0004, M0005.

4.27.4 ACOS, ACOSP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ACOS(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input angle value (Radian) of Cosine operation	LREAL
D	Device number to save operation result in	LREAL

[Flag Set]

Flag	Content	Device number
error	Set when S value is not in between -1.0 and 1.0	F110

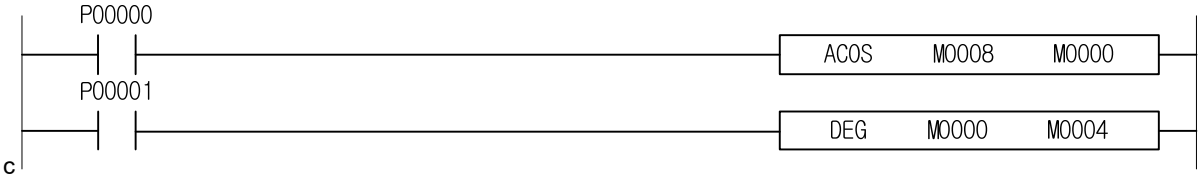
1) ACOS (Arc Cosine)

(1) It performs Arc COS operation of data value in specified area S to save in D. At this moment, data type of S and D is of long real number, and internal operation will be processed after converted to long real number.

(2) Output value is of radian. Refer to DEG, for the conversion from radian to degree.

(3) If S's value is 0.8660…($\sqrt{3}/2$), operation result is. 0.5235... (π/6rad = 30°).

2) Example



c

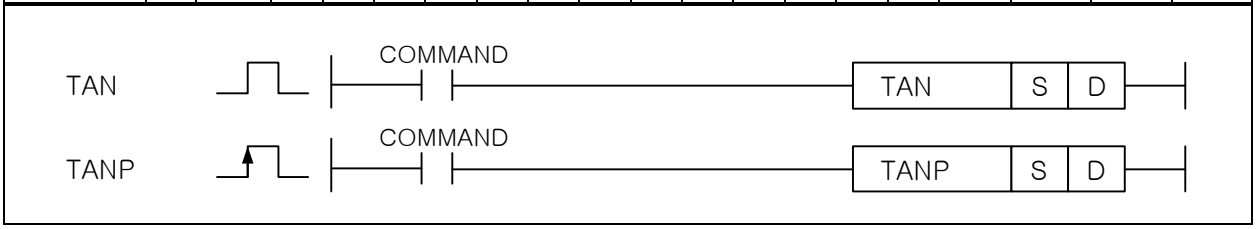
It performs ACOS operation of value in M0008, M0009 and saves them in the M0000, M0001.

And then it converts the Radian value in the M0000, M0001 into the Degree value and saves them in the M0004, M0005.

4.27.5 TAN, TANP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TAN(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input angle value (Radian) of Tangent operation	LREAL
D	Device number to save operation result in	LREAL

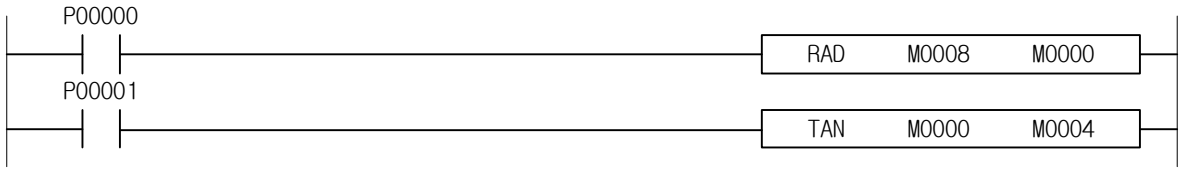
1) TAN (Tangent)

(1) It performs Tangent operation of data value in specified area S to save in D. . At this moment, data type of S and D is of long real number.

(2) Input value is of radian. Refer to RAD for details on Conversion of angle to radian.

(3) If S's value is 0.5235…(π/6 rad = 300), operation result is 0.5773.

2) Example



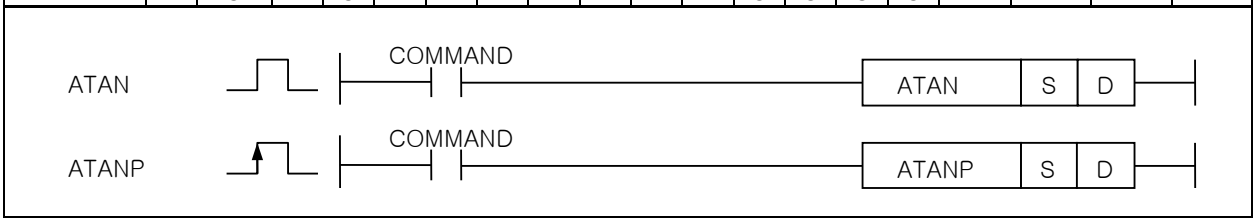
It performs TAN operation of value in M0008, M0009 and saves them in the M0000, M0001.

And then it converts the Radian value in the M0000, M0001 into the Degree value and saves them in the M0004, M0005.

4.27.6 ATAN, ATANP

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
ATAN(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O			



[Area setting]

Operand	Description	Data size
S	Device number where TAN value for Arc Tangent is saved	LREAL
D	Device number to save operation result in	LREAL

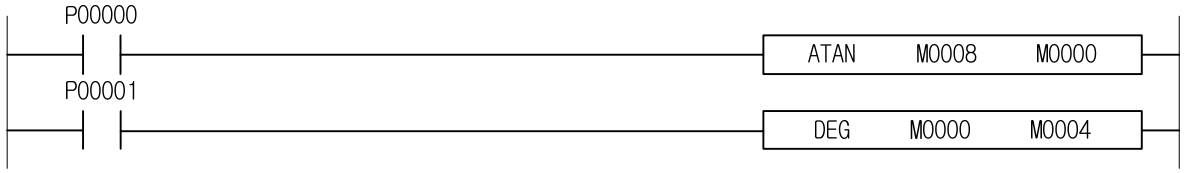
1) ATAN (Arc Tangent)

(1) It performs Arc Tangent operation of data value in specified area S to save in D. At this moment, data type of S and D is of long real number, and internal operation will be processed after converted to long real number.

(2) Output value is of radian. Refer to DEG, for the conversion from radian to degree.

(3) If S's value is 1.0, operation result is. 0.7853... (π/4 rad = 45°).

2) Example



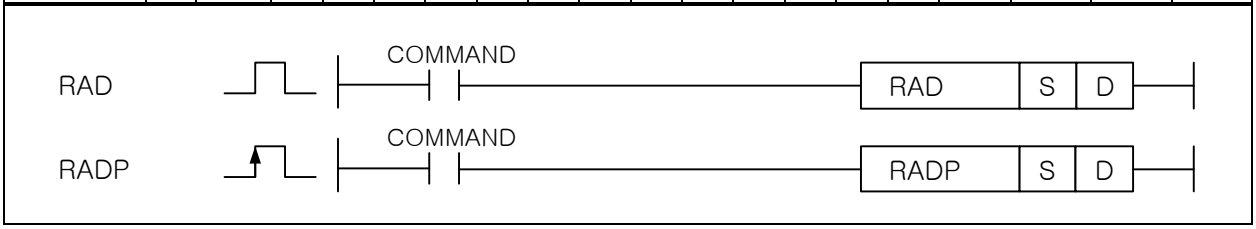
It performs TAN operation of value in M0008, M0009 and saves them in the M0000, M0001.

And then it converts the Radian value in the M0000, M0001 into the Degree value and saves them in the M0004, M0005.

4.27.7 RAD, RADP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RAD(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Angle data	LREAL
D	Device number to save in the operation result of converted Radian value.	LREAL

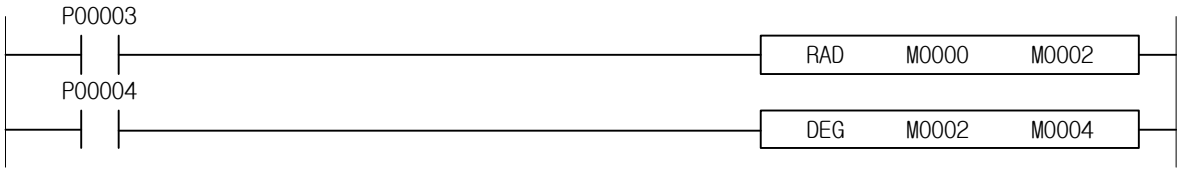
1) RAD (Radian)

(1) It converts angle (0) of data in specified area S to radian to save in D. At this moment, data type of S and D is of double real. At this moment, data type of S and D is of long real number.

(2) In radian unit, conversion to degree is as follows

(3) Radian = Degree x π/180

2) Example

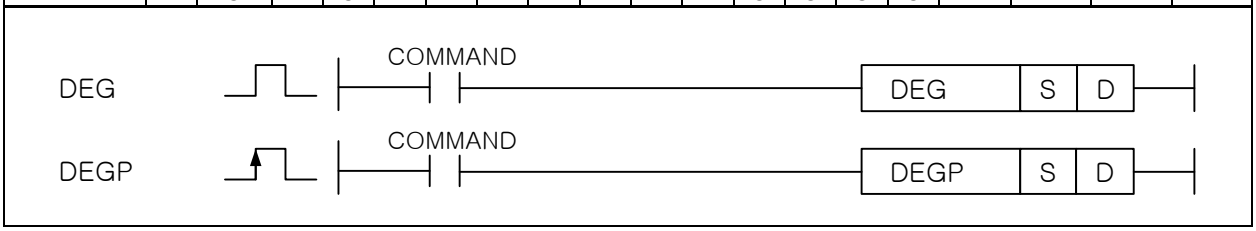


It performs the degree value in M0000, M0001 into the radian value and saves them in the M0002, M0003.And then it converts the Radian value in the M0002, M0003 into the Degree value and saves them in the M0004, M0005.

4.27.8 DEG, DEGP

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DEG(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Radian value	LREAL
D	Device number to save operation result in	LREAL

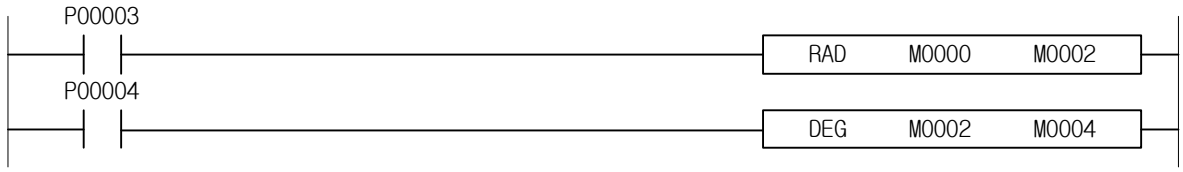
1) DEG (Degree)

(1) It converts radian of data in specified area S to angle (degree) to save in D. At this moment, data type of S and D is of double real. At this moment, data type of S and D is of long real number.

(2) In radian unit, conversion to degree is as follows

Degree = Radian x 180 / π

2) Example

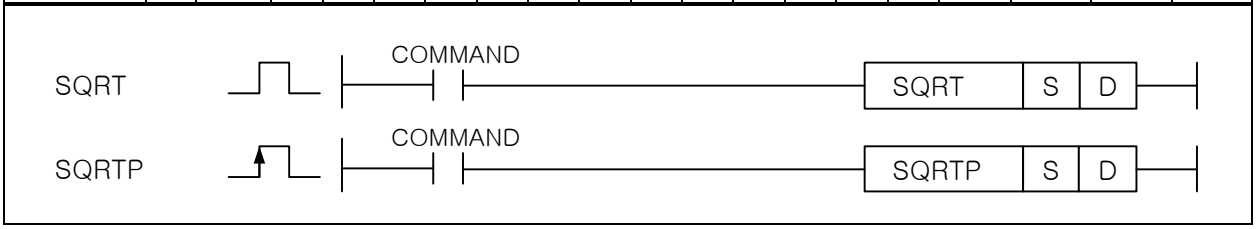


It performs the Radian value in the M0000, M0001 into the degree value and saves them in the M0002, M0003.And then it converts the degree value in the M0002, M0003 into the radian value and saves them in the M0004, M0005.

4.27.9 SQRT, SQRTP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SQRT(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input value to perform SQRT operation	LREAL
D	Device number to save operation result in	LREAL

[Flag Set]

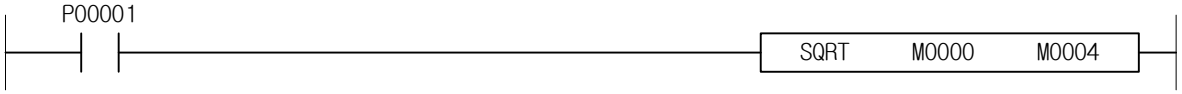
Flag	Content	Device number
error	To be set if value in specified area S is negative	F110

1) SQRT (Square Root)

(1) It performs Square Root operation of data in specified area S to save in D. At this moment, data type of S and D is of long real number.

(2) If S is negative, operation error occurs.

2) Example

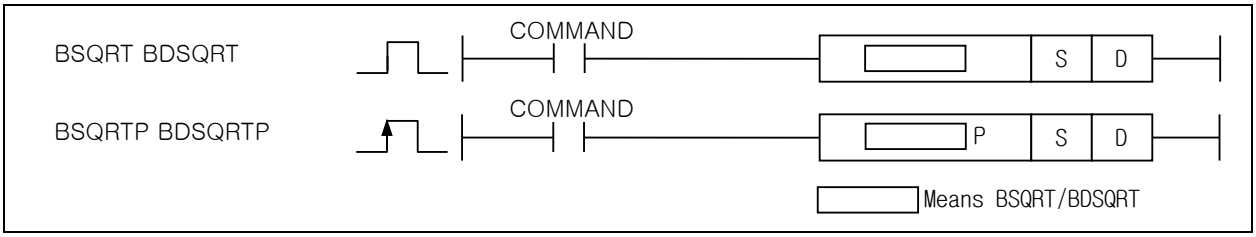


It performs Square Root operation of data in M0000, M0001 and saves them in M0004, M0005.

4.27.10 BSQRT, BSQRTP, BDSQRT, BDSQRTP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSQRT(P) BDSQRT(P)	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	D	O	-	-	-	-	-	-	-	-	-	O	-	O	O				



[Area setting]

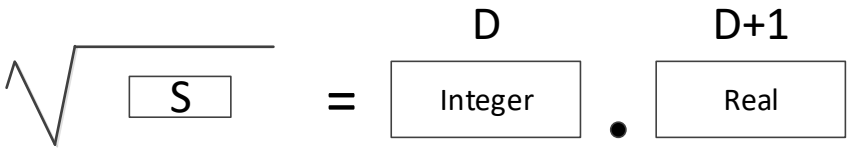
Operand	Description	Data type
S	The device number of the BCD data type is stored.	WORD/DWORD
D	Device number to be stored in BCD type the result of the square root operation.	WORD/WORD

[Flag Set]

Flag	Content	Device number
error	- As for SQRT(P) when S's value is other than 0~9999 (h270F) 89+ - As for BDSQRT(P) when S+1,S's value is other than 0~99999999 (h5F5E0FF) - If the input value is not BCD type ex) h000a, h999f - If the value of S is not 'h0~h9' but 'ha~hf'	F110

1) BSQRT(P)(BCD Square Root)

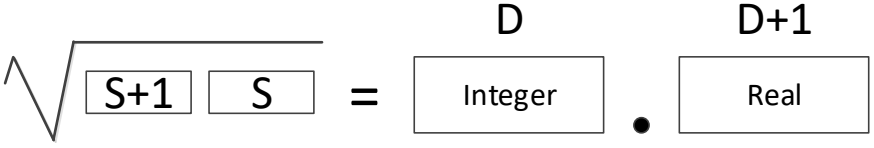
(1) It performs Square Root operation of BCD data in specified area S to save in D. At this moment, data type of S and D is BCD.



(2) The value that is specified in the S can have a value of 0-9999 in BCD type.
(3) The result D, and D +1 can have a value of 0 to 9999 in BCD value of each
(4) The value of the real result of operation, there is a possibility that value rounded to 5 digits after the decimal point is saved and error to occur about ±1.

2) BDSQRT(P)(BCD Double Square Root)

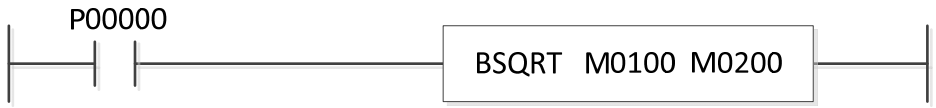
(1) It performs Square Root operation of BCD(DWORD) data in specified area S to save in D. At this moment, data type of S and D is BCD(DWORD).



(2) The value that is specified in the S can have a value of 0-99999999 in BCD type.
(3) The result D, and D +1 can have a value of 0 to 9999 in BCD value of each
(4) The value of the real result of operation, there is a possibility that value rounded to 5 digits after the decimal point is saved and error to occur about ±1.

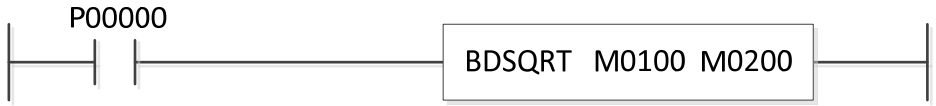
3) Example

(1) BSQRT



If M0100 is h9999, M0200(Integer) is h99, M0201 is h9950.

(2) BDSQRT

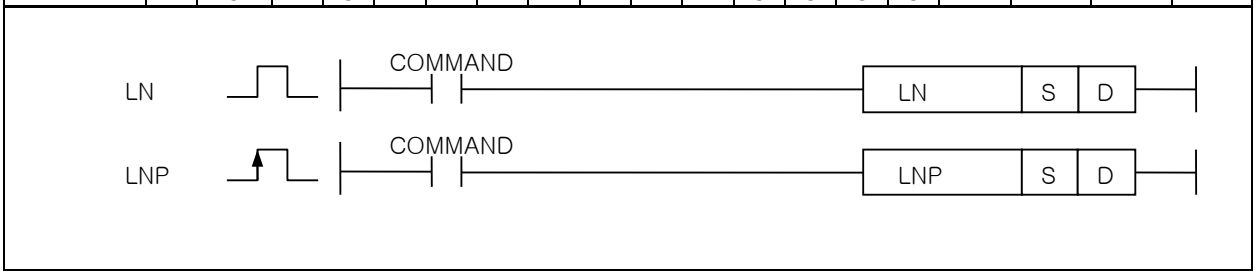


If M0100 is h99999999, M0200(Integer) is h9999, M0201 is h9999. Operation value is 9999.99994999 since the value rounded to five digits after the decimal point is stored, 9999 is stored in real .

4.27.11 LN, LNP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LN(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input value to perform natural logarithm operation.	LREAL
D	Device number to save operation result in	LREAL

[Flag Set]

Flag	Content	Device number
error	To be set if value in specified area S is negative	F110

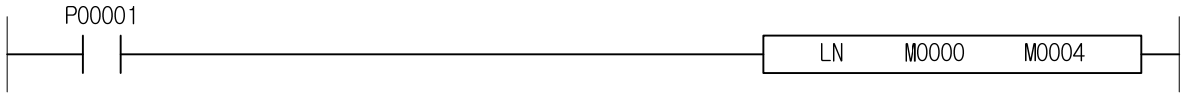
1) LN (Natural logarithm)

(1) It performs Natural logarithm operation of data in specified area S to save in D. At this moment, data type of S and D is of long real number.

(2) If S is zero or negative, operation error occurs.

(3) If S's value is 2.0, operation result is. 0.6931... ((2.0))).

2) Example

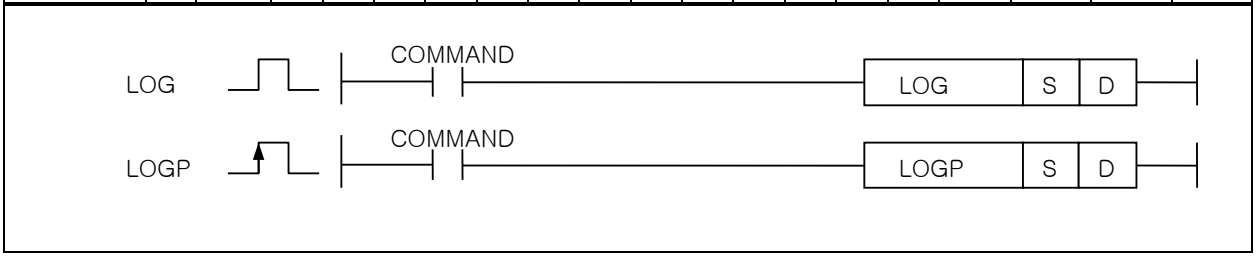


It performs Natural logarithm operation of data in M0000, M0001 and saves them in M0004, M0005.

4.27.12 LOG, LOGP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOG(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S	Input value to perform common logarithm operation.	LREAL
D	Device number to save operation result in	LREAL

[Flag Set]

Flag	Content	Device number
error	To be set if value in specified area S is negative	F110

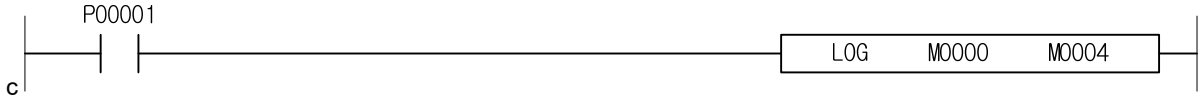
1) LOG (Common logarithm)

(1) It performs common logarithm operation of data in specified area S to save in D. At this moment, data type of S and D is of long real number.

(2) If S is zero or negative, operation error occurs.

(3) If S's value is 2.0, operation result is. 0.3010... (Log10 (2.0)).

2) Example

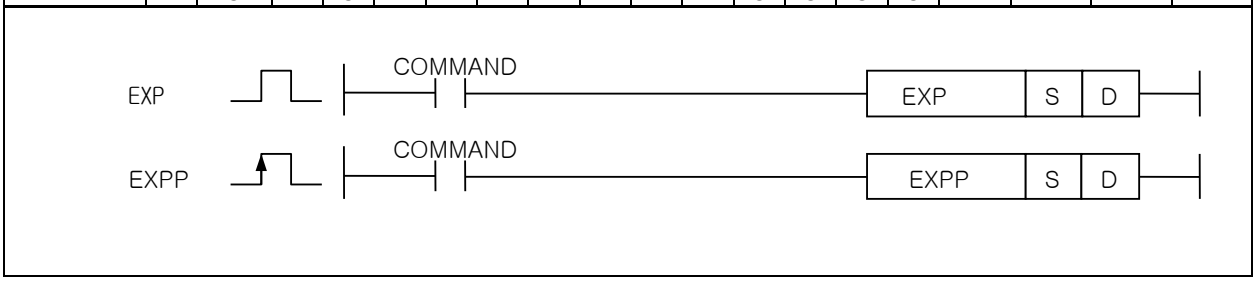


It performs common logarithm operation of data in M0000, M0001 and saves them in M0004, M0005.

4.27.13 EXP, EXPP

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
EXP(P)	S	O	-	O	O	O	-	-	-	-	O	O	O	O	O	2~4	-	-	-
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O			



[Area setting]

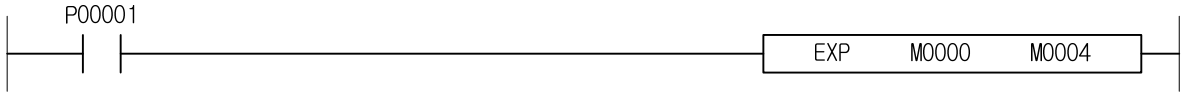
Operand	Description	Data size
S	Input value to perform exponential operation	LREAL
D	Device number to save operation result in	LREAL

1) EXP (Exponential operation)

(1) It performs exponential operation of data in specified area S to save in D. At this moment, data type of S and D is of long real number.

(2) If S's value is 2.0, operation result is. 7.3890(e^2).

2) Example

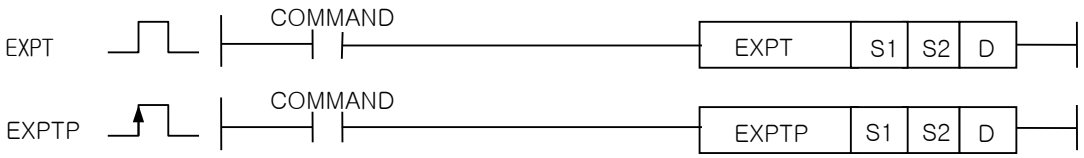


It performs exponential operation of data in M0000, M0001 and saves them in Lower M0004, M0005.

4.27.14 EXPT, EXPTP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EXPT(P)	S1	O	-	O	O	O	-	-	-	-	O	O	O	O	O	4~8	-	-	-
	S2	O	-	O	O	O	-	-	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				



[Area setting]

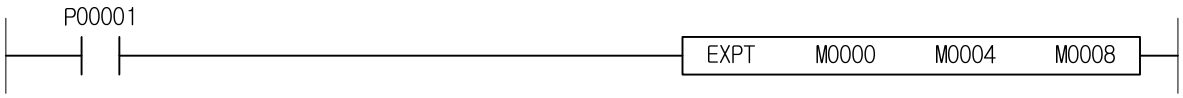
Operand	Description	Data size
S1	The base number for operation	LREAL
S2	The exponential number for operation	LREAL
D	Device number to save operation result in	LREAL

1) EXPT (Exponential operation)

(1) It performs Exponential operation of data in specified area S1 and S2 to save in D. At this moment, data type of S1,S2 and D is of long real number.

(2) When S1 is 1.5 and S2 is 3, operation result is 3.3753.375 (1.5).

2) Example



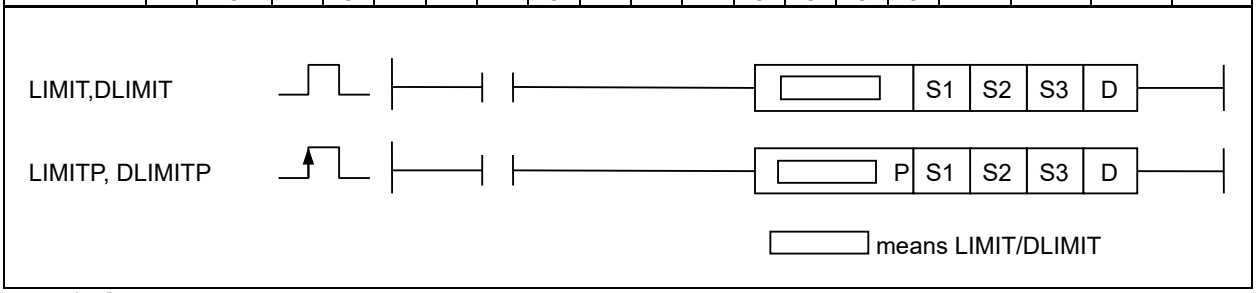
It performs exponential operation of data in M0000, M0001 and saves them in Lower M0008, M0009.
Program

4.28 Data Control Instruction

4.28.1 LIMIT, LIMITP, DLIMIT, DLIMITP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LIMIT(P) DLIMIT(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S1	Device number where input value to control is saved	INT/DINT
S2	Maximum output value	INT/DINT
S3	Minimum output value	INT/DINT
D	Device number to save output value in	INT/DINT

[Flag Set]

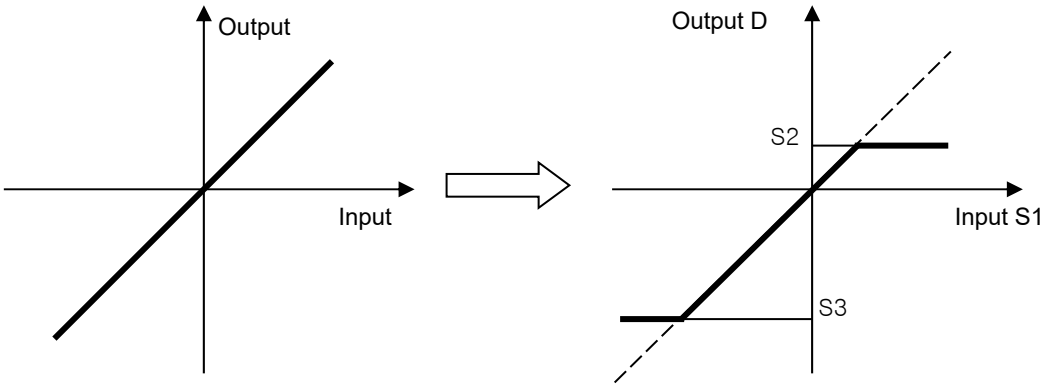
Flag	Content	Device number
error	If the maximum output is smaller than the minimum output.	F110

1) LIMIT

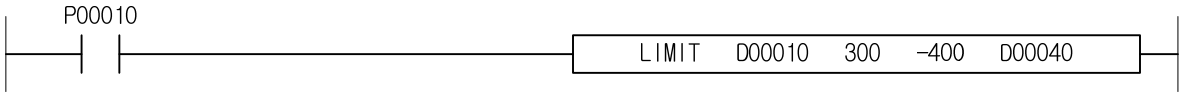
(1) It saves controlled output value in D, based on the value available in the range designated as the maximum/minimum of the input value specified in S1.

(2) Output Condition

S1 < S3 이면, D = S3
S3 < S1 < S2 이면, D = S1
S2 < S1 이면, D = S2



2) Example



Program that outputs to D00040 by limiting the input value to D00010 to the upper limit of 300 and the lower limit of -400

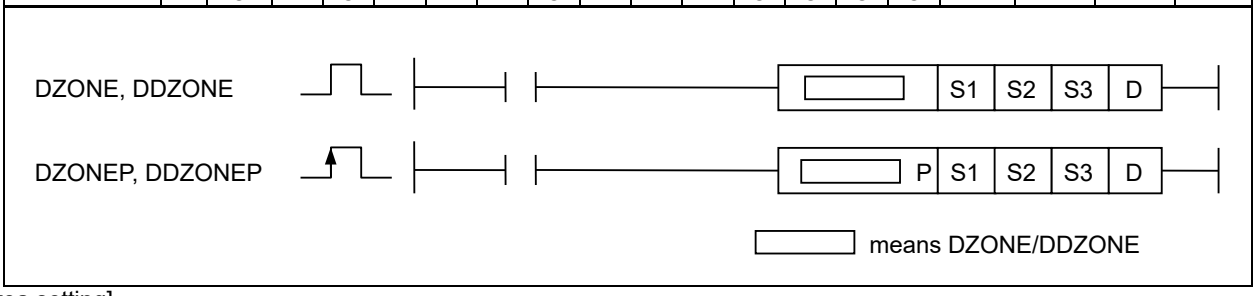
If D00010 is -500, D00040 = -400(lower limit)
If D00010 is -400, D00040 = -400

If D00010 is -400, D00040 = -300
If D00010 is -200, D00040 = -200
If D00010 is 0, D00040 = 0
If D00010 is 200, D00040 = 200
If D00010 is 300, D00040 = 300
If D00010 is 400, D00040 = 300(upper limit)
If D00010 is 500, D00040 = 300(upper limit)

4.28.2 DZONE, DZONEP, DDZONE, DDZONEP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DZONE(P) DDZONE(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	-	-	-
	S2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S1	Device number where input value to control is saved	INT/DINT
S2	Horizontal radius of dead zone	INT
S3	Inclination [%] in dead zone, (0%=0, 100%=1)	INT
D	Device number to save output value in	INT/DINT

[Flag Set]

Flag	Content	Device number
error	If inclination exceeds 0~100[%] Horizontal radius of dead zone exceeds 0~32767.	F110

1) DZONE

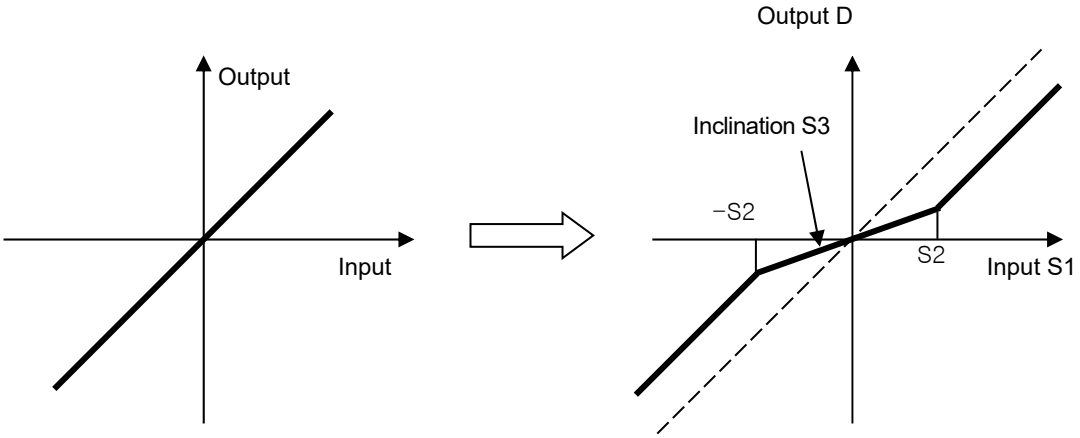
(1) It saves output value converted from input value specified in S1 based on dead zone's horizontal radius and inclination in D.

(2) Output Condition

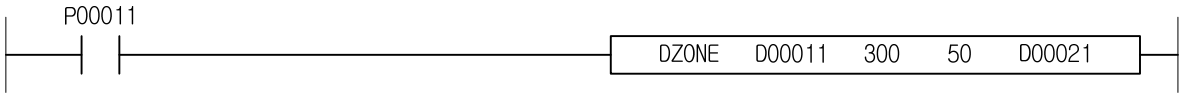
$$S1 < -S2 \quad \text{이면,} \quad D = S1 - \frac{S3}{100} \times S2 + S2$$

$$-S2 < S1 < S2 \quad \text{이면,} \quad D = \frac{S3}{100} \times S1$$

$$S2 < S1 \quad \text{이면,} \quad D = S1 + \frac{S3}{100} \times S2 - S2$$

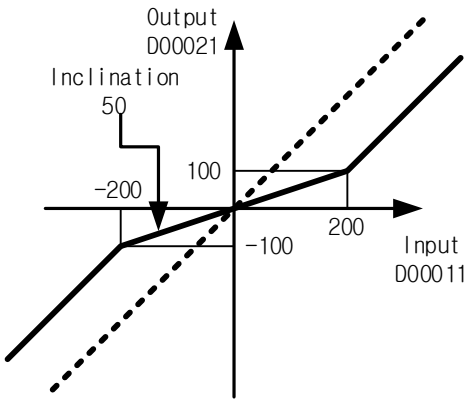


2) Example



Program that outputs to D00021 by limiting the input value to D00011 to the Horizontal radius of -300 ~ 300 and the Inclination of 50

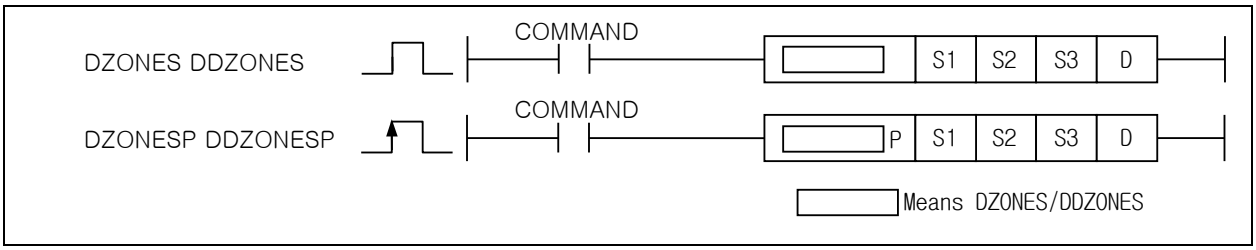
If D00010 is -500, D00040 = -350
If D00010 is -400, D00040 = -250
If D00010 is -300, D00040 = -150
If D00010 is -200, D00040 = -100
If D00010 is 0, D00040 = 0
If D00010 is 200, D00040 = 100
If D00010 is 300, D00040 = 150
If D00010 is 400, D00040 = 250
If D00010 is 500, D00040 = 350



4.28.3 DZONES, DZONESP, DDZONES, DDZONESP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DZONE(P) DDZONE(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	S3	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D	O	-	-	-	-	-	-	-	-	-	-	-	O	O				



[Area setting]

Operand	Description	Data type
S1	Input value	INT/DINT
S2	Lower limit of dead zone	INT/DINT
S3	Upper limit of dead zone	INT/DINT
D	Device number to save output value in	INT/DINT

[Flag Set]

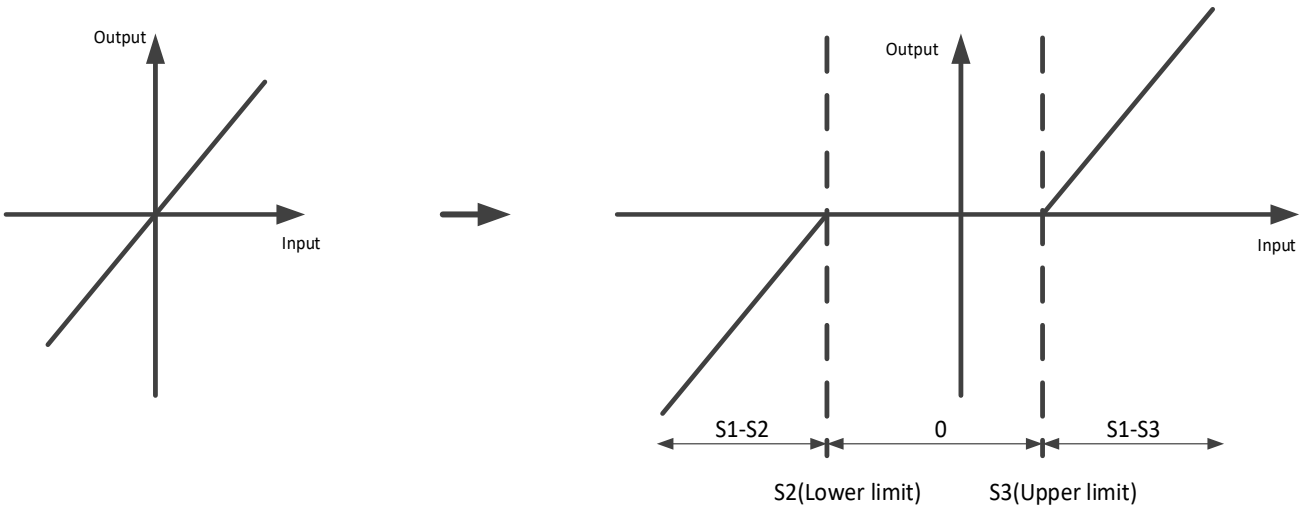
Flag	Content	Device number
error	If S3 < S2	F110

1) DZONES(Dead Zone Separate)

(1) Input value specified by S1 is converted based on the lower and upper limits of Dead Zone, it is stored in D.

(2) Output Condition

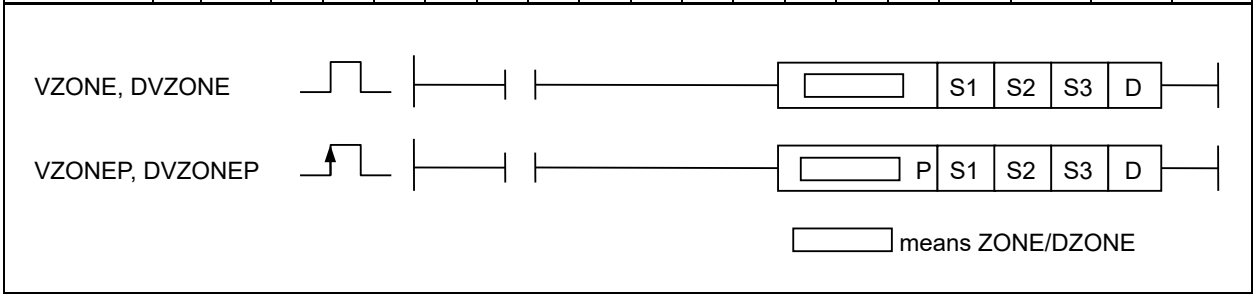
If S2(Lower limit) > S1(Input), D(Output) = S1(Input) – S2(Lower limit)
If S3(Upper limit) > S1(Input), D(Output) = S1(Input) – S3(Upper limit)
If S2(Lower limit) <= S1(Input) <= S3(Upper limit), D(Output) = 0
If {S2(Lower limit) == S3(Upper limit)} < S1(Input), D(Output) = S1(Input) – S3(Upper limit)
If {S2(Lower limit) == S3(Upper limit)} >S1(Input), D(Output) = S1(Input) – S3(Upper limit)



4.28.4 VZONE, VZONEP, DVZONE, DVZONEP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
VZONE(P) DVZONE(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S1	Device number where input value to control is saved	INT/DINT
S2	Vertical radius of vertical zone	INT
S3	Reciprocal of inclination [%] in vertical zone, (0%=inf, 100%=1)	INT
D	Device number to save output value in	INT/DINT

[Flag Set]

Flag	Content	Device number
error	If reciprocal of inclination exceeds 0~100[%] Horizontal radius of dead zone exceeds 0~32767.	F110

1) VZONE

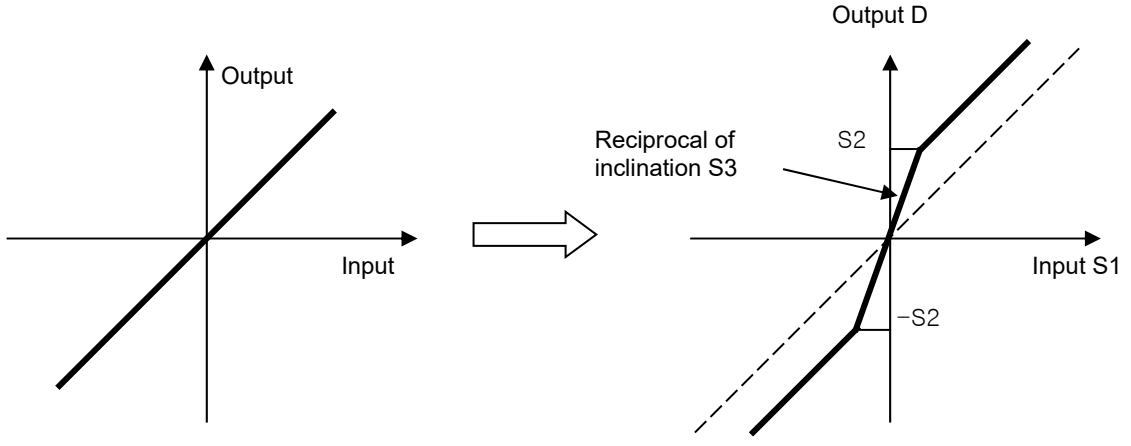
(1) It saves output value converted from input value specified in S1 based on vertical zone's horizontal radius and inclination in D.

(2) Output Condition

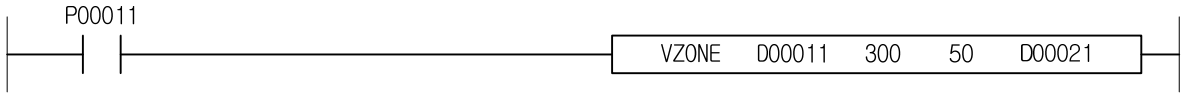
$$S1 < -\frac{S3}{100} \times S2 \quad \text{이면,} \quad D = S1 + \frac{S3}{100} \times S2 - S2$$

$$-\frac{S3}{100} \times S2 < S1 < \frac{S3}{100} \times S2 \quad \text{이면,} \quad D = \frac{100}{S3} \times S1$$

$$\frac{S3}{100} \times S2 < S1 \quad \text{이면,} \quad D = S1 - \frac{S3}{100} \times S2 + S2$$

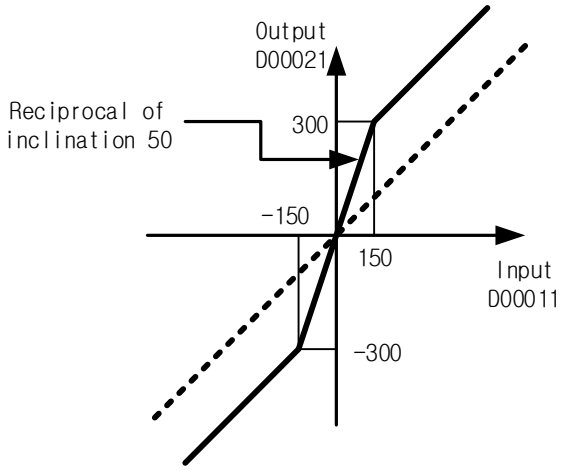


2) Example



Program that outputs to D00021 by limiting the input value to D00011 to the vertical radius of -300 ~ 300 and the reciprocal of inclination of 50.

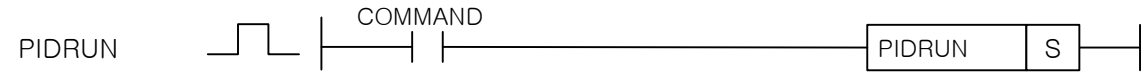
If D00011 is -500,	D00021 = -650
If D00011 is -200,	D00021 = -350
If D00011 is -150,	D00021 = -300
If D00011 is -100,	D00021 = -200
If D00011 is 0,	D00021 = 0
If D00011 is 100,	D00021 = 200
If D00011 is 150,	D00021 = 300
If D00011 is 200,	D00021 = 350
If D00011 is 500,	D00021 = 650



4.28. 5 PIDRUN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PIDRUN	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-	2	-	-	-



[Area setting]

Operand	Description	Data size
S	Loop Number to perform PID operation (XGK : 0~31,XGB : 0 ~ 15)	Constant

1) PIDRUN (PID RUN)

(1) User should operate K area(XGK is K1000 ~ K2047 , XGB is K1200 ~ K1850 in word)'s PID Loop (S:Loop Number) saved as adjusted to PID format.

(2) K device PID parameter area How to assign PID parameter positions in K device is as shown in the table below.

(3) PID common area shows all the loops' simple setting and state. The bit position in double word in XGK (the bit position in word in XGB) is just the loop number.
For more information, please refer to the list of XGK PID parameters below.

(4) Input value by user and PID output value for the user to use are saved together in PID loop's individual parameter.
For more information, please refer to the list of XGK PID parameters below.

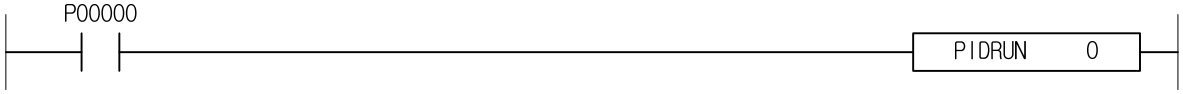
2) Quick Start

(1) For simple application, PV and MV are respectively used as controller's input and output. The value user should input is SV, MV_man, Kp, Ti and Td.
PV : Controller's input (sensor output to be controlled), AD module mainly used.
MV : Controller's output (input signal to be controlled), DA module mainly used.
SV : set point value, Where sensor's output is input as desired to reach through the control.
MV_max : Maximum control output. where maximum range of control output is input. Usually 10000 is input (usually 4000 is input in XGB case). And if this value is 0, more than 0 will not be output. Kp, Ti, Td : Where proportional, integral and differential coefficients are respectively input and tuned.

Notes

Ti value is the denominator of integral term. Thus, reduce Ti to increase integral effect, or enlarge Ti to decrease integral effect.
In case PIDRUN Block is to be deleted for modification during run, let it deleted in the state that contact point is off If modified during run with contact point on, the output value will be kept as before, which causes error that control is successively performed when the identical loop is later added with contact point always on.
Please refer to the built-in PID section of the separate XGK / XGB CPU user manual.
Be well informed of PIDRUN, PIDPRMT, PIDPAUSE and PIDINIT instructions to keep from any accident caused by abnormal operation.

3) Example



- XGK PID parameter list

K device value	Symbol	Data type	Content
K10000+m	_PIDn_MAN	Bit	PID Output Select (0:Auto, 1:Manual)
K10020+m	_PIDn_PAUSE	Bit	PID PAUSE (0: STOP/RUN 1:PAUSE)
K10040+m	_PIDn_REV	Bit	PID Operate Direction (0:Forward, 1:Reverse)
K10060+m	_PIDn_AW2D	Bit	PID Anti Wind-up2 (0:Enable, 1:Disable)
K10080+m	_PIDn_REM_RUN	Bit	PID Remote RUN bit for HMI (,0:STOP 1:RUN)
K10100+m	_PIDn_P_on_PV	Bit	PID proportional calculation source selection (0: ERR, 1: PV)
K10120+m	_PIDn_D_on_ERR	Bit	PID derivative calculation source selection (0:PV, 1:ERR)
K10140+m	_PIDn_AT_EN	Bit	PID auto-tuning setting (0:Disable, 1:Enable)
K10160+m	_PIDn_MV_BMPL	Bit	MV no-impulse conversion at PID mode switching (A/M) (0:Disable, 1:Enable)
K1024+32n	_PIDn_SV	INT	PID setpoint value (SV) – loop n
K1025+32n	_PIDn_T_s	WORD	PID operation period (T_s)[0.1msec] – loop n
K1026+32n	_PIDn_K_p	REAL	PID P - Constant (K_p)- loop n
K1028+32n	_PIDn_T_i	REAL	PID I - constant (T_i)[sec] – loop n
K1030+32n	_PIDn_T_d	REAL	PID D - constant (T_d)[sec] – loop n
K1032+32n	_PIDn_d_PV_max	WORD	PID Max. delta_PV Limit- loop n
K1033+32n	_PIDn_d_MV_max	WORD	PID Max. delta_MV Limit- loop n
K1034+32n	_PIDn_MV_max	INT	PID MV max. value limit – loop n
K1035+32n	_PIDn_MV_min	INT	PID MV min. value limit – loop n
K1036+32n	_PIDn_MV_man	INT	PID manual output (MV_man) – loop n
K1037+32n	_PIDn_STATE	WORD	PID State - loop n
K10370+320n	_PIDn_ALARM0	Bit	PID Alarm 0 (1:T_s setting is small) – loop n
K10371+320n	_PIDn_ALARM1	Bit	PID Alarm 1 (1:K_p is 0) – loop n
K10372+320n	_PIDn_ALARM2	Bit	PID Alarm 2 (1:delta PV is limited) – loop n
K10373+320n	_PIDn_ALARM3	Bit	PID Alarm 3 (1:delta MV is limited) – loop n
K10374+320n	_PIDn_ALARM4	Bit	PID Alarm 4 (1:MV max. value is limited) – loop n
K10375+320n	_PIDn_ALARM5	Bit	PID Alarm 5 (1:MV min. value is limited) – loop n
K10376+320n	_PIDn_ALARM6	Bit	PID Alarm 6 (1:AT abnormal cancel state) – loop n
K10377+320n	_PIDn_ALARM7	Bit	PID Alarm 7 - loop n
K10378+320n	_PIDn_STATE0	Bit	PID State 0 (0:PID_STOP, 1:PID_RUN) – loop n
K10379+320n	_PIDn_STATE1	Bit	PID State 1 (0:AT_STOP, 1:AT_RUN) – loop n
K1037A+320n	_PIDn_STATE2	Bit	PID State 2 (0:AT_UNDONE, 1:DONE) – loop n
K1037B+320n	_PIDn_STATE3	Bit	PID State 3 (0:REM_STOP, 1:REM_RUN) – loop n
K1037C+320n	_PIDn_STATE4	Bit	PID State 4 (0:AUTO_OUT, 1:MAN_OUT) – loop n
K1037D+320n	_PIDn_STATE5	Bit	PID State 5 (0:CAS_STOP, CAS_RUN) – loop n
K1037E+320n	_PIDn_STATE6	Bit	PID State 6 (0:SLV/SINGLE, 1:CAS_MST) – loop n
K1037F+320n	_PIDn_STATE7	Bit	PID State 7 (0:AW_STOP, 1:AW_ACT) – loop n
K1038+32n	_PIDn_PV	INT	PID present value (PV) – loop n
K1039+32n	_PIDn_PV_old	INT	PID previous present value (PV_old) – loop n
K1040+32n	_PIDn_MV	INT	PID Output value (MV) – loop n
K1041+32n	_PIDn_MV_BMPL_val	WORD	PID no impulse operation memory – loop n
K1042+32n	_PIDn_ERR	DINT	PID control error value – loop n
K1044+32n	_PIDn_MV_p	REAL	PID output value P factor - loop n
K1046+32n	_PIDn_MV_i	REAL	PID output value I factor - loop n
K1048+32n	_PIDn_MV_d	REAL	PID output value D factor - loop n
K1050+32n	_PIDn_DB_W	WORD	PID deadband setting (operate after stabilization) – loop n
K1051+32n	_PIDn_Td_lag	WORD	PID derivative function Lag filter – loop n
K1052+32n	_PIDn_AT_HYS_val	WORD	PID auto-tuning hysterisys setting – loop n
K1053+32n	_PIDn_AT_SV	INT	SV setting at PID auto-tuning – loop n
K1054+32n	_PIDn_AT_step	WORD	Indicates PID auto-tuning state (User setting disable) – loop n
K1055+32n	_PIDn_INT_MEM	WORD	PID internal memory (User setting disable) – loop n

* ☐ : User setting disable area
* n : PID's loop number, decimal expression
* m : PID's loop number, hexadecimal expression

Notes

If PID related instructions are not used, it can be used just like a normal K device
Controlled Input of PV lets it connected to sensor output to control with MOV instruction, etc
Controlled Output of MV lets it connected to driver to control with MOV instruction, etc.
PV, MV and the value to monitor can be all inspected in graphs or table format at a glance through XG5000's trend monitor or data trace to check the operation of the control system.

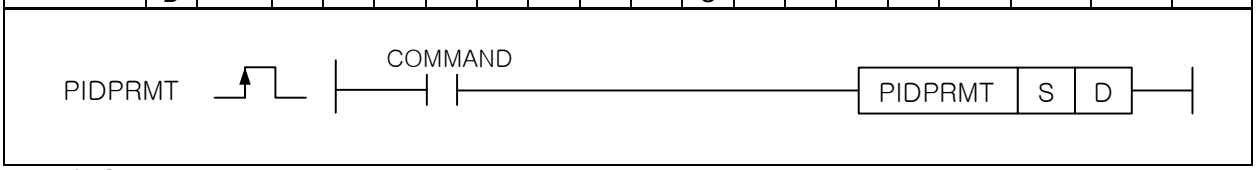
- XGB PID parameter list

Classification	Device	Type	Name	Function
PID common area	K1200	16bit	_PID_MAN	PID Output Select (0:Auto, 1:Manual)
	K1201	16bit	_PID_PAUSE	PID pause (0: STOP/RUN, 1: PAUSE)
	K1202	16bit	_PID_REV	PID Operate Direction (0:Forward, 1:Reverse)
	K1203	16bit	_PID_AW2D	PID Anti Wind-up2 (0:Enable, 1:Disable)
	K1204	16bit	_PID_REM_RUN	PID Remote RUN bit for HMI (,0:STOP 1:RUN)
	K1205	-	-	No use
	K1206	16bit	_PID_D_on_ERR	PID Derivative term (0:on PV, 1:on ERR)
	K1207	-	-	No use
	K1208	16bit	_PID_PWM_EN	PID PWM Enable (0:Disable, 1:Enable)
	K1209	16bit	_PID_STD	PID RUN Status (0:Stop, 1:Run)
	K1210	16bit	_PID_ALARM	PID display of warning status (0: Normal, 1: Warning)
	K1211	16bit	_PID_ERROR	PID display of error status (0: Normal, 1: Error)
	K2112~1215	-	Reserved	No use
Loop area	K1216+40*S	INT	_PID00_SV	PID Set Value (SV)
	K1217+40*S	WORD	_PID00_T_s	PID sampling time (T_s)
	K1218+40*S	REAL	_PID00_K_p	PID P - Constant (K_p)
	K1220+40*S	REAL	_PID00_T_i	PID I – constant (T_i)
	K1222+40*S	REAL	_PID00_T_d	PID D – constant (T_d)
	K1224+40*S	WORD	_PID00_d_PV_max	PID Max. delta_PV Limit
	K1225+40*S	WORD	_PID00_d_MV_max	PID Max. delta_MV Limit
	K1226+40*S	INT	_PID00_MV_max	PID MV maximum value limit
	K1227+40*S	INT	_PID00_MV_min	PID MV minimum value limit
	K1228+40*S	INT	_PID00_MV_man	PID Manual MV
	K1229+40*S	INT	_PID00_PV	PID Process Value (PV)
	K1230+40*S	INT	_PID00_PV_old	PID one step previous PV (PV_old)
	K1231+40*S	INT	_PID00_MV	PID Manipulated Value (MV)
	K1232+40*S	DINT	_PID00_ERR	PID Control Error Value
	K1234+40*S	REAL	_PID00_MV_p	PID P component of the MV
	K1236+40*S	REAL	_PID00_Mv_i	PID I component of the MV
	K1238+40*S	REAL	_PID00_MV_d	PID D component of the MV
	K1240+40*S	WORD	_PID00_DB_W	PID deadband setting (operate after stabilization)
	K1241+40*S	WORD	_PID00_Td_lag	PID Lag value of Derivative term
	K1242+40*S	WORD	_PID00_PWM	PID PWM contact point setting value
	K1243+40*S	WORD	_PID00_PWM_Prd	PID PWM output cycle
	K1244+40*S	WORD	_PID00_SV_RAMP	PID SV ramping
	K1245+40*S	WORD	_PID00_PV_Track	PID PV Tracking
	K1246+40*S	INT	_PID00_PV_MIN	PID PV minimum limit
	K1247+40*S	INT	_PID00_PV_MAX	PID PV maximum limit
	K1248+40*S	Word	_PID_ALM_CODE	PID alarm code
	K1249+40*S	Word	_PID_ERR_CODE	PID error code
	K1250~1255	-	Reserved	No use

4.28.6 PIDPRMT

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PIDPRMT	S	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2	-	-	-
	D	-	-	-	-	-	-	-	-	-	O	-	-	-	-				



[Area setting]

Operand	Description	Data size
S	Device number where PID operation information to change is saved	INT
D	Loop number to change PID operation information (0~31)	Constant

1) PIDPRMT (PID Parameter)

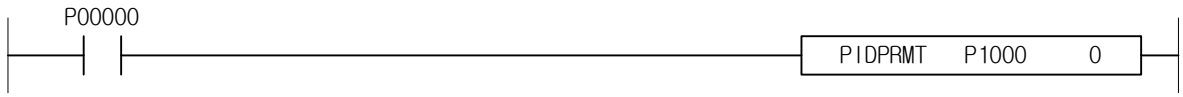
(1) It changes partial PID parameter the moment contact point is ON.

(2) Operand S designates the first word address of place of parameter to change, Operand D is constant (0~31) and means loop number.

(3) It always operates to make much faster tuning available regardless of PID Loop UN/STOP/PAUSE state.

(5) Changeable parameters by PIDPRMT are SV, Ts, Kp, Ti and Td with applicable format as follows. Starting from operand S, the data types assigned are as shown in the table below.

2) Example

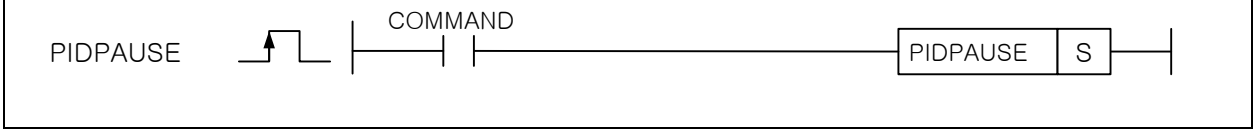


Device	Parameter	Data type	Yes	Unit
S+0	SV	[WORD]	5000	System configuration
S+1	Ts	[WORD]	10000	0.1 msec
S+2	Kp	[REAL]	3.32	sec
S+4	Ti	[REAL]	9.3	sec
S+6	Td	[REAL]	0.001	sec

4.28.7 PIDPAUSE

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PIDPAUSE	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-	2	-	-	-



[Area setting]

Operand	Description	Data size
S	Loop number to convert PID operation to PAUSE(temporary stop) state (0~31)	Constant

1) PIDPAUSE (PID PAUSE)

(1) It operates only when contact point is ON, in order to convert RUN to PAUSE (temporary stop) state of PID loop.

(2) When paused, the output value of the PID loop retains the final value before the pause, and the integral constant is also retained. If it returns to the RUN state again, the previous state is not initialized and continues to operate.

(3) PAUSE is only available in the RUN state, not in the STOP state.

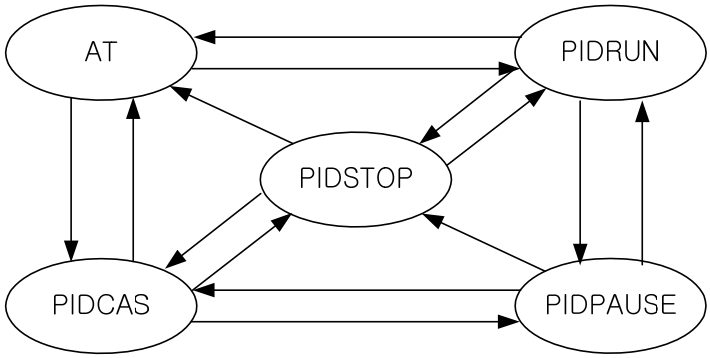
(4) The PIDn_PAUSE bit is accessed directly, it may collide with this instruction on the ladder program and malfunction.

Notes

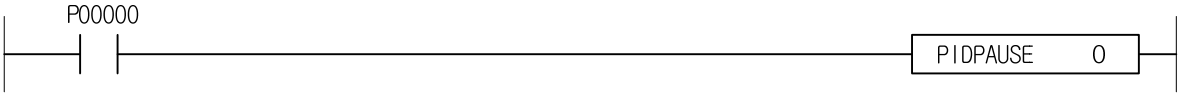
Before PID loop is stabilized, any system easily unstable or with external hindrance or noise highly expected shall not be used if not surely necessary since it may cause divergence due to PIDPAUSE. In addition, its user should monitor the system to be able to stop the system urgently anytime at PAUSE, and should not leave it in PAUSE state for long.

2) Status of PID loop

PID loop has 5 types of operation status as shown below and it can conversion of operation status only indication of below arrows.



3) Example



4.28.8 PIDINIT

[Applicable Product: XGK]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
PIDINIT	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-	2	-	-	-

[Area setting]

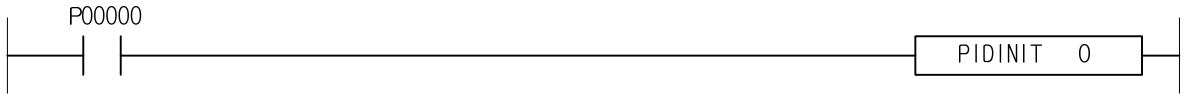
Operand	Description	Data size
S	Loop number to convert PID operation to PAUSE(temporary stop) state (0~31)	Constant

1) PIDINIT (PID Initial)

(1) It initializes setting and status of applicable PID loop.

(2) The area to be initialized at this time is all bits and word devices of the designated loop and is initialized to 0.

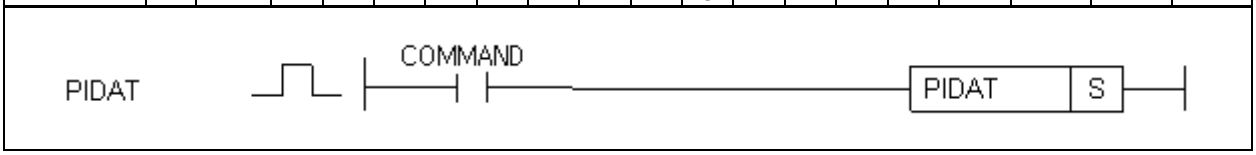
2) Example



4.28.9 PIDAT

[Applicable Product: XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PIDAT	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-	2	-	-	-

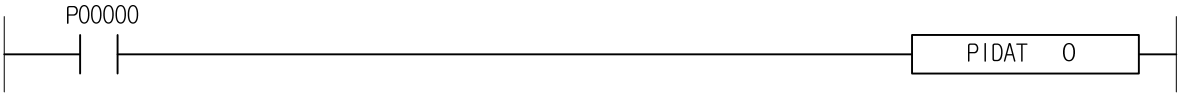


[Area setting]

Operand	Description	Data size
S	Loop number to perform AT operation (0~15)	Constant

1) PIDAT (PID AutoTune)
   (1) User should operate parameter or K area(K1856 ~ K2176 in word)'s PID Loop (S:Loop Number) auto-tuning saved as adjusted to AT format.
   (2) K device AT parameter area
   How to assign AT parameter positions in K device is as shown in the table below.
   (3) AT common area shows all the loops' simple setting and state. The bit position in word is just the loop number.
   (4) Input value by user and AT output value for the user to use are saved together in AT loop's individual parameter.
   User setting value: SV, Ts, MV_max, MV_min, PWM, Hys_Val
   PID output value: PV, MV, STATUS, ERR_Code, K_p, T_i, T_d
2) Quick Start
   (1) For simple application, PV and MV are respectively used as controller's input and output. The value user should input is SV, Ts.
   PV : Controller's input (sensor output to be controlled), AD module mainly used.
   MV : Controller's output (input signal to be controlled), DA module mainly used.
   SV : set point value, Where sensor's output is input as desired to reach through the control.

3) Example

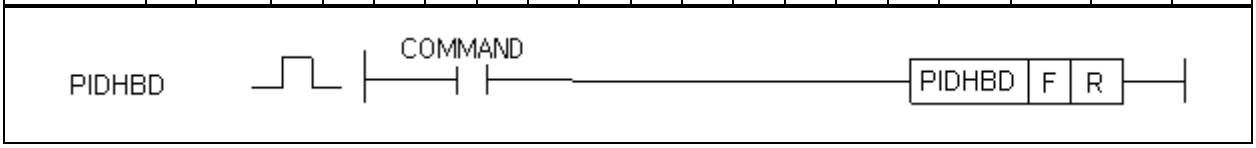


Classification	Device	Type	Name	Function
AT common area	K1856	16bit	_AT_REV	AT Direction (0:Forward, 1:Reverse)
	K1857	16bit	_AT_PWM_EN	AT PWM Enable (0:Disable, 1:Enable)
	K1858	16bit	_AT_ERROR	AT Error (0: Normal 1: Error Occurs)
	K1859	-	Reserved	No use
Loop area	K1860+20*S	INT	_AT00_SV	AT Set Value (SV)
	K1861+20*S	WORD	_AT00_T_s	AT sampling time (T_s)
	K1862+20*S	INT	_AT00_MV_max	AT MV maximum value limit
	K1863+20*S	INT	_AT00_MV_min	AT MV minimum value limit
	K1864+20*S	WORD	_AT00_PWM	AT PWM contact point setting value
	K1865+20*S	WORD	_AT00_PWM_Prd	AT PWM output cycle
	K1866+20*S	WORD	_AT00_HYS_val	AT hysteresis setting – loop 00
	K1867+20*S	WORD	_AT00_STATUS	AT auto-tuning status indication
	K1868+20*S	WORD	_AT00_ERR_CODE	AT error code
	K1870+20*S	REAL	_AT00_K_p	AT result P – constant (K_p)
	K1872+20*S	REAL	_AT00_T_i	AT result I – constant (T_i)
	K1874+20*S	REAL	_AT00_T_d	AT result D – constant (T_d)
	K1875+20*S	INT	_AT00_PV	AT present value
	K1876+20*S	INT	_AT00_MV	AT output value
	K1877~1879	Word	Reserved	Reserved

4.28.10 PIDHBD

[Applicable Product: XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PIDHBD	F	-	-	-	-	-	-	-	-	-	O	-	-	-	-	2	-	-	-
	R	-	-	-	-	-	-	-	-	-	O	-	-	-	-				



[Area setting]

Operand	Description	Data size
F	Loop number to operate forward PID operation (0~15)	Constant
R	Loop number to operate reverse PID operation (0~15)	Constant

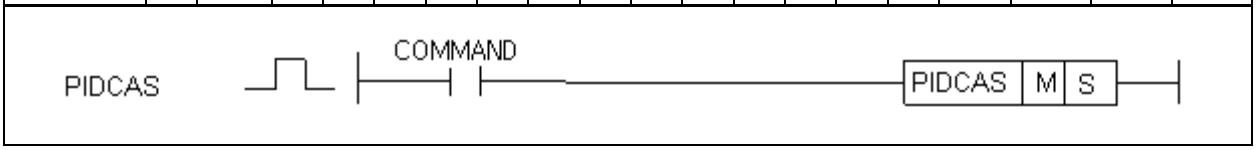
1) PIDHBD (PID Hybrid)
   (1) User should operate forward/reverse mixing operation connecting to forward/reverse parameter or K area(K1200 ~ K1850 in word)'s PID Loop saved as adjusted to PID format.
   (2) K device PID parameter area
   Refer to PIDRUN instruction to assign parameter positions in K device of each loop.
2) Quick Start
   (1) When you use PIDHBD instruction, you should assign the forward operation loop number and reverse operation loop number correctly.
   (2) If you use the loop on other instruction like PIDRUN after using in PIDHBD instruction, control operation can operate abnormally.

3) Example

4.28. 11 PIDCAS

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
PIDCAS	M	-	-	-	-	-	-	-	-	-	O	-	-	-	-	2	-	-	-
	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-			



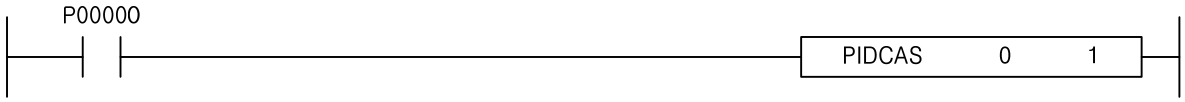
For XGK

[Area setting]

Operand	Description	Data size
M	CASCADE master loop number (0~31)	Constant
S	CASCADE slave loop number (0~31)	Constant

1) PIDCAS (PID Cascade)
   (1) When the contact is on, cascade operation starts.
   (2) Operand M is the number of the master loop and operand S is the number of the slave loop.
   (3) Operands M and S can only input constants from 0 to 31, but cannot be the same.
   (4) Two loops used once in PIDCAS cannot be used in another PIDCAS or PIDRUN.
   (5) Master and slave loops are set on each K device introduced in PIDRUN.

2) Example



For XGB

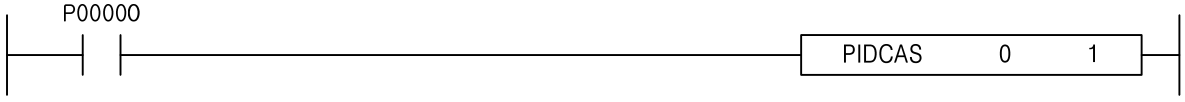
[Area setting]

Operand	Description	Data size
M	CASCADE external loop number (0~15)	Constant
S	CASCADE internal loop number (0~15)	Constant

1) PIDCAS (PID Cascade)
   (1) User should operate cascade operation connecting to external/internal parameter or K area(K1200 ~ K1850 in word)'s PID Loop saved as adjusted to PID format.
   (2) K device PID parameter area
   Refer to PIDRUN instruction to assign parameter positions in K device of each loop.

2) Quick Start
   (1) Assign an external loop and an internal loop correctly.
   (2) If you use the loop on other instruction like PIDRUN after using in PIDCAS instruction, control operation can operate abnormally.

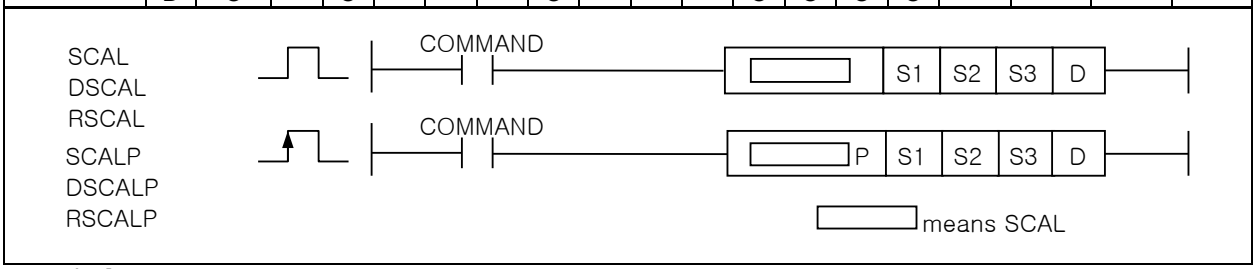
3) Example



4.28.12 SCAL, SCALP, DSCAL, DSCALP, RSCAL, RSCALP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SCAL(P) / DSCAL(P) / RSCAL(P)	S1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	S3	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S1	Device number of input data to input	INT / DINT / REAL
S2	Scale upper limit of input data	INT / DINT / REAL
S2+1	Scale lower limit of input data	INT / DINT / REAL
S3	Scale upper limit of output data	INT / DINT / REAL
S3+1	Scale lower limit of output data	INT / DINT / REAL
D	Device number to save output data	INT / DINT / REAL

[Flag Set]

Flag	Content	Device number
error	In case of error in lower limit and upper limit of input data	F110
error	In case scale upper limit of input data is same with lower limit	F110

1) SCL, DSCAL, RSCAL

(1) Scales the input value S1 in the range of S2+1≤S1≤S2 into the output value D in the range of S3+1≤D≤S3.

(2) In case S1 is out of range [S2+1~S2], each is replaced into S2+1, S2.

(3) In case S3 < S3+1, scaling conversion is available.

(4) In case it is set as scale upper limit and lower limit change, if error flag is On, output changes as 0.

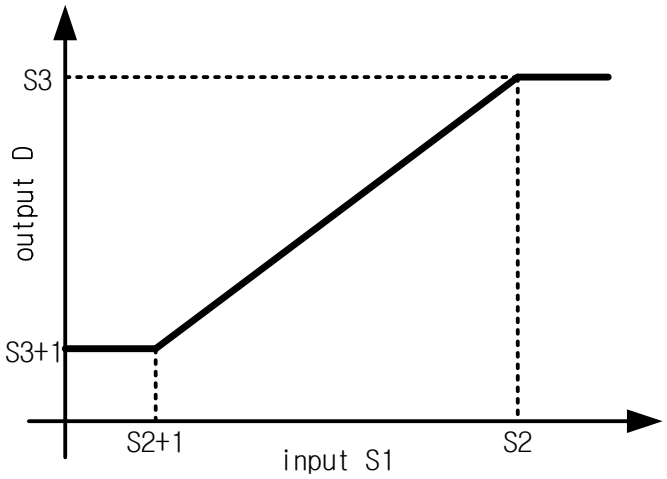
(5) In case scale upper limit and lower limit of input data is same,in the following output condition, since some denominator become 0, error flag is On, output changes to 0.

(6) Output Condition

$$\text{If} \quad S1 < S2+1 \quad \text{Then} \quad D = S3+1$$

$$\text{If} \quad S2+1 \leq S1 \leq S2 \quad \text{Then} \quad D = \frac{S3 - S3+1}{S2 - S2+1} \ (S1 - S2) + S3$$

$$\text{If} \quad S2 < S1 \quad \text{Then} \quad D = S3$$



(7) The result of the operation of INT/DINT type is represented rounded off the number to one decimal place.

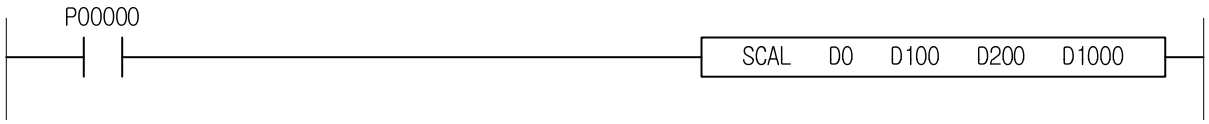
(8) If the result of INT / DINT operation exceeds the maximum / minimum value that can be expressed, it is displayed as the maximum / minimum value.

(9) In case operation result exceeds the max./min. value that is expression available in the REAL type operation process, it is expressed as ±1.INF00000e+000, so when using more than ±1.000e+010 at nominator or less than ±1.000e-010 at denominator, be careful.

(10) In case of operating DINT type, if setting value is more than 10 million, error may occurs.

2) Example

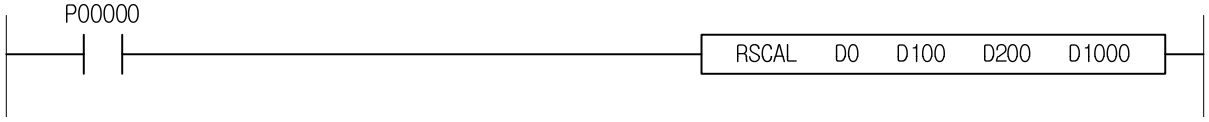
(1) SCAL program scales value between 0 and 16000 to value between 100 and 200.



D100 = 16000
D101 = 0
D200 = 200
D201 = 100
Substitute each.

input D0		output D1000
-100	→	100
0	→	100
5000	→	131
16000	→	200
18000	→	200

(2) RSCAL program scales value between 0 and 1000 to value between 2000 and 1000.



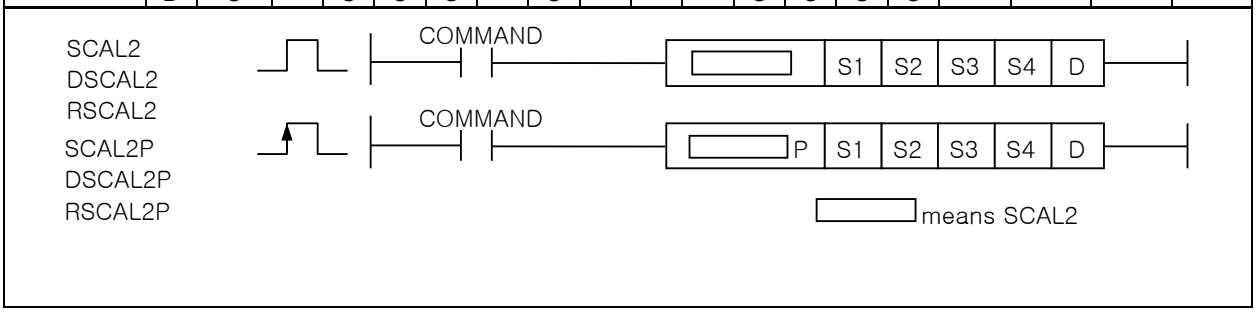
D100 = 1000
D102 = 0
D200 = 1000
D202 = 2000
Substitute each.

input D0		output D1000
-100	→	2000
0	→	2000
300	→	1700
1000	→	1000
1100	→	1000

4.28.13 SCAL2, SCAL2P, DSCAL2, DSCAL2P, RSCAL2, RSCAL2P

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SCAL2(P) / DSCAL2(P)/ RSCAL2(P)	S1	O	-	O	O	O	-	O	-	-	O	O	O	O	O	4~7	O	-	-
	S2	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	S3	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	S4	O	-	O	O	O	-	O	-	-	O	O	O	O	O				
	D	O	-	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
S1	Device number of input data to change	INT / DINT / REAL
S2	Standard deviation of input data	INT / DINT / REAL
S3	Standard deviation of output data	INT / DINT / REAL
S4	Offset of outut data	INT / DINT / REAL
D	Device number to save output data	INT / DINT / REAL

[Flag Set]

Flag	Content	Device number
error	In case input data standard deviation is 0	F110

1) SCL2, DSCAL2, RSCAL2

(1) It scales input S1 to output D through first order function determined by S2, S3, S4.

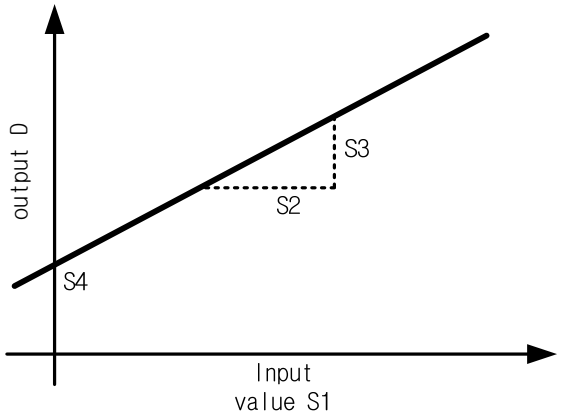
(2) If operation result exceeds the upper/lower limit of each data, it is expressed as max./min. value of data size.

(3) In case S3/ S2 is negative number,negative scaling conversion is available.

(4) In case scale upper limit and lower limit of input data is same,in the following output condition, since some denominator become 0, error flag is On, output changes to 0.

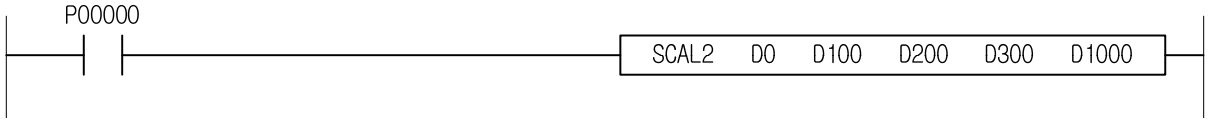
(5) Output Condition

$$D = \frac{S3}{S2} S1 + S4$$



(7) The result of the operation of INT/DINT type is represented rounded off the number to one decimal place.
(8) If the result of INT / DINT operation exceeds the maximum / minimum value that can be expressed, it is displayed as the maximum / minimum value.
(9) In case operation result exceeds the max./min. value that is expression available in the REAL type operation process, it is expressed as ±1.INF00000e+000, so when using more than ±1.000e+010 at nominator or less than ±1.000e-010 at denominator, be careful.
(10) In case of operating DINT type, if setting value is more than 10 million, error may occurs.

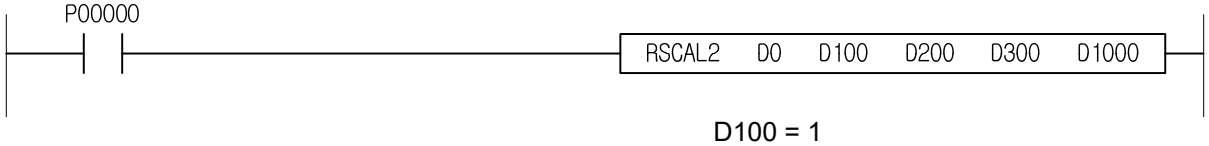
2) Example
(1) Program that scales input value to 1/16 and outputs it.



D100 = 16
D200 = 1
D300 = 0
Substitute each.

input D0		output D1000
-160	→	-10
0	→	0
8000	→	500
16000	→	1000
18000	→	1125

(2) Program that scales input value to double and adds 10



D100 = 1
D200 = 2
D300 = 2000
Substitute each.

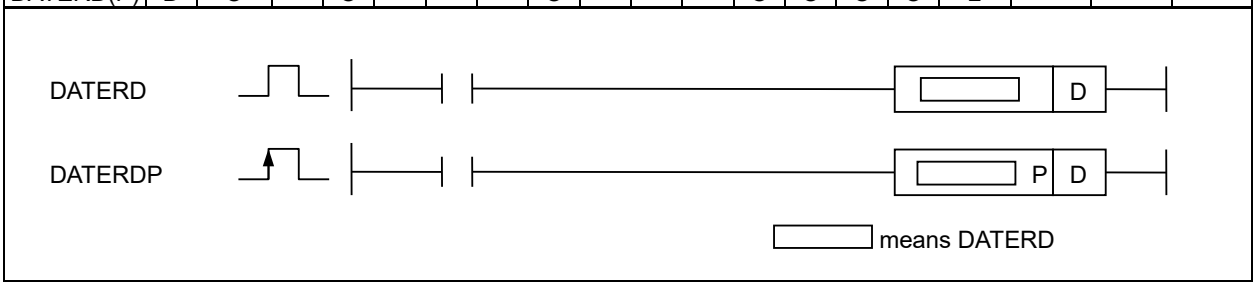
input D0		output D1000
-100	→	-190
0	→	10
300	→	610
1000	→	2010
1100	→	2210

4.29 Time Related Instruction

4.29.1 DATERD, DATERDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DATERD(P)	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2	-	-	-



[Area setting]

Operand	Description	Data size
D	Device number to save data transferred	WORD

1) DATERD (Date Read)

(1) It reads date and time data of PLC to saves in D.

Time data ⇒

b15 ··· b8	b7 ··· b0	
Month	Year	D
Hour	Date	D+1
Sec	Min	D+2
100 years	Day	D+3

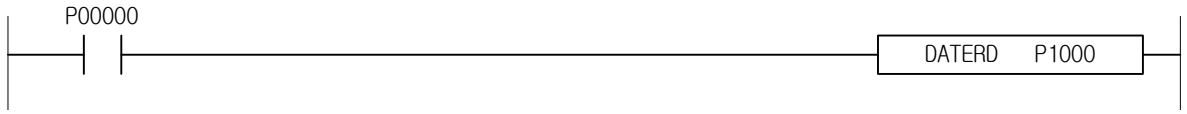
(2) All the time data value is provided in BCD format.

(3) '100 years' above stands for the unit of 1000 and 100.
For example, if present PLC time is 14:59:40, Oct. 15, 2004 Friday, its result to be saved will be as follows.

b15 ··· b8	b7 ··· b0	
H10	H04	D
H14	H15	D+1
H40	H59	D+2
H20	H04	D+3

(4) Details of days: 0-Sunday, 1-Monday, 2-Tuesday, 3-Wednesday, 4-Thursday, 5-Friday, 6-Saturday.

2) Example



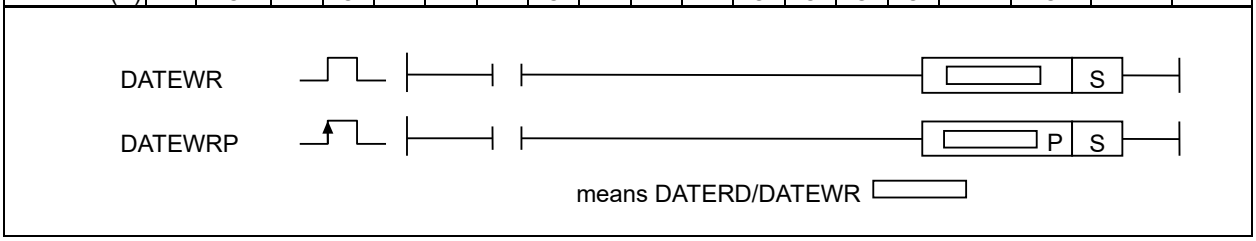
Program to read the date and time data of PLC and save it in P1000 ~ P1003

Year ---- P10000 ~ P10007
Month ---- P10008 ~ P1000F
Date ---- P10010 ~ P10017
Hour ---- P10018 ~ P1001F
Minute ---- P10020 ~ P10027
Second ---- P10028 ~ P1002F
Day ---- P10030 ~ P10037
Hundred year ---- P10038 ~ P1003F

4.29.2 DATEWR, DATEWRP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DATEWR(P)	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2	O	-	-



[Area setting]

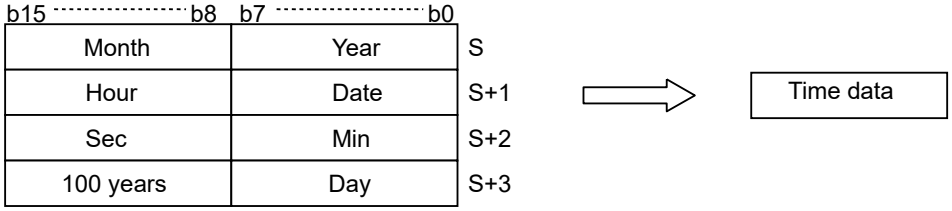
Operand	Description	Data size
S	Device number time data is saved in	WORD * 4

[Flag Set]

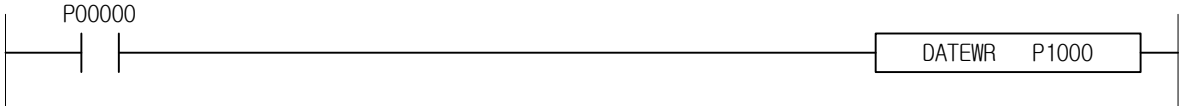
Flag	Content	Device number
error	If time data size specified in S exceeds its applicable range	F00040

1) DATEWR (Date Write)

(1) It sets PLC clock to time data value of the area specified in S, S+1, S+2, S+3,
(2) All the time data value is provided in BCD format.
(3) Details of days: 0-Sunday, 1-Monday, 2-Tuesday, 3-Wednesday, 4-Thursday, 5-Friday, 6-Saturday. The day of the week is automatically output as the result date without inputting the day data.



2) Example



Program to input the clock data of P1000 ~ P1003 to PLC when the command is executed.

Year ---- P10000 ~ P10007
Month ---- P10008 ~ P1000F
Date ---- P10010 ~ P10017
Hour ---- P10018 ~ P1001F
Minute ---- P10020 ~ P10027
Second ---- P10028 ~ P1002F
Day ---- P10030 ~ P10037
Hundred year ---- P10038 ~ P1003F

4.29.3 ADDCLK, ADDCLKP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ADDCLK(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				

[Area setting]

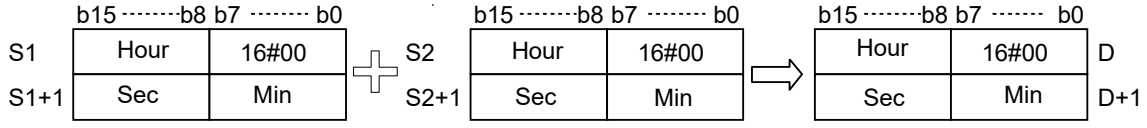
Operand	Description	Data size
S1	Device number time data is saved in	DWORD
S2	Device number time data is saved in	DWORD
D	Device number to save result in	DWORD

[Flag Set]

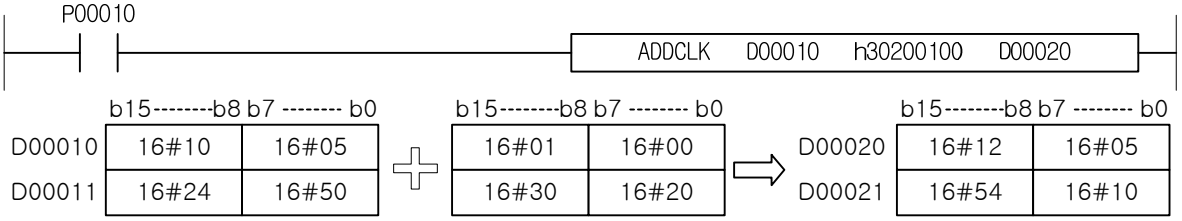
Flag	Content	Device number
error	If S1, S2' data exceeds time data size	F110

1) ADDCLK (Add Clock)

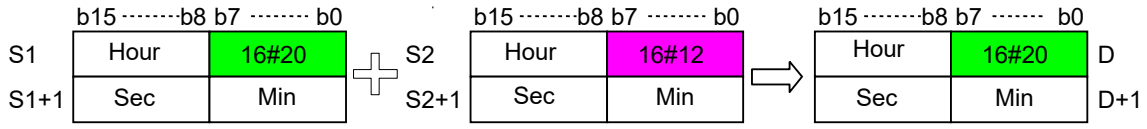
(1) It saves the result of the time data value in specified area S1 plus the time data value in specified area S2, to save in D, D+1.



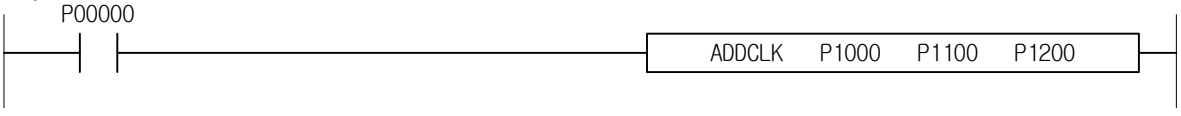
(2) Time data value shall be input in BCD format. For example, if time data is in D00010, to which 1 hour 20 minimum 30 sec. is added to be in D20, its input will be as follows



(4) If specified device S2's lowest byte value exists, the value in that position will be not operated.



2) Example



It adds up the time data in the P1000, P1001 and P1100, P1101 and saves them in the P1200, P1201.

4.29.4 SUBCLK, SUBCLKP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SUBCLK(P)	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~6	O	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				

[Area setting]

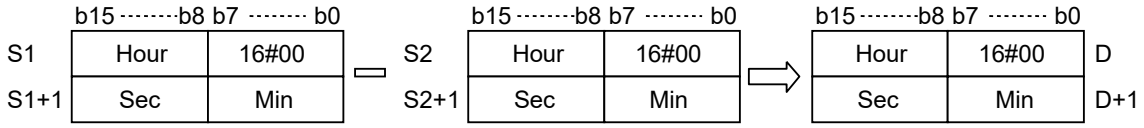
Operand	Description	Data size
S1	Device number time data is saved in	DWORD
S2	Device number time data is saved in	DWORD
D	Device number to save result in	DWORD

[Flag Set]

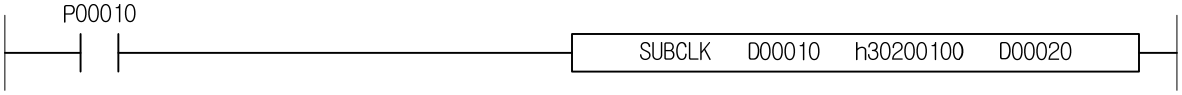
Flag	Content	Device number
error	If S1, S2' data exceeds time data size	F110

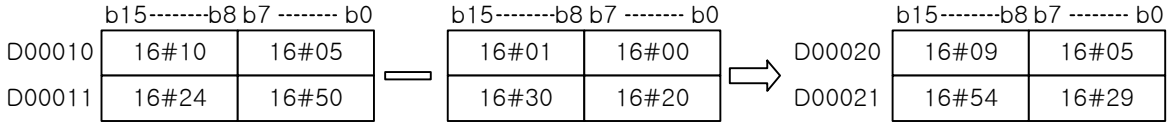
1) SUBCLK (Sub Clock)

(1) It saves the result of the time data value in specified area S1 minus the time data value in specified area S2, to save in D, D+1.

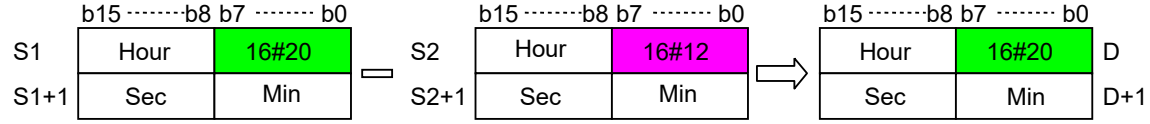


(2) Time data value shall be input in BCD format. For example, if time data is in D00010, to which 1 hour 20 minimum 30 sec. is subtracted to be in D20, its input will be as follows

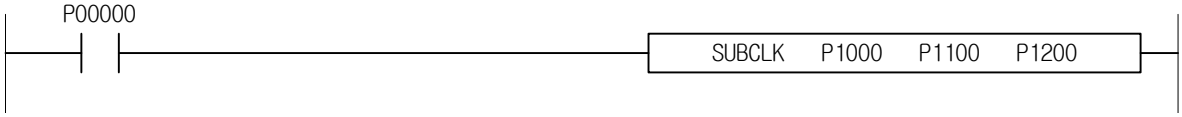




(3) If specified device S2's lowest byte value exists, the value in that position will be not operated.



2) Example

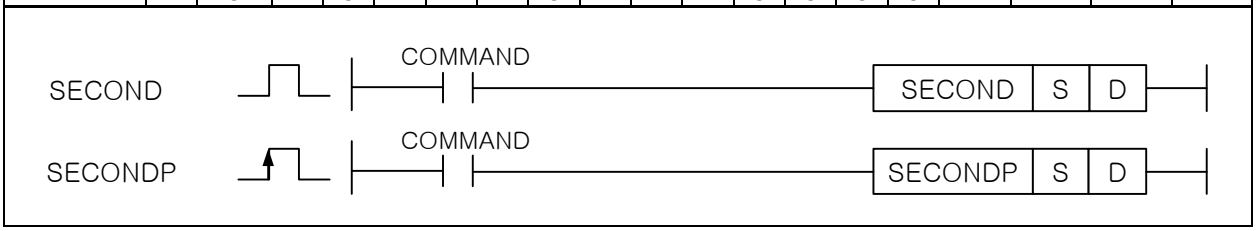


It subtract the time data in the P1000, P1001 and P1100, P1101 and saves them in the P1200, P1201.

4.29.5 SECOND, SECONDP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SECOND(P)	S	O	-	O	-	-	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

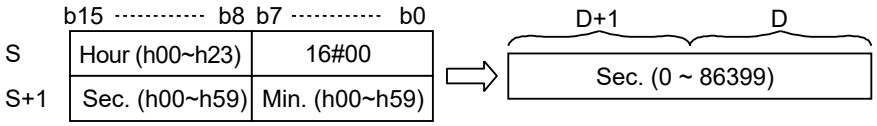
Operand	Description	Data size
S	Data to transfer or device number data is saved in	DWORD
D	Device number to save data transferred	DWORD

[Flag Set]

Flag	Content	Device number
error	If S, S+1, S+2's data exceeds time data size respectively.	F110

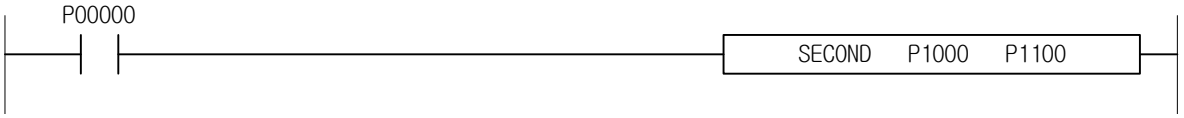
1) SECOND (Second)

(1) It converts time data value in specified area S to second data to save D+1,D.



(2) Time data shall be input in BCD format. And if applicable data range is exceeded, error (F110) may occur respectively

2) Example

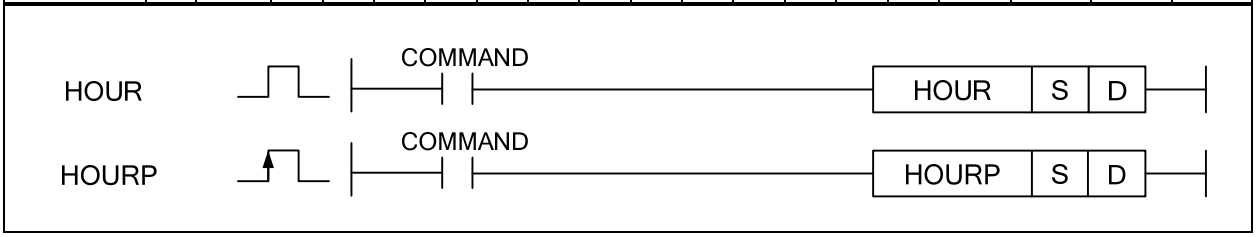


A program that converts time data values entered in P1000 and P1001 to seconds and stores them in P1100 and P1101.

4.29.6 HOUR, HOURP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
HOUR(P)	S	O	-	O	-	-	-	O	-	-	O	O	O	O	O	2~4	O	-	-
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

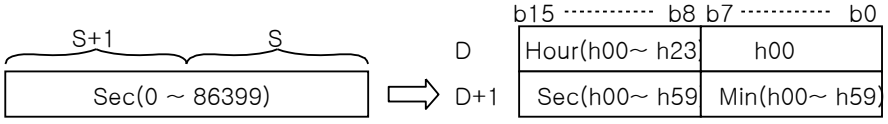
Operand	Description	Data size
S	Data to transfer or device number data is saved in	DWORD
D	Device number to save data transferred	DWORD

[Flag Set]

Flag	Content	Device number
error	If the second in specified S is larger than 86399	F110

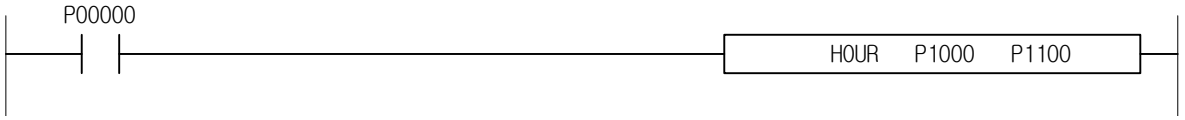
1) HOUR (Hour)

(1) It converts second data in specified area S+1, S to time data to save in D+2, D+1, D.



(2) Time data will be saved in BCD format.

2) Example

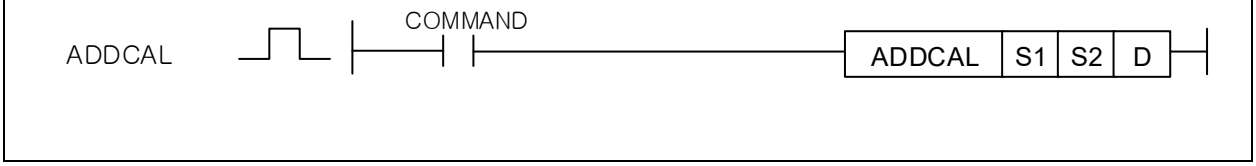


A program that converts second data values entered in P1000 and P1001 to hour and stores them in P1100 and P1101.

4.29.7 ADDCAL

[Applicable Product: XGK]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ADDCAL	S1	O	-	O	-	-	-	O	-	-	-	-	-	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	D	O	-	O	-	-	-	O	-	-	-	-	-	O	O				



[Area setting]

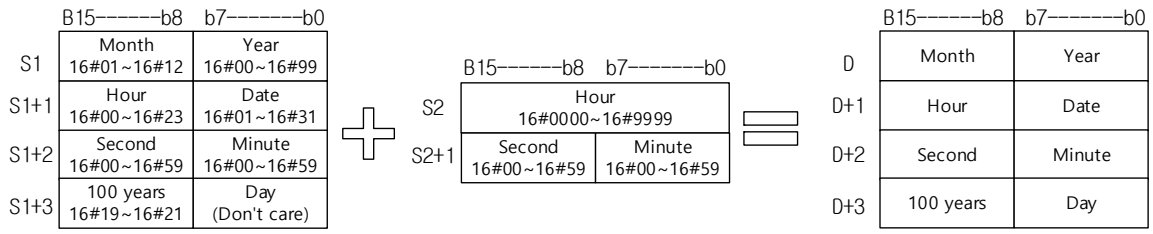
Operand	Description	Data size
S1	Device number calendar data is saved in	WORD
S2	Device number clock data is saved in	WORD
D	Device number to save result in	WORD

[Flag Set]

Flag	Content	Device number
error	1. When S1 data is out of RTC data range - Range of RTC data: 1/1/1984 12:00:00 AM ~ 6/6/2163 11:59:59 PM If an invalid date is set even if it is not outside the RTC data range (ex: 2019-11-31 10:57:30) - Do not check the validity of day data(Don't care) 2. When the data of S2 exceeds the size of the time data - 0000:00:00 ~ 9999:59:59 3. When the value of S1 and S2 is not of BCD format. 4. When S1 operation result is out of RTC data range 5. When the set device number exceeds the range	F110

1) ADDCAL (Add Calender)

(1) It saves the result of the calendar data value in specified area S1 plus the time data value in specified area S2, to save in D.



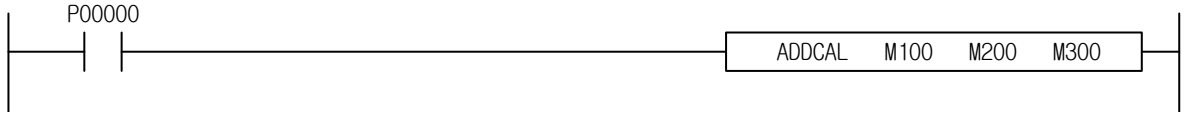
(2) It sets time data value of the area specified in S1+0, S1+1, S1+2, S1+3.
The time data format is the same as the system flags F0053 to F0056.

(3) All time data values are set in BCD format.

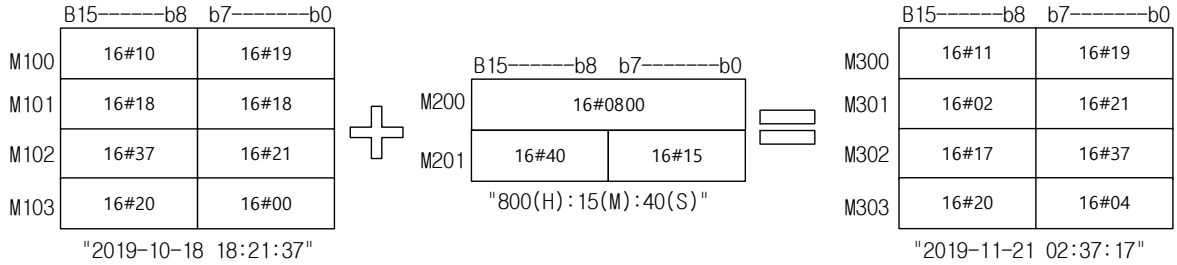
(4) Details of days: 0-Sunday, 1-Monday, 2-Tuesday, 3-Wednesday, 4-Thursday, 5-Friday, 6-Saturday.

(5) The day of the week is automatically output as the result date without inputting the day data.

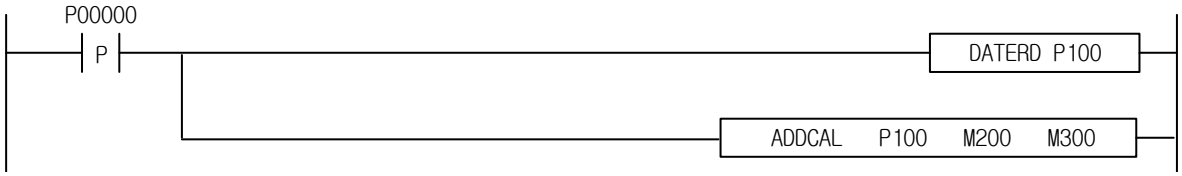
2) Example 1



It adds up the calendar data in the M100, M103 and M200, M201 and saves them in the M300, M303.



3) Example 2



Predictable alarm time can be set by using RTC data and calendar command provided by PLC.
When P0000 is On, a program that reads the date and time data of the PLC and stores the time data set in M200 to M201 and the alarm time after operation in M300 to M303.

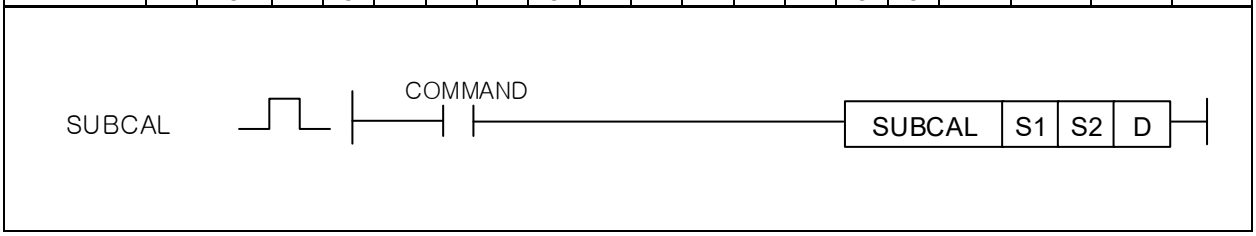
4) ST (Automatic program assignment)

```
ADDCAL_EN(EN:=(*BIT*), S1:=(*WORD*), S2:=(*WORD*), D=>(*WORD*))
```

4.29.8 SUBCAL

[Applicable Product: XGK]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SUBCAL	S1	O	-	O	-	-	-	O	-	-	-	-	-	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	D	O	-	O	-	-	-	O	-	-	-	-	-	O	O				



[Area setting]

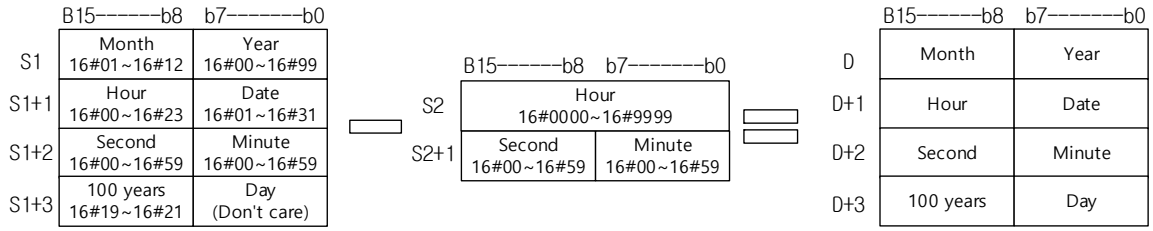
Operand	Description	Data size
S1	Device number calendar data is saved in	WORD
S2	Device number clock data is saved in	WORD
D	Device number to save result in	WORD

[Flag Set]

Flag	Content	Device number
error	1. When S1 data is out of RTC data range - Range of RTC data: 1984-01-01 00:00:00 ~ 2163-06-06 23:59:59 If an invalid date is set even if it is not outside the RTC data range (ex: 2019-11-31 10:57:30) - Do not check the validity of day data(Don't care) 2. When the data of S2 exceeds the size of the time data - 0000:12:00 AM ~ 9999:59:59 3. When the value of S1 and S2 is not of BCD format. 4. When S1 operation result is out of RTC data range 5. When the set device number exceeds the range	F110

1) SUBCAL (Subtract Calender)

(1) It saves the result of the calendar data value in specified area S1 minus the time data value in specified area S2, to save in D.



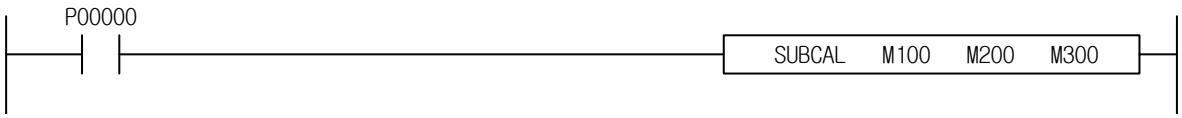
(2) It sets time data value of the area specified in S1+0, S1+1, S1+2, S1+3.
The time data format is the same as the system flags F0053 to F0056.

(3) All time data values are set in BCD format.

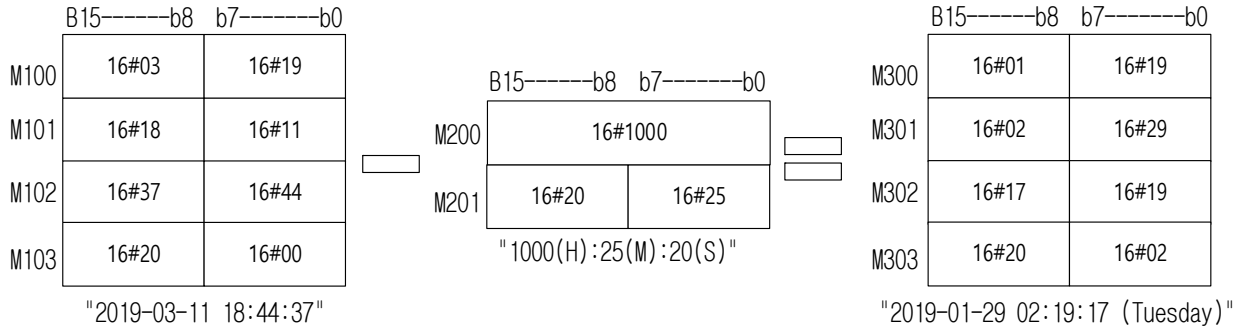
(4) Details of days: 0-Sunday, 1-Monday, 2-Tuesday, 3-Wednesday, 4-Thursday, 5-Friday, 6-Saturday.

(5) The day of the week is automatically output as the result date without inputting the day data.

2) Example



It adds up the calendar data in the M100, M103 and M200, M201 and saves them in the M300, M303.



3) ST (Automatic program assignment)

SUBCAL_EN(EN:=(*BIT*), S1:=(*WORD*), S2:=(*WORD*), D=>(*WORD*))

4.30 Branch Instruction

4.30.1 JMP, LABEL

[Applicable Product: XGK, XGB]

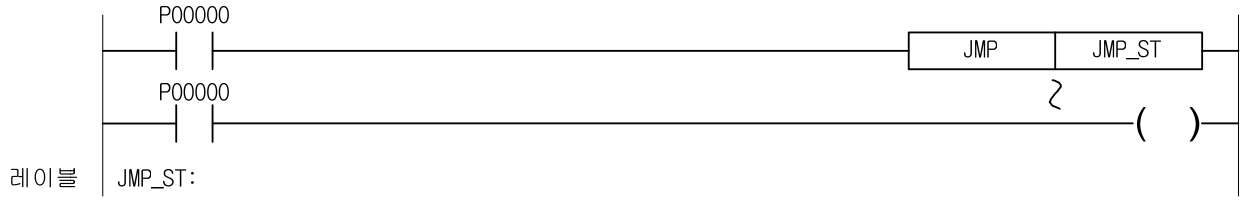
Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
JMP	Label	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
LABEL	Label	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-

[Area setting]

Operand	Description	Data type
Label	Position label to jump on (English : up to 16, Korean : up to 8)	STRING

1) JMP

(1) If JMP (label) instruction's input contact point is On, it will jump on the place after specified label (LABEL), and all the instructions between JMP and label will not be operated.
(2) The numbers overlapped with are not available. JMP can be used repeatedly.
(3) It is a good idea to put programs that should not be handled in the event of an emergency between JMP and the label.



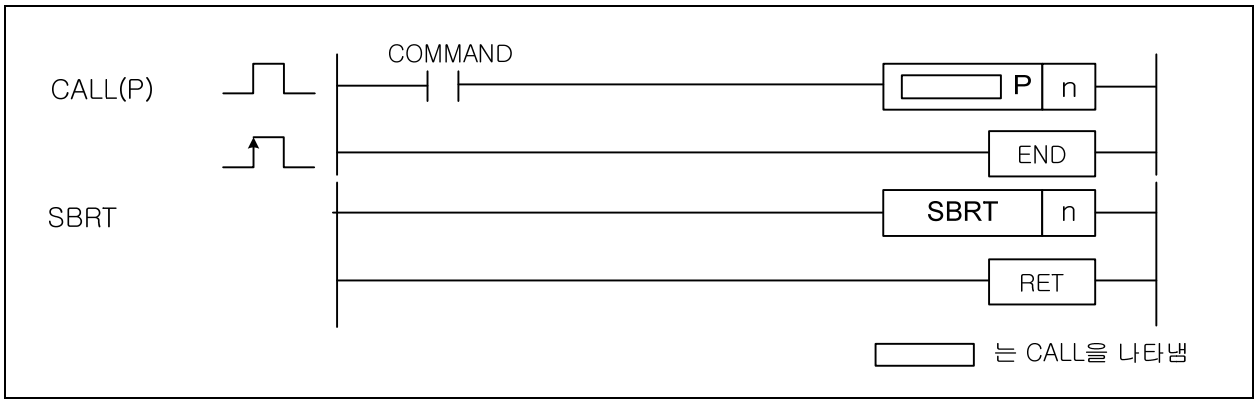
2) Example

(1) Program that does not execute the program between JMP SKIP_RING and label SKIP_RING when the input signal P00020 is On.

4.30.2 CALL, CALLP, SBRT, RET

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CALL(P)	n	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
SBRT	n	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-



[Area setting]

Operand	Description	Data type
n	Function's label to call (English : up to 16, Korean : up to 8 characters)	STRING

1) CALL

(1) If input condition is allowed while program executed, the program between SBRT n ~ RET instructions will be executed according to CALL n instruction.

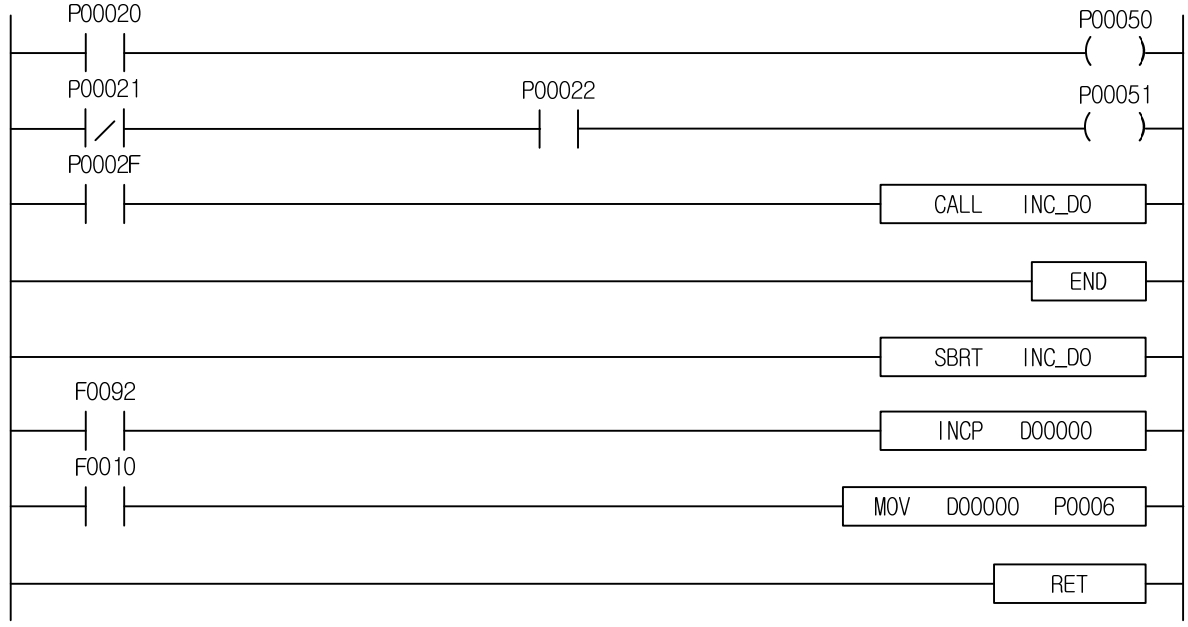
(2) CALL No. can be duplicated, and the program between SBRT n ~ RET instructions shall be at the back of END instruction.

(3) Error processing condition In case the total SBRT number of XGK exceeds 512,XGB exceeds 128: Program downloading unavailable.
. With CALL n and without SBRT n

(4) Calling other SBRT is available in SBRT for 16 times.

(5) In SBRT, CALL can be located next to END

2) Example



CALL INC_D0 is executed when the input signal P0002F is On, and a program that executes the program between SBRT INC_D0 to RET commands.

4.31 Loop Instruction

4.31.1 FOR, NEXT

[Applicable Product: XGK, XGB]

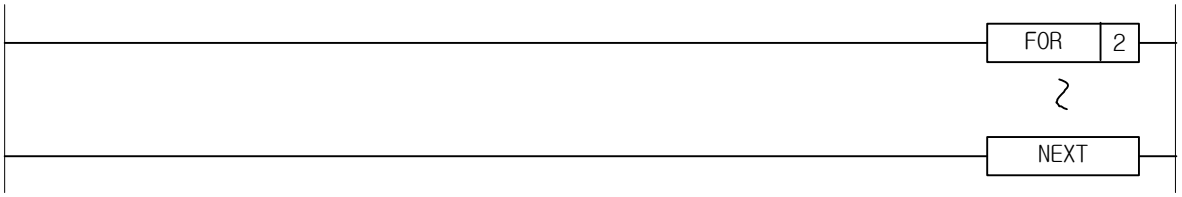
Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FOR	n	O	-	O	O	O	-	O	-	-	O	O	O	O	O	2	O	-	-
NEXT		-	-	-	-	-	-	-	-	-	-	-	-	-	-	1			

[Area setting]

Operand	Description	Data type
n	Number of times to execute FOR~NEXT	WORD

1) FOR~NEXT
   (1) PLC meeting FOR in RUN mode will execute the process between FOR~NEXT instructions for n times and then the next step of NEXT instruction.
   (2) 0 ~ 65535 is available for n.
   (3) Up to 16 is available for NESTING of FOR~NEXT. If this is exceeded, program downloading will be unavailable.
   (4) As another method to escape from FOR~NEXT loop, BREAK instruction can be used.
   (5) Since scan time may be longer than expected, use WDT instruction not to exceed WDT setting limit.

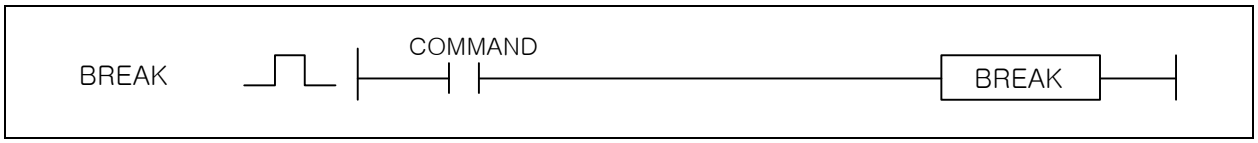
2) Example
   Where PLC executes FOR~NEXT for 2 times in RUN mode.



4.31. 2 BREAK

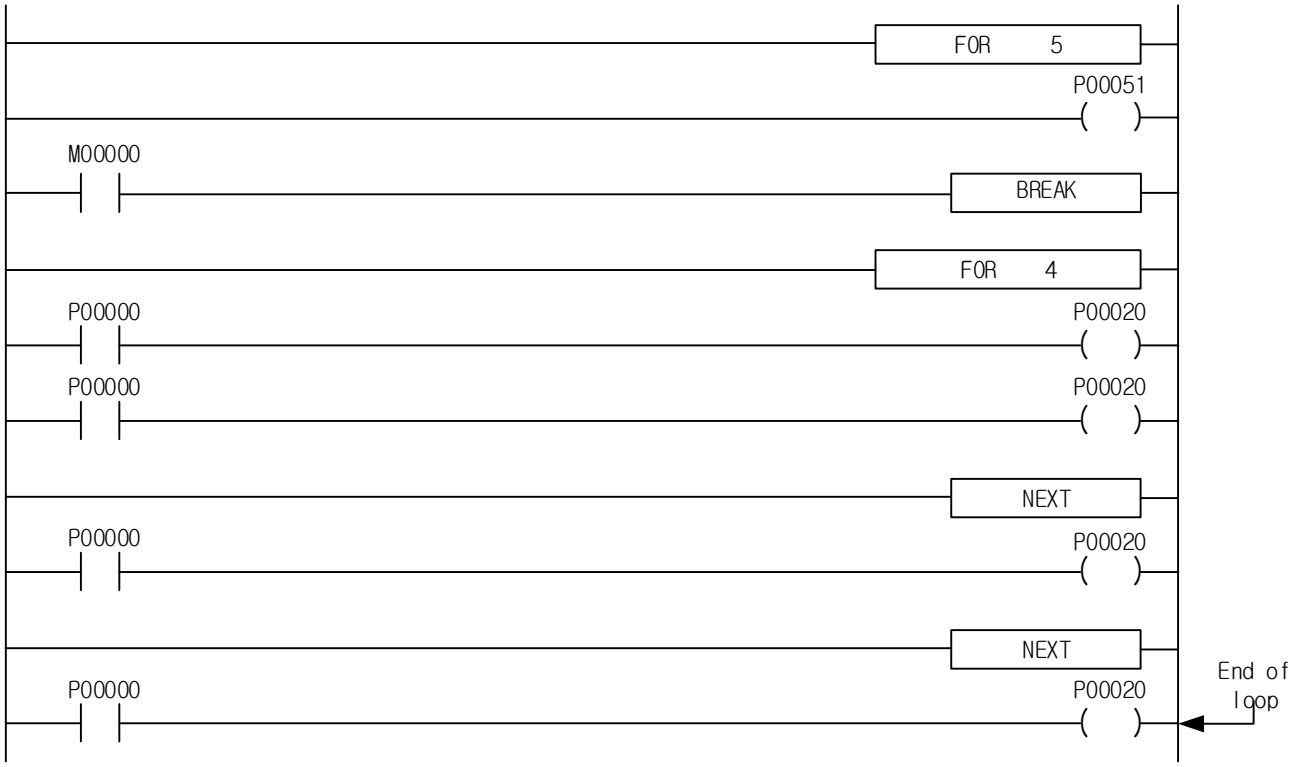
[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BREAK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) BREAK
   (1) It is used to escape from FOR~NEXT section.
   (2) BREAK instruction can not be used solely. It shall be surely used only between FOR~NEXT. If not used between FOR~NEXT, it will cause program error to make program downloading unavailable.

2) Example
   (1) Where M0000 if On ignores 5 times of FOR~NEXT loop inside, escapes to 'Loop End' position and continue to execute the operation.

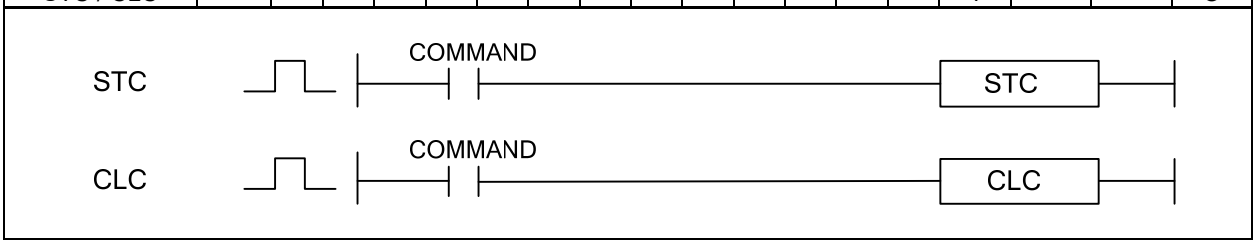


4.32 Carry Flag Related Instruction

4.32.1 STC, CLC

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
STC / CLC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	O



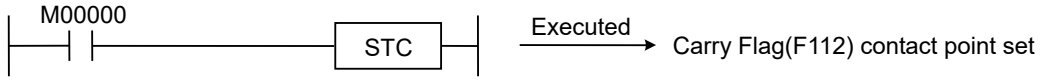
[Flag Set]

Flag	Content	Device number
Carry	To be set if execution condition of STC is On To be reset if execution condition of CLC is On No change if STC or CLC execution condition is Off	F112

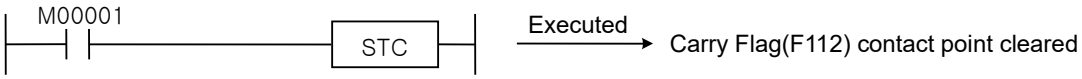
1) STC(Set Carry Flag)
If input condition is On, Carry Flag(F112) will be set(On).

2) CLC(Clear Carry Flag)
If input condition is On, Carry Flag(F112) will be cleared (Off).

3) Example
Where Carry Flag(F112) will be set if input M00000 is On.



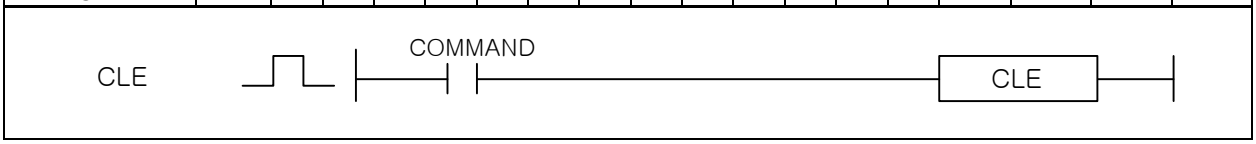
It clears the set Carry Flag(F112) if input M00001 is On..



4.32. 2 CLE

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

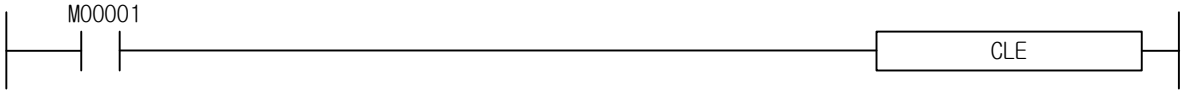


[Flag Set]

Flag	Content	Device number
error latch	Reset when execution condition is On No change when execution condition is Off	F115

1) CLE(Clear Latch Error Flag)
If input condition is On, error latch Flag(F115) will be reset() Off).

2) Example
(1) If input condition M0001 is On, Error Latch Flag (F115) will be cleared

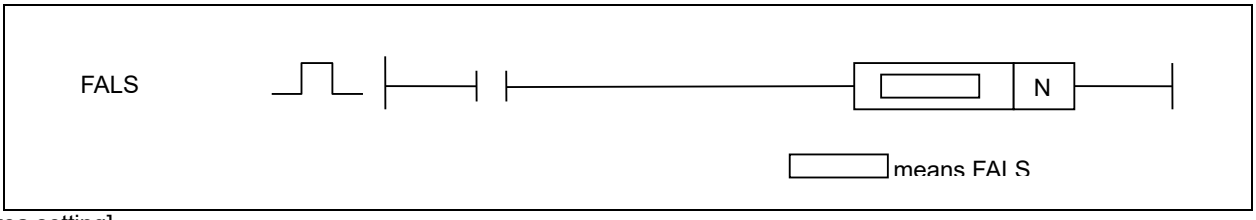


4.33 System Instruction

4.33. 1 FALS

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
FALS	N	-	O	-	O	O	-	O	-	-	O	O	-	O	O	2	-	-	-

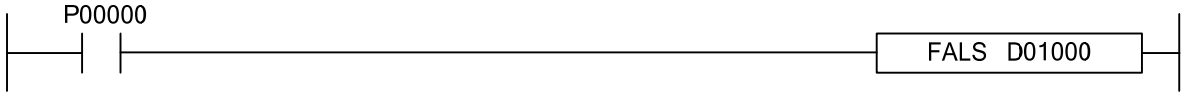


[Area setting]

Operand	Description	Data type
N	Number to be saved in F area (F0014)	WORD

1) FALS
   (1) It saves N in specified address of F area.
   (2) h0000 ~ hFFFF is available for N, and the first produced N will be saved till it is canceled.
   (3) Use FALS 0000 to cancel FALS.

2) Example

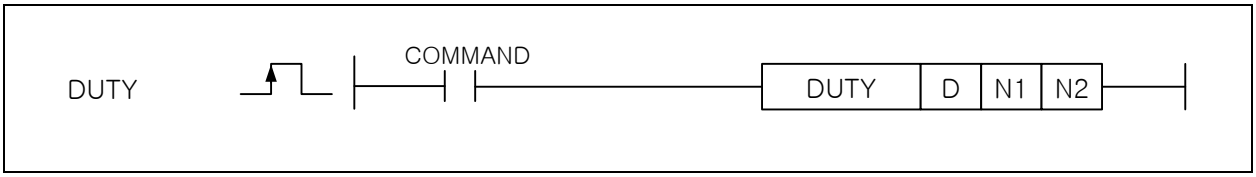


When turning on input signal, P00000, it saves D01000 data to F0014.

4.33. 2 DUTY

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
DUTY	D	-	O	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
	N1	-	-	-	-	-	-	-	-	-	O	-	-	-	-				
	N2	-	-	-	-	-	-	-	-	-	O	-	-	-	-				

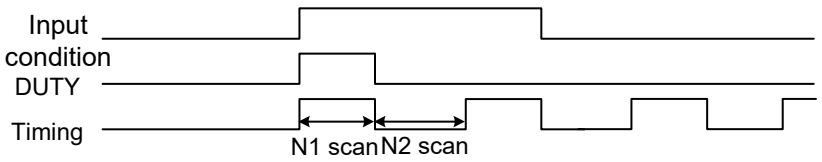


[Area setting]

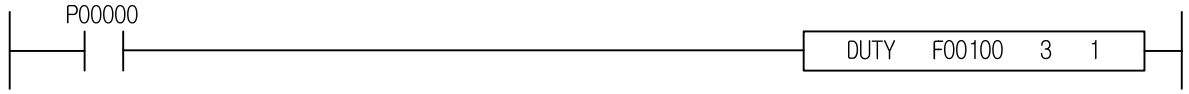
Operand	Description	Data type
D	F100 ~ F107	End bit of BSFT Operation
N1	Number of scans to be On	WORD
N2	Number of scans to be Off	WORD

1) DUTY

(1) It generates the pulse to make user's timing pulse F area (F100~F107) specified in D, On for N1 scan and Off for N2 scan.
(2) If input condition is Off, the timing pulse (F100~F107) will be Off.
(3) If N1 = 0, the timing pulse will be always Off.
(4) If N1 > 0, N2 = 0 , the timing pulse will be always On
(5) If DUTY instruction operates to start to generate the timing pulse with input condition once ON, the timing pulse will be continuously produced even if duty's input condition is Off.



2) Example



Program that generates timing pulse when F00100 is On for 3 scans and Off for 1 scan when input signal P00000 is On.

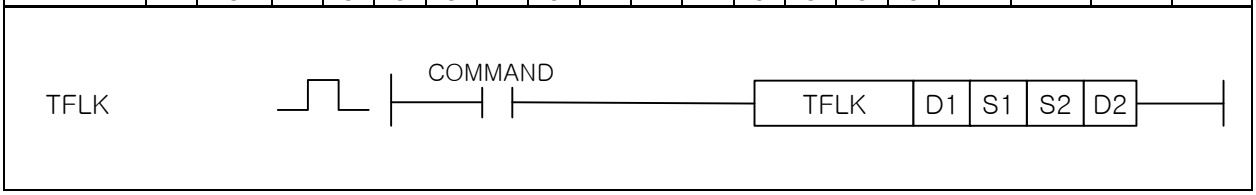
Notes

Timing pulse will keep operating even if DUTY instruction applicable to specific timing pulse is canceled through modification during Run.

4.33. 3 TFLK

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TFLK	D1	O	-	-	-	-	-	-	O	-	-	-	-	-	-	4~7	O	-	-
	S1	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	S2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	D2	O	-	O	O	O	-	O	-	-	-	O	O	O	O				

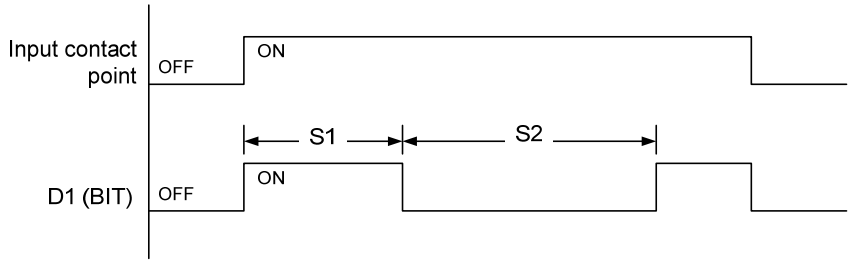


[Area setting]

Operand	Description	Data type
D1	Bit number to be On/Off for setting time	End bit of BSFT Operation
S1	Time to turn the bit On specified in D1	WORD
S2	Time to turn the bit Off specified in D1	WORD
D2	(D2+0) : Present time being executed (D2+1) : Time unit to be used (0-1ms, 1-10ms, 2-100ms, 3-1s) (D2+2) ~ (D2+3): System area (word * 2)	WORD

1) TFLK

(1) It is used to turn the specified D1 bit On for S1 time and then Off for S2 time when input contact point is On.



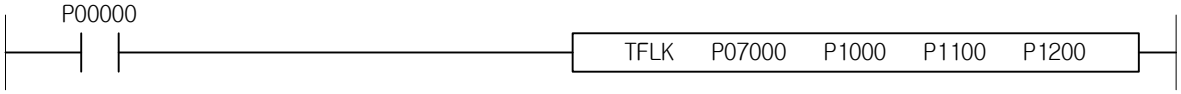
(2) If contact point is Off, the present time being executed in D2 will be initialized, and the bit specified in D1 will be Off. If contact point is back On, the instruction will be executed from the first.

(3) Time unit has set to be used in D2+1.
0 – 1ms, 1 – 10ms, 2 – 100ms, 3 – 1s. If time unit is more than 4, error will not occurred. And all is to be set a 1s.

(4) In order to execute this instruction, 3-word data area is necessary. D2+2, D2+3, D2+4 will be used inside the instruction for this. Thus, when setting D2, be concerned about each device's range.

2) Example

(1) Program to turn P070000 bit on for P1000 time and off for P1100 time when input condition P00000 is On.
(2) The current time being executed is stored in P1200, and the time unit to be executed is set in P1201.
(3) P1202 and P1203 are used internal the instruction.



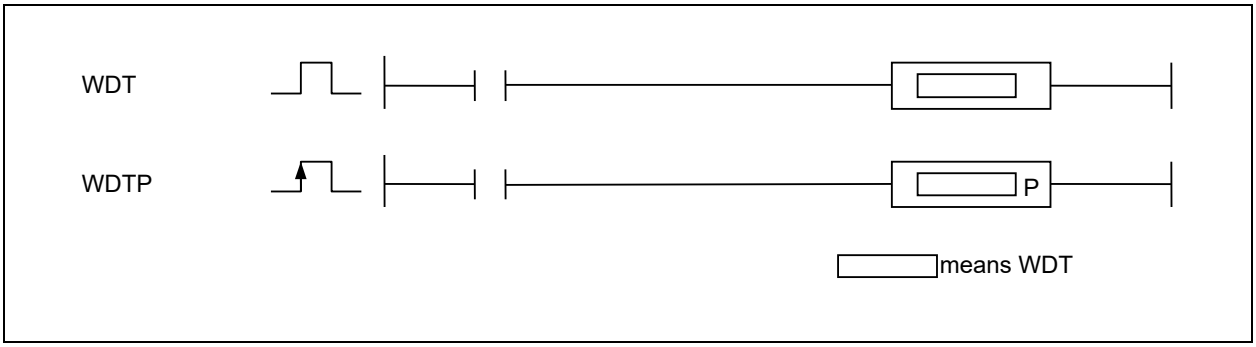
Precautions

(1) Be careful of using indirect designation (#) or index ([Z]) because the TFLK instruction has internal processing parts without contact point ON.
For example, an error occurs without contact point ON if you use M100[Z10] for one of the TFLK instruction operands and if Z10's value exceeds 1947 that can be outside the M area.

4.33.4 WDT, WDTP

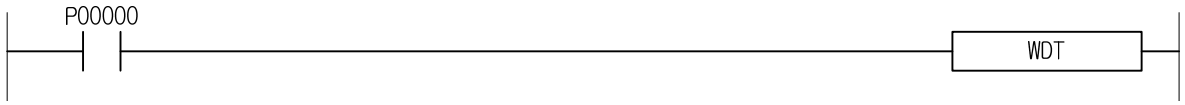
[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WDT(P)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) WDT(Watch Dog Timer Clear)
   (1) It resets Watch Dog Timer during program operation.
   (2) WDT is used to stop the program operation if time from the step 0 to END exceeds the maximum Watch Dog Setting range during program execution.

2) Example

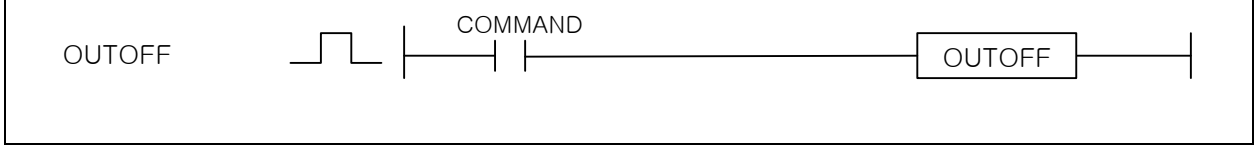


When input condition P00000 is On, the scan time until the execution of WDT instruction is cleared.

4.33. 5 OUTOFF

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
OUTOFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

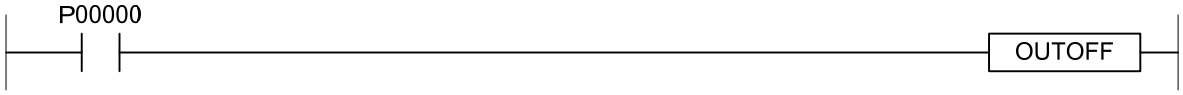


1) OUTOFF

(1) If input condition is allowed, the whole output will be Off, and internal operation will go on with F113 (whole output Off) Flag to be set in F area.

(2) If input condition is Off, It operates normally.

2) Example



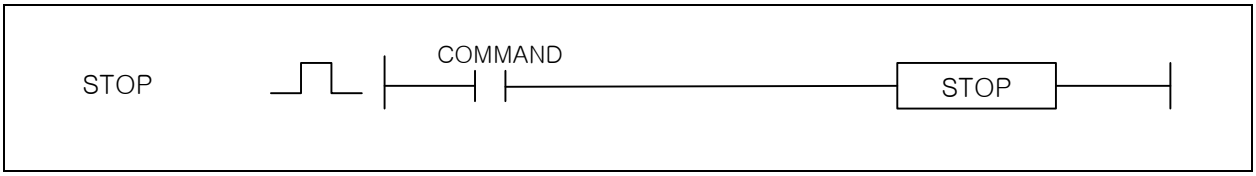
(1) When input condition P00000 is On, all outputs are off, and all output Off flag (F113) is on.

(2) If input condition is Off, It operates normally.

4.33. 6 STOP

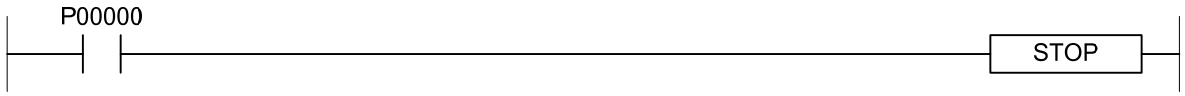
[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
STOP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) STOP
   (1) It converts to program mode after the scan presently in progress is completed.
   (2) This instruction is used to stop the operation at specific time desired.

2) Example



When the input condition P00000 is On, the system stops operating after completing the scan.

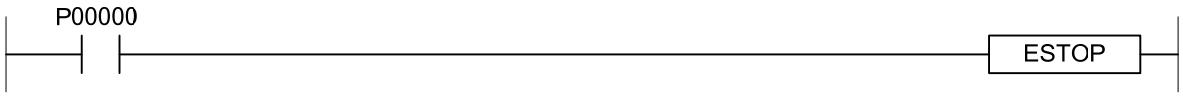
4.33. 7 ESTOP

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ESTOP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

1) ESTOP (Emergency Stop)
   (1) When the ESTOP instruction is executed, the operation of the PLC is stopped immediately.
   (2) This command can be used in case of emergency.

2) Example

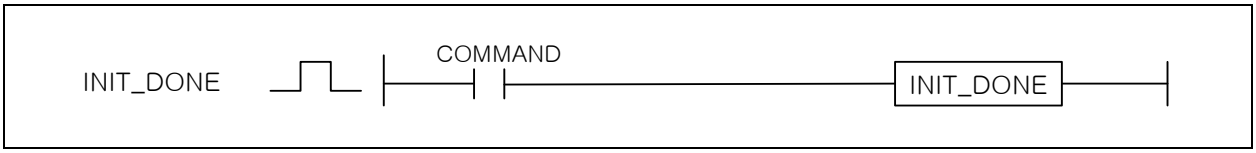


When the input condition P00000 is On, the ESTOP command is executed and the system stops operating.

4.33.8 INIT_DONE

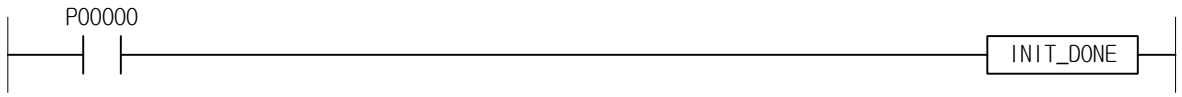
[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
INIT_DONE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



1) INIT_DONE (Initial Task Done)
   (1) This command terminates the initialization task.
   (2) When writing the initialization task program, you must use this command to end the initialization task program. Otherwise, the initialization task program cannot be terminated and you cannot enter the scan program.

2) Example
   (1) Program that the initialization task ends when P00000 contact is On



4.34 Interrupt Related Instruction

4.34.1 EI, DI

[Applicable Product: XGK, XGB]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EI / DI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

1) EI

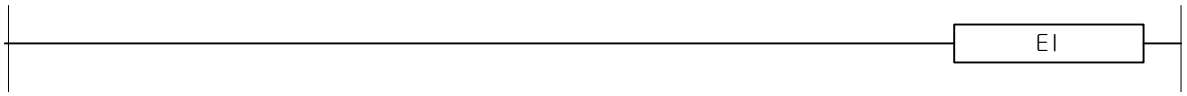
All the prepared task programs are executed.

2) DI

All the prepared task programs are not executed.

3) Example

Program that executes all cycle time and internal contact task programs in the project



4.34.2 EIN, DIN

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
EIN / DIN	n	-	-	-	-	-	-	-	-	-	O	-	-	-	-	1	-	-	-

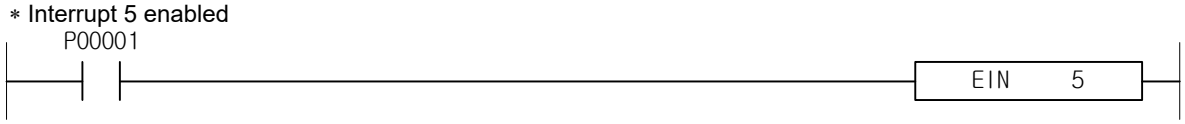
[Area setting]

Operand	Description	Data type
n	Interrupt number to specify.	WORD

1) EIN

(1) Specified n task program is executed.

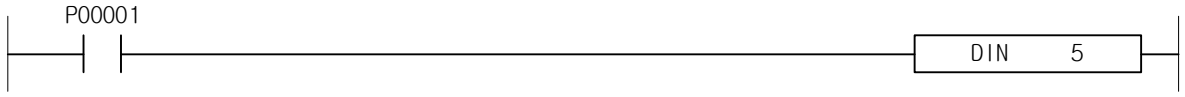
* Interrupt 5 enabled



2) DIN

(1) Specified n task program is stopped.

* Interrupt 5 disable



Notes

The task number is as follows

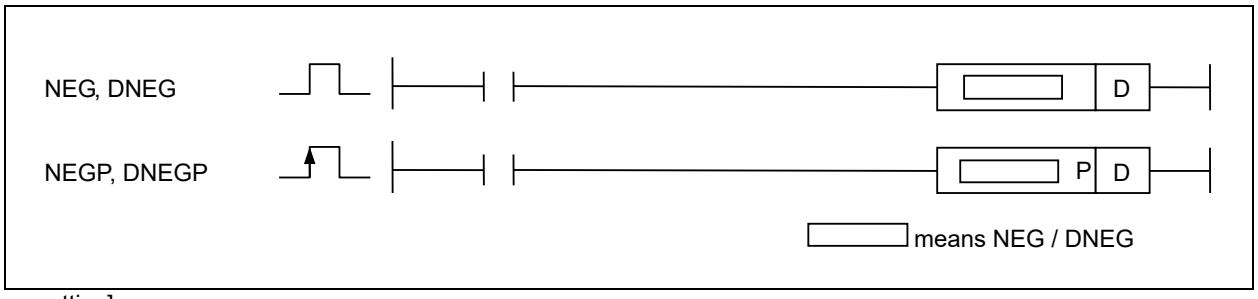
Interrupt	XGK	XGB
Cycle task	0 ~ 31	0 ~ 7
External contact task	32 ~ 63 (It is not available to set at XGK series)	8 ~ 15
Internal contact task	64 ~ 95	16 ~ 23

4.35.3 Sign Reversion Instruction

4.35.1 NEG, NEGP, DNEG, DNEGP

[Applicable Product: XGK, XGB]

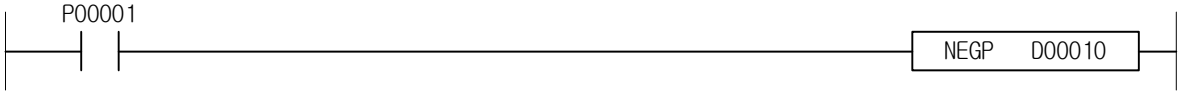
Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
NEG(P) DNEG(P)	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2	-	-	-



[Area setting]

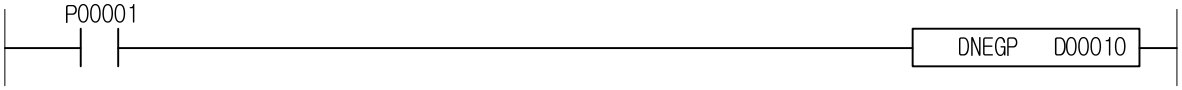
Operand	Description	Data type
D	Area to convert signs	WORD/DWORD

1) NEG(Word Negative)
   (1) It converts the sign of the detail in specified area D to save in D area.
   (2) View Monitoring Option is available for monitoring if signed, and the value converted to negative is useful only in Signed Operation.



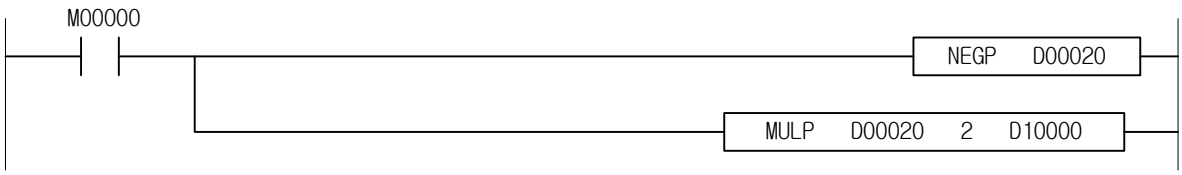
Classification	Before executed	After executed
Area	D0010	D0010
Data	-30 (hFFE2)	30 (h001E)

2) DNEG(Double Word Negative)
   It changes the sign of content saved in D, D+1 and save in D, D+1.
   (2) View Monitoring Option is available for monitoring if signed, and the value converted to negative is useful only in Signed Operation.



Classification	Before executed	After executed
Area	D0010, D0011	D0010, D0011
Data	-30 (hFFFFFFE2)	30 (h0000001E)

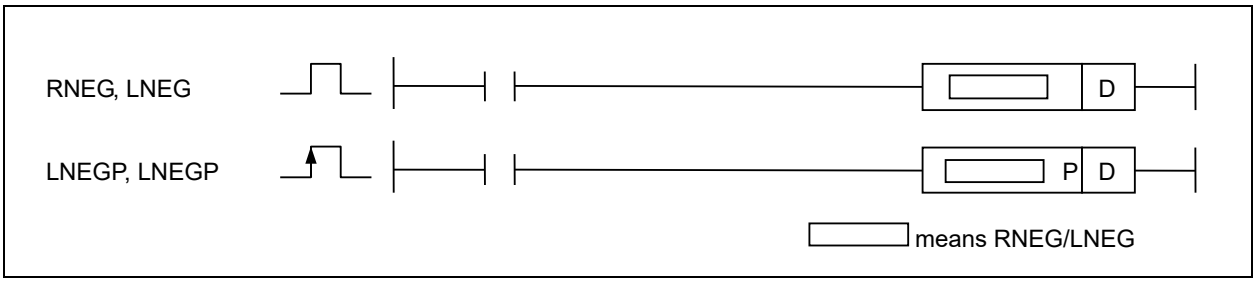
3) Example
   (1) Where D0020 value converted to negative is operated as signed.



4.35.2 RNEG, RNEGP, LNEG, LNEGP

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
RNEG(P) LNEG(P)	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2	-	-	-

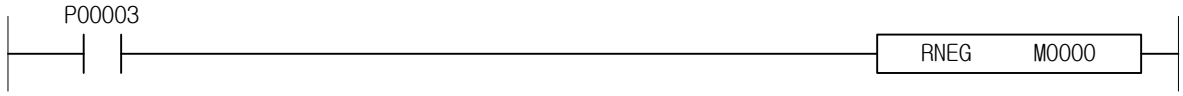


[Area setting]

Operand	Description	Data type
D	Area to convert signs	REAL/LREAL

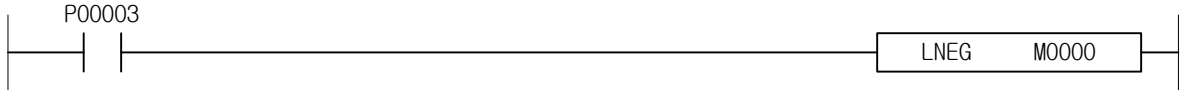
1) RNEG(Real Negative)
   (1) It converts the sign of the detail in specified area D to save in D area.
   (2) RNEG is used to reverse the single real number sign.

Before executed	After executed
-3.383240094	3. 383240094

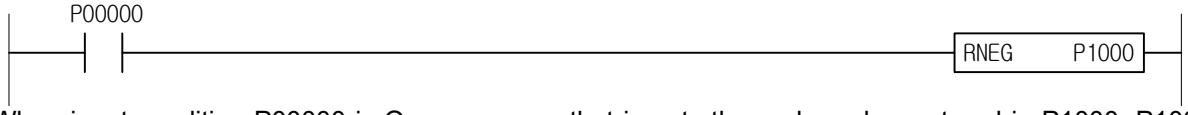


2) LNEG(Long real Negative)
   (1) It converts the sign of the detail in specified area D to save in D area.
   (2) LNEG is used to reverse the double real number sign.

Before executed	After executed
-3.3832400941234567	3. 3832400941234567



3) Example

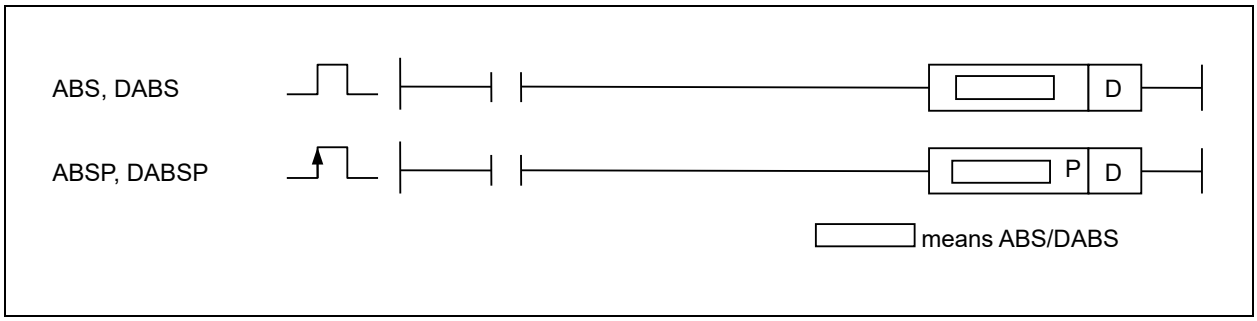


When input condition P00000 is On, a program that inverts the real number entered in P1000, P1001 by sign and stores it in P1000, P1001

4.35.3 ABS, ABSP, DABS, DABSP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ABS(P) DABS(P)	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O	2	-	-	-

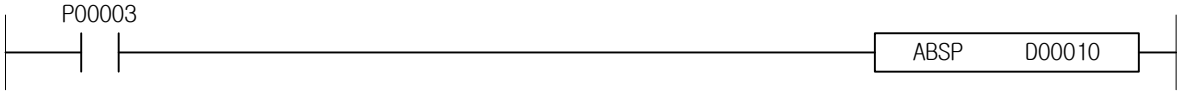


[Area setting]

Operand	Description	Data type
D	Area to convert absolute value	WORD/DWORD

1) ABS(Absolute Value)

(1) It converts the absolute value in specified area D to save in D area.

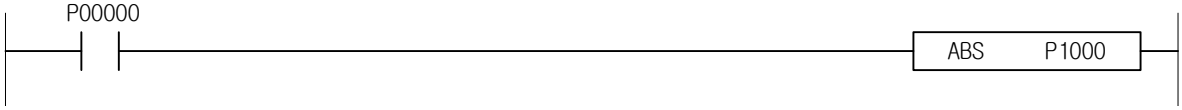


Classification	Before executed	After executed
Area	D0010	D0010
Data	-00030(hFFE2)	00030(h001E)

2) DABS (Double Absolute Value)

(1) It converts the absolute value in specified area D, D+1 to save in D, D+1 area.

3) Example



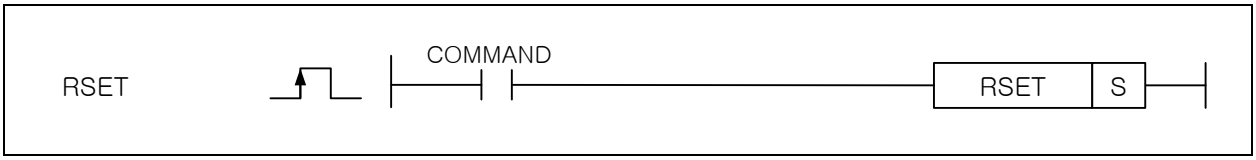
When input condition P00000 is On, program that converts P1000 value into absolute value and stores it in P1000 area again.

4.36 File Related Instruction

4.36.1 RSET, RSETP

[Applicable Product: XGK]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
RSET(P)	S	O	-	O	-	-	-	O	-	-	O	-	O	O	O	2	O	-	-



[Area setting]

Operand	Description	Data type
S	Block number to convert, or device number (0~1) where Block number to convert is saved	WORD

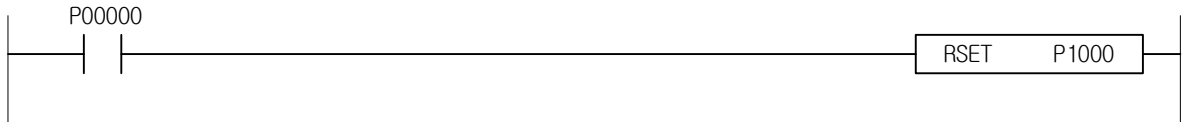
1) RSET(R_No. set)
   (1) It converts the set block number to the block number specified S. Presently specified block number can be identified with F158.
   (2) Converting STOP to RUN state will make the block number initialized to 0
   If S value exceeds the maximum block number range, Error Flag(F110) will be set.

Notes

Convertible block number is as follows.
XGK-CPUH/XGK-CPUA : 0~1
XGK-CPUS/XGK-CPUE : 0

Thus, as for XGK-CPUS, no RSET instruction will be needed.

2) Example

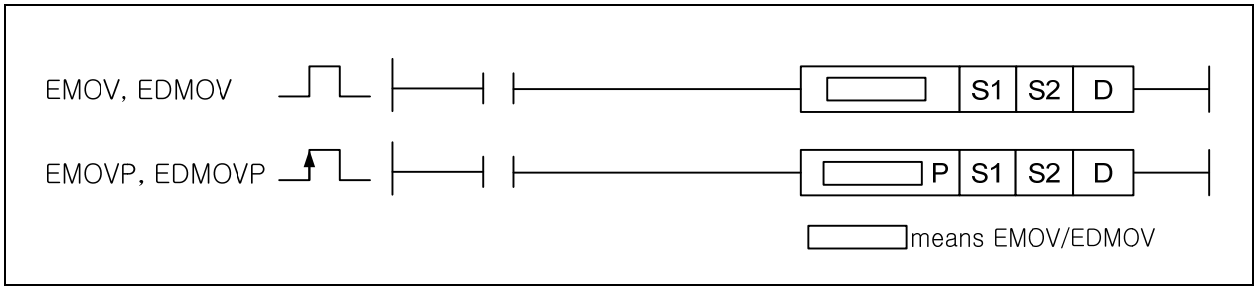


Program to convert the set block number to the block number set in P1000 when input condition P00000 is On

4.36.2 EMOV, EMOVP, EDMOV, EDMOVP

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EMOV(P) EDMOV(P)	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	-	4~7	-	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	-				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	-				

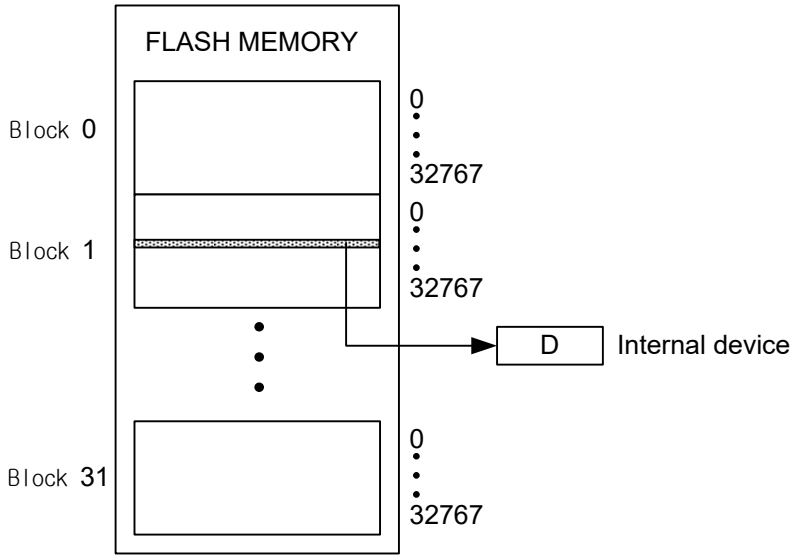


[Area setting]

Operand	Description	Data size
S1	Block number of flash area	WORD
S2	Device number where data desired in the specified block S1 is saved.	WORD
D	Device number to save	WORD

1) EMOV (Transfer Flash Memory Word Data)

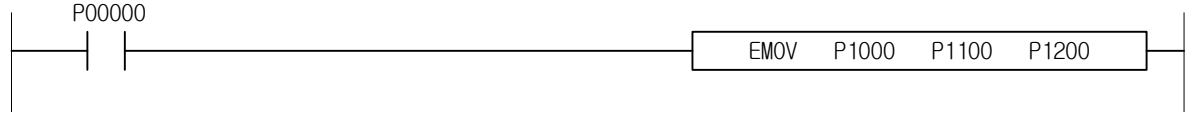
(1) It transfers S2's word data in the specified block S1 to D.



2) EDMOV (Transfer Flash Memory Double Word Data)

(1) It transfers S2+1,S2's double word data in the specified block S1 to D+1, D.

3) Example



When input condition P00000 is On, a program that saves the word data of the device number designated as P1100 within the block number of the flash area designated as P1000 as P1200.

4.36. 3 EBREAD

[Applicable Product: XGK]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EBREAD	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	-	2~4	-	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	-				

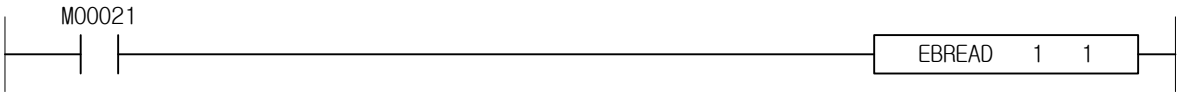
[Area setting]

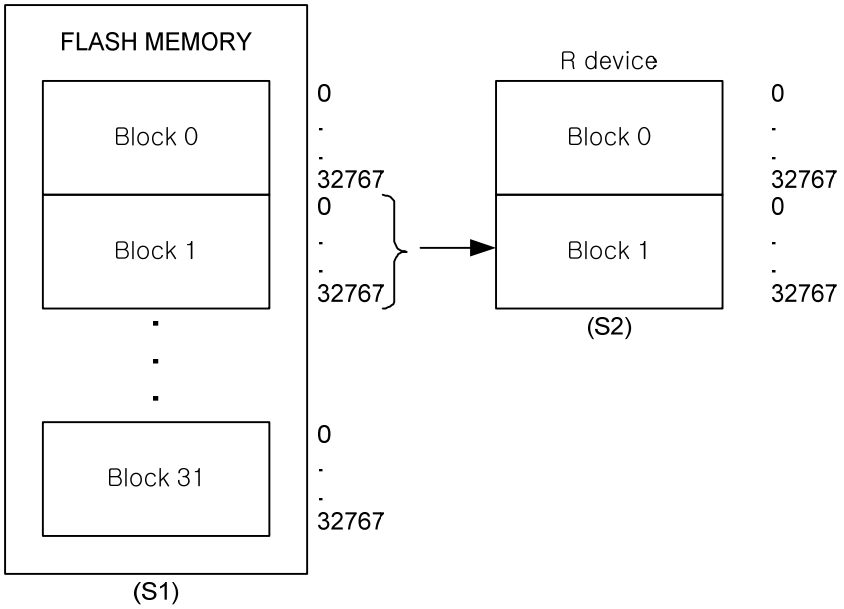
Operand	Description	Data size
S1	Block number of flash area (0 ~ 31)	WORD
S2	R device's block number to save (0 ~ 1)	WORD

1) EBREAD (Read Flash Memory Block)

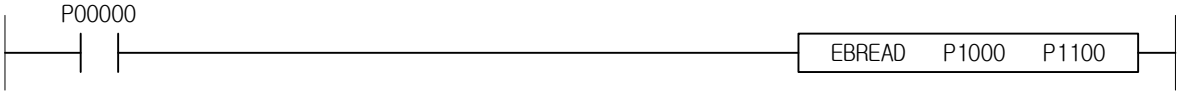
(1) It reads 1 block detail in specified flash S1 to the block inside the internal RAM applicable to S2.

(2) Check Read Flag applicable to the block number to ensure it is completed.





2) Example

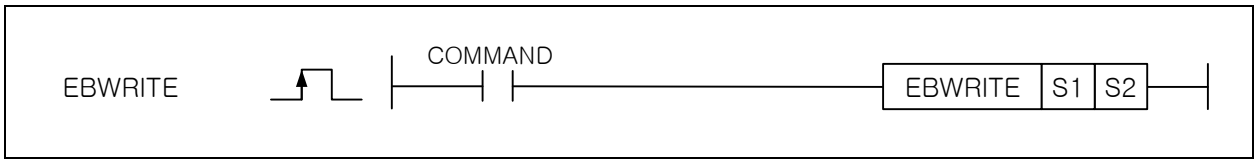


When input condition P00000 is On, a program that saves one block of the flash area of the number designated by P1000 as the R device area of the block number corresponding to P1100.

4.36.4 EBWRITE

[Applicable Product: XGK]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EBWRITE	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	-	2~4	-	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	-				

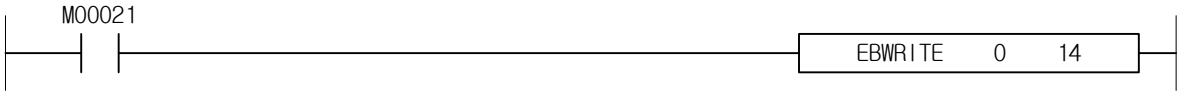


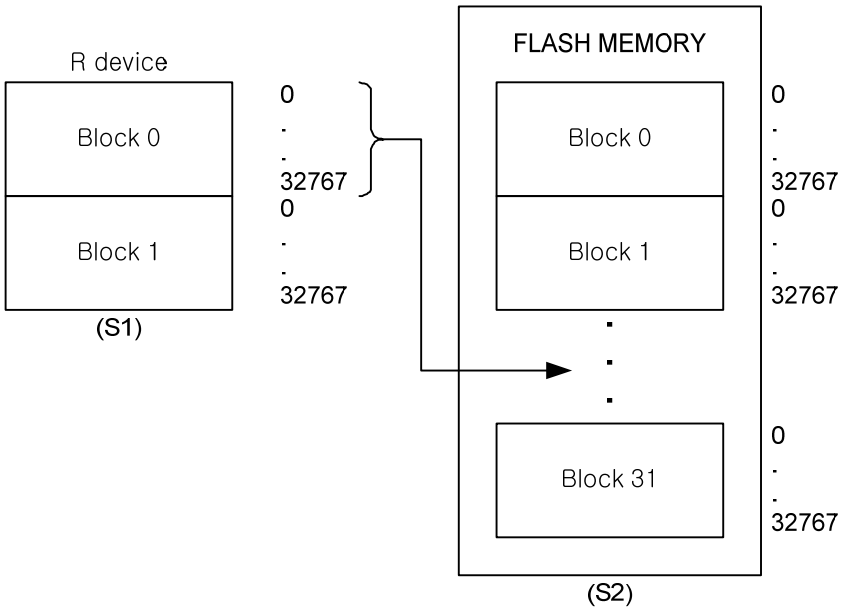
[Area setting]

Operand	Description	Data size
S1	Block number (0~1)of R device (internal RAM)	WORD
S2	Block number of flash area to save(0 ~ 31)	WORD

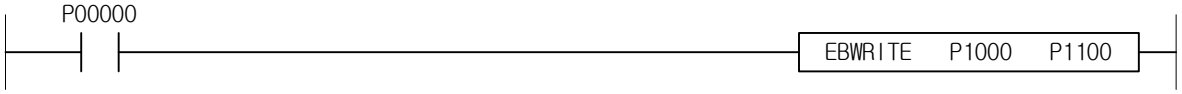
1) EBWRITE (Write Flash Memory Block)

(1) It writes 1 block detail in specified R device S1 to the block in specified flash area S2 when the rising edge pulse is input. Check Write Flag applicable to the block number to ensure it is completed.





2) Example

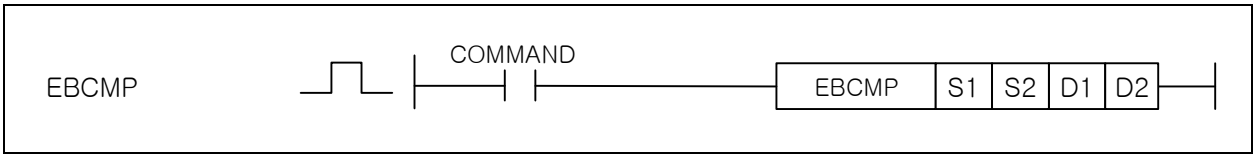


When input condition P00000 is On, a program that saves one block of the flash area of the number designated by P1000 as the R device area of the block number corresponding to P1100

4.36. 5 EBCMP

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EBCMP	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	-	4~7	-	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	-				
	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	-				
	D2	O	-	O	-	-	-	O	-	-	-	O	O	O	-				



[Area setting]

Operand	Description	Data size
S1	R device's block number (CPUH : 0~1, CPUS : 0)	WORD
S2	Flash memory's block number (0~31)	WORD
D1	D1: Number of mismatch (0~20. If it is more than 20. no more Compare Operation will be executed) D1+1: Presently processed number of words	WORD
D2	Compare operation status code 0 Before executing command or comparing 1. Completion of comparison 2 No comparison (flash memory in use)	WORD

1) EBCMP (EEPROM BLOCK COMPARE)

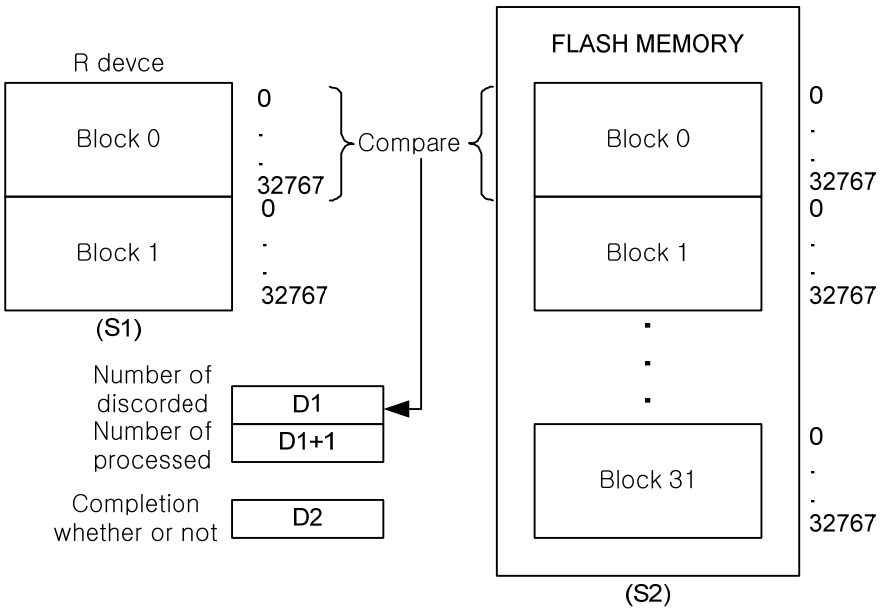
(1) It compares the content of a block of R device (S1) with the content of a block of flash memory (S2) to check if identical.

(2) If the device's value specified in D2 is 1 and the value in D1 is 0, they are identified completely identical

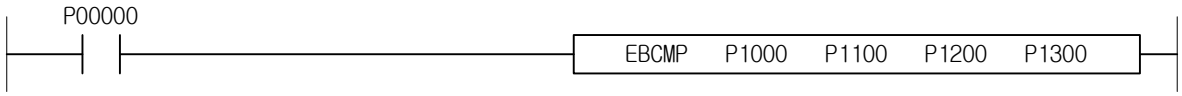
(3) If not identical, its number will be saved in D1. The location which is not identical will not be saved

(4) The comparison command cannot be executed because the flash memory is already occupied by another process.
The value of comparison operation status code D2 is 2.

* Supported versions by product
- XGK-CPUE/A/S/H/U/UN: O/S V4.70 or higher
- XGK-CPUSN/UN/HN: O/S V1.40 or higher
- XBC-DN/DP32U: O/S V1.9 or higher
- XBC-DN/DPxxH: O/S V3.3 or higher
- XBC-DN/DPxxSU: O/S V2.2 or higher



2) Example

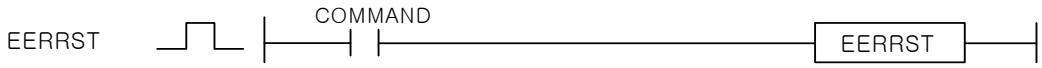


If the input condition P00000 is On, the contents of one block of the R device area of the number specified by P1000 and the flash area of the number specified by P1100 are compared and mismatched.The number of inconsistencies is saved as P1200 and 1 is stored in P1300 when the comparison operation is completed.

4.36. 6 EERRST

[Applicable Product: XGK]

Command	Applicable area														Step	Flag		
	PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EERRST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-



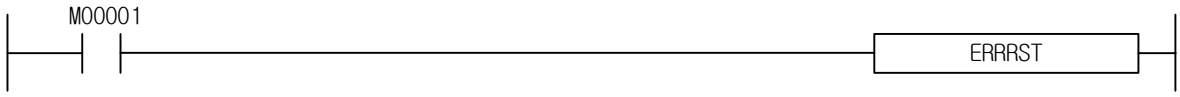
1) EERRST (EEPROM Error Reset)

(1) If input contact point becomes On, it is clear the Flash Block Status Flag (F0159, WORD) and the Block Error Flag (F0164, DWORD).

Flag name	Type	Description	Note
F0159	WORD	BIT 0: Reading representative Flag BIT 1: Writing representative Flag BIT 2: Error representative Flag	
F0160	DWORD	Block information of Reading executed	
F0162	DWORD	Block information of Writing executed	
F0164	DWORD	Block information of Error occurred	

2) Example

When contact point M00001 becomes On, it is clear the Error bit of F0159 and F0164 (DWORD)



4.37 F area Control Instruction

4.37. 1 FSET

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FSET	D	-	O	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-

[Area setting]

Operand	Description	Data size
D	Of F area, XGK is F10240 ~ F2047F area / XGB is F2000 ~ F255F	End bit of BSFT Operation

1) FSET
   (1) It is to be set the bit between F10240~F2047F among the Special Relay Area F.
   (2) It can be able to control the F area as shown below

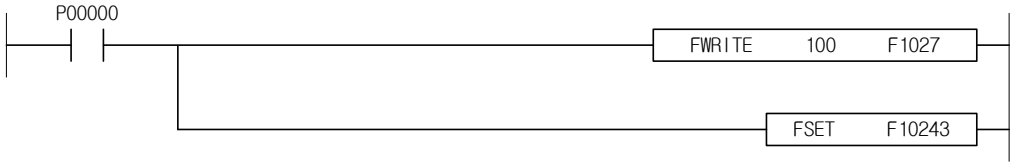
Flag name	Data size	Contact Point		Usage	Note
		XGK	XGB		
_RTC_WR	End bit of BSFT Operation	F10240	-	Data write and read in RTC.	XGB:Unavailable
_SCAN_WR	End bit of BSFT Operation	F10241	F2001	Initializing the value of scan.	
_CHK_ANC_ERR	End bit of BSFT Operation	F10242	F2002	Request detection of external error.	
_CHK_ANC_WAR	End bit of BSFT Operation	F10243	F2003	Request detection of external slight error (warning).	
_INIT_DONE	End bit of BSFT Operation	F10250	F2010	Initialization complete displayed.	
_ANC_ERR[n]	WORD	F1026	F0202	Display information of external serious error	
_ANC_WAR[n]	WORD	F1027	F0203	Minor error information in external device	
_MON_YEAR_DT	WORD	F1034	-	Clock data(MON/year)	XGB:Unavailable
_TIME_DAY_DT	WORD	F1035	-	Clock data(Hour/Date)	
_SEC_MIN_DT	WORD	F1036	-	Clock data(Second/Minute)	
_HUND_WK_DT	WORD	F1037	-	Clock data(100 Years/Day)	

2) Contact point function
   (1) F10240: After moving the clock data which hits to each area in F1034~F1037 of clock information data area, If F10240 bit is changed to On using the FSET instruction, RTC data of PLC is reflected in clock data of F1034~F1037 area(Not support in XGB) At this time, the set F10240 bit is automatically reset after data is reflected in RTC.
   (2) F10241: It initializes the value of _SCAN_MAX, _SCAN_MIN, _SCAN_CUR
   (3) F10242: If this bit become Set and the value in F1026 area is not 0, the Error will occur. If critical error is occurred, PLC operation status is changed to Error status.
   (4) F10243(XGB:F2003): similar to F10242 bit, if this bit is set, a warning message is issued if the value in the F1027 area is not 0. If Warning is occurred, P.S.LED of CPU module and CHK LED become On.

To clear this warning, write 0 to F1027 area and set F10242 bit again to clear. Refer to XGK-CPU User's Manual Chapter 6, 7 About th F10242 and F10243 contact point more detail.

3) Example

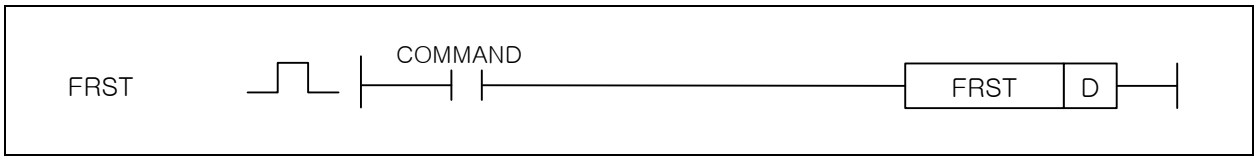
(1) If contact point P00000 connected with external device is changed to On, Write '100' in F1027(_ANC_WAR) and Warning Flag become Set.



4.37. 2 FRST

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FRST	D	-	O	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-



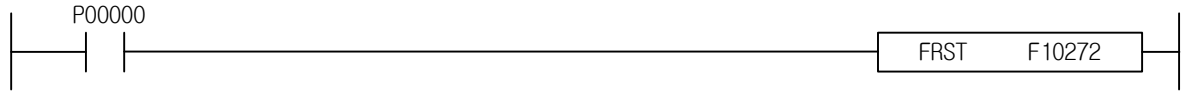
[Area setting]

Operand	Description	Data size
D	XGK is F10240 ~ F2047F, XGB is F2000 ~ F255F area in F area.	End bit of BSFT Operation

1) FRST
   (1) It is used to instruction to reset the bit of F10240~F2047 for XGK (F2000 ~ 255F for XGB) in F area of Special Relay area.
   (2) It is not need to use the FRST instruction because the bit of F10240 ~ F10243 for XGK(F2000 ~ 255F for XGB) in F area become to reset after 1 Scan automatically even if the bit become Set.

Flag name	Data size	Contact Point		Reset operation
		XGK	XGB	
_RTC_WR	End bit of BSFT Operation	F10240	F2000	Auto Reset area
_SCAN_WR	End bit of BSFT Operation	F10241	F2001	
_CHK_ANC_ERR	End bit of BSFT Operation	F10242	F2002	
_CHK_ANC_WAR	End bit of BSFT Operation	F10243	F2003	

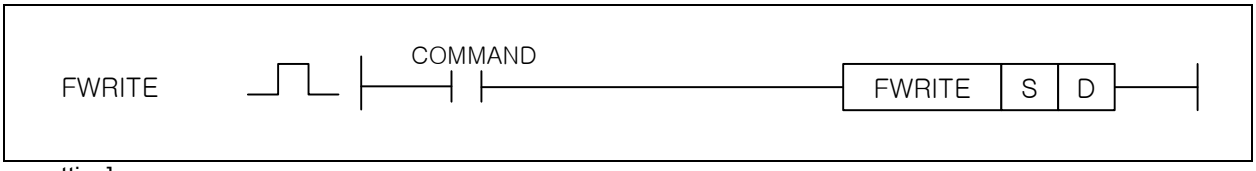
2) Example
   (1) Reset the No.3 bit of external Warning information area(_ANC_WAR)
   (2) If P00000 is changed to On, NO3. bit of _ANC_WAR(F1027) is changed to Reset.



4.37. 3 FWRITE

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FWRITE	S	O	O	O	O	O	-	O	-	-	O	O	O	O	-	2~3	-	-	-
	D	-	O	-	-	-	-	-	-	-	-	-	-	-	-				

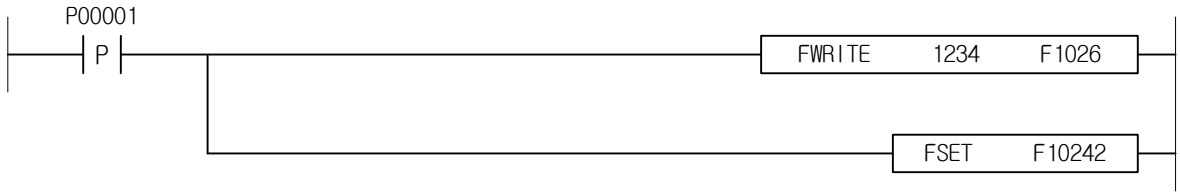


[Area setting]

Operand	Description	Data size
S	Number of Data or Device	WORD
D	XGK is F1024 ~ F2047, XGB is F200 ~ F255 area in F area.	WORD

1) FWRITE
   (1) It is used to instruction to save temporary value in word of F1024~F2047 in Special Rely in F area
   (2) The value saved by FWRITE is removed Power OFF
   (3) It is used to saved the word data in area repectively when detect the external device Error or Warning.

2) Example
   (1) If P00001 connected with external device is changed to On, data of '1234' is witten in F1026(_ANC_ERR) and the request of detection of external device Error flag become Set. So PLC operation status is changed to Error status.

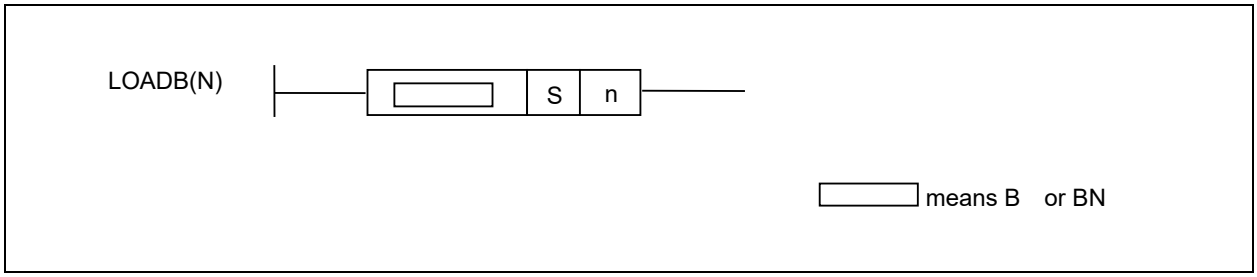


4.38 Bit Control Instruction In Word Area

4.38.1 LOADB, LOADBN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LOADB LOADBN	S	O		O	O	O	-	O	-	-	-	O	O	O	O	2	-	-	-
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



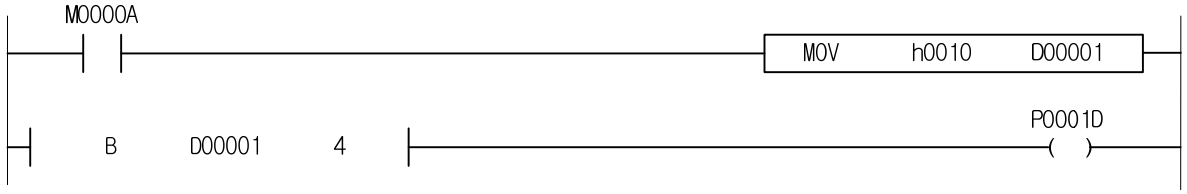
[Area setting]

Operand	Description	Data size
S	Word area of the relevant device	WORD
n	nth bit in Word area	WORD

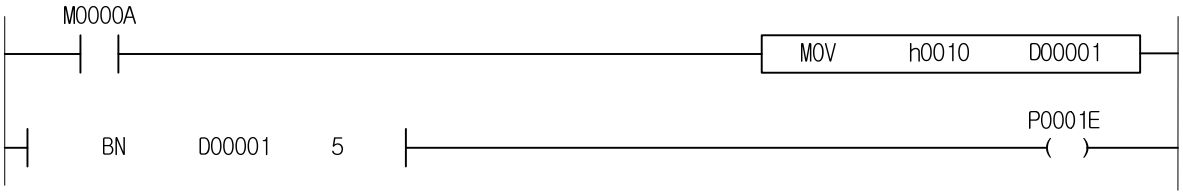
1) LOADB
   (1) This instruction takes nth bit of word data (S) as a present operation result
   (2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

2) LOADBN
   (1) This instruction takes reverses nth bit of word data (S) as a present operation result
   (2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

3) Example
If bit 4 of D00001 becomes 1, P0001D is ON



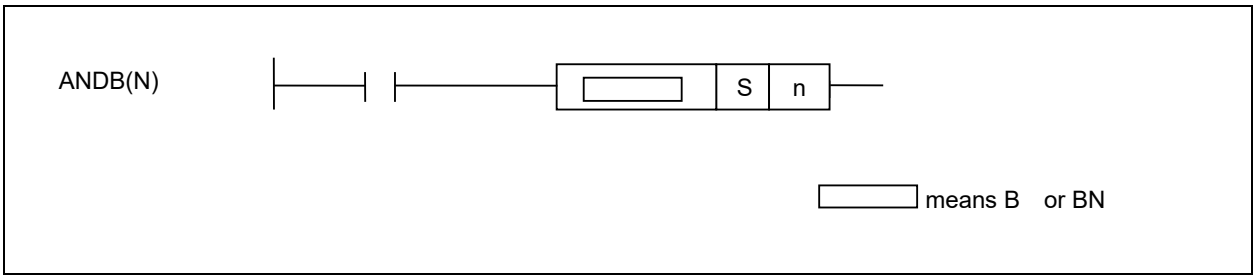
If bit 5 of D00001 becomes 0, P0001E is ON



4.38.2 ANDB, ANDBN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ANDB ANDBN	S	O		O	O	O	-	O	-	-	-	O	O	O	O	2	-	-	-
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



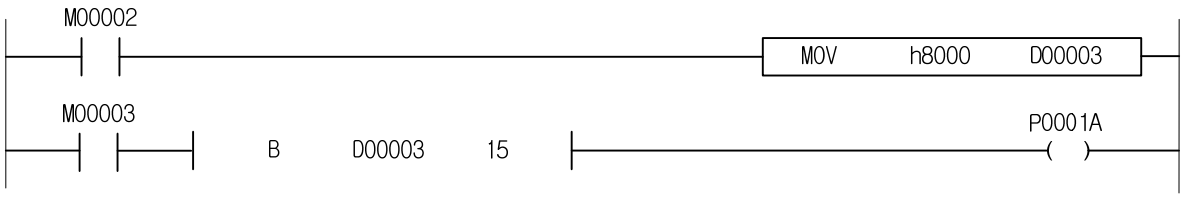
[Area setting]

Operand	Description	Data size
S	Word area of the relevant device	WORD
n	nth bit in Word area	WORD

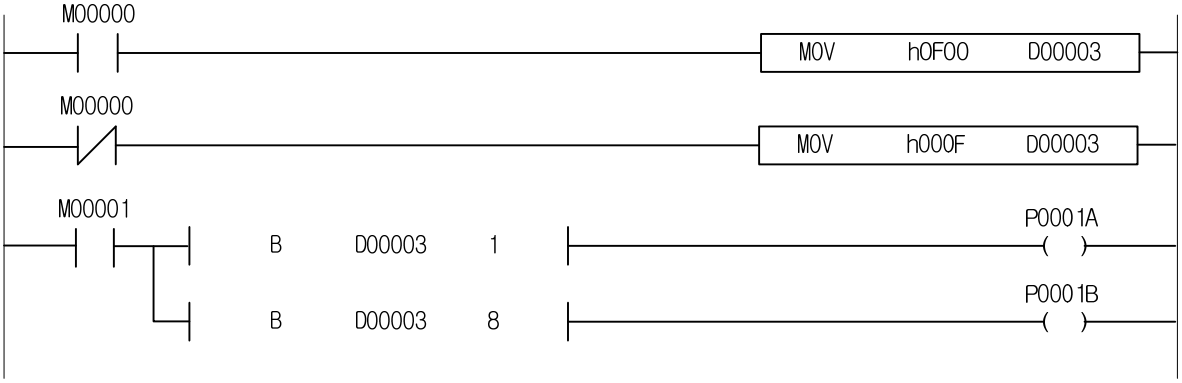
1) ANDB
(1) This instruction takes nth bit of word data (S) and do AND operation with a present operation result.
(2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

2) ANDBN
(1) This instruction reverses nth bit of word data (S) and do AND operation with a present operation result.
(2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

3) Example
If 15th bit (b15) of D00003 is 1, P0001A becomes ON when M0003 is ON.



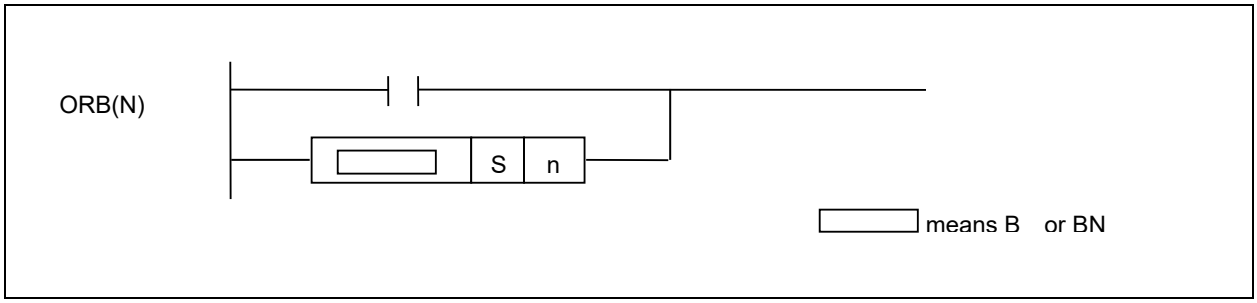
Output P0001A, P0001B according to bit 1 and bit 8 values of D00003



4.38.3 ORB, ORBN

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ORB ORBN	S	O		O	O	O	-	O	-	-	-	O	O	O	O	2	-	-	-
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



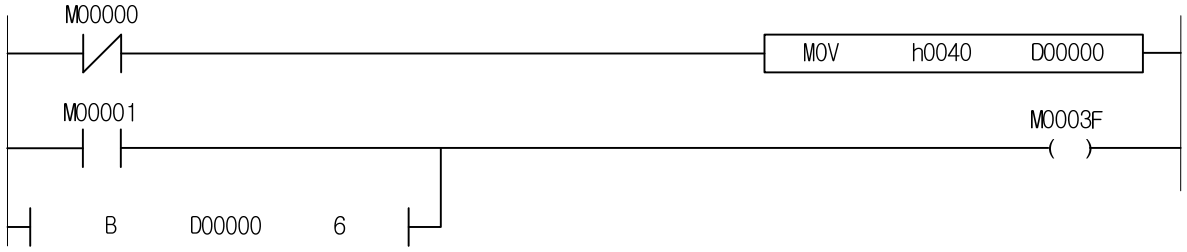
[Area setting]

Operand	Description	Data size
S	Word area of the relevant device	WORD
n	nth bit in Word area	WORD

1) ORB
   (1) This instruction takes nth bit of word data (S) and do OR operation with a present operation result.
   (2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

2) ORBN
   (1) This instruction reverses nth bit of word data (S) and do OR operation with a present operation result.
   (2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

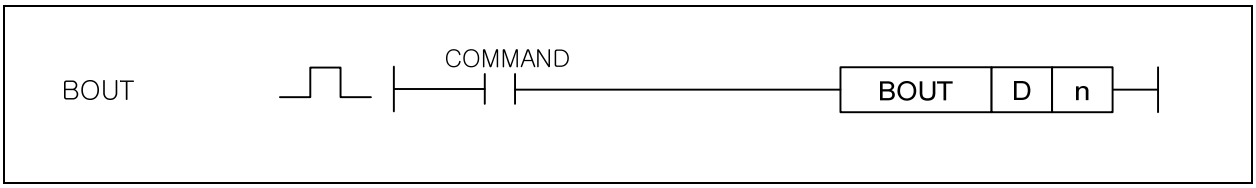
3) Example
If bit 6 of D00000 becomes 1 or M00001 becomes 1, M0003F is ON.



4.38.4 BOUT

[Applicable Product: XGK, XGB]

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
BOUT	D	O		O	O	O	-	O	-	-	-	O	O	O	O	2	-	-	-
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O			



[Area setting]

Operand	Description	Data size
D	Word area of the relevant device	WORD
n	nth bit in Word area	WORD

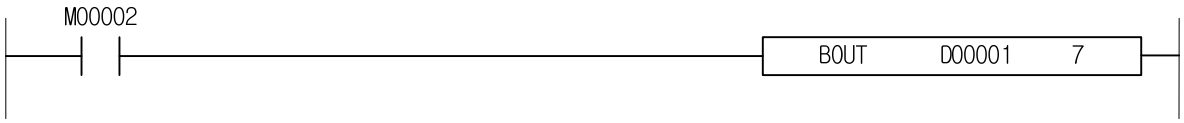
1) BOUT

(1) This instruction outputs a present operation result to nth bit of specified D area.

(2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

2) Example

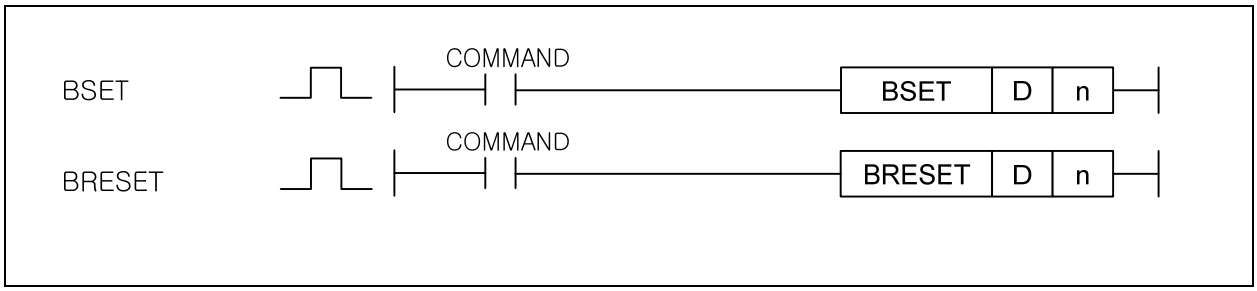
When M00002 is ON, 7th bit (b17) of D00001 becomes ON.



4.38.5 BSET, BRESET

[Applicable Product: XGK, XGB]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
BSET BRESET	D	O		O	O	O	-	O	-	-	-	O	O	O	O	2	-	-	-
	n	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



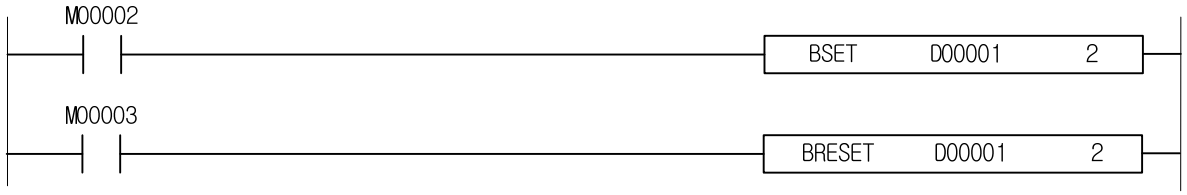
[Area setting]

Operand	Description	Data size
D	Word area of the relevant device	WORD
n	nth bit in Word area	WORD

1) BSET
   (1) When the condition is satisfied, set nth bit of specified D area
   (2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

2) BRESET
   (1) When the condition is satisfied, reset nth bit of specified D area.
   (2) It takes only lower 4 bits of n value to decide bit position Therefore, it doesn't occur an error when n value exceeds the Word's range.

3) Example
If M00002 is ON, it sets the 2nd bit (b2) of D00001. And if M00003 is ON, it resets the 2nd bit (b2) of D00001



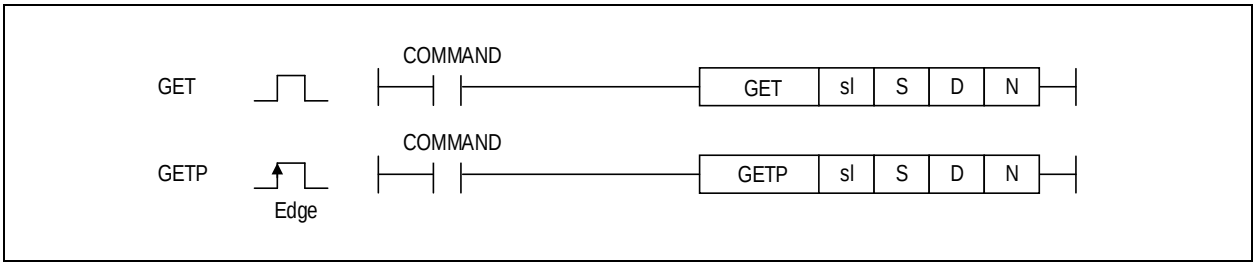
4.39 Special Module Related Instruction

4.39.1 GET, GETP / Special module internal memory read command

This command is used to read data from the internal memory of a special module.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GET(P)	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-				
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				
	N	O	-	O	-	-	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data size
sl	Base (x) and slot (y) number with special module: h00xy	WORD
S	Start address of internal memory in special module	WORD
D	Start address of Device in CPU which is saving the data to read	WORD
N	Number of data to read	WORD

[Flag Set]

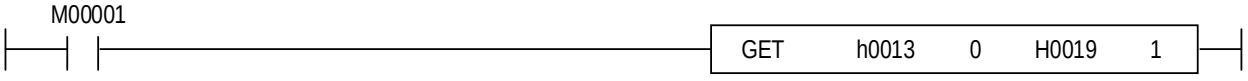
Flag	Content	Device number
PUT/GET error	1. When there is no module or special module in the designated base / slot 2. If PUT/GET instruction is not completed correctly 3. If the max base range supported by each CPU is exceeded	F0015 ~ F0022

1) Function

(1) This instruction is used to read the data of special module with memory.

(2) Writes N word data from the device designated by D to the memory (designated by S: address) of the special module designated by sl (slot number of the special module).

(3) The setting method of sl is set to 2 hexadecimal digits. In the case of h0013 as shown in the program below, the first digit '1' is the base number, and the second '3' is the slot number.



2) Error

(1) If there is no special module in the position designated as sl or if the GET command is not executed normally, the corresponding position bit of F0015 ~ F0022 (WORD) for PUT / GET error flags for XGK, and F0015 (WORD) for XGB is set. . At this time, the operation error flags F110 and F115 are also set.

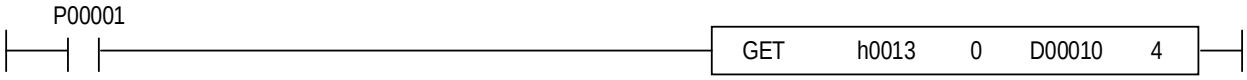
(2) If the module does not exist in the position designated by sl, only PUT / GET error flags F0015 to F0022 are set, and operation error flags F110 and F115 are not set.

3) Example

(1) LD

(a) This is an example of the case where XGF-AV8A is installed in slot 1 base 3 with XGK CPU.

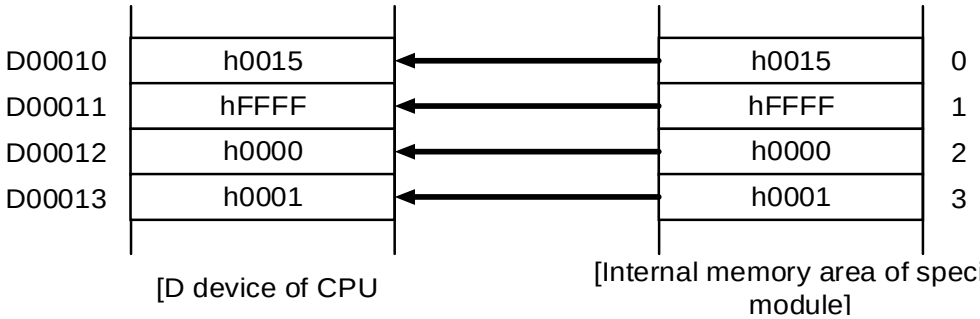
(b) When input signal P00001 is On, 4 words of data are stored in D00010 to D00013 from the internal memory address 0 of the special module (XGF-AV8A).



(c) The arbitrary contents set in the fixed areas 0 to 3 of XGF-AC8A are as follows.

Internal Memory Address	Item	Initial setting content	Internal memory value
0	No. of Channel	Channel 0,2,4	h0015
1	Input voltage range	-10 ~ 10V	hFFFF
2	Output data range	0 ~ 16000	h0000
3	Filter enable	Channel 0	H0001

(d) When the instruction is executed, 4 words of data are stored in D00010 ~ D00013 from address 0 of the internal memory area of the installed special module (XGF-AC8A).



(2) ST (Automatic program assignment)

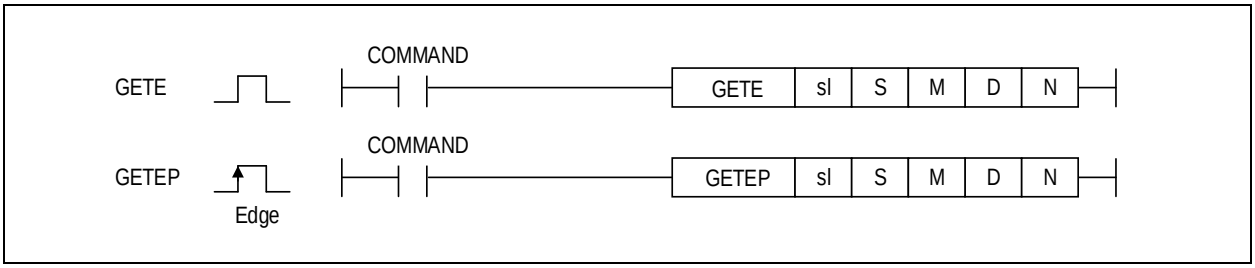
```
GET(sl:=(*WORD_CONSTANT*), S:=(*WORD_CONSTANT*), D=>(*WORD*), N:=(*WORD*));
```

4.39.2 GETE, GETEP /Special module internal memory read command(XGF-RD8A).

This command is used to read data from the internal memory of a XGF-RD8A. It is used to read the upper word and the lower word separately among double words.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	-	-	-	-	-	-

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
GETE(P)	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	5	O	-	-
	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-				
	M	O	-	O	-	-	-	-	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				
	N	O	-	O	-	-	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data size
sl	Base (x) and slot (y) number where the module is mounted: h00xy	WORD
S	Internal Memory Address of module : 0 ~ 1,023WORD	WORD
M	Upper or lower word of internal memory address: 1 or 0	WORD
D	Device to store the data read from the module	WORD
N	Number of data words to read in module: 1 ~ 64	WORD

[Flag Set]

Flag	Content	Device number
PUT/GET error	1. If there is no module in the specified slot or it is not a special module. 2. If operand 'S' is set as 1024(h400) or more. 3. If (remainder of S/64) + N > 64 4. If operand 'M' is set as another value except 0 or 1. 5. If D+3N > each maximum memory area 6. If operand 'N' exceeds range(1~64)	F0015 ~ F0022

1) Function

(1) This command is used to read data from the memory of the special module (XGF-RD8A).

(2) Reads N word data from the memory (address specified in S) of the module installed in the slot designated as sl into the PLC internal device area designated as D.

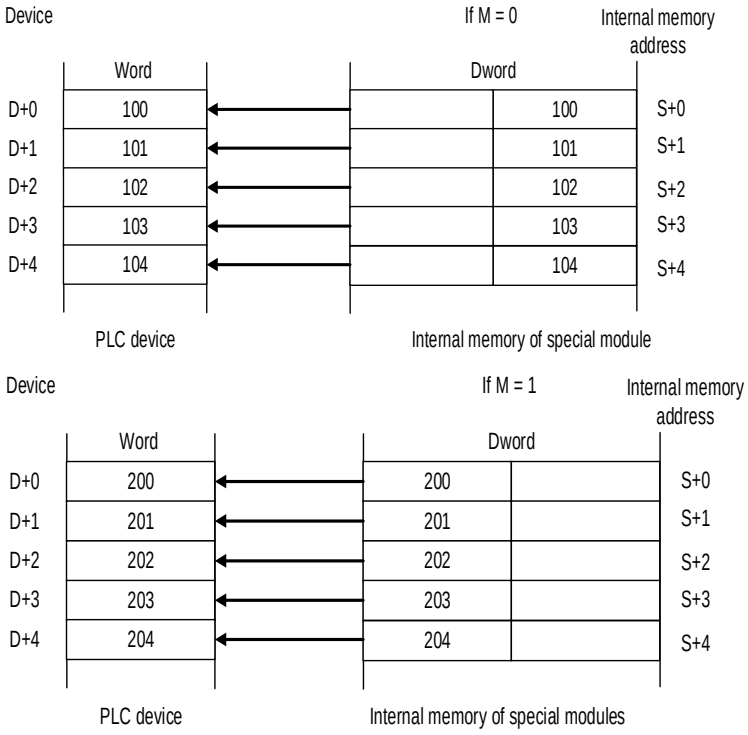
(3) Module internal memory designated by S is double word unit memory.

(4) The double word memory designated by S can be selected in word units using operand M.

(5) From the device specified in D, the PLC internal device area corresponding to 3 times the number specified in N is allocated and used.

(a) From the device set as D, N x 3 device space must be secured.

(b) For example, if operand D is set to M00011 and N is set to 5, the instruction internally uses the area from M00011 to M00026. That is, in addition to the M00011 ~ M00015 set in the command, the areas from M00016 to M00026 (reserved area) are used internally by the instruction, so be careful not to overlap with other programs.



2) Error

(1) This command sets an error flag when an error occurs and does not execute the module Access.

(2) The error occurs in the following cases.

(a) If there is no module in the specified slot or it is not a special module.

- If there is no module in the designated slot, only error flags (F0015 to F0022) are set.

- In case of other modules in the designated slot, the error flags (F0015 to F0022) and operation error flags (F110, F115) are set together.

(b) If operand 'S' is set as 1024(h400) or more.

(c) If (remainder of S/64) + N > 64

- The internal memory is composed of one block of 64 words.

(0 ~ 63 / 64 ~ 127 / … / 960 ~ 1,023)

Data that can be read from the instruction at a time is based on one block (64 words).

- If (remainder of S/64) + N > 64 , an error occurs because the data area to be read exceeds 1 block unit.

(For example, if 10 words from 60 to 69 in the internal memory are read in one command, an error occurs because it exceeds 0 to 63, which is a block unit.)

(d) If operand 'M' is set as another value except 0 or 1.

(e) If D+3N > each maximum memory area

(f) If operand 'N' exceeds range(1~64)

3) Example

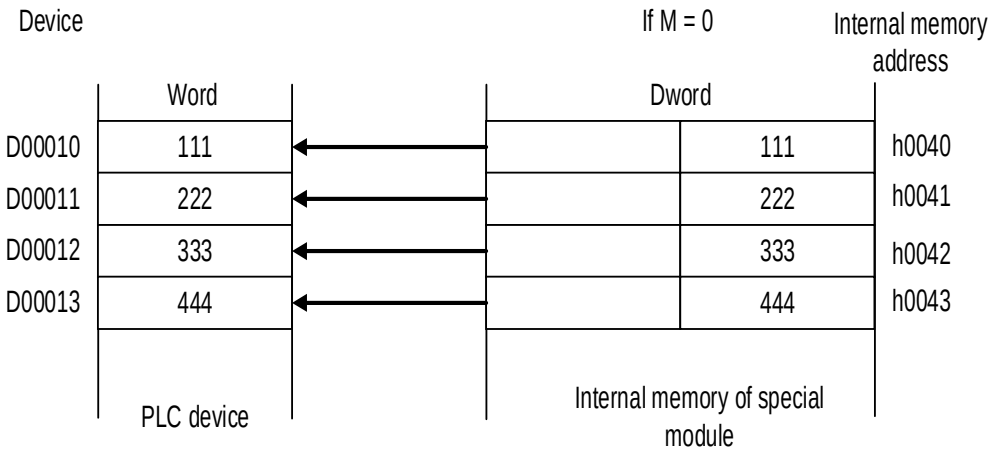
(1) LD

(a) This is an example of the case where the special module (XGF-RD8A) is installed in slot 1, base 3 with XGK CPU.

(b) This is an example of a program that reads the input change value for each channel from device D00010 to D00013 when the input contact P00001 is On, the data in the lower word area of the special module internal memory address 64(h40).

The arbitrary contents set in the internal memory of XGF-RD8A are as follows.

Memory address			Content		R/W	Command
HEX		Decimal	Upper	Lower		
$0H_H$	$0L_H$	0	Unused	Specify operation channel	Read/Write	GETE/ PUTE
$1H_H$	$1L_H$	1	Channel 4 sensor type setting	Channel 0 sensor type setting		
$2H_H$	$2L_H$	2	Channel 5 sensor type setting	Channel 1 sensor type setting		
…	…	…	…	…		
$40H_H$	$40L_H$	64	Channel 4 Input rate (rate alarm function data)	Channel 0 Input rate (rate alarm function data)	Read	GETE
$41H_H$	$41L_H$	65	Channel 5 Input rate (rate alarm function data)	Channel 1 Input rate (rate alarm function data)		
$42H_H$	$42L_H$	66	Channel 6 Input rate (rate alarm function)	Channel 2 Input rate (rate alarm function data)		
$43H_H$	$43L_H$	67	Channel 7 Input rate (rate alarm function)	Channel 3 Input rate (rate alarm function data)		
…	…	…	…	…	…	…



(2) ST (Automatic program assignment)

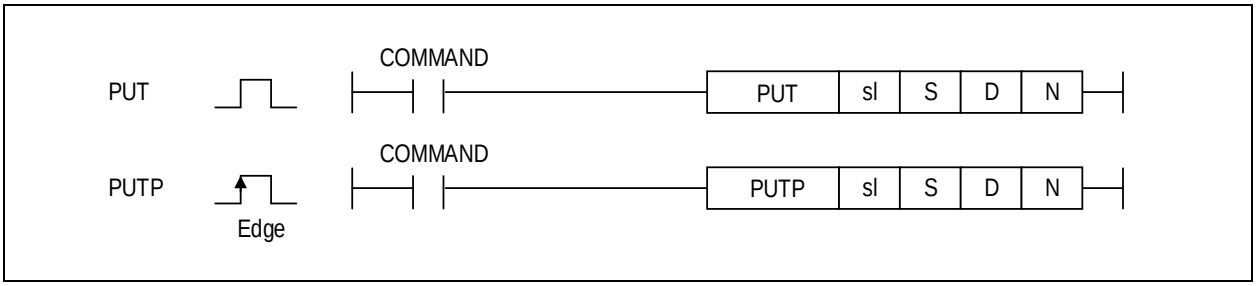
```
GETEP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S:=(*WORD_CONSTANT*), M:=(*WORD*), D=>(*WORD*),
N:=(*WORD*));
```

4.39.3 PUT, PUTP / Special module internal memory write command

This command is used to write data to the internal memory of a special module.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
PUT(P)	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-				
	D	O	-	O	-	-	-	-	-	-	O	O	O	O	O				
	N	O	-	O	-	-	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data size
sl	Base (x) and slot (y) number with special module: h00xy	WORD
S	Address of internal memory in special module	WORD
D	Start number or constant of device that stores data to be saved in special module	WORD
N	The number of data to save	WORD

[Flag Set]

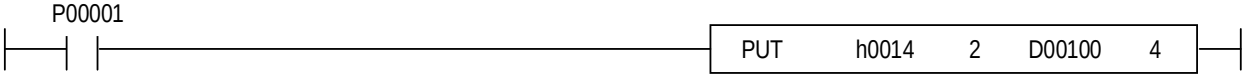
Flag	Content	Device number
PUT/GET error	1. When there is no module or special module in the designated base / slot 2. If PUT/GET instruction is not completed correctly 3. If the max base range supported by each CPU is exceeded	F0015 ~ F0022

1) Function

(1) This command is used to write data to a special module with memory.

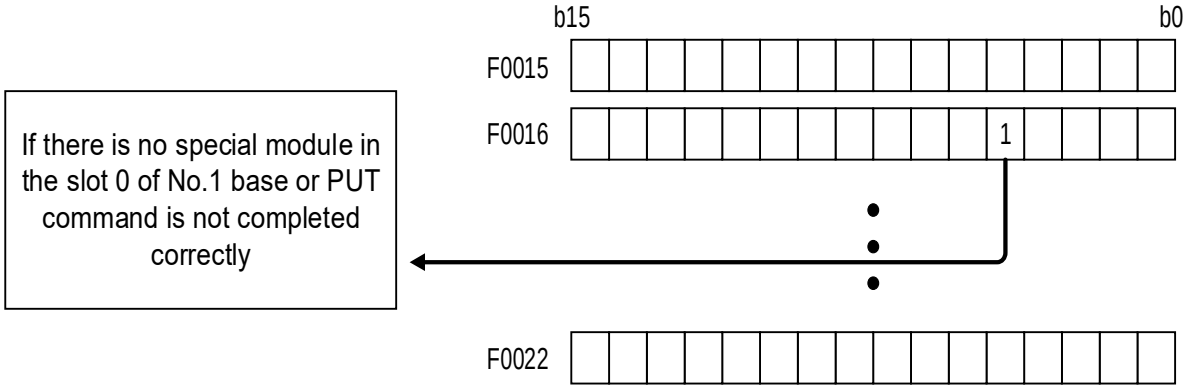
(2) Writes N word data from the device designated by D to the memory (designated by S: address) of the special module designated by sl (slot number of the special module).

(3) The setting method of sl (slot number of the special module) is set to 2 hexadecimal digits. In the case of h0014 as shown in the program below, the first digit '1' is the base number, and the second '4' is the slot number.



2) Error

(1) If it is another module at the location designated by sl (slot number of the special module), or if the PUT instruction is not executed normally, the corresponding location bit of F0015~F0022(WORD) for XGK, which is the PUT/GET error flag, and F0015(WORD) for XGB It is set.

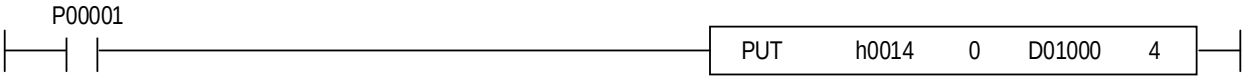


3) Example

(1) LD

(a) This is an example of the case where XGF-AV8A is installed in slot 1 base 4 with XGK CPU.

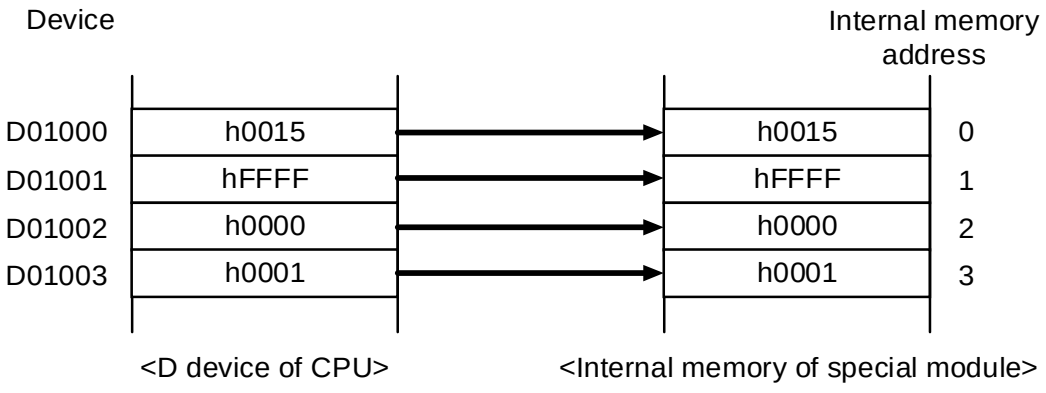
(b) When input signal P00001 is On, 4 words of data are stored in D01000 to D01003 from the internal memory address 0 of the special module (XGF-AV8A).



The contents of fixed area 0~3 of XGF-AC8A are as follows.

Internal Memory Address	Item	Content	Setting Value
0	No. of Channel	Channel 0,2,4	h0015
1	Input voltage range	-10 ~ 10V	hFFFF
2	Output data range	0 ~ 16000	h0000
3	Filter enable	Channel 0	H0001

When the instruction is executed, Save the value of 4 words stored in devices D01000 ~ D01003 in address 0~3 of the internal memory area of the special module (XGF-AC8A).



(2) ST (Automatic program assignment)

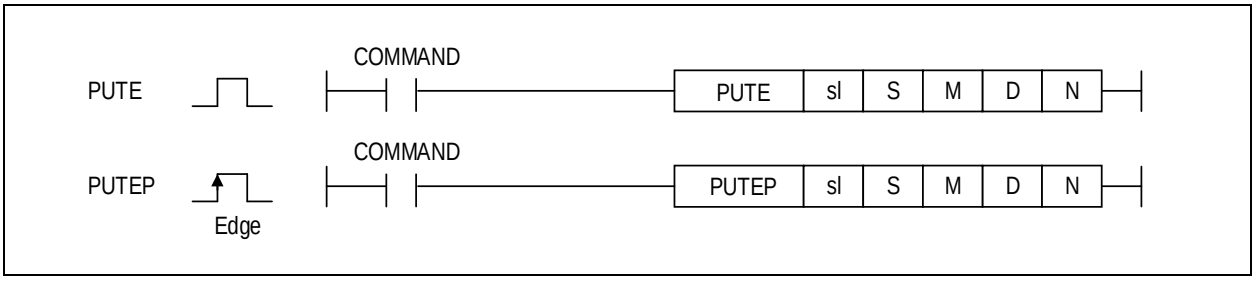
```
PUT(sl:=(*WORD_CONSTANT*), S:=(*WORD_CONSTANT*), D=>(*WORD*), N:=(*WORD*));
```

4.39.4 PUTE, PUTEP /Special module internal memory write command(XGF-RD8A).

This command is used to write data to the internal memory of a XGF-RD8A. It is used to write the upper word and the lower word separately among double words.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	-	-	-	-	-	-

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
PUTE(P)	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	5	O	-	-
	S	-	-	-	-	-	-	-	-	-	O	-	-	-	-				
	M	O	-	O	-	-	-	-	-	-	O	O	O	O	O				
	D	O	-	O	-	-	-	-	-	-	-	O	O	O	O				
	N	O	-	O	-	-	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data size
sl	Base (x) and slot (y) number where the module is mounted: h00xy	WORD
S	Internal Memory Address of module : 0 ~ 1,023WORD	WORD
M	Upper or lower word of internal memory address: 1 or 0	WORD
D	Device that stores data to be saved in the module	WORD
N	Number of data words to write in module: 1 ~ 64	WORD

[Flag Set]

Flag	Content	Device number
PUT/GET error	1. If there is no module in the specified slot or it is not a special module. 2. If operand 'S' is set as 1024(h400) or more. 3. If (remainder of S/64) + N > 64 4. If operand 'M' is set as another value except 0 or 1. 5. If D+3N > each maximum memory area 6. If operand 'N' exceeds range(1~64)	F0015 ~ F0022

1) Function

(1) This command is used to write data to the memory of the special module (XGF-RD8A).

(2) Writes N word data designated as D to the internal memory (address designated to S) of the module mounted in the slot designated as sl.

(3) Module internal memory designated by S is double word unit memory.

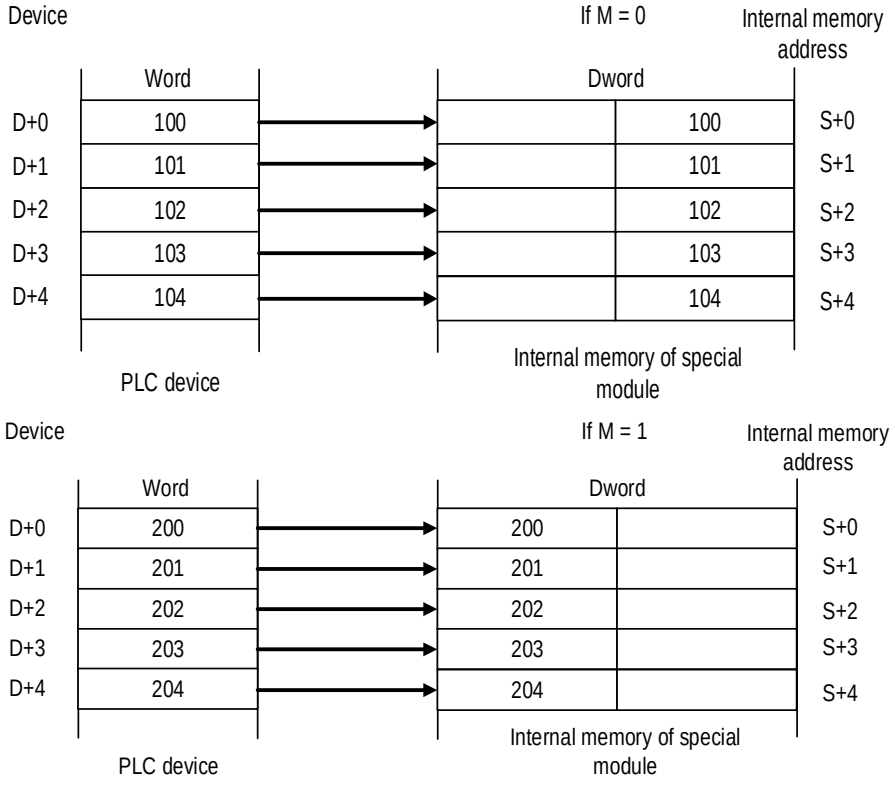
(4) The double word memory designated by S can be selected in word units using operand M.

(5) From the device specified in D, the PLC internal device area corresponding to 3 times the number

specified in N is allocated and used.

(a) From the device set as D, N x 3 device space must be secured.

(b) For example, if operand D is set to M00011 and N is set to 5, the instruction internally uses the area from M00011 to M00026. That is, in addition to the M00011 ~ M00015 set in the command, the areas from M00016 to M00026 are used internally by the instruction, so be careful not to overlap with other programs.



2) Error

(1) This command sets an error flag when an error occurs and does not execute the module Access.

(2) The error occurs in the following cases.

(a) If there is no module in the specified slot or it is not a special module.

- If there is no module in the designated slot, only error flags (F0015 to F0022) are set.

- In case of other modules in the designated slot, the error flags (F0015 to F0022) and operation error flags (F110, F115) are set together.

(b) If operand 'S' is set as 1024(h400) or more.

(c) If (remainder of S/64) + N > 64

- The internal memory is composed of one block of 64 words.

(0 ~ 63 / 64 ~ 127 / … / 960 ~ 1,023)

Data that can be read from the instruction at a time is based on one block (64 words).

- If (remainder of S/64) + N > 64 , an error occurs because the data area to be read exceeds 1 block unit.

(For example, if 10 words from 60 to 69 in the internal memory are read in one command, an error occurs because it exceeds 0 to 63, which is a block unit.)

(d) If operand 'M' is set as another value except 0 or 1.

(e) If D+3N > each maximum memory area

(f) If operand 'N' exceeds range(1~64)

3) Example

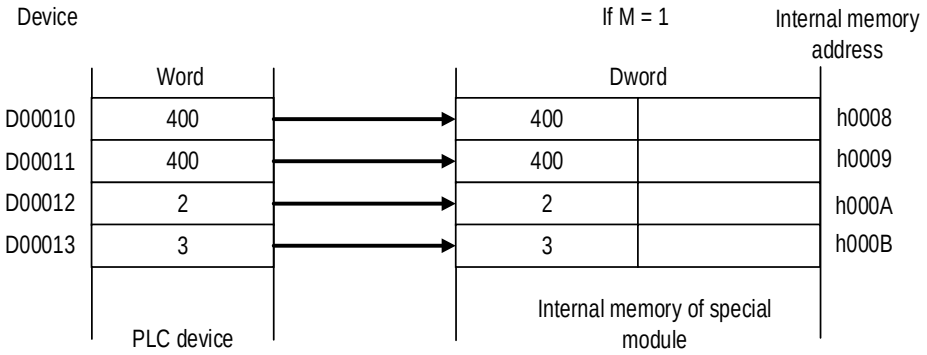
(1) LD

(a) This is an example of the case where the special module (XGF-RD8A) is installed in slot 1, base 3 with XGK CPU.

(b) When input contact P00001 is On, it is a program that saves the 4 word data of devices D00010 to D00013 as the upper word area among the internal memory of addresses 8 to 12 of the special module internal memory.

(c) The arbitrary contents set in the internal memory of XGF-RD8A are as follows.

Memory address			Content		R/W	Command
HEX		Decimal	Upper	Lower		
$0H_H$	$0L_H$	0	Unused	Specify operation channel	Read/Write	GETE/PUTE
$1H_H$	$1L_H$	1	Channel 4 sensor type setting	Channel 0 sensor type setting		
$2H_H$	$2L_H$	2	Channel 5 sensor type setting	Channel 1 sensor type setting		
…	…	…	…	…		
$8H_H$	$8L_H$	8	Channel 6 filter value setting	Channel 2 filter value setting	Read/Write	GETE/PUTE
$9H_H$	$9L_H$	9	Channel 7 filter value setting	Channel 3 filter value setting		
AH_H	AL_H	10	Channel 4 average processing method setting	Channel 0 average processing method setting		
BH_H	BL_H	11	Channel 5 average processing method setting	Channel 1 average processing method setting		
…	…	…	…	…	…	…



(2) ST (Automatic program assignment)

```
PUTEP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S:=(*WORD_CONSTANT*), M:=(*WORD*), D=>(*WORD*),
N:=(*WORD*));
```

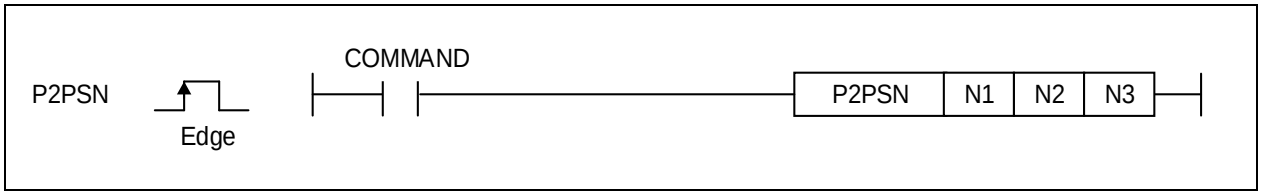
4.40 Communication Module Related Instruction

4.40.1 Setting of P2PSN/ Station No.

This is a command to change the destination station number of P2P block.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
P2PSN	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number(0 ~ 63)	WORD
N3	Station address (0 ~ 63)	WORD

[Flag Set]

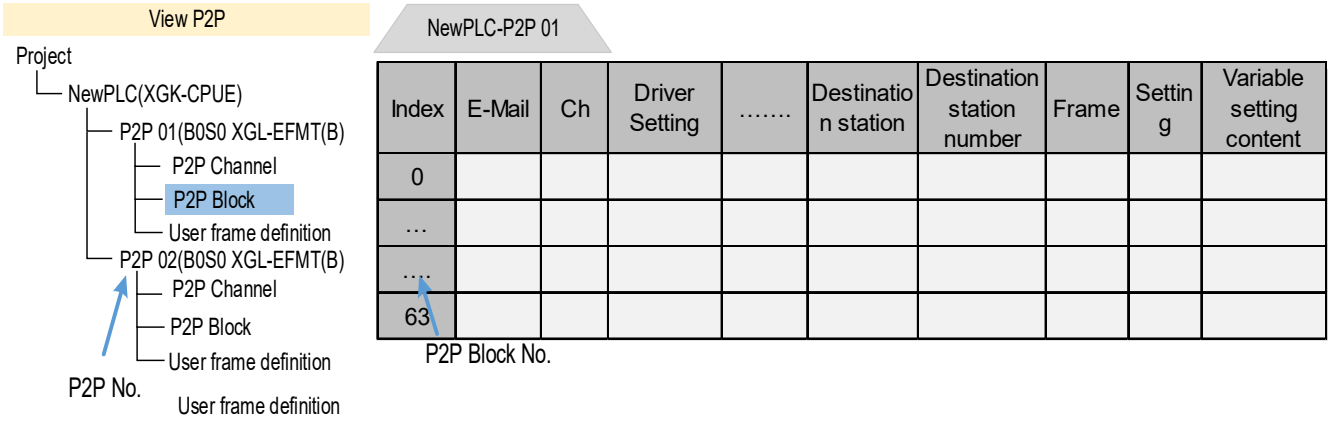
Flag	Content	Device number
error	If the value of N1, N2 and N3 goes outside the relevant range	F110

1) Function

(1) This command is to change the destination station number to communicate in P2P service.

(2) The destination station number of the N2th block of the P2P number designated by N1 is changed to the value of N3. It is used when communicating by changing only the destination station number without changing the data to be transmitted/received during P2P communication.

(3) Applied product: FDEnet, Cnet



2) Error

(1) If the value of N1(1~8), N2(0~63) and N3(0~63) goes outside the relevant range, set the error flag (F110).

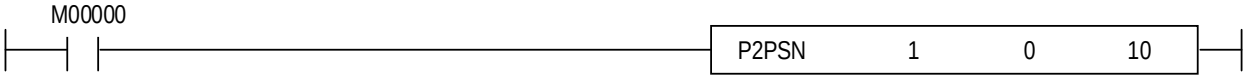
3) Example

(1) LD

* Execution order and instruction

(a) The following example is an example of changing the destination station number of P2P block using P2PSN instruction.

(B) When M00000 is On, the destination station number of block 0 of P2P 01 is changed to 10 stations.



(2) ST (Automatic program assignment)

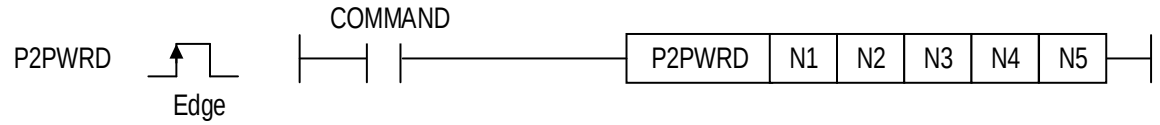
```
P2PSN_EN(EN:=(*BIT*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*));
```

4.40.2 P2PWRD / Specify reading area (WORD)

This command is used to change the data size of the P2P READ block and the starting address of the area to read the word device.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
P2PWRD	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	O	O	O	O	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number set when reading/writing individually(1~4)	WORD
N4	Data size (1 ~ 1400)	WORD
N5	Start address of read area	WORD

[Flag Set]

Flag	Content	Device number
error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

1) Function

(1) This command is used to change the data size of the P2P READ block and the starting address of the area to read.

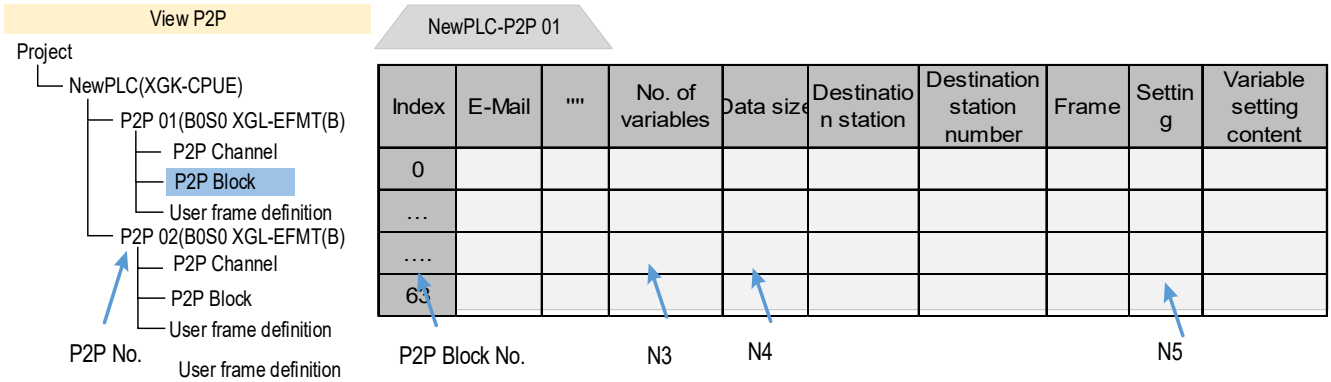
(2) Change the setting of N2 block of P2P designated by N1.

If the method is “1.Individual”, change the starting address of the read area of the N3th variable to N5.

N4 data size is ignored at this time and is not changed.

If the method is “2.Continuous”, change N4 and N5 to the data size and the starting address of the area to read, respectively.

(2) Applied product: Enet, FDEnet, Cnet(Cnet, FEnet XGT dedicated communication only)



2) Error

(1) If the value of N1(1~8), N2(0~63), N3(0~4) and N4(1~1400) goes outside the settable range, set the error flag (F110).

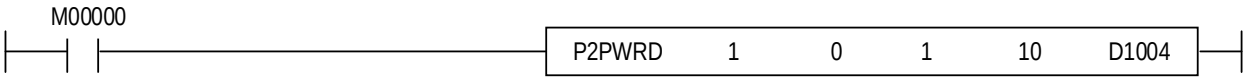
3) Example

(1) LD

* Execution order and instruction

(a) The following example is an example of changing the data size and the read area of P2P Read block using P2PWRD instruction.

(b) When M00000 is On, the data size of block 0 of P2P 01 is changed to 10 and the starting address of the read area is changed to D1004.



(2) ST (Automatic program assignment)

P2PWRD_EN(EN:=(*BIT*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*), Num4:=(*WORD*), Num5:=(*WORD*));

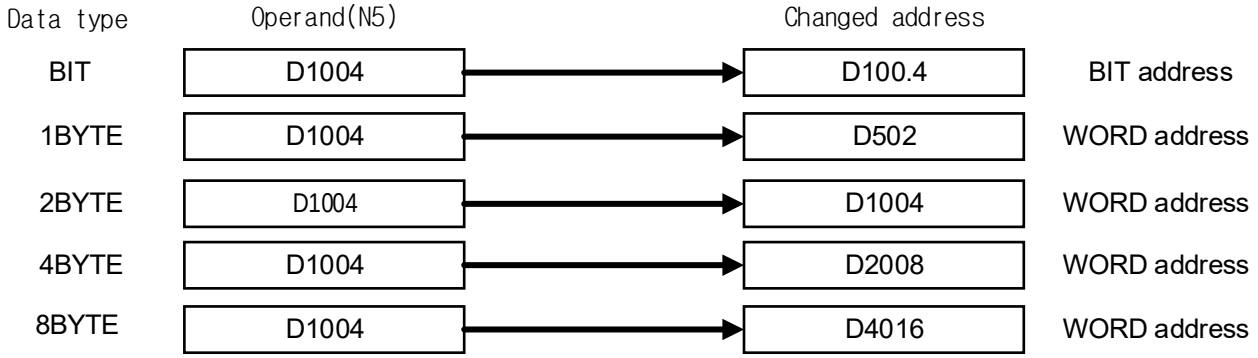
4) Caution

(1) In case of individual command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.

(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.

(3) Depending on the data type, the starting address of the area to be read is applied differently.

Ex) When reading area is changed to D1004

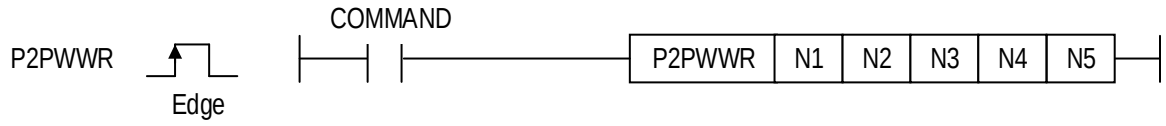


4.40.3 P2PWWR / Specify writing area (WORD)

This command is used to change the data size of the P2P WRITE block and the starting address of the area to write the word device.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
P2PWWR	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	O	O	O	O	-	O	-	-		O	O	O	O				



[Area setting]

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number set when reading/writing individually(1~4)	WORD
N4	Data size (1 ~ 1400)	WORD
N5	Start address of write area	WORD

[Flag Set]

Flag	Content	Device number
error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

1) Function

(1) This command is used to change the data size of the P2P READ block and the starting address of the area to write.

(2) Change the setting of N2 block of P2P designated by N1.

If the method is “1.Individual”, change the starting address of the write area of the N3th variable to N5.

N4 data size is ignored at this time and is not changed.

If the method is “2.Continuous”, change N4 and N5 to the data size and the starting address of the area to write, respectively.

(3) Applied product: Enet, FDEnet, Cnet(Cnet, FEnet XGT dedicated communication only)

2) Error

(1) If the value of N1(1~8), N2(0~63), N3(0~4) and N4(1~1400) goes outside the settable range, set the error flag (F110).

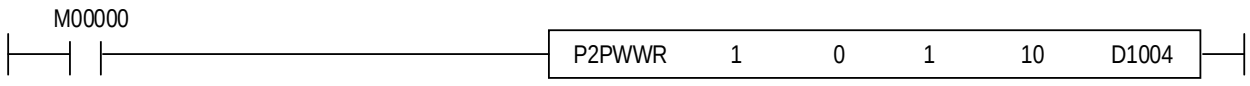
3) Example

(1) LD

* Execution order and instruction

(a) The following example is an example of changing the data size and the write area of P2P WRITE block using P2PWWR instruction.

(b) When M00000 is On, the data size of block 0 of P2P 01 is changed to 10 and the starting address of the write area is changed to D1004.

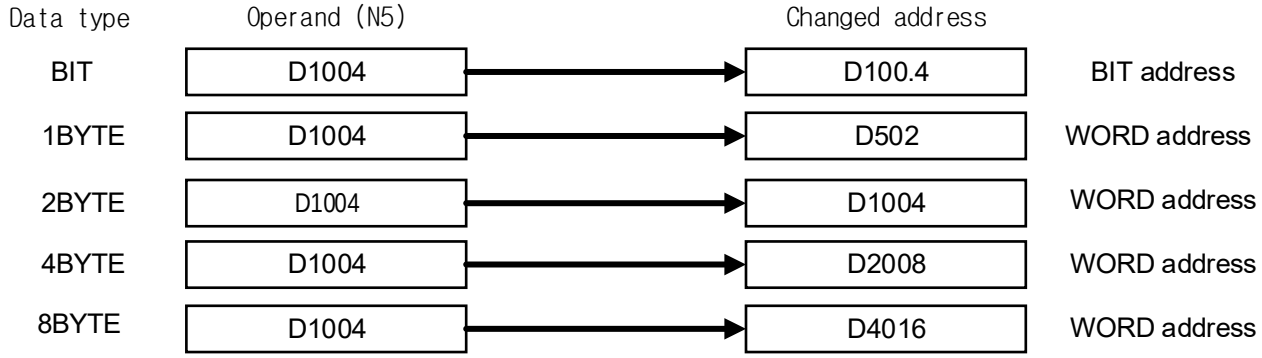


(2) ST (Automatic program assignment)

P2PWWR_EN(EN:=(*BIT*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*), Num4:=(*WORD*), Num5:=(*WORD*));

4) Caution

(1) In case of individual command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.
(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.
(3) Depending on the data type, the starting address of the area to be write is applied differently.
Ex) When writing area is changed to D1004



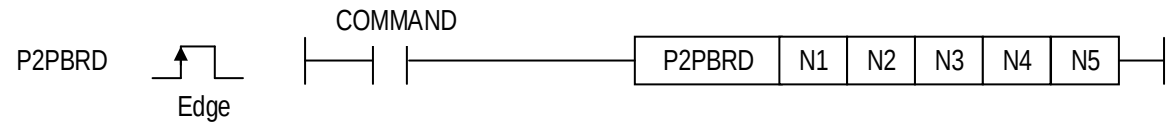
4.40.4 P2PBRD / Specify reading area (BIT)

This command is used to change the data size of the P2P READ block and the starting address of the area to read the BIT device.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

]

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
P2PBRD	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	O	O	O	O	-	-	O	O	-	O	-	-	-				



[Area setting]

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number set when reading/writing individually(1~4)	WORD
N4	Data size (1 ~ 2000)	WORD
N5	Start address of read area	End bit of BSFT Operation

[Flag Set]

Flag	Content	Device number
error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

1) Function

(1) This command is used to change the data size of the P2P READ block and the starting address of the area to read.

(2) Change the setting of N2 block of P2P designated by N1.

If the method is “1.Individual”, change the starting address of the read area of the N3th variable to N5.

N4 data size is ignored at this time and is not changed.

If the method is “2.Continuous”, change N4 and N5 to the data size and the starting address of the area to read, respectively.

(3) Applied product: Enet, FDEnet, Cnet(Cnet, FEnet XGT dedicated communication only)

2) Error

(1) If the value of N1(1~8), N2(0~63), N3(0~4) and N4(1~2000) goes outside the settable range, set the error flag (F110).

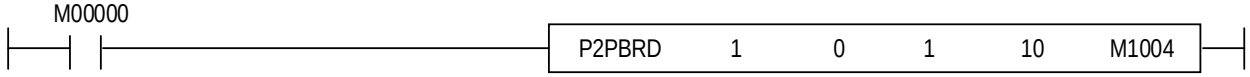
3) Example

(1) LD

* Execution order and instruction

(a) The following example is an example of changing the data size and the read area of P2P Read block using P2PBRD instruction.

(b) When M00000 is On, the data size of block 0 of P2P 01 is changed to 10 and the starting address of the read area is changed to M1004.



(2) ST (Automatic program assignment)

P2PBRD_EN(EN:=(*BIT*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*), Num4:=(*WORD*), Num5:=(*BIT*));

4) Caution

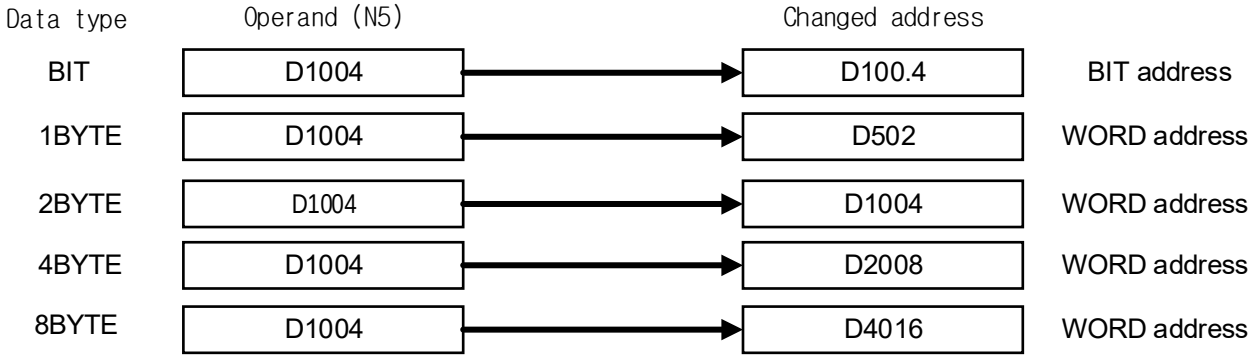
(1) In case of individual command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.

(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.

(3) The size of variable (N4) is used in byte.

(4) Depending on the data type, the starting address of the area to be read is applied differently.

Ex) When reading area is changed to M1004

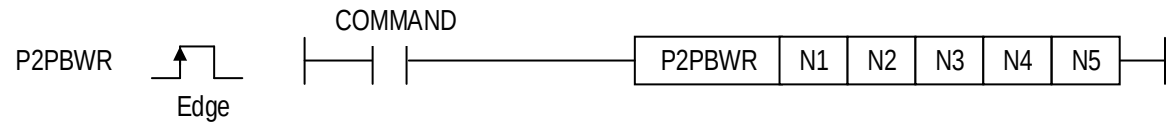


4.40.5 P2PBWR / Specify writing area (BIT)

This command is used to change the data size of the P2P WRITE block and the starting address of the area to write the BIT device.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
P2PBWR	N1	O	O	O	O	O	-	O	-	-	O	O	O	O	O	4~6	O	-	-
	N2	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N3	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N4	O	O	O	O	O	-	O	-	-	O	O	O	O	O				
	N5	O	O	O	O	O	-	-	O	O	-	O	-	-	-				



[Area setting]

Operand	Description	Data size
N1	P2P number (1 ~ 8)	WORD
N2	Block number (0 ~ 63)	WORD
N3	Variable number set when reading/writing individually(1~4)	WORD
N4	Data size (1 ~ 2000)	WORD
N5	Start address of write area	End bit of BSFT Operation

[Flag Set]

Flag	Content	Device number
error	If the value of N1, N2, N3 and N4 goes outside the relevant range	F110

Function

(1) This command is used to change the data size of the P2P WRITE block and the starting address of the area to write.

(2) Change the setting of N2 block of P2P designated by N1.

If the method is 1 Individual, change the starting address of the write area of the N3th variable to N5.

N4 data size is ignored at this time and is not changed.

If the method is 2 Continuous, change N4 and N5 to the data size and the starting address of the area to write, respectively.

(3) Applied product: Enet, FDEnet, Cnet(Cnet, FEnet XGT dedicated communication only)

2) Error

(1) If the value of N1(1~8), N2(0~63), N3(0~4) and N4(1~2000) goes outside the settable range, set the error flag (F110).

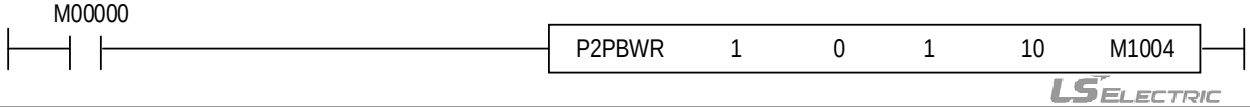
3) Example

(1) LD

* Execution order and instruction

(a) The following example is an example of changing the data size and the write area of P2P WRITE block using P2PBWR instruction.

(b) When M00000 is On, the data size of block 0 of P2P 01 is changed to 10 and the starting address of the write area is changed to M1004.

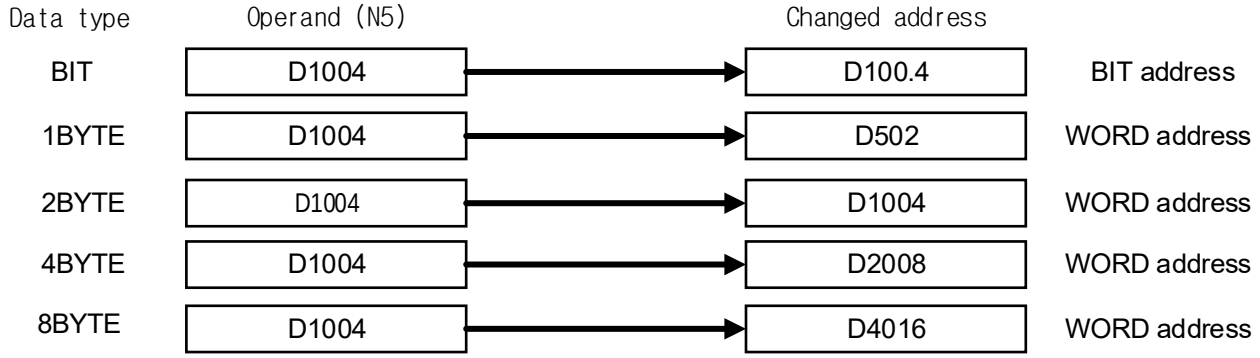


(2) ST (Automatic program assignment)

P2PBWR_EN(EN:=(*BIT*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*), Num4:=(*WORD*), Num5:=(*BIT*));

4) Caution

(1) In case of individual command, a value between 1 and 4 is used for the variable number (N3) and the size of valuable (N4) does not apply.
(2) In case of continuous command, 1 is always used for the variable number (N3) and the size of variable (N4) applies.
(3) Depending on the data type, the starting address of the area to be write is applied differently.
Ex) When writing area is changed to M1004

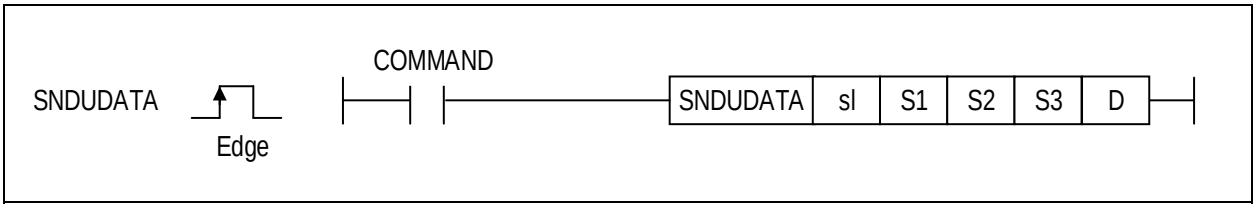


4.40.6 SNDUDATA / User frame definition data communication

This is a command to send the user frame definition data.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	O	O	X	O	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SNDUDATA	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O				
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	S3	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
sl	Base (x) and slot (y) number with Communication module(Cnet, FEnet): h00xy	WORD
S1	Channel information (1~2)	WORD
S2	Start device number where data to be sent is saved	WORD
S3	Size of data to be sent (up to 1024 bytes)	WORD
D	Temporary device number to be used internally in the command	WORD

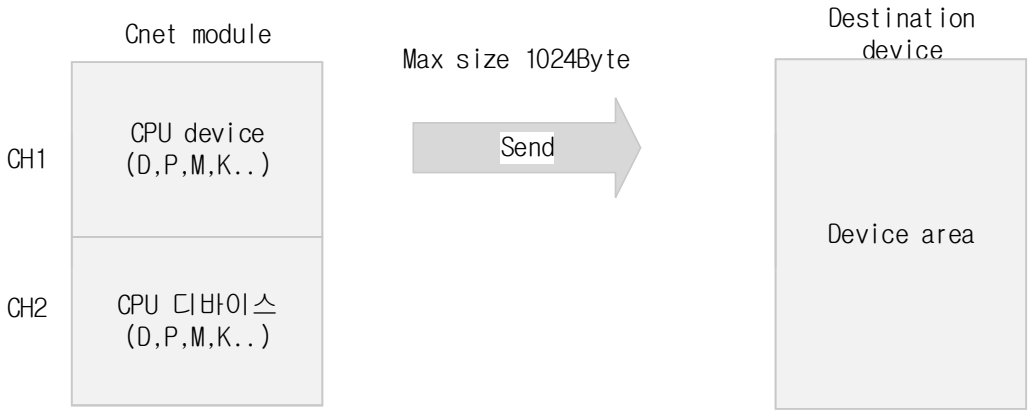
[Flag Set]

Flag	Content	Device number
error	1. When the sl value does not match the base and slot number where the communication module (Cnet, FEnet) is installed.	F110

1) Function

(1) This command sends the user frame definition data (UDATA).
(2) Enter the base number and the slot number where the communication module (Cnet i/F, FEnet) is installed.
(3) S1 means channel number and in case of Cnet, only 1 or 2 should be set, and FEnet should input P2P channel set as user defined.

(4) S2 indicates the address of start area where UDATA is saved.
(5) S3 indicates the size of UDATA to be sent and S3 data is sent from the area designated by S2.
Up to 1024 can be transmitted and the unit is Byte.



(6) D is a device area used as a temporary area for saving command information, and the size is 4 words (D+0 ~ D+3)
In the case of FEnet module, the upper 1Byte indicates the Ethernet connection status, and the lower 1Byte indicates the command status information.
In case of Cnet module, it is displayed as '00'.
All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D	WORD	Status code
D+1	WORD	Reserved area (Usage prohibited)
D+2	WORD	Reserved area (Usage prohibited)
D+3	WORD	Reserved area (Usage prohibited)

(7) Applied product: Cnet, FEnet

2) Error

(1) If the sl value does not match the base and slot number where the communication modules (Cnet, FEnet) are installed, set the error flag (F110).

3) Status Information

(1) Upper byte

Status code	Status information	Meaning
00	Initial status	Before command execution or when Cnet module is installed
01	Disconnect	No Ethernet connection
02	Connect	Ethernet connection is complete
03	Waiting for connection	Waiting for response for Ethernet connection.
04	Connecting	Ethernet connecting
05	Disconnecting	Disconnecting Ethernet

* If a command error occurs, the upper byte is displayed as 00.

(2) Lower byte

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where the communication module (Cnet, FEnet) is not installed.
03	Channel setting error	Cnet: If the S1 channel information value is not 1 or 2 Fenet: If the P2P channel setting of S1 channel information value is user frame definition.
04	Transmitted data size setting error	If the transmitted data size is less than 0 or exceeds 1024
05	Communication parameter setting error	If the communication parameter of communication module(Cnet,FEnet) are not set by user frame definition or link enable is not set
06	Timeout error	When there is no response to the command due to communication module (Cnet, FEnet) error.
07	Version compatibility error	Cnet: Cnet version is below V3.2, CPU version is below V4.2 FEnet: FEnet version is below V8.0 , CPU version is below V4.7
09	Performing previous command	When the start condition is met before execution of the previous command is completed for the same slot.

4) Example

(1) LD

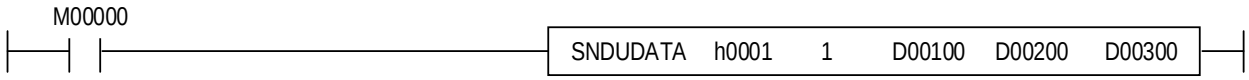
* Execution order and instruction

(a) The following example is an example of sending UDATA using SNDUDATA command.

(b) Use channel 1 of Cnet module installed in slot 0, base 1

(c) When M00000 is On, the number of data stored in D00200 is transmitted from the D00100 device.

(d) D00300~D00303 areas are used for command processing.



(2) ST (Automatic program assignment)

SNDUDATA_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), S2:=(*WORD*), S3:=(*WORD*), D=>(*WORD*));

5) Caution

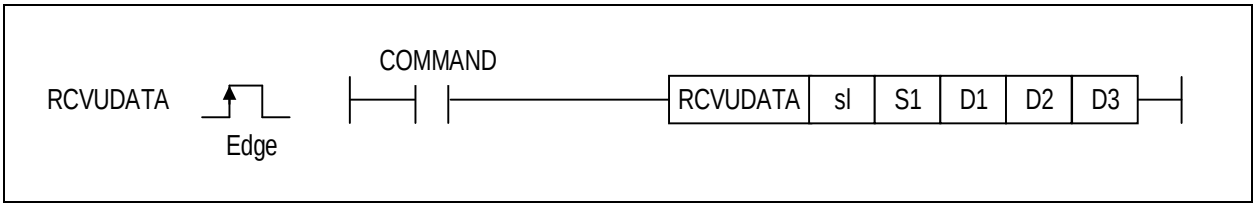
(1) Device D+1~D+3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

4.40.7 RCVUDATA / User frame definition data communication

This is a command to send the user frame definition data.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	O	O	X	O	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
RCVUDATA	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	O			
	D2	O	-	O	-	-	-	O	-	-	-	O	O	O	O			
	D3	O	-	O	-	-	-	O	-	-	-	O	O	O	O			



[Area setting]

Operand	Description	Data type
sl	Base (x) and slot (y) number with Communication module(Cnet, FEnet): h00xy	WORD
S1	Channel information (1~2)	WORD
D1	Start device number to save the received data	WORD
D2	Size of received data (up to 1024 bytes)	WORD
D3	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Content	Device number
error	1. When the sl value does not match the base and slot number where the communication module (Cnet, FEnet) is installed.	F110

1) Function

(1) This command receives the user definition data (UDATA).

(2) Enter the base number and the slot number where the communication module (Cnet i/F, FEnet) is installed.

(3) S1 means channel number and in case of Cnet, only 1 or 2 should be set, and FEnet should input P2P channel set as user defined.

(4) D1 indicates the address of the start area where received UDATA will be saved.

(5) D2 indicates the size of received UDATA and the unit is byte.

(6) D3 is a device area used as a temporary area for saving command information, and the size is 4 words (D3 ~ D3+3).

In the case of FEnet module, the upper 1Byte indicates the Ethernet connection status, and the lower 1Byte indicates the command status information.

In case of Cnet module, it is displayed as '00'.

All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D3	WORD	Status code
D3+1	WORD	Reserved area (Usage prohibited)
D3+2	WORD	Reserved area (Usage prohibited)
D3+3	WORD	Reserved area (Usage prohibited)

(7) Applied product: Cnet, FDEnet

2) Error

(1) If the sl value does not match the base and slot number where the communication modules (Cnet, FEnet) are installed, set the error flag (F110).

3) Status Information

(1) Upper byte

Status code	Status information	Meaning
00	Initial status	Before command execution or when Cnet module is installed
01	Disconnect	No Ethernet connection
02	Connect	Ethernet connection is complete
03	Waiting for connection	Waiting for response for Ethernet connection.
04	Connecting	Ethernet connecting
05	Disconnecting	Disconnecting Ethernet

(3) Lower byte

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where the communication module (Cnet, FEnet) is not installed.
03	Channel setting error	Cnet: If the S1 channel information value is not 1 or 2 Fenet: If the P2P channel setting of S1 channel information value is user frame definition.
04	There is no received data	If no data has been received
05	Communication parameter setting error	If the communication parameter of communication module(Cnet,FEnet) are not set by user frame definition or link enable is not set
06	Timeout error	When there is no response to the command due to communication module (Cnet, FEnet) error.
07	Version compatibility error	Cnet: Cnet version is below V3.2, CPU version is below V4.2 FEnet: FEnet version is below V8.0 , CPU version is below V4.7
09	Performing previous command	When the start condition is met before execution of the previous command is completed for the same slot.

* Status code 9 is XGB only

4) Example

(1) LD

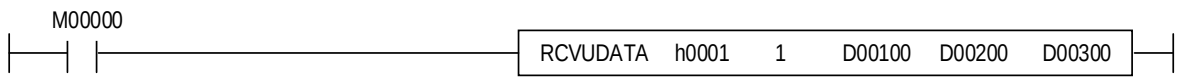
* Execution order and instruction

(a) The following example is an example of receiving UDATA using RCVUDATA command.

(b) Use channel 1 of Cnet module installed in slot 0, base 1

(c) When M00000 is On, if there is receive data, it save data as much as the data set in D00200 from D00100 device.

(d) D00300~D00303 areas are used for command processing.



(2) ST (Automatic program assignment)

```
RCVUDATA_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), Dst1:=(*WORD*), Dst2:=(*WORD*), Dst3=>(*WORD*));
```

5) Caution

(1) Device D+1~D+3 specified to D3 is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

(2) Since the maximum size of the received data is 1024 bytes, the device address set in D1 + the size of the received data set in D2 must be set so as not to exceed the end area of the CPU module device.

4.40.8 SENDDTR / DTR control

Command to control DTR signal among RS232 signal lines.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	O	O	X	O	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
SENDDTR	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O			

[Area setting]

Operand	Description	Data type
sl	Base (x) and slot (y) number where Cnet odule is mounted: h00xy	WORD
S1	Channel information (1~2)	WORD
S2	DTR setting value(0 : Off or 1: On(communication ready completion))	WORD
D	Temporary device number to be used internally in the command	WORD

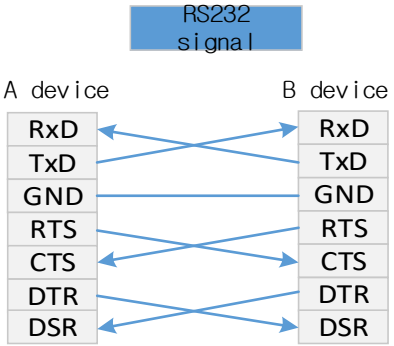
[Flag Set]

Flag	Content	Device number
error	1. If sl value does not match with base number or slot number where the CNET module is installed	F110

1) Function

(1) This command is a command to send DTR (Data Terminal Ready) signal to communicate that communication ready is completed.
(2) Enter the base number and the slot number where Cnet module is installed.
(3) S1 indicates the channel number and only 1 or 2 should be set.
(4) S2 should be set to 0 or 1 only as DTR value. DTR (Data Terminal Ready) is an RS232 signal line that informs the other device that the device is capable of transmitting and receiving.

No.	Pin name	Pin descrition	Direction
1	DCD	Signal to notify the destination device when connection is complete	input
2	RxD	Recive data	input
3	TxD	Send data	output
4	DTR	Sending and receiving is possible(Host)	output
5	GND	Ground	-
6	DSR	Sending and receiving is possibl	input
7	RTS	Ready to receive data(Host)	output
8	CTS	Ready to receive data(Server)	input
9	RI	Ring display	input



(5) D is a device area used as a temporary area for saving command information, and the size is 4 words (D ~ D+3) All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D	WORD	Status code
D+1	WORD	Reserved area (Usage prohibited)
D+2	WORD	Reserved area (Usage prohibited)
D+3	WORD	Reserved area (Usage prohibited)

(6) Applied product: Cnet

2) Error

(1) If the sl value does not match the base and slot number where Cnet module is installed, set the error flag (F110).

3) Status Information

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where Cnet module is not installed.
03	Channel setting error	If the S1 channel information value is not 1 or 2
04	DTR level setting error	If the S2 DTR setting value is not 0 or 1
05	Communication parameter setting error	If the communication parameter of Cnet module is not set by user frame definition or link enable is not set.
06	Timeout error	If there is no response to the command due to Cnet module F module error
07	Version compatibility error	If the Cnet version is below V3.2 and the relevant command is not supported (If the CPU version is below V4.2, program download will not be available.)
09	Performing previous command	When the start condition is met before execution of the previous command is completed for the same slot.

* Status code 9 is XGB only

4) Example

(1) LD

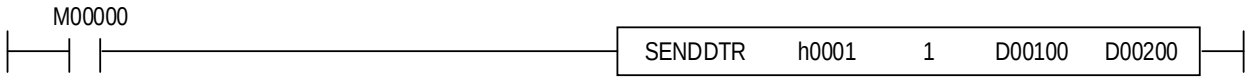
* Execution order and instruction

(a) The following example is an example of controlling the DTR signal using the SENDDTR instruction.

(b) Use channel 1 of Cnet module installed in slot 0, base 1

(c) When M00000 is On, the DTR signal is controlled by the values (0, 1) saved in D00100.

(d) D00200~D00203 areas are used for command processing.



(2) ST (Automatic program assignment)

```
SENDDTR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), S2:=(*WORD*), D=>(*WORD*));
```

5) Caution

(1) Device D+1~D+3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

4.40.9 SENDDTR / RTS (Ready To Send) control

Command to control RTS signal among RS232 signal lines.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	O	O	X	O	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
SENDRTS	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O			

[Area setting]

Operand	Description	Data type
sl	Base (x) and slot (y) number where Cnet odule is mounted: h00xy	WORD
S1	Channel information (1~2)	WORD
S2	RTS setting value(0 : Off or 1: On(Send request))	WORD
D	Temporary device number to be used internally in the command	WORD

[Flag Set]

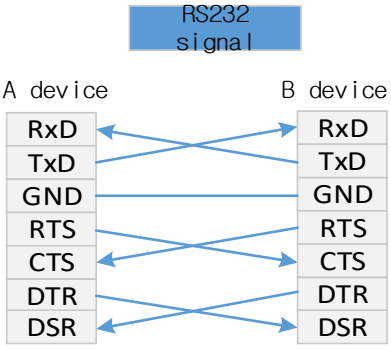
Flag	Content	Device number
error	1. If sl value does not match with base number or slot number where the CNET module is installed	F110

1) Function

(1) This command sends RTS (Request To Send) which is a signal that indicates its own reception buffer status.
(2) Enter the base number and the slot number where Cnet module is installed.
(3) S1 indicates the channel number and only 1 or 2 should be set.
(4) S2 should be set to 1 to receive data from the modem as RTS value, and the settable values should be set to 0 or 1.

RTS (Request To Send) with RS232 signal line is a signal that requests the send to the external device by notifying the receive buffer status of the device.

No.	Pin name	Pin descrition	Direction
1	DCD	Signal to notify the destination device when connection is complete	input
2	RxD	Recive data	input
3	TxD	Send data	output
4	DTR	Sending and receiving is possible(Host)	output
5	GND	Ground	-
6	DSR	Sending and receiving is possibl	input
7	RTS	Ready to receive data(Host)	output
8	CTS	Ready to receive data(Server)	input
9	RI	Ring display	input



(5) D is a device area used as a temporary area for saving command information, and the size is 4 words (D ~ D+3) All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D	WORD	Status code
D+1	WORD	Reserved area (Usage prohibited)
D+2	WORD	Reserved area (Usage prohibited)
D+3	WORD	Reserved area (Usage prohibited)

(6) Applied product: Cnet

2) Error

(1) If the sl value does not match the base and slot number where Cnet module is installed, set the error flag (F110).

3) Status Information

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where Cnet module is not installed.
03	Channel setting error	If the S1 channel information value is not 1 or 2
04	DTR level setting error	If the S2 DTR setting value is not 0 or 1
05	Communication parameter setting error	If the communication parameter of Cnet module is not set by user frame definition or link enable is not set.
06	Timeout error	If there is no response to the command due to Cnet module F module error
07	Version compatibility error	If the Cnet version is below V3.2 and the relevant command is not supported (If the CPU version is below V4.2, program download will not be available.)
09	Performing previous command	When the start condition is met before execution of the previous command is completed for the same slot.

* Status code 9 is XGB only

4) Example

(1) LD

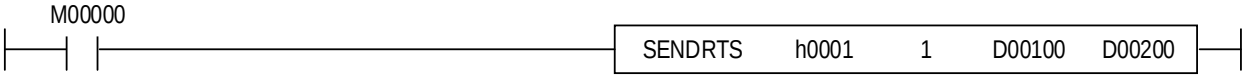
* Execution order and instruction

(a) The following example is an example of controlling the RTS signal using the SENDRTS instruction.

(b) Use channel 1 of Cnet module installed in slot 0, base 1

(c) When M00000 is On, the RTR signal is controlled by the values (0, 1) saved in D00100.

(d) D00200~D00203 areas are used for command processing.



(2) ST (Automatic program assignment)

SENDRTS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), S2:=(*WORD*), D=>(*WORD*));

5) Caution

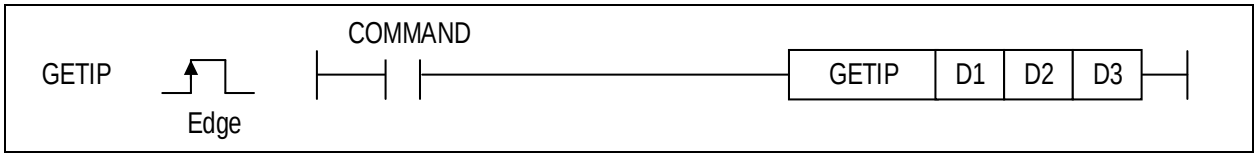
(1) Device D+1~D+3 specified to D is the space where various information used in the command is saved. Therefore, the user should not change the value of the relevant area arbitrarily. If the value of the relevant area is changed arbitrarily, the command will not operate normally.

4.40.10 GETIP / Local Ethernet information read

This command reads local Ethernet information (IP, Subnet mask, Gateway).

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	O	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
GETIP	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	D2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D3	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
D1	Device number to save IP Address.	WORD
D2	Device number to save subnet mask.	WORD
D3	Device number to save gateway	WORD

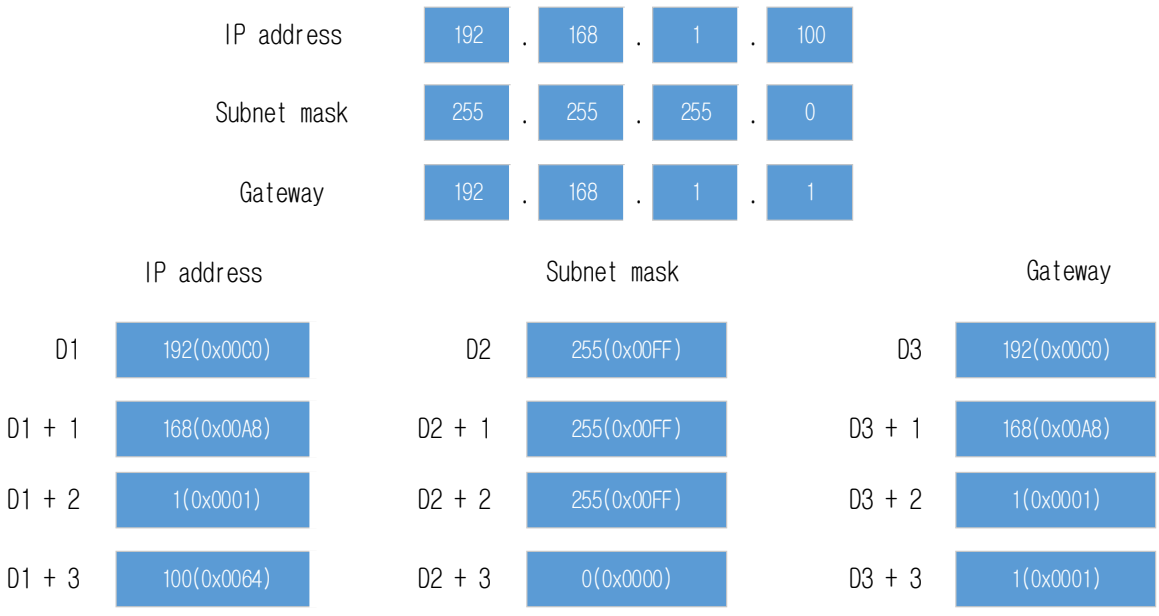
[Flag Set]

Flag	Content	Device number
error	1. Local Ethernet parameter setting is abnormal 2. Command execution is not completed in one scan(XGK-CPUSN/HN/UN). 3. If the IP address, subnet mask, and gateway settings are invalid	F110

1) Function

(1) This command reads local Ethernet information and saves it in the specified device.

(2) The IP address, subnet mask, and gateway settings are saved as follows: Each address is assigned 4 words.



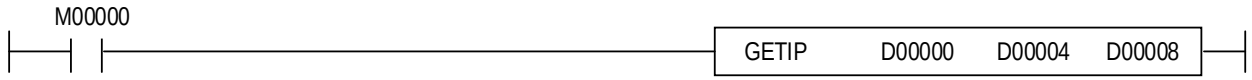
2) Example

(1) LD

* Execution order and instruction

(a) The example below is an example of saving local Ethernet information to a configured device using the GETIP command.

(b) When the input signal M00000 is on, the local Ethernet IP address, subnet mask, and gateway settings are read and saved in D00000, D00004, and D00008 respectively.



(2) ST (Automatic program assignment)

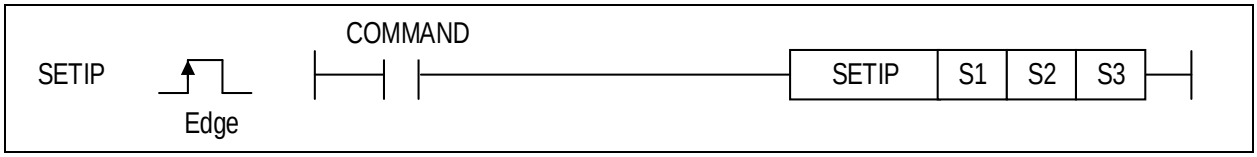
```
GETIP_EN(EN:=(*BIT*), Dst1=>(*WORD*), Dst2=>(*WORD*), Dst3=>(*WORD*));
```

4.40.11 SETIP/ Local Ethernet information setting

This command set local Ethernet information (IP, Subnet mask, Gateway).

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	O	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
SETIP	S1	O	-	O	-	-	-	O	-	-	-	O	O	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	S3	O		O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

Operand	Description	Data type
S1	Device number to save IP Address.	WORD
S2	Device number to save subnet mask.	WORD
S3	Device number to save gateway.	WORD

[Flag Set]

Flag	Content	Device number
error	1. Local Ethernet parameter setting is abnormal 2. If the IP address, subnet mask, and gateway settings are invalid 3. When DHCP is set(XBCU-DN32U/UA/UP, XBMH-DN32H/HP)	F110

1) Function

(1) This command is setting local Ethernet information.

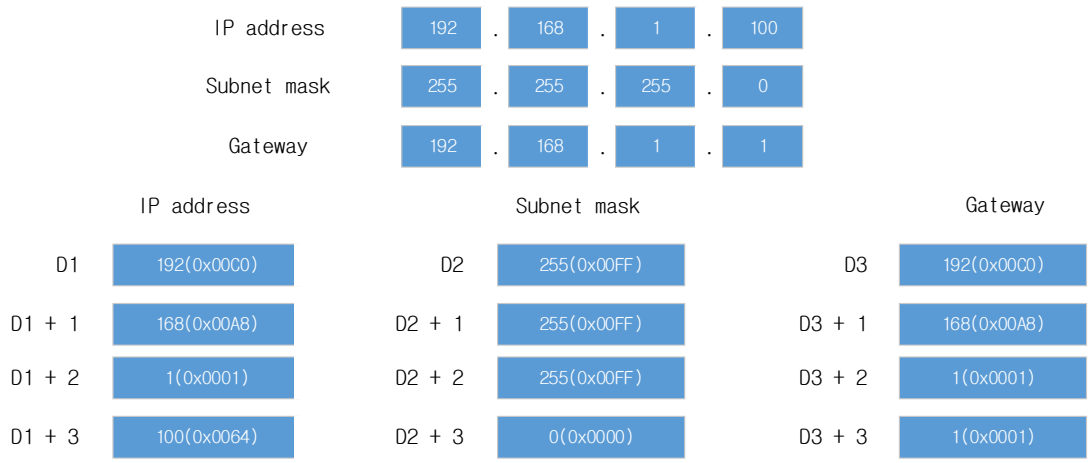
(2) Change the values set in S1, S2, and S3 to the IP address, subnet mask, and gateway of the local Ethernet.(It cannot be used on models without Local Ethernet).

Set the IP address, subnet mask, and gateway at the same time. To change only the IP address

Use the current subnet mask and gateway settings using the GETIP command.

When setting the IP address, you should pay attention to the address setting as below.

(For example, when setting the IP address to 192.168.1.100, in order to input the setting value to the device, 192(0x00C0) in S1, 168(0X00A8) in S1+1, 1(0x0001) in S1+2, and (0x0064) in S1+3 must be entered in 3.)



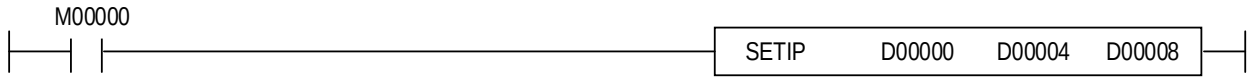
2) Example

(1) LD

* Execution order and instruction

(a) The example below is setting local Ethernet information to a configured device values using the SETIP command.

(b) When the input signal M00000 is on, the local Ethernet IP address, subnet mask, and gateway are setting to values saved in D00000, D00004, and D00008 respectively.



(2) ST (Automatic program assignment)

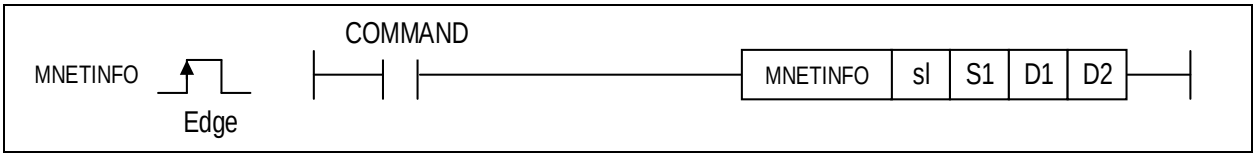
```
SETIP_EN(EN:=(*BIT*), S1:=(*WORD*), S2:=(*WORD*), S3:=(*WORD*));
```

4.40.12 MNETINFO / FENET module Ethernet information read

This command reads Ethernet information(IP, Subnet mask, Gateway, MAC(Medium Access Control) of FENET module.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MNETINFO	SI	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	-	-	O	O				
	D1	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	D2	O	-	O	-	-	-	O	-	-	-	-	-	O	O				



[Area setting]

Operand	Description	Data type
sl	Base number and slot number where the FEnet module is installed	WORD
S1	Version of diagnosis information(Version information : 1 input)	WORD
D1	Device number to save IP, Subnet, Gateway, MAC Address.	WORD
D2	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Content	Device number
error	1. When the sl value does not match the base and slot number where FEnet module is installed.	F110

1) Function

(1) This command can read the IP address, subnet mask, gateway, and MAC settings of the FENET module.
(2) sl enters the base and slot number where the FENET module is installed.
(3) S1 enters the version of the information you want to read
In the case of the version of the diagnostic information, a future version will be added, but currently only version 1 can be entered.
(3) The read setting value is expressed as below.

Ex) IP Address : 192.168.0.100
Subnet : 255.255.255.0
Gateway : 192.168.0.1
MAC address : 00-16-EA-50-AB-CD

D1 : 192 (0x00C0) // IP Address
D1 + 1 : 168 (0x00A8)
D1 + 2 : 0 (0x0000)
D1 + 3 : 100 (0x00C8)
D1 + 4 : 255 (0x00FF) // Subnet Address
D1 + 5 : 255 (0x00FF)
D1 + 6 : 255 (0x00FF)
D1 + 7 : 0 (0x0000)
D1 + 8 : 192 (0x00C0) // GateWay Address
D1 + 9 : 168 (0x00A8)
D1 + 10 : 0 (0x0000)
D1 + 11 : 1 (0x0001)

D1 + 12 : 0x0000 // MAC Address
D1 + 13 : 0x0016
D1 + 14 : 0x00EA
D1 + 15 : 0x0050
D1 + 16 : 0x00AB
D1 + 17 : 0x00CD

(5) D2 is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D2	WORD	Error code
D2+1	WORD	Internal status(WAIT or DONE)
D2+2	WORD	RETRY COUNT

2) Status Information

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where FEnet module is not installed.
03	Version compatibility error	If the FEnet version is below V8.1 and the relevant command is not supported (If the CPU version is below V1.4, program download will not be available.)
04	User set value error	When version information is 0
05	Timeout error	If there is no response to the command due to FEnet module F module error
06	Performing previous command	When the start condition is met before execution of the previous command is completed for the same slot.
08	IO Skip setting error	The user has skipped the module.
09	Module detach error	The module is dropped out during execution

3) Example

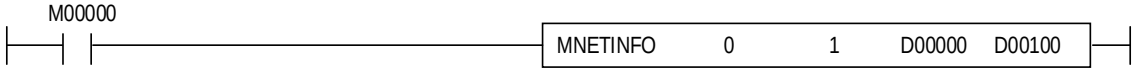
(1) LD

* Execution order and instruction

(a) The example below is an example of saving the Ethernet information of the FENET module to the value of the configured device using the MNETINFO command.

(b) When the FENET module is installed in slot 0, when the input signal M00000 is On, the IP address, subnet mask, gateway, and MAC address settings of the FENET module Ethernet are stored in D00000 to D00017 respectively.

(c) In D00100~D00103 area, status information of command is saved.



(2) ST (Automatic program assignment)

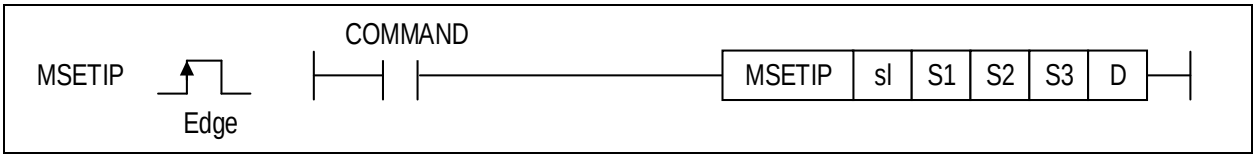
```
MNETINFO_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), Dst1=>(*WORD*), Dst2=>(*WORD*))
```

4.40.13 MSETIP / FENET module Ethernet information Setting

This is the command to set the Ethernet information (IP, Subnet mask, Gateway) of the ENET module.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MSETIP	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	S2	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	S3	O	-	O	-	-	-	O	-	-	-	-	-	O	O				
	D	O	-	O	-	-	-	O	-	-	-	-	-	O	O				



[Area setting]

Operand	Description	Data type
Sl	Base number and slot number where the FEnet module is installed	WORD
S1	Device number to save IP Address.	WORD
S2	Device number to save subnet mask.	WORD
S3	Device number to save gateway.	WORD
D	Temporary device number to be used internally in the command	WORD

[Flag Set]

Flag	Content	Device number
error	1. When the sl value does not match the base and slot number where FEnet module is installed.	F110

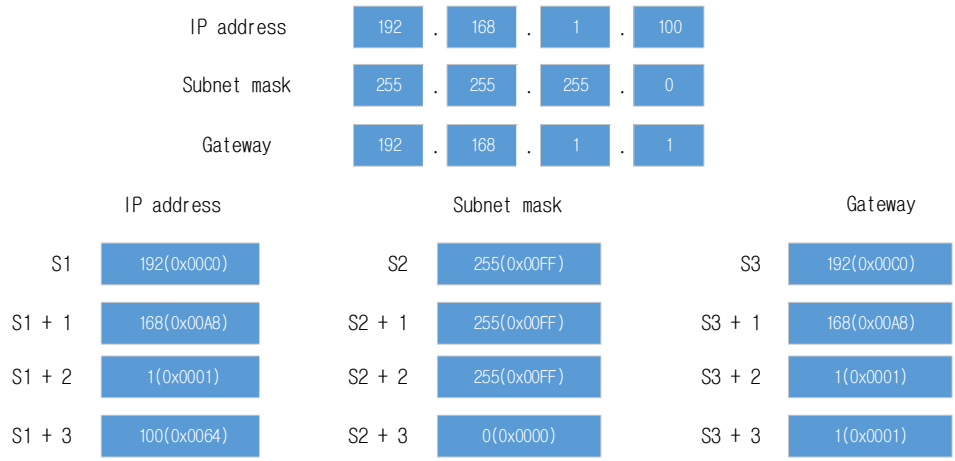
1) Function

(1) This command is to set Ethernet information of FENET module. It is a command to change IP address, subnet mask, and gateway settings.

(2) Enter the base number and the slot number where FEnet module is installed.
(2) Set the Ethernet address of the FENET module to the values set in S1, S2, and S3.
(4) Set the IP address, subnet mask, and gateway at the same time. To change only the IP address, use the MNETINFO command to load and use the currently set subnet mask and gateway settings.

(5) When setting the IP address, you should pay attention to the address setting as below.
(For example, when setting the IP address to 192.168.0.100, in order to input the setting value to the device, enter 192 (0x00C0) for S1, 168 (0x00A8) for S1+1, 0 (0x0000) for S1+2, and 100 (0x00C8) for S1+3.)

(6) If the FENET module is configured with DHCP, the IP of the module is not changed.



(7) D is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D	WORD	Status code
D+1	WORD	Internal status(WAIT or DONE)
D+2	WORD	RETRY COUNT

2) Status Information

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where FEnet module is not installed.
03	Version compatibility error	If the FEnet version is below V8.1 and the relevant command is not supported (If the CPU version is below V1.4, program download will not be available.)
04	User set value error	When the IP, subnet, and gateway values set by the user are out of range 1) When IP is out of the setting range (1~223) 2) When SBNET is all 0 or 255 3) When GATEWAY[3] is out of the setting range (1~254)
05	Timeout error	If there is no response to the command due to FEnet module F module error
06	Performing previous command	When the start condition is met before execution of the previous command is completed for the same slot.
07	Communication setting value error	Communication parameter setting error (If communication Ethernet parameters were not downloaded)
08	IO Skip setting error	The user has skipped the module.
09	Module detach error	The module is dropped out during execution

3) Example

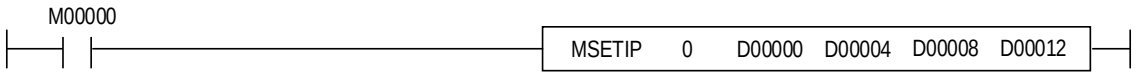
(1) LD

* Execution order and instruction

(a) The example below is an example of setting the Ethernet information of the FENET module to the value of the configured device using the MSETIP command.

(b) When the FENET module is installed in slot 0, when the input signal M00000 is On, the IP address, subnet mask, gateway, and MAC address settings of the FENET module Ethernet are stored in D00000, D00004 to D00008 respectively.

(c) In D00012~D00014 area, status information of command is saved.



(2) ST (Automatic program assignment)

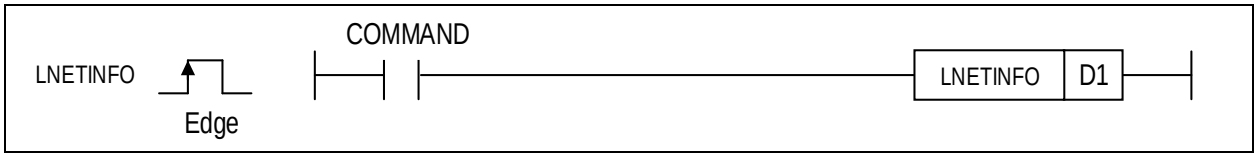
```
MSETIP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), S2:=(*WORD*), S3:=(*WORD*),
D=>(*WORD*))
```

4.40.14 LNETINFO / Local Ethernet information read(MAC)

This command reads local Ethernet information (IP, Subnet mask, Gateway, MAC).

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LNETINFO	D1	O	-	O	-	-	-	O	-	-	-	-	-	O	O	2	-	-	-



[Area setting]

Operand	Description	Data type
D1	Device number to save IP, Subnet, Gateway, MAC Address.	WORD

1) Function

(1) This command can read the IP address, subnet mask, gateway, and MAC settings of the local FENET module.
(2) The read setting value is expressed as below.

Ex) IP Address : 192.168.0.100
Subnet : 255.255.255.0
Gateway : 192.168.0.1
MAC address : 00-16-EA-50-AB-CD

D1 : 192 (0x00C0) // IP Address
D1 + 1 : 168 (0x00A8)
D1 + 2 : 0 (0x0000)
D1 + 3 : 100 (0x00C8)
D1 + 4 : 255 (0x00FF) // Subnet Address
D1 + 5 : 255 (0x00FF)
D1 + 6 : 255 (0x00FF)
D1 + 7 : 0 (0x0000)
D1 + 8 : 192 (0x00C0) // GateWay Address
D1 + 9 : 168 (0x00A8)
D1 + 10 : 0 (0x0000)
D1 + 11 : 1 (0x0001)
D1 + 12 : 0x0000 // MAC Address
D1 + 13 : 0x0016
D1 + 14 : 0x00EA
D1 + 15 : 0x0050
D1 + 16 : 0x00AB
D1 + 17 : 0x00CD

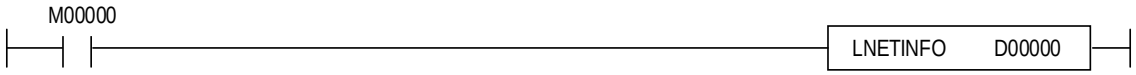
2) Example

(1) LD

* Execution order and instruction

(a) The example below is an example of saving the Ethernet information of the local FENET module to the value of the configured device using the LNEINFO command.

(b) When the input signal M00000 is on, the local Ethernet IP address, subnet mask, gateway and MAC address setting values are saved in D00000 ~ D00017 respectively.



(2) ST (Automatic program assignment)

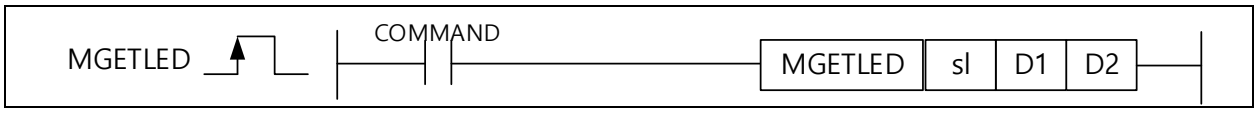
```
LNETINFO_EN(EN:=(*BIT*), D1=>(*WORD*))
```

4.40.15 MGETLED / FENT module LED information

This command reads the LED status information of local Ethernet.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	X	X	X	X	X	X

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
MGETLED	sl	O		O				O			O			O	O	-	O	-	-
	D1	O		O				O						O	O				
	D2	O		O				O						O	O				



[Area setting]

Operand	Description	Data type
sl	Base number and slot number where the FEnet module is installed	Word
D1	Device number to save LED information.	DWORD
D2	Status code	Word

[Flag Set]

Flag	Description	Device number
error	1. Error Code	F110

1) Function

(1) This command is to read LED information of the FENET module.

(2) S1 enters the base and slot number where the FENET module is installed..

Ex) In case of No. 3 base and No. 5 slot: h35

When the device number of D1 is M0, the LED information is expressed as follows according to the read operation status of the module.

Ex) HS(High speed link)setting, LNK0 ON, RUN: h00001201

For LED information, refer to the LED bitmap below.

Bitmap LED info.

Number	LED information	Number	LED information
0	HS	8	ACT0
1	P2P	9	LINK0
2	PADT	10	ACT1
3	ERR	11	LINK1
4	SVR	12	RUN
5	RELAY	13	-
6	CHK	14	-
7	FAULT	15	-

(4) D2 is the temporary area to save command information, and a value to be saved is as follows. All initial values are 0, and if the user modifies the data value arbitrarily, the command may malfunction.

CPU area	Data size	Stratus type
D2	Word	Error code
D2+1	Word	Internal status(WAIT or DONE)
D2+2	Word	RETRY COUNT

Status code	Status information	Meaning
00	Initial status	Before command execution
01	Complete	If the command has been executed normally
02	Module setting error	When the sl value is set to the base or slot where FEnet module is not installed.
03	Version compatibility error	If the FEnet version is below V8.3 and the relevant command is not supported (If the CPU version is below V1.5, program download will not be available.)
05	Timeout error	If there is no response to the command due to FEnet module F module error
06	Performing previous command	When the start condition is met before the execution of the previous command is completed for the same slot.(It can also occur when a command to read the IP/MAC information of the FENET module is being executed.)
07	Buffer Full error	When the request memory buffer is full
08	IO Skip setting error	The user has skipped the module.
09	Module detach error	The module is dropped out during execution

2) Example

(1) LD

* Execution order and instruction

(a) The example below is an example of saving the LED information of the FENET module to the value of the configured device using the GETLED command.

(b) When the FENET module is installed in slot No. 0 base 1, when the input signal P0000 is On, the LED information setting values of the FENET module stored in M00000.

(c) Status information of command is saved in M0010.

For details of the value h0001A01 stored in M0000, check the bitmap information below.

	Number	LED information	Number	LED information	
ⓐ	0	HS	8	ACT0	ⓒ
	1	P2P	9	LINK0	
	2	PADT	10	ACT1	
	3	ERR	11	LINK1	
ⓑ	4	SVR	12	RUN	ⓓ
	5	RELAY	13	-	
	6	CHK	14	-	
	7	FAULT	15	-	

Refer to lower word 1A01

ⓓ ⓒ ⓑ ⓐ

0001,1010,0000,0001

It is expressed as above.

Therefore, if you check the information from ⓐ

➔ HS high speed link setting, LNK0, LINK1 connection, indicating that the status is RUN

(2) ST (Automatic program assignment)

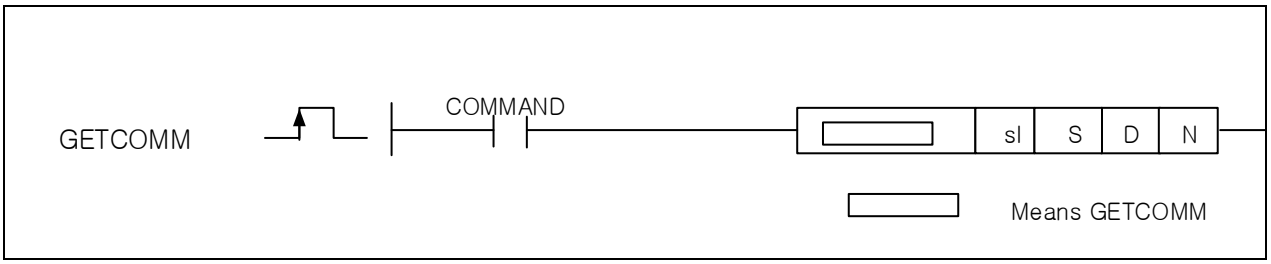
```
MGETLED_EN(EN:=(*BIT*), sl=>(*WORD*), Dst1=>(*DWORD*), Dst2=>(*WORD*));
```

4.40.16 GETCOMM / CANopen Module SDO command (receive)

The SDO instruction is largely divided into the read instruction GETCOMM and the write instruction PUTCOMM. At this time, the command can be set for only one sub index.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	X	X	X	O	O	O	X	O	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GETCOMM	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S	O	-	O	-	-	-	-	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	-	-	-	-	O	O*1)	O	O				
	N	O	-	O	-	-	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
sl	Slot number where the communication module is installed(set in hexadecimal)	WORD
S	Slave station number, SDO index and sub index to read	WORD
D	Start address of the device to store the data read from the slave	WORD
N	Maximum byte length of data to read from communication module, actual data is N (total size), that is, data after 8 is actual data	WORD

[Flag Set]

Flag	Content	Device number
PUTCOMM/ GETCOMM error	- If there is no communication module in the designated slot, the corresponding bit is ON. - If the PUTCOMM/GETCOMM instruction is not executed properly, the corresponding bit is turned on.	F0015 Bit14 of D device
PUTCOMM / GETCOMM Complete	- If a normal response is received from the destination station communication module, the corresponding bit is on.	F0023 Bit15 of D device

1) Function

(1) This command is used to read the data of the other device through the communication module.

(2) Sends 6 bytes of command data from the internal device area designated as S to the communication module designated as sl (slot number of the communication module) to the communication module, and saves the result value from the communication module as the internal device area designated by operand D.

At this time, the maximum byte allowed is N

(3) If there is no special module in the position designated as sl or if the GETCOMM command is not executed normally, the corresponding position bit of F0015(WORD) for PUTCOMM/GETCOMMT error flags are set.

---

*) In XGB, N area is flash area, so it can be read only herefore, X area does not support N area as D offer land.

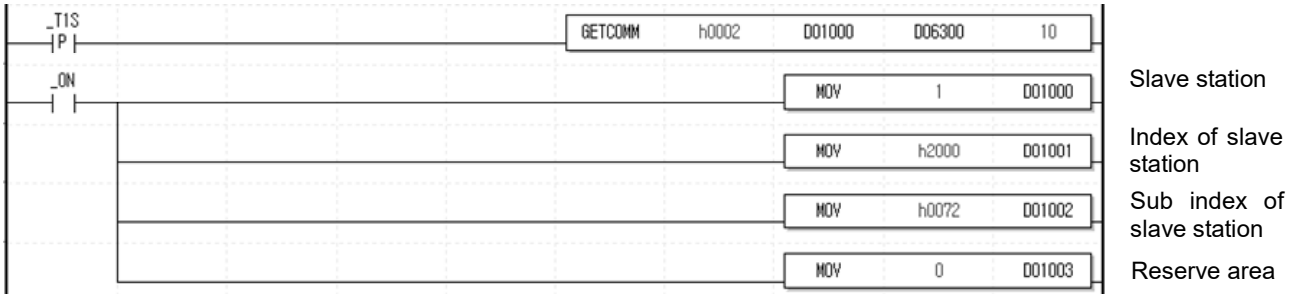
(4) This command is not processed in a scan synchronous method. In other words, after multiple scans after a request, a response may come from the other device, so the result is not immediately known when processing the command.

(5) The processing result can be checked with a flag.
(6) 1 The setting method of sl (slot number of the communication module) is set to 2 hexadecimal digits. In the case of h0002 as shown in the program below, the third digit '' is the base and the forth ”2' is the slot number.

(7) If (S + 8)Byte or (D + N)Byte exceeds the area, F110, F115 bits are set

2) Example

This program reads 4 bytes of data of h2000 index and sub index h0072 of slave station 1 from the CANOpen master module installed in slot 2 and stores it in D6300.



▷ Meaning for each operand

(1) sl(h0002): base 0 slot 02

(2) S(D1000~D1003): slot and object index

Device	Bit[15-8]	Bit[7-0]	Address assignment
S + 0	-	Destination station number	D1000
S + 1	Slave object index(High)	Slave object index(Low)	D1001
S + 2	-	Slave object sub index	D1002
S + 3	Reserved	Reserved	D1003

(3) D(6300~D6304)

Device	Bit[15-8]	Bit[7-0]	Address assignment
D + 0	NDR(Bit15), ERR(Bit14)	-	D6300
D + 1	Length(High)	Length(Low)	D6301
D + 2	Error Code(High)	Error Code(Low)	D6302
D + 3	Reserved	Reserved	D6303
D + 4	Data0	Data1	D6304

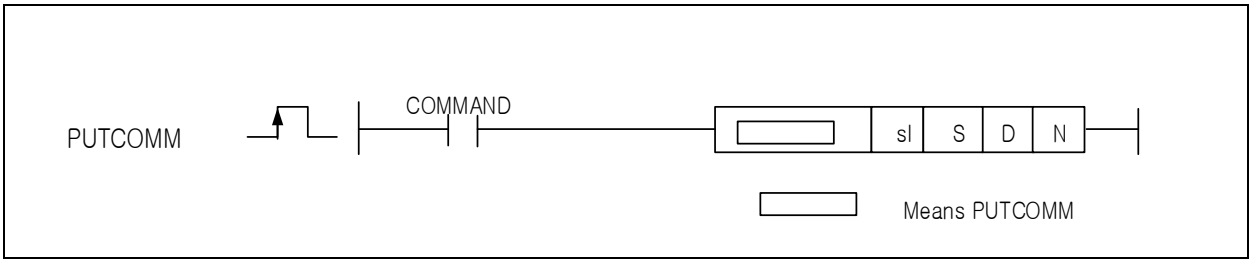
N(10): Total data length, 2 bytes with real data length of N-8

4.40.17 PUTCOMM / CANopen Module SDO command (send)

The SDO instruction is largely divided into the read instruction GETCOMM and the write instruction PUTCOMM. At this time, the command can be set for only one sub index.

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	X	X	X	O	O	O	X	O	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GETCOMM	sl	-	-	-	-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S	O	-	O	-	-	-	-	-	-	-	O	O	O	O				
	D	O	-	O	-	-	-	-	-	-	-	O	O*2)	O	O				
	N	O	-	O	-	-	-	-	-	-	O	O	O	O	O				



[Area setting]

Operand	Description	Data type
sl	Slot number where the communication module is installed(set in hexadecimal)	WORD
S	Slave station number, SDO index and sub index to write	WORD
D	Save command processing result	WORD
N	Maximum byte length to write data, Data is N (total size) is 8 + real data size	WORD

[Flag Set]

Flag	Content	Device number
PUTCOMM/ GETCOMM error	- If there is no communication module in the designated slot, the corresponding bit is ON. - If the PUTCOMM/GETCOMM instruction is not executed properly, the corresponding bit is turned on.	F0015 Bit14 of D device
PUTCOMM / GETCOMM Complete	- If a normal response is received from the destination station communication module, the corresponding bit is on.	F0023 Bit15 of D device

1) Function

(1) This command is used to write the data of the other device through the communication module

(2) Sends N bytes of command data from the internal device area designated as S to the communication module designated as sl (slot number of the communication module) to the communication module, and saves the result value from the communication module as the internal device area designated by operand D.

(3) If there is no special module in the position designated as sl or if the PUTCOMM command is not executed normally, the corresponding position bit of F0015(WORD) for flags are set.

(4) This command is not processed in a scan synchronous method. In other words, after multiple scans after a request,

* In XGB, N area is flash area, so it can be read only Therefore, X area does not support N area as D offer land.

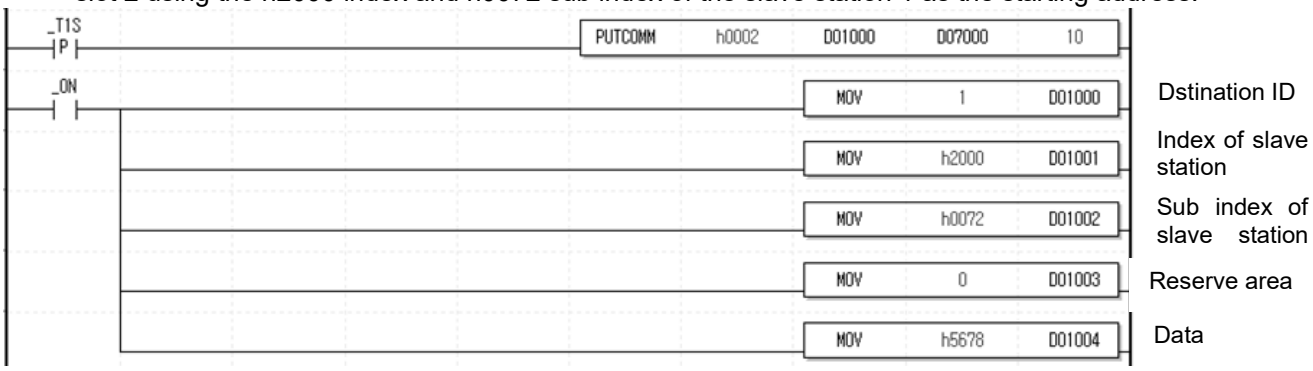
a response may come from the other device, so the result is not immediately known when processing the command.

(5) The processing result can be checked with a flag.
(6) 1 The setting method of sl (slot number of the communication module) is set to 2 hexadecimal digits. In the case of h0002 as shown in the program below, the third digit '' is the base and the forth ”2' is the slot number.

(7) If (S + N)Byte or (D + 8)Byte exceeds the area, F110, F115 bits are set.

2) Example

This is a program that performs 2-byte data writing on the CANOpen master module installed in slot 2 using the h2000 index and h0072 sub index of the slave station 1 as the starting address.



▷ Meaning for each operand

1) sl(h0002): base 0 slot 02

2) S(D1000~D1004): slot and object index, data

Device	Bit[15-8]	Bit[7-0]	Address assignment
S + 0	-	Destination station number	D1000
S + 1	Slave object index(High)	Slave object index(Low)	D1001
S + 2	-	Slave object sub index	D1002
S + 3	Reserved	Reserved	D1003

3) D(7000~D7003): command processing result

Device	Bit[15-8]	Bit[7-0]	Address assignment
D + 0	NDR(Bit15), ERR(Bit14)	-	D7000
D + 1	Length(High)	Length(Low)	D7001
D + 2	Error Code(High)	Error Code(Low)	D7002
D + 3	Reserved	Reserved	D7003

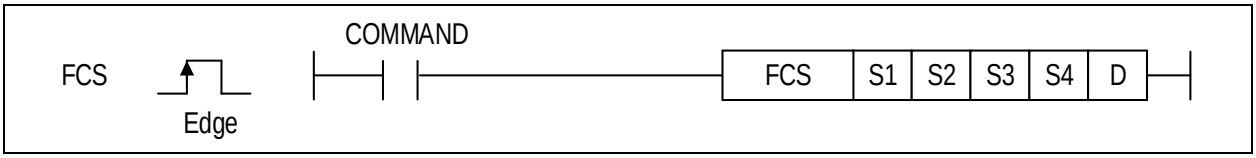
N(10): Total data length, 2 bytes with real data length of N-8

4.40.18 FCS / Error detection command

This command executes the FCS (Frame Check Sequence).

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	O	O	O	X	X	X	X	X	X

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
FCS	S1	O		O					O	O						O	-	-
	S2	O		O				O			O			O	O			
	S3	O		O				O			O			O	O			
	S4	O		O				O			O			O	O			
	D	O		O				O						O	O			



[Area setting]

Operand	Description	Data type
S1	Start device number where data to be sent is checked	BYTE
S2	Size of data to be checked(1~1024 bytes)	WORD
S3	Check Type (1 ~ 17)	WORD
S4	Return Value Ascii setting (0: Hexa Value, 1: Ascii Value)	WORD
D	FCS Return Value	DWORD

1) Function

(1) This command executes the FCS (Frame Check Sequence).
(2) S1 is display the start device number where data to be checked is saved.
(3) S2 is display the data size to be checked
(4) S3 specifies the type of FCS

FCS Type	Content	Unit
1	BYTE SUM	Byte
2	WORD SUM	Word
3	BYTE XOR	Byte
4	DLE AB	Byte
5	DLE SIEMENS	Byte
6	LSIS CRC	Word
7	BYTE SUM 2's COMP	Byte
8	CRC 8	Byte
9	CRC 16	Word
10	BYTE SUM 1's COMP	Byte
11	7BIT SUM	Byte
12	7BIT XOR	Byte
13	CRC 16 IBM	Word
14	CRC 16 CCITT	Word
15	MODBUS CRC	Word
16	MODBUS ASCII	Byte
17	BYTE SUM NIBBLE ASCII	Byte

(5) S4 sets Ascii of Return Value.
(6) D displays the device number that saves the result of FCS
(7) If the range of S1~S4 is out of range, error flag (F110) is set.
(8) In case of operand S1 Byte Type, it is accessed by Bit, so in case of FCS Type, Byte Align must be entered.

For example, in the case of the next address of D00000, input as D00000.8 and an error occurs when entering D00000.1~D00000.7 or D00000.9~D00000.F.

(9) In the case of word units among FCS types, the word alignment must be entered.
If Align does not fit, it is calculated as follows. (Word Align does not cause an error)
For size 5 bytes from address 0x10 -> calculate 4 bytes from address 0x10(1Byte not included)
For size 5 bytes from address 0x11 -> calculate 4 bytes from address 0x10(1Byte not included)
For size 4 bytes from address 0x11 -> calculate 4 bytes from address 0x10

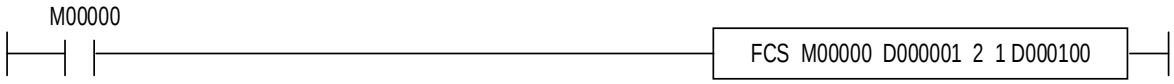
2) Example

(1) LD

* Execution order and instruction

(a) This is an example of executing frame error detection using FCS instruction and saving the result value to the value of the set device.

(b) When the input signal M00000 is on, the local Ethernet IP address, subnet mask, gateway and MAC address setting values are saved in D00000 ~ D00017 respectively.



(2) ST (Automatic program assignment)

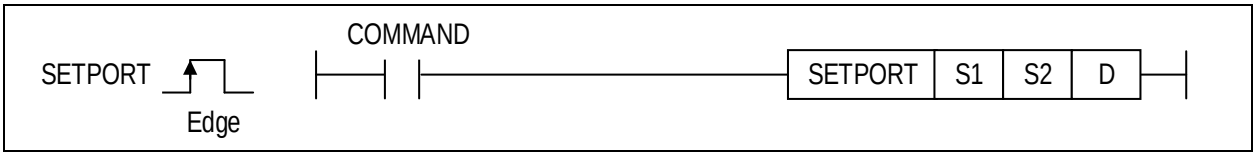
```
FCS(s1:=(*BYTE*), s2:=(*WORD*), s3:=(*WORD*), s4:=(*WORD*), D=>(*DWORD*))

FCS_EN(EN:=(*BIT*), s1:=(*BYTE*), s2:=(*WORD*), s3:=(*WORD*), s4:=(*WORD*))FIFRD(S:=(*WORD*),
D=>(*WORD*))
```

4.40.19 SETPORT / Local Ethernet Port Setting

This is a command to set the local Ethernet port.(for main unit built-in Ethernet)

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	X	X	X	O XBC-U: V2.1	X	X	X	X	O XBM-H: V1.3 XBM-HP: V2.2 XBM-H2: V2.2

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
SETPORT	S1	O	-	O	-	-	-	O	-	-	O	O	O	O	O	4~7	O	-	-
	S2	O	-	O	-	-	-	O	-	-	O	O	O	O	O			
	D	O	-	O	-	-	-	O	-	-	-	O	O	O	O			



[Area setting]

Operand	Description	Data type
S1	Device area where the channel number to be set is stored	Word
S2	Device area where the port number to be set is stored	Word
D	Device area where the status code is stored	Word

[Flag Set]

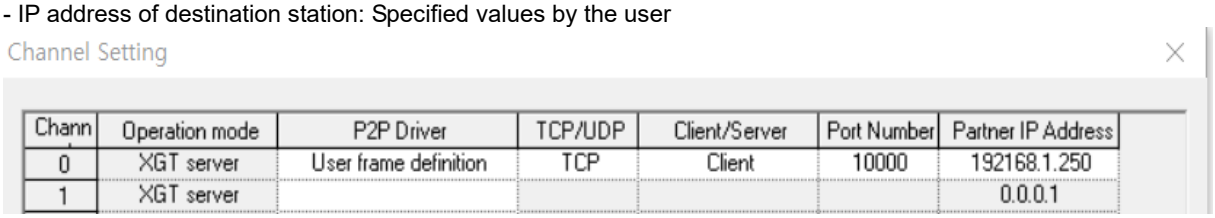
Flag	Content	Device number
error	In case of wrong channel setting error, port setting, etc.(when status code 2~4 occurs)	F110

1) Function

(1) This command is setting local Ethernet port.

(2) Conditions of use : The following P2P setting values must be applied to the PLC.

- P2P driver:user frame definitio
- TCP/UDP: TCP
- Port Number: Specified values by the user
- IP address of destination station: Specified values by the user



(3) Enter the channel and port number of local Ethernet to be set in the device area set in S1 and S2.

(4) Status information is saved in the device area set in D.

Status code	Status information	Meaning
0	Initial status	Before command execution
1	Complete	If the command has been executed normally
2	Channel setting error	Out of the channel setting range(Normal range: 0 to 14)
3	Driver setting error	When the P2P driver is not user frame definition
4	Port setting error	Out of the Port setting range(Normal range: 1 to 65535)

(5) Applied product: XGB local Ethernet support main unit (Not available in XBL-EMTA.)

- XBC-DxxxU: Ver 2.0 or higher
- XBC-DN32H: Ver 1.3 or higher
- XBC- Dx32HP/ H2 Ver: 2.2 or higher

2) Example

(1) Execution order and instruction(LD)

(a) The following example is an example of setting the port of local Ethernet using the SENDRTS instruction.

(b) When the input signal M00000 is on, set the local Ethernet channel and port to the values saved in D00004, and D00008 respectively. At this time, the status information is saved in D00008.

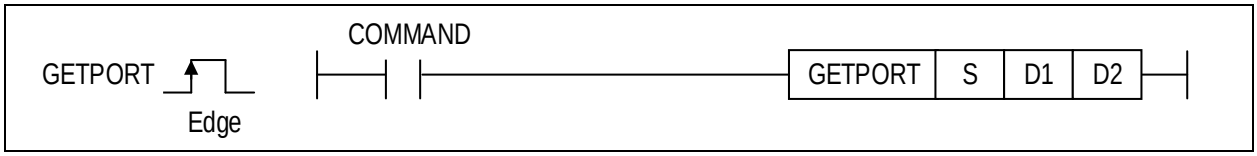
When executing SETPORT while communicating with the external device, the connection with the external device is normally terminated through handshake, and the port number is changed after that.

4.40.20 GETPORT / Local Ethernet Port Read

This is a command to read the local Ethernet port information.(for main unit built-in Ethernet)

Available type	XGK					XGK-N			XBC-U				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	X	X	X	X	X	X	X	X	O XBC-U: V2.1	X	X	X	X	O XBM-H: V1.3 XBM-HP: V2.2 XBM-H2: V2.2

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
GETPORT	S	O	-	O	-	-	-	O	-	-	O	O	O	O	O	4~7	O	-	-
	D1	O	-	O	-	-	-	O	-	-	-	O	O	O	O				
	D2	O	-	O	-	-	-	O	-	-	-	O	O	O	O				



[Area setting]

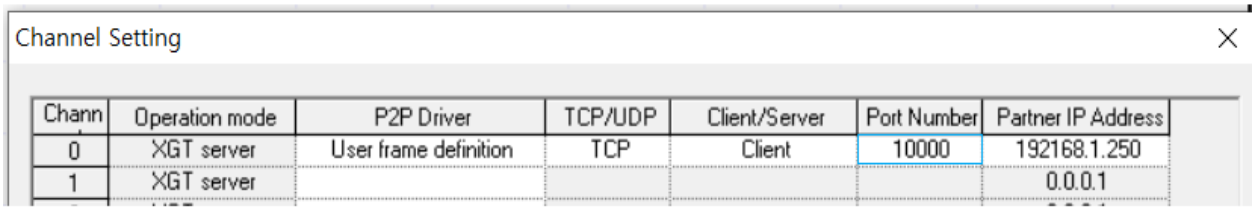
Operand	Description	Data type
S	Device number where the channel number to be read is stored	Word
D1	Device area where the Port number to be read is stored	Word
D2	Device area where the status code is stored	Word

[Flag Set]

Flag	Content	Device number
error	In case of wrong channel setting error, port setting, etc.(when status code 2~3 occurs)	F110

1) Function

(1) This command is to read the port setting of the local Ethernet.



(2) Input the channel number to read into the device area set in S.
(3) The port number read into D1 is saved.
(4) The following status information is stored in the D2 area.

Status code	Status information	Meaning
0	Initial status	Before command execution
1	Complete	If the command has been executed normally
2	Channel setting error	Out of the channel setting range(Normal range: 0 to 14)
3	Driver setting error	When the P2P driver is not user frame definition

(5) Applied product: XGB local Ethernet support main unit (Not available in XBL-EMTA.)
- XBC-DxxxU: Ver 2.1 or higher
- XBC-DN32H: Ver 1.3 or higher
- XBC- Dx32HP/ H2 Ver: 2.2 or higher

2) Example

(1) Execution order and instruction(LD)

(a) The following example is setting the local Ethernet port using the GETPORT instruction.

(b) When the input signal M00000 is on, read port value of channel saved in D0000 as D00004.
At this time, the status information is saved in D00008.

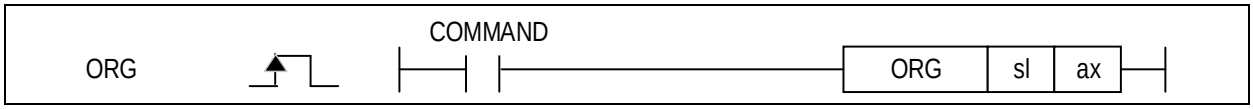
4.41 Position Control Instruction (APM)

4.41.1 ORG / home position return

Home position return control is a function to return to the position (machine home) that is the starting point for positioning control.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
ORG	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Home position return is carried out to confirm the home of the machine when applying the power.
(2) Before operating home return, it is required to set home return parameter per axis.
(3) If the home is determined by home return, the home detection signal is not recognized during positioning operation.

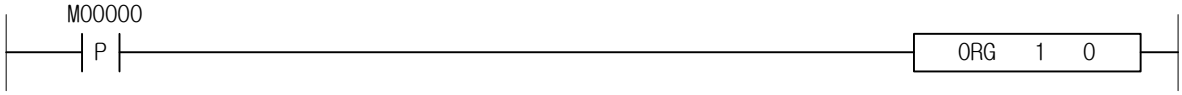
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

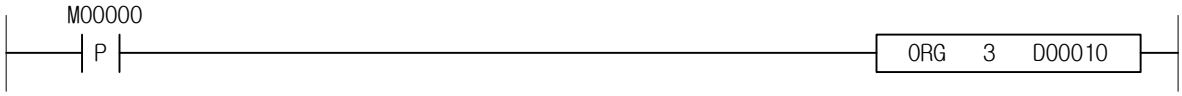
(1) LD: Ladder Diagram

- Program to execute home return command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On.



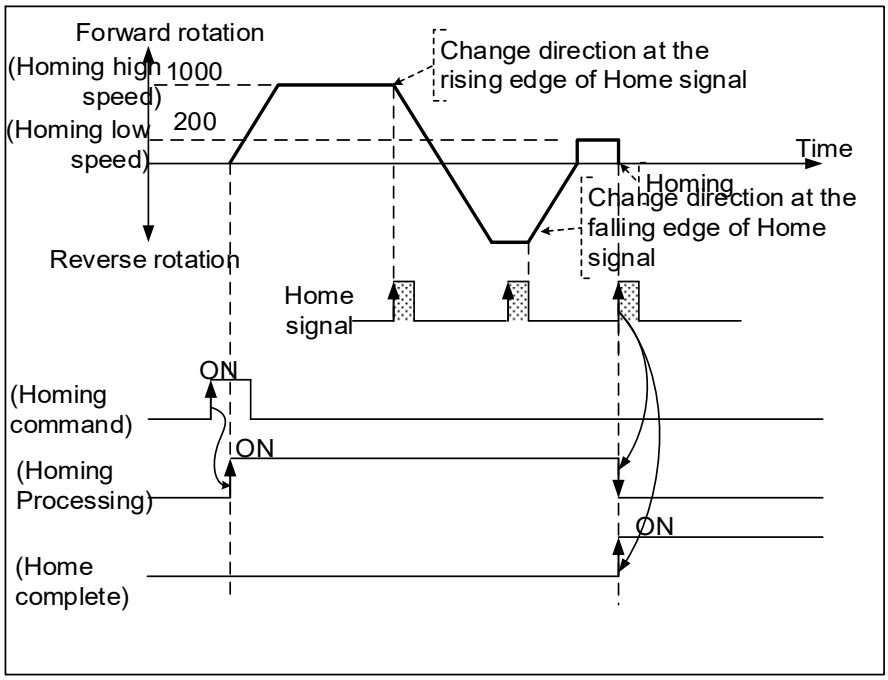
※ To read the status information of the axis, refer to the description of the SRD instruction.

- A program that executes home return command command on the axis designated in D00010 when the input signal M00000 of the positioning module mounted in slot number 3 is on.



※ To read the status information of the axis, refer to the description of the SRD instruction.

(2) Timer chart



3) ST(Structure Text):Automatic program assignment
ORG_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

(1) When an emergency stop occurs, set the homing state of the axis to either '0: Maintain previous state' or '1:undecided homing'.
- 0: Maintaining the previous state: Even if the axis stops due to an emergency stop, the homing status does not change.
- 1: undecided homing : The homing status is canceled when the axis stops due to an emergency stop.

(2) When setting the homing speed, it is recommended to set the homing-low speed as low speed as possible. If the home return low speed is set too fast, an error may occur between the home position when the home signal is detected and the position after home return is completed.

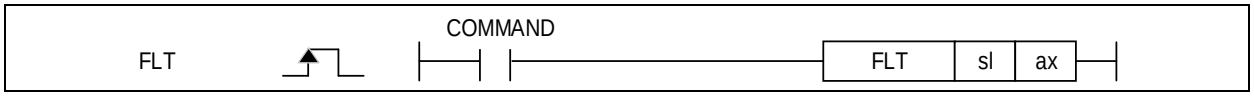
(3) When complete homing, external input signal (DOG and HOME signal) do not effect to positioning control.

4.41.2 FLT / floating home setting

This is used to force to set the current position as the home without carrying out the homing action of the machine.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
FLT	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The current position of the axis designated by ax is changed to the home position, and the homing is completed.

(2) After executing the floating home setting command, the current position is changed to “0”.

- Modify the current position into “Homing end position” of homing parameter and become home-decided status.
- After floating home setting command is executed, the current position is changed to 'The position of homing completion' of homing parameter.

< Related parameter (Home return parameter)>

Item	Content
Position of homing completion	Set the position after homing completion or floating home setting

※ To read the status information of the axis, refer to the description of the SRD instruction.

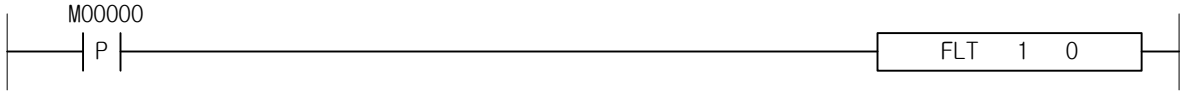
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

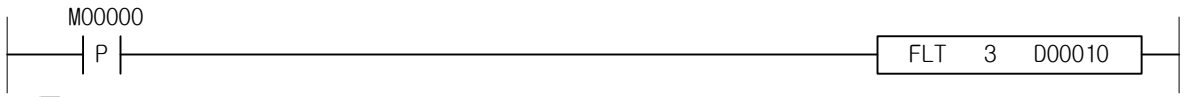
3) Example

(1) LD: Ladder Diagram

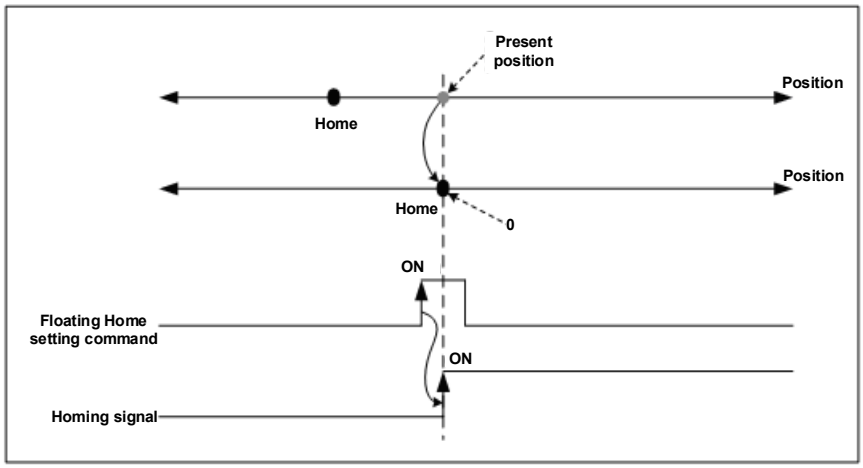
- Program to execute home return command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On



- Program that executes home return command on the axis designated in D00010 when input signal M00000 of positioning module installed in slot number 1 is On.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment
FLT_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

(1) When an error occurs, remove the cause of the error and then reset the error, set the floating home again and change the operation step number using the start step number change command, and then execute it.

(2) In case of pulse output positioning type, the floating home setting command is not executed and an error occurs when the drive ready signal is “Off”. When drive ready signal is in 'ON' execute floating home setting command.

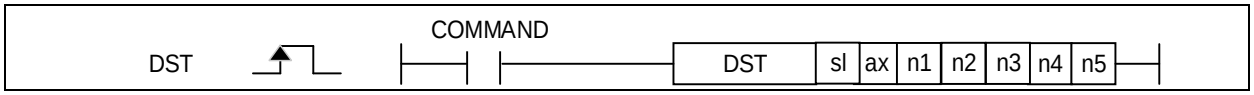
(3) In the case of the network positioning type, the floating home setting command occurs an error in the servo-off state and is not executed. “Servo On” command, and then execute the floating home setting command when the Servo on signal is On.

4.41.3 DST / Direct start

Do not use operating data, directly input positioning data by auxiliary data and perform positioning control.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
DST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Target position	DINT
n2	Target speed	DWORD
n3	Dwell time	WORD
n4	M code No.	WORD
n5	Control word	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction does not use the operation data from XG-PM in the positioning module, and sets the positioning data in the command as auxiliary data to give a direct start command.

(2) The target position n1 is directly started at the target speed n2 on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module), and dwell time n3 is required to complete the position determination after reaching the target position.
Other auxiliary operations can be executed by setting the M code of n4, and various controls can be performed by using bits information of the n5 control word.

■ Details of Control word (n5) for each Bit are as follows.

15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Deceleration time	Acceleration Time	-	0:Absolute 1:Relative	-	0:Position control 1:Speed control 2:Feed control

(3) If control word word(n5) is h0012, it shall be set by Feed control, relative, acceleration time 1, and deceleration time 1.

(4) 2~3, 5~7 ,and 12~15th bit of the control word is the unused area and does not affect the s etting.

(5) If you want to perform a reverse speed control, enter a small position than the current position in the entry n1 is the speed control in the reverse direction.

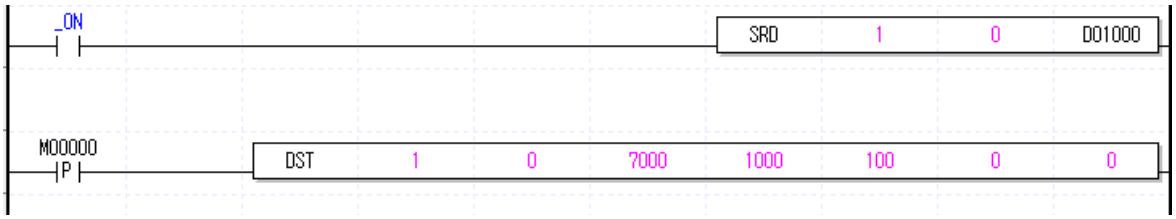
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

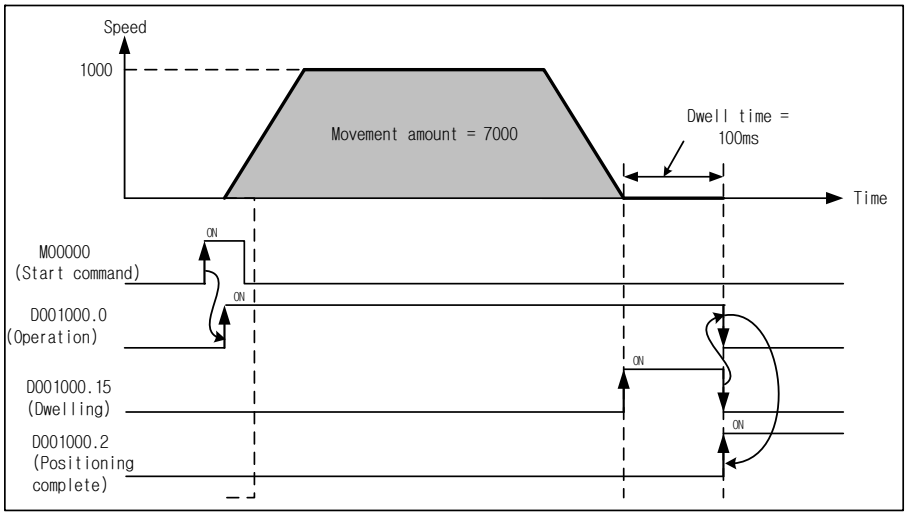
(1) LD: Ladder Diagram

Program to execute direct start command with X axis, position control, target speed 500, absolute position 1000, acceleration/deceleration time 3 times, dwell time 10ms, M code 20 when the input signal M00000 of the positioning module installed in slot number 1 is on.



※ To read the status information of the axis, refer to the description of the SRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

DST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*DWORD*), Num 3:=(*WORD*), Num4:=(*WORD*), Num5:=(*WORD*));

4) Caution

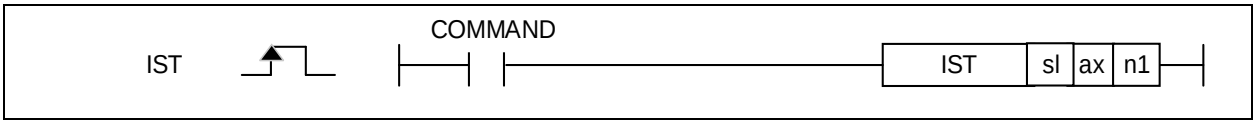
(1) Direct start only can use when it is shortened operation.
In case that Interpolation operation, use indirect starts.

4.41.4 IST / Indirect start

Indirect start starts position control by designating the step number where the operation data is set.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
IST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Step number to start (0~400) ※ XGB position : Built-in(0~80), XGB extension(0~150)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction starts position control by designating the step number of the operation data stored in the module..

(2) It operates in n1 step on the ax axis of the position module designated by sl (slot number).

※ Setting auxiliary data of indirect start

Setting item	Content
Operation step	Set the step number of the operation data to be executed. (0 or 1~ 4000)

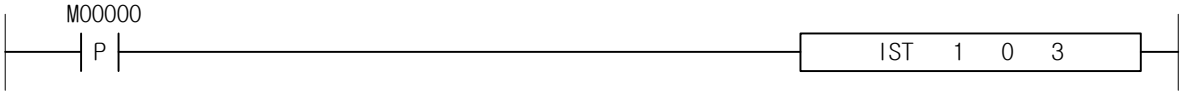
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

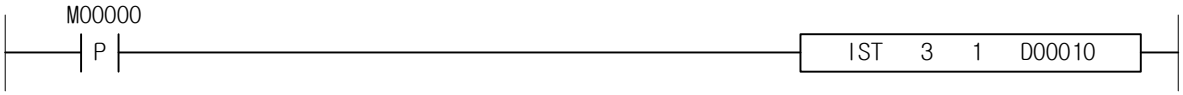
(1) LD: Ladder Diagram

- Program to execute indirect start operation with step 3 on the X axis when the input signal M00000 of the positioning module mounted in slot number 1 is on.



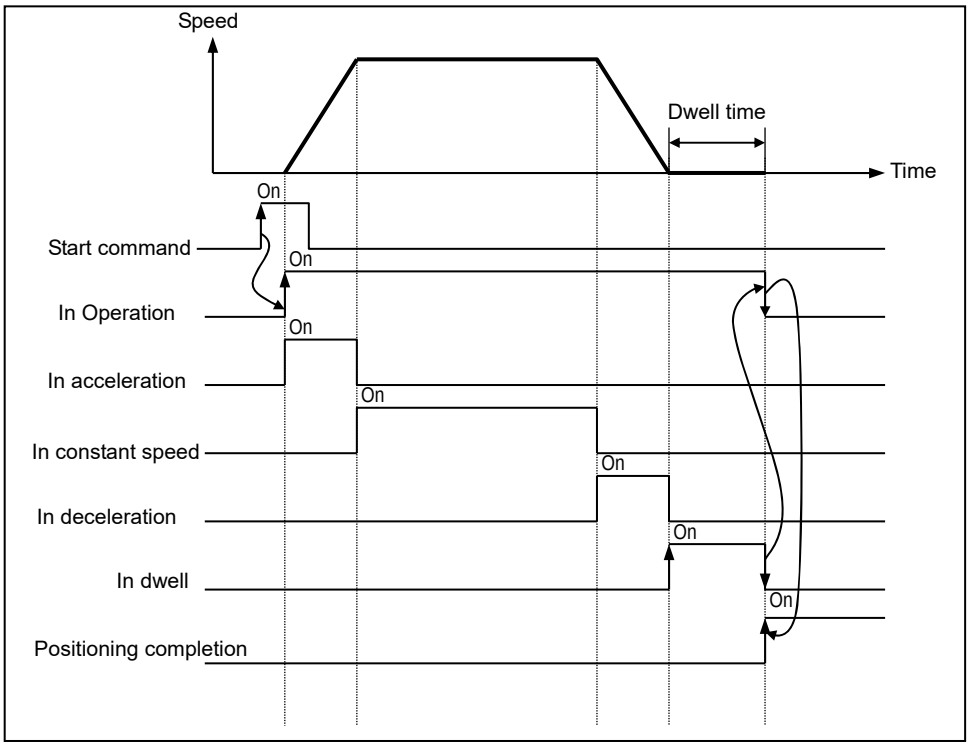
※ To read the status information of the axis, refer to the description of the SRD instruction.

- Program to executes indirect start operation with the step designated as D00010 on the Y axis when input signal M00000 of positioning module installed in slot number 3 is On



※ To read the status information of the axis, refer to the description of the SRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

IST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) After decelerating stop, when operating indirect start, positioning operation is operated with the settting step.
In case of using with mode, Signal “On” of M code has to “Off” for restart. After M code on signal change 'Off' by cancel M code (XMOF)」 command operates command.

When restarting after an internal emergency stop or an external emergency stop, the M code On signal stopped by the emergency stop is automatically “Off”, so the operation can be executed in the set operation step for indirect start.

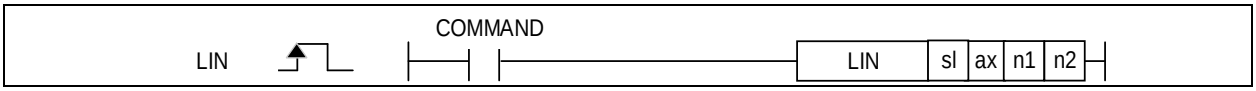
(3) When 0 is set in the operation step of indirect start and then the indirect start command is executed, it is executed with the operation data stored in the current step number.

4.41.5 LIN / Linear interpolation

Linear interpolation control is executed from the start address (current stop position) to the target position using the designated axis (more than 2 axes).

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
LIN	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Step No. to operate (0~400) ※ XGB position : Built-in(0~80), XGB extension(0~150)	WORD
n2	Set axis to operate(Bit0:X axis, Bit1:Y axis, Bit2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a linear interpolation command to the positioning module.
(2) This is a command for linear interpolation of step n1 with the axis set in n2 to the axis designated with ax of the positioning module specified by sl (slot number of the positioning module).
(3) When setting the axis to operate linear interpolation in n2, set the bit of the assigned axis for each bit as shown below.

15 ~ 3	2	1	0
Unused	Z axis(XGB unused)	Y-Axis	X-Axis

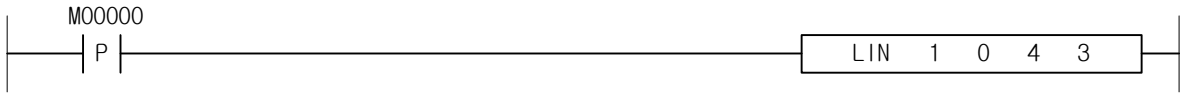
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

- A program that executes step 4 on the X axis with linear interpolation between the X and Y axes when the input signal M00000 of the positioning module mounted in slot number 1 is on.



- A Program that executes the steps specified in D00010 on the Y axis by linear interpolation on the X, Y, and Z axes when input signal M00000 of positioning module installed in slot number 3 is On

(2) Timer chart

axis1 and axis2 are main and sub axis each. Execute linear interpolation by the setting as follows.

In case of Start position (0, 0), Target position (2000, 6000), operation is as follows.

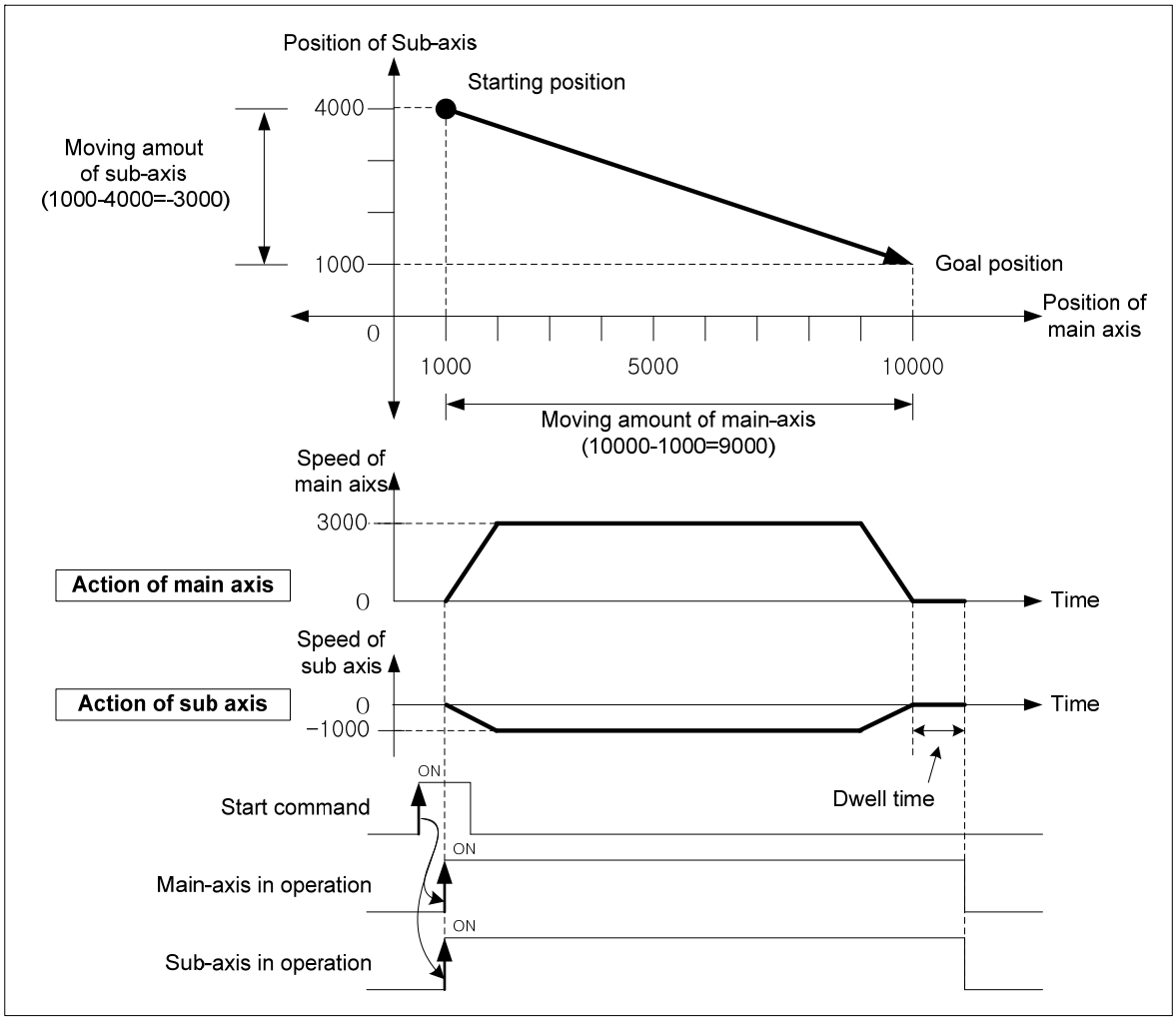
■ Setting of XG-PM

▪ Main axis(axis1) operation data

Step No.	Control method	Operation method	Target position [pls]	Operation speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time	Sub axis setting
1	Absolute, Linear Interpolation	Single,End	10000	3000	No.1	No.1	0	100	Axis 2

▪ Subordinate axis(axis2) operation data

Step No.	Control method	Operation method	Target position [pls]	Operation speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time	Sub axis setting
1	Absolute, Single-axis Position Control	Single,End	1000	0	No.1	No.1	0	0	No axis setting



(3) ST (Structure Text): Automatic program assignment

LIN_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

※ Linear interpolation with 2 axes may not be executed in the case below.

■ 「Subordinate axis setting」 error

- 「Subordinate axis setting」 value of main axis operation data is 'No axis setting'

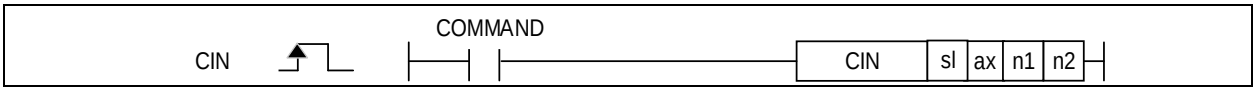
- 「Subordinate axis setting」value of main axis operation data is same as the main axis no.
- In case of the value of 「Subordinate axis setting」of main axis operation data exceed settable axis No.

4.41.6 CIN / Circular interpolation

Execute positioning control until target position by the trajectory of arc and control sub-axis as using axis-2 according to data of main axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
CIN	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Step number to execute circular interpolation ※ XGB position : XGB extension(0~150)	WORD
n2	Set the subordinate axis for circular interpolation operation (Bit0:X axis, Bit1:Y axis, Bit2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

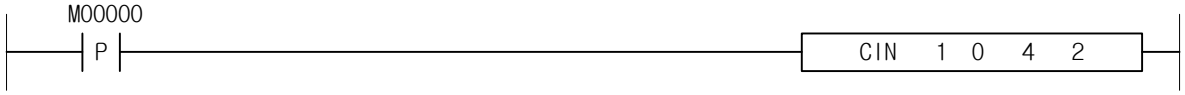
Flag	Content	Device number
error	ax value is out of range	F110

1) Function
   (1) This instruction is a circular interpolation command to the positioning module.
   (2) This is a command to perform circular interpolation operation in step n1 with the axis set in n2 as the subordinate axis to the axis designated as ax in the positioning module designated by sl (slot number of the positioning module).
   (3) When setting the axis to operate circular interpolation in n2, set the bit of the assigned axis for each bit as shown below.

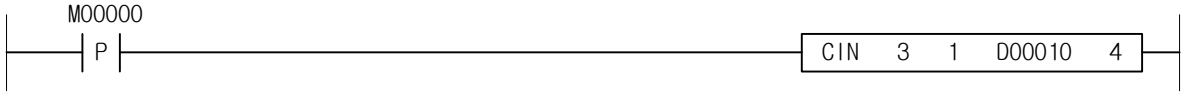
15 ~ 3	2	1	0
Unused	Z axis(XGB unused)	Y-Axis	X-Axis

2) Error
   (1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example
   - A program that executes circular interpolation operation with the X axis as the main axis and the Y axis as the subordinate axis in step 4 on the axis when the input signal M00000 of the positioning module mounted in slot number 1 is on.



   - A Program that executes circular interpolation operation with the step designated in D00010 as the Y axis as the main axis and the Z axis as the sub axis when input signal M00000 of positioning module installed in slot number 3 is On



(2) Timer chart

Operate circular interpolation of designating midpoint and absolute coordinate (main axis; axis 1, sub axis; axis 2)

■ Start position (0, 0), target position (0, 0), auxiliary point (1000, 1000), direction of rotation: CW

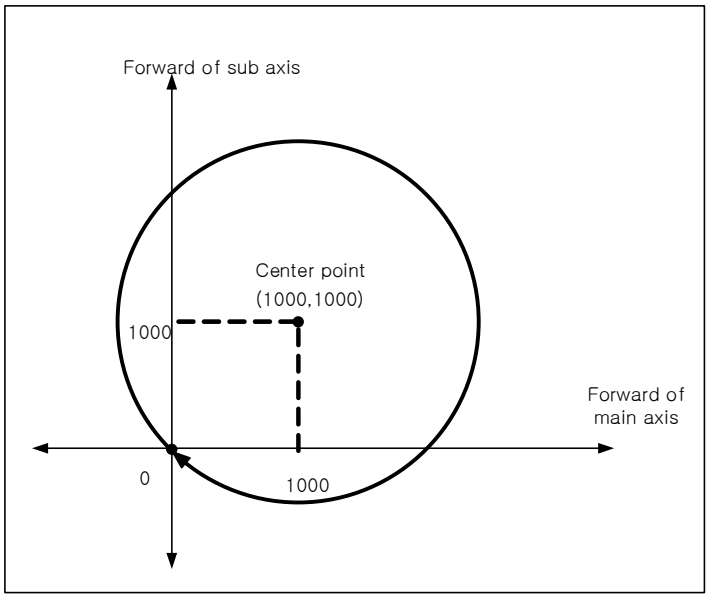
■ Setting of XG-PM

▪ Main axis(axis1) operation data

Step No.	Control method	Operation method	Target position [pls]	Operation speed [pls/s]	Acc. No.	Deceleration No.	M Code	Dwell Time	Subordinate axis Setting	Circular Interpolation auxiliary point	Circular Interpolation Mode	Circular Interpolation turns
1	Absolute, circular arc interpolation	Single,End	0	1000	No.1	No.1	0	100	Axis 2	1000	Midpoint,CW	0

▪ Subordinate axis(axis2) operation data

Step No.	Control method	Operation method	Target position [pls]	Operation speed [pls/s]	Acc. No.	Deceleration No.	M Code	Dwell Time	Subordinate axis Setting	Circular Interpolation auxiliary point	Circular Interpolation Mode	Circular Interpolation turns
1	Absolute, single position control	Single,End	0	0	No.1	No.1	0	0	No axis setting	1000	Midpoint	0



(3) ST (Structure Text): Automatic program assignment

CIN_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

※ In this following case, it will be error and can not working circular interpolation of method of designating center point.

(1) 「Subordinate axis setting」 error

- 「Subordinate axis setting」 value of main axis operation data is 'No axis setting'
- 「Subordinate axis setting」 value of main axis operation data is same as the main axis no.
- When the "subordinate axis setting" value of the main axis operation data is the axis number not currently connected to the network.

(2) When the control unit of the main axis or subordinate axis is set to “degree”

(3) When the center point designated as the auxiliary point is the same as the start position or target position

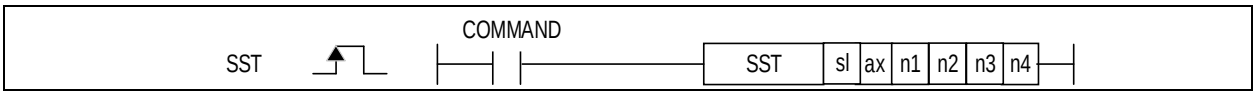
(4) When the radius of the calculated arc exceed 2147483647pls

4.41.7 SST / Simultaneous Start

Simultaneous start concurrently executes the positioning operation data for 2 to 4 axes according to axis information and setting steps.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	X-axis step number to operate Simultaneous start ※ XGB position : Built-in(0~80), XGB extension(0~150)	WORD
n2	Y-axis step number to operate Simultaneous start ※ XGB position : Built-in(0~80), XGB extension(0~150)	WORD
n3	Z-axis step number to operate Simultaneous start ※ XGB position : Disable	WORD
n4	Axis setting to operate Simultaneous start ※ XGB position: Fixed to 3	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a simultaneous start command to the positioning module.

(2) The axis designated as ax of the positioning module designated as sl (slot number of the positioning module) is instructed to simultaneous start n1 step on the X axis, n2 step on the Y axis, and n3 step on the Z axis (XGB is not used Command.

(3) hen setting the axis to execute simultaneous start in n4, set the bit of the assigned axis for each bit as shown below.

15 ~ 3	2	1	0
Unused	Z axis(XGB unused)	Y-Axis	X-Axis

That is, axis4, axis2, axis1 will be set if set as h000B

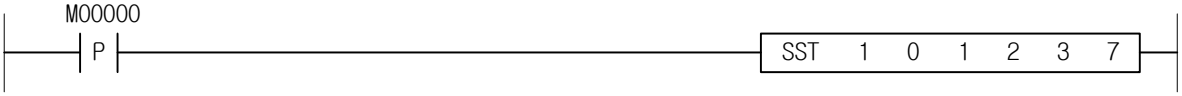
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

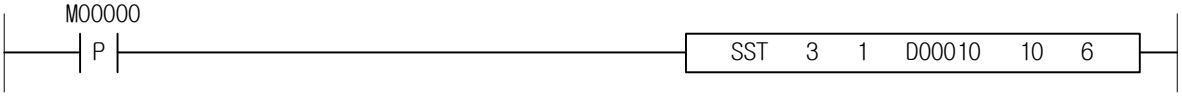
3) Example

(1) LD: Ladder Diagram

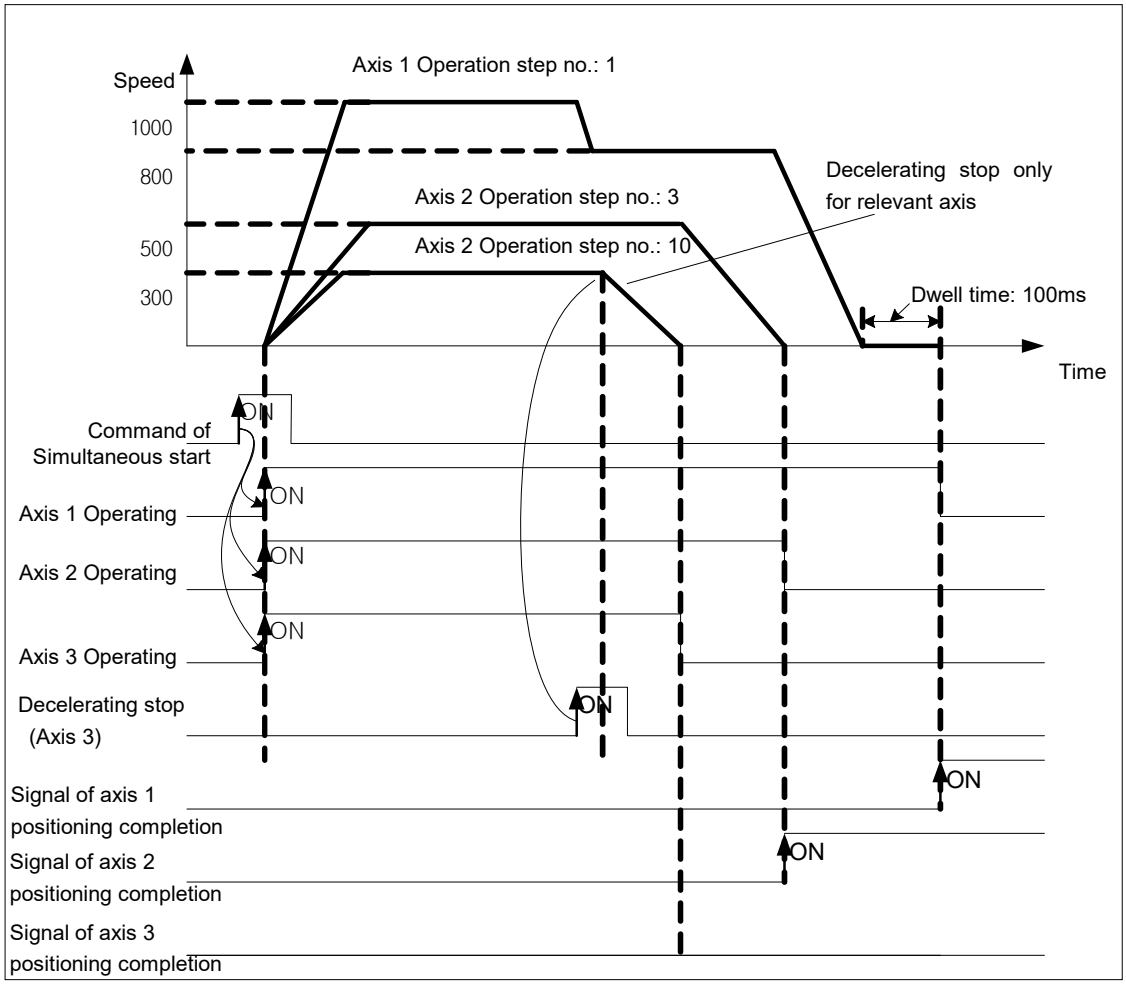
- Program that executes the simultaneous start command on X axis with step 1 on the X axis ,step 2 on the Y axis and step 3 on the Z axis when the input signal M00000 of the positioning module installed in slot number 1 is on.



- A Program that executes the simultaneous start command on Y axis with steps specified in D00010 on the X axis,step 10 on the Y axis when input signal M00000 of positioning module installed in slot number 3 is On.



(2) Timer chart



<Setting items in XG-PM for simultaneous start>

▪ 1 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single, Continuous	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single,End	1800	800	No.1	No.1	0	100

▪ 2 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
3	Absolute, Single axis position control	Single,End	900	500	No.2	No.2	0	0

▪ 3 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
10	Absolute, Single axis speed control	Single,End	1000	300	No.3	No.3	0	100

(3) ST (Structure Text): Automatic program assignment
SST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*), Num4:=(*WORD*));

4) Caution

※ In these cases can not operate all of the axes which were set simultaneous start by error.

(1) When an error occurs in the operation data even in one of the simultaneous start setting axes.
(Output error code to the axis.)

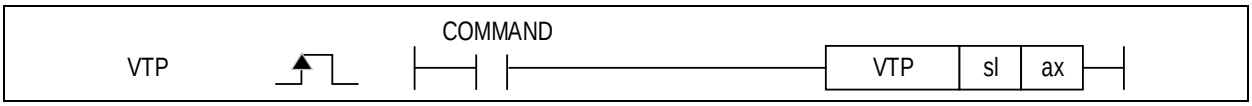
(2) Simultaneous start command axis setting is wrong
- When only the command axis is set (Must set more than 2 axes.)
- In case of exceeding number of possible setting axis of current using module among the possible setting axes

4.41.8 VTP / Speed/Position control switch

This command is a command to switch speed/position control to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
VTP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command converts the speed control operation to position control operation and operates the positio n to the target position set during speed control.

(2) This is a command to switch speed/position control to ax (designated axis) of the positioning module of t he slot designated by sl.

(3) The control method of operation data or direct start is set to “single speed control”, and positioning contr ol is performed with the “speed/position switching” command during speed control operation.

(4) The direction of movement is determined by the sign of the target position value.
- ■ Forward operation: When the position value is positive (+)
- ■ Reverse operation: When the position value is negative(-)

(5) In the case of speed/position switching, set the speed/position switching coordinates as to whether the p osition value should be the relative position value or absolute position value at the time the speed/positio n switching command is executed.

Item	Setting value	Content
Speed/Position switching coordinate	0 : Relative	Executes positioning as far as the set value from position where speed/position switching command is executed.
	1 : Absolute	Considers the set value as absolute position and executes positioning into the set absolute position.

(6)In speed/position switching control, setting of coordinate values does not affect operation.
In other words, actions of “Absolute, Single axis speed control” and “Relative, Single axis speed control” are same.

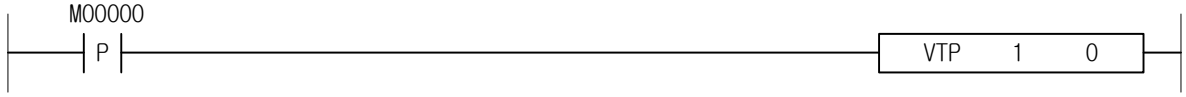
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

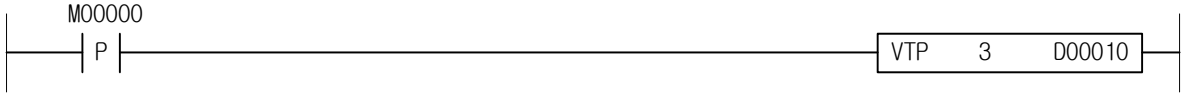
3) Example

(1) LD: Ladder Diagram

- Program to execute position/speed control switch command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On.

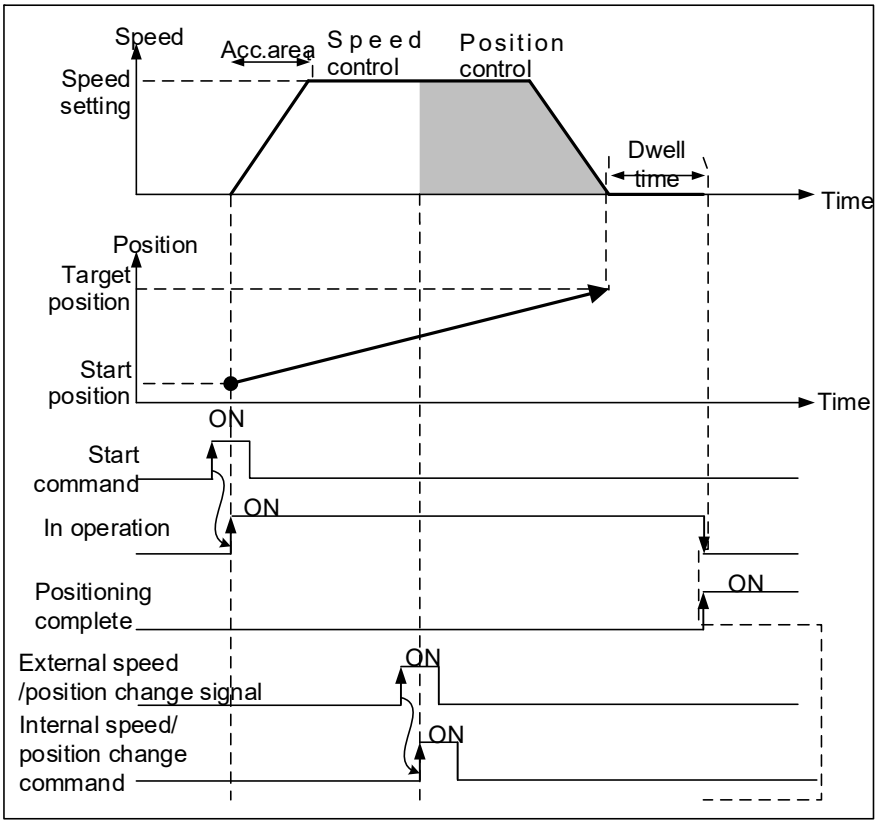


- Program that executes position/speed control switch command on the axis designated in D00010 when input signal M00000 of positioning module installed in slot number 3 is On.



(2) Timer chart

※ Speed/Position switch coordinate : Absolute



(3) ST (Structure Text): Automatic program assignment

```
VTP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

(1) Set the operation pattern of speed control as 'End' or 'Keep'.
When set to "Continuous", speed control cannot be executed.

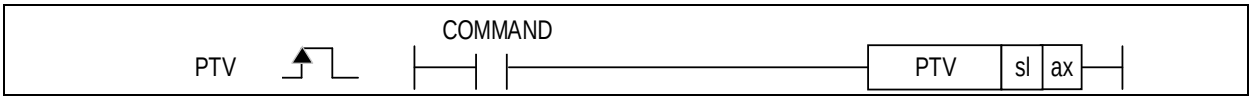
(2) Speed/Position switching coordinates = "0: Relative" When the operation data or the target position setting value of direct start is 0, the speed/position switching command does not operate and an error occurs.
In this case, it continues to operate with speed control.

4.41.9 PTV / Position/Speed control switch

If a command is executed during position control operation, the speed control operation is executed at the speed value set at the start of position control.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PTV	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If position/speed switch control is executed while position control is in operation, it is changed to speed control operation at the speed value set when starting position control, and operates until a stop factor such as deceleration stop occurs.

(2) This is a command to switch position/Speed control switch to ax (designated axis) of the positioning module of the slot designated by sl.

(3) Set control method of operating data as 'Single axis position control' and user may change position control to speed control with 'Speed/Position Switching'.

(4) The direction of movement is determined by the values set in the coordinates and the target position.

■ In the case of 「Absolute, Single axis position control」
- Starting position < Target position : Positioning operation in forward direction
- Starting position > Target position : Positioning operation in reverse direction

■ In the case of 「Relative, Single axis position control」
- The target position value is positive (+ or unsigned) : forward direction (current position increase) positioning
- The target position value is negative (-) : reverse direction (current position decrease)

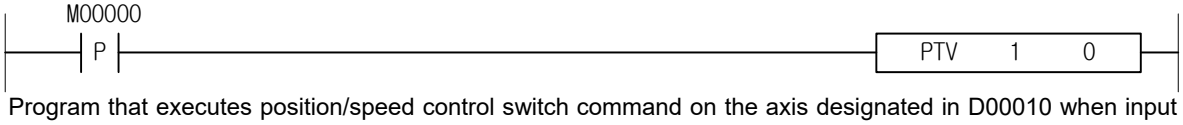
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

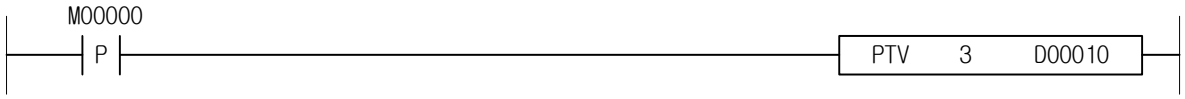
3) Example

(1) LD: Ladder Diagram

- Program to execute position/speed control switch command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On.

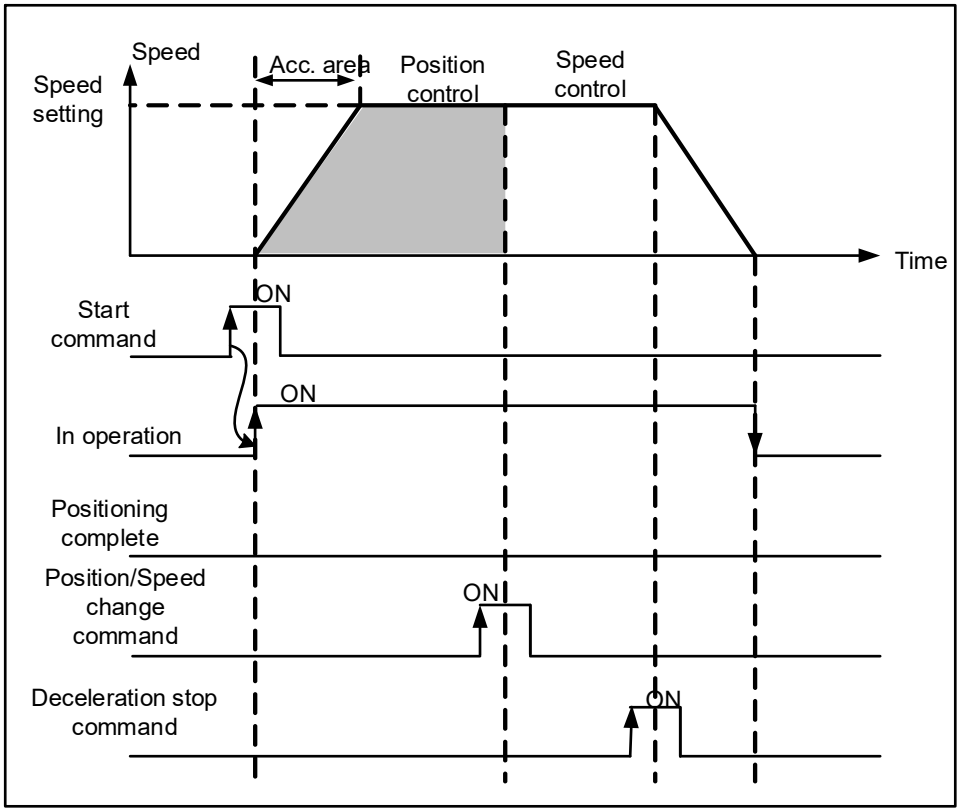


- Program that executes position/speed control switch command on the axis designated in D00010 when input signal M00000 of positioning module installed in slot number 3 is On.



(2) Timer chart

※ Below is a timing chart for the example above. After operating the position control by the DST command, the position/speed control change occurs by the PTV command and the speed is controlled at the speed set in the DST.



(3) ST (Structure Text): Automatic program assignment

```
PTV_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

(1) Position/speed switching command is not inputted before positioning to the target position, it stops by deceleration and finishes the positioning.

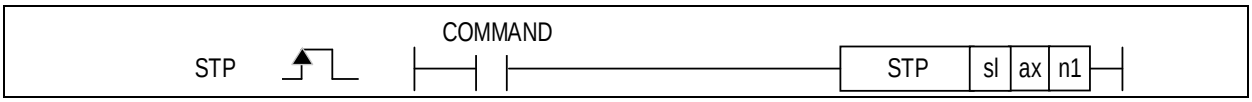
(2) After position/speed switching, software high/low limit check depends on 'Soft high/low limit in speed control' of extended parameter.

4.41.10 STP / Deceleration stop

The command is a command that stops decelerating for a set deceleration time by receiving a start command.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
STP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	deceleration time (0 ~ 2,147,483,647 ms)	DWORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a decelerating stop command to the positioning module.

(2) The decelerating stop command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).

(3) he deceleration stop command has the same contents as the acceleration section, constant speed section and deceleration section.

(4) Deceleration time means the time required from deceleration start to stop and it is available to set from 0 ~ 2,147,483,647ms.
But if setting as '0', it stops only by deceleration time set at the beginning of operation

(5) Deceleration time means the time required from the speed limit of basic parameter on operation axis to stop.

(6) When stopping with deceleration stop command, positioning operation is not completed because the positioning operation is not completed to the set target position, and M code is not “On” in the After mode of the M code mode.
Then, when the indirect start command (step number = current step number) is executed in the stopped state.

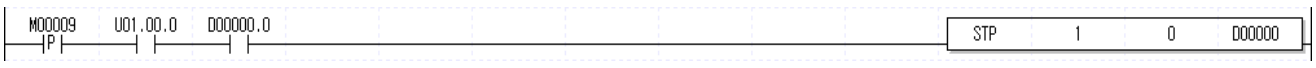
- In positioning with absolute coordinates, the system operates with the remaining position value not output from the current operation step.
- In positioning with relative coordinates, the target position is operated for the set value.

2) Error

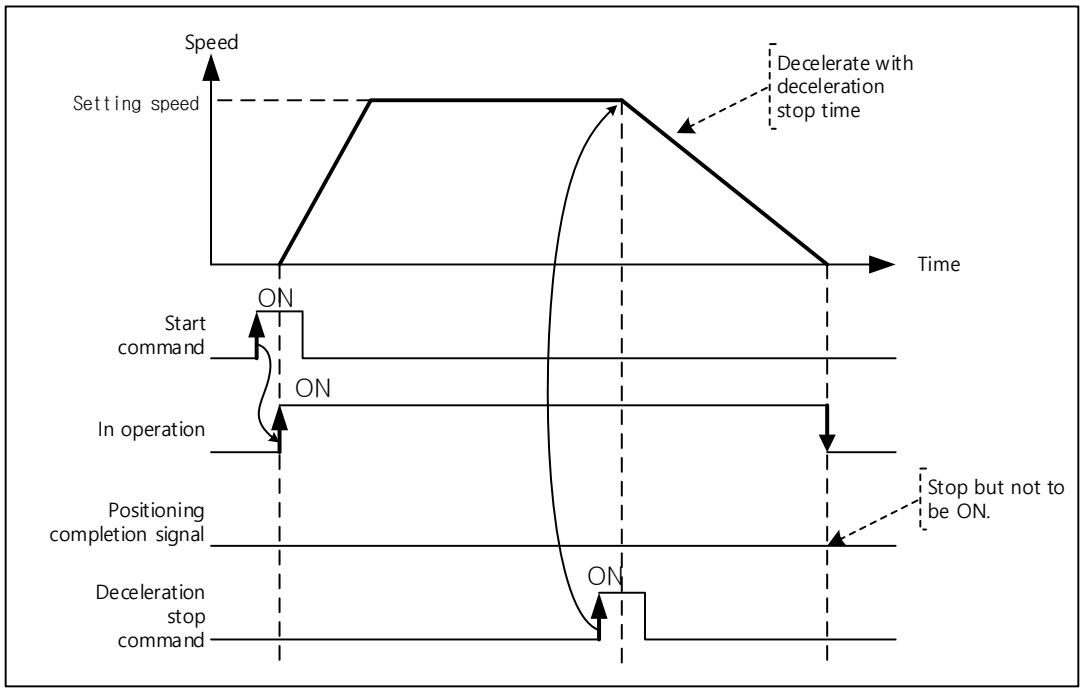
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

STP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*));

4) Caution

(1) If a deceleration stop command is input during the execution of jog operation, an error occurs. Use “Stop Jog” command for Jog operation stop.

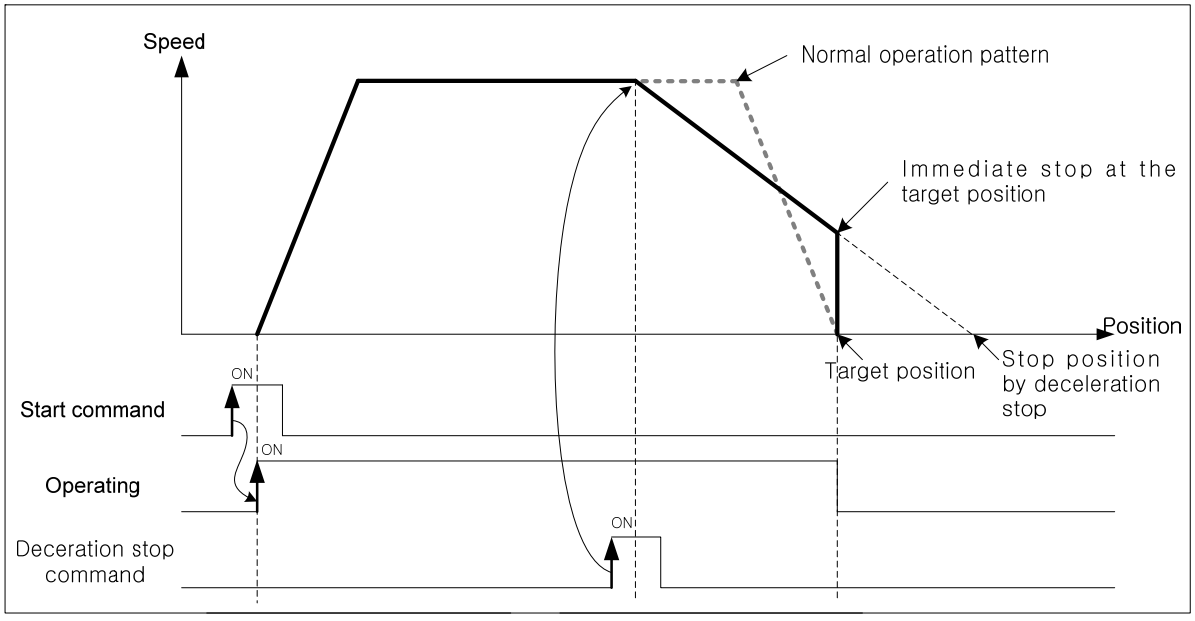
(2) During Continuous Operation of Linear interpolation or circular interpolation, because the PLC does not check the direction of movement, does not deceleration stop even if the moving direction is changed.

(3) If there is opposite direction of target position set on operation data, it may cause damages to machine because of rapid direction changing.

➔ To avoid impact to the machine, do not set the operation method to "Continuous", but to "Keep".

(4) If the deceleration distance is longer than distance to target position when input deceleration stop command during positioning control operation, it will be stopped at the target position.

(5) In the XGB built-in positioning, if the deceleration time is 0, it stops immediately. Otherwise, it stops according to the operation data of the corresponding operation step, or in the case of direct start, according to the acceleration/deceleration number set in the DST instruction.

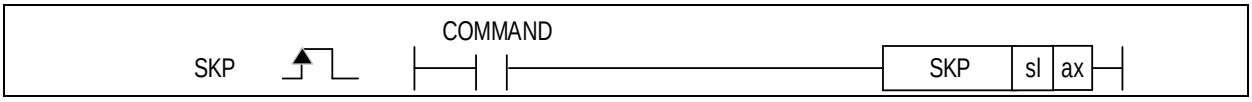


4.41.11 SKP / Skip operation

This command ends the operation of the currently operating step and continues operation to the next step.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SKP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	deceleration time (0 ~ 2,147,483,647 ms)	DWORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command decelerates and stops the currently running operation step, and changes the operation data of the next operation step number to execute position

(2) After the skip operation command is executed, deceleration stops and the operation of the next step continues.

(3) It can be used when the operation mode is End, Keep or Continuous operation and the operation pattern is in the acceleration, constant speed, and deceleration sections.

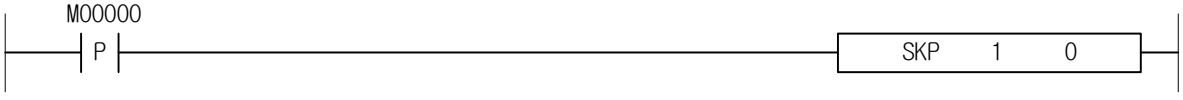
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

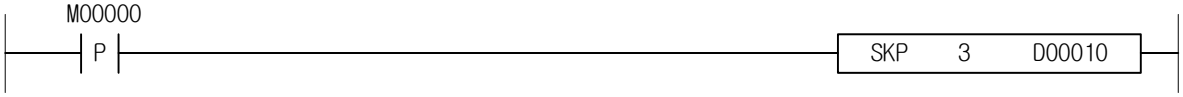
3) Example

(1) LD: Ladder Diagram

- Program to execute skip command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On

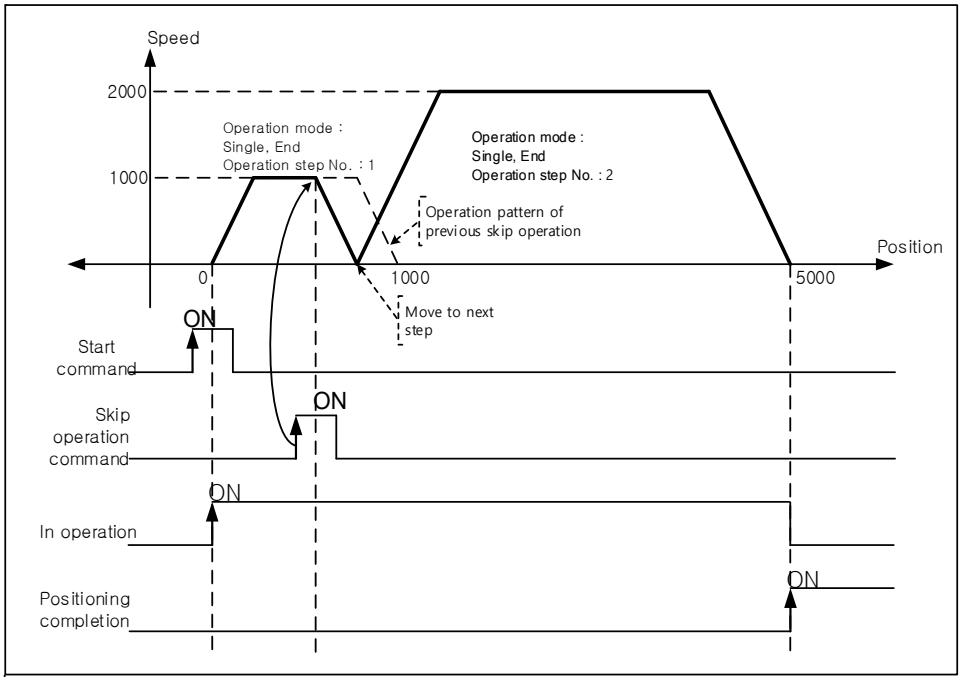


- Program that executes skip command on the axis designated in D00010 when input signal M00000 of positioning module installed in slot number 3 is On.



(2) Timer chart

※ The following is an example of a timing chart for skip operation for 1 axis in operation by the IST command.



(3) ST (Structure Text): Automatic program assignment
SKP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

(1) If the skip operation command is executed while the operation data of the next step is not set, an error occurs.

(2) In the cases below, continuous operation is not executed and previous operation is being kept.

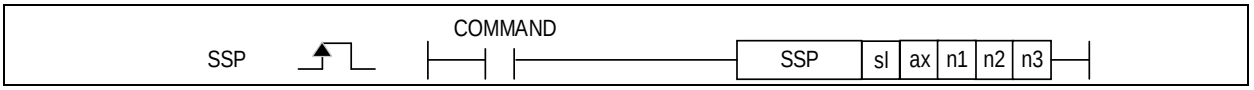
- Execute skip operation command on the sub axis of linear interpolation.
- Skip operation in linear interpolation operation must be executed on main axis.
- Execute skip operation command on the subordinate axis of sync. operation.
- Execute skip operation command on the axis in Jog operation.
- When the currently operating axis is executed by direct start
- Execute skip operation on the axis in Inching operation.
- Execute skip operation on the subordinate axis of circular interpolation.
- Skip operation in circular interpolation operation must be executed on main axis.

4.41.12 SSP / Position Synchronization

This command starts positioning with the operation data of the step number set by the command axis (subordinate axis) when the current position of the main axis coincides with the position set in position

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SSP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Position value of main axis for position synchronization operation	DINT
n2	Step number of instruction axis to operate when Position Synchronization starts ※ XGB position : Built-in(0~80), XGB extension(0~150)	WORD
n3	Main axis setting for Position Synchronization	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

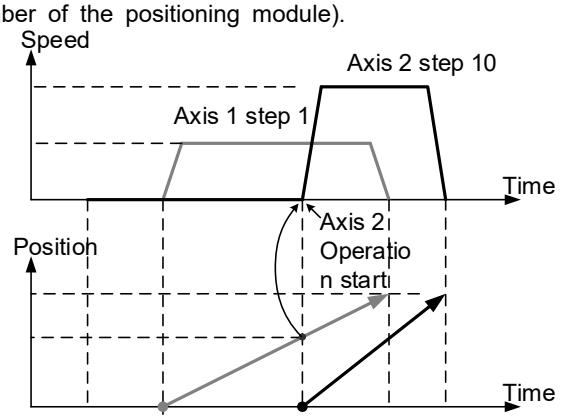
[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a positioning synchronization command to the positioning module.

(2) Position synchronization command executes to start the n2 step of the command axis ax when the main axis n3 axis becomes the position of n1 on the axis designated as ax of the positioning module designated by sl (slot number of the positioning module).



(3) Position synchronization command can be executed only when the main axis is in honing status.

(4) The position synchronization command starts in synchronization with the subordinate axis according to the current position of the main axis.

(5) The position synchronization command must be executed on the subordinate axis.

(6) When the position synchronization command is executed, it is in the operating state and the actual operation starts the operation of the subordinate axis when the current position of the main axis matches the set position of the position synchronization.

(7) In case of cancellation after executing the SSP command at the subordinate axis, if you execute the stop command, the SSP command shall be released.

(1) The values that can be set for n3 are as follows.

Setting Value	Axis	
	XGK	XGB
0	X-Axis	X-Axis
1	Y-Axis	Y-Axis
2	Z-Axis	Not available
3	Encoder	

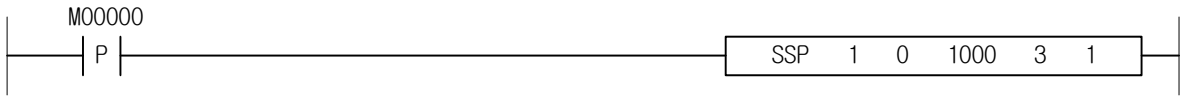
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

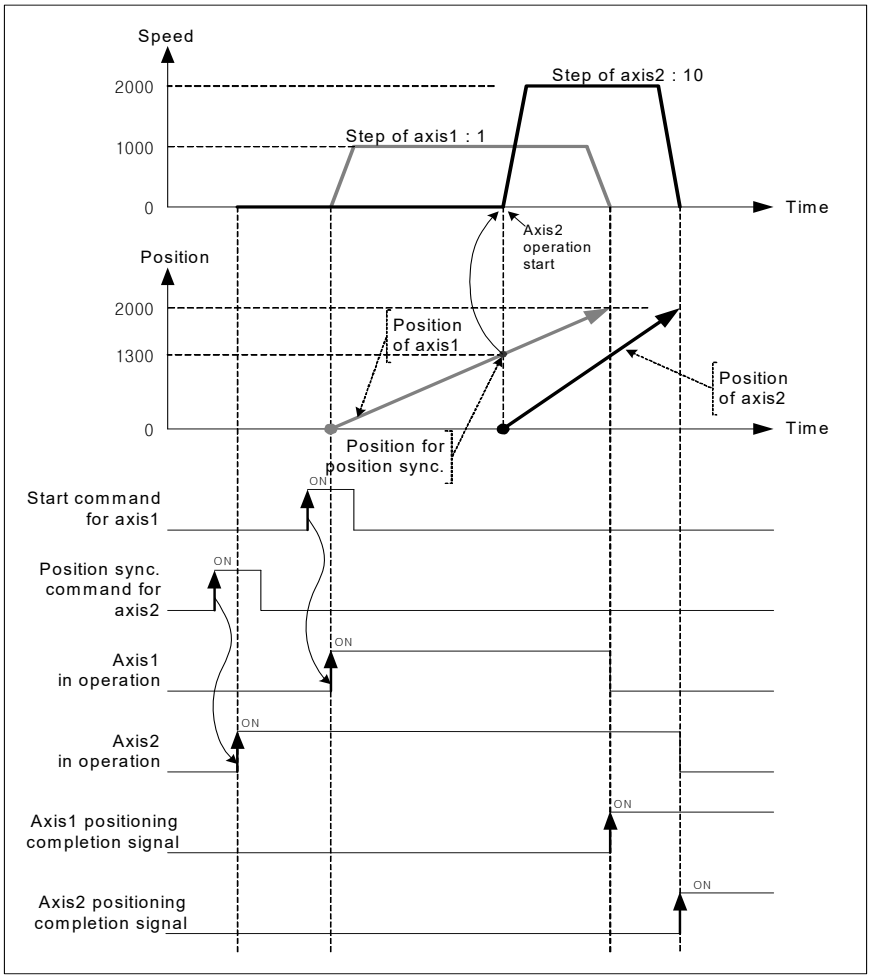
(1) LD: Ladder Diagram

- Program that executes position synchronization operation on the X axis with step 3 of the X axis and the Y axis as the main axis where the position of Y axis is 1000 when the input signal M00000 of the positioning module installed in slot number 1 is on.



(2) Timer chart

※ The following is a timing chart that executes position synchronization with the operation data of No. 10 of the subordinate axis when the position synchronization position of the main axis is 1300 with 1 axis as the main axis and 2 axes as the subordinate axis.



(3) ST (Structure Text): Automatic program assignment

```
SSP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*),
        Num3:=(*WORD*));
```

4) Caution

※ Position sync. control can be executed in the case below.

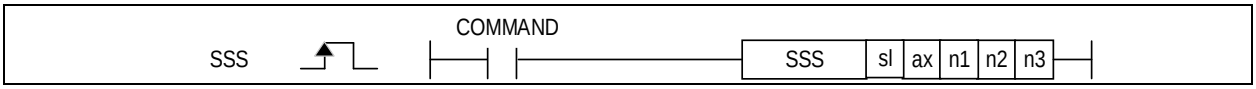
- An error occurs when the position synchronization command is executed while the M code signal is on. Make M code “OFF” with “M code release (XMOF)” command before use.
- If the axis set as the main axis is not the configurable axis of the module currently in use, or if the ma in axis setting is set to be the same as the command axis, an error occurs. Set the main axis among one of the axis can be set on module.

4.41.13 SSS / Speed Synchronization

The speed synchronization command operates at the set speed synchronization ratio and the subordinate axis operates in the same way as the main axis operation pattern.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
SSS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Main axis setting value of speed synchronization ratio : (1~65535) ※ XGB Built-in position : 1~10,000 (0.01% ~ 100,00%)	WORD
n2	Subordinate axis setting value of speed synchronization ratio : (1~65535) ※ XGB built-in position :Delay time: 1~10(ms)	WORD
n3	Main axis to operate with speed synchronization(0:X axis,1:Y axis, 2:Z axis, 3:encoder)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The speed synchronization command operates at the set speed synchronization ratio and the subordinate axis operates in the same way as the main axis operation pattern. When the speed synchronization command is executed, the subordinate axis is in the status of speed synchronization operation, and when the stop command is executed on the subordinate axis, the status of the speed synchronization operation of the subordinate axis is released.

(2) Ratio of Speed sync. is calculated as follows.
Speed synchronization ratio = set value of subordinate axis / set value of main axis, and the values that can be set in n3 are as follows.

Setting Value	Axis	
	XGK	XGB
0	X-Axis	X-Axis
1	Y-Axis	Y-Axis
2	Z-Axis	High speed counter Ch0
3	Encoder	High speed counter Ch1
4	Not available	High speed counter Ch2
5		High speed counter Ch3
6		High speed counter Ch4
7		High speed counter Ch5
8		High speed counter Ch6
9		High speed counter Ch7

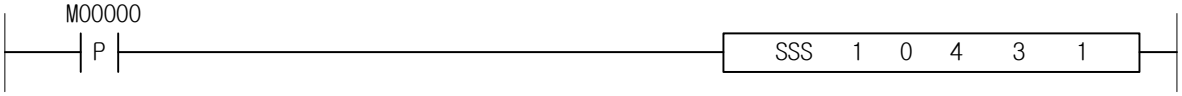
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

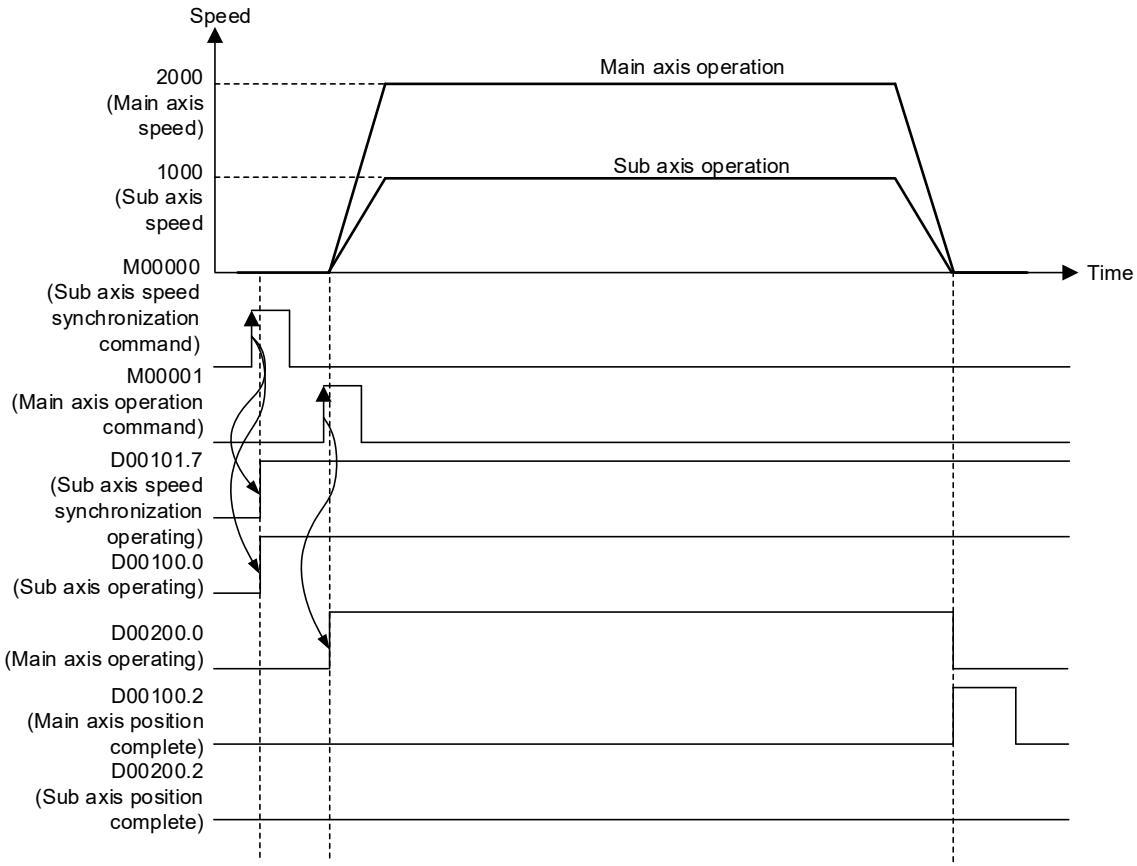
(1) LD: Ladder Diagram

- Y axis sets the main axis, the main axis ratio: the sub axis ratio is 4:3, and the program that operates speed synchronization command on the X axis when the input signal M00000 of the positioning module installed in slot number 1 is on.



(2) Timer chart

※ This is a timing chart of a program that executes a speed synchronization command with 1 axis for the sub axis, 2 axes for the main axis, and a speed synchronization ratio of 1/2 (the main axis setting value is 2 and the sub axis setting value is 1). (b) By direct start, the main axis (2 axes) operates at speed (2000) and position (10000).
At this time, the axis (1 axis) is 1000, which is 1/2 the speed of the main axis (2 axes), and operates the same as the pattern in which the main axis (2 axes) moves.



(3) ST (Structure Text): Automatic program assignment
SSS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(* WORD*), Num3:=(*WORD*));

4) Caution

※ In the case below, speed synchronization Operating indication is not executed due to an error.

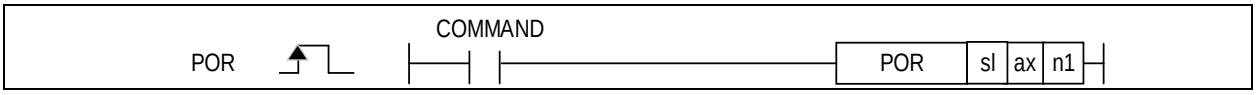
(1) The axis where the M code signal is on cannot execute the speed synchronization command due to an error. Before executing the speed synchronization command, execute the M code release (XMOF) command and change the M code to Off.
(2) Set the main axis and sub axis the same, and an error occurs
(3) An error occurs if the speed of the subordinate axis exceeds the speed limit by the speed synchronization ratio. If the subordinate axis exceeds the speed limit value during speed synchronous operation, deceleration stops with the basic parameter 'Dec. time of Emergent stop'.
(4) When changing the speed of the subordinate axis with the speed synchronization command, be careful as the difference between the speeds before and after the change may cause shock to the machine and machine.

4.41.14 POR / Position Override

The position override command is used to change the target position during position control operation.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
POR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Target position value to change (Absolute coordinate)	DINT

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If you want to change the target position during operation by positioning data, change the target position with the position override command.

(2) The position override command can be used in the Acceleration, Constant speed, and Deceleration sections of the operation pattern, and the available operation modes are End operation, Keep operation, and Continuous operation.

(3) It may be executed several times in operation.

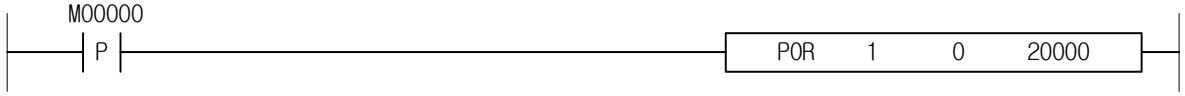
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

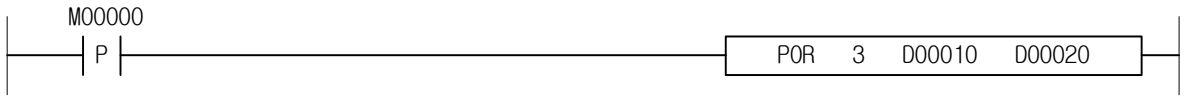
3) Example

(1) LD: Ladder Diagram

- Program that executes the position override command to change the target position of the X axis to 20000 when the input signal M00000 of the positioning module mounted in slot number 1 is on.

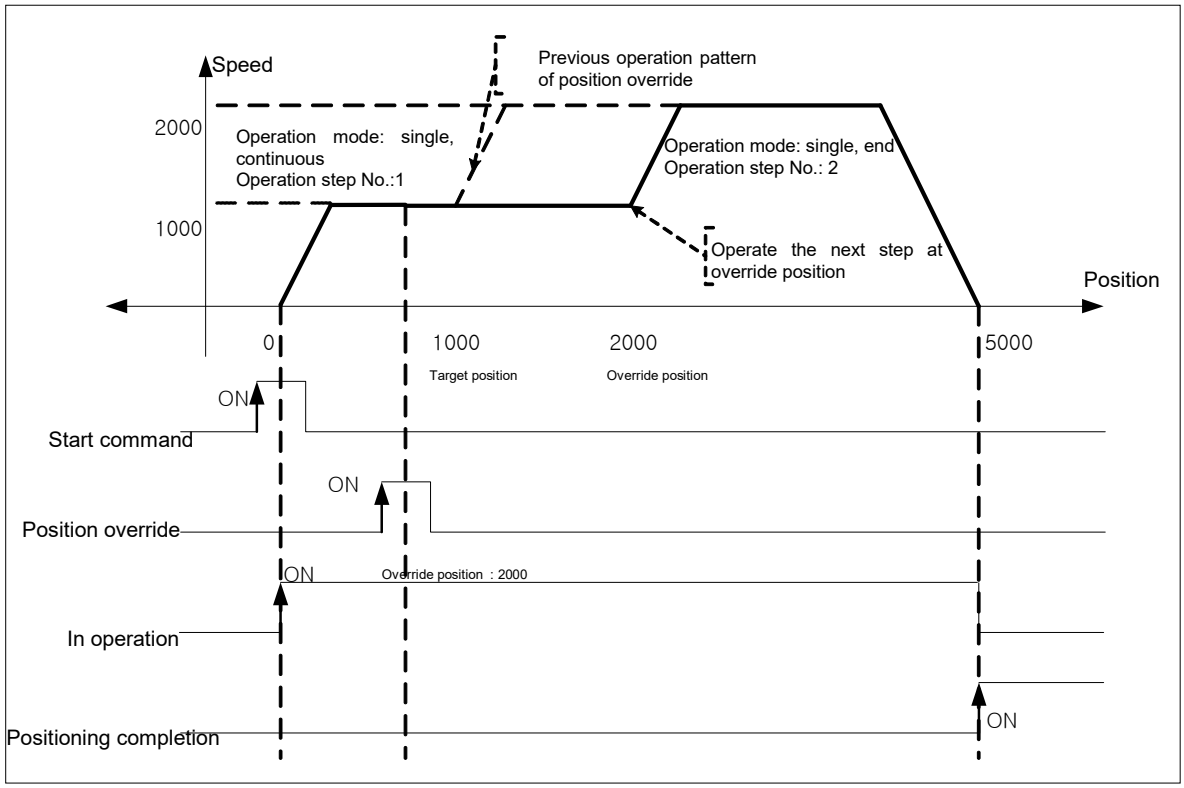


- Program that executes the position override command to change the target position of the axis set in D00010 to the value set in D00020 when the input signal M00000 of the positioning module mounted in slot number 3 is On.



(2) Timer chart

※ The following is a timing chart for the example of executing position override when indirect starting is executed on the command axis and the position of the command axis is set value 2000.



(3) ST (Structure Text): Automatic program assignment

```
POR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*));
```

4) Caution

※ In the cases below, position override is not executed and previous operation is being kept.

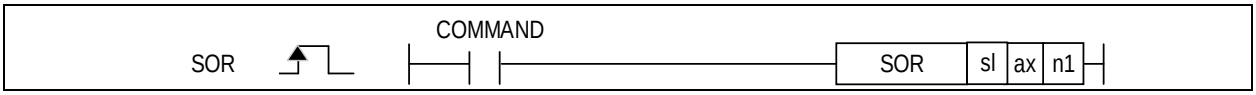
(1) Execute position override command in dwell.
(2) Current operation is not positioning control(single axis positioning, Inching operation).
(3) Execute position override command on the axis operating linear interpolation.
(4) Execute position override command on the axis operating circular interpolation.
(5) Execute continuous operation command on subordinate axis in sync. operation.

4.41.15 SOR / Speed Override

The speed override command is used to change the target speed during speed control operation.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SOR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Goal speed value to change	DWORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When user wants to change the operation speed of positioning control, user may change the speed with speed override command.

(2) Speed override command is available in Acceleration and Constant speed section and available operation modes are End, Keep ,and Continuous.

(3) The unit of speed override value depends on unit of axis.

(4) It may be executed several times in operation.

2) Error

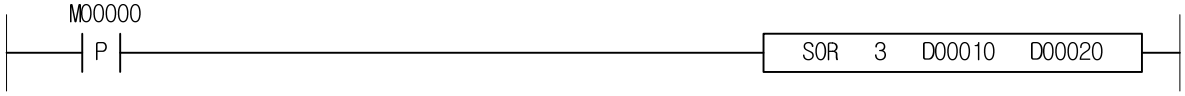
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

- Program that executes the speed override command to change the target speed of the X axis to 5000 when the input signal M00000 of the positioning module installed in slot number 1 is on.

- Program that executes the speed override command to change the target speed of the axis set in D00010 to the value set in D00020 when the input signal M00000 of the positioning module installed in slot number 3 is On.

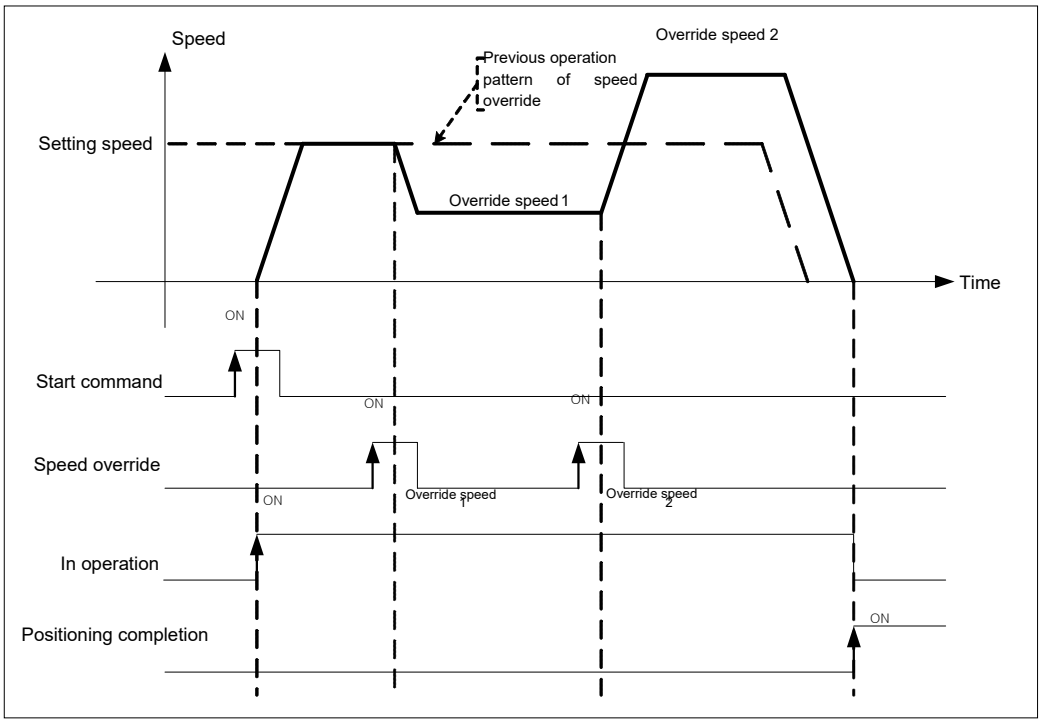


(2) Timer chart

※ Below is the timing chart of the speed override example.
The command axis executes the speed override command multiple times after the speed indirect command.

※ XG-PM setting items(Axis operation data to be used for indirect start IST)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	2000	No.1	No.1	0	0



(3) ST (Structure Text): Automatic program assignment
SOR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*));

4) Caution

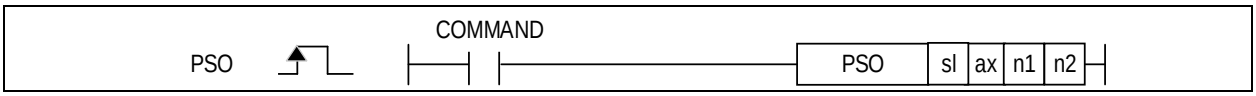
※ In the cases below, speed override is not executed and previous operation is being kept.
(1) The value of speed override command exceeds speed limit of basic parameter.
(2) The speed value of speed override command must be below speed limit.
(3) Execute speed override command on the subordinate axis of linear interpolation.
(4) Execute speed override command on the subordinate axis of circular interpolation.
(5) Execute speed override command on subordinate axis of sync. operation.
(6) Execute speed override command in deceleration area.

4.41.16 PSO / Positioning speed Override

This command operates by changing the target speed when reaching the designated position during speed control operation.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PSO	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Position value to execute speed change (-2147483648 ~ 2147483647)	DINT
n2	Target speed value to change (LD:1~1000000, OC:1~200000) ※ XGB built-in position:1~100,000	DWORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Positioning speed override command is available in Acceleration and Constant speed section and available operation modes are End, Keep ,and Continuous.

(2) Positioning speed override command is available in Acceleration and Constant speed section and available operation modes are End, Keep ,and Continuous.

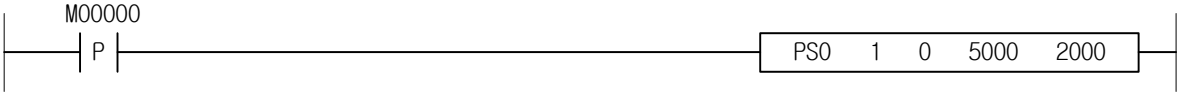
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

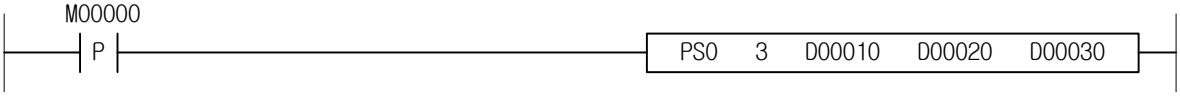
3) Example

(1) LD: Ladder Diagram

- A program that executes the positioning speed override command to change the target speed to 2000 where the current position reaches 5000 on the X axis when input signal M00000 of the positioning module installed in slot number 1 is On,



- A program that executes the positioning speed override command to change the target speed to the value set in D00030 where the current position on the axis designated in D00010 becomes the value set in D00020 when input signal M00000 of the positioning module installed in slot number 1 is On,

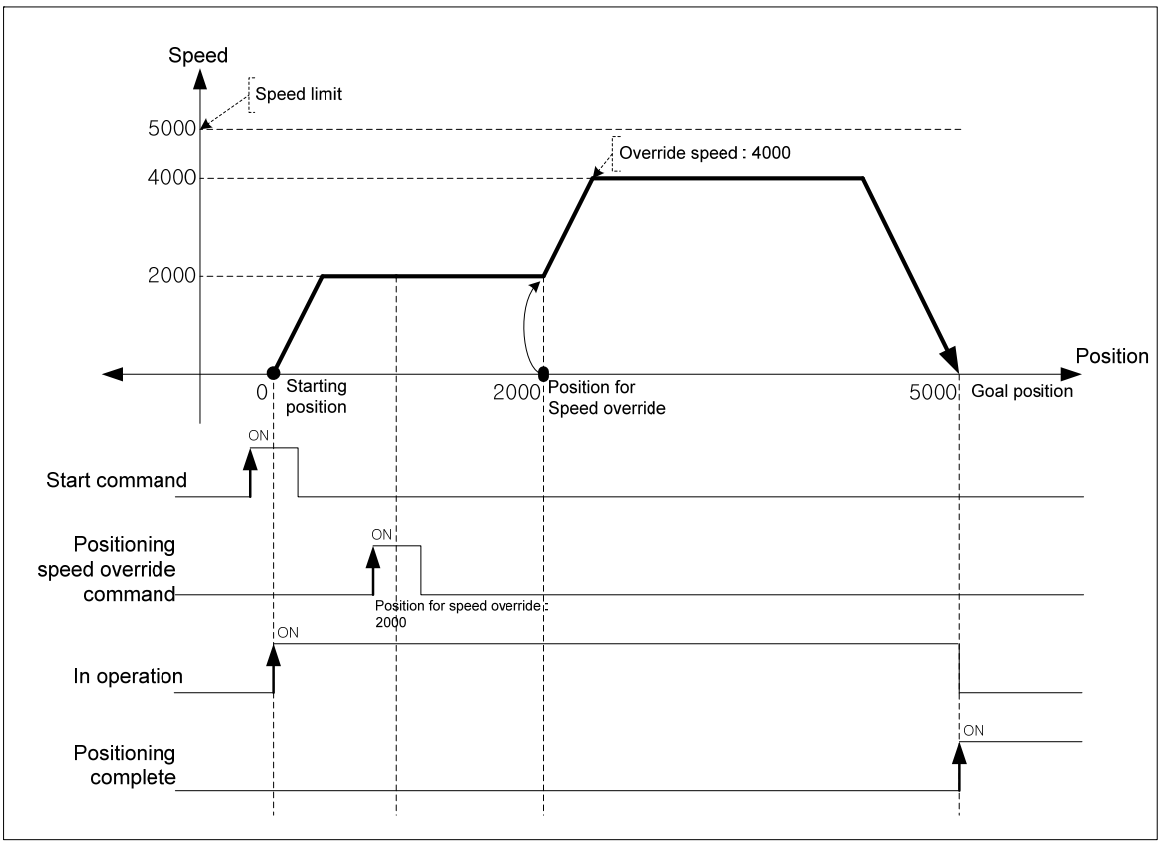


(2) Timer chart

※ The following is an example of operating indirect start to command axis and executing the speed override command with the speed value 4000 when the command axis reaches the positioning speed override value (n1): 2000.

※ XG-PM setting items(Axis operation data to be used for indirect start IST)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0



(3) ST (Structure Text): Automatic program assignment

PSO_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*DWORD*));

4) Caution

※ In the cases below, positioning speed override is not executed and previous operation is being kept.

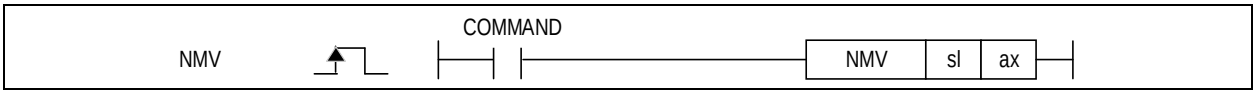
(1) Current operation is not positioning control(single axis positioning, Inching operation).
(2) The value of speed override command exceeds speed limit of basic parameter.
(3) Execute positioning speed override command on the subordinate axis of linear interpolation.
(4) Execute positioning speed override command on the subordinate axis of circular interpolation.
(5) Execute positioning speed override command on subordinate axis of sync. operation.
(6) In the case that acc./dec. pattern of extended parameter is 'S-curve operation.
(7) If execute positioning speed override in dec. area., although error does not occurred but speed override is not executed.

4.41.17 NMV / Continuous Operation

Execute positioning control changing the current operation step no. to the next one.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
NMV	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If continuous operation command is executed, the step No. is changed from the step in current operation to the next step No. and operates positioning operation to the speed and the target position of the next step. Connection with the next step is executed by continuous operation pattern.

(2) Continuous operation command changes the only current operation pattern in operation, not changes the operation data.

(3) It can be used when the operation mode is End, Keep or Continuous operation and the operation pattern is in the acceleration, constant speed, and deceleration sections.

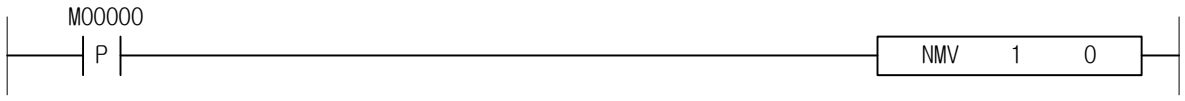
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

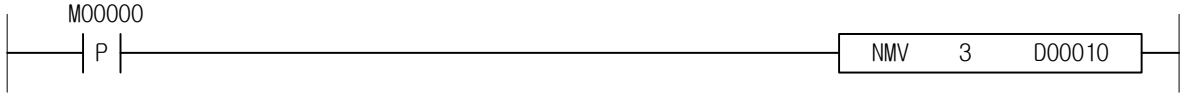
3) Example

(1) LD: Ladder Diagram

- Program to execute continuous run command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On

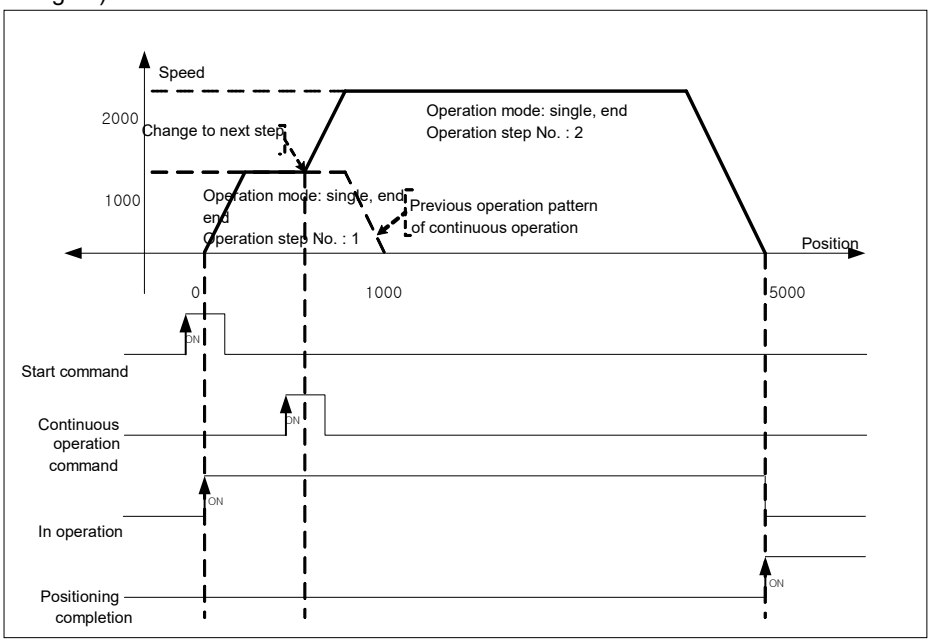


- Program that executes continuous run command on the axis designated in D00010 when input signal M00000 of positioning module installed in slot number 3 is On



(2) Timer chart

he following is an example in which the command axis (1 axis) is executed by continuous operation without deceleration stop from start step 1 to next start step 2 by NMV instruction even if the operation parameter of the command axis is set single or end.
(Only the current operation pattern of the currently executing step is changed, but the operation data is not changed.)



※ XG-PM setting items(Axis operation data to be used for indirect start IST)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0

(3) ST (Structure Text): Automatic program assignment

```
NMV_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ In the cases below, continuous operation is not executed and previous operation is being kept.

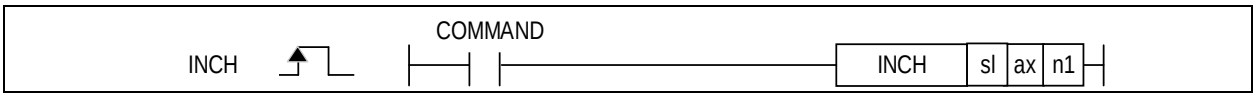
(1) In the case that acc./dec. pattern of extended parameter is 'S-curve operation.
(2) Current status is dwelling
(3) When the current control method is not single-axis position control or linear interpolation.
(4) Speed data value of operation step to be executed next is 0 or exceeds the speed limit.
(5) When the continuous operation command is executed for the subordinate axis of linear interpolation, the continuous operation command during linear interpolation operation must be executed on the main axis.
(6) Execute continuous operation command on axis in circular interpolation.
(7) Execute continuous operation command on subordinate axis in sync. operation.
(8) The current operation step no. is the last step(400) of operation data.
(9) When the currently operating axis is executed by direct start

4.41.18 INCH / Inching Operation

Manual operation is executed as much as the target movement amount set at the inching speed set in the manual operation parameter.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
INCH	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Position value to move for inching operation (–2147483648 ~ 2147483647 pulse)	DINT

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is a kind of manual operation and executing positioning at the speed already set on manual operation parameter as much as the amount of movement already set on the data of inching operation command.Position control is executes to the target position.

(2) It executes the relative coordinate operation by inching operation speed set in manual operation parameter as much as position value (n1).

(3) A simple comparison with jog start as one of manual operation, While the operation by ON/OFF of Jog signal is difficult in moving to the correct position as the operation starts and stops according to the command, the inching command enables to set the desired transfer amount easily and reach the goal point.

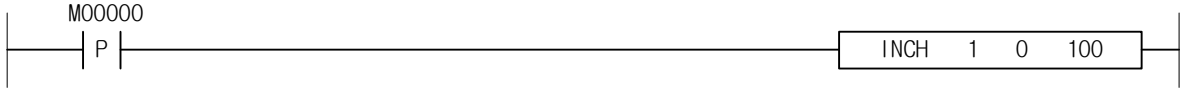
(4) Thus, it is available to reach the correct target position by moving fast near the working position by Jog command and operating the detail movement by inching command.

2) Error

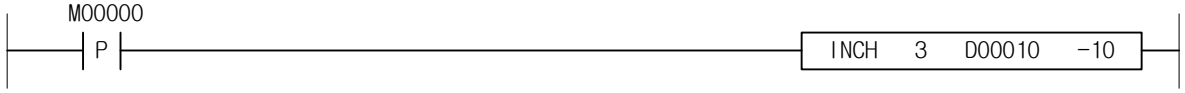
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

- When input signal M00000 of positioning module installed in slot number 1 is On executes inching command to move 100 on X axis.



- When input signal M00000 of the positioning module mounted in slot number 3 is On a program that executes the inching command to move 10 in the opposite direction to the axis specified in D00010.



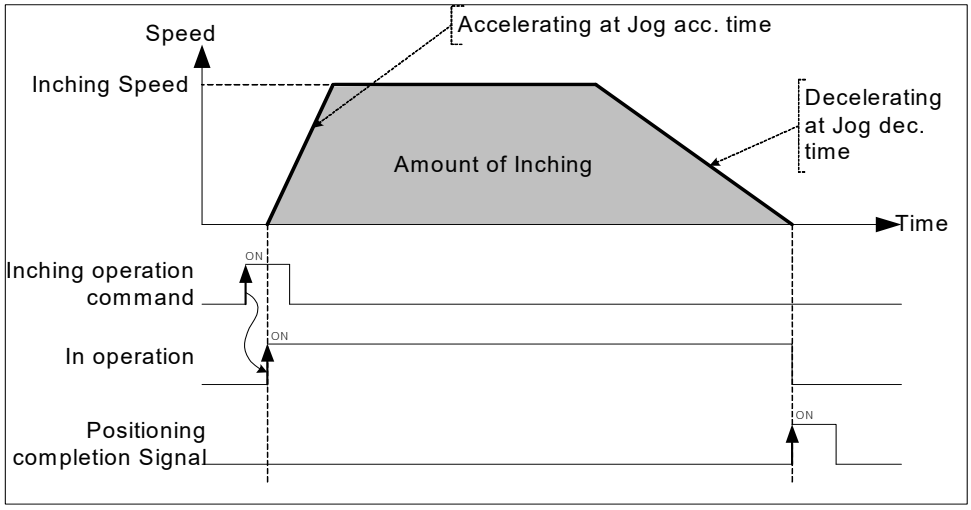
(2) Timer chart

※ Below is a brief example of inching operation, follow the manual operation parameters below.

※ XG- PM Related parameter setting (Manual operation parameter)

Item	Setting value	Content
JOG acceleration speed	0 ~ 2147483647	Set the accelerating time for acceleration of Inching operation
Jog dec. time	0 ~ 2147483647	Set the decelerating time for deceleration of Inching operation
Inching Speed	1 ~ Speed limit value	Set the speed of Inching operation

The command axis is accelerated with the jog acceleration time set in the manual operation parameter to reach the preset inching speed in the manual operation parameter. This is an example in which the positioning is completed after the jog deceleration time is applied and the amount of inching movement set in the instruction is moved.



(3) ST (Structure

Text): Automatic program assignment

```
INCH_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*));
```

4) Caution

(1) The direction of movement is determined by the sign of the inching amount set as auxiliary data.
- The amount of inching movement is positive (+): Positioning operation in forward direction
- The amount of inching movement is negative (-): Positioning operation in in reverse direction

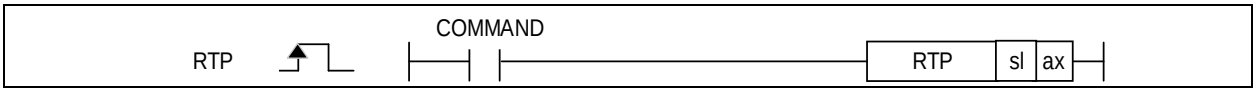
(2) Acc./Dec process and Inching speed
- Use Jog acc./dec. time of manual operation as acc./dec. time of Inching operation.
- Set Jog acc./dec. time on 'Jog acc./dec. time' of manual operation parameter setting of XG-PM.
- The inching speed is set in the inching speed among the manual operation parameter setting items of XG-PM.
- If inching speed is set out of the setting range, error will occur and the operation does not work.

4.41.19 RTP / Manual operation previous position return

This function is used to return to the position where the positioning before manual operation is completed after moving to any position by manual operation (jog operation, inching operation).

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RTP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If the current position is changed as external axis speed sync. operation, inching operation, Jog operation after completing the positioning, it returns to the previous position of manual operation.

(2) If manual operation is not executed, the position return command before manual operation is ignored.

(3) Direction of moving depends on the current position and the previous position of manual operation.

- Starting position < The previous position of manual operation : Forward direction
- Starting position > The previous position of manual operation : Reverse direction

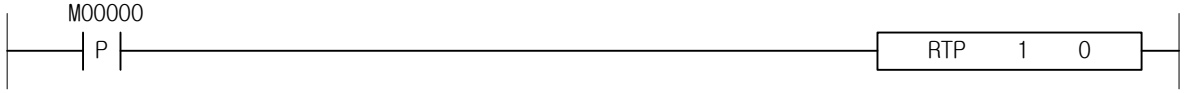
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

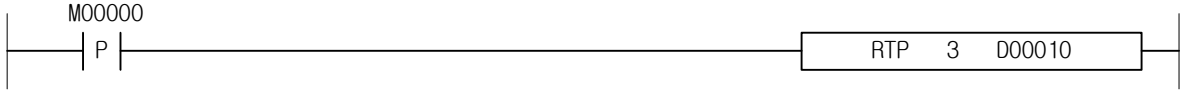
3) Example

(1) LD: Ladder Diagram

- Program that executes the return command to the previous position before manual operation on the X axis when the input signal M00000 of the positioning module installed in slot number 1 is on.



- Program that executes the return command to the previous position of manual operation on the axis designated in D00010 when the input signal M00000 of the positioning module mounted in slot number 3 is on.



(2) Timer chart

※ The following is a brief example of the command to return to the position before manual operation.

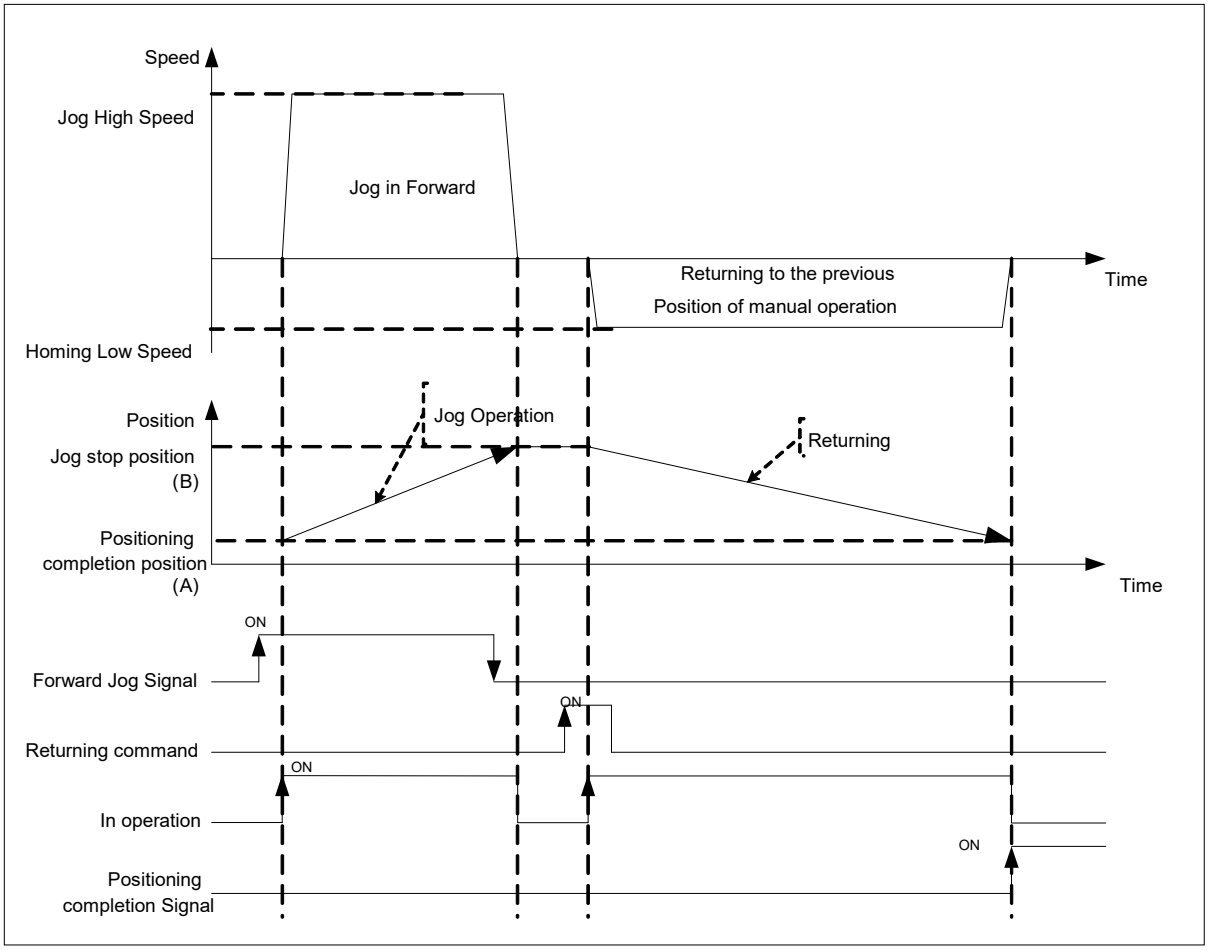
1) Forward jog operation is executed while the jog start (manual operation) command is on. (Jog high speed)

2) Then, when the command to return to the previous position of the manual position is commanded, the

positioning is completed by returning to the jog reverse low speed as much as the previous travel distance

※ XG- PM Related parameter setting (Manual operation parameter)

Item	Setting value	Content
Jog low speed	1 ~ Speed limit value	Set the position return operation speed before manual operation.
JOG acceleration speed	0 ~ 2147483647	Set the acceleration time to be used when acceleratingthe po sition return operation before manual operation..
Jog dec. time	0 ~ 2147483647	Set the deceleration time to be used when decelerating the manual operation previous position return operation.



(3) ST (Structure Text): Automatic program assignment

```
RTP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ Contents related to acceleration/deceleration processing and position return speed before manual operation

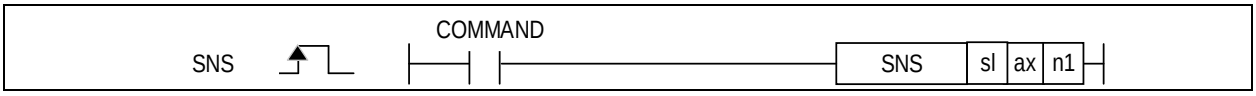
(1) Acc./Dec. time of manual operation previous position return is used for the jog acceleration/deceleration time of manual operation parameter.
(2) Among the manual operation parameter setting items of XG-PM, set the acceleration and deceleration time in the jog acceleration/deceleration time.
(3) The speed of manual operation previous position return uses jog low speed among manual operation parameter setting items of XG-PM.
(4) The manual operation previous position return speed is set out of the setting range, error will occur and the operation does not work.

4.41.20 SNS / Start Step Number Change

This command is for changing the current step no. when executing indirect start command

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)		XBF	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SNS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Step number setting for next operation	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a start step change command to the positioning module.

(2) Execute the operation step number change command to change the next operation step to n1 on the axis designated by ax of the positioning module specified by sl (slot number of the positioning module).

(3) When starting with setting step no. as 0 in indirect start command, current operation step no. is executed. The current step no. may be changed by start step no. change command.

(4) This command may be only executed in stop motion or error arises.

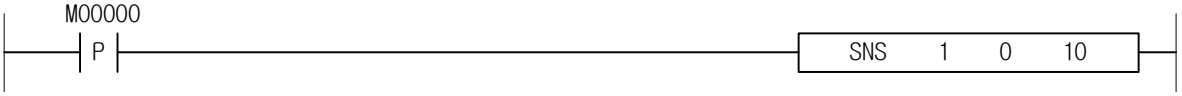
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

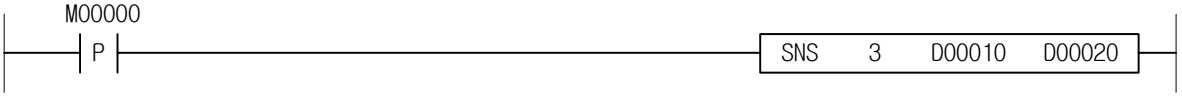
3) Example

(1) LD: Ladder Diagram

- Program to execute the operation step change command to set the next operation step on the X axis to number 10 step when the input signal M00000 of the positioning module mounted in slot number 1 is on.

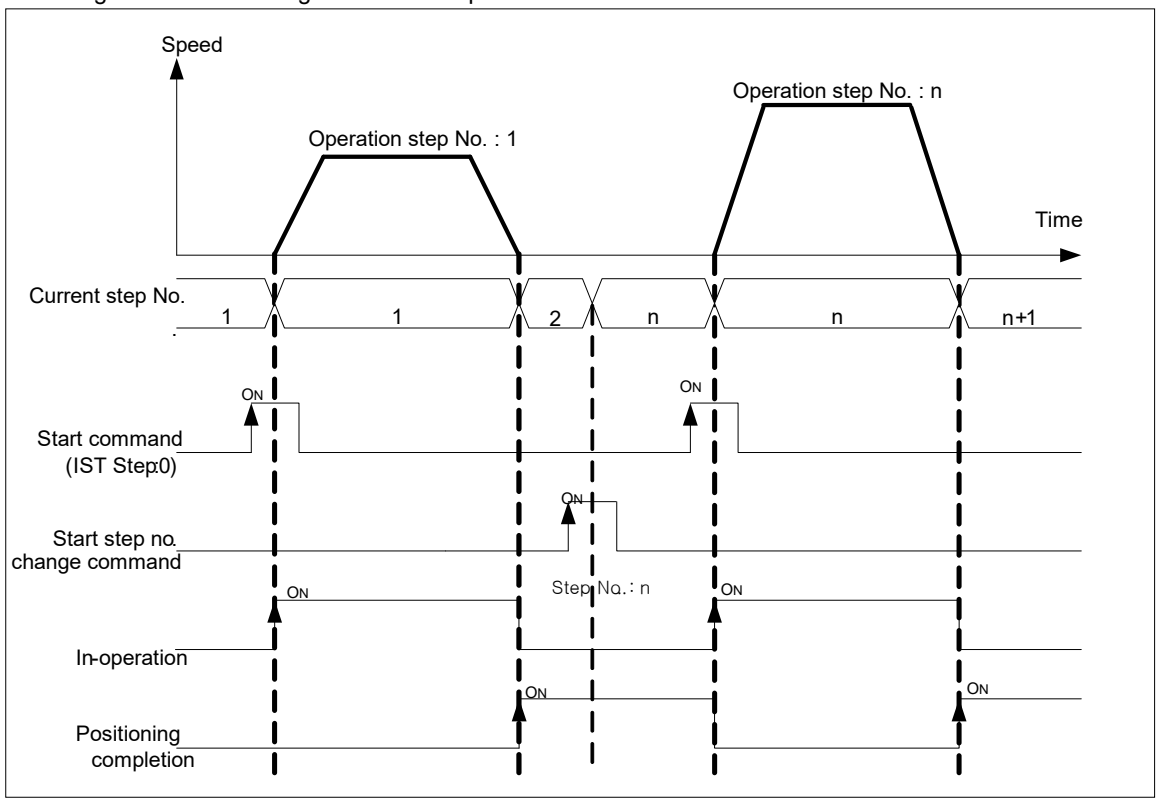


- Program that executes operation step change command to change the next operation step to the value set in D00020 on the axis designated in D00010 when the input signal M00000 of the positioning module mounted in slot number 3 is On.



(2) Timer chart

※ The following is a timing chart of an example that shows the current step number change status by the step change Command during indirect start operation.



(3) ST (Structure Text): Automatic program assignment

SNS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) If the step number is 0, the current step number is maintained.

※ In the case below, start step no. change command is not executed.

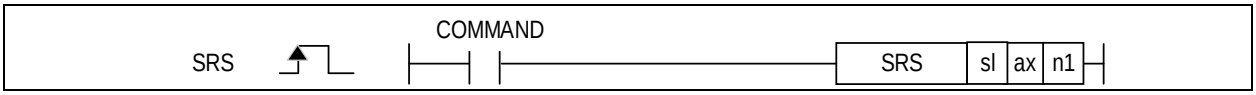
- When step no. to change is out of 0 ~ 400.

4.41.21 SRS / Repeat Step Number Change

This is the function to change the repeat operation step number to be executed next in the position control where the operation method is "Repeat".

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SRS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Repeat step number to change (0~400)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The repeat step is changed to the step number set in step number (n1).

(2) Set the step to be designated as the next operation after operating the set step repeatedly among the operation methods (single , repeat).

(3) If the repeat operation step number change is not executed and set to the repeat operation mode of end/keep/continuous operation, the current operation step number is changed to operate step 1 after the positioning operation is completed.

(4) If the repeat operation step number change command is executed, it changes to the designated step, not step 1.

(5) This command can be executed even while operating.

2) Error

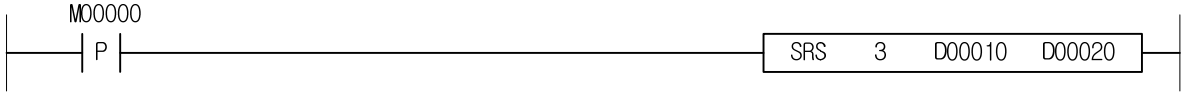
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

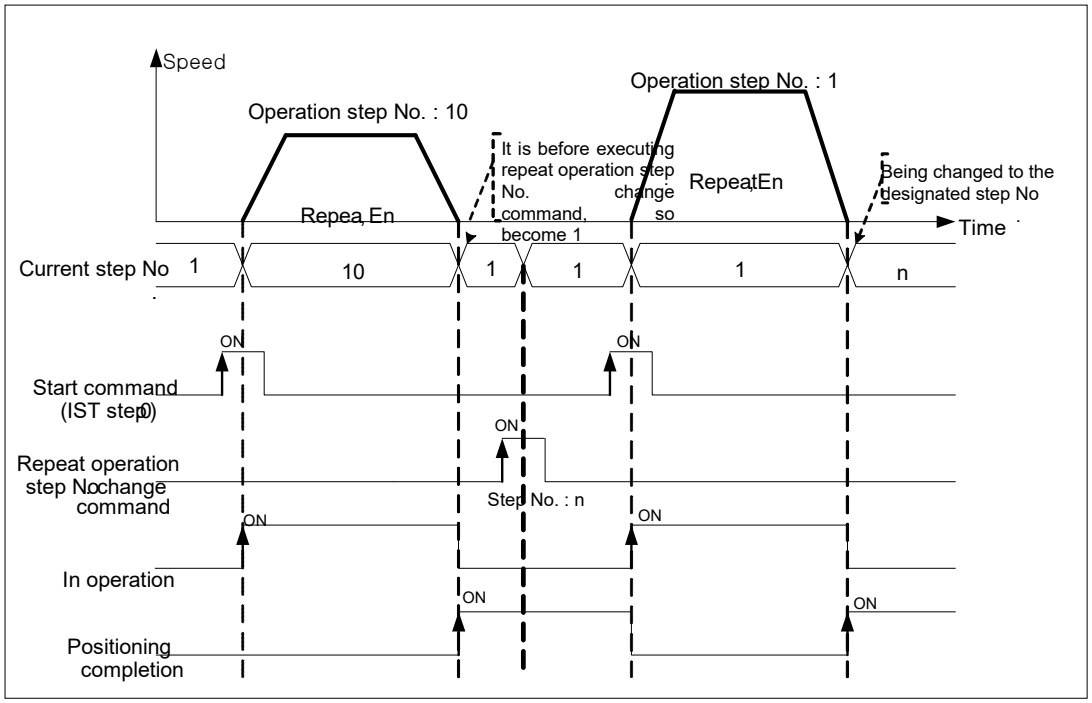
- Program to execute the repeat step change command to set the repeat step on the X axis to number 10 step when the input signal M00000 of the positioning module mounted in slot number 1 is on.

- Program that executes repeat step change command to change the repeat step to the value set in D00020 on the axis designated in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ The following is a timing chart of an example in which the current step number is changed by the repeat step number change command during indirect start operation.



(3) ST (Structure Text): Automatic program assignment

SRS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) If the step no. is 0, keep the previous step no.

(2) The repeat step number change command does not change the current operation step at the time of execution, and changes to the step specified by the repeat operation step number change command after the operation of positioning data whose operation method is set to “Repeat” is completed.

※ In the case below, repeat operation step no. change command is not executed.

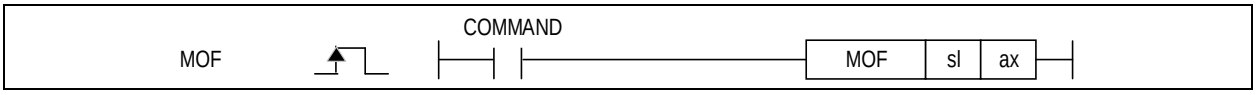
- When step no. to change is out of 0 ~ 400.

4.41.22 MOF / M code Off

When M code occurs, M code signal and M code No. are released at the same time

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
MOF	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When M code Off occurs, M code signal and M code No. are released at the same time
M code and M code No. are changed to OFF and 0, respectively.

(2) This command can be executed in any section while operating or after positioning completion.

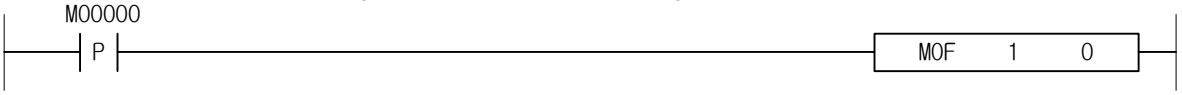
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

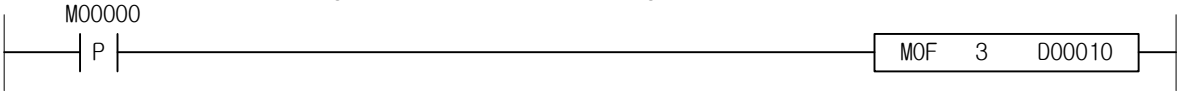
3) Example

(1) LD: Ladder Diagram

- A program that executes the M code off command that turns off the M code generated on the X axis and clears the M code value when the input signal M00000 of the positioning module installed in slot number 1 is on.



- Program that executes the M code off command that turns off the M code generated in D00010 and clears the M code value when the input signal M00000 of the positioning module installed in slot number 3 is on.

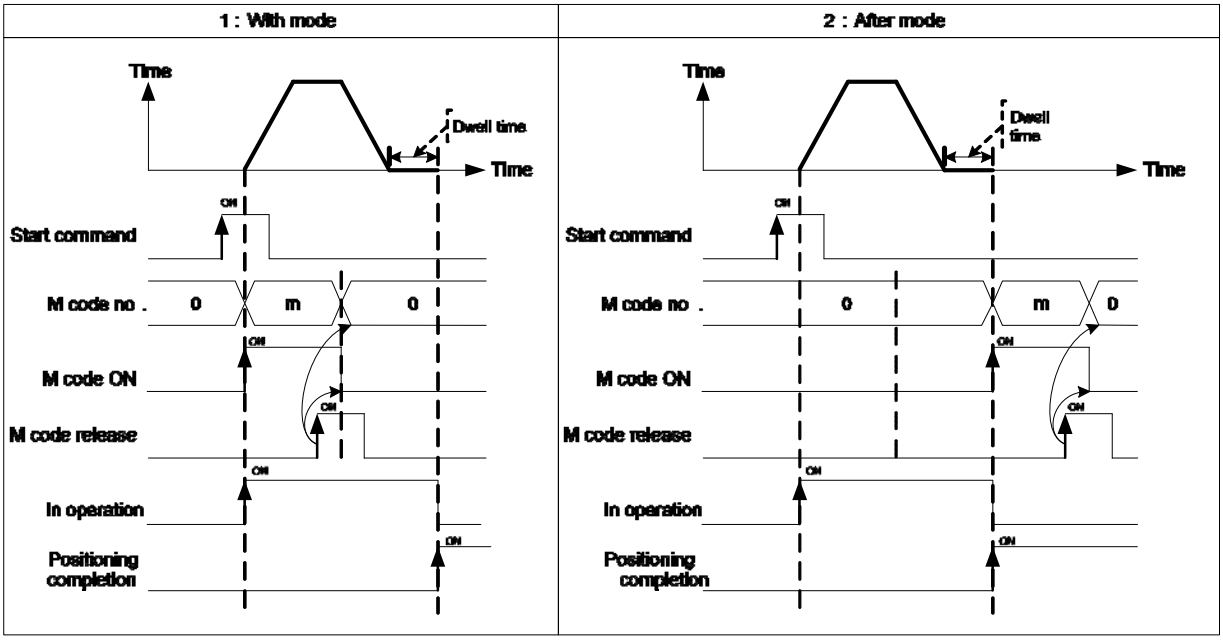


(2) Timer chart

※ The following is a brief timing chart for M code change according to two M code settings.

- Setting of XG-PM(extended parameter)

Item	Setting value	Content
M code mode	0:None	Not to output M code signal and M code no.
	1:With	Start and turn M code signal 'on' at the same time, then output M code no. set in operation data.
	2:After	After finishing positioning by start command, turn M code signal 'on' and then output M code no. set in operation data.



(3) ST (Structure Text): Automatic program assignment

```
MOF_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

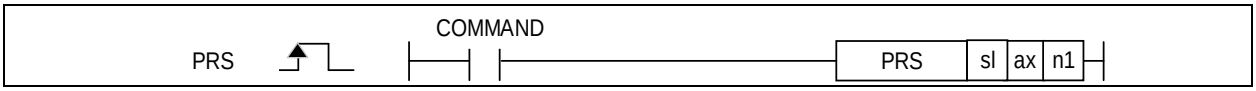
※ In the keep operation mode, if the M code number and M code ON signal occur, the operation of the next step is in the standby state, and the M code on signal waits for Off.
When the M code off command is executed, The next step run keep operation automatically.

4.41.23 PRS / Present Position Preset

This command is for changing the current position value to the value at user's pleases.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
PRS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Current position value to change	DINT

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If you execute the command to change the current position in the undecided homing state, it is changed to the homing state.

(2) If the current position is changed by the current position change command, the mechanical home position executed by home return is changed, and when you want to use the mechanical home position again, you must execute home return again.

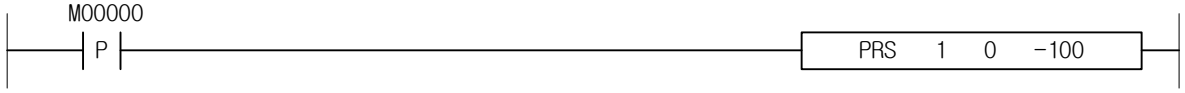
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

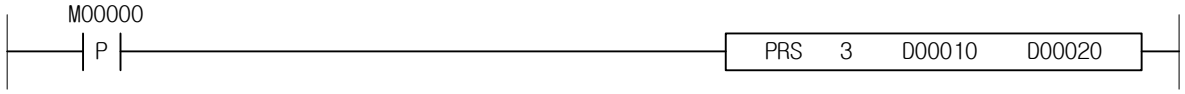
3) Example

(1) LD: Ladder Diagram

- Program that executes the current position change command to set the current position value on the X-axis to -100 when the input signal M00000 of the positioning module installed in slot number 1 is on.

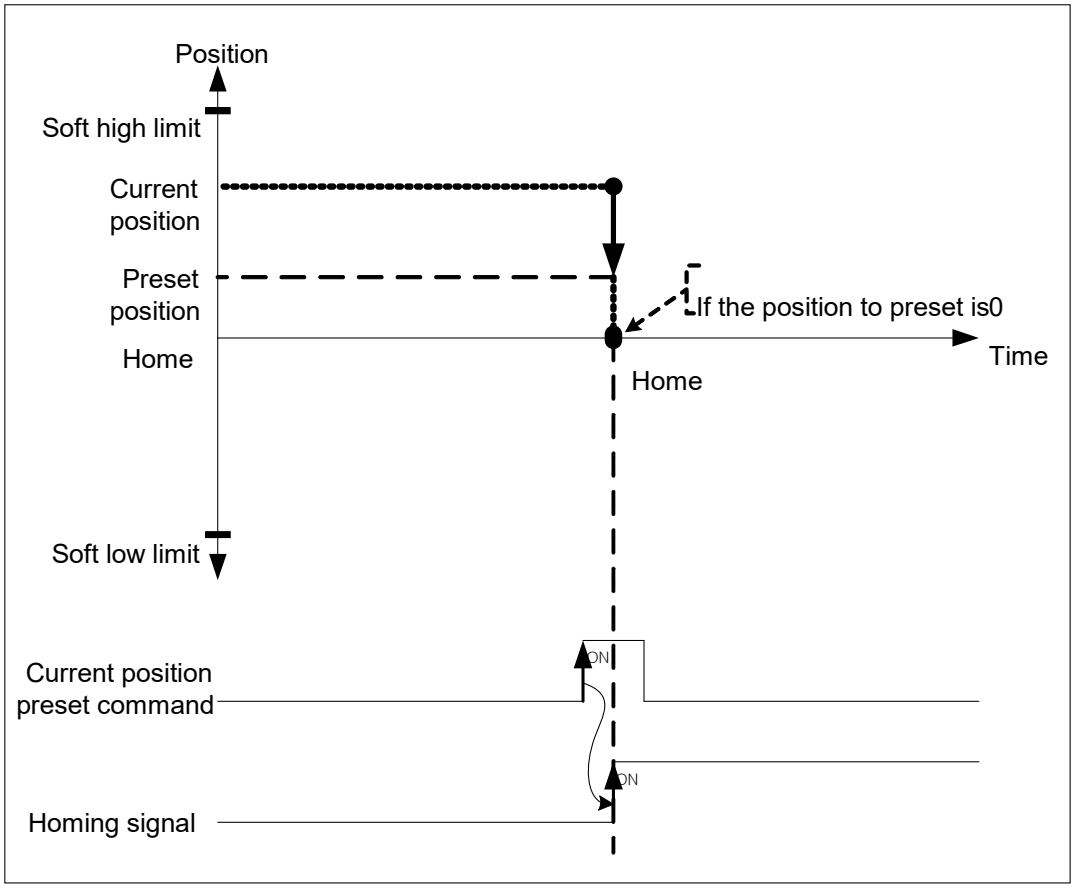


- Program that executes the current position change command that changes the current position to the value set in D00020 on the axis designated in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is on.



(2) Timer chart

※ Below is an example timing chart to set the preset position value to 0.



(3) ST (Structure Text): Automatic program assignment

```
PRS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD), Num1:=(*DINT*));
```

4) Caution

(1) The current position preset command cannot be executed in operation due to an error.

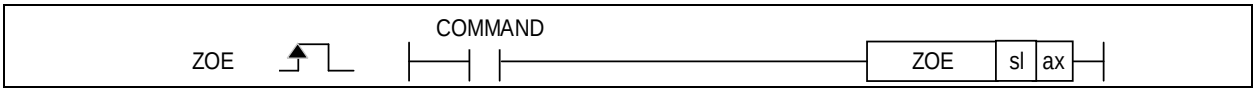
(2) If the current position preset position setting value is outside the range of the soft upper limit and soft lower limit of the extended parameter, an error occurs.

4.41.24 ZOE / ZONE Output Enable

This command allows the output of the ZONE1, ZONE2, and ZONE3 signals in the ZONE section set in the common parameters.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ZOE	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a Zone output enable command to the positioning module.

(2) Executes the zone output Enable command that enable zone output to the axis designated by ax of the positioning module designated by sl (slot number).

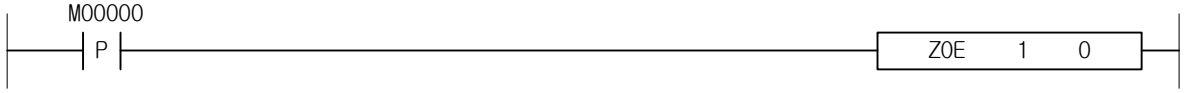
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

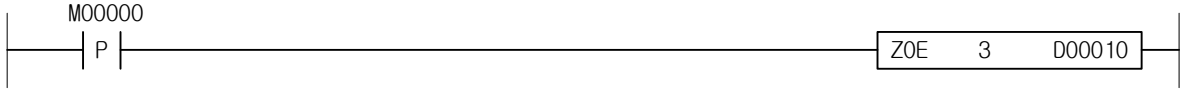
3) Example

(1) LD: Ladder Diagram

- Program that executes the Zone output enable command that allows Zone output on the X axis when Input signal M00000 of the positioning module installed in slot number 1 is On.

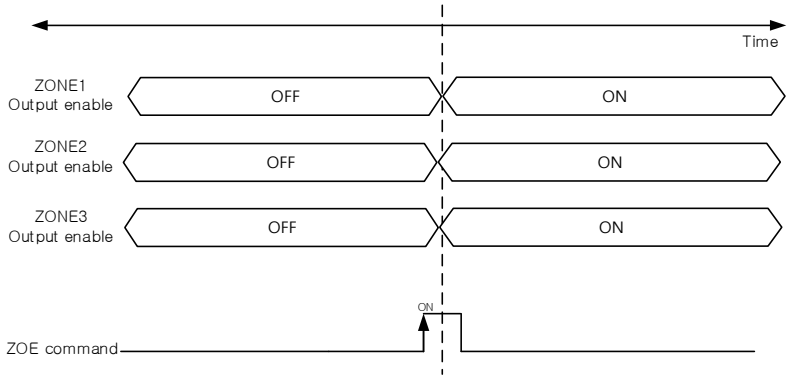


- Program that executes the zone output enable command that allows zone output to D00010when M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ The following is a timing chart for the ZONE output enable status.



(3) ST (Structure Text): Automatic program assignment

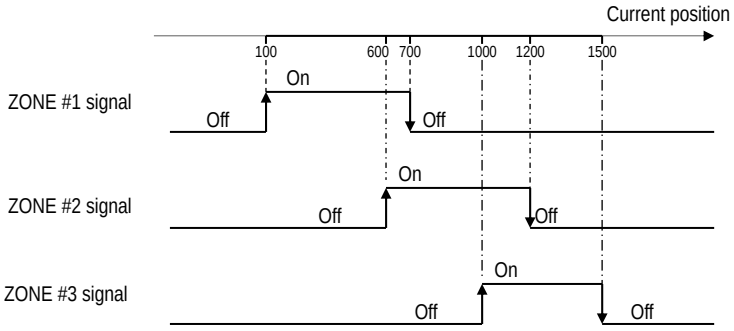
```
ZOE_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ When the current position passes between the address values set as ZONE, the set ZONE number is “On”. Therefore, it is possible to perform a separate operation using “On” information when controlling the zone set as ZONE.

- ZONE setting range : -2,147,483,648 ~ 2,147,483,647(unit: pulse)
- The use of ZONE settings is as follows.

ZONE1 ON area	100pls
ZONE1 OFF area	700pls
ZONE2 ON area	600pls
ZONE2 OFF area	1200pls
ZONE3 ON area	1000pls
ZONE3 OFF area	1500pls



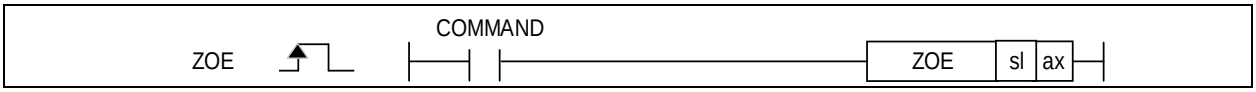
- “On start point” must be set smaller than “On end point”.

4.41.25 ZOD / ZONE Output Disable

This command disables the output of the ZONE1, ZONE2, and ZONE3 signals in the ZONE section set in the common parameters.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ZOE	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a Zone output disable command to the positioning module.

(2) Executes the zone output disable command that inhibits zone output to the axis designated by ax of the positioning module designated by sl (slot number.

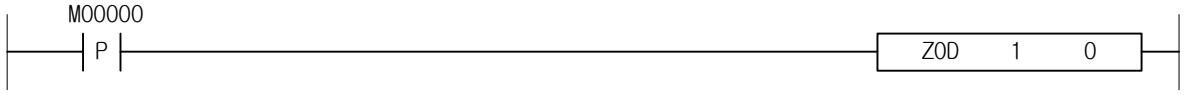
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

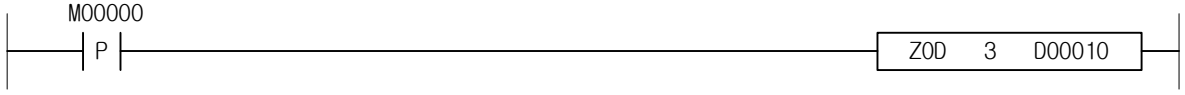
3) Example

(1) LD: Ladder Diagram

- Program that executes the Zone output disable command that inhibits Zone output on the X axis when Input Signal M00000 of the positioning module installed in slot number 1 is On.

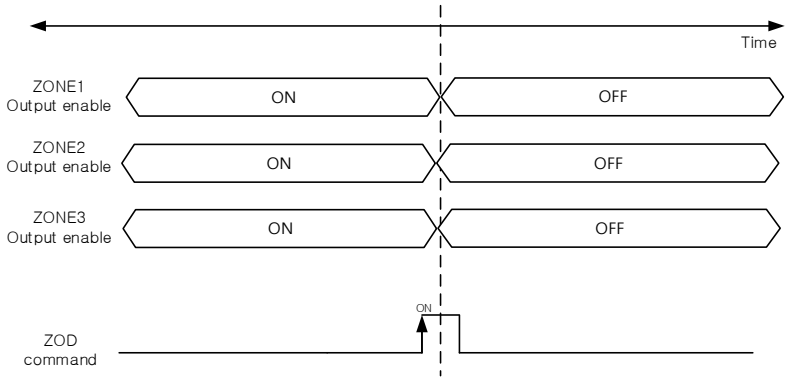


- Program that executes the zone output disable command that inhibits zone output to D00010 when M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ The following is a timing chart for the ZONE output disable status.



(3) ST (Structure Text): Automatic program assignment

```
ZOD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

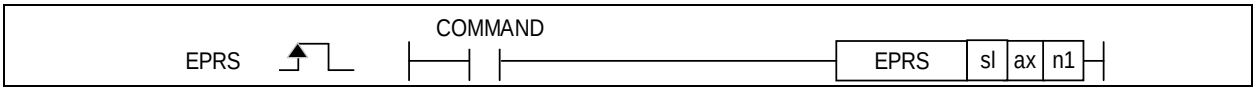
※ There are no special precautions for this command.

4.41.26 EPRS / Encoder Position Preset

This command is for changing the value of current encoder position to the value at user's pleases.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
EPRS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Encoder setting value to change (0~4294967295)	DINT

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command changes the current value of the encoder to the preset value (D).

(1) Execute the encoder present change command to change the encoder present value to n1 on the axis designated by ax of the positioning module specified by sl (slot number of the positioning module.

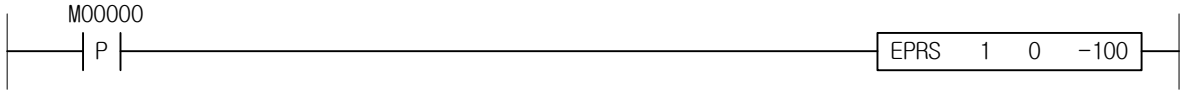
2) Error

(1) No error occurred (F110).

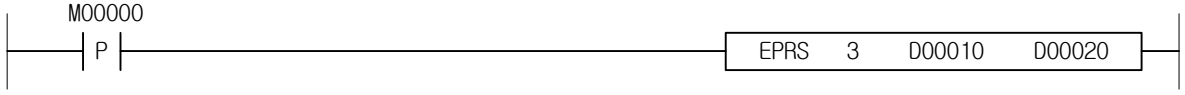
3) Example

(1) LD: Ladder Diagram

- Program that executes the encoder present value change command to set the encoder present value on the X-axis to -100 when the input signal M00000 of the positioning module installed in slot number 1 is on.

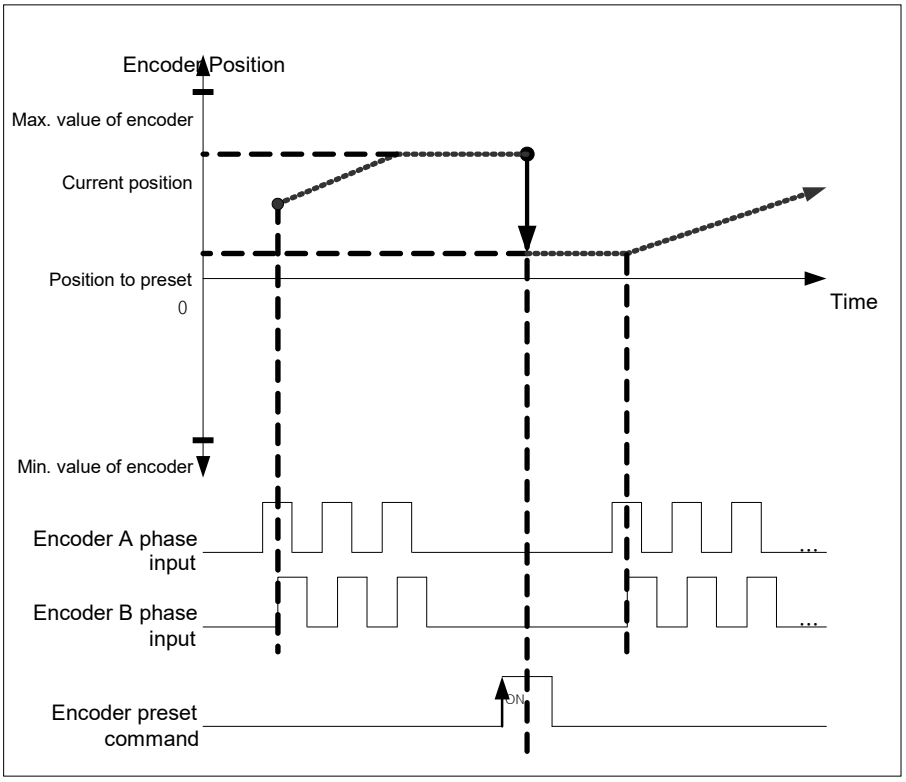


- Program that executes the encoder present value change command that changes the encoder present value set in D00020 on the axis designated in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is on.



(2) Timer chart

※ Below is a brief timing chart of an example encoder preset function.



(3) ST (Structure Text): Automatic program assignment

```
EPRS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), Num1:=(*DINT*), Num2:=(*WORD*));
```

4) Caution

(1) If there is an axis that operates the encoder as the main axis, the speed of the subordinate axis may change rapidly, so the encoder preset command cannot be executed.

(2) Encoder preset command should be executed in the status that external encoder pulse input is not entered.

※ In the cases below, encoder preset command may not be executed and error arises.

- When there is an axis that operates the encoder as the main axis
- When the encoder preset position value is outside the range of the common parameter encoder maximum/minimum value.

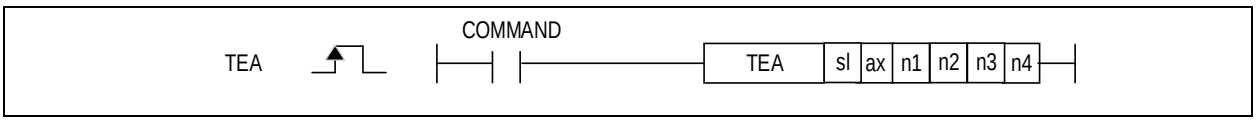
4.41.27 TEA / Single Teaching

This is a function to change the target position value/operation speed value of the step number specified by the user with a single teaching command without directly modifying the positioning operation data in XG-PM.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TEA	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of direct start command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Data value for teaching	DINT
n2	Step No. for teaching (0~400)	WORD
n3	Teaching method setting 0:RAM teaching or 1:ROM teaching	WORD
n4	Teaching Item setting 0:Position teaching or 1:Speed teaching	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a function to change the value of the target position or operation speed set in one designated step.

(2) Execute the teaching command to change the target position or target speed to the value of n1 according to the value of n4 in the data of step n2 of the ax axis on the axis designated as ax of the positioning module designated by sl (slot number).

(3) It is convenient to use when the target position value and operation speed value are frequently changed.

(4) The value of target position being changed is position teaching, the value of operating speed being changed is speed teaching.

(5) At this time, RAM teaching or ROM teaching can be performed depending on the value set in n3.

The values that can be set for n3 are as follows.

Setting Value	Teaching method
0	RAM Teaching
1	ROM teaching

The values that can be set for n4 are as follows.

Setting Value	Teaching items
0	Position teaching
1	Speed teaching

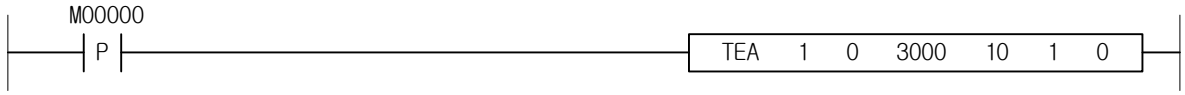
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

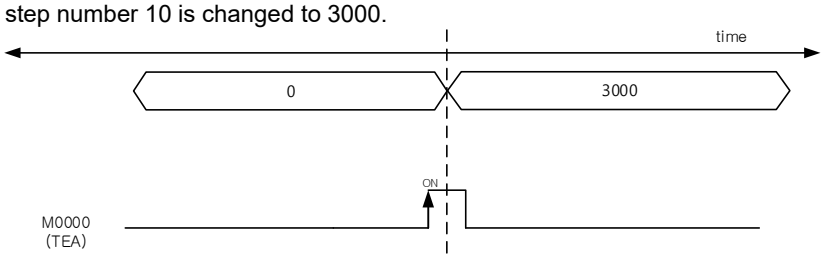
- Program that executes the ROM teaching command that changes the target position value of step 10 on the X axis to 3000 when the input signal M00000 of the positioning module installed in slot number 1 is on.



(2) Timer chart

※ Below is a timing chart for the example above.

- The current target position is set to 0. If M0000 is ON, the operation X-axis operation data target position value of step number 10 is changed to 3000.



(3) ST (Structure Text): Automatic program assignment

```
TEA_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*),
                Num3:=(*WORD*), Num4:=(*WORD*));
```

4) Caution

※ Teaching command may not be executed in the case as follows.

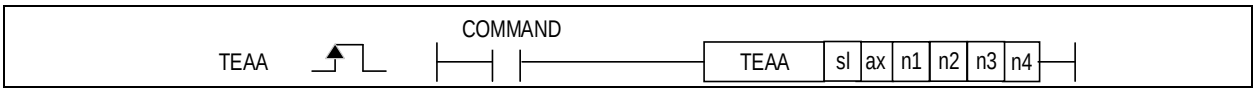
(1) When the teaching step number is set to a value other than 1 to 400

4.41.28 TEAA / Plural Teaching

This is a function to change the target position value/operation speed value of the step number specified by the user with plural teaching command without directly modifying the positioning operation data in XG-PM.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TEAA	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of direct start command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	leading step No. for teaching (0~400)	WORD
n2	Teaching method setting 0:RAM teaching or 1:ROM teaching	WORD
n3	Teaching Item setting 0:Position teaching or 1:Speed teaching	WORD
n4	Number of step for Teaching (1~16)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is for changing operating speed or the target position on several steps.

(2) It is convenient to use when the target position value and operation speed value are frequently changed.

(3) The value of target position being changed is position teaching, the value of operating speed being changed is speed teaching.

(4) Teaching Array command is available to be executed when the axis is operating. But teaching data of operating step do not apply instantly. Operating step data will apply end of present step operation and the data of the remaining steps are changed immediately.

(5) RAM teaching and ROM teaching are available depending on the saving position.

※ The values that can be set for n2 are as follows.

Setting Value	Teaching method
0	RAM Teaching
1	ROM teaching

※ The values that can be set for n3 are as follows.

Setting Value	Teaching items
0	Position teaching
1	Speed teaching

(6) The teaching data value should be set in the memory area of the separate positioning module before giving the teaching array command.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

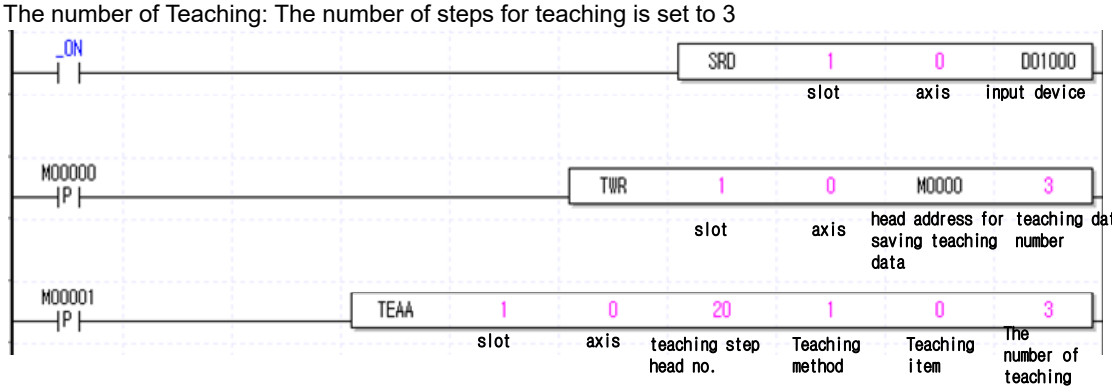
(a) If M00000 is On while the current axis is ready, plural teaching data write command TWR is executed on axis 1.

At this time, the data stored in three DWORDs from the leading address M0000 of teaching data storage is used. (Plural teaching data 1 ~ 3 stored in M0000 ~ M0004 (DWORD))

Quantity	Device number	Teaching array data
1	M0000	2000
2	M0002	4000
3	M0004	6000

(b) Thereafter, when M00001 is ON, plural teaching commands TEAA are performed with the following settings.

- Leading number of teaching step: From step 20, 3 steps, namely steps 20 to 22, are executed.
- Teaching method: ROM teaching is executed with “1” set.
- Teaching item: Plural teaching is executed with “0” set. (M0000~M0004(DWORD) set as TWR)
- The number of Teaching: The number of steps for teaching is set to 3



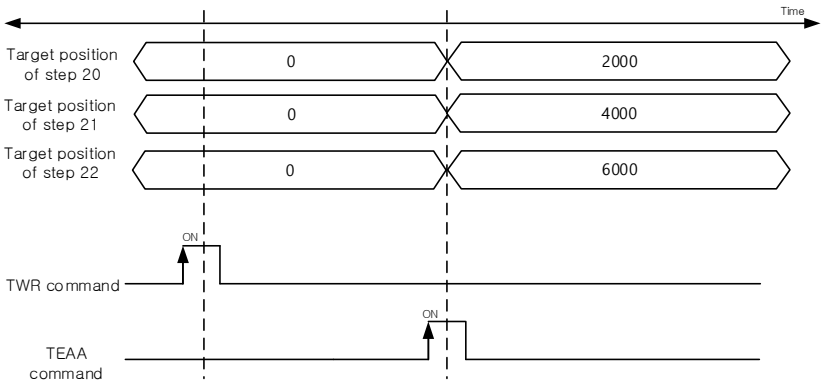
※ To read the status information of the axis, refer to the description of the SRD instruction.

※ For details of the plural teaching data write command, refer to the description of the TWR command.

(2) Timer chart

※ Below is a timing chart for the example above.

- The Initial target position is set to 0.



(3) ST (Structure Text): Automatic program assignment

```
TEAA_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*),
        Num3:=(*WORD*), Num4:=(*WORD));
```

4) Caution

※ Plural teaching array command may not be executed in the case as follows.

(1) The number of plural teaching is out of the range (1~16).

(2) The number of teaching setting number is out of the range (1~400).

(3) The plural teaching command is available to be executed when the axis is operating. But teaching data of operating step do not apply instantly. Operating step data will apply end of present step operation and the data of the remaining steps are changed immediately.

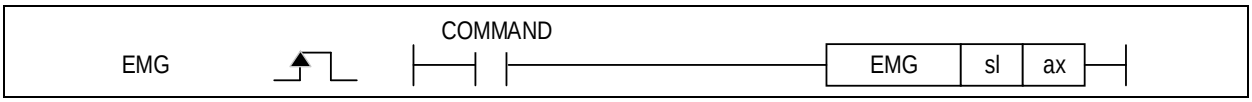
(4) The plural teaching data must be set in the data setting area for teaching array before plural teaching command is executed.
Refer to the teaching array command XTWR.

4.41.29 EMG / Emergency Stop

if an emergency stop is encountered during an operation-related command, it stops immediately.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
EMG	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of floating home setting (0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Execute internal emergency stop command to command axis.

(2) Dec. time in emergency stop become the time which set on 'Emergency stop dec. time' item of each basic parameter.

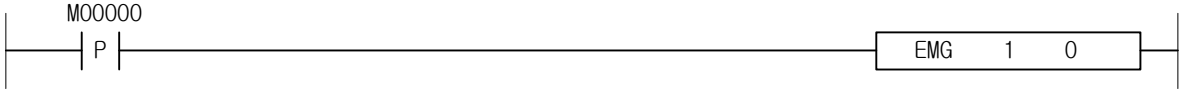
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

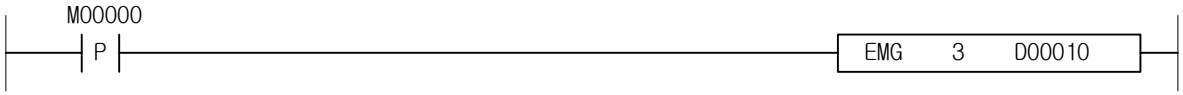
3) Example

(1) LD: Ladder Diagram

- Program to execute emergency stop Command command on X-axis when input signal M00000 of positioning module installed in slot number 1 is On

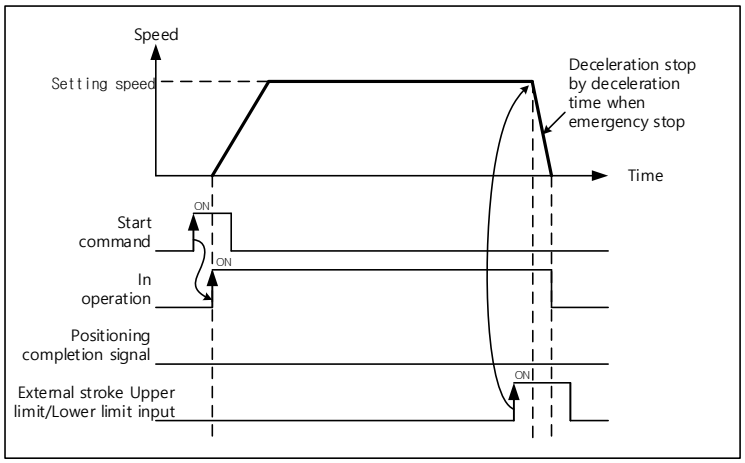


- Program that executes emergency stop command on the axis designated in D00010 when input signal M00000 of positioning module installed in slot number 1 is On



(2) Timer chart

※ Below is the timing chart of the emergency stop example.



(3) ST (Structure Text): Automatic program assignment

EMG_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

※ There are two cases in which emergency stop is executed.

(1) In case of internal emergency stop, error 481 will occur and in case of external emergency stop, error 491 will occur.

(2) M code signal will be 'Off' after Emergency stop.

(3) There are two type of Emergency stop: External emergency stop and Internal emergency stop.

▪ Internal emergency stop command

The "Emergency stop" command EMG of the XG-PM and the sequence program decelerates to the time set in the "Emergency stop dec. time" of the basic parameter, stops and an error occurs.

▪ External emergency stop Signal

When the emergency stop input signal of the servo drive is On, it decelerates to the time set in "Emergency stop dec. time" of the basic parameter, stops and an error occurs.

■ Setting related parameter (Basic parameter)

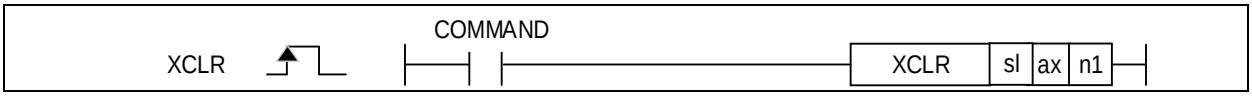
Item	Setting value	Content
Emergency stop dec. time	0 ~ 2147483647 [ms]	Set deceleration time for using when detect hardware high/low limit signal. The Emergency stop dec. time means the time it takes to decelerate to zero speed from the speed limit.

4.41.30 CLR / Error Reset/Output Inhibit Off

This is the command that reset the error occurred on command axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
CLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Output inhibit off setting	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The error occurred in the command axis is reset, and the pulse output inhibit status is canceled.

(2) The output inhibit status is off when n1 is 1, and setting is 0.

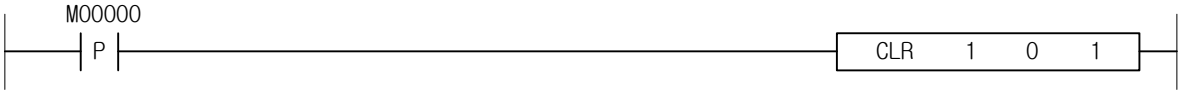
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

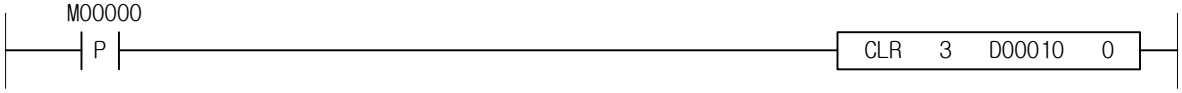
3) Example

(1) LD: Ladder Diagram

- Program that executes error reset command to clear the error occurred in X axis and release the output prohibited at the same time when input signal M00000 of positioning module installed in slot number 1 is On,

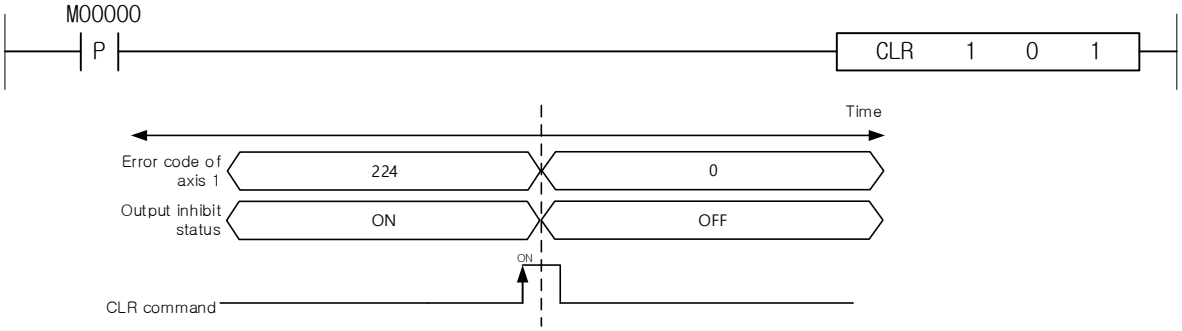


- Program that executes the error reset command to clear the error that occurred in the axis specified in D00010 when input signal M00000 of positioning module installed in slot number 1 is On,



(2) Timer chart

※ Below is a timing chart of a simple error reset/output inhibit off example.



(3) ST (Structure Text): Automatic program assignment

CLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

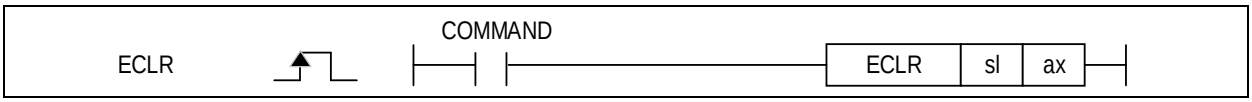
※ There are no special precautions for this command.

4.41.31 ECLR / Error History Reset

This command resets the error history, which is the history of errors in the command axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
ECLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of rangee	F110

1) Function

(1) This is the command that reset the error history about command axis.

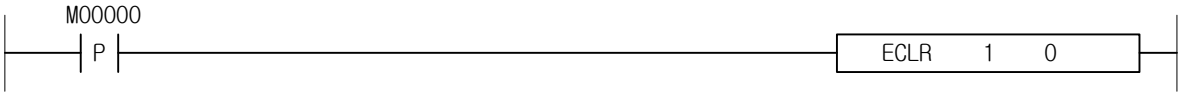
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

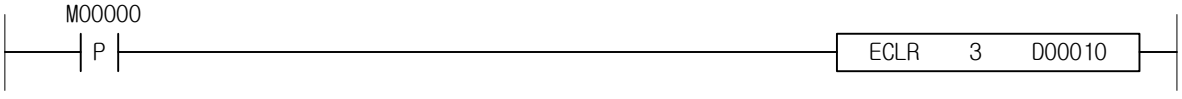
3) Example

(1) LD: Ladder Diagram

- Program that executes the error history reset command to clear the error history stored in the X axis when the input signal M00000 of the positioning module installed in slot number 1 is on.

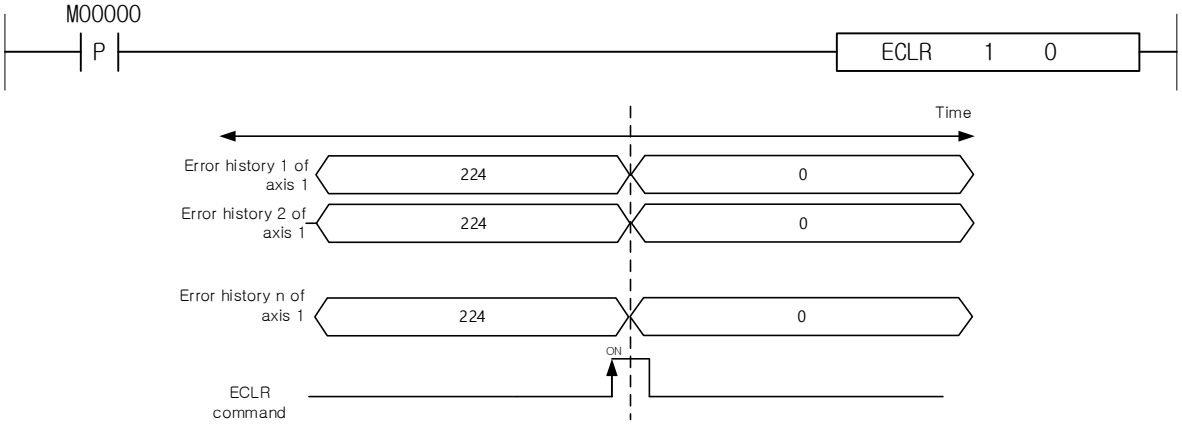


- Program that executes the error history reset command to clear the error history stored in the axis designated in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is on.



(2) Timer chart

※ Below is a timing chart of a simple error history reset example.



(3) ST (Structure Text): Automatic program assignment

```
ECLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

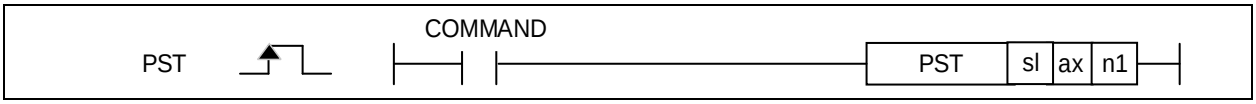
※ There are no special precautions for this command.

4.41.32 PST / Point Operation

This is a positioning operation that sequentially executes the operation data of the step number specified by the user with one command.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Point operation data numbers	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of rangee	F110

1) Function

(1) This is a positioning operation that sequentially executes the operation data of the step number specified by the user with one operation command, and is called PTP (Point To Point) run.

(2) Regardless of the end, keep, or continuous operation mode, points are operated as many as the set number of points from step setting (point 1). At this time step setting should be set to the step number that operates first in the case of keep or continuous operation mode.

(3) Executes the point operation command according to the step value stored in the point operation data area of the ax axis on the axis designated as ax of the positioning module designated by sl (slot number of the positioning module).

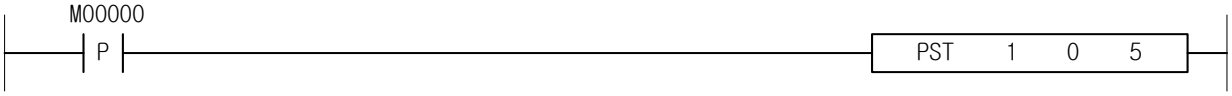
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

- Program that executes the point operation command to perform point operation with 5 data stored in the point operation data area of the X axis when the input signal M00000 of the positioning module installed in slot number 1 is on.

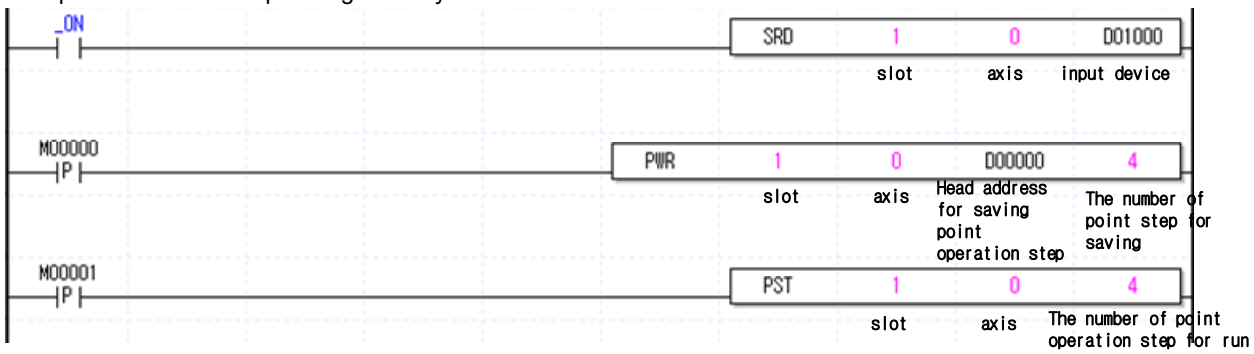


- Example for timing chart

(a) If M00000 is On while the current axis is homing status, the point operation step write command PWR is executed on axis 1.
At this time, the data stored in 4 words is used from the leading address of the point start step storage D00000.
(Point start step data 1 ~ 4 stored in D00000 ~ D00004 (WORD))

data	Device number	Point start step data
1	D00000	1
2	D00001	2
3	D00002	10
4	D00003	20

(b) Thereafter, when M00001 is ON, point operation Command PST are performed with the following settings.
- Point step No.: Point operation steps 1, 2, 10, and 20 are executed from the 4 points operation points to be operated and the steps designated by the PWR command.



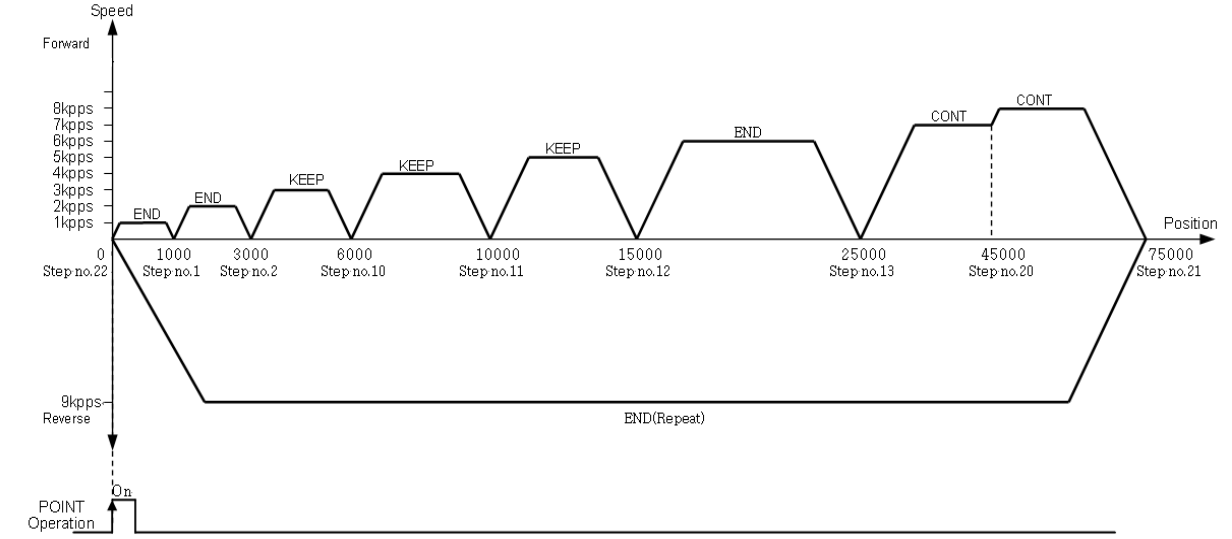
(c) Below is the 1-axis operation data set in XG-PM.
(Since keep/continuous/end operation is mixed, please refer to it when applying the operation method.)

■ Setting of XG-PM

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	20
2	Absolute, Single axis position control	Single,End	3000	2000	No.1	No.1	0	20
10	Absolute, Single axis position control	Single,Keep	6000	3000	No.1	No.1	0	20
11	Absolute, Single axis position control	Single,Keep	10000	4000	No.1	No.1	0	20
12	Absolute, Single axis position control	Single,Keep	15000	5000	No.1	No.1	0	20
13	Absolute, Single axis position control	Single,End	25000	6000	No.1	No.1	0	20
20	Absolute, Single axis position control	Single, Continuous	45000	7000	No.1	No.1	0	0
21	Absolute, Single axis position control	Single, Continuous	75000	8000	No.1	No.1	0	0
22	Absolute, Single axis position control	Repeat,End	0	9000	No.1	No.1	0	0

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment
PST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

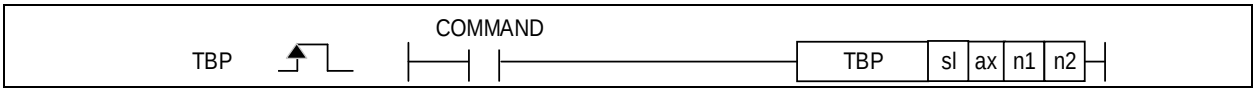
(1) Before executing point operation, writing of point operation step must be done first.

4.41.33 TBP / Basic Parameter Teaching

This command is used to change the value of a specific item among basic parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TBP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Teaching data(Change value of the item to be changed among the basic parameters)	DINT
n2	Items to change among basic parameters (1~16), hFF	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to give teaching command of basic parameter to positioning module.

(2) Execute the basic parameter teaching command that changes the item of n2 to the value of n1 among the basic parameters of the axis designated by ax of the positioning module specified by sl (slot number of the positioning module.

(3) The values that can be set in the parameter items are as follows.

(4) To set all of the basic parameters with one TBP command, hFF(255) value must be set to n2.

Item		Setting Value
1	Speed limit value	LD:1~1000000 OC:1~200000
2	Bias speed	
3	Acc./Dec. Time 1	0~65535
4	Acc./Dec. Time 2	
5	Acc./Dec. Time 3	
6	Acc./Dec. Time 4	
7	Pulse number /revolution	1~65535
8	Travel per revolution	
9	Pulse Output Mode	0:CW/CCW 1:PLS/DIR 2:Phase A/B
10	Unit	0:pulse 1:mm 2:inch 3:degree
11	Unit multiplier	0:x1 1:x10 2:x100 3:x1000

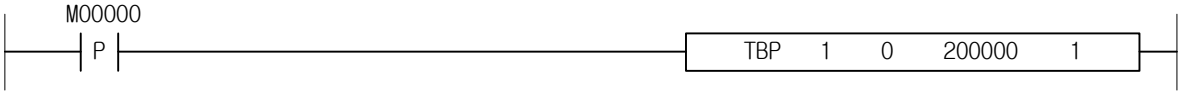
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

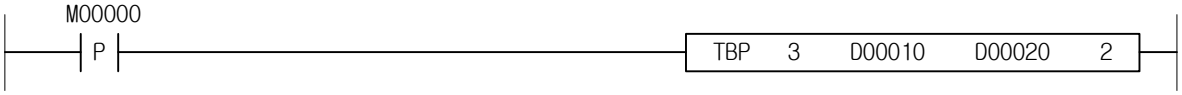
3) Example

(1) LD: Ladder Diagram

- Program to execute teaching command of basic parameter to change speed limit value of 200000 among basic parameters on X axis when input signal M00000 of positioning module installed in slot number 1 is On.

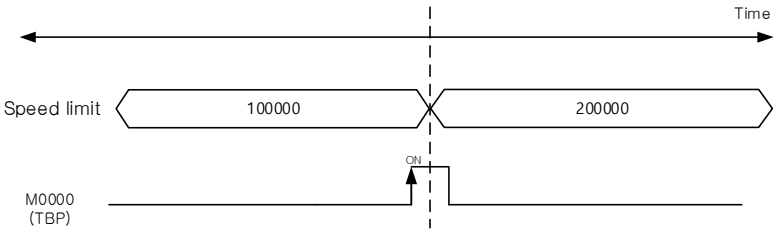


- Program to executes teaching command of basic parameters to change the bias speed among the basic parameters to the value set in D00020 on the axis specified in D00010 when input signal M00000 of the position module installed in slot number 3 is On.



(2) Timer chart

※ This is a timing chart for teaching on extended parameters. (Speed limit changed to 200000)



(3) ST (Structure Text): Automatic program assignment

TBP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*));

4) Caution

(1) The parameter value modified by the teaching command of the Basic parameter is valid only while the power is ON. Parameter too save the basic parameter values modified by the teaching command to the flash memory, after teaching the basic parameters, the parameter values modified using the parameter/operation data storage command WRT must be stored in the flash memory.

(2) It may take several scans depending on the number of multiple teaching data.

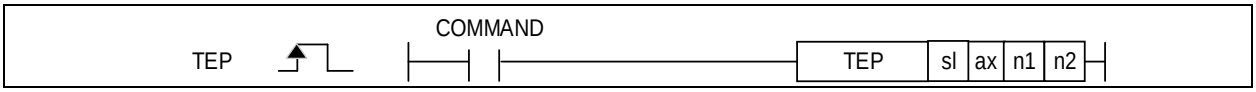
(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

4.41.34 TEP / Extended Parameter Teaching

This command is used to change the value of a specific item among extended parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TEP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Teaching data(Change value of the item to be changed among the extended parameter)	DINT
n2	Items to change among extended parameter (1~16), hFF	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to give teaching command of extended parameter to positioning module.

(2) Execute the extended parameter teaching command that changes the item of n2 to the value of n1 among the extended parameter of the axis designated by ax of the positioning module specified by sl (slot number of the positioning module).

(3) The values that can be set for n2 are as follows.

Setting Value	Item	
1	S/W High Limit	
2	S/W Low Limit	
3	Backlash compensation amount	
4	Positioning completion output time	
5	S-curve ratio	
6	External command selection	0:Start 1:JOG 2:Skip
7	Pulse output direction	0:forward direction 1:reverse direction
8	Acceleration/Deceleration Pattern	0:Trapezoid 1:S-Curve
9	M Code mode	0:None 1:With 2:After
10	Position display during constant speed operation	0: Not display 1:Display
11	Detection of upper and lower limits during constant speed operation	0: Not detect 1 : detect
12	External speed/position control switching enable	0:disabled,1:enabled
13	External command enable	0:disabled,1:enabled
14	External stop enable	0:disabled,1:enabled
15	External simultaneous start enable	0:disabled,1:enabled
16	Positioning completion condition	0:Dwell time 1:In position signal 2:Dwell time AND In position signal 3:Dwell time OR In position signal

(4) To set all of the extended parameter with one TEP command, hFF(255) value must be set to n2.

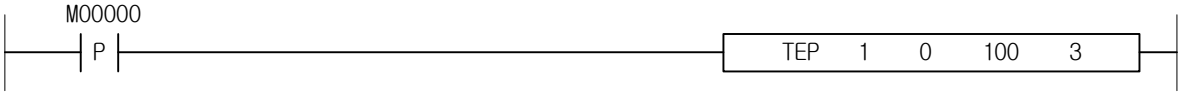
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

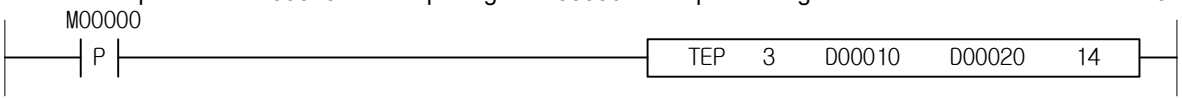
3) Example

(1) LD: Ladder Diagram

Program that executes the extended parameter teaching command that changes the amount of backlash correction among the X-axis extended parameters to 100 when the input signal M00000 of the positioning module installed in slot number 1 is On.

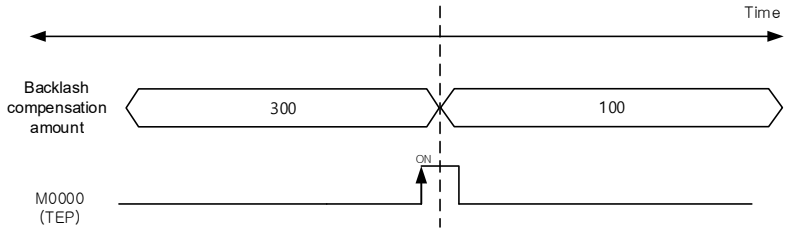


- Program that changes the external stop allowable among the basic parameters to the value set in D00020 among the axes specified in D00010 when input signal M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ This is a timing chart for teaching on extended parameters. (Changed the amount of backlash correction to 100)



(3) ST (Structure Text): Automatic program assignment

TEP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*));

4) Caution

(1) The parameter value modified by the teaching command of the extended parameter is valid only while the power is ON.
Parameter too save the extended parameter values modified by the teaching command to the flash memory, after teaching the extended parameters, the parameter values modified using the parameter/operation data storage command WRT must be stored in the flash memory.

(2) It may take several scans depending on the number of multiple teaching data.

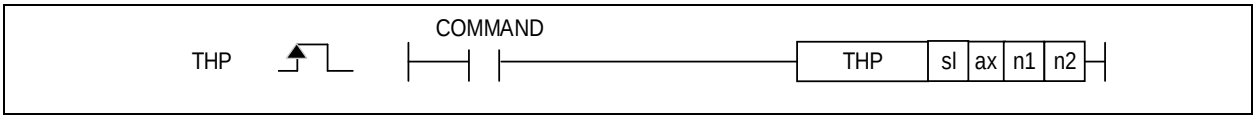
(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

4.41.35 THP / Home return Parameter Teaching

This command is used to change the value of a specific item among home return parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
THP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis to perform basic parameter teaching (0:X 축, 1:Y 축, 2:Z 축)	WORD
n1	Teaching data(Change value of the item to be changed among the home return parameter)	DINT
n2	Items to change among home return parameter (1~9), hFF	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to give teaching command of home return parameter to positioning module.

(2) Execute the home return parameter teaching command that changes the item of n2 to the value of n1 among the home return parameter of the axis designated by ax of the positioning module specified by sl (slot number of the positioning module).

(3) The values that can be set for n2 are as follows.

Setting Value	Item	
1	Home address	
2	High speed homing	
3	Low speed homing	
4	Home return acceleration/deceleration time	
5	Home return dwell time	
6	Home compensation amount	
7	Restart time for home return	
8	Homing method	0:DOG/Home(Off) 1:DOG/Home(On) 2:Upper/Lower limit, HOME 3:DOG 4:High speed home return 5:Upper/Lower limit
9	Homing direction	0:forward direction 1:reverse direction

2) Error

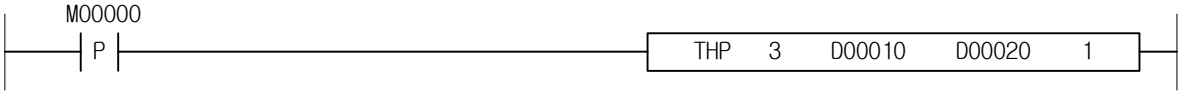
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

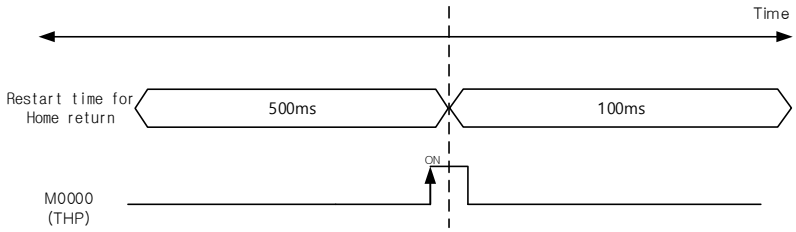
- Program that executes the home position return parameter teaching command to change the home position restart time of the home position return parameter among the home position return parameters on the X axis to 100 ms when the input signal M00000 of the positioning module installed in slot number 1 is On.

Program that executes the home position return parameter teaching command that changes the home position address among the home position return parameters to the value set in D00020 on the axis designated in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ This is a timing chart for teaching on home return parameters. (Change the home return restart time to 100ms)



(3) ST (Structure Text): Automatic program assignment

```
THP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*));
```

4) Caution

(1) The parameter value modified by the teaching command of the home return parameter is valid only while the power is ON.
Parameter too save the home return parameter values modified by the teaching command to the flash memory, after teaching the home return parameters, the parameter values modified using the parameter/operation data storage command WRT must be stored in the flash memory.

(2) It may take several scans depending on the number of multiple teaching data.

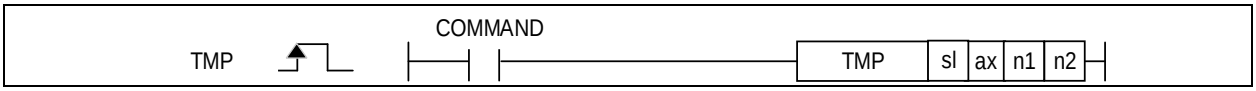
(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

4.41.36 TMP / Manual Operation Parameter Settings

This command is used to change the value of a specific item among manual operation parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TMP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis to perform basic parameter teaching (0:X 축, 1:Y 축, 2:Z 축)	WORD
n1	Teaching data(Change value of the item to be changed among the manual operation parameter)	DINT
n2	Items to change among manual operation parameter (1~4), hFF	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to give teaching command of manual operation parameter to positioning module.

(2) Execute the manual operation parameter teaching command that changes the item of n2 to the value of n1 among the manual operation parameter of the axis designated by ax of the positioning module specified by sl (slot number of the positioning module).

(3) The values that can be set for n2 are as follows.

Setting Value	Item
1	Jog high speed
2	Jog low speed
3	Jog acceleration/deceleration time
4	Inching speed

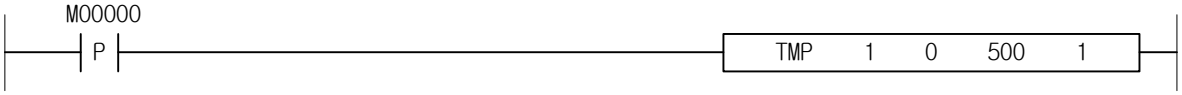
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

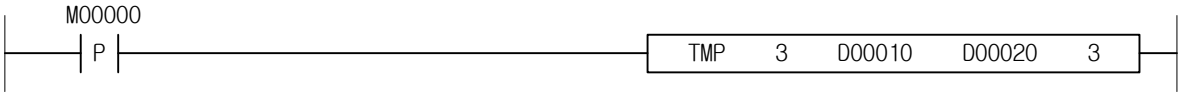
3) Example

(1) LD: Ladder Diagram

A program to execute manual operation parameter teaching command to change jog high speed speed to 5000 among manual operation parameters of X axis when the input signal M00000 of the positioning module installed in slot number 1 is On.

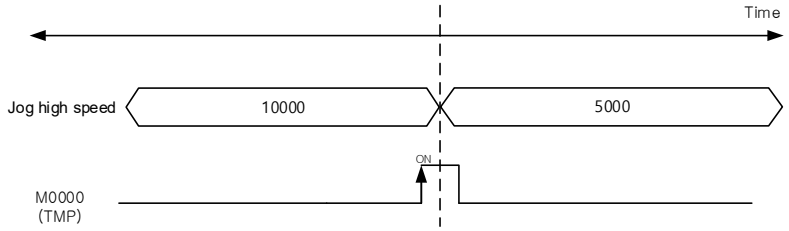


A program that executes manual operation parameter teaching command to change the jog acceleration/deceleration time among the manual operation parameters to the value set in D00020 among the axes specified in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is O.n



(2) Timer chart

※ This is a timing chart for teaching on manual operation parameters. (Changed Jog High Speed to 5000)



(3) ST (Structure Text): Automatic program assignment

```
TMP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*));
```

4) Caution

(1) The parameter value modified by the teaching command of the manual operation parameter is valid only while the power is ON.
Parameter too save the manual operation parameter values modified by the teaching command to the flash memory, after teaching the manual operation parameters, the parameter values modified using the parameter/operation data storage command WRT must be stored in the flash memory.

(2) It may take several scans depending on the number of multiple teaching data.

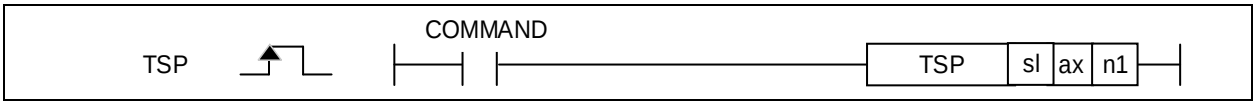
(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

4.41.37 TSP / Input Signal Parameter Teaching

This command is a command to give teaching command of input signal parameter to positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
TSP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Teaching data(Change value of input signal parameter)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is to give teaching command of input signal parameter to positioning module.

(2) The teaching command is executed on the input signal parameter that changes the input signal parameter of the axis designated by ax of the positioning module specified by sl (slot number of the positioning module) to the n1 value.

(2) Each bit of n1 value is assigned to the input signal as below, and if the bit value is 0, the corresponding signal is recognized as A contact, and if it is 1, it is recognized as B contact.

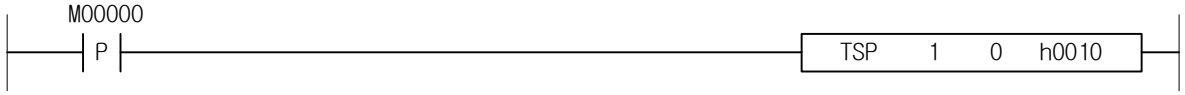
Bit	Input Signal	Bit	Input Signal
0	Upper limit signal	6	Command
1	Lower limit signal	7	Auxiliary command signal
2	DOG signal	8	Speed/Position Control Switch Signal
3	Home signal	9	In-position signal
4	Emergency stop signal	10	External simultaneous start signal
5	Deceleration stop signal	11 ~ 15	Unused

2) Error

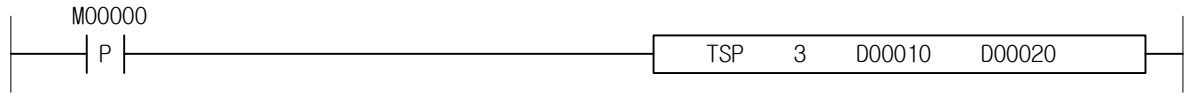
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

- A program that executes the input signal parameter teaching command that changes the emergency stop signal to the B contact among the input signal parameters of the X axis when the input signal M00000 of the positioning module installed in slot number 1 is On.

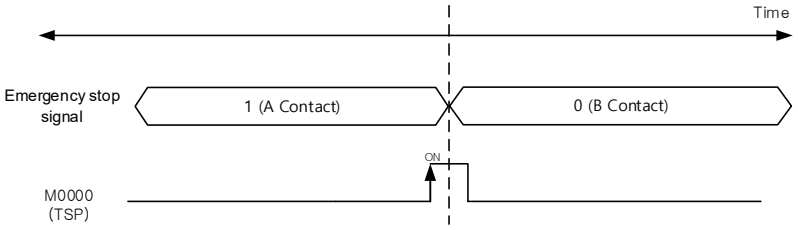


- A program that executes teaching command on the input signal parameter that changes the input signal parameter on the axis designated in D00010 to the value set in D00020 when the input signal M00000 of the positioning module installed in slot number 3 is on.



(2) Timer chart

※ This is a timing chart for teaching on input signal parameters. (Changed Jog High Speed to 5000)



(3) ST (Structure Text): Automatic program assignment

TSP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

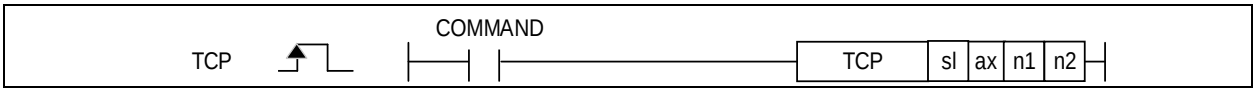
(1) The parameter value modified by the teaching command of the input signal is only valid while the power is ON. To save modified parameters by the input signal parameter teaching command to the flash memory, modified parameter values using the parameter/operation data storage command WRT must be stored in the flash memory after input signal parameter teaching, .

4.41.38 TCP / Common Parameter Teaching

This command is used to change the value of a specific item among common parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TCP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis to perform basic parameter teaching (0:X 축, 1:Y 축, 2:Z 축)	WORD
n1	Teaching data(Change value of the item to be changed among the common parameter)	DINT
n2	Items to change among common parameter (1~14), hFF	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is to give common parameter teaching command to positioning module.

(2) Execute the common parameter teaching command that changes the item of n2 to the value of n1 among the common parameter of the axis designated by ax of the positioning module specified by sl (slot number of the positioning module).

(3) The values that can be set for n2 are as follows.

Setting Value	Item	
1	Pulse output level	0:Low Active 1:High Active
2	Circular interpolation method	0:Middle point 1:Center point
3	Encoder pulse Input mode	0:CW/CCW(1 phase 1 multiplication) 1:CW/CCW(1 phase 2 multiplication) 2:Pulse/Dir(1 phase 1 multiplication) 3:Pulse/Dir(1 phase 2 multiplication) 4:PhaseA/B(2 phase 1 multiplication) 5:PhaseA/B(2 phase 2 multiplication) 6:PhaseA/B(2 phase 4 multiplication)
4	Encoder auto reload value	
5	Zone output mode	0:Individual output 1 : Batch output
6	Zone 1 axis setting	0:X axis 1:Y axis 2:Z axis 3:Encoder
7	Zone 2 axis setting	
8	Zone 3 axis setting	
9	Zone1 On area	
10	Zone1 Off area	
11	Zone2 On area	
12	Zone2 Off area	
13	Zone3 On area	
14	Zone3 Off area	

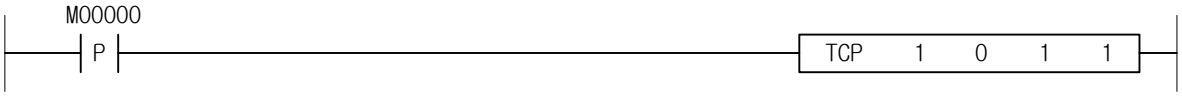
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

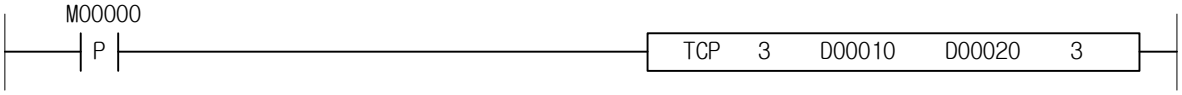
3) Example

(1) LD: Ladder Diagram

- A program to execute common parameter teaching command to change jog high speed speed to 5000 among common parameters of X axis when the input signal M00000 of the positioning module installed in slot number 1 is On.

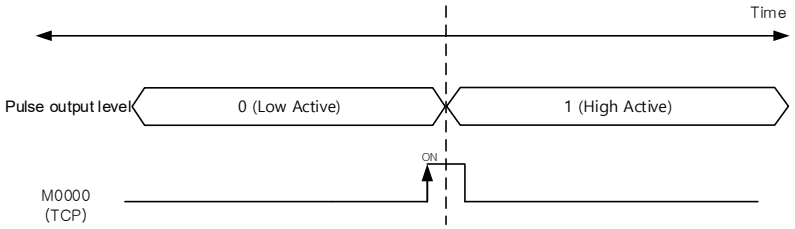


- A program that executes common parameter teaching command to change the encoder pulse input mode among the common parameters to the value set in D00020 among the axes specified in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ This is a timing chart for teaching on common parameters. (Changed Jog High Speed to 5000)



(3) ST (Structure Text): Automatic program assignment

```
TCP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*));
```

4) Caution

(1) The parameter value modified by the teaching command of the common parameter is valid only while the power is ON.
To save the common parameter values modified by the teaching command to the flash memory, the parameter values modified using the parameter/operation data storage command WRT must be stored in the flash memory after teaching the common parameters.

(2) It may take several scans depending on the number of multiple teaching data.

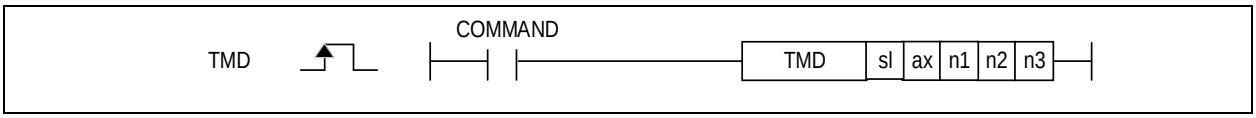
(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

4.41.39 TMD / Operation Data Teaching

This command is to change the operation data value of the command axis to the set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TMD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis to perform basic parameter teaching (0:X 축, 1:Y 축, 2:Z 축)	WORD
n1	Teaching data(Change value of the item to be changed among the common operation parameter)	DINT
n2	Items to change among operation parameter (1~11, hFF)	WORD
n3	Step number of the operation data to be changed	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command teaches the value of a specific item among the operation data items of the command axis to the set value.

(2) This command changes the value of n2 (item to be changed among operation data) of the designated axis n3 (operation data step to be changed) to n1 (set value).

(3) The values that can be set in the operation data items are as follows.

Item		Setting Value
1	Target position	-2147483648 ~ 2147483647
2	Circular interpolation auxiliary position	-2147483648 ~ 2147483647
3	Operation speed	0 ~ Max.speed(speed limit)
4	Dwell time	0 ~ 50000
5	M Code no.	0 ~ 65535
6	Control method	0:Position 1: Speed
7	Program control method	0:Single 1:Repeat
8	Operating Pattern	0:End, 1:Keep 2: Continuous
9	Coordinate	0:Absolute 1:Incremental
10	Increasing/Decreasing No.	1 ~ 4
11	Circular Interpolation direction	0:CW 1:CCW

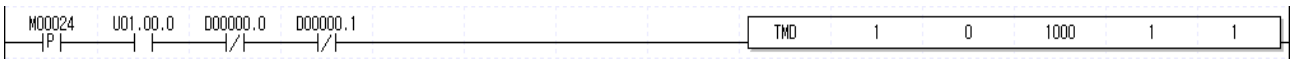
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

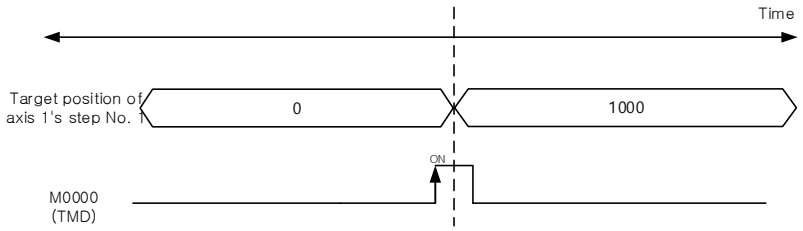
(1) LD: Ladder Diagram

-A program to change the target position of step 1 in operation data on axis 1 to 1000 when the input signal M00024 of the positioning module installed in slot number 1 is On.



(2) Timer chart

※ This is a timing chart for teaching operation data. (Changed Jog High Speed to 5000)



(3) ST (Structure Text): Automatic program assignment

```
TMD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(* DINT*), Num2:=(*WORD*),
        Num3:=(*WORD*));
```

4) Caution

(1) The parameter value modified by the operation data teaching command is only valid while the power is ON. To save the operation data modified by the teaching command to the flash memory, the parameter values modified using the parameter/operation data storage command WRT must be stored in the flash memory after teaching the common parameters.

(2) It may take several scans depending on the number of multiple teaching data.

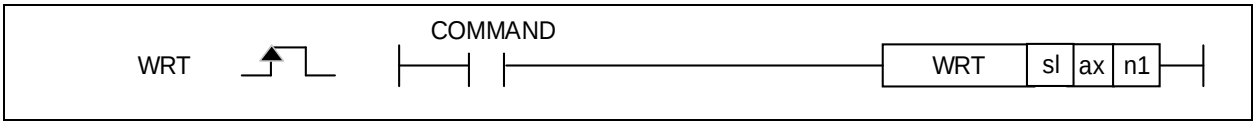
(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

4.41.40 WRT / Parameter/ Operation data Save

This command saves the parameters and operation data set in the selected axis in FRAM.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	O	O	X	O	O	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
WRT	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Axis to save data – Selection axis (bit0:X axis, bit1:Y axis, bit2:Z axis)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is to give parameter save to positioning module.

(2) This command saves the current operation parameters of n1 axes to the Flash ROM on the axis designated as ax of the positioning module designated by sl (slot number of the positioning module).

(3) When setting the axis to save parameter in n1, set the bit of the assigned axis for each bit as shown below.

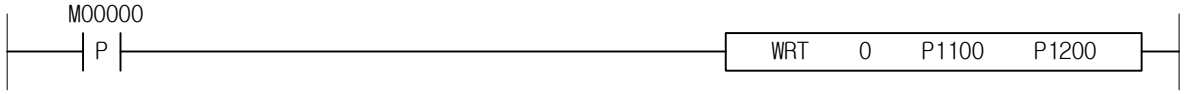
	3~ 15	2	1	0
XGK	Unused	Z-Axis	Y-Axis	X-Axis
XGB		PID parameter	High speed counter parameter	Positioning parameter

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram



(2) Timer chart

※ The timing chart is omitted.

(3) ST (Structure Text): Automatic program assignment

```
WRT_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));
```

4) Caution

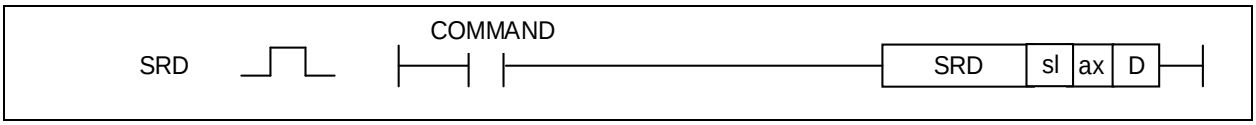
※ There are no special precautions for this command.

4.41.41 SRD / Operating Status Read

This is the command that checks the operation state of command axis and save it on designated device.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
SRD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
D	Leading No. of device to read and save the current state value	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is used to read the current status of the positioning module.

(2) Read the current status data of the axis designated by ax of the positioning module designated by sl (slot number of the positioning module) into the CPU area designated by D.

(3) The values stored in the CPU area designated as D are as follows.

CPU area	Data size	Stratus type
D	WORD	Operating status information 1
D+1	WORD	Operating status information 2
D+2	WORD	Axis information
D+3	WORD	External input signal status
D+4	DWORD	Current Position
D+6	DWORD	Current Speed
D+8	WORD	Step No.
D+9	WORD	M code No.
D+10	WORD	Error state
D+11 ~ D+20	WORD	Error History 1 ~ 10
D21	WORD	Encoder (Lower)
D22	WORD	Encoder (Upper)

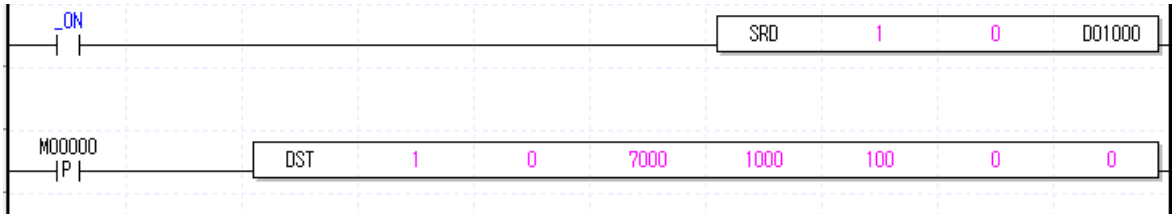
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

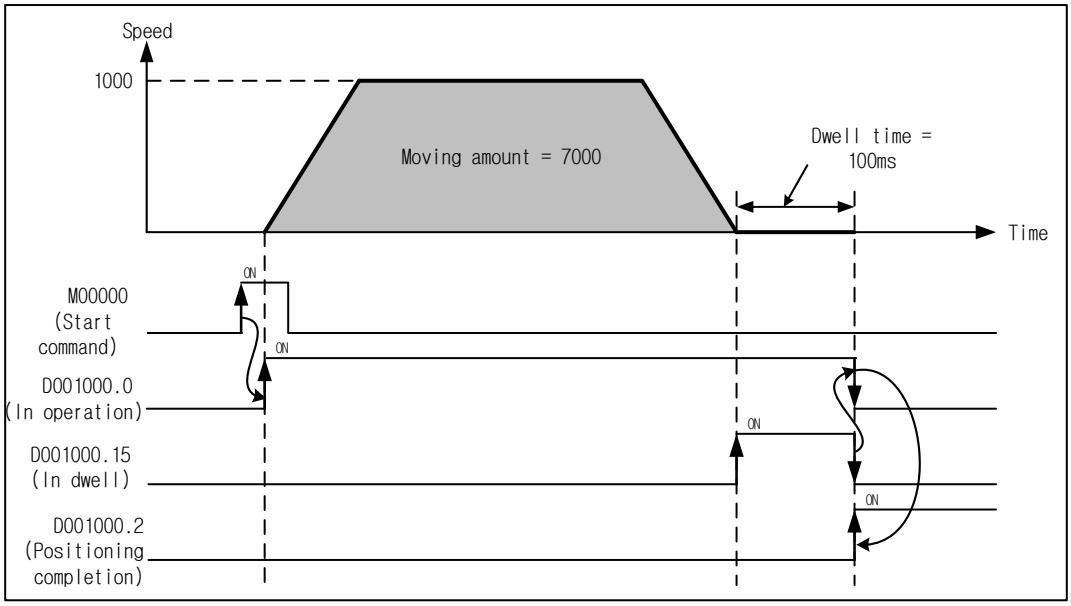
(1) LD: Ladder Diagram

Program to execute direct start with X axis, position control, target speed 500, absolute position 1000, acceleration/deceleration time 3 times, dwell time 10ms, M code 20 when the input signal M00000 of the positioning module installed in slot number 1 is On.



※ To read the status information of the axis, refer to the description of the SRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

SRD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

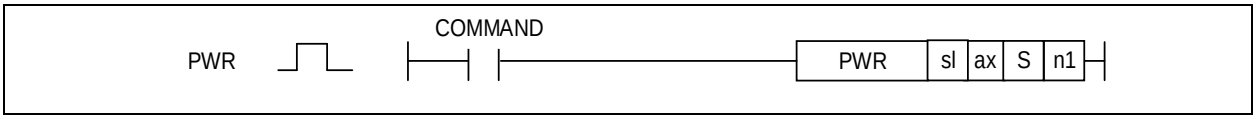
(1) The SRD command is a level command unlike other positioning module commands (Edge).

4.41.42 PWR / Point Start Step Data Setting

This is the command to set the point step area for starting the point of this command to the value stored in the device.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	S	O	-	O	-	-	-	O	-	-	-	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of point operation step write command(0:X axis, 1:Y axis, 2:Z axis)	WORD
S	The leading address of the device where the point operation step is stored.	WORD
n1	Number of writing point operation steps	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command sets the point operation step required when the positioning module performs point operation. Move the point operation step value to be used in the axis designated as ax of the positioning module designated by sl (slot number of the positioning module) from the CPU area designated as S to the ax axis of the positioning module.

(2) The number of point operation steps set in n1 is 1 to 20.

(3) The values read in the CPU area designated as S are as follows.

CPU area	Size	Point operation step
S	WORD	Point operation step 1
~		~
S+19	WORD	Point operation step 20

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

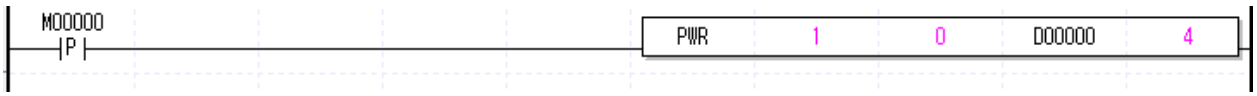
3) Example

(1) LD: Ladder Diagram

- Four points operation step setting of X axis is set to D00000 to D00003 when the input signal M00000 of the positioning module mounted in slot No. 1 is On.

However, point start is not executed only by setting the point start step data.

When the last PST start is executed, the designated point operation step starts point.



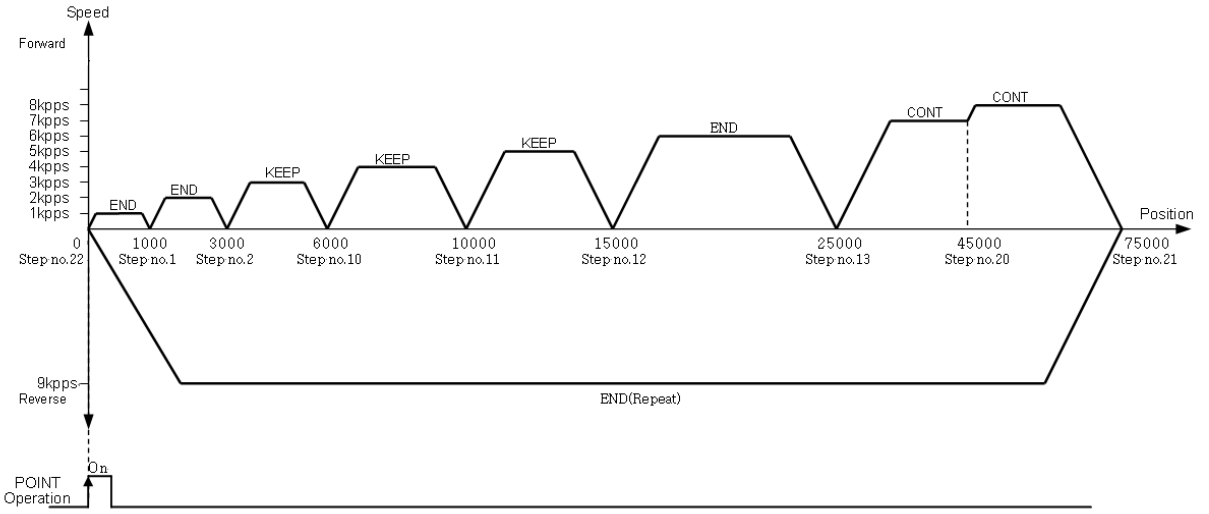
(2) Timer chart

This is an example of the operation method because the keep/continuous/end operation is mixed.

data	Device number	Point start step data
1	D00000	1
2	D00001	2
3	D00002	10
4	D00003	20

Setting in XG-PM (1 axis operation data)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	20
2	Absolute, Single axis position control	Single,End	3000	2000	No.1	No.1	0	20
10	Absolute, Single axis position control	Single,Keep	6000	3000	No.1	No.1	0	20
11	Absolute, Single axis position control	Single,Keep	10000	4000	No.1	No.1	0	20
12	Absolute, Single axis position control	Single,Keep	15000	5000	No.1	No.1	0	20
13	Absolute, Single axis position control	Single,End	25000	6000	No.1	No.1	0	20
20	Absolute, Single axis position control	Single, Continuous	45000	7000	No.1	No.1	0	0
21	Absolute, Single axis position control	Single, Continuous	75000	8000	No.1	No.1	0	0
22	Absolute, Single axis position control	Repeat,End	0	9000	No.1	No.1	0	0



(3) ST (Structure Text): Automatic program assignment
PWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

(1) Before executing point operation(PST), writing (PWR) of point operation step must be done first.

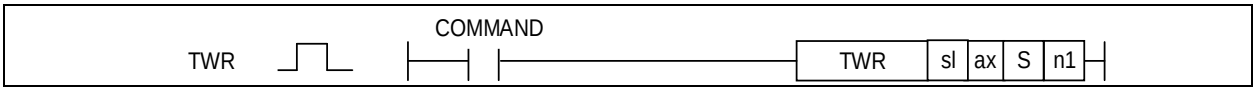
4.41.43 TWR / Plural Teaching Data Setting

Plural teaching data setting area is a command to set teaching data. This command must be executed before executing multiple teaching commands.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
TWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	S	O	-	O	-	-	-	O	-	-	-	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of writing plural teaching data(0:X axis, 1:Y axis, 2:Z axis)	WORD
S	The leading address of the device where the Plural teaching data is stored.	WORD
n1	The number of data to save	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command sets the teaching data required when the positioning module execute plural teaching.
(2) Move the teaching data values to be used for plural teaching commands of the axis designated by ax of the positioning module designated by sl (slot number of the positioning module) from the CPU area designated by S to the ax axis of the positioning module by n1
(3) The number of point operation steps set in n1 is 1 to 16.
(4) The values read in the CPU area designated as S are as follows.

CPU area	Size	Point operation step
S	DWORD	Teaching data 1
~		~
S+15	DWORD	Teaching data 16

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

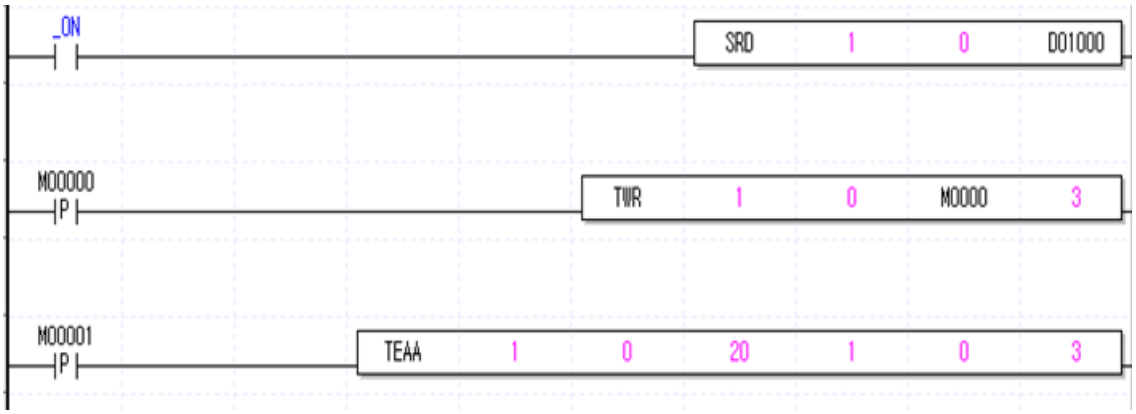
(1) LD: Ladder Diagram

(a) If M00000 is On while the current axis is ready, plural teaching data write command TWR is executed on axis 1.
At this time, the data stored in three DWORDs from the leading address M0000 of teaching data storage is used.
(Plural teaching data 1 ~ 3 stored in M0000 ~ M0004 (DWORD))

Quantity	Device number	Teaching array data
1	M0000	2000
2	M0002	4000
3	M0004	6000

(b) Thereafter, when M00001 is ON, plural teaching commands TEAA are executed with the following settings.

- Leading number of teaching step: From step 20, 3 steps, namely steps 20 to 22, are executed.
- Teaching method: ROM teaching is executed with “1” set.
- Teaching item: Plural teaching is executed with “0” set.
  (M0000~M0004(DWORD) set as TWR)
- The number of Teaching: The number of steps for teaching is set to 3

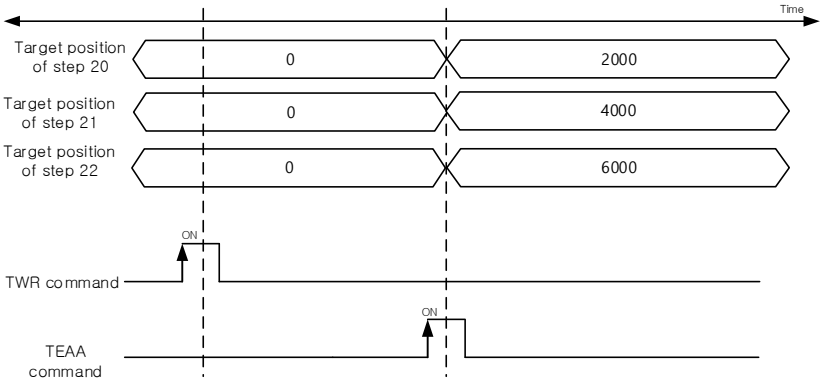


※ For details of the plural teaching data write command, refer to the description of the TWR command.

(2) Timer chart

※ Below is a timing chart for the example above.

- The Initial target position is set to 0.



(3) ST (Structure Text): Automatic program assignment

TWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

※ Plural teaching array command may not be executed in the case as follows.

(1) The number of plural teaching is out of the range (1~16).

(2) The number of teaching setting number is out of the range (1~400).

(3) The plural teaching command is available to be executed when the axis is operating. But teaching data of operating step do not apply instantly. Operating step data will apply end of present step operation and the data of the remaining steps are changed immediately.

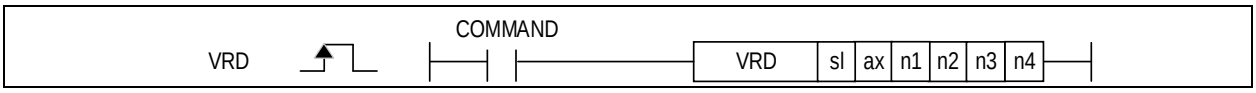
(4) The plural teaching data must be set in the data setting area for teaching array before plural teaching command is executed.
Refer to the teaching array command XTWR.

4.41.44 VRD / Variable Data Read

This command is a command to read the desired data by directly designating the module's internal memory address such as command axis parameters and operation data.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
VRD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Leading address of data in module internal memory to read(0~ 12147)	WORD
n2	Offset between blocks (0 ~12147)	WORD
n3	Size of one block (1 ~ 128)	WORD
n4	No. of block to read (1 ~ 128)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is a command to read the data of “block size” set in n3 from the “read address” set in n1 of the positioning module internal memory among parameters and operation data into the CPU in WORD unit.
If the number of “blocks” set in n4 is 2 or more, blocks that are separated from the “read address” by the “block offset” set in n2 are read in order of “number of blocks”-1 times.

(2) Max data size (Block size X No. of block) can be read with one command is 128 WORD.

(3) ” Variable data read“ can be executed in operation.

(4) If you execute Read variable data, the data read from positioning module will be saved in common area.

To save to the device for use in the PLC program, use the GETM command [read address: h280, data size: read data size (DWORD)] after executing the variable data read command as in the program example.

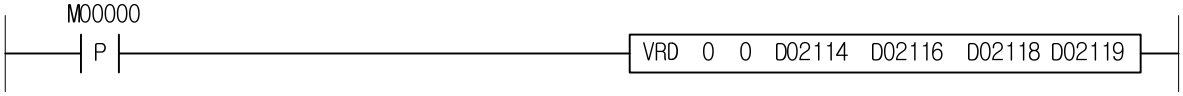
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

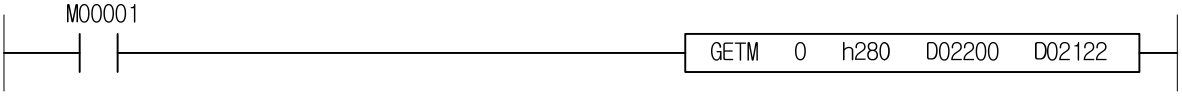
3) Example

(1) LD: Ladder Diagram

- Command to read WORD unit data into CPU with “block size” set in OP5 from “read address” set in OP3 of positioning module internal memory.

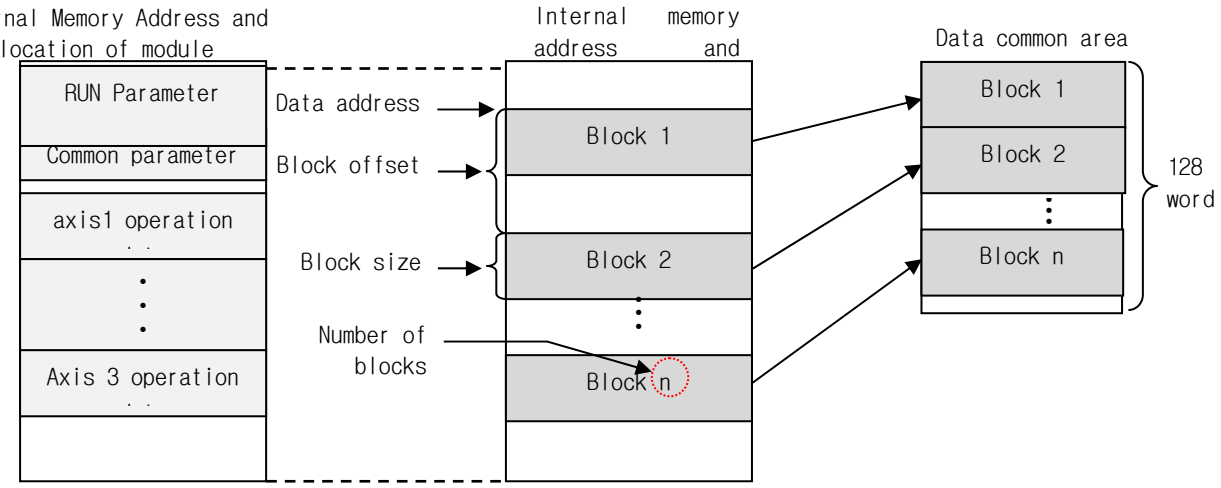


- To save to the device for use in the PLC program, use the GETM command [read address: h280, data size: read data size (DWORD)] after executing the variable data read command as in the program example.



(2) Timer chart

※ Internal Memory Address and location of module



(3) ST (Structure Text): Automatic program assignment

```
VRD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*), Num2:=(*DWORD*), Num3:=(*WORD*), Num4:=(*WORD*));
```

4) Caution

※ You have to execute GETM command minimum 2ms after executing 'Variable data read’ to save the read data in common

※ In the following case, error occurs and cannot execute 'Variable data read' command

▪ Read data size (Block size x No. of block) is 0 or higher than 128 WORD.

※ If you execute Variable data read command in XGK PLC, Read data from positioning module is saved in common area. To save in device for using in PLC program, use GETM command [Read address: 0, data size: Read data size (DWORD)] In XGK/XGR PLC, Read data is saved in register set in Function Block automatically.

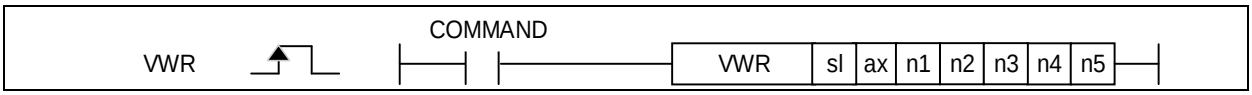
4.41.45 VWR / Variable Data Write

This command is a command to write the desired data by directly designating the module's internal memory address such as command axis parameters and operation data.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
VWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Leading address where data to write is saved.	WORD
n2	Leading address to write module internal memory data(0~ 12147)	WORD
n3	Offset between blocks (0 ~12147)	WORD
n4	Size of one block (1 ~ 128)	WORD
n5	No. of block to read (1 ~ 128)	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Writes the data of “block size” from the “write address” position among the parameters, operation data, and cam data of the positioning module internal memory in the data set in the PLC program (in WORD units). In case 'No. of block' is higher than 2, writes blocks with interval of 'OFFSET' starting 'Write address' as many as 'CNT'-1.

(2) Max data size (Block size X No. of block) can be read with one command is 128 WORD.

(3)“Variable data write” command cannot be executed in operation.

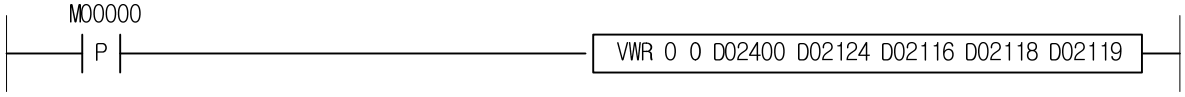
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

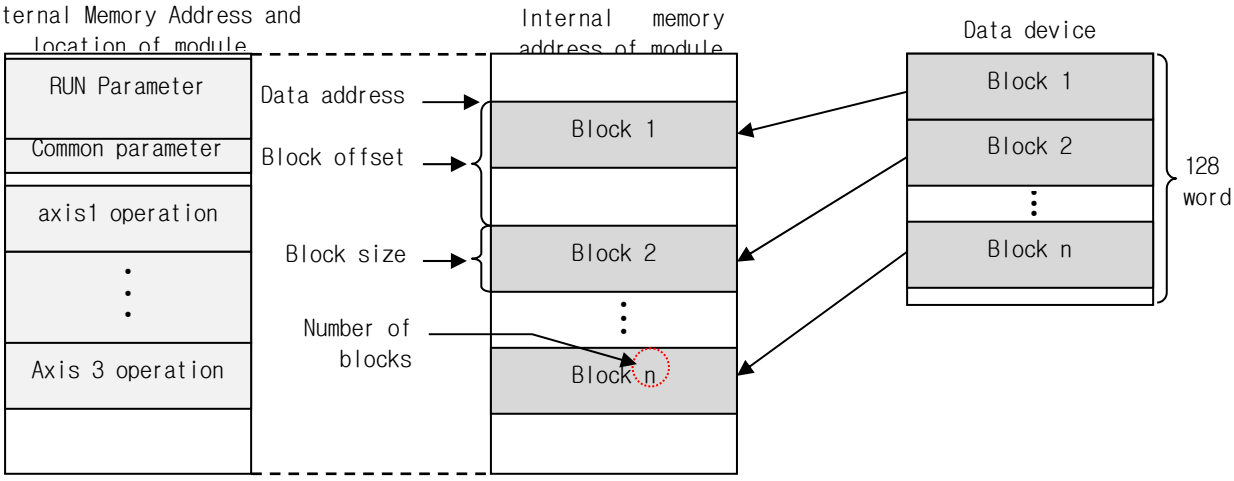
(1) LD: Ladder Diagram

Command to execute WORD unit write with the data specified in OP3 in the PLC program as much as the OP6 "block size" at the "write address" position set in OP4 when the input signal M00000 is On.



(2) Timer chart

※



(3) ST (Structure Text): Automatic program assignment

VWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*DWORD*), Num 3:=(*DWORD*), Num4:=(*WORD*), Num5:=(*WORD*));

4) Caution

※ In case you execute 'Variable data write', the changed value is kept during power on. So, to save the data, execute 'Parameter/operation data save (XWRT)' command.

※ In the following case, error occurs and cannot execute 'Variable data write' command

(1) Data range setting error

- Write data size (Block size x No. of block) is 0 or higher than 128 WORD

(2) Block overlap error

- In case module internal block to write is overlapped each other(In case no. of block is higher than 2, block offset is smaller than block size).

(3) Execution inhibition error in operation

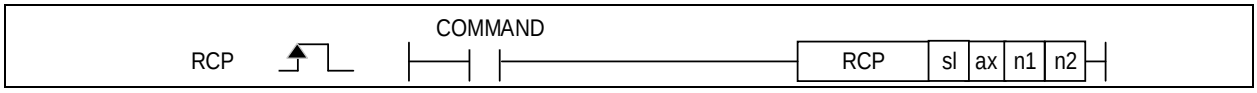
- When one axis of the positioning module is operating

4.41.46 RCP / Current Position Section Repeat

This command sets or prohibits the current position section of the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
RCP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis to perform basic parameter teaching (0:X 축, 1:Y 축, 2:Z 축)	WORD
n1	Section to repeat	DINT
n2	Section repeat enable/disable	WORD

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command sets or prohibits the current position section of the positioning module.

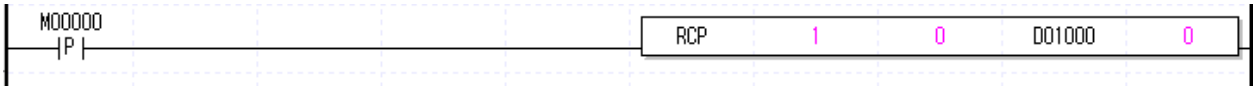
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

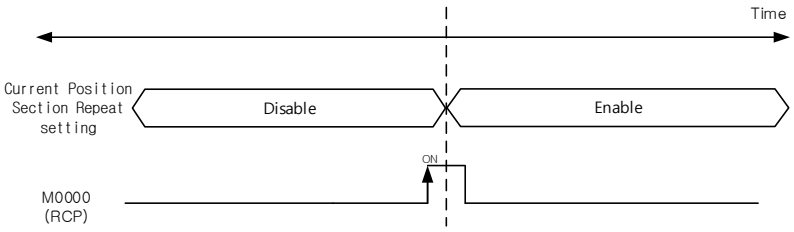
(1) LD: Ladder Diagram

※ Enables repeat setting of the current position section set in D01000.



(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
RCP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

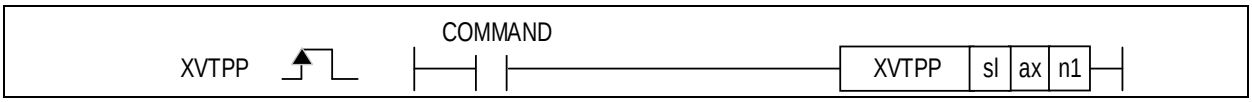
(1) Repeating the current position section operates only in direct start operation

4.41.47 VTPP / Position specified speed/position switching control

This command executes positioning operation as much as the specified position movement amount after the speed/position control is switched to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XVTPP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Position movement amount to set when switching speed/position control	DINT

※ Operand setting range is based on XGF-PxxA. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When this command is executed, the state of speed control operation is switched to position control, and position control is executed as much as the position movement amount set n1.

(2) This is a command to switch position specified speed/position control to ax (designated axis) of the positioning module of the slot designated by sl.

(3) The control method of operation data or direct start is set to “single speed control”, and positioning control is performed with the “position specified speed/position switching” command during speed control operation.

(4) In the position specified speed/position switching control, the setting of the operation data or coordinate values of direct start does not affect the operation. In other words, actions of “Absolute, Single axis speed control” and “Relative, Single axis speed control” are same.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

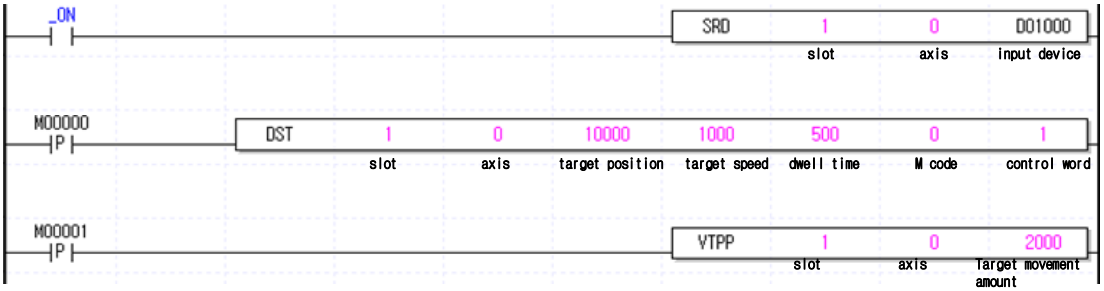
(a) When M00000 is turned on while the home is determined, speed control starts according to the set value of direct start on the command axis (1 axis).

(b) In the example below, speed control is executed at the target speed: 1000 after M00000 is turned on.

(c) Then, when M00001 is ON, the position specified speed/position switch control is executed. At this time, the target position does not follow the target position set by DST. After the speed/position switching, the target movement amount will follow the position movement amount set in the VTPP. At this time, the set absolute coordinate/relative coordinate follows the value set in the DST command.

※ Bit-specific contents of DST setting control word (OP7) are as follows.

15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Deceleration time	Acceleration Time	-	0:Absolute 1:Relative	-	0:Position control 1:Speed control 2:Feed control

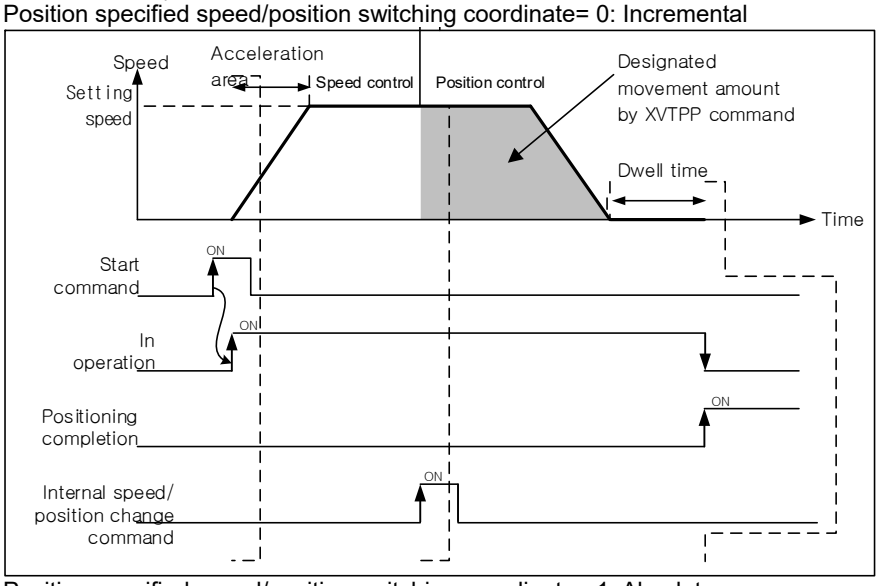


※ To read the status information of the axis, refer to the description of the SRD instruction.

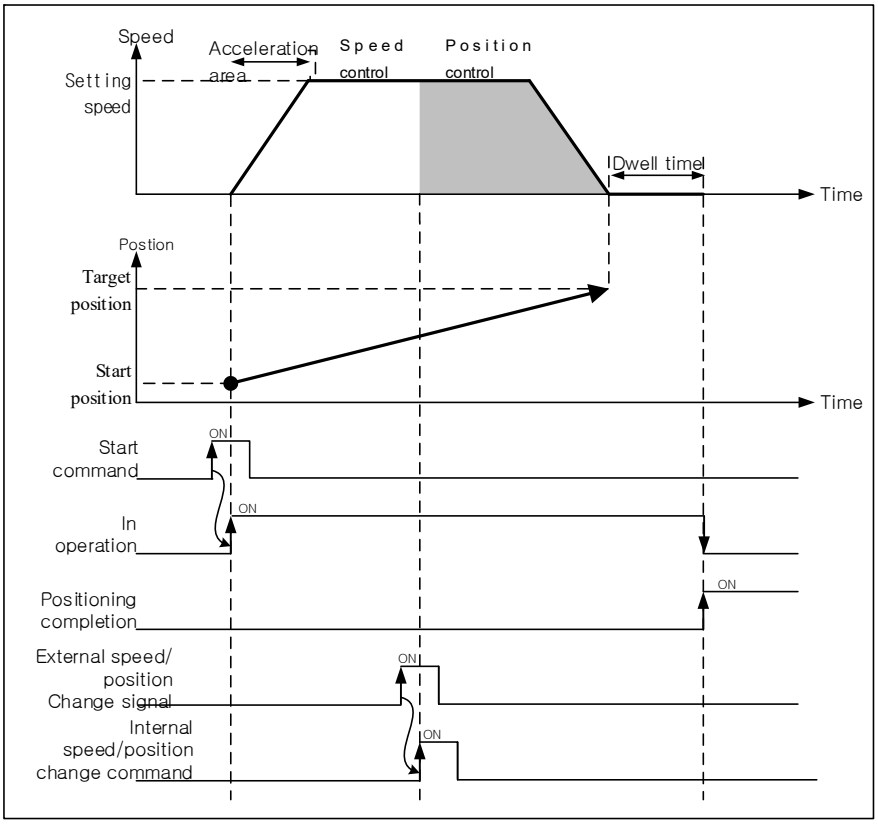
(2) Timer chart

※ The target position below is the target movement amount set in the VTPP. (Not the target position value set in DST, etc.)

1) Position specified speed/position switching coordinate= 0: Incremental



2) Position specified speed/position switching coordinate= 1: Absolute



(3) ST (Structure Text): Automatic program assignment
VTPP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*));

4) Caution

(1) Set the operation pattern of speed control as 'End" or "Keep'.
If set to "Continuous", an error occurs and speed control cannot be executed.

(2) If the value of target position is 0,「position specified speed/position switching」command may not be executed.
In this case, an error occurs and operation continues with speed control.

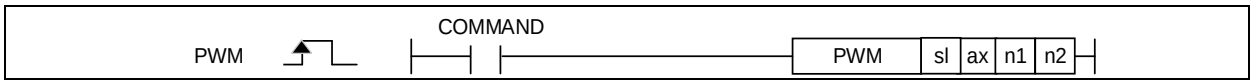
(3) Speed/position switching coordinate= 0: If the target position operand setting value of the "position specified speed/position switching" command is 0 in relative, the positioning speed/position switching command does not work.
In this case, an error occurs and operation continues with speed control.

4.41.48 PWM / Pulse Width Modulation Output

This command executes positioning operation as much as the specified position movement amount after the speed/position control is switched to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PD02A
	X	X	X	X	X	X	X	X	O	O	O	X	O	O	X	X

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
PWM	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	-	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	-	O	O				
	n2	O		O				O			O		-	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution(0:X axis, 1:Y axis, 2:Z axis)	WORD
n1	Output cycle : 1~20,000(ms)	WORD
n2	Off duty ratio:0~100(%)	WORD

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to give PWM output to Built-in positioning module.
(2) While the input condition of XGB positioning is On, pulse train is output with the cycle set in n1 and Off Duty set in n2 on the axis designated as ax.
(3) During PWM output, the current position address does not change, and the bit (X axis: K04200, Y axis: K04300) during pulse output and the bit during constant speed (X axis: K0420D, Y axis: K0430D) are turned on.
(4) When the pulse width modulation is output by the command, other positioning commands do not work. Also, note that external input contacts such as upper and lower limit limits do not operate.
(5) In case of pulse width modulation output by PWM command, stop operation by STP and EMG command is not executed.
(6) PWM supported version for each product
- XBM-DNxxS:H/W V2.0 or higher, O/S V3.10 or higher
- XBC-DN/DPxxH: O/S V2.03 or higher
- XBC-DN/DpxxSU: O/S V1.10 or higher
- XBC-DN/DP32U, XBC-DN32H :Version doesn't matter

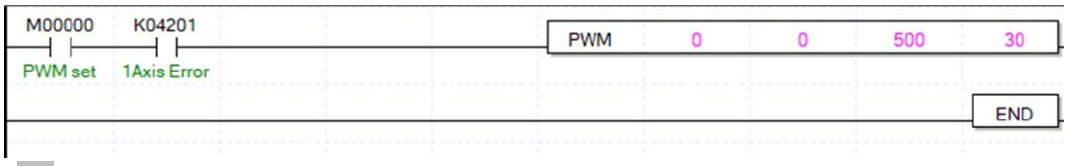
2) Error

(1) If a value other than 0 or 1 is specified as ax (command axis), the error flag (F110) is set and the command is not executed.

3) Example

(1) LD: Ladder Diagram
(a) The example of the program below describes the operation of the PWM command.
(b) The example of using PWM command is explained based on the X axis.
(c) PWM command is executed while M0000 is On as X-axis PWM command signal.
At this time, it does not operate when the X-axis is running or in error.
(d) When the PWM command is executed, the pulse train is output at a specified output cycle (500ms) and off duty (30%).

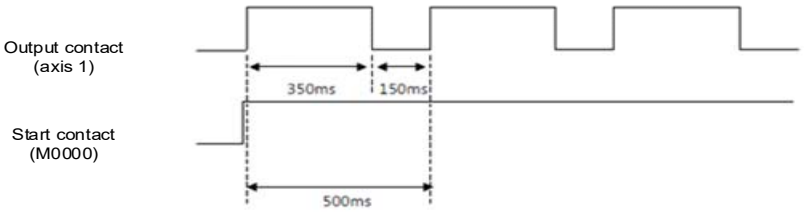
At this time, the set absolute coordinate/relative coordinate follows the value set in the DST command.



IL Program

Rung	Step	Commands	OP 1	OP 1 comment	OP 2	OP 2 comment	OP 3	OP 3 comment	OP 4	OP 4 comment
0	0	LOAD	M00000	PWM set						
	1	AND	K04201	1Axis Error						
	2	PWM	0		0		500		30	
1	6	END								

(2) Timer chart



4.42 Position Control Instruction (XPM)

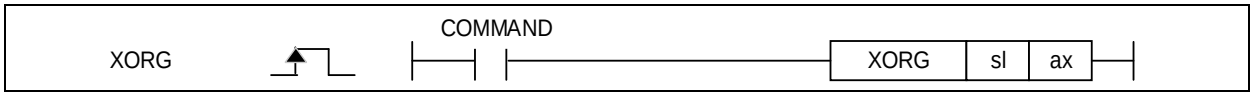
4.42.1 XORG / home return

Home position return control is a function to return to the position (machine home) that is the starting point for positioning control.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XORG	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute home return: 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Home position return is carried out to confirm the home of the machine when applying the power.
(2) Before operating home return, it is required to set home return parameter per axis.
(3) If the home is determined by home return, the home detection signal is not recognized during positioning operation.
(4) For pulse type modules such as XBF-DxxxUP, XBM-H(P) and XGF-PxxH, the PLC itself executes the homing function.

*** Home return method**

a) Methods using DOG

- Home detection after DOG Off (0:DOG /HOME(Off))
- Home detection after DOG On and deceleration (1:DOG /HOME(on))
- Home detection by DOG(3: DOG)

b) Methods without using DOG

- Home detection by Home and upper/lower limit(2: Upper/Lower limit/HOME)
- High speed Home detection (4: High speed home)
- Home detection by upper/lower limit(5: Upper/Lower limit)
- Home detection by home(6: Home)

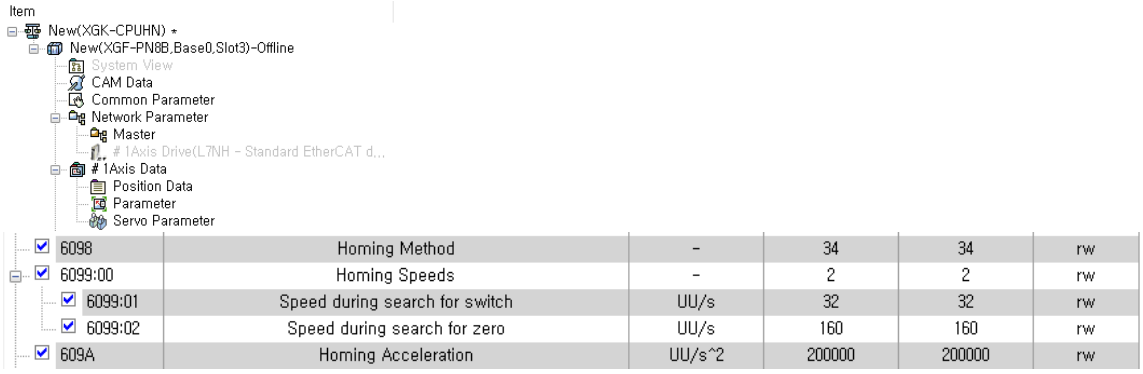
※ The internal setting of () of each item can be set in the home return mode of the home return parameter of XG-PM.

Homing Parameter	Home position	0 pls
	Home high speed	1000 pls/s
	Home low speed	200 pls/s
	Home acc. time	500 ms
	Home dec. time	500 ms
	Home dwell time	0 ms
	Home compensation	0 pls
	Home restart time	0 ms
	Home method	0: DOG/Home(OFF)
	Home direction	1: Reverse

(5) For network type positioning modules such as XBF-PN0xB and XGF-PNx(A)B, the PLC executes the homing function when the homing command is executed. PLC receives feedback of homing result.

※ In the () internal setting of each item, the manufacturer-specific slave is added in XG-PM, and then the home operation method is set in the servo parameter setting for each axis.

< Example inXG-PM setting (ex) L7NH: 0x6098) >



※ Parameters for Home return

Index	sub	name	Data type	unit
0x6040	-	Control word	UINT	-
0x6041	-	Status word	UINT	-
0x607C	-	Home offset	DINT	[pls]
0x6098	-	Homing method	SINT	-
0x6099	-	Homing speed	-	-
	0	The number of item	USNT	-
	1	Switch searching speed	UDINT	[pls/s]
	2	Zero searching speed	UDINT	[pls/s]
0x607D	-	Software position limit	-	-
	0	The number of item	USINT	-
	1	Position limit minimum	DINT	[pls]
	2	Position limit maximum	DINT	[pls]
0x609A	-	Homing accerlation	UDINT	[pls/s]

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

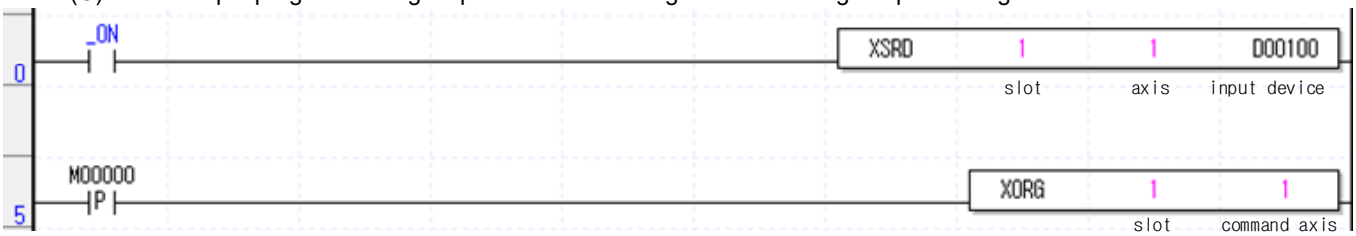
3) Example

(1) LD: Ladder Diagram

(a) When M00000 is On, the homing command is executed for command axis 1.

(b) At this time, the home return method follows the XG-PM homing parameter setting.

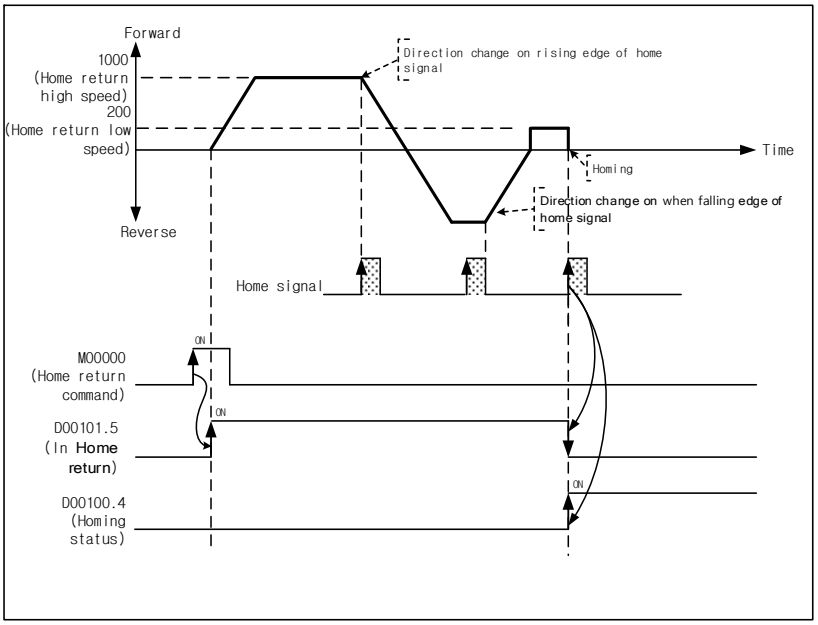
(C) The example program of single operation after setting the home using the positioning function is as follows



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

<For pulse type, set the value related to home return in the home return parameter of XG-PM>



(3) ST (Structure Text): Automatic program assignment
XORG_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

<For pulse type modules such as XGF-PxxH, For built-in pulse positioning module such as XBM-DxxxUP, XBM-H(P)>

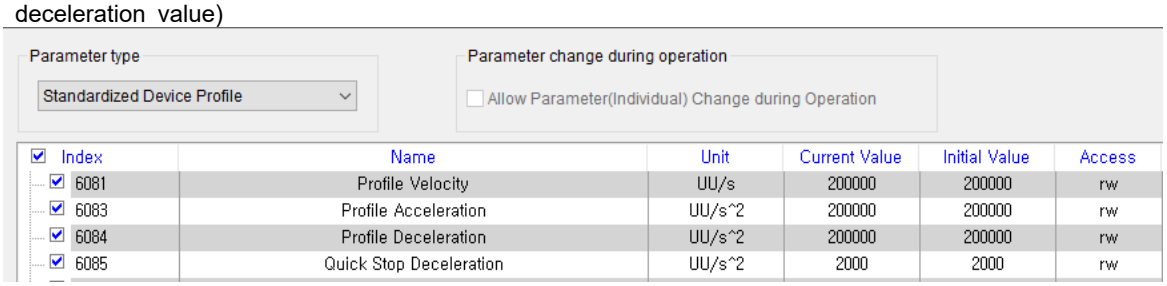
(1) When an emergency stop occurs, set the homing state of the axis to either '0: Maintain previous state' or '1:undecided homing'.
- 0: Maintaining the previous state: Even if the axis stops due to an emergency stop, the homing status does not change.
- 1: undecided homing : The homing status is canceled when the axis stops due to an emergency stop.

(2) When setting the homing speed, it is recommended to set the homing-low speed as low speed as possible.
If the home return low speed is set too fast, an error may occur between the home position when the home signal is detected and the position after home return is completed.

(3) When complete homing, external input signal (DOG and HOME signal) do not effect to positioning control.

<For network type positioning modules such as XBF-PN0xB and XGF-PNx(A)B>

※ The emergency stop/deceleration stop deceleration speed control during homing is set below. (Quick stop deceleration value)



Index	Name	Unit	Current Value	Initial Value	Access
6081	Profile Velocity	UU/s	200000	200000	rw
6083	Profile Acceleration	UU/s^2	200000	200000	rw
6084	Profile Deceleration	UU/s^2	200000	200000	rw
6085	Quick Stop Deceleration	UU/s^2	2000	2000	rw

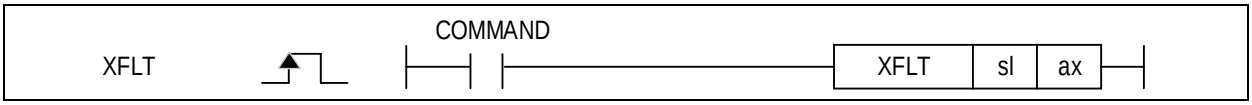
4.42.2 XFLT / floating home setting

This is used to force to set the current position as the home without carrying out the homing action of the machine..

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XFLT	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to setting floating home: 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The current position of the axis designated by ax is changed to the home position, and the homing is completed.

(2) After executing the floating home setting command, the current position is changed to “0”.

※ For pulse type modules such as XBF-DxxxUP, XBM-H(P) and XGF-PxxH

- Modify the current position into “Homing end position” of homing parameter and become home-decided status.
- After floating home setting command is executed, the current position is changed to 'The position of homing completion' of homing parameter.

< Related parameter (Home return parameter)>

Item	Content
Position of homing completion	Set the position after homing completion or floating home setting

2) Error

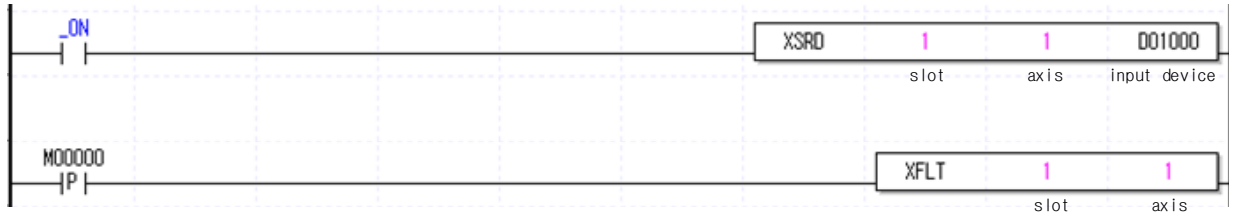
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

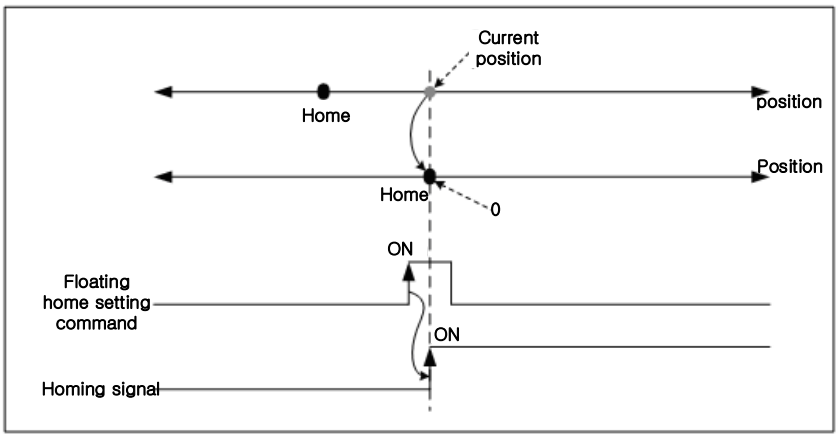
(a) When M00000 is On, the floating home setting command is executed for command axis 1.

(b) The current position of the axis is forcibly set to 0, and the homing of the axis is completed.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment
XFLT_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

(1) When an error occurs, remove the cause of the error and then reset the error, set the floating home again and change the operation step number using the start step number change command, and then execute it.

(2) In case of pulse output positioning type, the floating home setting command is not executed and an error (error code : 212) occurs when the drive ready signal is “Off When drive ready signal is in 'ON' execute floating home setting command.

(3) In the case of the network positioning type, the floating home setting command occurs an error (error code : 212) in the servo-off state and is not executed. “Servo On” command, and then execute the floating home setting command when the Servo on signal is On.

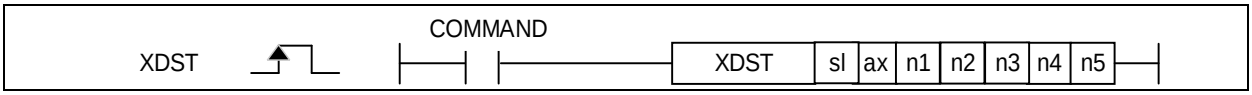
4.42.3 XDST / Direct start

Do not use operating data, directly input positioning data by auxiliary data and perform positioning control.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XDST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute direct start command : 1 ~ 8(Real axis)	WORD
n1	Target position	DINT
n2	Target speed	DWORD
n3	Dwell time	WORD
n4	M code No.	WORD
n5	Control word	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction does not use the operation data from XG-PM in the positioning module, and sets the positioning data in the command as auxiliary data to give a direct start command.

(2) The target position n1 is directly started at the target speed n2 on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module), and dwell time n3 is required to complete the position determination after reaching the target position.
Other auxiliary operations can be executed by setting the M code of n4, and various controls can be performed by using bits information of the n5 control word.

■ Details of Control word (n5) for each Bit are as follows.

15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Deceleration time	Acceleration Time	-	0:Absolute 1:Relative	-	0:Position control 1:Speed control 2:Feed control

(3) If control word word(n5) is h0012, it shall be set by Feed control, relative, acceleration time 1, and deceleration time 1.

(4) 2~3, 5~7 ,and 12~15th bit of the control word is the unused area and does not affect the setting.

(5) If you want to perform a reverse speed control, enter a small position than the current position in the entry n1 is the speed control in the reverse direction.

2) Error

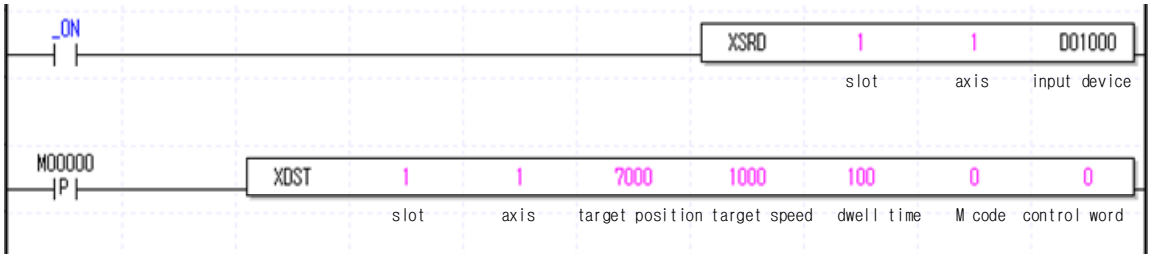
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

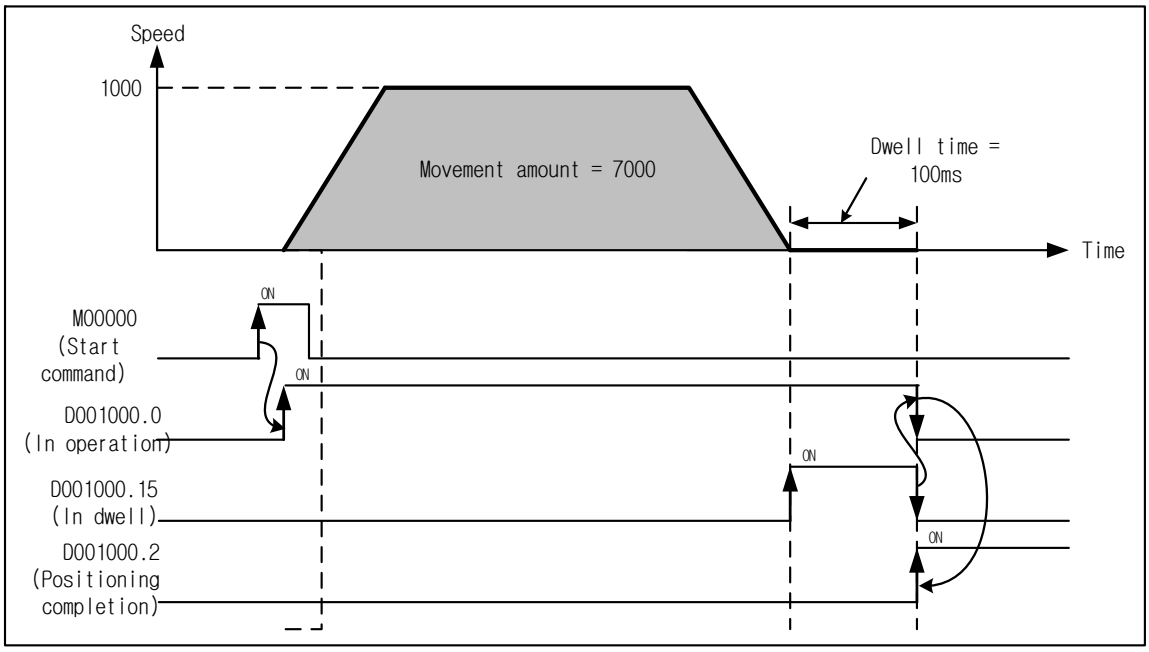
(a) When 00000 is turned on while the home is determined, direct start executes on the command axis (1 axis).

(b) It operates at a target speed of 1000 as long as the target position 7000, and positioning is completed after 100 ms of dwell time after reaching the target position. The control word is operated by position control and absolute coordinate setting.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XDST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*DWORD*), Num 3:=(*WORD*), Num4:=(*WORD*), Num5:=(*WORD*));

4) Caution

(1) Direct start only can use when it is single operation.
In case that Interpolation operation, use indirect starts.

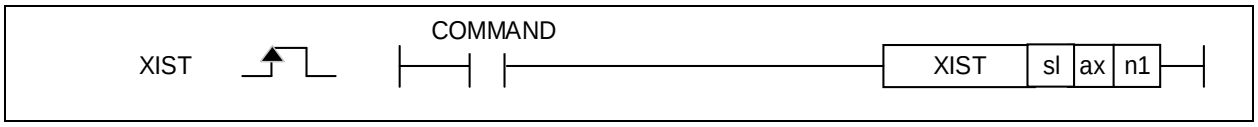
4.42.4 XIST / Indirect start

Indirect start starts position control by designating the step number where the operation data is set.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XIST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute indirect start command : 1 ~ 8(Real axis)	WORD
n1	Step number to start	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command executes positioning control by specifying the step number of the operation data to be executed with the operation data stored in the positioning module.

(2) The operation command is executed in step n1 on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module).

※ Setting auxiliary data of indirect start

Setting item	Content
Operation step	Set the step number of the operation data to be executed. (0 or 1~ 4000)

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

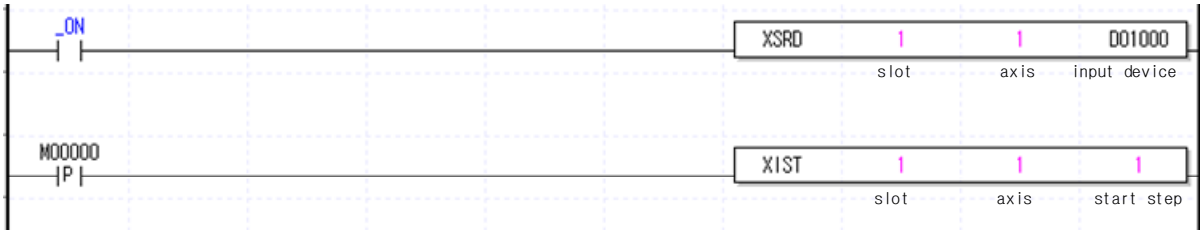
(1) LD: Ladder Diagram

(a) If M00000 is turned on while the home is determined, the indirect start command of step 1 is executed for command axis 1.

(b) At this time, the operation setting value follows the operation data for each step in XG-PM below.

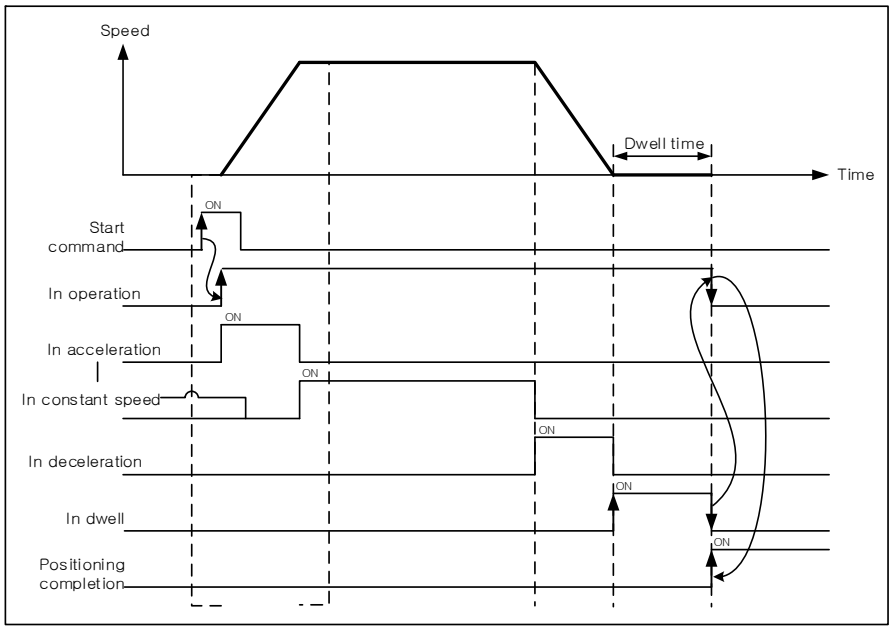
※ Setting items in XG-PM (unlike direct start, setting operation data by step number in XG-PM)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	10000	1000	No.1	No.1	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XIST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) After decelerating stop, when operating indirect start, positioning operation is operated with the settting step. In case of using with mode, Signal “On” of M code has to “Off” for restart. After M code on signal change 'Off' by cancel M code (XMOF)」command operates command.

When restarting after an internal emergency stop or an external emergency stop, the M code On signal stopped by the emergency stop is automatically “Off”, so the positioning operation can be executed in the set operation step for indirect start.

(3) When 0 is set in the operation step of indirect start and then the indirect start command is executed, it is executed with the operation data stored in the current step number.

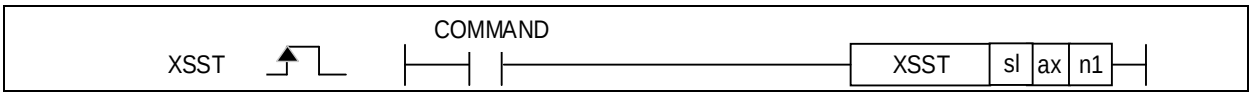
4.42.5 XSST / Simultaneous Start

Simultaneous start concurrently executes the positioning operation data for 2 to 4 axes according to axis information and setting steps.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Axis setting to simultaneous start	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a simultaneous start command to the positioning module.
(2) The axis which command simultaneous start is basically included without being set in operating axis.
(3) This command executes the simultaneous start step with data stored in the axis set to n1 on the axis designated as ax of the positioning module designated by sl (slot number of the positioning module).
(4) Set the selection axis by setting each bit of axis.

15 ~ 8 Bit	7 Bit	6 Bit	5 Bit	4 Bit	3 Bit	2 Bit	1 Bit	0 Bit
Do Not Use	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1

※ ex) That is, axis4, axis2, axis1 will be set if set as h000B

(5) To set steps of axis for simultaneous start, use XSWR command or PUT/PUTP command to set simultaneous start step no. on simultaneous start step memory address. This must be complete before simultaneous start executes.

2) Error

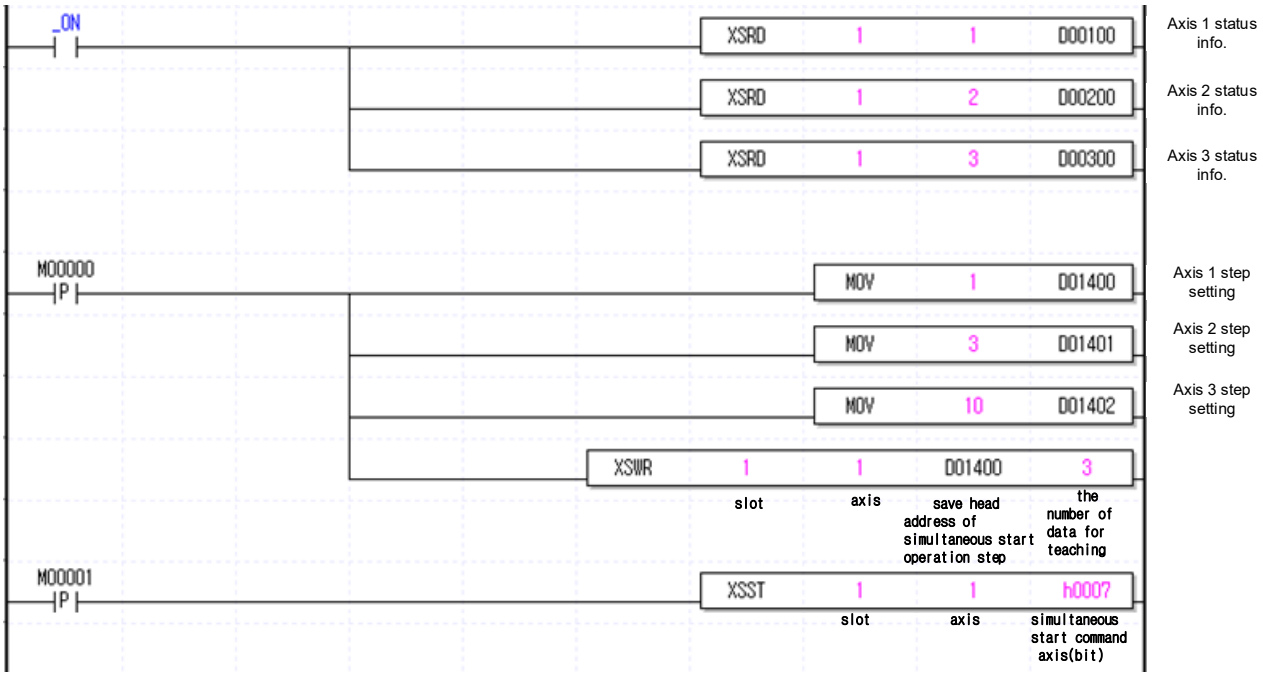
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) If M00000 is turned on while the home is determined, the simultaneous start command is executed for the command axes 1, 2, and 3 axes.

(b) At this time, the operation setting value follows the operation data for step each axis in XG-PM below.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

<Setting items in XG-PM for simultaneous start>

▪ 1 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single, Continuous	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single,End	1800	800	No.1	No.1	0	100

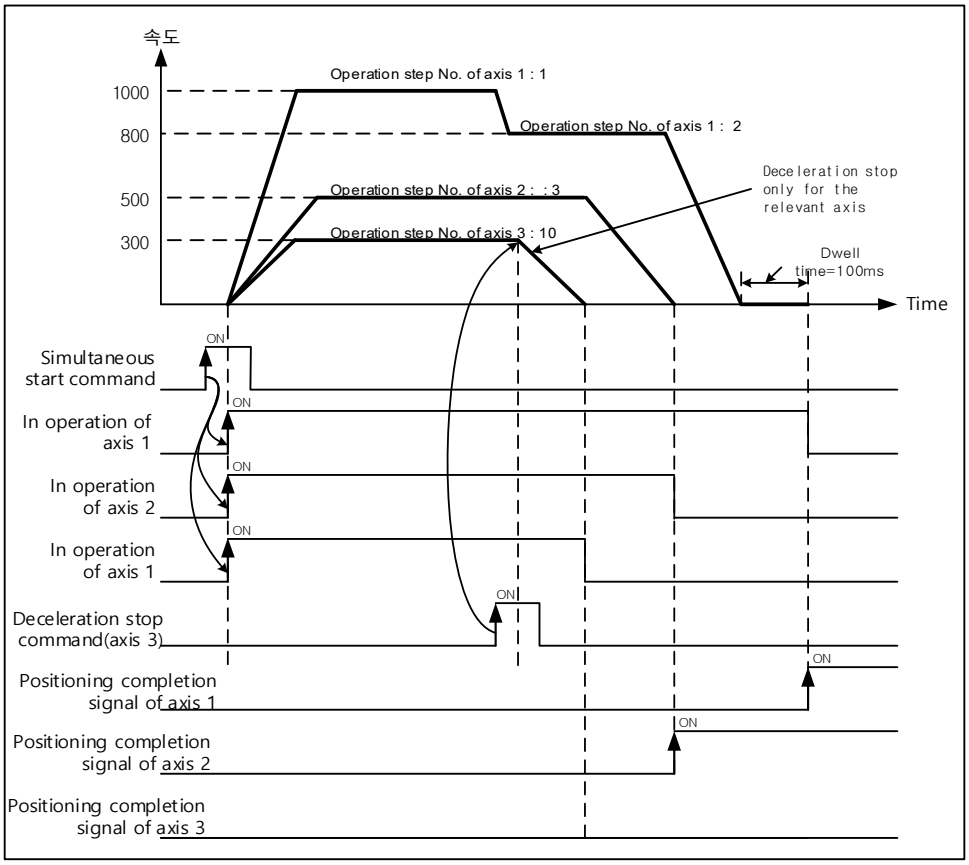
▪ 2 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
3	Absolute, Single axis position control	Single,End	900	500	No.2	No.2	0	0

▪ 3 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
10	Absolute, Single axis speed control	Single,End	1000	300	No.3	No.3	0	100

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XSST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

In these cases can not operate all of the axes which were set simultaneous start by error.

(1) When occurred error in over an axis among setting axes of simultaneous start.(Output error code in its axis.)

(2) When command axis of simultaneous start was wrong.(Error code :296)

- When only the command axis is set (Must set more than 2 axes.)
- In case of exceeding number of possible setting axis of current using module among the possible setting axes

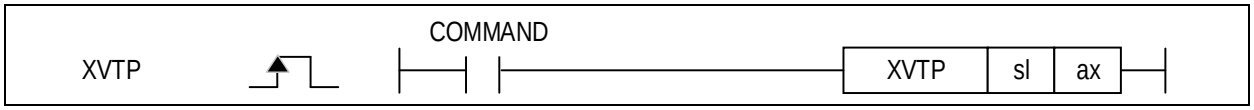
4.42.6 XVTP / Speed/Position control switch

This command is a command to switch speed/position control to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XVTP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command converts speed control operation to position control operation and executes position control operation to the target position set during speed control.

(2) This is a command to switch speed/position control to ax (designated axis) of the positioning module of the slot designated by sl.

(3) Set the operation data or direct start control method to "single speed control", and execute the positioning with the "Speed/Position switching" command during speed control operation.

(4) The direction of movement is determined by the sign of the target position value.
- Forward operation: When the position value is positive (+)
- Reverse operation: When the position value is negative(-)

(5) In the case of speed/position switching, set the speed/position switching coordinates as to whether the position value should be the relative position value or absolute position value at the time the speed/position switching command is executed.

Item	Setting value	Content
Speed/Position switching coordinate	0 : Relative	Executes positioning as far as the set value from position where speed/position switching command is executed.
	1 : Absolute	Considers the set value as absolute position and executes positioning into the set absolute position.

(6)In speed/position switching control, setting of coordinate values does not affect operation.
In other words, actions of “Absolute, Single axis speed control” and “Relative, Single axis speed control” are same.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

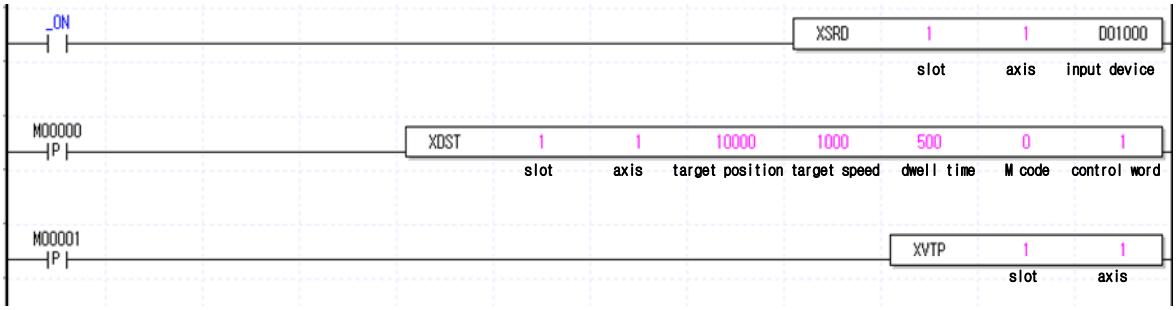
(a) When 00000 is turned on while the home is determined, speed control starts according to the set value of direct start on the command axis (1 axis).

(b) The direction of movement is determined by the sign of the target position value.
In the example below, speed control is executed at the target speed: 1000 after M00000 is turned on.

(c) Then, when M00001 is ON, the speed/position switching control is executed.
At this time, the target position does follow the target position and control word set by XDST.
At this time, the set absolute coordinate/relative coordinate follows the value set in the XDST command.

※ Bit-specific contents of XDST setting control word (OP7) are as follows.

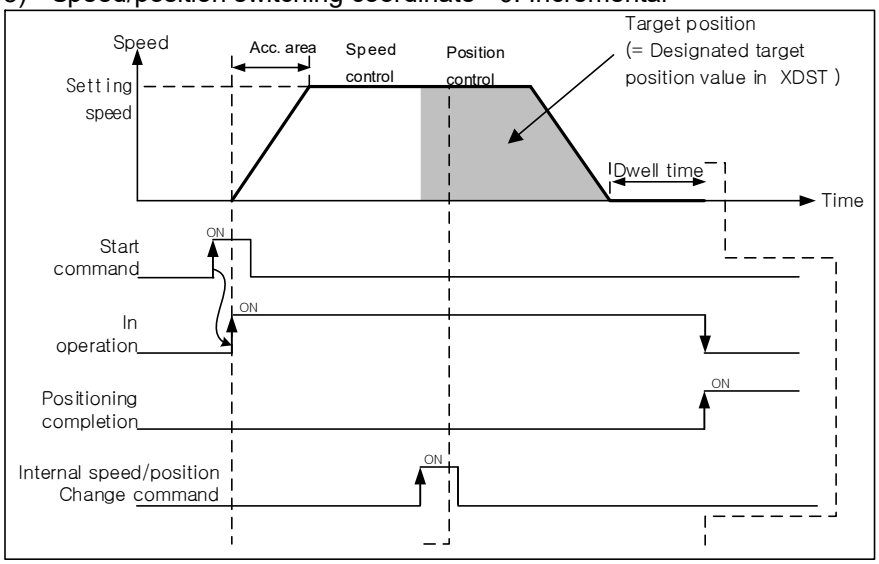
15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Deceleration time	Acceleration Time	-	0:Absolute 1:Relative	-	0:Position control 1:Speed control 2:Feed control



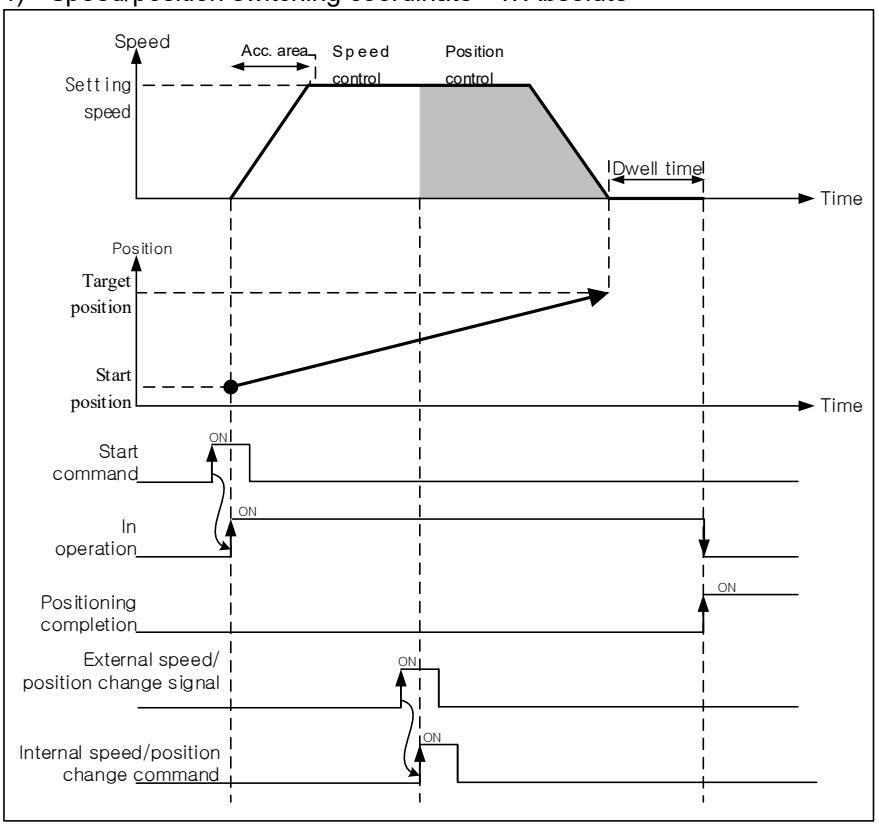
※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

3) Speed/position switching coordinate= 0: Incremental



4) Speed/position switching coordinate= 1: Absolute



(3) ST (Structure Text): Automatic program assignment

```
XVTP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

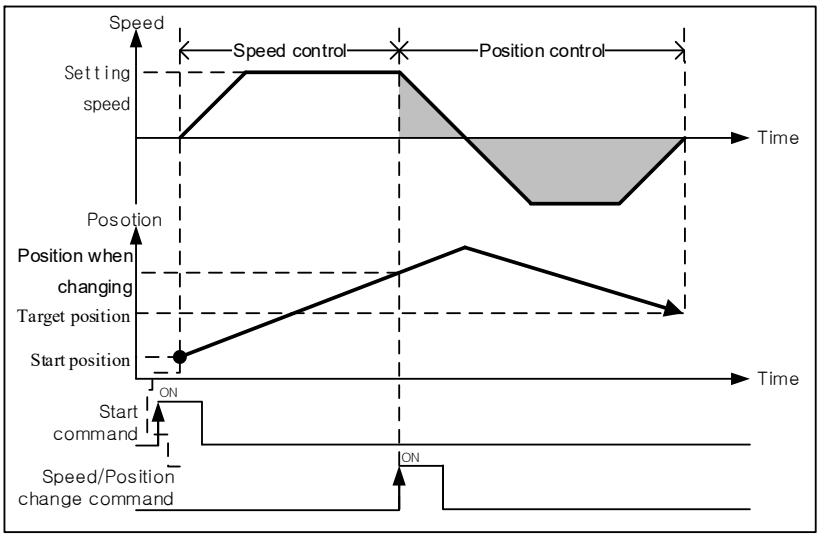
(1) Set the operation pattern of speed control as 'End' or 'Keep'.
If “Continuous” is set as, error (error code:236) arises and speed control may not be executed.

(2) Speed/Position switching coordinates = "0: Relative" When the operation data or the target position setting value of direct start is 0, the speed/position switching command does not operate and an error occurs(error code:304). In this case, it continues to operate with speed control.

(3) When the speed/position switching command is executed, if the target position is smaller than the current position, the action varies depending on enable/disable of the infinite running repeat function.

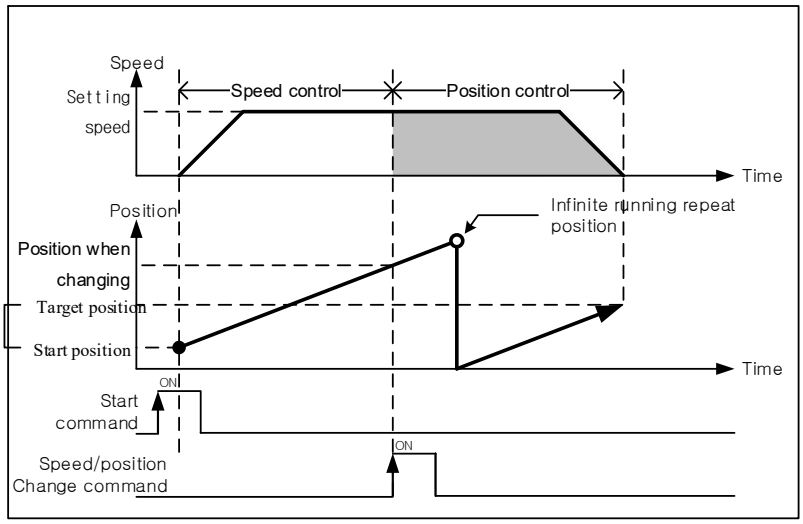
a) Infinite running repeat =0 : disable

- After deceleration stop, it operates in the opposite direction and executes positioning operation to the target position.



b) Infinite running repeat =1 : enable

- It operates in the same direction and executes positioning operation to the target position within the next repeated infinite running.



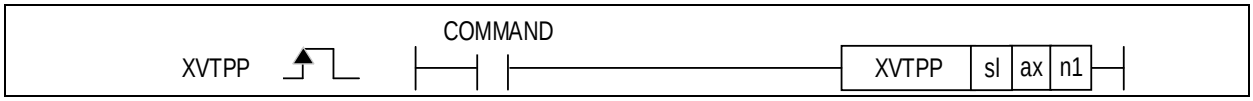
4.42.7 XVTPP / Position Specified Speed/Position Control Switch

This command executes positioning operation as much as the specified position movement amount after the speed/position control is switched to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XVTPP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Position movement amount to set when switching speed/position control	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When this command is executed, the state of speed control operation is switched to position control, and position control is executed as much as the position movement amount set n1.

(2) This is a command to switch position specified speed/position control to ax (designated axis) of the positioning module of the slot designated by sl.

(3) Set the operation data or direct start control method to "single speed control", and execute the positioning with the "Position specified Speed/Position switch" command during speed control operation.

(4) In the position specified speed/position switching control, the setting of the operation data or coordinate values of direct start does not affect the operation. In other words, actions of “Absolute, Single axis speed control” and “Relative, Single axis speed control” are same.

(5) Position specified speed/position switching control ignores the operation data or the value set in the target position of direct start, and executes positioning with the value set in the target position operand of the "position specified speed/position switching" command.

(6) Position specified speed/position switching, set the speed/position switching coordinates as to whether the position value should be the relative position value or absolute position value at the time the speed/position switching command is executed.

Item	Setting value	Content
Position specified speed/position switch coordinate	0 : Relative	Positioning is executed from the position where the position specified speed/position switch command was executed to the position incremented by the set value.
	1 : Absolute	Considers the set value as absolute position and executes positioning into the set absolute position.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

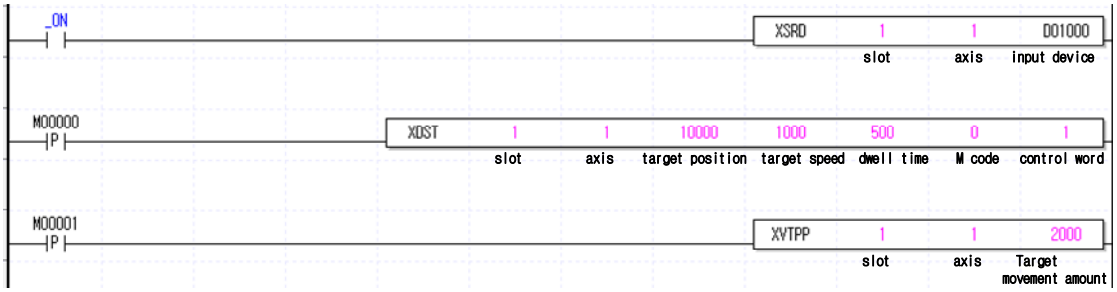
3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, speed control starts according to the set value of direct start on the command axis (1 axis).
(b) In the example below, speed control is executed at the target speed: 1000 after M00000 is turned on.
(c) Then, when M00001 is ON, the position specified speed/position switch control is executed.
At this time, the target position does not follow the target position set by XDST.
After the speed/position switching, the target movement amount will follow the position movement amount set in the XVTPP.
At this time, the set absolute coordinate/relative coordinate follows the value set in the XDST command.

※ Bit-specific contents of XDST setting control word (OP7) are as follows.

15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Deceleration time	Acceleration Time	-	0:Absolute 1:Relative	-	0:Position control 1:Speed control 2:Feed control

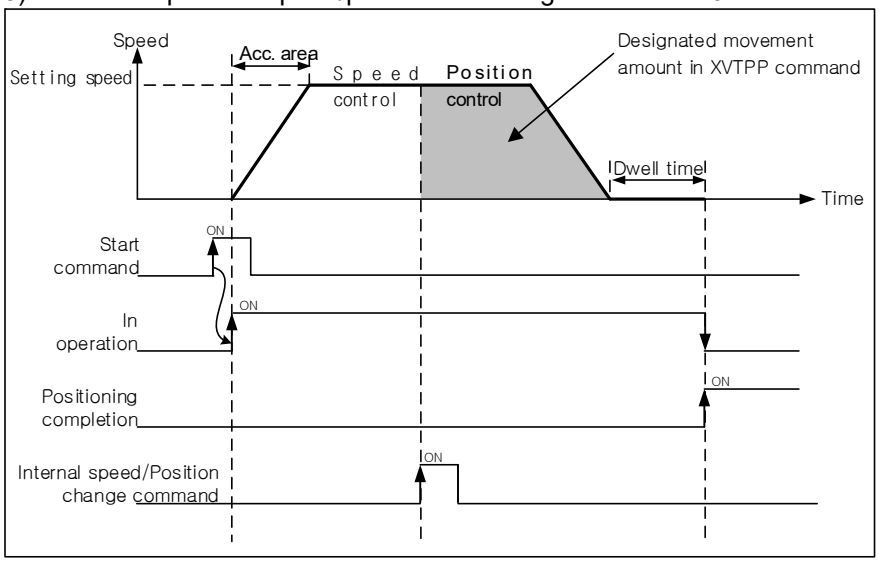


※ To read the status information of the axis, refer to the description of the XSRD instruction.

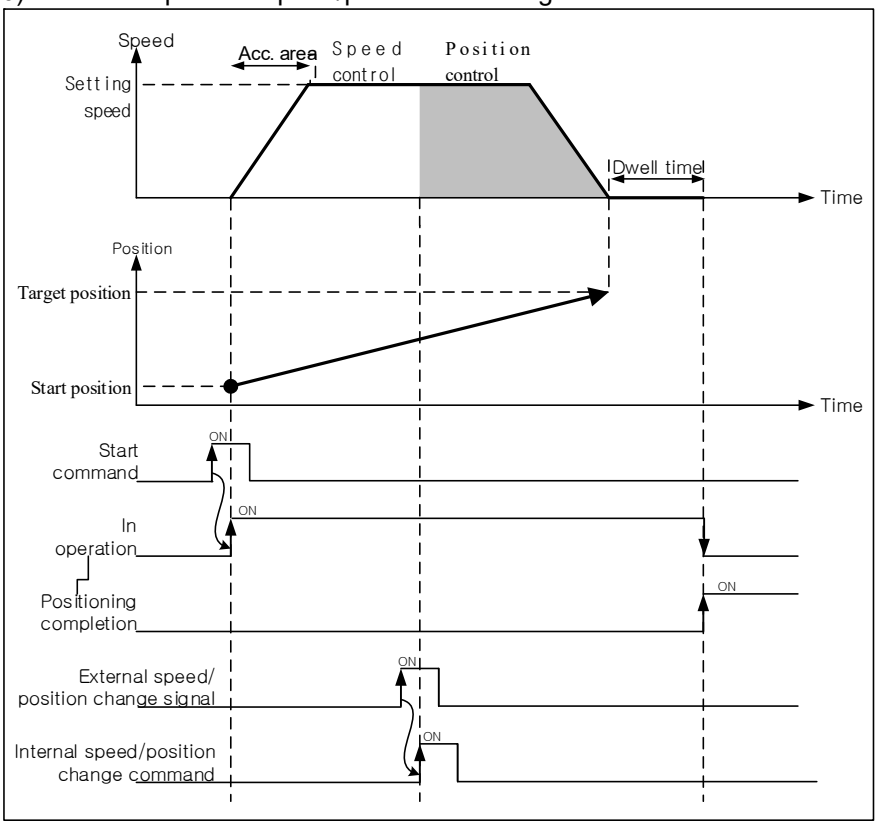
(2) Timer chart

※ The target position below is the target movement amount set in the XVTPP. (Not the target positio n value set in XDST, etc.)

5) Position specified speed/position switching coordinate= 0: Incremental



6) Position specified speed/position switching coordinate= 1: Absolute



(3) ST (Structure Text): Automatic program assignment
XVTPP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*));

4) Caution

(1) Set the operation pattern of speed control as 'End" or "Keep'.
If 'Continuous' is set as, error (error code:236) arises and speed control may not be executed.

(2) If the target position operand setting value of the "position specified speed/position switching" command is 0 in relative, the positioning speed/position switching command does not work. In this case, it continues to operate with speed control.

(3) Speed/position switching coordinate= 0: If the target position operand setting value of the "position specified speed/position switching" command is 0 in relative, the positioning speed/position switching command does not work.
In this case, it continues to operate with speed control.

(4) Infinite running repeat =1 : enable,speed/position switching coordinate= 1 : If you set the position opposite to the operating direction from absolute to the position operand of the position specified speed/position switching command, an error (error code:306) occurs and operation continues with speed control. (When setting the (-) position value for forward speed control operation or Setting the (+) position value for reverse speed control operation)

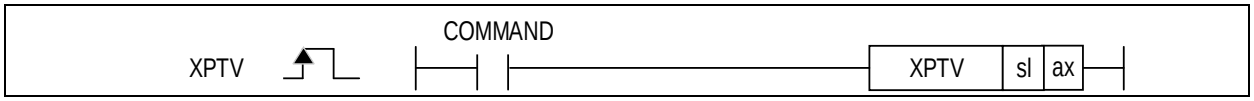
4.42.8 XPTV / Position/Speed control switch

If a command is executed during position control operation, the speed control operation is executed at the speed value set at the start of position control.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XPTV	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If position/speed switch control is executed while position control is in operation, it is changed to speed control operation at the speed value set when starting position control, and operates until a stop factor such as deceleration stop occurs.

(2) This is a command to switch position/speed control to ax (designated axis) of the positioning module of the slot designated by sl.

(3) Set control method of operating data as 'Single axis position control' and user may change position control to speed control with 'Speed/Position Switching'.

(4) The direction of movement is determined by the values set in the coordinates and the target position.
- ■ In the case of 「Absolute, Single axis position control」
  - ▪ Starting position < Goal position : Positioning operation in forward direction
  - ▪ Starting position > Target position : Positioning operation in reverse direction
- ■ In the case of 「Relative, Single axis position control」
  - ▪ The target position value is positive (+ or unsigned) : forward direction (current position increase) positioning
  - ▪The target position value is negative (-) : reverse direction (current position decrease)

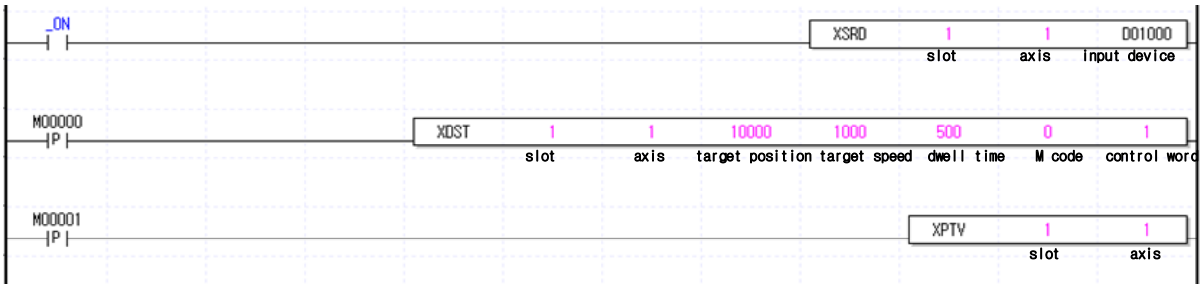
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

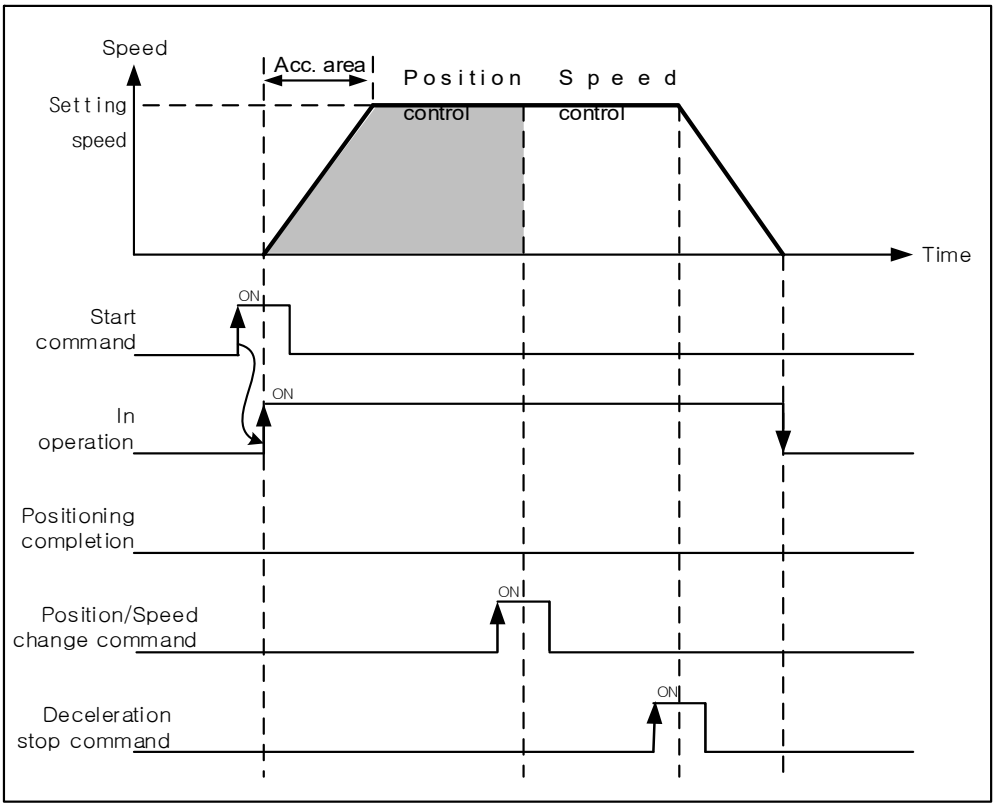
(a) When 00000 is turned on while the home is determined, position control starts according to the set value of direct start on the command axis (1 axis).
(b) In the example below, Enable M00000 is ON, position control operation is performed with the target position: 10000 and the target speed: 1000.
(c) Then, when M00001 is ON, the position/speed control switching is executed.
At this time, the converted target speed follows the target speed set by the existing XDST command.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above. After operating the position control by the XDST command, the position/speed control change occurs by the XPTV command and the speed is controlled at the speed set in the XDST.



(3) ST (Structure Text): Automatic program assignment
XPTV_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

(1) Position/speed switching command is not inputted before positioning to the Target position, it stops by deceleration and finishes the positioning.

(2) After position/speed switching, software high/low limit check depends on 'Soft high/low limit in speed control' of extended parameter.

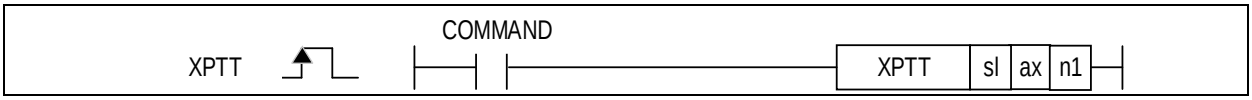
4.42.9 XPTT / Position/Torque Switch Control

If a command is executed during position control operation, it switches to torque control, and the torque value at this time follows the torque value set in the command.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XPTT	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Torque Command values (-32768 ~ 32767)	INT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to position/torque switch control to positioning module.

(2) This command executes the position/torque switch control with torque in the axis set to n1 on the axis designated as ax of the positioning module designated by sl (slot number of the positioning module).

(3) When position/torque switch control is executed while the position control is in operation, it switches to the torque control of the set torque value (n1) and maintains torque control until a stop such as deceleration stop occurs.

(4) With torque control, it can be stopped by "deceleration stop" or "skip operation" during operation, or the next operation can be continued.

(5) The range of torque value is -32768 ~ 32767 and the unit is [%]. The allowable range of torque value depends on the type of servo drive connected. Generally, the target torque value is limited to the maximum torque setting.

- Torque value is positive (+):Positioning operation in the forward direction (current position increasing direction)
- Torque value is negative (-):Positioning operation in the reverse direction (current position decreasing direction)

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

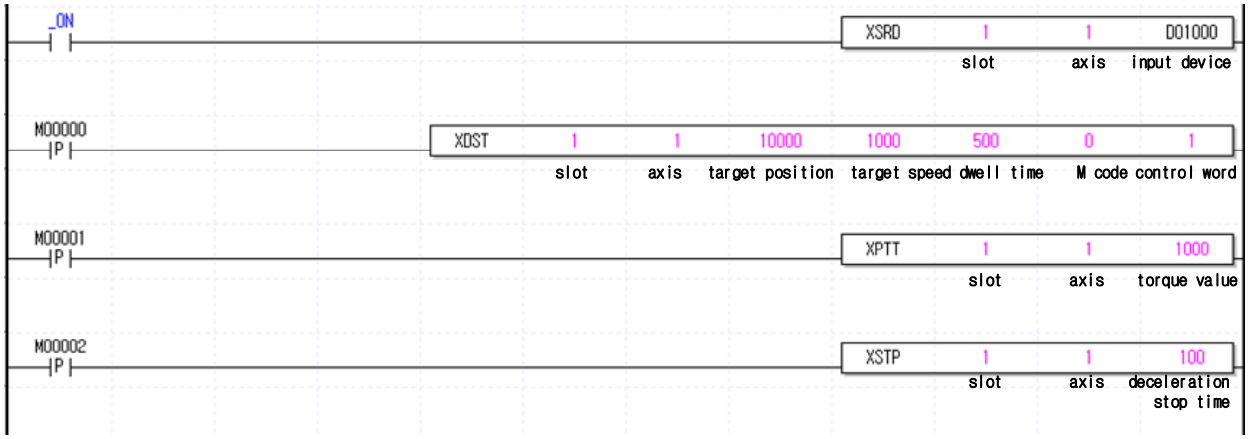
(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, position control starts according to the set value of direct start on the command axis (1 axis).

(b) In the example below, Enable M00000 is ON, position control operation is performed with the target position: 10000 and the target speed: 1000.

(c) Then, when M00001 is ON, the position/torque control switching is executed.
At this time, the converted torque value follows the torque value set in XPTT.

(d) When M00002 is ON, the torque control is decelerated and stopped by the deceleration stop command.

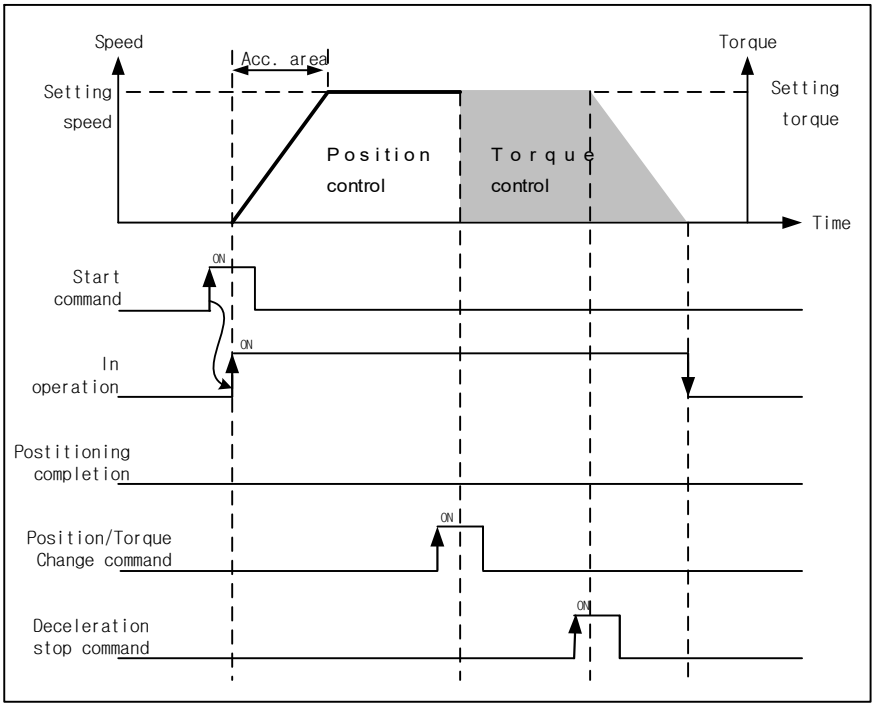


※

To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above. After operating the position control by the XDST command, the position/torque control change occurs by the XPTT command and the torque is controlled at the torque set in the XPST.
The torque control is stopped by the deceleration stop command.



(3) ST (Structure Text): Automatic program assignment

XPTT_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*INT*));

4) Caution

(1) The position/torque switching control command is valid only when the corresponding axis is in position control or inching operation.

(2) If the position/torque switching command is not input until the positioning is completed to the set target position, positioning is completed by deceleration stop.

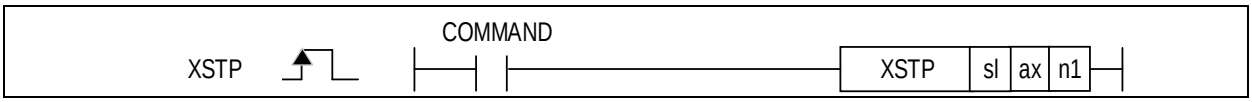
4.42.10 XSTP / Deceleration stop

The command is a command that stops decelerating for a set deceleration time by receiving a start.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSTP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	deceleration time (0 ~ 2,147,483,647 ms)	DWORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a deceleration stop command to the positioning module.

(2) The deceleration stop command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).

(3) he deceleration stop command has the same contents as the acceleration section, constant speed section and deceleration section.

(4) Deceleration time means the time required from deceleration start to stop and it is available to set from 0 ~ 2,147,483,647ms. But if setting as '0', it stops only by deceleration time set at the beginning of operation

(5) Deceleration time means the time required from the speed limit of basic parameter on operation axis to stop.

(6) If deceleration stop command is executed in speed sync., position sync. or CAM operation, it stops speed sync., position sync. or CAM operation depending on current operation control state.

(7) When stopping with deceleration stop command, positioning operation is not completed because the positioning operation is not completed to the set target position, and M code is not “On” in the After mode of the M code mode.

Then, when the indirect start command (step number = current step number) is executed in the stopped state,

- In positioning with absolute coordinates, the system operates with the remaining position value not output from the current operation step.
- In positioning with relative coordinates, the target position is operated for the set value.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

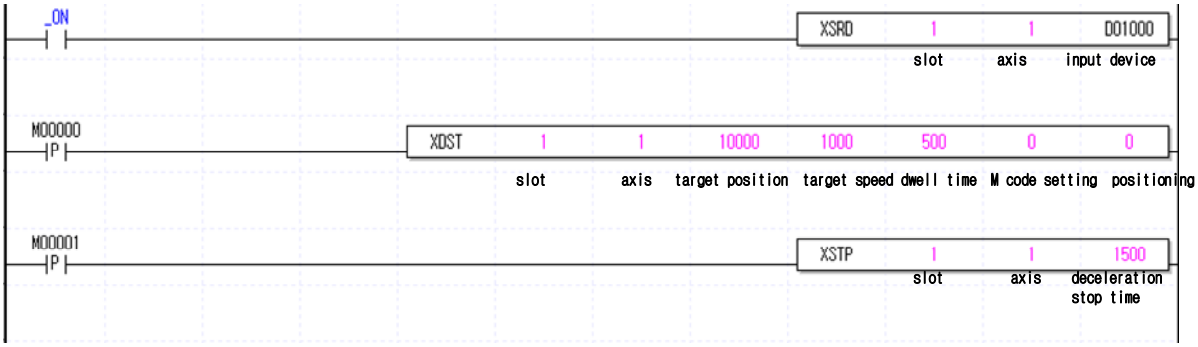
(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, position control starts according to the set value of direct start on the command axis (1 axis).

(b) Then, when M00001 is ON, the deceleration stop operation is executed with the set deceleration time.

※ Bit-specific contents of XDST setting control word (OP7) are as follows.

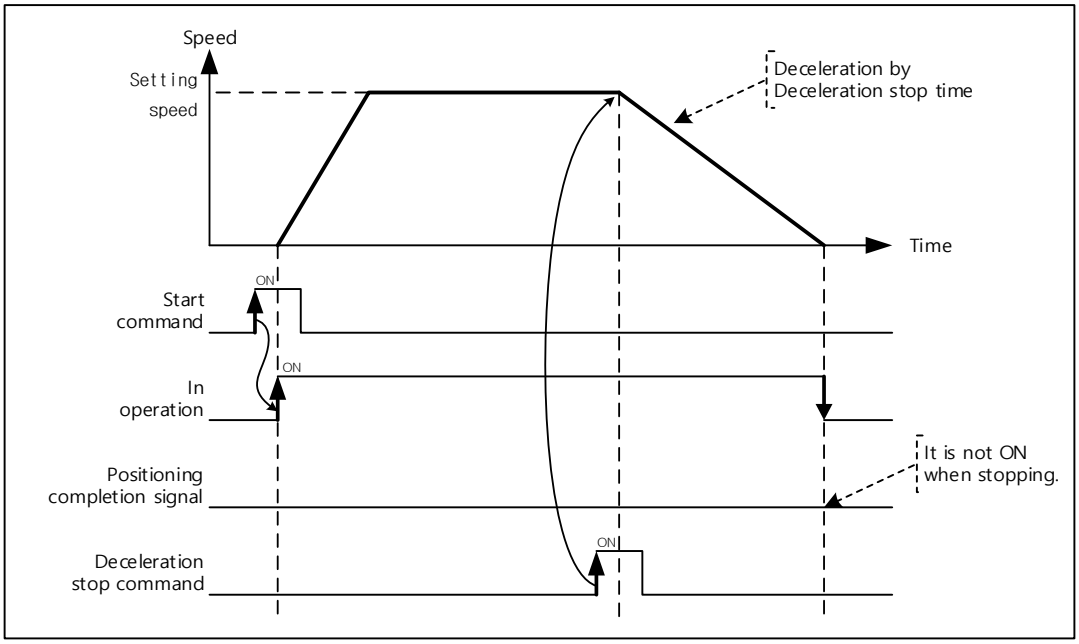
15 ~ 12	11 ~ 10	9 ~ 8	7 ~ 5	4	3 ~ 2	1 ~ 0
-	Deceleration time	Acceleration Time	-	0:Absolute 1:Relative	-	0:Position control 1:Speed control 2:Feed control



※

To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XSTP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*));
```

4) Caution

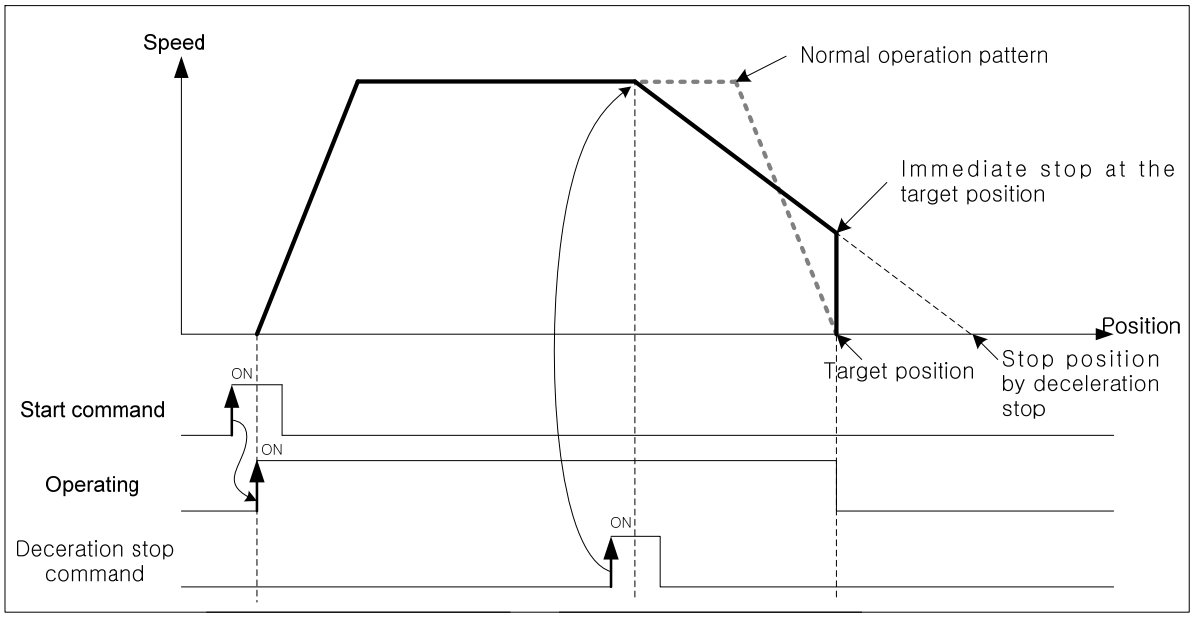
(1) If deceleration stop command is inputted while operate Jog, error (error code: 322) will be made. Use “Stop Jog” command for Jog operation stop.

(2) During Continuous Operation of Linear interpolation or circular interpolation, because the PLC does not check the direction of movement, does not deceleration stop even if the moving direction is changed.

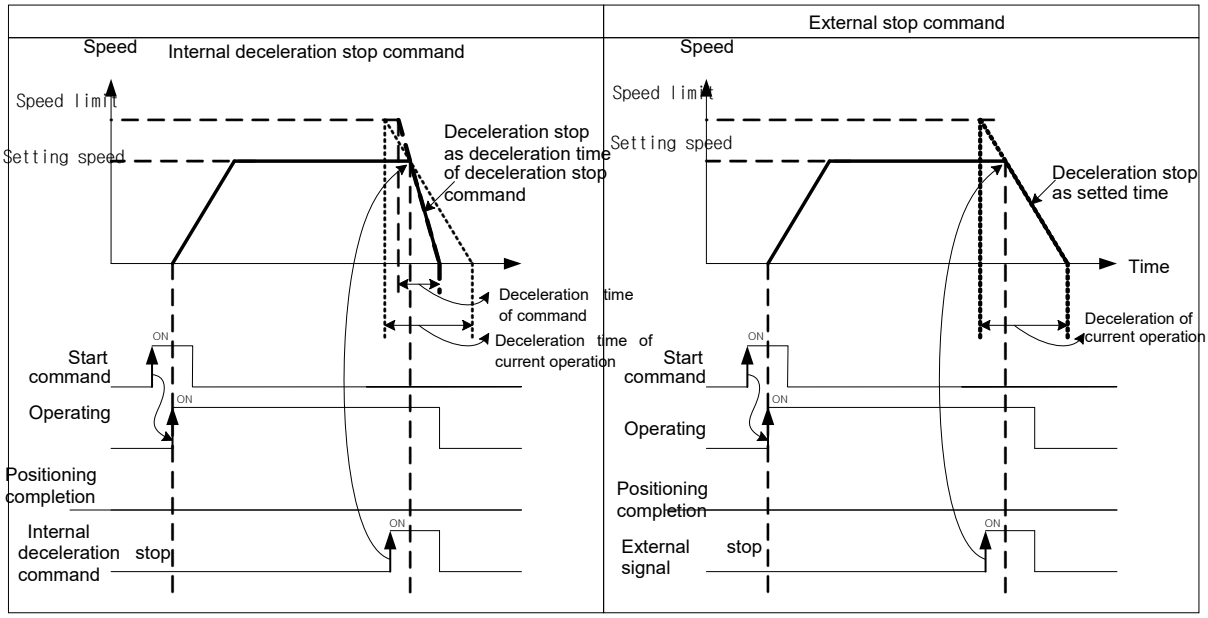
(3) If there is opposite direction of Target position set on operation data, it may cause damages to machine because of rapid direction changing.

➔ To avoid impact to the machine, do not set the operation method to "Continuous", but to "Keep".

When a deceleration stop command is input during position control operation, if the deceleration distance by the deceleration stop time is greater than the amount of movement to the target position, it immediately stops at the target position.



(6) When command internal deceleration stop. The value of deceleration time can bigger than set value of deceleration time by auxiliary data.



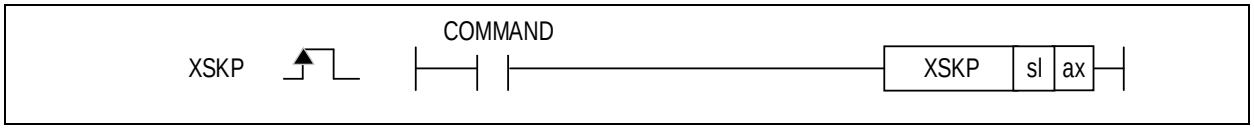
4.42.11 XSKP /Skip operation

This command ends the operation of the currently operating step and continues operation to the next step.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSKP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	deceleration time (0 ~ 2,147,483,647 ms)	DWORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command decelerates and stops the currently running operation step, and changes the operation data of the next operation step number to execute position

(2) SKIP operation command stops the operation and carries out the operation of next step after executing th e command other than Continuous operation command (XNMV).

(3) It can be used when the operation mode is End, Keep or Continuous operation and the operation pattern is in the acceleration, constant speed, and deceleration sections.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

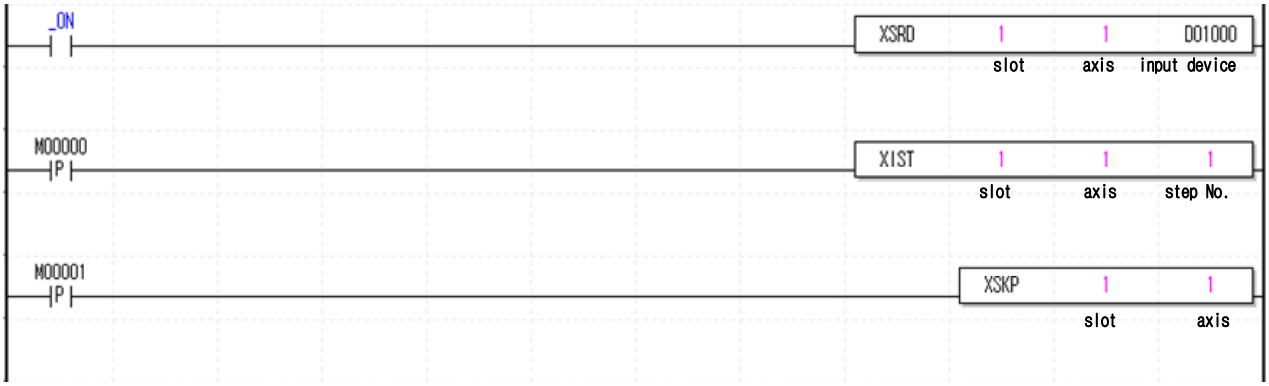
3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).
(b) Then, when M00001 is ON, the start of the step is deceleration stop, and the next step is executed.

※ XG-PM setting items

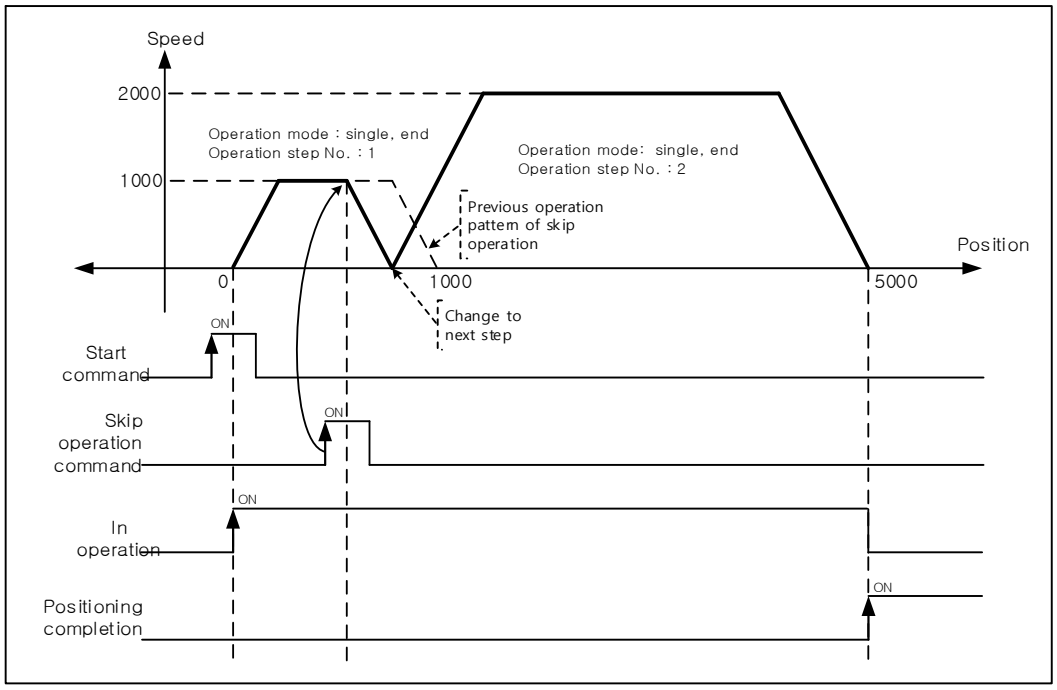
Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above. Skip operation command (XSKP) is executed for 1 axis in operation with absolute and single axis position control with XIST command.



(3) ST (Structure Text): Automatic program assignment

XSKP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

(1) If SKIP operation command is executed in the status that the operation data of next step is not yet set, Error 151 will occur.

(2) In the cases below, continuous operation is not executed and previous operation is being kept.

- Execute skip operation command on the sub axis of linear interpolation. (error code:332)
- Skip operation in linear interpolation operation must be executed on main axis.

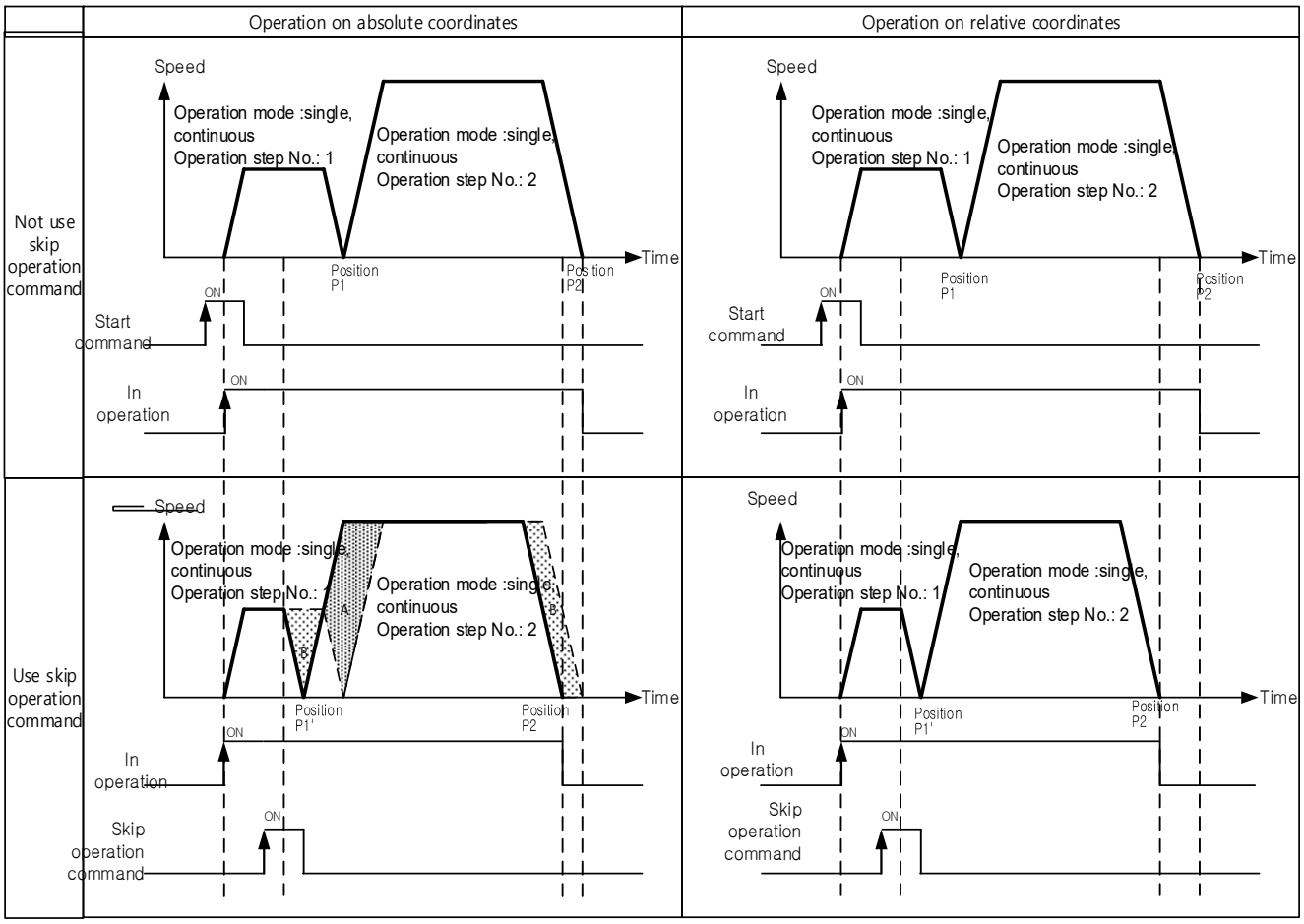
Execute skip operation command on the sub axis of synchronous operation. (error code:333)
- Execute skip operation command on the axis in Jog operation.(error code: 335)
- The current axis in operation is executed by direct start command. (error code : 336)
- Execute skip operation on the axis in Inching operation.(error code: 337)

Execute skip operation command on the sub axis of circular interpolation. (error code:338)
- Skip operation in circular interpolation operation must be executed on main axis.

(3) When set position data, there would be differences on skip operation command depending on absolute coordinates and relative coordinates,

■ The Target position of next operation step after skip operation command is executed on absolute coordinates is the same as the case did not execute skip operation. The current position of positioning completion is P2 by skip operation is P2.
(A area and B area both are same size)

When skip operation is executed on relative coordinates, the movement amount between current position and Target position is the real Target position. Therefore, the Target position is different from the one without continuous operation. The position determined by skip command is P1 + P2



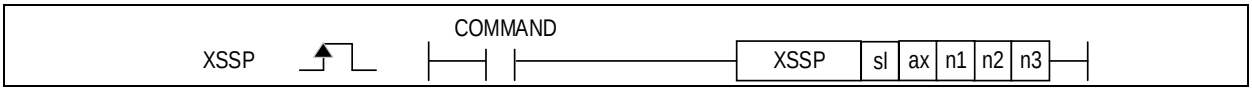
4.42.12 XSSP / Position Synchronization

This command starts positioning with the operation data of the step number set by the command axis (subordinate axis) when the current position of the main axis coincides with the position set in position synchronization.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSSP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Position value of main axis for position synchronization operation	DINT
n2	Step number of instruction axis to operate when Position Synchronization starts	WORD
n3	Main axis setting for Position Synchronization	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

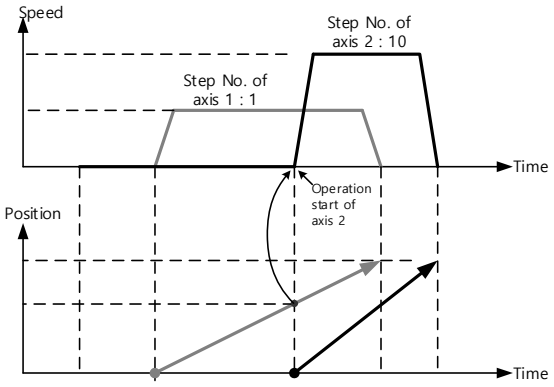
[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a Positioning synchronization command to the positioning module.

(2) The deceleration stop command is executed on the axis specified by ax of the positioning module specifie d by sl (slot number of the positioning module



(3) Position synchronization command can be executed only when the main axis is in honing status.

(4) The position synchronization command starts in synchronization with the subordinate axis according to the current position of the main axis.

(5) The position synchronization command must be executed on the subordinate axis.

(6) When the position synchronization command is executed, it is in the operating state and the actual operation starts the operation of the subordinate axis when the current position of the main axis matches the set position of the position synchronization.

(7) In case of cancellation after executing the SSP command at the subordinate axis, if you execute the stop command, the SSP command shall be released.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).

(b) Then, when M00001 is ON, the start of the step is deceleration stop, and the next step is executed.

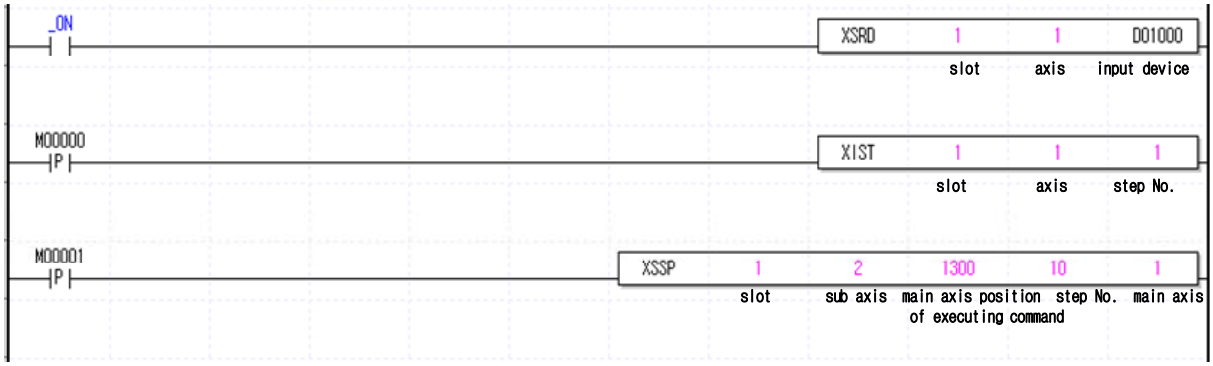
※ XG-PM setting items

▪ Main axis(axis1) operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Incremental, single-axis Position Control	Single,End	2000	1000	No.1	No.1	0	0

▪Operating data of sub-axis(axis2)

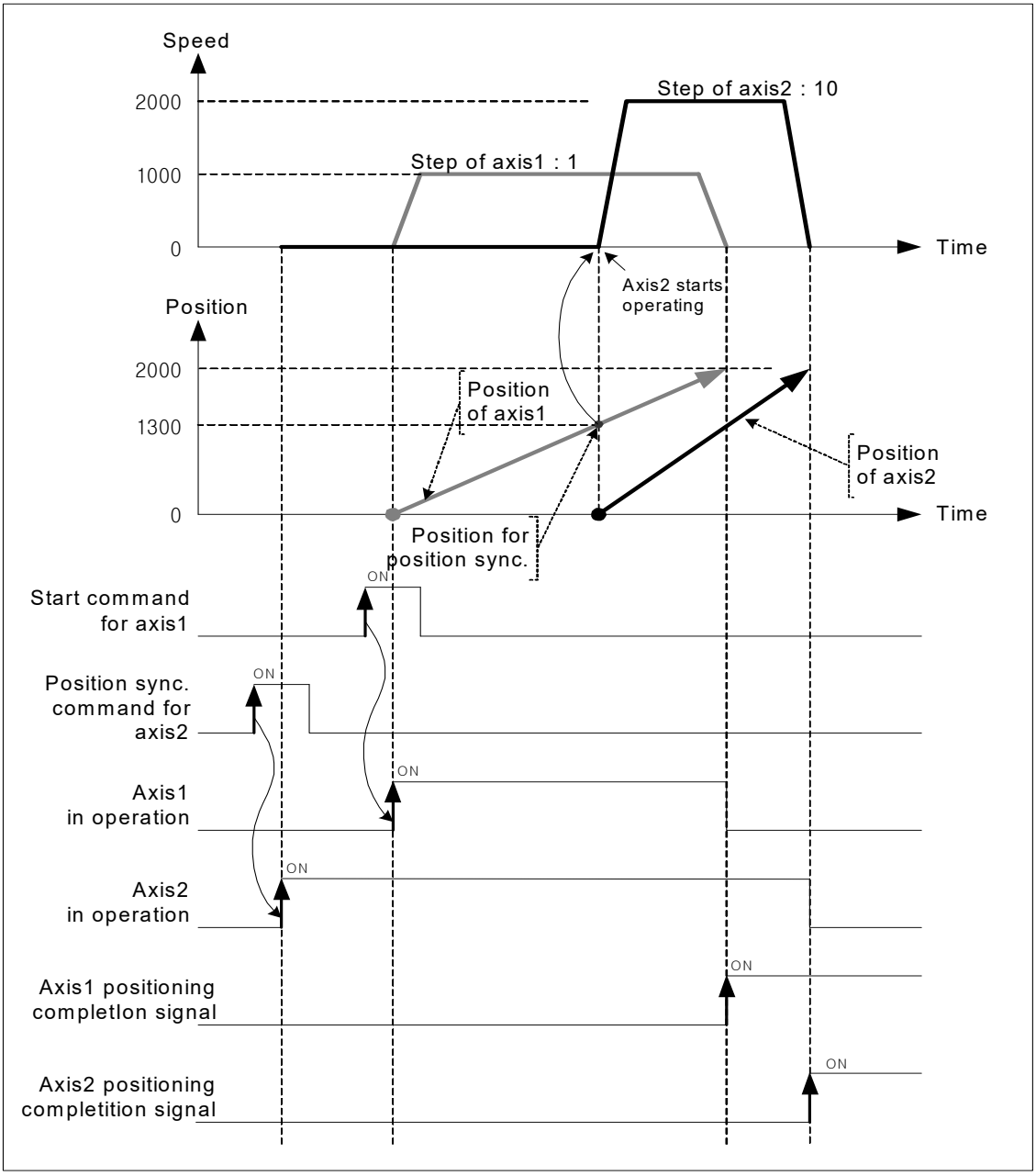
Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
10	Incremental, single-axis Position Control	Single,End	2000	2000	No.2	No.2	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.
Axis1 is main axis, axis2 is sub axis. The position of main axis for position sync. is 1300, execute position sync. with operation data no.10.



(3) ST (Structure Text): Automatic program assignment

XSSP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*), Num 3:=(*WORD*));

4) Caution

(1) Even though the current position of main axis and the setting value set on position sync. are not exactly same, if the current position of main axis is at between the position of main axis of previous scan and the current position of main axis, the sub axis will be executed with the positioning data of step no. set on operation step.

(2) Position sync. control can be executed in the case below.

- If position sync. command is executed in M code signal is On, error (code:343) arises. Make M code “OFF” with “M code release (XMOF)” command before use.
- If the current main axis is not the axis can be set on the current module or main axis and command axis are the same axis, error (code:355) arises. Set the main axis among one of the axis can be set on module.

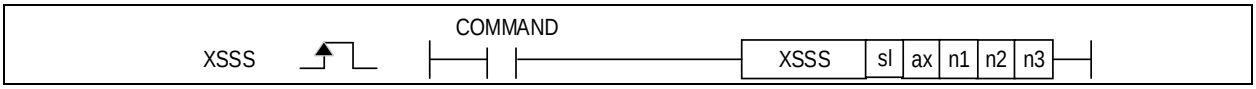
4.42.13 XSSS / Speed Synchronization

The speed synchronization command operates at the set speed synchronization ratio and the subordinate axis operates in the same way as the main axis operation pattern.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSSS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Subordinate axis to execute Speed synchronization : 1 ~ 8(Real axis)	WORD
n1	Main axis setting value of speed synchronization ratio : -32768~32767	INT
n2	Subordinate axis setting value of speed synchronization ratio : -32768~32767	INT
n3	Main axis to executes speed synchronization: 1~10(1~8: real axis, 9~10: encoder1~2)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax, n3) for the axis depends on the number of control axes and encoder channel supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The speed synchronization command operates at the set speed synchronization ratio and the subordinate axis operates in the same way as the main axis operation pattern. When the speed synchronization command is executed, the subordinate axis is in the status of speed synchronization operation, and when the stop command is executed on the subordinate axis, the status of the speed synchronization operation of the subordinate axis is released.

(2) Ratio of Speed sync. is calculated as follows.
Speed synchronization ratio = Subordinate axis setting value/main axis setting value

(3) The operation direction of the sub-axis is determined by the sign of the speed synchronization ratio. If it is positive, it operates in the direction of the main axis, and if it is negative, it operates in the opposite direction of the operation of the main axis. The speed synchronization ratio can be changed even when the subordinate axis is in speed synchronization operation.

2) Error

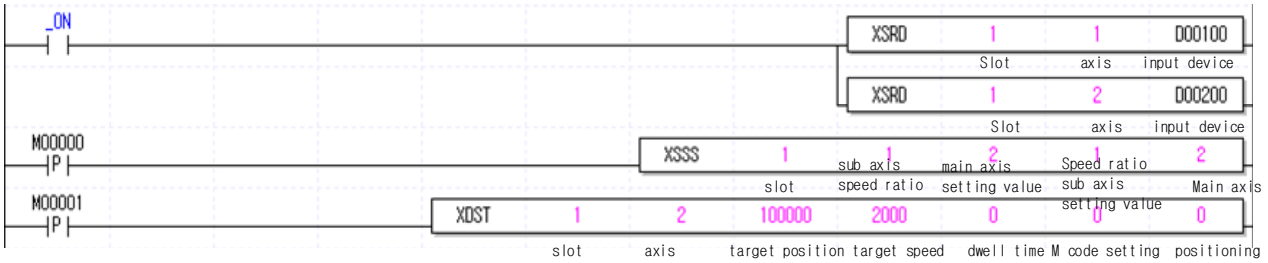
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

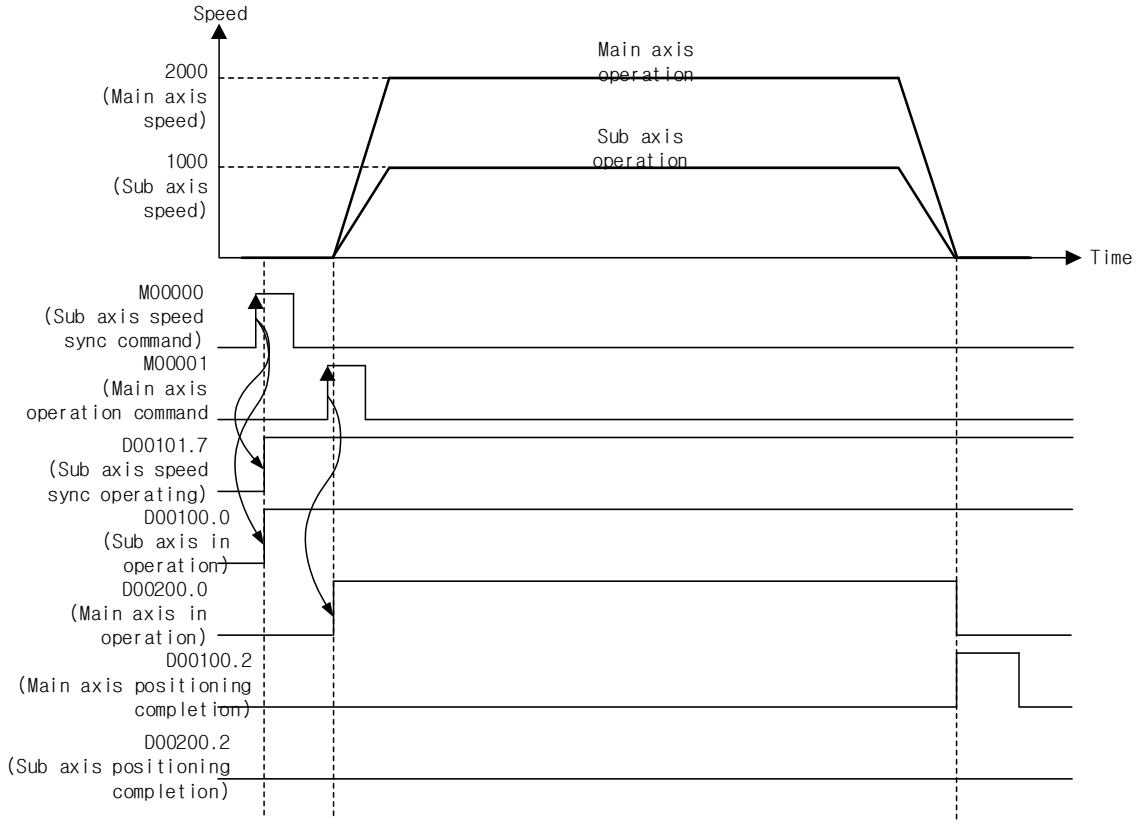
(a) When M00000 is On, the speed synchronization command is executed at 1 axis for the subordinate axis, 2 axes for the main axis, and 1/2 the speed synchronization ratio (2 for the main axis setting value and 1 for the sub axis setting value).

(b) When M00001 is On, the main axis (2 axes) moves to the set position (10000) at the set speed (2000). At this time, the axis (1 axis) is 1000, which is 1/2 the speed of the main axis (2 axes), and operates the same as the pattern in which the main axis (2 axes) moves.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment
XSSS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*INT*), Num2:=(*INT*), Num3:=(*WORD*));

4) Caution

※ In the case below, speed synchronization Operating indication is not executed due to an error.

(1) The axis where the M code signal is on cannot execute the speed synchronization command due to an error.(error code: 353) Before executing the speed synchronization command, execute the M code release (XMOF) command and change the M code to Off.

(2) If the main axis and sub axis are set the same,, (Code: 355) will occur.

(3) An error (error code: 357) occurs if the speed of the subordinate axis exceeds the speed limit by the speed synchronization ratio. If the subordinate axis exceeds the speed limit value during speed synchronous operation, deceleration stops with the basic parameter 'Dec. time of Emergent stop'.

(4) When changing the speed of the subordinate axis with the speed synchronization command, be careful as the difference between the speeds before and after the change may cause shock to the machine and machine.

(5) A speed synchronization command can be executed on the subordinate axis and an home return command can be executed on the main axis, but a speed synchronization command cannot be executed on the subordinate axis while the main axis is in the home return operation. However, when using LS Electric Servo (L7N/L7NH/L7NHF/PEGA series), the speed synchronization command can be executed on the subordinate axis even when the main axis is in the home return operation.

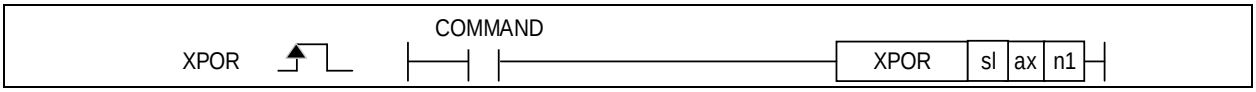
4.42.14 XPOR / Position Override

The position override command is used to change the target position during position control operation.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XPOR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Target position value to change (Absolute coordinate)	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If you want to change the target position during operation by positioning data, change the target position with the position override command.

(2) The position override command can be used in the Acceleration, Constant speed, and Deceleration sections of the operation pattern, and the available operation modes are End operation, Keep operation, and Continuous operation.

(3) It may be executed several times in operation.

2) Error

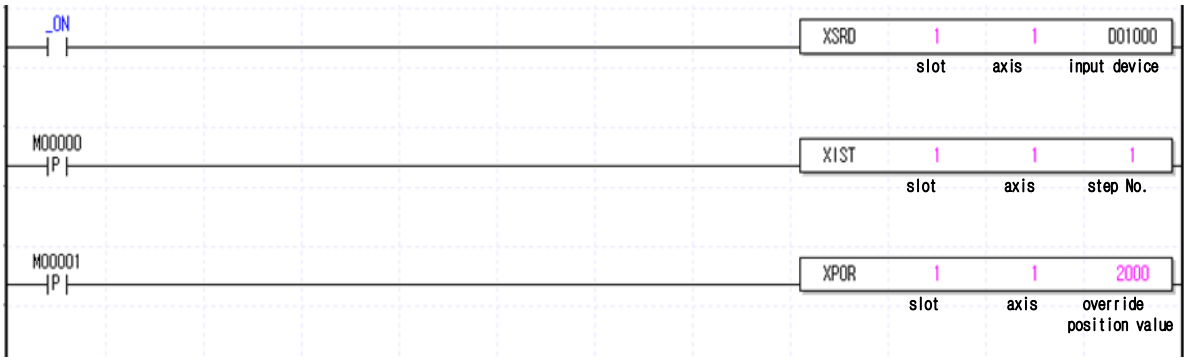
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).

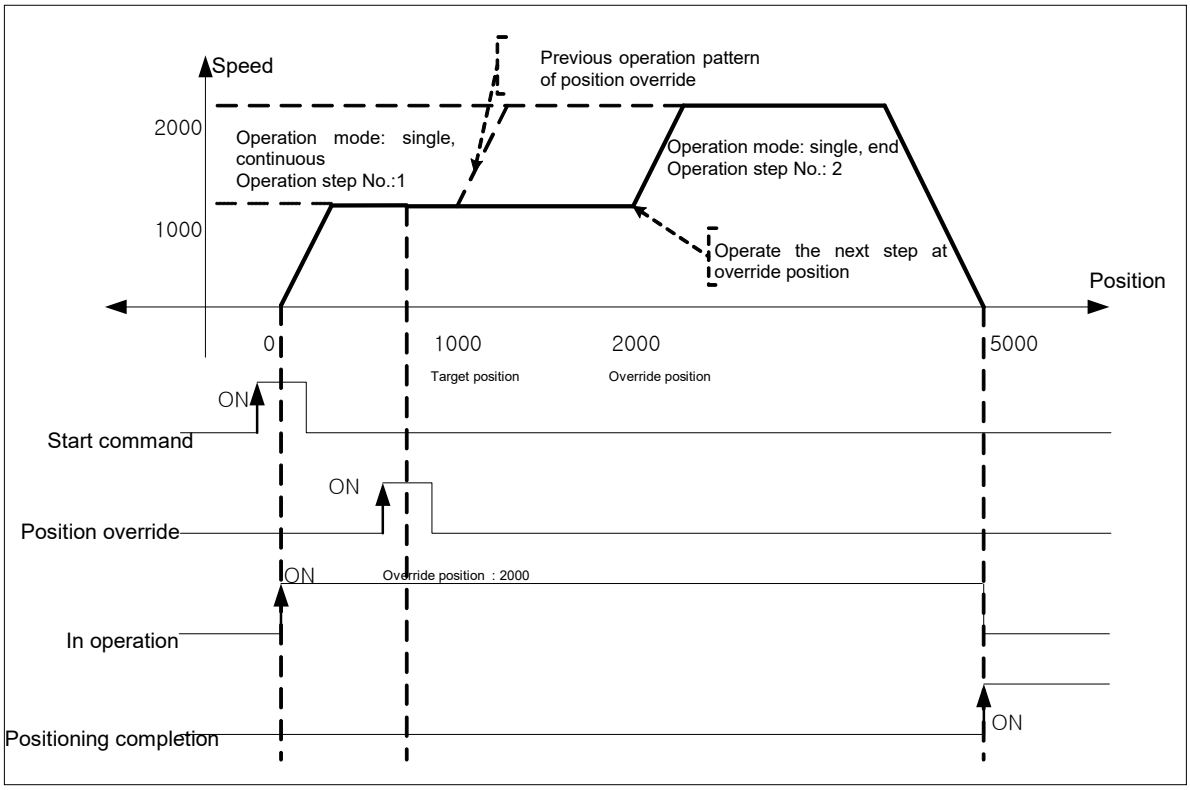
(b) Then, when M00001 is ON, position override is performed when the command axis position reaches the set value of 2000.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XPOR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*));
```

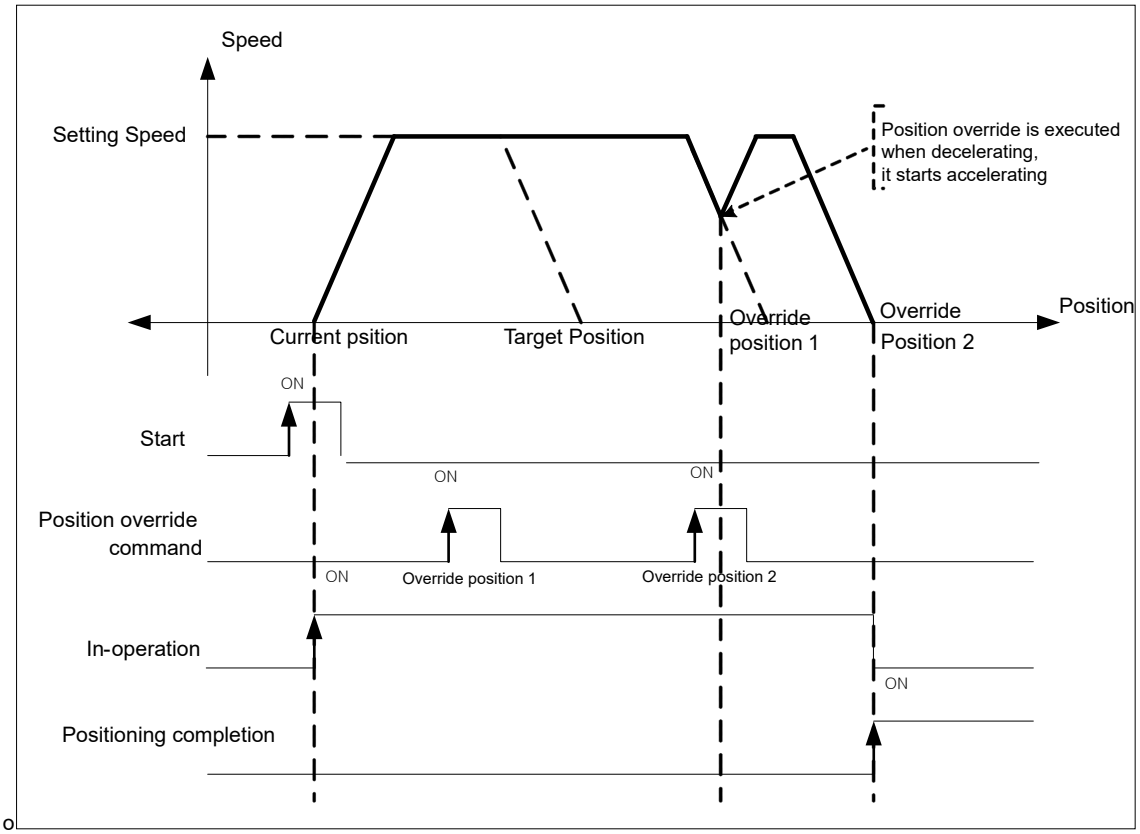
4) Caution

※ In the cases below, position override is not executed and previous operation is being kept.

(1) Execute position override command in dwell.(error code: 362)
(2) Current operation is not positioning control(single axis positioning, Inching operation). (error code:363)
(3) Execute position override command on the axis operating linear interpolation.(error code: 364)
(4) Execute position override command on the axis operating circular interpolation.(error code: 365)
(5) Execute continuous operation command on the sub axis of synchronous operation. (error code:366)

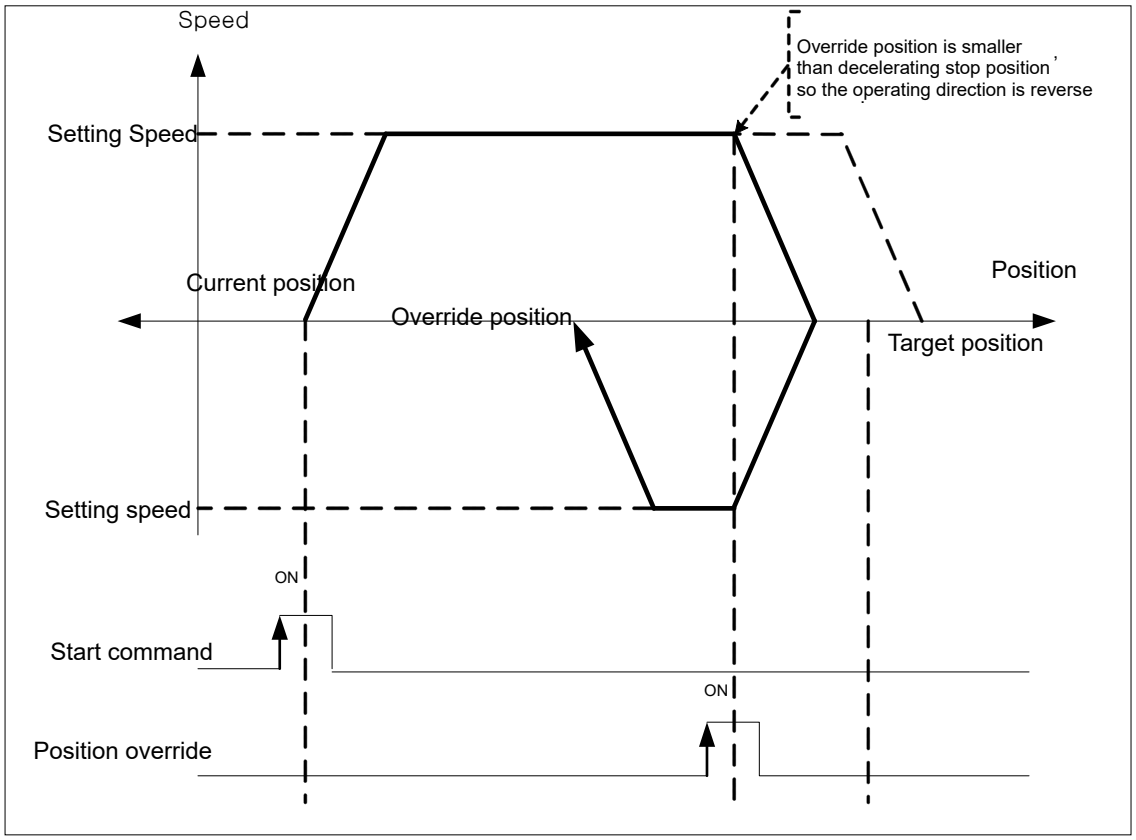
※ As the operation is different according to Position Override command during operation, cares should be taken in using.

a) When the position override position at the time of the position override command is greater than the stopped position by decelerating at the current speed.
- positioning in the current moving direction.



o

b) When the position override is smaller than the stopped position by decelerating at the current speed.
- After decelerating and stopping, operates in the opposite direction to position to the target position.



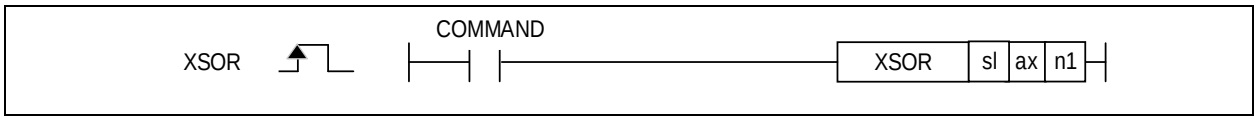
4.42.15 XSOR / Speed Override

The speed override command is used to change the target speed during speed control operation.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSOR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Goal speed value to change	DWORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When user wants to change the operation speed of positioning control, user may change the speed with speed override command.
(2) Speed override command is available in Acceleration and Constant speed section and available operation modes are End, Keep ,and Continuous.
(3) Speed override value (n1) will be set as '%' or 'Speed value' depending on the value which set on 'speed override' in common parameter.
(4) If unit of speed override value is %, the setting area is from 1 to 65,535, it means 0.01% ~ 655.35%.
(5) The unit of speed override value depends on unit of axis.
(6) It may be executed several times in operation.
(7) If you need to change the speed override direction, use the XSETOVR instruction, not the corresponding instruction.
IEC type XPM_SETOVR command is applied to real-time speed override even if the input contact is not turned off/on because the input condition is level type. XSETOVR instruction is not applicable because it is edge type of input condition.

※ Related parameter setting (common parameter)

Item	Setting value	Content
Speed override	0: % designate	Set the speed override setting value by %
	1:speed designate	Set the speed override setting value directly to the operating speed.

※ Auxiliary data of speed override command setting

Item	Setting value	Content
SPD	1 ~ 65535 (1=0.01%)	If speed override is “%”, set the speed by % (If it is 100%, set 10000)

	1 ~ Speed limit value	If speed override is “Exact number”, set the speed with exact number

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

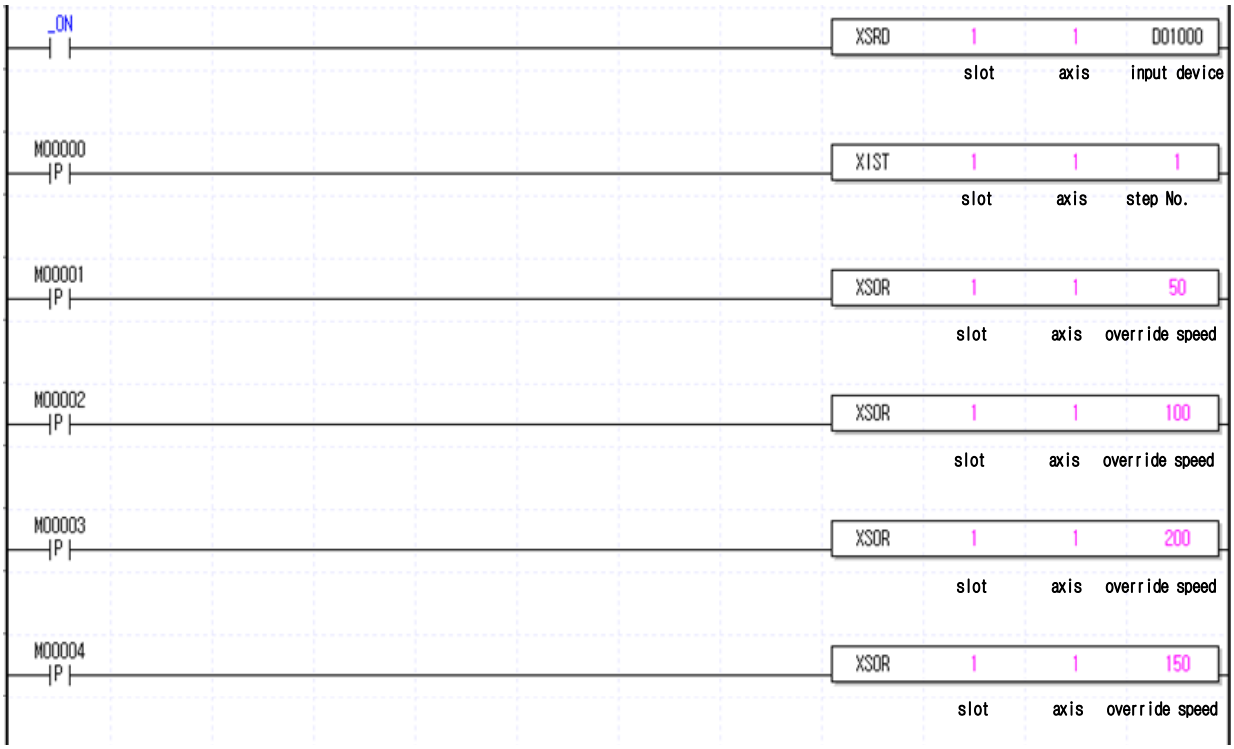
(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).
(b) After, if M00001 is ON,, the speed is overridden by applying 50% of the set speed (%) to the command axis (1 axis).
(c) If M00002 is ON during operation, the speed is overridden by applying 100% of the set speed (%) to the command axis (1 axis).
(d) If M00003 is ON during operation, the speed is overridden by applying 200% of the set speed (%) to the command axis (1 axis).
(e) If M00004 is ON during operation, the speed is overridden by applying 150% of the set speed (%) to the command axis (1 axis).

※ Related parameter setting (common parameter)

Item	Setting value	Content
Speed override	**0: % designate**	**Set the speed override setting value by %**
	1:speed designate	Set the speed override setting value directly to the operating speed.

※ XG-PM setting items(Axis operation data to be used for indirect start XIST)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	2000	No.1	No.1	0	0

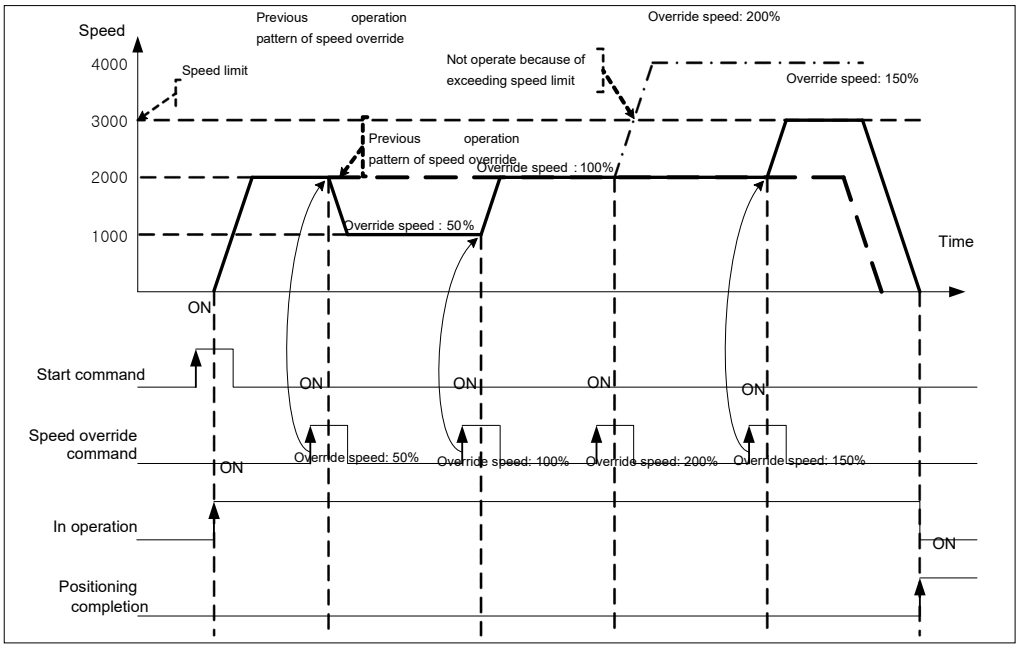


※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.

(3) ST (Structure Text): Automatic program assignment.



XSOR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*));

4) Caution

※ In the cases below, speed override is not executed and previous operation is being kept.

(1) The value of speed override exceeds speed limit of basic parameter. (error code:372)
- The speed value of speed override must be below speed limit.
- Override speed of linear interpolation for each axis need to be below speed limit.

(2) Execute speed override command on the subordinate axis of linear interpolation.(error code: 373)
- In linear interpolation, speed override must be executed on main axis.

(3) Execute speed override command on the subordinate axis of circular interpolation.(error code: 374)
- In circular interpolation, speed override must be executed on main axis.

(4) Execute speed override command on the subordinate axis of synchronous operation(error code: 375).

(5) Execute speed override command in deceleration area.(error code: 377)

(6) In the case that acc./dec. pattern of extended parameter is 'S-curve operation.(error code: 378)

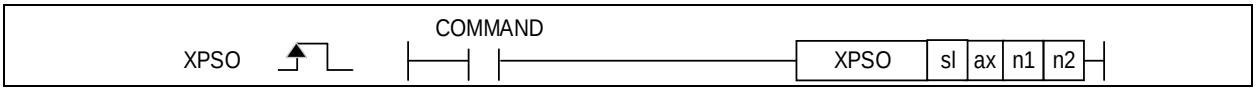
4.42.16 XPSO / Positioning speed Override

This command operates by changing the target speed when reaching the designated position during speed control operation.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XPSO	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Position value to execute speed change	DINT
n2	Goal speed value to change	DWORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Positioning speed override command is available in Acceleration and Constant speed section and available operation modes are End, Keep ,and Continuous.

(2) Positioning speed override command is available in Acceleration and Constant speed section and available operation modes are End, Keep ,and Continuous.

(3) User may set speed override value as '%setting' or 'speed setting' on [Speed override] of common parameter.

(4) User may select that consider the designated position value on 「position specified speed override coordinate」 of extended parameter as an absolute position or a relative position.

※ Related parameter setting (common parameter)

Item	Setting value	Content
Speed override	0: % designate	Set the speed override setting value by %
	1:speed designate	Set the speed override setting value directly to the operating speed.

※ Setting related parameter (extended parameter)

Item	Setting value	Content
Position specified speed Override coordinates	0 : Absolute	Speed override is executed in the designated absolute position
	1 : Relative	The current operation is performed at the position incremented by the value set at the starting position.

※ Auxiliary data setting of positioning speed override command

Item	Setting value	Content
SPD	1 ~ 65535 (1=0.01%)	If speed override is “%”, set the speed by % (If it is 100%, set 10000)
	1 ~ Speed limit value	If speed override is “Exact number”, set the speed with exact number

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

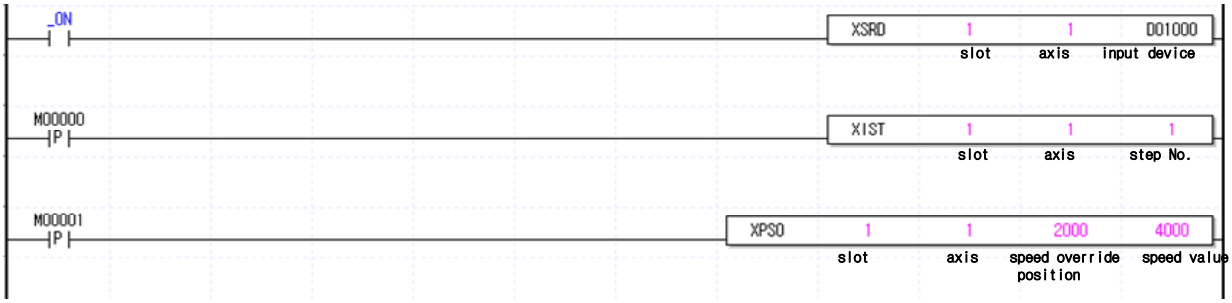
(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).
(b) Thereafter, when M00001 is ON, when the command axis (1 axis) reaches the position specified speed override value (n1): 2000, the speed value 4000 is applied to override the speed.

※ Related parameter setting (common parameter)

Item	Setting value	Content
Speed override	0: % designate	Set the speed override setting value by %
	1:speed designate	**Set the speed override setting value directly to the operating speed.**

※ XG-PM setting items(Axis operation data to be used for indirect start XIST)

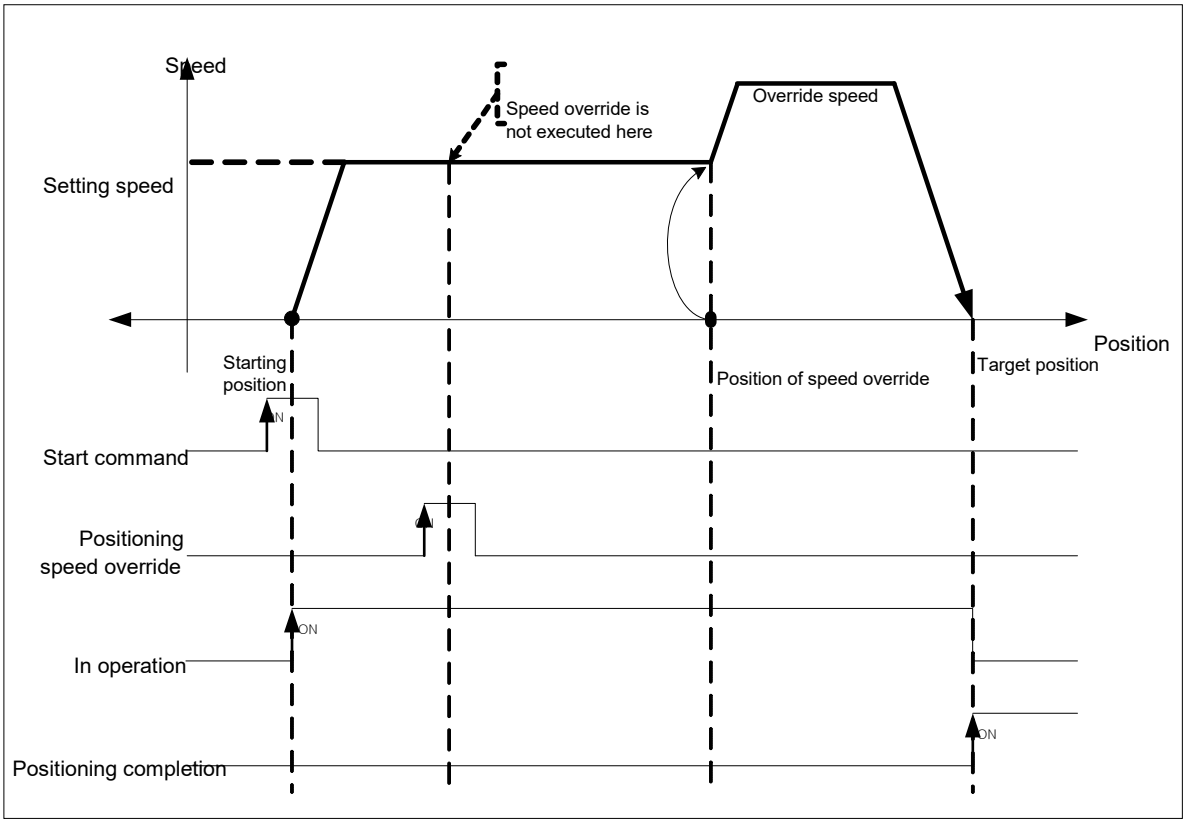
Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XPSO_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*DWORD*) );
```

4) Caution

※ While the current position is not exactly same as the value set on speed override, if the position of speed override is at between previous scan and current scan, speed override is executed at the speed set.

※ In the cases below, positioning speed override is not executed and previous operation is being kept.

(1) Current operation is not positioning control(single axis positioning, Inching operation). (error code:382)

(2) The value of speed override exceeds speed limit of basic parameter. (error code:383). The speed value of speed override must be below speed limit.
Override speed of linear interpolation for each axis need to be below speed limit.

(3) Execute speed override command on the subordinate axis of linear interpolation.(error code: 384). In linear interpolation, positioning speed override must be executed on main axis.

(4) Execute speed override command on the subordinate axis of circular interpolation.(error code: 385). In circular interpolation, positioning speed override must be executed on main axis.

(5) Execute speed override command on the subordinate axis of synchronous operation.(error code: 386)

(6) In the case that acc./dec. pattern of extended parameter is 'S-curve operation.(error code: 389)

(7) If execute positioning speed override in dec. area., although error does not occurred but speed override is not executed.
However, if it is not in the deceleration section and executes the positioning speed override command, and it is in the deceleration when it tries to override the speed at the specified position, an error (error code: 377) occurs.

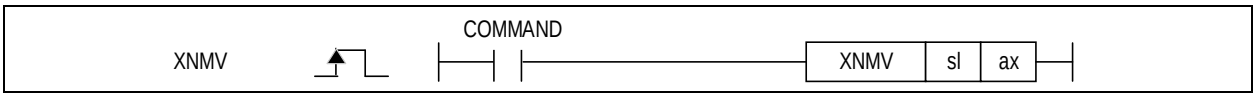
4.42.17 XNMV / Continuous Operation

Execute positioning control changing the current operation step no. to the next one.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XNMV	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If continuous operation command is executed, the step No. is changed from the step in current operation to the next step No. and operates positioning operation to the speed and the target position of the next step. Connection with the next step is executed by continuous operation pattern.

(2) Continuous operation command changes the only current operation pattern in operation, not changes the operation data.

(3) It can be used when the operation mode is End, Keep or Continuous operation and the operation pattern is in the acceleration, constant speed, and deceleration sections.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

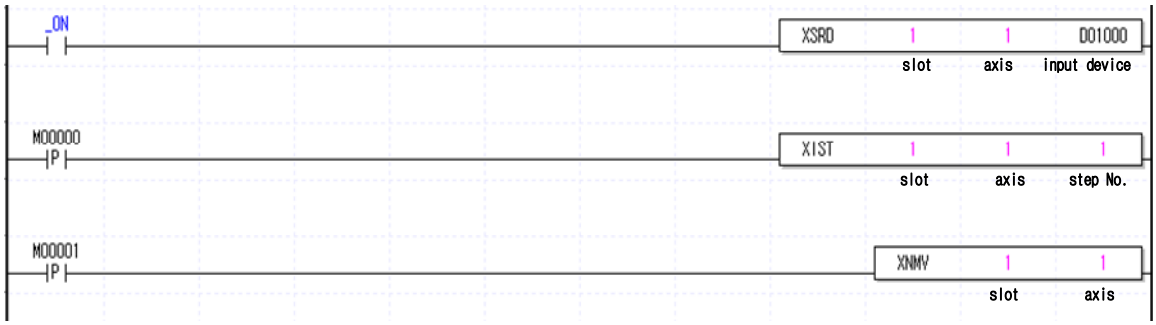
(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).

(b) Then, when M00001 is ON, the command axis (Axis #1) executes the next start step 2 from the current start step 1 continuously without deceleration stop.

※ XG-PM setting items(Axis operation data to be used for indirect start XIST)

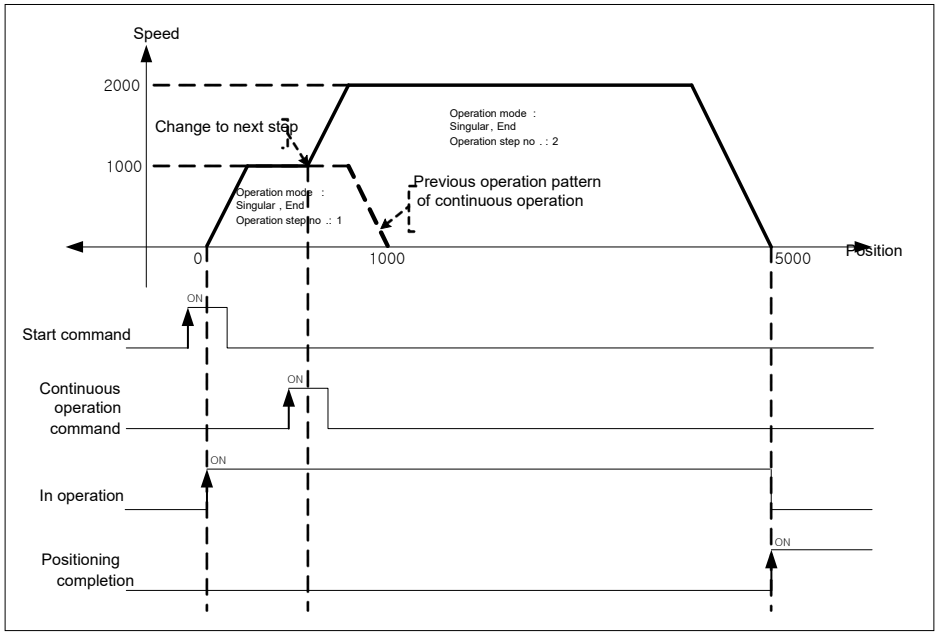
Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.
(Only the current operation pattern of the currently executing step is changed, but the operation data is not changed.)



(3) ST (Structure Text): Automatic program assignment

```
XNMV_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

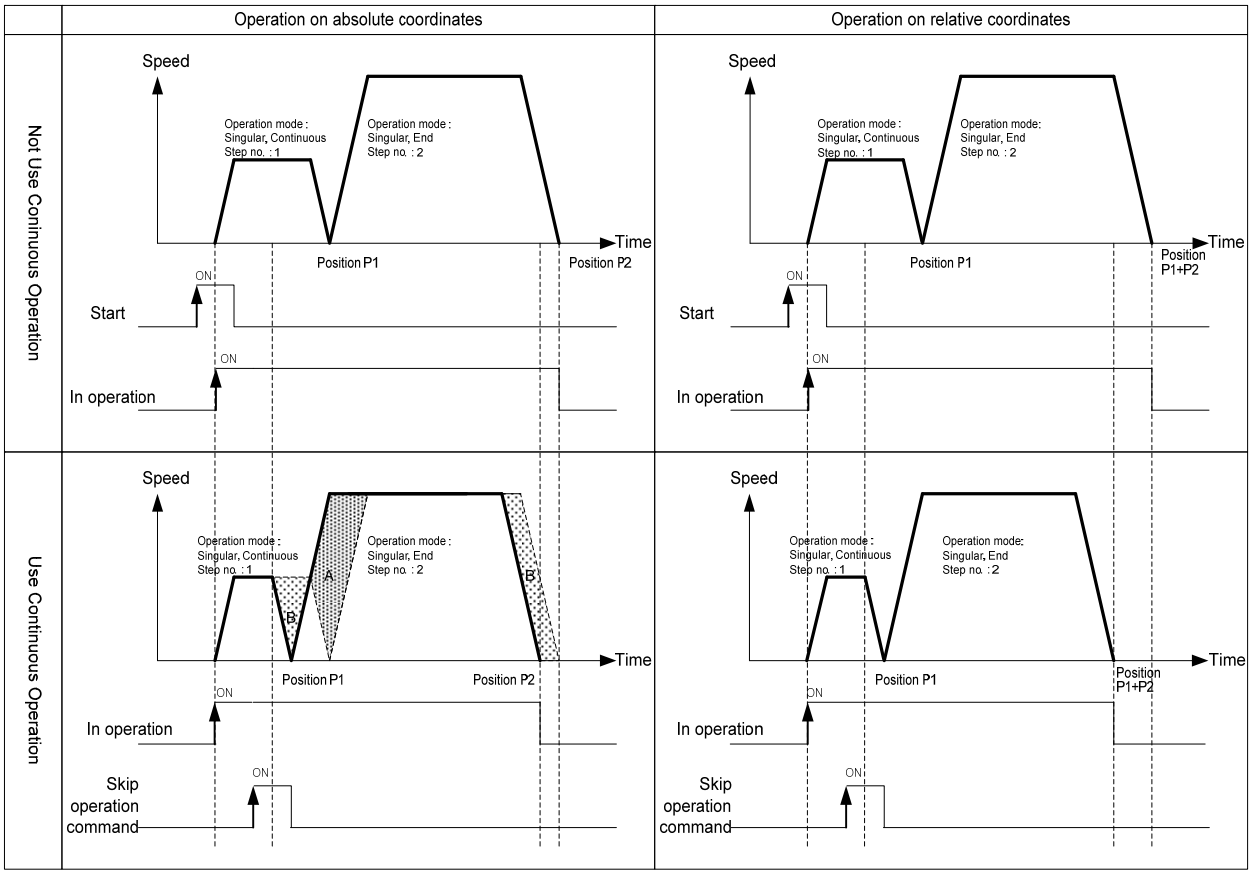
4) Caution

※ In the cases below, continuous operation is not executed and previous operation is being kept.

(1) In the case that acc./dec. pattern of extended parameter is 'S-curve operation.(error code: 390)
(2) Current status is dwelling(error code: 392)
(3) The current control is not single axis position control or linear interpolation. (error code : 393)
(4) Speed data value of operation step to be executed next is 0 or exceeds the speed limit. (error code : 394)
(5) Execute continuous operation command on the sub axis of linear Interpolation. (error code:395).User has to execute continuous operation command on main axis in linear interpolation.
(6) Execute continuous operation command on the axis of circular interpolation. (error code:397)
(7) Execute continuous operation command on the axis of circular interpolation. (error code:397)
(8) Execute continuous operation command on the sub axis of synchronous operation. (error code:397)
(9) The current axis in operation is executed by direct start command. (error code : 400)

※ There are differences of operation depending on between absolute coordinates and relative coordinates.

(1) Since the target position of the continuous operation command in absolute coordinates is the same, the target position after executing the continuous operation command is the same as when the continuous operation command is not executed.
The current position of positioning completion is P2 by continuous operation.
(A area and B area both are same size)
(2) When continuous operation is executed on relative coordinates, the movement amount between current position and Target position is the real Target position. Therefore, the Target position is different from the one without continuous operation. The position positioned by continuous operation is P1 + P2.



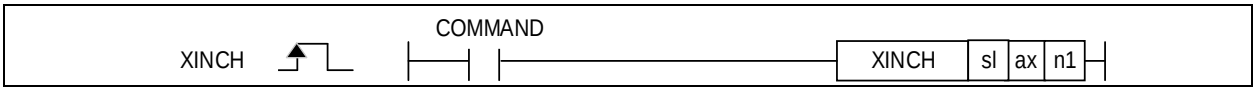
4.42.18 XINCH / Inching Operation

Manual operation is executed as much as the target movement amount set at the inching speed set in the manual operation parameter.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XINCH	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Position value to move for inching operation (–2147483648 ~ 2147483647 pulse)	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is a kind of manual operation and executing positioning at the speed already set on manual operation parameter as much as the amount of movement already set on the data of inching operation command.Position control is executes to the target position.

(2) It executes the relative coordinate operation by inching operation speed set in manual operation parameter as much as position value (n1).

(3) A simple comparison with jog start as one of manual operation, While the operation by ON/OFF of Jog signal is difficult in moving to the correct position as the operation starts and stops according to the command, the inching command enables to set the desired transfer amount easily and reach the goal point.

(4) Thus, it is available to reach the correct target position by moving fast near the working position by Jog command and operating the detail movement by inching command.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

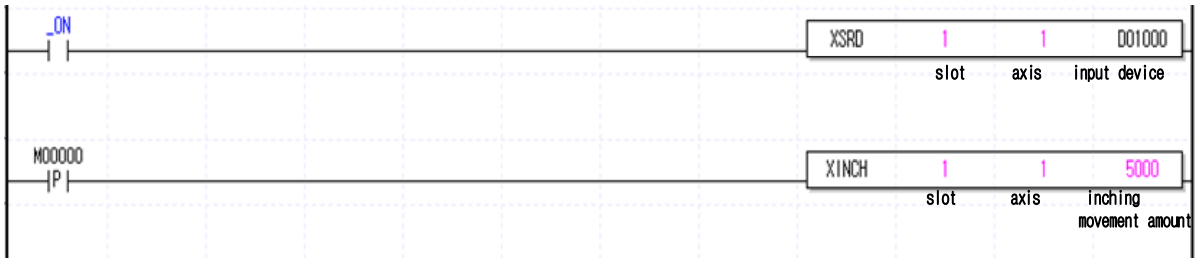
(a) When M00000 is turned on regardless of the homing, it accelerates to the jog acceleration time set as the manual operation parameter and reaches the preset inching speed in the manual operation parameter.

(b) This is an example in which the positioning is completed after the jog deceleration time is applied and the amount of inching movement set in the instruction is moved.

(c) This has the effect of manual operation as much as the amount of movement that is more precise when executing manual jog operation.

※ XG- PM Related parameter setting (Manual operation parameter)

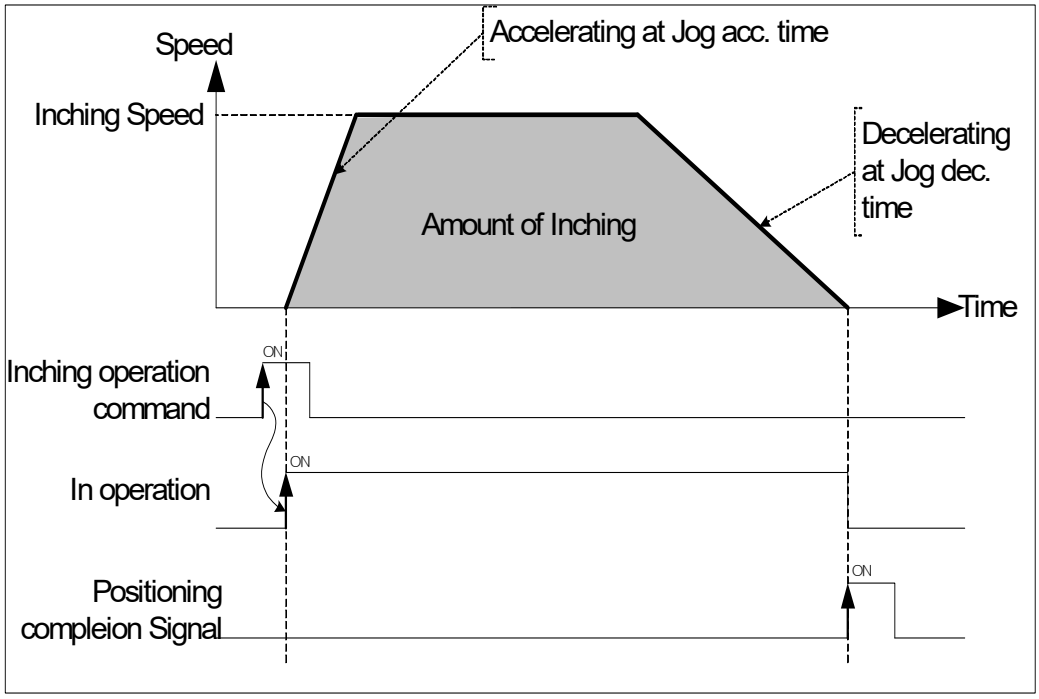
Item	Setting value	Content
JOG acceleration speed	0 ~ 2147483647	Set the accelerating time for acceleration of Inching operation
Jog dec. time	0 ~ 2147483647	Set the decelerating time for deceleration of Inching operation
Inching Speed	1 ~ Speed limit value	Set the speed of Inching operation



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XINCH_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*));
```

4) Caution

(1) The direction of movement is determined by the sign of the inching amount set as auxiliary data.
- The amount of inching movement is positive (+): Positioning operation in forward direction
- The amount of inching movement is negative (-): Positioning operation in in reverse direction

(2) Acc./Dec process and Inching speed
- Use Jog acc./dec. time of manual operation as acc./dec. time of Inching operation.
- Set Jog acc./dec. time on 'Jog acc./dec. time' of manual operation parameter setting of XG-PM.
- The inching speed is set in the inching speed among the manual operation parameter setting items of XG-PM.
- If inching speed is set out of the setting range, error will occur and the operation does not work.

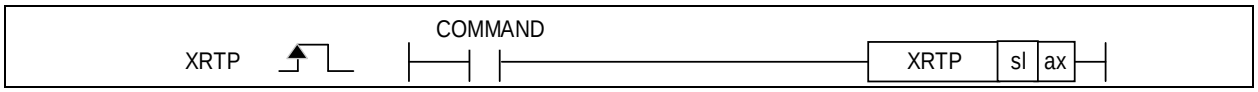
4.42.19 XRTP / Manual operation previous position return

This function is used to return to the position where the positioning before manual operation is completed after moving to any position by manual operation (jog operation, inching operation).

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XRTP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If the current position is changed as external axis speed sync. operation, inching operation, Jog operation after completing the positioning, it returns to the previous position of manual operation.
(2) If manual operation is not executed, the position return command before manual operation is ignored.
(3) Direction of moving depends on the current position and the previous position of manual operation.
- Starting position < The previous position of manual operation : Forward direction
- Starting position > The previous position of manual operation : Reverse direction

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

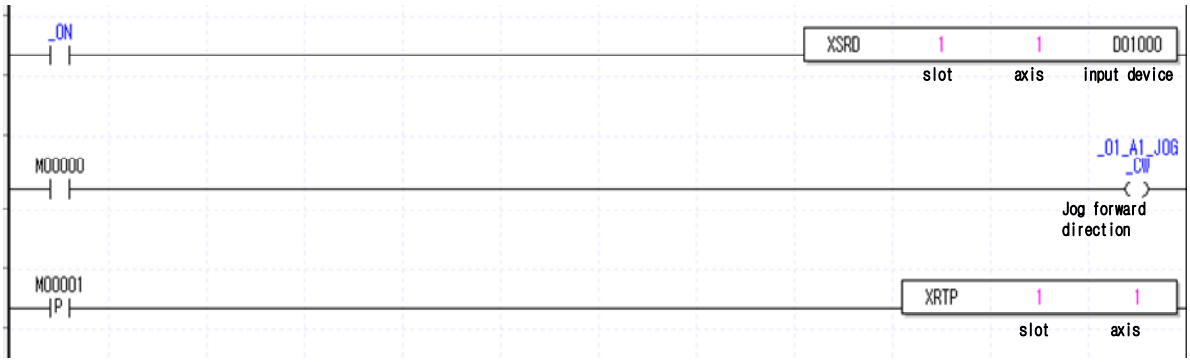
(1) LD: Ladder Diagram

(a) Regardless of whether the homing, forward jog start is performed while the jog start (manual operation) command M00000 is on. (Jog high speed)

(b) Then, when manual operation previous position return command M00001 is on, the positioning is completed by returning to the jog reverse low speed as much as the distance traveled while M0 is on.

※ XG- PM Related parameter setting (Manual operation parameter)

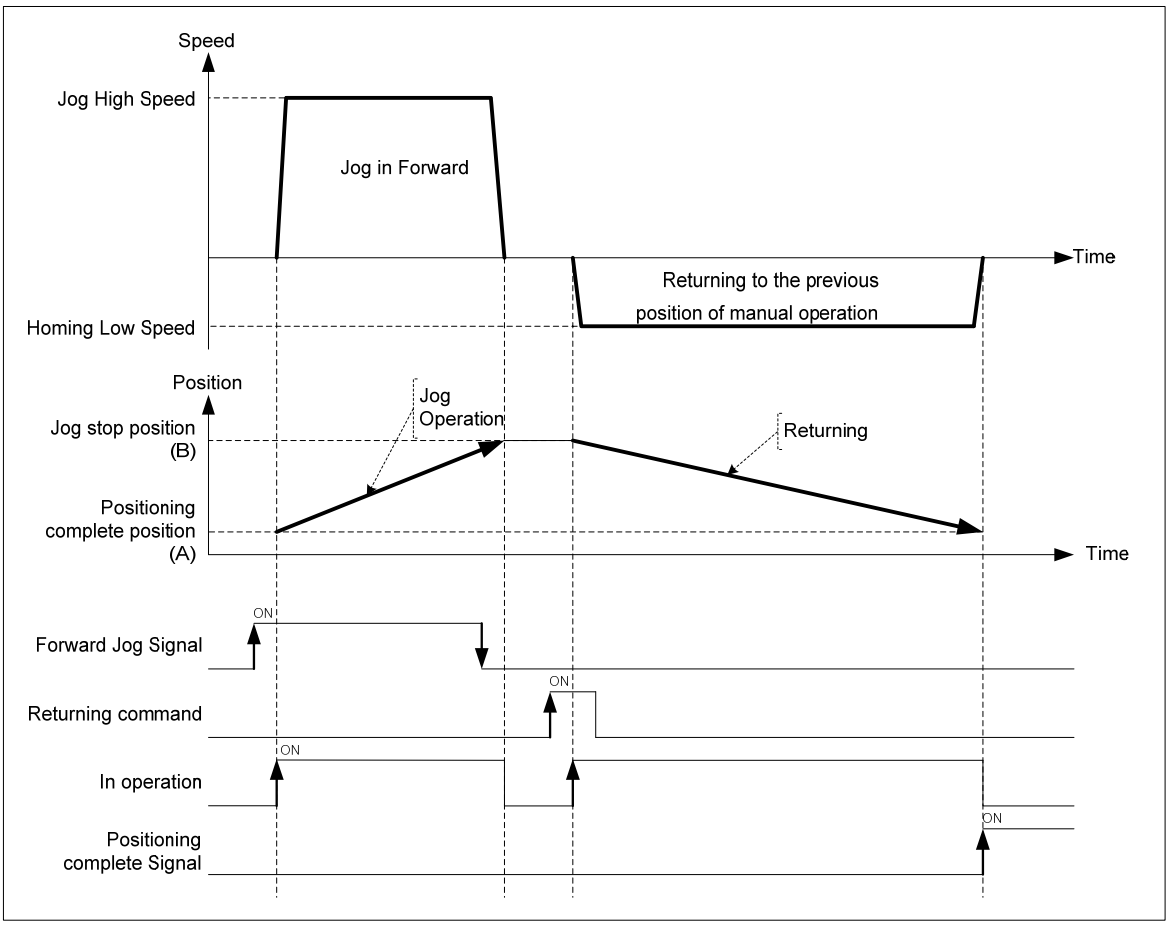
Item	Setting value	Content
Jog low speed	1 ~ Speed limit value	Set the position return operation speed before manual operation.
JOG acceleration speed	0 ~ 2147483647	Set the acceleration time to be used when acceleratingthe po sition return operation before manual operation..
Jog dec. time	0 ~ 2147483647	Set the deceleration time to be used when decelerating the manual operation previous position return operation.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XRTP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ Contents related to acceleration/deceleration processing and position return speed before manual operation

(1) Acc./Dec. time of manual operation previous position return is used for the jog acceleration/deceleration time of manual operation parameter.

(2) Among the manual operation parameter setting items of XG-PM, set the acceleration and deceleration time in the jog acceleration/deceleration time.

(3) The speed of manual operation previous position return uses jog low speed among manual operation parameter setting items of XG-PM.

(4) The manual operation previous position return speed is set out of the setting range, error will occur and the operation does not work.

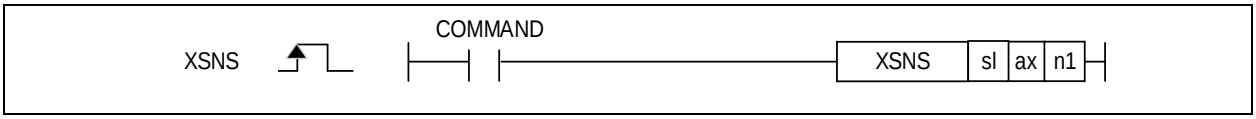
4.42.20 XSNS / Start Step Number Change

This command is for changing the current step no. when executing indirect start command

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSNS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Step number setting for next operation	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a start step change command to the positioning module.

(2) Execute the operation step number change command to change the next operation step to n1 on the axis designated by ax of the positioning module specified by sl (slot number of the positioning module).

(3) When operating with the step number set to 0 in the indirect start (XIST) command, the current operation step number is executed. The step number to be executed can be changed by the operation step number change command.

(4) This command may be only executed in stop motion or error arises.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).(Current step1)

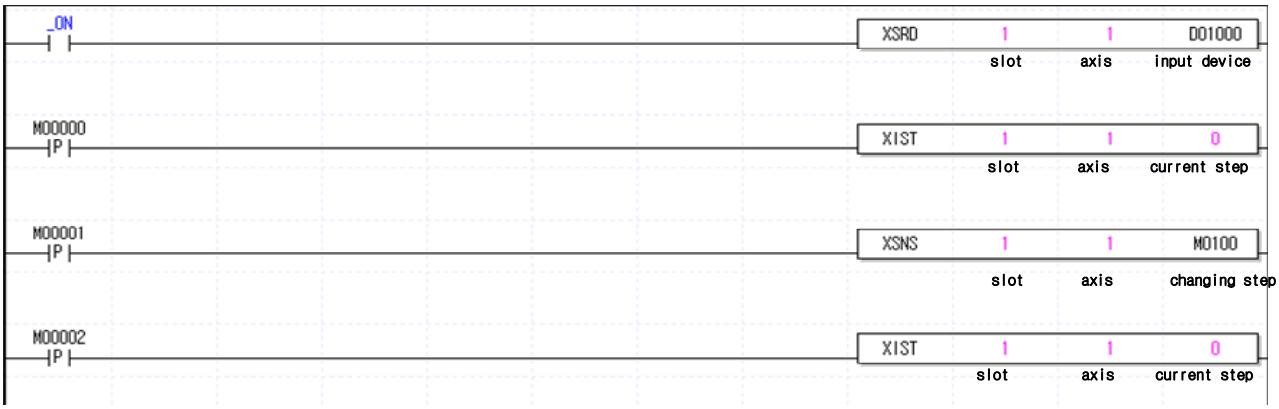
(b) The current step (step 1) indirect start is completed, and the operation state is stopped.

(c) If M00001 is ON in the stop state, the current step is changed to the value set in M0100.(Current step n)

(d) Then, when M00002 is On, indirect start is executed on the command axis (1 axis). (current step n))

※ XG-PM setting items(Axis operation data to be used for indirect start XIST)

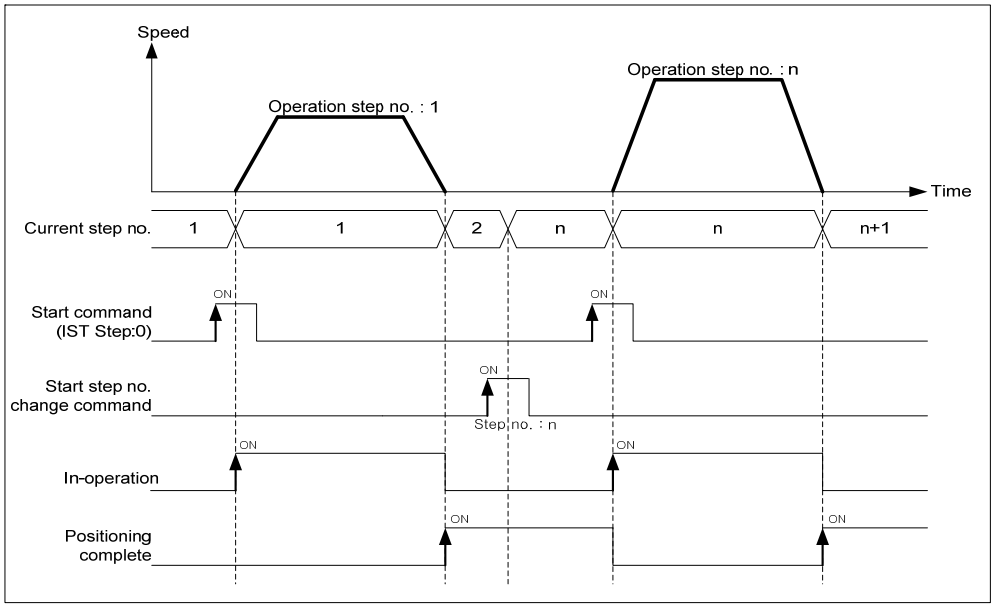
Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0
n	Absolute, Single axis position control	Single,End	8000	2500	No.1	No.1	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XSNS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) If the step number is 0, the current step number is maintained.

※ In the case below, start step no. change command is not executed.

- Step no. to change is out of 0 ~ 400. (error code:442)

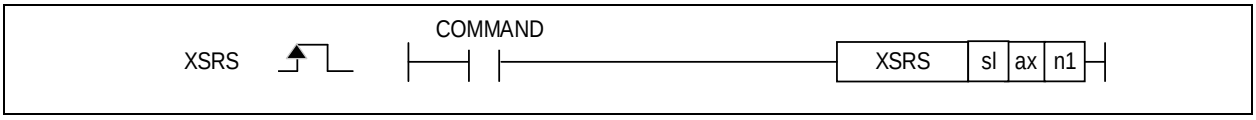
4.42.21 XSRS / Repeat Step Number Change

This command is for changing the repeat operation step no will be executed next.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSRS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-			
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O	4~7	O	-	-
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Change repeat step number	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Change repeat step into the step value which set on step no.(n1).

(2) It is available to be executed in operation.

(5) Set the step to be designated as the next operation after operating the set step repeatedly among the operation methods (single , repeat).

(4) If the repeat operation step number change is not executed and set to the repeat operation mode of end/keep/continuous operation, the current operation step number is changed to operate step 1 after the positioning operation is completed.

(5) If the repeat operation step number change command is executed, it changes to the designated step, not step 1.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, indirect start executes on the command axis (1 axis).(Current step10)

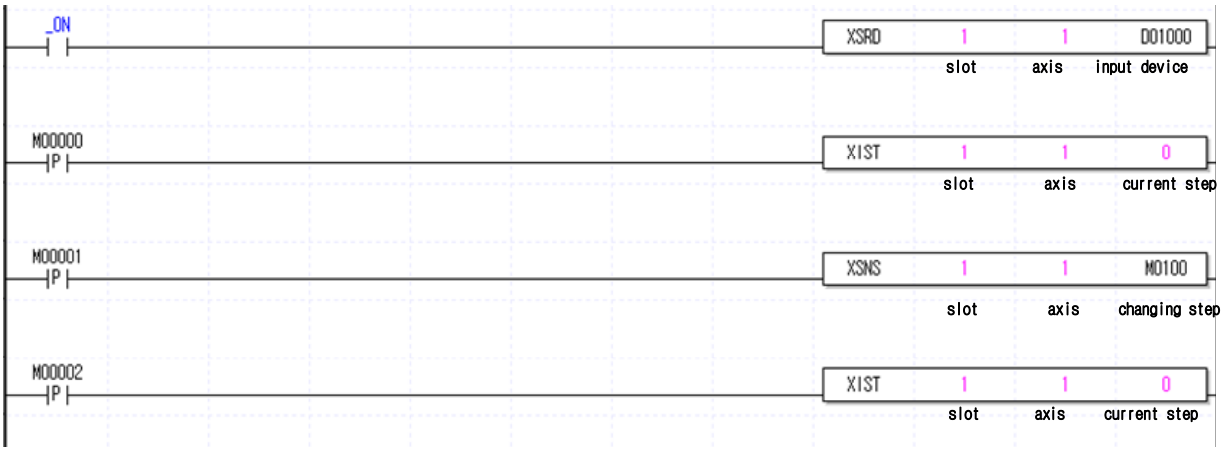
(b) The current step (step 1) indirect start is completed, and the operation state is stopped.(After the operation ends, Changed to current step 1.)

(c) If M00001 is ON in the stop state, the repeat is changed to the value set in M0100.(current step 1)

(d) Then, if M00002 is On, the current step (No. 1) is indirectly started on the command axis (1 axis).(After the operation ends, Changed to current step n.)

※ XG-PM setting items(Axis operation data to be used for indirect start XIST)

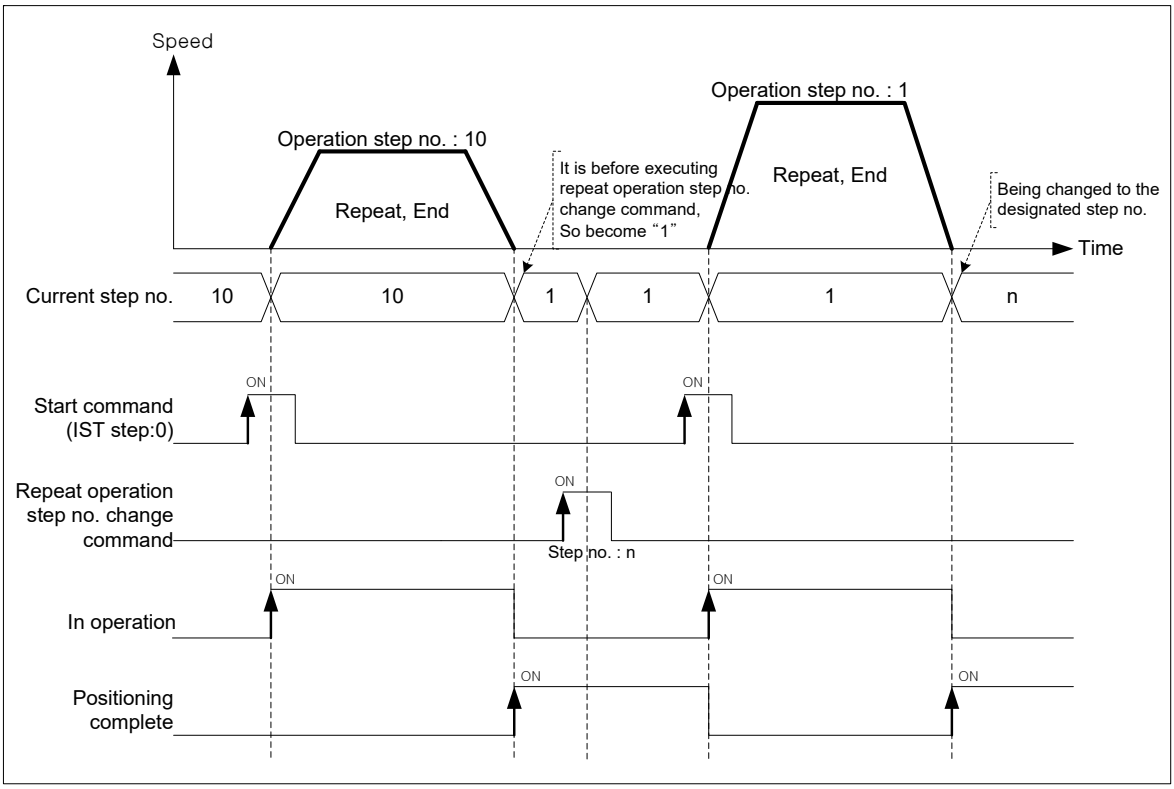
Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Repeat, end	5000	2000	No.1	No.1	0	0
n	Absolute, Single axis position control	Repeat,End	8000	2500	No.1	No.1	0	0



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XSRS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));
```

4) Caution

(1) If the step no. is 0, keep the previous step no.

(2) The repeat step number change command does not change the current operation step at the time of execution, and changes to the step specified by the repeat operation step number change command after the operation of positioning data whose operation method is set to “Repeat” is completed.

※ In the case below, repeat operation step no. change command is not executed.

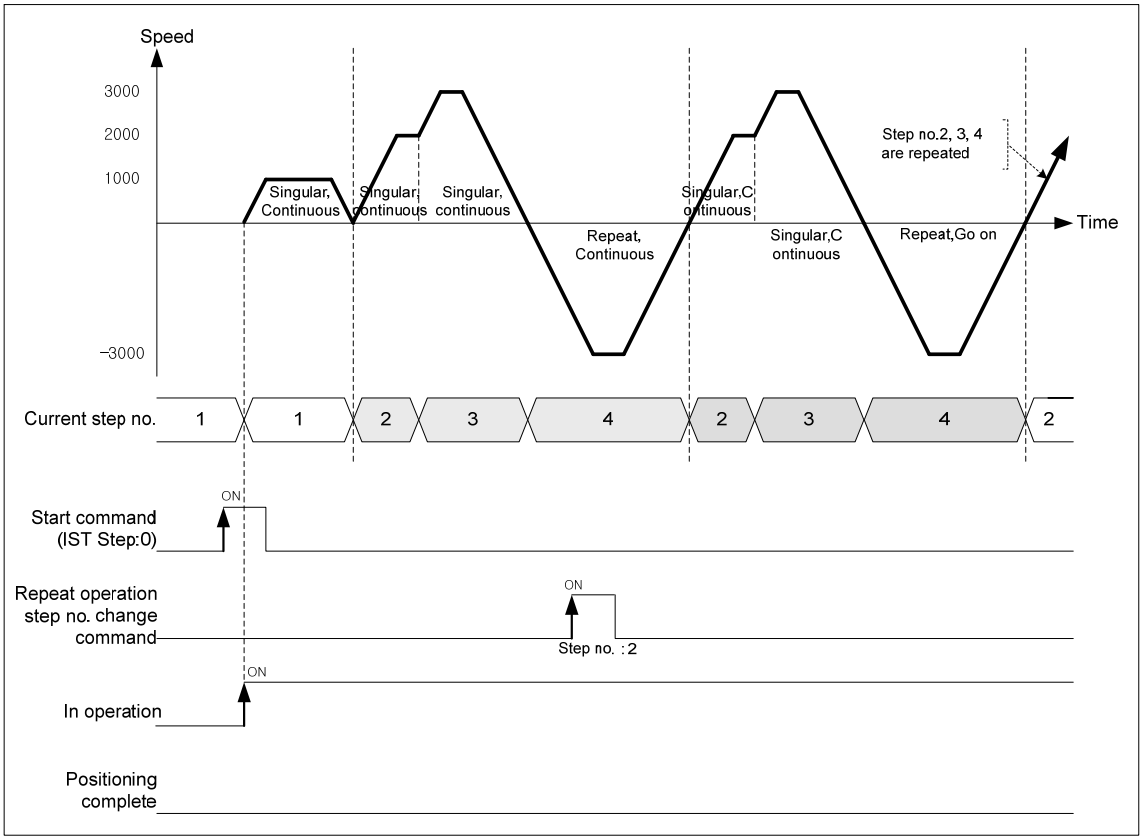
- Step no. to change is out of 0 ~ 400. (error code:442)

※ When using single/repeat, keep/continuous/end operation in combination, it operates in the following pattern. Therefore, please be careful with the current step number change/timing.

- axis1 current position : 0
- Setting of XG-PM
  - ▪ 1 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,Keep	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single, Continuous	2000	2000	No.1	No.1	0	0
3	Absolute, Single axis position control	Single, Continuous	4000	3000	No.1	No.1	0	0
4	Absolute, Single axis position control	Repeat, Continuous	2000	3000	No.1	No.1	0	0
5	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	0	0

- Time Chart



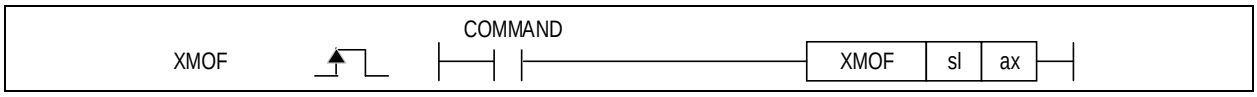
4.42.22 XMOF / M code Off

When M code occurs, M code signal and M code No. are released at the same time

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XMOF	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When M code Off occurs, M code signal and M code No. are released at the same time
M code and M code No. are changed to OFF and 0, respectively.

(2) This command can be executed in any section while operating or after positioning completion.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

※ XG-PM setting items(axis1 extended parameter setting)

Item	Setting value	Content
M code mode	0:None	Not to output M code signal and M code no.
	1:With	Start and turn M code signal 'on' at the same time, then output M code no. set in operation data.
	2:After	After finishing positioning by start command, turn M code signal 'on' and then output M code no. set in operation data.

<1:With>

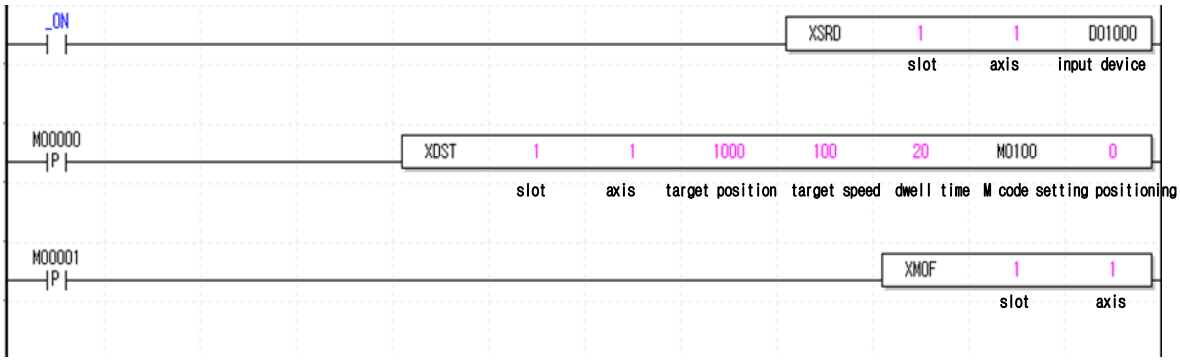
(a) When 00000 is turned on while the home is determined, direct start executes on the command axis (1 axis).

(b) As the 1-axis extension parameter is currently set to M code mode 1 (With), it is changed to m code M set in M0100 device of direct start (XDST) during operation. (M code changed 0 -> m while operating)

(c) If M00001 is ON during operation, XMOF command is executed and the M code is released and the value becomes 0.(M code is changed to m -> 0 immediately after XMOF command during operation)

<2:After>

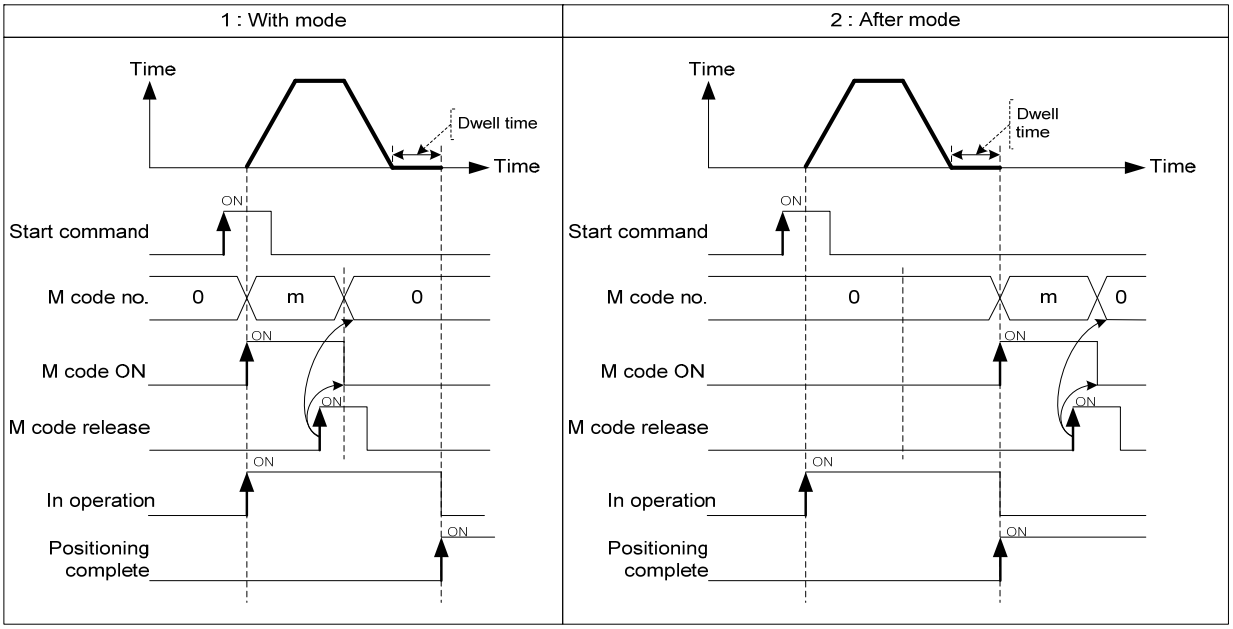
(a) When 00000 is turned on while the home is determined, direct start executes on the command axis (1 axis).
(b) As the 1-axis extension parameter is currently set to M code mode 1 (After), it is changed to nth M code set M0100 device of direct start (XDST) after positioning completion.
(M code changed 0 -> m after positioning completion)
(c) If M00001 is ON during operation, XMOF command is executed and the M code is released and the value becomes 0. (M code changed M -> m after positioning completion)



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XMOF_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

(1) In the keep operation mode, if the M code number and M code ON signal occur, the operation of the next step is in the standby state, and the M code on signal waits for Off. When the M code off command is executed, The next step run keep operation automatically.

※ When M Code using single ans keep/end operation in combination, it operates in the following pattern in case of using M code off command. Therefore, please be careful with the current M Code change/timing.

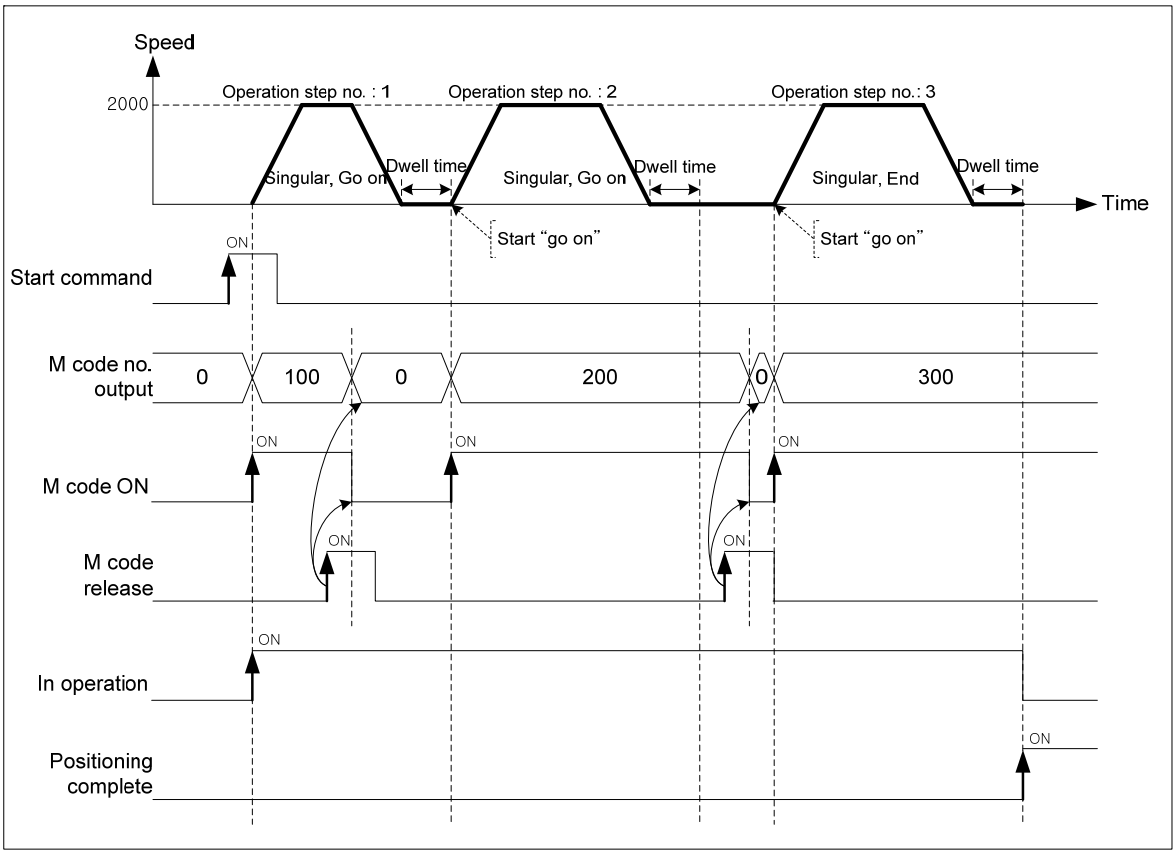
- Setting of XG-PM(extended parameter)

Item	Setting value	Content
M code mode	0:None	Not to output M code signal and M code no.
	1:With	Start and turn M code signal 'on' at the same time, then output M code no. set in operation data.
	2:After	After finishing positioning by start command, turn M code signal 'on' and then output M code no. set in operation data.

- Setting of XG-PM(Operation parameters for indirect start)

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,Keep	1000	2000	No.1	No.1	100	100
2	Absolute, Single axis position control	Single,Keep	3000	2000	No.1	No.1	200	100
3	Absolute, Single axis position control	Single,End	5000	2000	No.1	No.1	300	100

- Timing chart



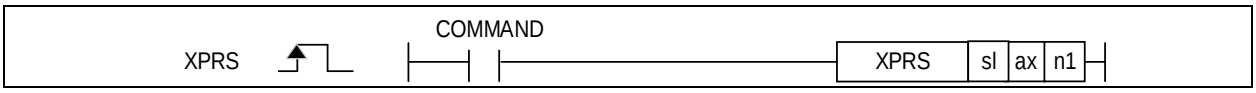
4.42.23 XPRS / Encoder Position Preset

This command is for changing the current position value to the value at user's pleases.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XPRS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Current position value to change	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If you execute the command to change the current position in the undecided homing state, it is changed to the homing state.

(2) If the current position is changed by the current position change command, the mechanical home position executed by home return is changed, and when you want to use the mechanical home position again, you must execute home return again.

2) Error

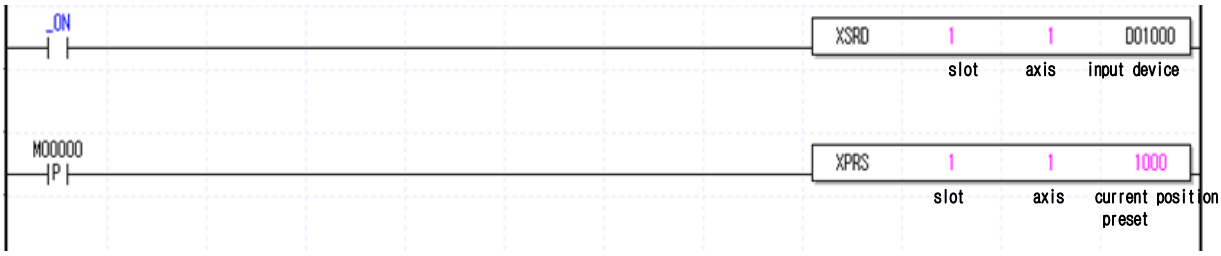
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) If M00000 is On regardless of whether the homing, the current position is changed to the position value set as a command.

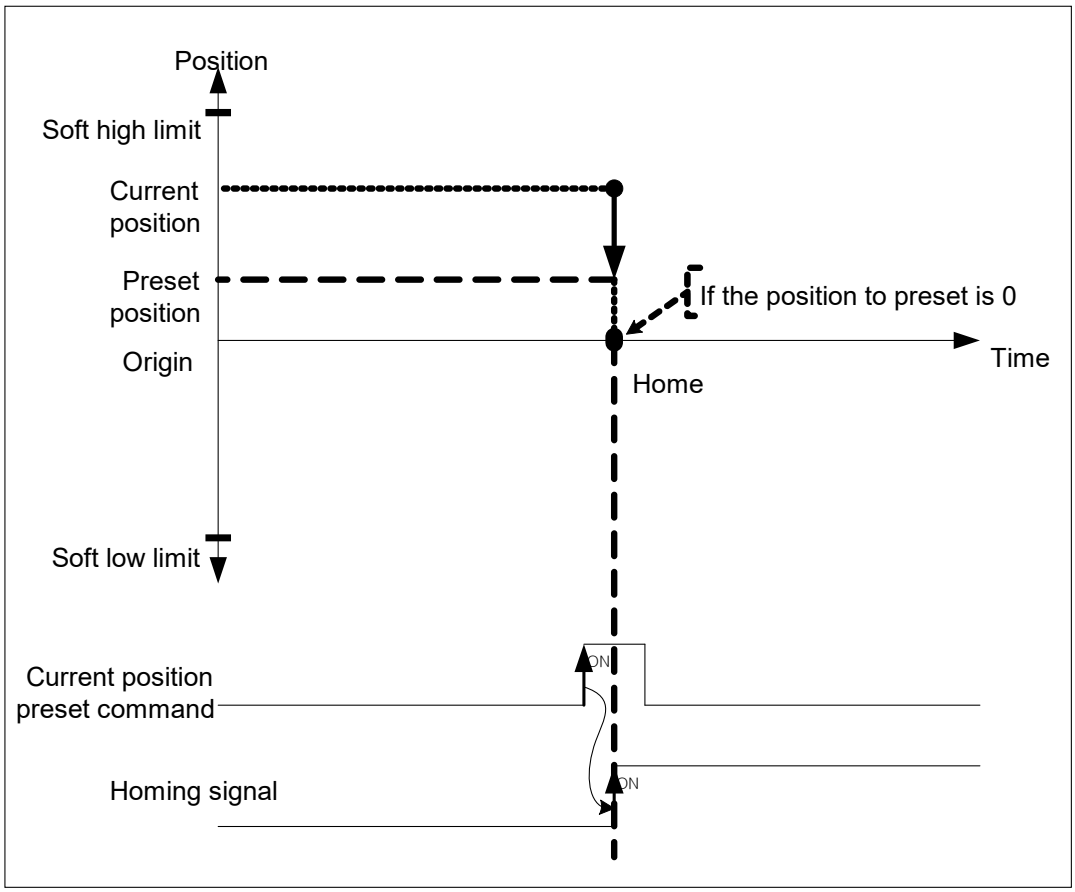
(b) The position is changed to the preset setting position, and the homing is completed at the same time.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XPRS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD), Num1:=(*DINT*));
```

4) Caution

(1) The current position preset command cannot be executed in operation due to an error.

(2) Setting value of current position preset exceeds soft high/low limit of extended parameter. (error code:452)

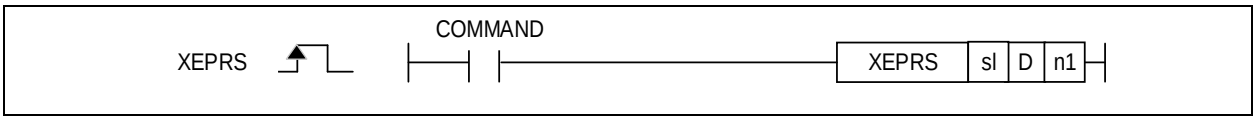
4.42.24 XEPRS / Encoder Preset

This command is for changing the value of current encoder position to the value at user's pleases.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XEPRS	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	D	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
D	Changing Encoder Position	DINT
n1	Changing Encoder(0: encoder 1, 1: encoder 2)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (n2) for the axis depends on the number of encoder channel setting supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command changes the current value of the encoder to the preset value (D).

(2) Depending on the value set in the encoder parameter (n2), the current position of encoder 1 is changed when it is 0, and the current position of encoder 2 is changed when it is 1.

2) Error

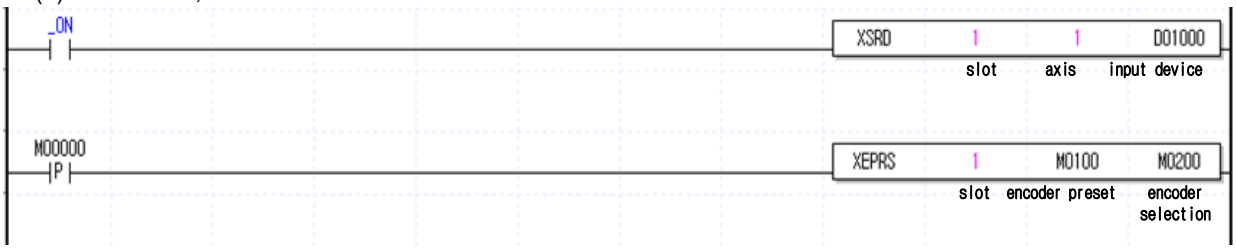
(1) No error occurred (F110).

3) Example

(1) LD: Ladder Diagram

(a) If M00000 is On while the pulse is input to the current encoder and the encoder value is increased, the current encoder value is changed to the value of M0100 set in the command, and the encoder value continues to increase.

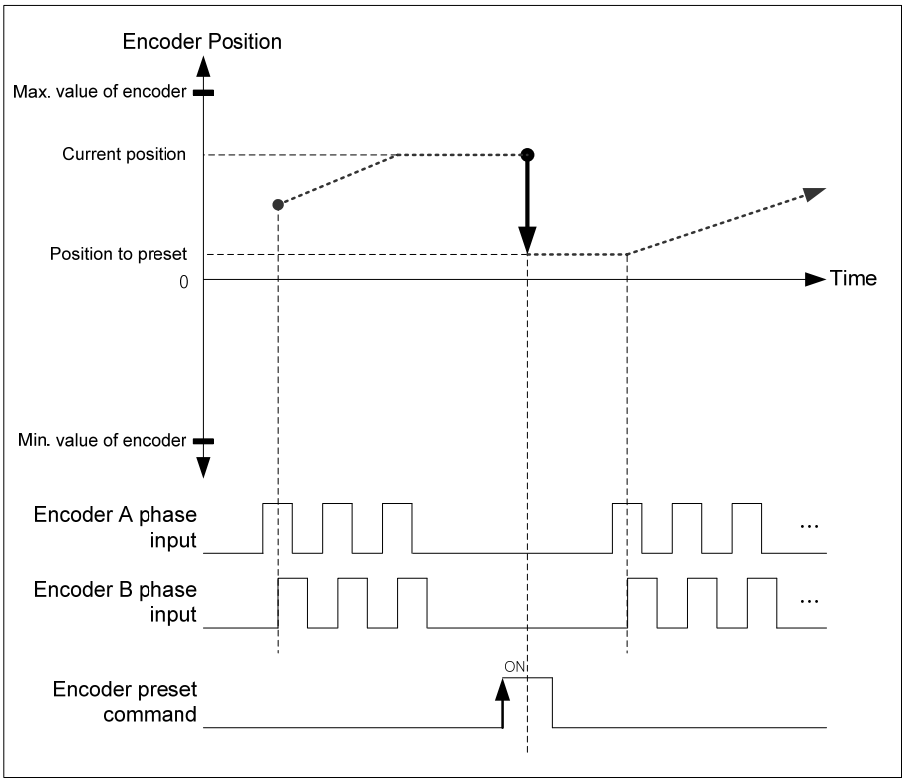
(b) At this time, the selected encoder follows the encoder channel set in M0200.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

```
XEPRS_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), Num1:=(*DINT*), Num2:=(*WORD*));
```

4) Caution

(1) Do not execute the preset command for 2 encoder channels as one contact, but execute each channel.

(2) If there is an axis that operates the encoder as the main axis, the speed of the subordinate axis may change rapidly, so the encoder preset command cannot be executed.

(3) Encoder preset command should be executed in the status that external encoder pulse input is not entered.

※ In the cases below, encoder preset command may not be executed and error arises.

- There is an encoder 1 as a main axis (error code: 532)
- There is an encoder 2 as a main axis (error code: 533)
- Preset position value of encoder 1 exceeds the max./min. value of encoder of common parameter. (error code: 534)
- Preset position value of encoder 2 exceeds the max./min. value of encoder of common parameter. (error code: 535)

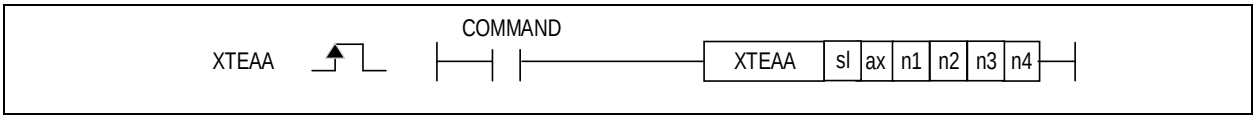
4.42.25 XTEAA / Plural Teaching

This is a function to change the target position value/operation speed value of the step number specified by the user with plural teaching command without directly modifying the positioning operation data in XG-PM.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XTEAA	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute direct start command : 1 ~ 8(Real axis)	WORD
n1	leading step No. for teaching (0~400)	WORD
n2	Teaching method setting 0:RAM teaching or 1:ROM teaching	WORD
n3	Teaching Item setting 0:Position teaching or 1:Speed teaching	WORD
n4	Number of step for Teaching	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is for changing operating speed or the target position on several steps.
(2) It is convenient to use when the target position value and operation speed value are frequently changed.
(3) The value of target position being changed is position teaching, the value of operating speed being changed is speed teaching.
(4) User may change maximum 16 data.
(5) Teaching Array command is available to be executed when the axis is operating. But teaching data of operating step do not apply instantly. Operating step data will apply end of present step operation and the data of the remaining steps are changed immediately.
(6) RAM teaching and ROM teaching are available depending on the saving position.

■ RAM teaching function
- You can change the speed value and position value, but if power is off, the speed value and position value will be lost.

■ ROM teaching function
- It can be used by changing the speed value and position value. By storing the operation data in FRAM (non-volatile memory), it is possible to permanently preserve the existing speed value and position value even when the power is turned off.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

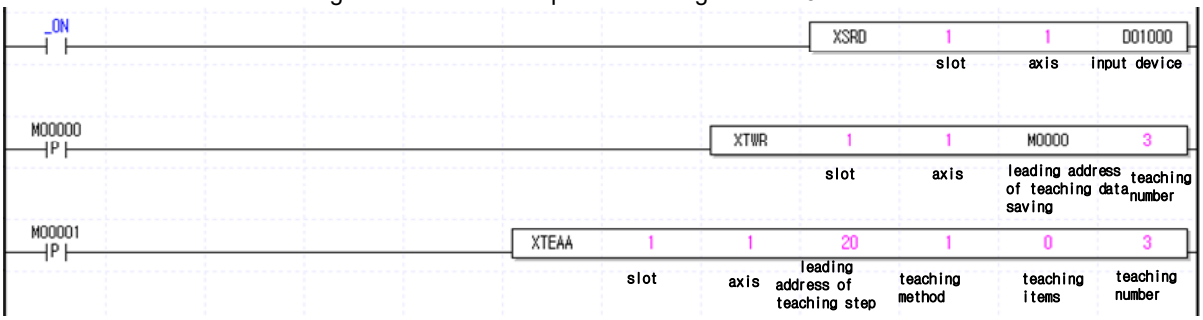
(1) LD: Ladder Diagram

(1) If M00000 is On while the current axis is ready, plural teaching data write command XTWR is executed on axis 1. At this time, the data stored in three DWORDs from the leading address M0000 of teaching data storage is used. (Plural teaching data 1 ~ 3 stored in M0000 ~ M0004 (DWORD))

Quantity	Device number	Teaching array data
1	M0000	2000
2	M0002	4000
3	M0004	6000

(b) Thereafter, when M00001 is ON, plural teaching commands XTEAA are executed with the following settings.

- Leading number of teaching step: From step 20, 3 steps, namely steps 20 to 22, are executed.
- Teaching method: ROM teaching is executed with “1” set.
- Teaching item: Plural teaching is executed with “0” set. (M0000~M0004(DWORD) set as XTWR)
- The number of Teaching: The number of steps for teaching is set to 3



※

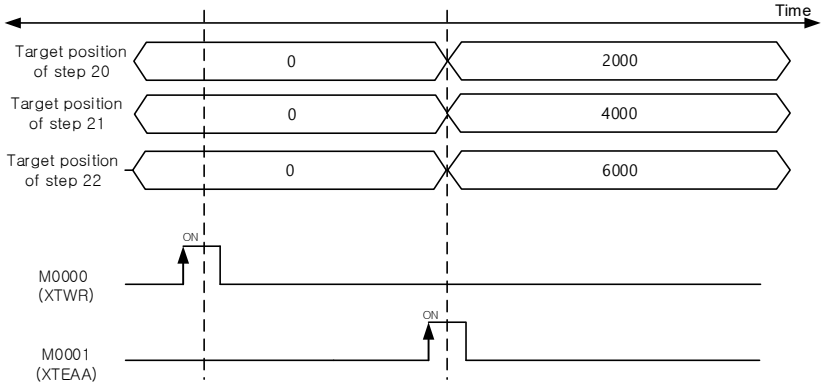
To read the status information of the axis, refer to the description of the XSRD instruction.

※ For details of the plural teaching data write command, refer to the description of the XTWR command.

(2) Timer chart

※ Below is a timing chart for the example above.

- The current target position is set to 0.



(3) ST (Structure Text): Automatic program assignment

XTEAA_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*), Num4:=(*WORD*));

4) Caution

※ Plural teaching array command may not be executed in the case as follows.

(1) The number of teaching array is out of the range (1~16). (Error code: 462)

(2) The number of teaching step is out of the range (1~400). (Error code: 465)
Total number (Teaching step no. + The number of Teaching) must be below 400.

(3) The plural teaching command is available to be executed when the axis is operating. But teaching data of operating step do not apply instantly. Operating step data will apply end of present step operation and the data of the remaining steps are changed immediately.

(4) The plural teaching data must be set in the data setting area for teaching array before plural teaching command is executed.

Refer to the teaching array command XTWR.

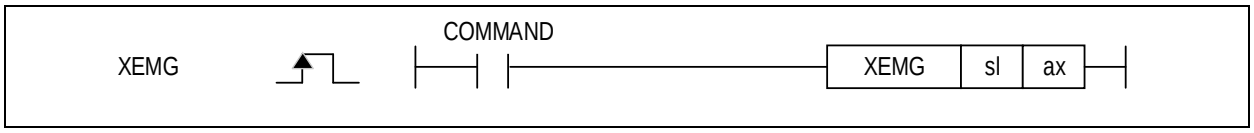
4.42.26 XEMG / Emergency Stop

if an emergency stop is encountered during an operation-related command, it stops immediately.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XEMG	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to setting floating home: 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Execute internal emergency stop command to command axis.

(2) Dec. time in emergency stop become the time which set on 'Emergency stop dec. time' item of each basic parameter.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

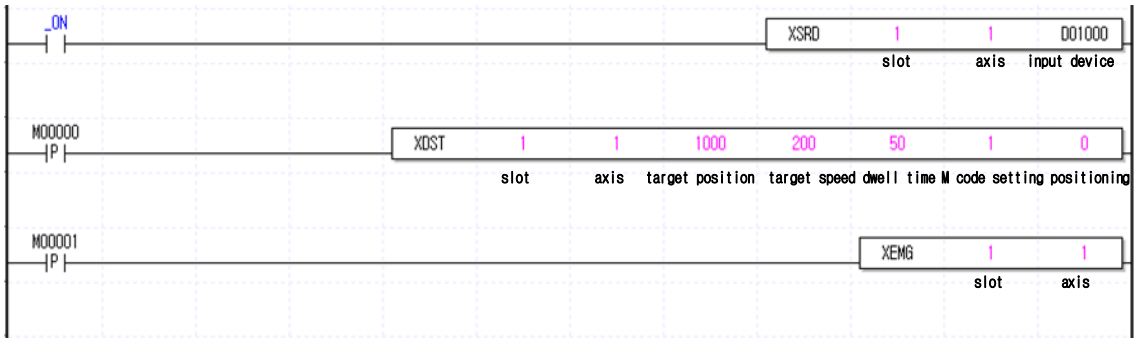
3) Example

(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, direct start executes on the command axis (1 axis).
(Target position:1000, Target speed:200, Dwell Time:50, M Code:1,Control mode: Position)

※ XG-PM setting items(axis1 extended parameter setting)

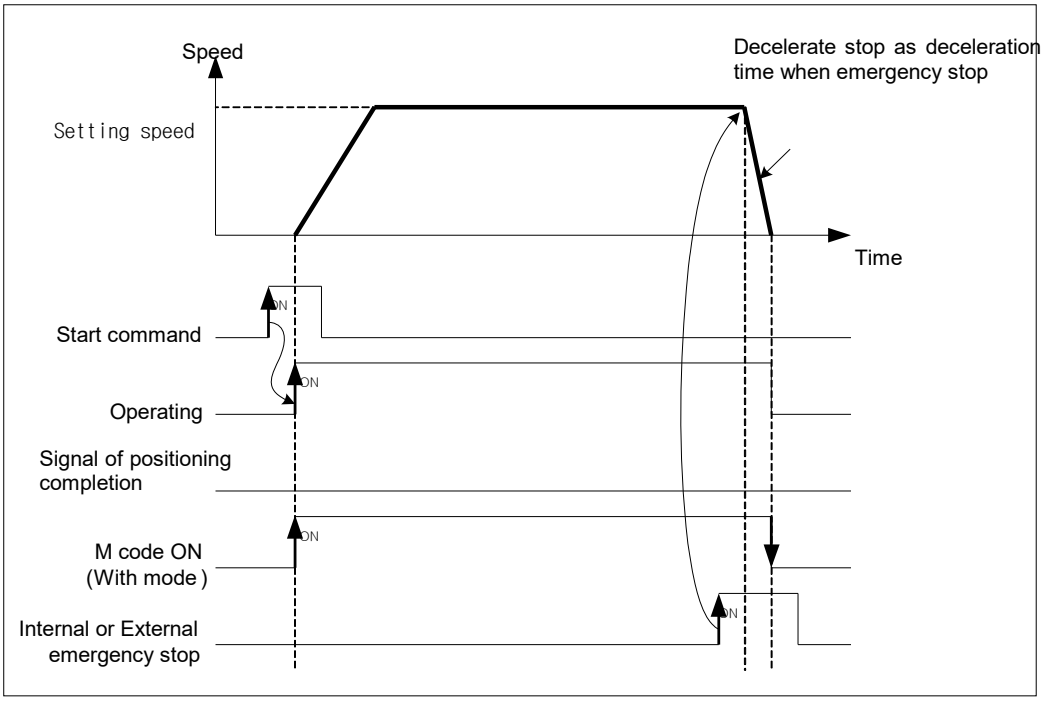
Item	Setting value	Content
M code mode	0:None	Not to output M code signal and M code no.
	1:With	Start and turn M code signal 'on' at the same time, then output M code no. set in operation data.
	2:After	After finishing positioning by start command, turn M code signal 'on' and then output M code no. set in operation data.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XEMG_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

※ There are two cases in which emergency stop is executed.

(1) In case of internal emergency stop, error 481 will occur and in case of external emergency stop, error 491 will occur.
(2) M code signal will be 'Off' after Emergency stop.
(3) There are two type of Emergency stop: External emergency stop and Internal emergency stop.

- Internal emergency stop command
  The "Emergency stop" command XEMG of the XG-PM and the sequence program decelerates to the time set in the "Emergency stop dec. time" of the basic parameter, stops and an error occurs.
- External emergency stop Signal
  When the emergency stop input signal of the servo drive is On, it decelerates to the time set in "Emergency stop dec. time" of the basic parameter, stops and an error occurs.

■ Setting related parameter (Basic parameter)

Item	Setting value	Content
Emergency stop dec. time	0 ~ 2147483647 [ms]	Set deceleration time for using when detect hardware high/low limit signal. The Emergency stop dec. time means the time it takes to decelerate to zero speed from the speed limit.

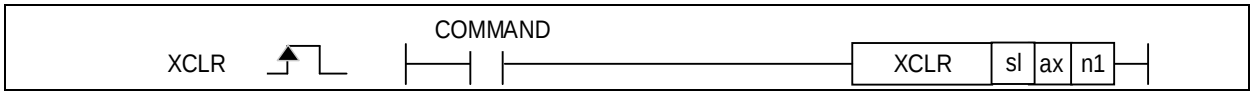
4.42.27 XCLR / Error Reset

This is the command that reset the error occurred on command axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XCLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Error reset items (0: axis error reset, 1: common error reset, as display n XPM)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is the command that reset the error occurred on command axis.

(2) If the error reset item is set to "0", the axis error is cleared. If the command is executed with the error reset item "1", the common error is cleared.

(3) Common error item of n1 does not affect operation even if it is set by any value.

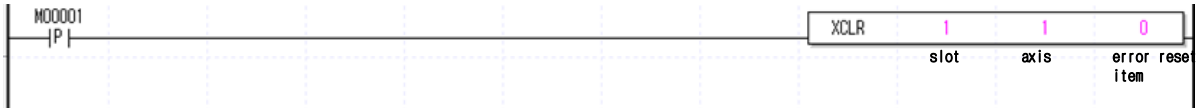
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

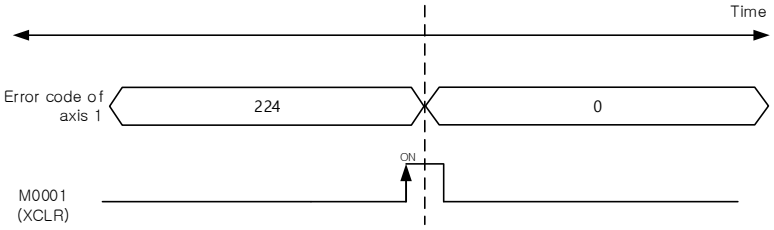
(1) LD: Ladder Diagram

(a) Program to execute error reset command on axis 1 when input signal M00001 of positioning module installed in slot number 1 is On



(b) Program to execute error reset command on axis 1 when input signal M00001 of positioning module installed in slot number 1 is On.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XCLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));
```

4) Caution

※ There are no special precautions for this command.

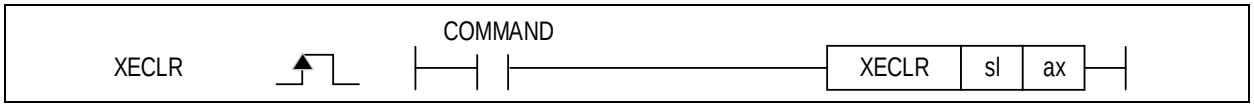
4.42.28 XECLR / Error History Reset

This command resets the error history, which is the history of errors in the command axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XECLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is the command that reset the error history about command axis.

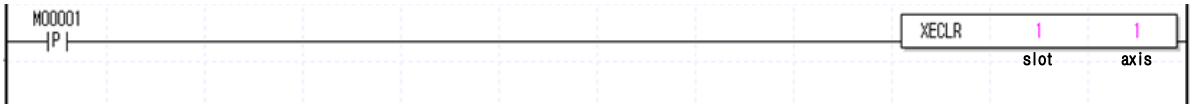
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

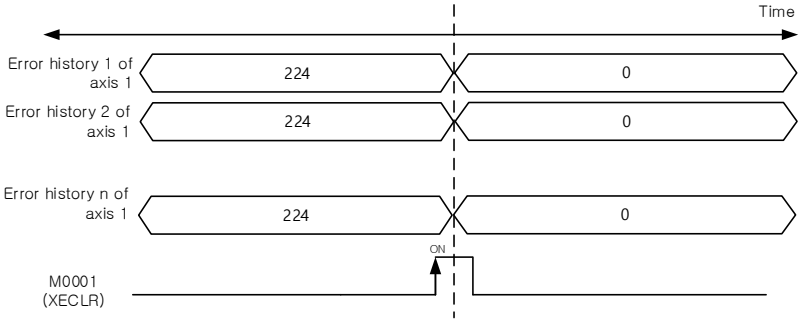
3) Example

(1) LD: Ladder Diagram

(a) Program to execute error history reset command on axis 1 when input signal M00001 of positioning module installed in slot number 1 is On.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XECLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

※ There are no special precautions for this command.

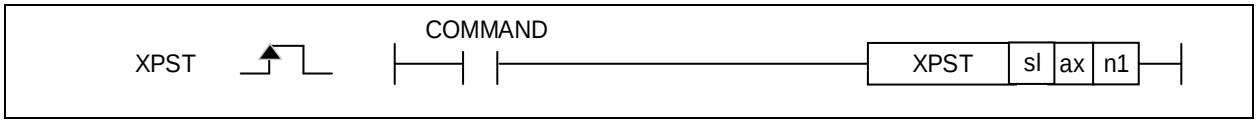
4.42.29 XPST / Point Operation

This is a positioning operation that sequentially executes the operation data of the step number specified by the user with one command.

Available type	XGK					XGK-N			XBC				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XPST	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute point run start command : 1 ~ 8(Real axis)	WORD
n1	Point operation data numbers	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is a positioning operation that sequentially executes the operation data of the step number specified by the user with one operation command, and is called PTP (Point To Point) run.

(2) Regardless of the end, keep, or continuous operation mode, points are operated as many as the set number of points from step setting (point 1). At this time step setting should be set to the step number that operates first in the case of keep or continuous operation mode.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

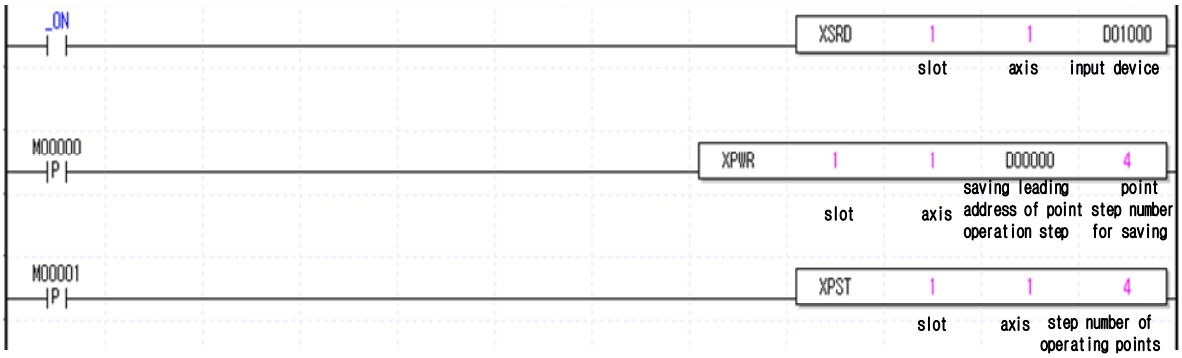
(a) If M00000 is On while the current axis is homing status, the point operation step write command XPWR is executed on axis 1.

At this time, the data stored in 4 words is used from the leading address of the point start step storage D00000.
(Point start step data 1 ~ 4 stored in D00000 ~ D00004 (WORD))

data	Device number	Point start step data
1	D00000	1
2	D00001	2
3	D00002	10
4	D00003	20

(b) Thereafter, when M00001 is ON, point operation commands XPST are performed with the following settings.

- Point step No.: Point operation steps 1, 2, 10, and 20 are executed from the 4 points operation points to be operated and the steps designated by the XPWR command.



(c) Below is the 1-axis operation data set in XG-PM.

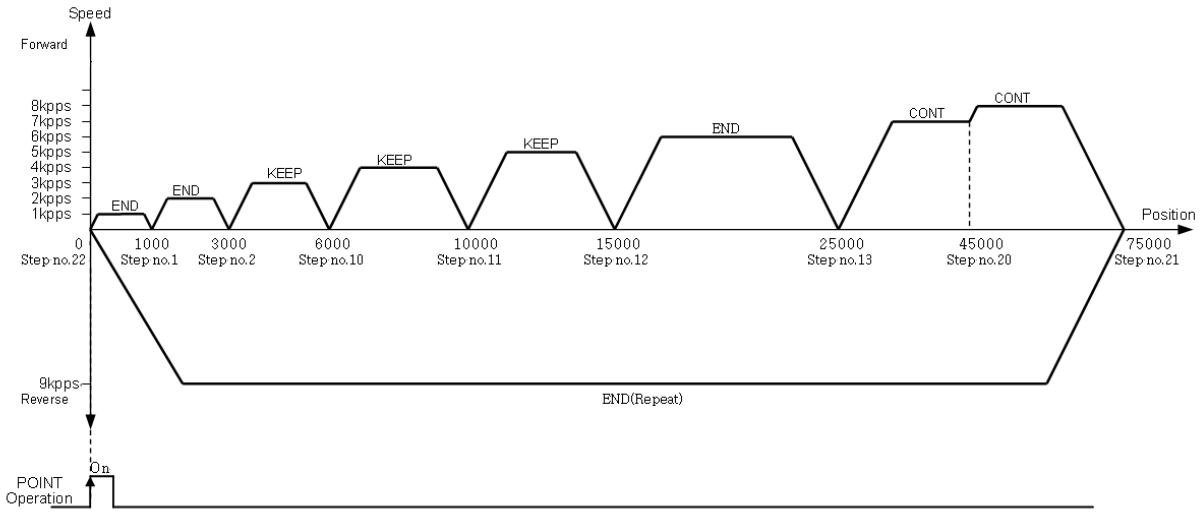
(Since keep/continuous/end operation is mixed, please refer to it when applying the operation method.)

■ Setting of XG-PM

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	20
2	Absolute, Single axis position control	Single,End	3000	2000	No.1	No.1	0	20
10	Absolute, Single axis position control	Single,Keep	6000	3000	No.1	No.1	0	20
11	Absolute, Single axis position control	Single,Keep	10000	4000	No.1	No.1	0	20
12	Absolute, Single axis position control	Single,Keep	15000	5000	No.1	No.1	0	20
13	Absolute, Single axis position control	Single,End	25000	6000	No.1	No.1	0	20
20	Absolute, Single axis position control	Single, Continuous	45000	7000	No.1	No.1	0	0
21	Absolute, Single axis position control	Single, Continuous	75000	8000	No.1	No.1	0	0
22	Absolute, Single axis position control	Repeat,End	0	9000	No.1	No.1	0	0

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XPST_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) Before executing point operation, writing of point operation step must be done first.

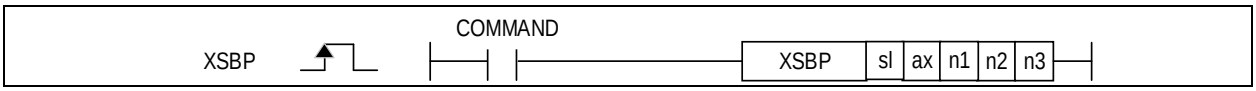
4.42.30 XSBP / Basic Parameter Teaching

This command is used to change the value of a specific item among basic parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSBP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis for basic parameter teaching: 1 to 8 (Real axis)	WORD
n1	Teaching data(Change value of the item to be changed among the basic parameters)	DWORD
n2	Items to change among basic parameter (1~21, 255(hFF))	WORD
n3	Teaching method setting (0:RAM teaching or 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is to change the value of n2 (item to change among basic parameter items) of the designated axis to n1 (set value).

(2) N3 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.

(3) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

(4) To set all of the basic parameter with one XSBP command, hFF(255) value must be set to n2 parameter.
The items of basic parameter should be saved first in the multiple teaching memory address below.
Data can be set by PUT command or XTWR command.

※ The basic parameter setting items are different for each product, so refer to each product's user manual.

※ When using the PUT instruction, refer to the instruction manual of each product for the memory address.

-> It was created based on the network positioning module because it is difficult to display all the items for each positioning module type in the command book.

※ Basic parameter setting items (based on XGF-PN4B/8B or XBF-PN04B/08B)

Parameter item		Parameter value setting range
1	Speed limit value	㎜ : 1 ~ 2,147,483,647 [X10^{-2} ㎜/Minutes] Inch : 1 ~ 2,147,483,647 [X10^{-3}Inch/Minutes] Degree : 1 ~ 2,147,483,647 [X10^{-3}Degree/Minutes] pulse : 1 ~ 2,147,483,647 [pulse/Sec]
2	Acceleration time 1	1 ~ 2147483647 [ms]
3	Acceleration time 2	
4	Acceleration time 3	
5	Acceleration time 4	
6	Deceleration time 1	1 ~ 2147483647 [ms]
7	Deceleration time 2	
8	Deceleration time 3	
9	Deceleration time 4	
10	Dec. time of Emergent stop	1 ~ 2147483647 [ms]
11	Pulse number /revolution	1 ~ 200,000,000
12	Transfer distance per 1 rotation	
13	Unit	0:Pulse, 1:mm, 2:Inch, 3:Degree
14	Double precision of unit	0:x 1, 1:x 10, 2:x 100, 3:x 1000
15	Speed command unit	0: Unit/Time, 1: rpm
16	Encoder selection *1	0:Incremental encoder , 1: Absolute encoder
17	Current pos. compensation amount	0 ~ 255
18	User specified position display ratio	0 ~ 7
19	User specified speed display ratio	0 ~ 7
20	Axis type	0: Real axis, 1: Virtual axis
21	Torque command unit	0:1%, 1:0.1%

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

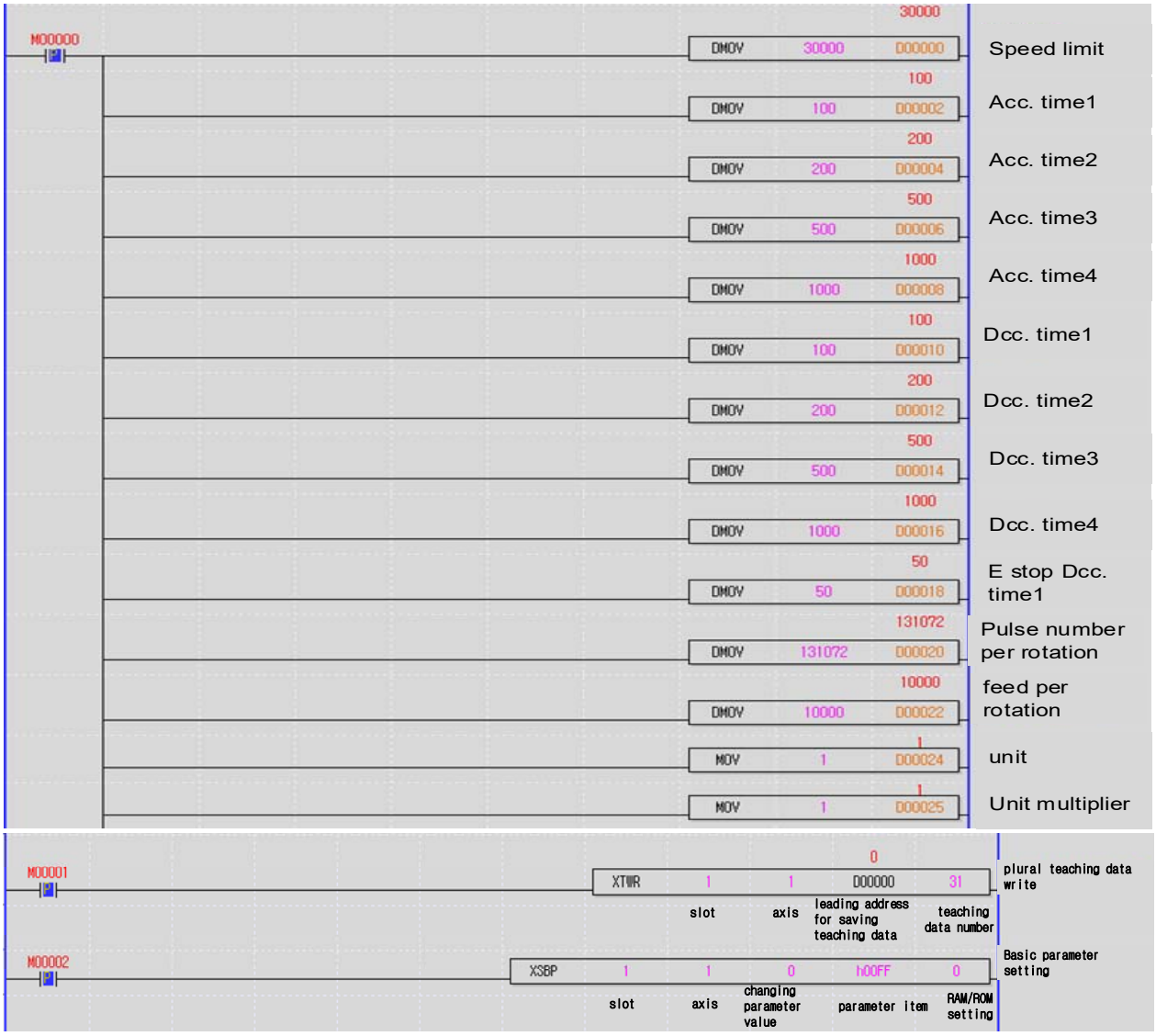
(1) LD: Ladder Diagram

※The following is an example program that changes all items of basic parameters with one XSBP command.

(a) When M00000 is On, the data set in D00000 ~ D00030 are saved in teaching data memory.

(b) When M00001 is On, 31 multiple teaching data writes are set from the device start address D00000.

(c) When M00002 is On, all basic parameters are set by XSBP command.



(2) Timer chart

※ The timing chart for multiple teaching is omitted.

(3) ST (Structure Text): Automatic program assignment

XSBP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*DWORD*), Num3:=(*WORD*));

4) Caution

(1) It may take several scans depending on the number of multiple teaching data.

(2) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

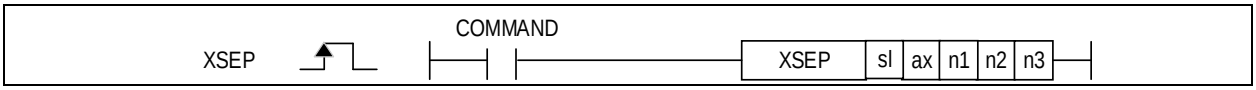
4.42.31 XSEP / Expansion Parameter Teaching

This command is used to change the value of a specific item among extended parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSEP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis for basic parameter teaching: 1 to 8 (Real axis)	WORD
n1	Teaching data(Change value of the item to be changed among the extended parameter)	DINT
n2	Items to change among extended parameter (1~ 2, 1~20, 255(hFF))	WORD
n3	Teaching method setting (0:RAM teaching or 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is to change the value of n2 (item to change among extended parameter items) of the designated axis to n1 (set value).

(2) N3 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.

(3) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

(4) To set all of the expansion parameter with one XSEP command, hFF(255) value must be set to n2 parameter. The items of extended parameter should be saved first in the multiple teaching memory address below.
Data can be set by PUT command or XTWR command.

※ The extended parameter setting items are different for each product, so refer to each product's user manual.

※ When using the PUT instruction, refer to the instruction manual of each product for the memory address.

-> It was created based on the network positioning module because it is difficult to display all the items for each positioning module type in the command book.

※ Basic parameter setting items (based on XGF-PN4B/8B or XBF-PN04B/08B)

Parameter item		Parameter value setting range
1	S/W upper limit	㎜ :-2147483648 ~ 2147483647[X10^{-4} ㎜] Inch:-2147483648 ~ 2147483647[X10^{-5}Inch] degree:-2147483648 ~ 2147483647[X10^{-5}degree] pulse:-2147483648 ~ 2147483647[pulse]
2	S/W low limit	
3	-	-
4	Positioning completion time	0 ~ 65,535[ms]
5	S-curve ratio	1 ~ 100
6	Command in-position range	㎜ : 0~ 65,535 [X10^{-4} ㎜] Inch : 0~ 65,535 [X10^{-5}Inch] degree:0 ~ 65535[X10^{-5}degree] pulse:0 ~ 65535[pulse]
7	axis2 Linear interpolation continuous operation circular arc adding position	㎜ : 0~ 2,147,483,647 [X10^{-4} ㎜] Inch:0 ~ 2147483647[X10^{-5}Inch] degree:0 ~ 2147483647[X10^{-5}degree] pulse:0 ~ 2147483647[pulse]
8	Acceleration/Deceleration Pattern	0:Trapezoid operation, 1:S-Curve operation
9	M Code mode	0:None, 1:With, 2:After
10	Detection of upper and lower limits during speed control	0: Not detect , 1 : detect
11	Positioning completion condition	0:Dwell time 1:In position signal 2:Dwell time and In position signal 3:Dwell time or In position signal
12	Positioning method of interpolation continuous operation	0:Target position passage, 1:Near target position passage
13	Circular interpolation of 2 axes linear interpolating continuous operation	0:No circular arc addition, 1:Circular arc addition continuous operation
14	External command selection#	0:External speed/Position control switch, 1 :External stop command, 2: External latch command *1
15	External command	0:disabled,1:enabled
16	Positioning speed override coordinate	0: Absolute coordinate ,1: Relative coordinate
17	Infinite running repeat position	㎜ : 1~ 2,147,483,647 [X10^{-4} ㎜] Inch:1 ~ 2147483647[X10^{-5}Inch] degree:1 ~ 2147483647[X10^{-5}degree] pulse:1 ~ 2147483647[pulse]
18	Infinite running repeat	0:disabled,1:enabled
19	Speed/Position switching coordinate	0:Relative, 1:Absolute
20	Interpolation speed selection	0: main axis speed, 1:synthetic speed
21	Cam restart	0:disabled,1:enabled

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

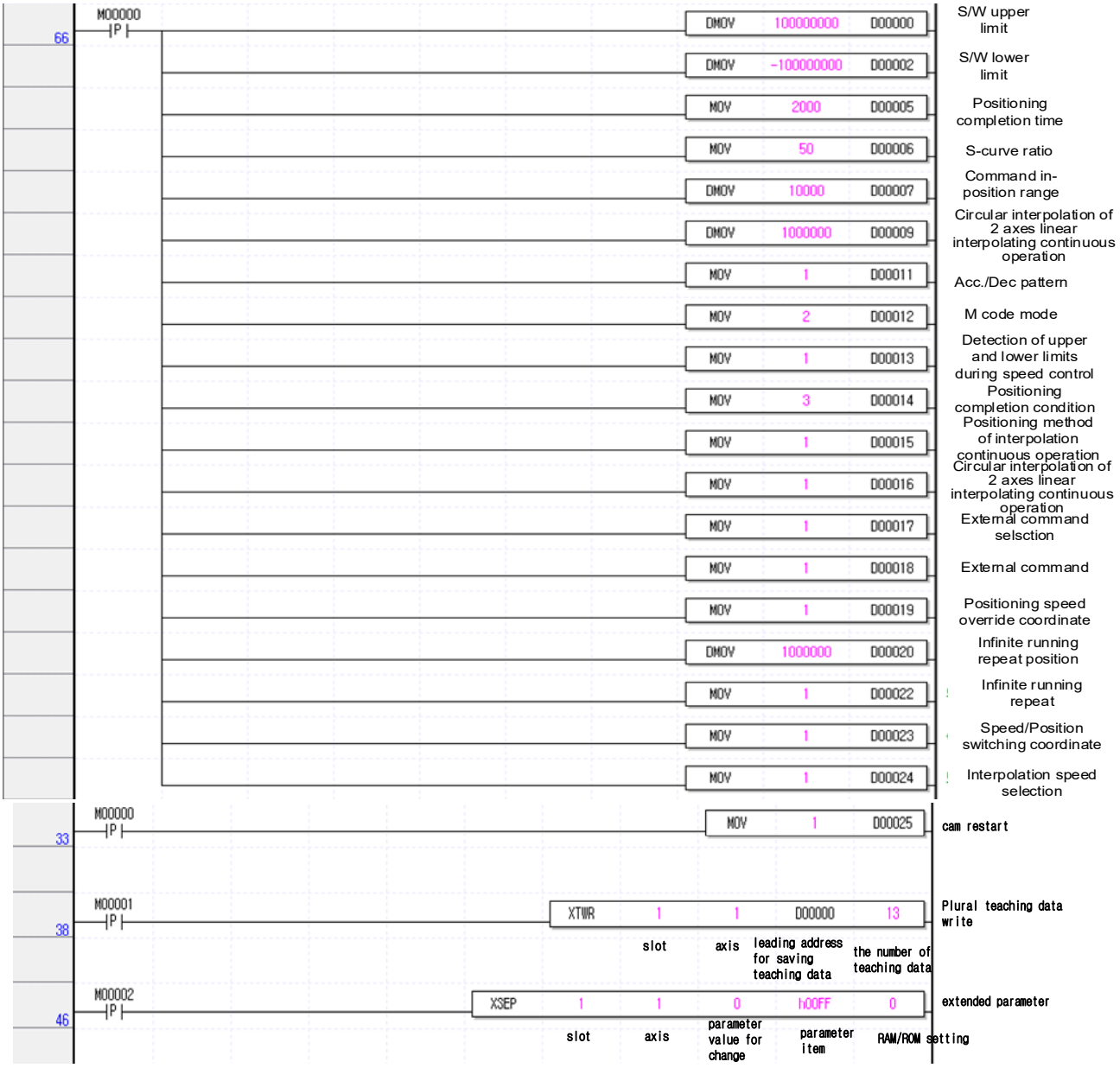
(1) LD: Ladder Diagram

※The following is an example program that changes all items of extended parameters with one XSEP command.

(a) When M00000 is On, the data set in D00000 ~ D00030 are saved in teaching data memory.

(b) When M00001 is On, 31 multiple teaching data writes are set from the device start address D00000.

(c) When M00002 is On, all extended parameters are set by XSBP command.



(2) Timer chart

※ The timing chart for multiple teaching is omitted.

(3) ST (Structure Text): Automatic program assignment

XSEP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*), Num3:=(*WORD*));

4) Caution

(1) It may take several scans depending on the number of multiple teaching data.

(2) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

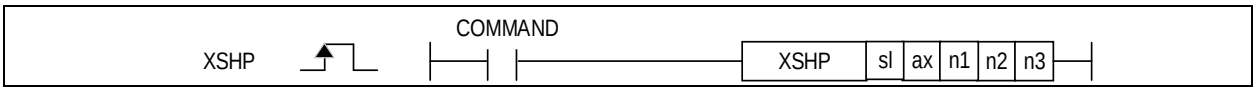
4.42.32 XSHP / Home return Parameter Teaching

This command is used to change the value of a specific item among home return parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	X

※ This command does not apply to the network positioning module (XBF-PNxxB). Applicable to pulse type modules.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSHP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis for basic parameter teaching: 1 to 8 (Real axis)	WORD
n1	Teaching data(Change value of the item to be changed among the home return parameter)	DINT
n2	Items to change among home return parameter (1~10)	WORD
n3	Teaching method setting (0:RAM teaching or 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PxxH. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command teaches the parameter item of home return parameter.
(2) This command is to change the value of n2 (item to change among home return parameter items) of the designated axis to n1 (set value).
(3) N3 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.
(4) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

※ Home return parameter setting item (based on pulse output type module)

	Parameter item	Parameter value setting range
1	Home address	-
2	High speed homing	-
3	Low speed homing	-
4	Acc.time for homing	-
5	Dec.time for homing	-
6	Home return dwell time	-
7	Home compensation amount	-
8	Restart time for home return	-
9	Homing method	0:DOG/Home(Off) 1:DOG/Home(On) 2:Upper/Lower limit, HOME 3:DOG 4:High speed home return 5:Upper/Lower limit
10	Homing direction	0:forward direction 1:reverse direction

2) Error

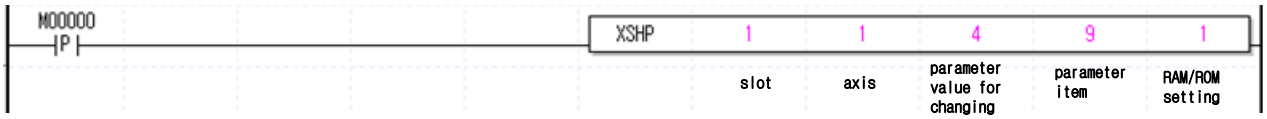
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

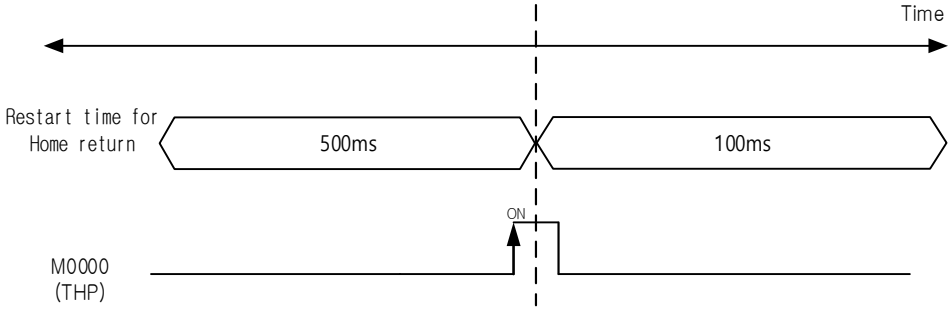
(a) When M00000 is On, item 9 (home return method) of home return parameter is changed to parameter value 4 (high-speed home return).

(b) Teaching method 1: set ROM teaching.



(2) Timer chart

※ The timing chart is omitted.



(3) ST (Structure Text): Automatic program assignment

XSHP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*WORD*), Num 3:=(*WORD*));

4) Caution

(1) It may take several scans depending on the number of multiple teaching data.

(2) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

(3) To set all of the home return parameter with one XSHP command, hFF(255) value can not set to n2 parameter.

(4) Home return parameter setting command is unavailable to be executed when the axis is operating.

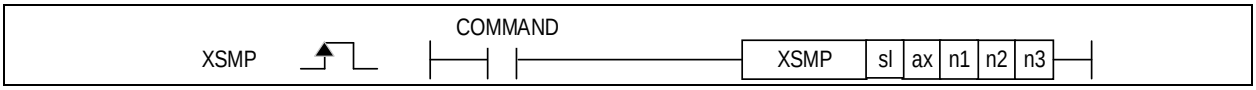
4.42.33 XSMP / Manual Operation Parameter Settings

This command is used to change the value of a specific item among manual operation parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	X

※ This command does not apply to the network positioning module (XBF-PNxxB).

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSMP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis for basic parameter teaching: 1 to 8 (Real axis)	WORD
n1	Teaching data(Change value of the item to be changed among the manual operation parameter)	DWORD
n2	Items to change among manual operation parameter (1~5)	WORD
n3	Teaching method setting (0:RAM teaching or 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command teaches the parameter item of manual operation parameter.

(2) This command is to change the value of n2 (item to change among manual operation parameter items) of the designated axis to n1 (set value).

(3) N3 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.

(4) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

※ Manual operation parameter setting items (based on XGF-PN4B/8B or XBF-PN04B/08B)

Parameter item	
1	Jog high speed
2	Jog low speed
3	Jog acc. time
4	Jog dec. time
5	Inching speed

2) Error

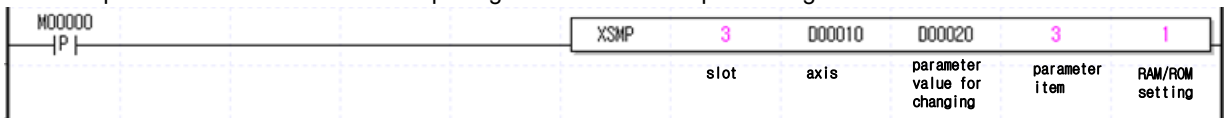
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) A program to execute manual operation parameter teaching command to change and save RAM jog high speed speed to 500 among manual operation parameters of axis 1 when the input signal M00000 of the positioning module installed in slot number 1 is On.

A program that executes manual operation parameter teaching command to change and save ROM jog acceleration/deceleration time among the manual operation parameters to the value set in D00020 among the axes specified in D00010 when the input signal M00000 of the positioning module installed in slot number 3 is On.



(2) Timer chart

※ The timing chart is omitted.

(3) ST (Structure Text): Automatic program assignment

XSMP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*), Num2:=(*WORD*), Num3:=(*WORD*));

4) Caution

(1) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

(2) To set all of the manual operation parameter with one XSHP command, hFF(255) value can not set to n2 parameter.

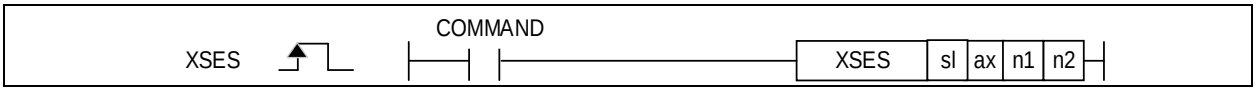
4.42.34 XSES / IN/OUT Parameter Settings

This is the command that changes the value of the item (OP4) which already set among Input/output signal parameter items to setting value (bit control).

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	X

※ This command does not apply to the network positioning module (XBF-PNxxB).

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSES	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis for basic parameter teaching: 1 to 4 (Real axis)	WORD
n1	Teaching data(Change value of the item to be changed among the Input/Output parameter)	WORD
n2	Teaching method setting (0:RAM teaching or 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PxxH. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command teaches input/output signal parameters of the command axis to the set value (bit control).

(2) This command sets the value of n2 (item to be changed among input/output parameter items) of the designated axis on/off in bit units.

(3) n2 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.

(4) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

(5) The input signal applied with each bit of the value to be set in parameter item is as follows.
If each bit are set, it operates as “B contact point”. If they are clear, it operates as “A contact point”

Bit	Signal	Setting range	Initial value
0	Upper limit signal	0 : A contact , 1: B contact	A contact
1	Lower limit signal	0 : A contact , 1: B contact	A contact
2	DOG signal	0 : A contact , 1: B contact	A contact
3	Home signal	0 : A contact , 1: B contact	A contact
4	Emergency stop/Decelerating stop signal	0 : A contact , 1: B contact	A contact
5	Speed/Position control switch signal	0 : A contact , 1: B contact	A contact
6	Drive ready signal	0 : A contact , 1: B contact	A contact
7	In-position signal	0 : A contact , 1: B contact	A contact
8	Deviation counter clear/set position output signal	0 : A contact , 1: B contact	A contact
9~11	Input filter	0:Not Use, 1:1ms, 2:3ms,3:5ms, 4:10ms, 5:20ms,6:50ms, 7:100ms	0:Not Use
12 ~ 15	Not Use	Not Use	Not Use

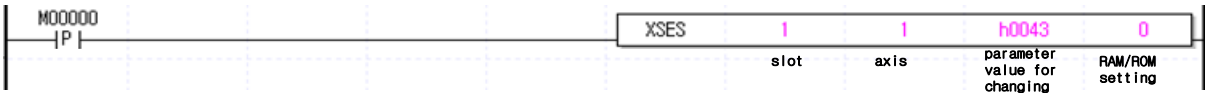
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) Change the upper limit signal, lower limit signal, drive ready signal to “B contact”, and the other signal to “A contact” among the input/output parameters of 1 axis. It is a program when the input signal M00000 of the positioning module installed in slot number 1 1 is On. (RAM setting method)



※ Bit conversion setting value for parameter setting (hex) to be changed

Classification(Byte)	Upper byte				Lower byte			
Classification(Bit)	3	2	1	0	3	2	1	0
Binary		v					v	v
Hexadecimal	4				3			

(2) Timer chart

※ The timing chart is omitted.

(3) ST (Structure Text): Automatic program assignment

XSES_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

(1) There is no teaching completion flag.

(2) Input/Output signal parameter setting command is unavailable to be executed when the axis is operating.

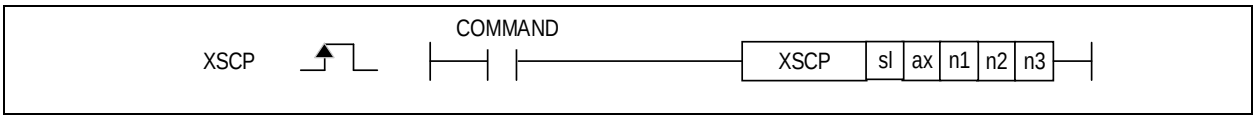
4.42.35 XSCP / Common Parameter Settings

This command is used to change the value of a specific item among common parameter items to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSCP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis for basic parameter teaching: 1 to 8 (Real axis)	WORD
n1	Teaching data(Change value of the item to be changed among the common operation parameter)	DINT
n2	Items to change among common parameter (1 ~ 10, 255)	WORD
n3	Teaching method setting (0:RAM teaching or 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is to change the value of n2 (item to change among manual operation parameter items) of the designated axis to n1 (set value)

(2) This command is to change the value of n2 (item to change among manual operation parameter items) of the designated axis to n1 (set value)

(3) n3 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.

(4) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

(5) The value to be set in parameter item is as follows.

Setting Value	Item	Setting range	Initial value
1	Speed override command type	0: % designate, 1 : Speed designate	0: % designate
2	Encoder pulse Input mode	0:CW/CCW 1 multiplication, 1:PULSE/DIR 1 multiplication, 2:PULSE/DIR 2 multiplication, 3:PHASE A/B 1 multiplication, 4:PHASE A/B 2 multiplication, 5:PHASE A/B 4 multiplication	3: PHASE A/B 1 multiplication
3	Maximum value of encoder	-2147483648 ~ 2147283647	2,147,483,647
4	Minimum value of encoder		-2,147,483,648
5	Pulse output level	0 : Low Active, 1 : High Active	0 : Low Active
6	Homing status at emergency stop	0:Hold the previous state, 1:undecided homing'	0:Hold the previous state
7	Position specified speed Synchronization Target position coordinates	0:Relative, 1:Absolute	0 : Relative
8	Average encoder number	0: Not use,1:5 times, 2:10 times, 3:20 times	0:Not Use

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) Program to change encoder input maximum value (3) among common parameters on axis 1 to 20000000 (RAM setting method) when the input signal M00000 of the positioning module installed in slot number 1 is On.

(2) Timer chart

※ The timing chart is omitted.

(3) ST (Structure Text): Automatic program assignment

XSCP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(* DINT*), Num2:=(*WORD*), Num3:=(*WORD*));

4) Caution

(1) To set all of the common parameter with one XSCP command, hFF(255) value can set to n2 parameter. At this time, items of common parameters must be stored in plural teaching memory addresses first. Data can be set by PUT command or XTWR command.

Please refer to the XSEP instruction for an example of plural teaching.

(2) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

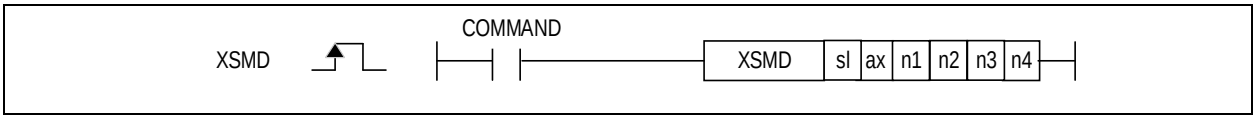
4.42.36 XSMD / Operation Data setting

This command is used to change the value of a specific item among position data to a set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSMD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Operation data value to change	DINT
n2	Operation data Item No. to change (1~ 17, 256)	WORD
n3	Operation data step No. to change (0~400)	WORD
n4	0:RAM setting, 1:ROM setting	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command teaches the value of a specific step item among the operation data items of the command axis to the set value.

(2) This command changes the value of Item n2 (item to be changed among operation data) of the designated axis n3 (specified step) to n1 (set value).

(3) n4 item 0: If RAM is set, the changed value is maintained only while power is applied to the positioning module.
1: If ROM is set, it is retained even when power is not applied to the positioning module.

(4) The number of times for ROM teaching is not limited because operation data is saved on FRAM Memory.

(5) The values to be set in operation data item are as follows.

Setting Value	Item	Setting range	Initial value
1	Target position	㎜ : -2147483648 ~ 2,147,483,647 [X10^{-4} ㎜] Inch : -2147483648~ 2,147,483,647 [X10^{-5}Inch]	0
2	Auxiliary point of circular arc interpolation	Degree : -2147483648 ~ 2,147,483,647 [X10^{-5}Degree] pulse:-2147483648~ 2147483647[pulse]	0
3	Operating speed	㎜ : 1 ~ 2,147,483,647 [X10^{-2} ㎜/Minutes] Inch : 1 ~ 2,147,483,647 [X10^{-3}Inch/Minutes] Degree : 1 ~ 2,147,483,647 [X10^{-3}Degree/Minutes] pulse : 1 ~ 2,147,483,647 [pulse/Sec]	0
4	Dwell time	0 ~ 65,535[ms]	0
5	M code No.	0 ~ 65,535	0
6	Sub axis setting	Bit unit setting Bit 7 / Bit 6 / Bit 5 / Bit 4 / Bit 3 / Bit 2 / Bit 1 Axis 8 / Axis 7 / Axis 6 / Axis 5 / Axis 4 / Axis 3 / Axis 2	No axis setting
7	Helical interpolation axis	0, axis1 ~ axis4 (0: General circular arc interpolation)	Do Not Use
8	No. of circular interpolation turn	0~65,535	0
9	Coordinate	0:absolute, 1:incremental	0 : Absolute
10	Control method	0:Single axis positioning, 1: Single axis speed control 2:Shortening Feed control, 3:Linear interpolation, 4:Circular arc interpolation	0:Single-axis Position Control
11	Operation method	0:Single, 1:Repeat	0:Single
12	Operating pattern	0:End, 1:Keep, 2: Continuous	0:End
13	Circular arc size	0:Circular arc<180 1:Circular arc>=180	0: Arc<180
14	Acc. No.	1 ~ 4	1
15	Deceleration Number	1 ~ 4	1
16	Circular interpolating method	0:midpoint, 1:central point, 2:radius	0:midpoint
17	Circular interpolating direction	0:CW, 1:CCW	0:CW

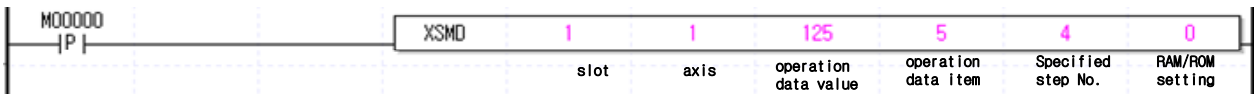
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) Program to change the value of M code item (5) among the operation data of step (4) to the operation data value (125) on axis 1 (RAM setting method) when the input signal M00000 of the positioning module installed in slot number 1 is on.



(2) Timer chart

※ The timing chart is omitted.

(3) ST (Structure Text): Automatic program assignment

```
XSMD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(* DINT*), Num2:=(*WORD*),
Num3:=(*WORD*), Num4:=(*WORD*));
```

4) Caution

(1) To set all of the common parameter with one XSMD command, hFF(255) value can set to n2 parameter. Please refer to the XSEP instruction for an example of plural teaching.

(2) Operation data teaching command is available to be executed when the axis is operating.
But teaching data of operating step do not apply instantly. Operating step data will apply end of present step operation.

(3) There is no teaching completion flag. Therefore, please perform multiple teachings, give a slight delay according to the number of teachings, and perform the next command. (Over 100ms depending on the number of items)

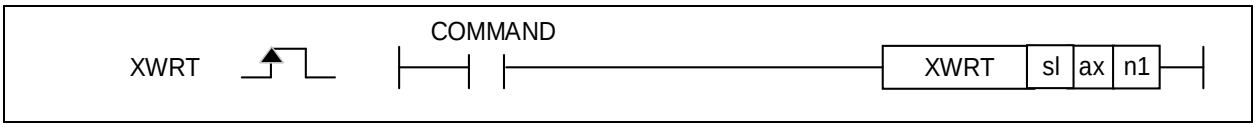
4.42.37 XWRT / Parameter/ Operation data Save

This command saves the parameters and operation data set in the selected axis in FRAM.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XWRT	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Axis to save data(selection Axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command saves the parameters and operation data set in the selected axis in FRAM.
Here, the command axis is a formally existing axis

(2) The current parameters and operation data of the set axis are saved in FRAM and hold even when the power is turned off.

(3) There is no limit to the number of execution of parameter/operation data save command.

(4) Set the selection axis by setting each bit of axis.

15 ~ 8 Bit	7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
Do Not Use	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) A program that saves the current data (parameters and operation data) in FRAM on axis 1 to 8 when the input signal M00000 of the positioning module installed in slot number 1 is on.

(b) A program that saves the current data (parameters and operation data) in FRAM on the 1,2,5 axes when the input signal M00000 of the positioning module installed in slot number 1 is on.

(2) Timer chart

※ The timing chart is omitted.

(3) ST (Structure Text): Automatic program assignment

XWRT_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) This command takes 15ms to execute per axis.

Other commands take the following time for each axis.

- XGF-PN8A: 1.6 ms (when using 2 axes) to 4.8 ms (when using 8 axes)
- XGF-PN4B: 2 ms (when using 3 axes) to 4 ms (when using 4 axes)
- XGF-PN8B: 2 ms (when using 3 axes) to 4 ms (when using 8 axes)

(2) When the cam data is modified by the variable data write (XVWR) command, the changed cam data is saved in FLASH, not FRAM when XWRT is executed. Therefore, please note that writing may take a while.

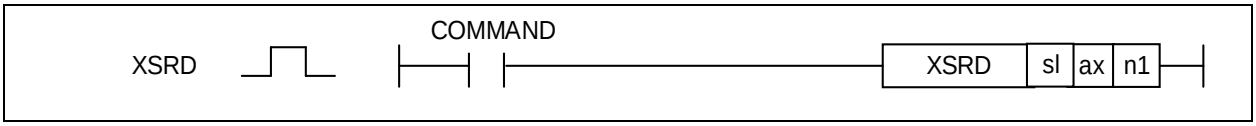
4.42.38 XSRD / Operating Status Read

This is the command that checks the operation state of command axis and save it on designated device.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSRD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Leading No. of device to read and save the current state value	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is the command that checks the operation state of command axis and save it on designated device.

(2) Unlike other positioning commands, this command is a Level command, not a rising edge command recognition method.

(3) The current state will be saved like items below depending on leading no. of specified device.

For detailed status information by model, please refer to the user manual for each model.

Device number	Size	Stratus type	
		XGF-PN8A	XGF-PN4B/PN8B
Device	WORD	Operation State Information (Lower)	
Device + 1	WORD	Operation State Information (Upper)	
Device + 2	WORD	Axis information	
Device + 3	WORD	External input signal status	
Device + 4	DINT	Current Position	
Device + 6	DWORD	Current Speed	
Device + 8	WORD	Step No.	
Device + 9	WORD	M code No.	
Device + 10	WORD	Error state	
Device + 11 ~ Device + 17	WORD	Error History 1 ~ 7	
Device + 18	WORD	Error history 8	External input lower
Device + 19	WORD	Error history 9	External input upper
Device + 20	WORD	Servo error information	
Device + 21	DINT	Encoder 1 value	
Device + 23	DINT	Encoder 1 value	
Device + 25	DINT	Command position	
Device + 27	DWORD	Command speed	
Device + 29	WORD	Torque	
Device + 30	WORD	Common error information	

(5) If you use the GET command, you can read only the type of status you need.

For detailed address information, refer to Chapter 5 Status Information Memory Address of each module user's

manual.

2) Error

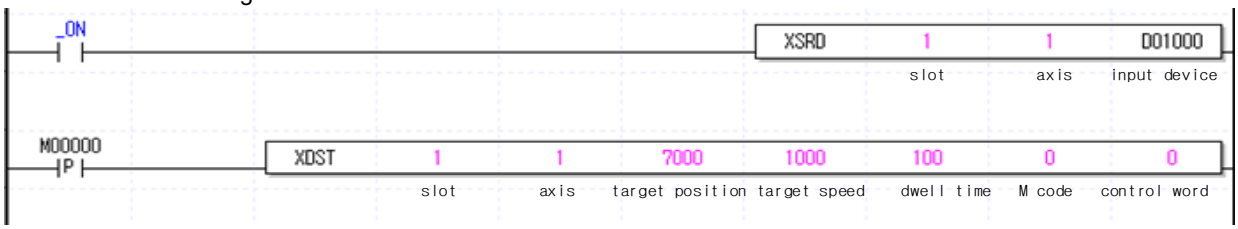
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

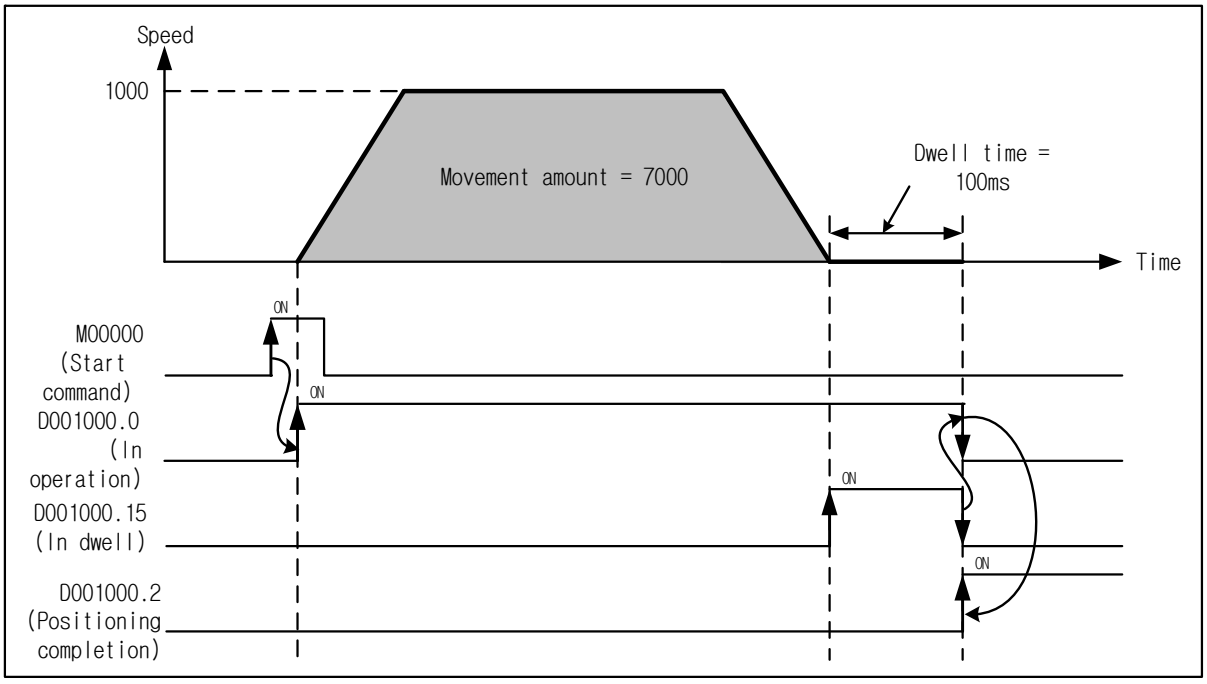
(1) LD: Ladder Diagram

(a) When 00000 is turned on while the home is determined, direct start executes on the command axis (1 axis).

(b) It operates at a target speed of 1000 as long as the target position 7000, and positioning is completed after 100 ms of dwell time after reaching the target position. The control word is operated by position control and absolute coordinate setting.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XSRD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) XSRD just execute High level action. When input condition is 'On' it keeps operating and it does not operate when it's 'Off'.

※ The instructions dedicated to the positioning module operate on the rising edge.

That is, when the input condition is On, the operation is performed only once for the first time, and to perform the operation again, the input condition must be Off and then On again.

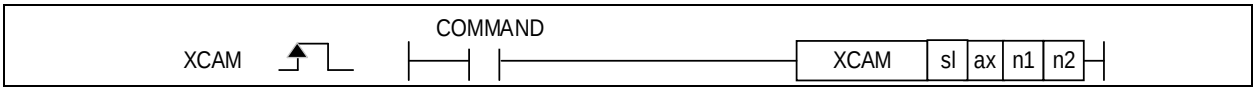
4.42.39 XCAM / Cam Operation

The command executes subordinate cam control with the cam data set in synchronization with the position of the axis set as the main axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XCAM	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Subordinate axis to execute cam command (1 ~ 8: axis 1 ~ axis 8)	WORD
n1	Main axis of cam operation (1 ~ 8: 1 axis ~ 8 axes, 9: encoder)	WORD
n2	Cam data block no. to apply to operation (1 ~ 8,9:user CAM)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

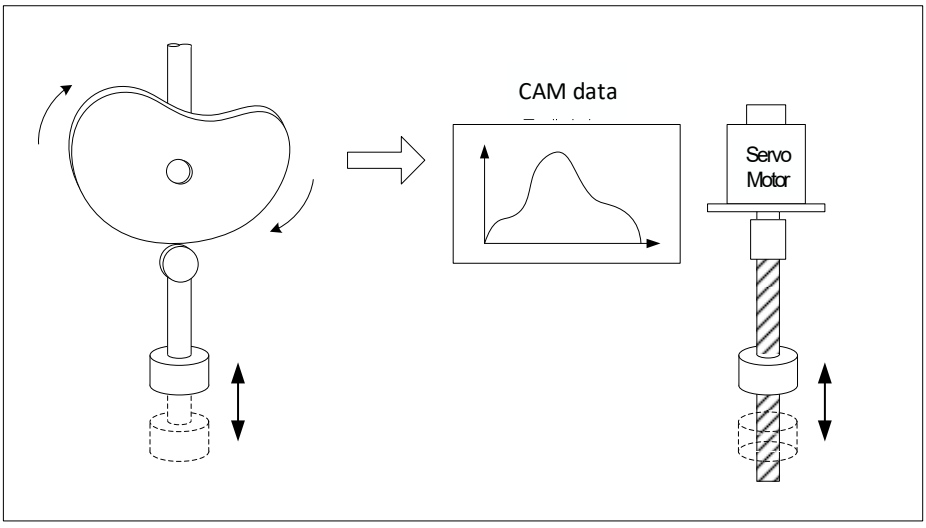
Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Cam operation converts mechanical cam motion into cam data represented by cam curves, and executes cam axis control in synchronization with the position of the motor set as the main axis.

(2) It commands to operate CAM with CAM data of n2, with n1 axis as the main axis for the sub-axis designated as ax.

(3) Cam data can be set in the cam data in the project window of XG-PM and must be written to the positioning module before starting cam operation.



(4) In order to use user CAM operation, you have to set CAM block number 9.
(5) In case of user cam operation, user cam data can be changed by variable data write command even during operation.
(6) In the case of user cam operation, it is operated by setting the cam data in the device in the PLC program rather than setting the cam data in XG-PM, and the number of cam data is 30.
(7) For more information on user CAM operation setting, please refer to Chapter Use 9 User Cam Operation of the Module.
(8) CAM data point can be saved at the specified memory address of each axis by using 'Write Variable Data' (XVWR) command.
(9) CAM data point can be saved at the specified memory address of each axis by using ' Variable Data Write' (XVWR) command.

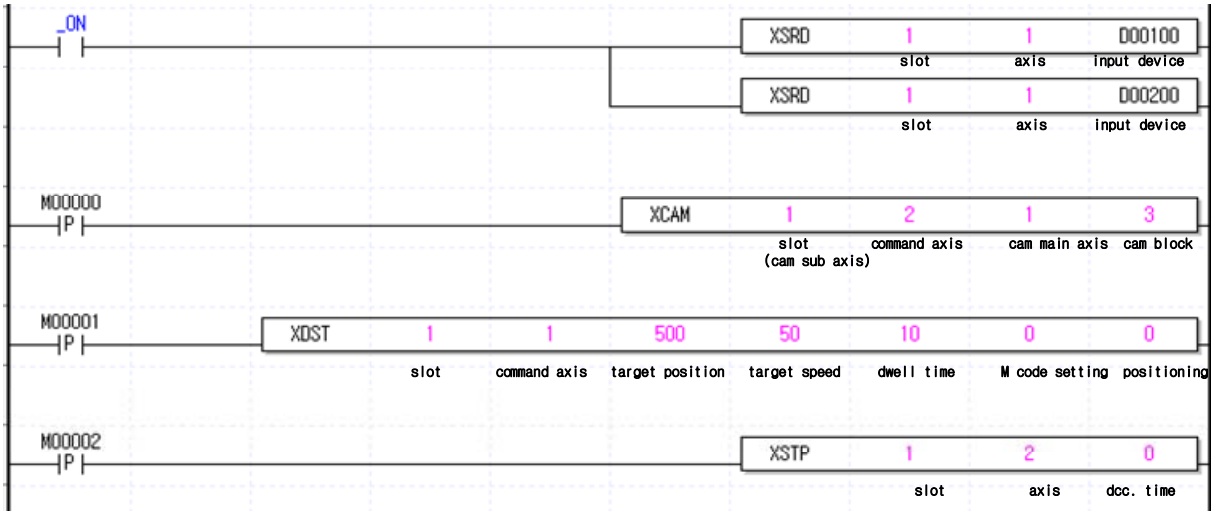
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

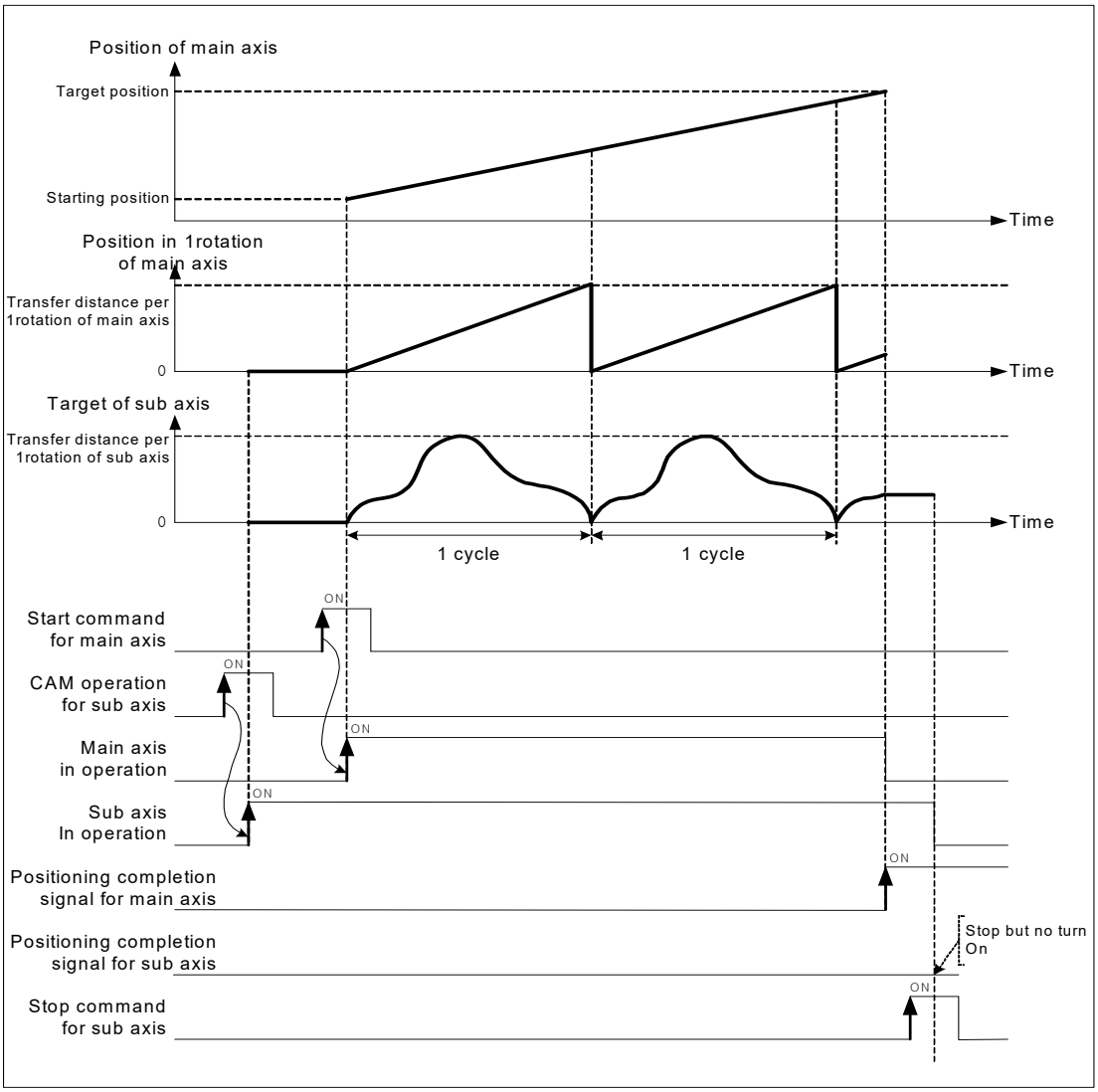
(a) When M00000 is On, the cam control main/sub axis are set. Cam control sub axis/main axis setting is indicated in the current state
(Cam control subordinate axis: axis 2, Main axis 1, cam control block 3 setting)
(b) When M00001 is turned on in the homing state, the main axis starts at the target position 500 at the target speed of 50, and when the target position is reached, positioning completion is end after 10 ms of dwell time.
(c) If you look at the position within one revolution of the main axis, when the operation of the main axis starts, the “current position within one rotation of the main axis” increases to the “number of pulses per revolution-1” set in the parameter, and then becomes 0 again. It repeats with the position value of 0 ~ “Number of pulses per revolution-1”.
(d) Cam control is executed when the main axis starts according to the set cam profile.
(e) When the M00002 contact is on, the sub axis cam control is released by the deceleration stop command.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XCAM_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

(1) The time when the changed user cam data is reflected is after one cycle of the currently operating user cam data is completed.

(2) When set CAM block data after point unit setting, 'Ending position of main axis' must be set as positive multiple number of point unit. For example, if the unit of main axis is 'degree' and point unit is 10, 'Ending position of main axis' must be set as multiple number of 10 like 40, 90, 180, ···.

※ CAM operation command may not be executed in the cases below.

- If execute CAM operation command in being On of M code, error (702) occurred.
- If the set main axis is not a settable axis or if the main axis setting is set equal to the command axis, an error (704) occurs.
- If speed of main axis is too fast and speed of sub axis exceeds speed limit, error (708) occurred.
- In the case that the speed of main axis exceeds the speed limit, error arises and it decelerate in」 Dec. time of emergent stop'.

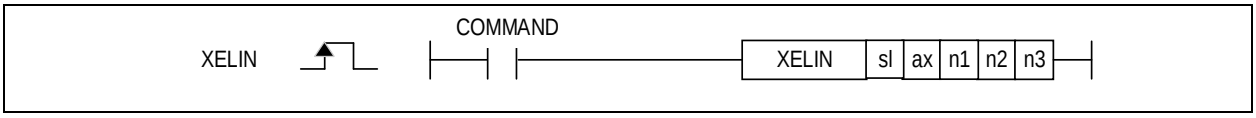
4.42.40 XELIN / Ellipse Interpolation

This command distorts the operation data of the step set by circular interpolation at the ratio set in the ellipse ratio, and makes the ellipse operation as much as the set operation angle.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XELIN	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Command axis to perform ellipse interpolation: 1~ 8 (real axis)	WORD
n1	Step no. to execute ellipse interpolation	WORD
n2	Ellipse l ratio (1 = 0.01%) (0 ~ 65535)	WORD
n3	Degree for ellipse interpolation (degree) (1 = 0.1°) (0 ~ 65535)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The axis designated as ax is commanded to interpolate the ellipse by the angle set in n3 at the ratio set by n2 in step n1.

(2) Execute positioning control until target position by trajectory angle of the ellipse is set to operate and control sub-axis as using axis- 2 according to data of main axis.

(3) Combinations of axis to be used in ellipse interpolation control are unlimited and 2 axes from axis1~8 are used.

(4) Starting position and target position must be same when executing ellipse interpolation.

(5) The ellipse interpolation is set as circular interpolation using the center point designation method in the operation data, and the ratio and size of the ellipse are set as auxiliary data for the "ellipse interpolation" command.

Auxiliary data	Setting Value	Content
Ratio of ellipse (%)	0 ~ 65535	Set the ratio of horizontal axis and vertical axis with the ratio to the circle (65535 = 655.35%)
Size(Degree) of ellipse	0 ~ 65535	Set the degree of ellipse's movement (3650 = 360.0°)

(6) When executing ellipse interpolation, the radius changes continuously and composing speed also changes depending on the ratio of ellipse.

(7) Moving direction of ellipse is decided by the direction set on 'circular interpolation mode' of operation data.

- 「Center point, CW」- Execute ellipse interpolation in clockwise.

▪ 「Center point, CCW」- Execute ellipse interpolation in counterclockwise.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) When M00001 is turned on in the homing state,

Execute ellipse interpolation with 20% of ellipse ratio, 360°of movement degree and relative coordinates

- Start position (100, 100).
- Start position (amount of movement) setting:(0, 0).
- Auxiliary point setting(amount of movement) setting:(500,200).

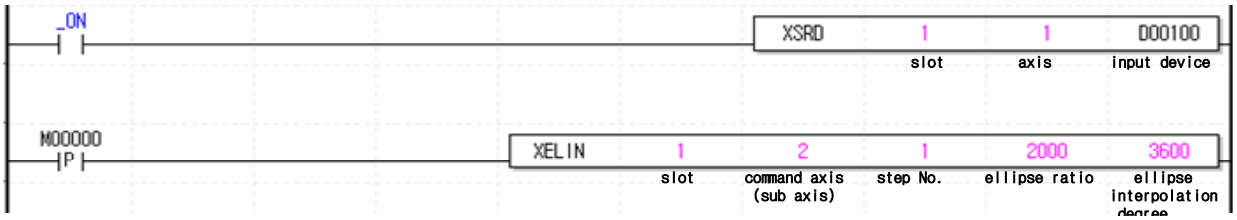
■ Setting of XG-PM

< Main axis(axis1) operation data>

Step No.	Control method	Operation method	Target position [pls]	Operation speed [pls/s]	Acc. No.	Deceleration No.	M Code	Dwell Time	Subordinate axis Setting	Circular Interpolation auxiliary point	Circular Interpolation Mode	Circular Interpolation turns	Helical interpolation
1	Incremental, Circular Interpolation	Single,End	0	1000	No.1	No.1	0	100	Axis 2	800	Midpoint,CW	0	Do Not Use

<Operating data of sub-axis(axis2)>

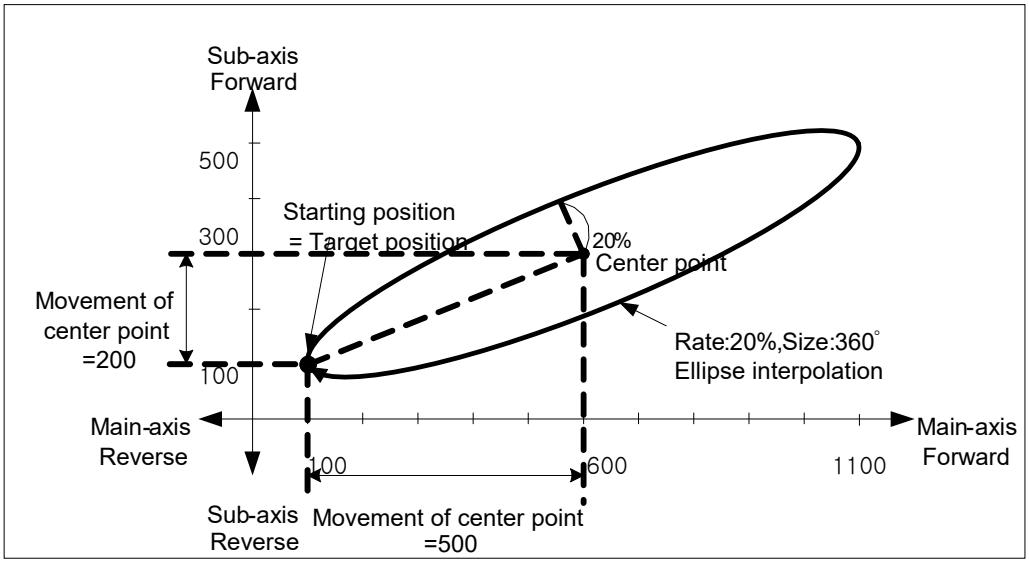
Step No.	Control method	Operation method	Target position [pls]	Operation speed [pls/s]	Acc. No.	Deceleration No.	M Code	Dwell Time	Subordinate axis Setting	Circular Interpolation auxiliary point	Circular Interpolation Mode	Circular Interpolation turns	Helical interpolation
1	Incremental, single axis positioning control	Single,End	0	0	No.1	No.1	0	0	None	400	Midpoint	0	Do Not Use



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

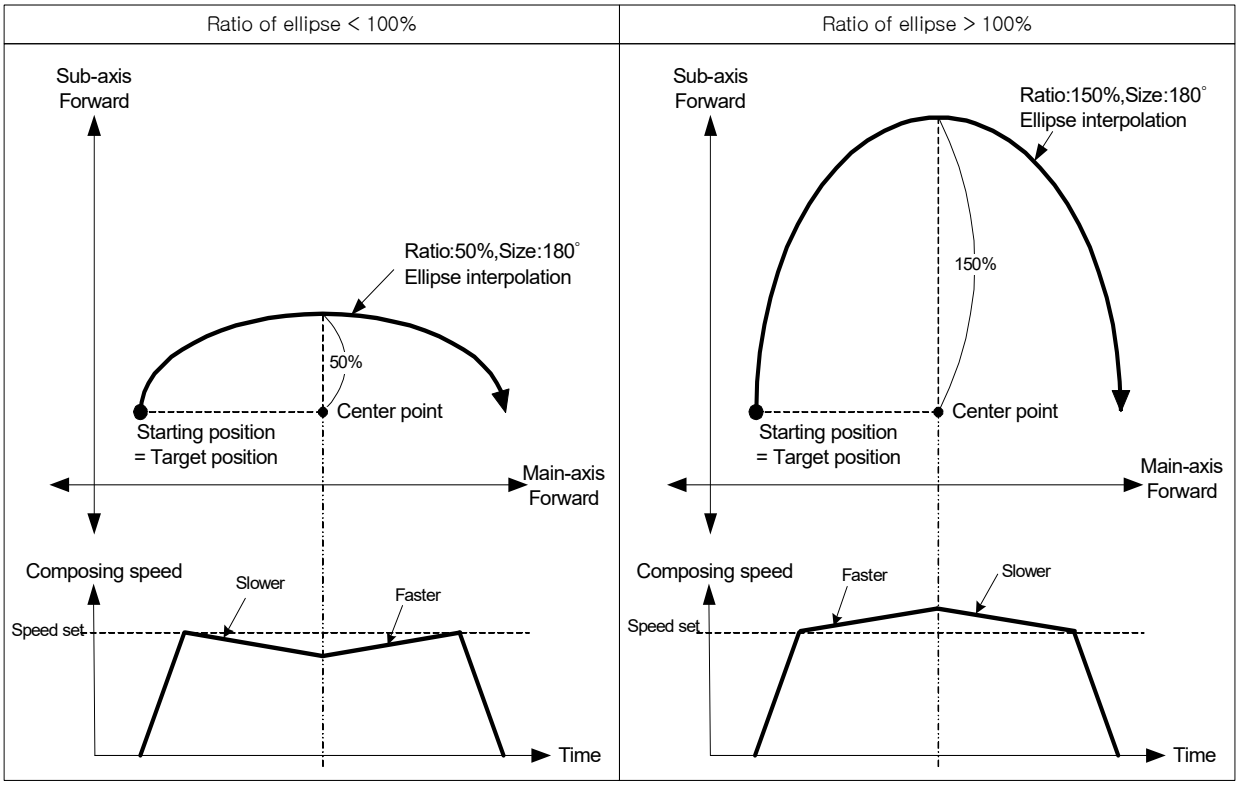
XELIN_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*));

4) Caution

※ Ellipse interpolation control is executed by the standard set on operating data of main-axis.

When executing ellipse interpolation, only「Target position」and「Auxiliary point of circular interpolation」affect the operation of ellipse interpolation. In other words, whatever value is set as, it does not affect the action and no errors occurred.

When the ratio of ellipse is bigger than 100%, operating speed of sub axis and composing speed get faster. So it calls user's attention.Sub axis of ellipse interpolation is not limited by 'speed limit', so user must set operating speed below limit.



※ Ellipse interpolation may not be executed in the case below.

- 「Sub-axis setting」error (error code:547)
  - -「Subordinate axis setting」value of main axis operation data is 'No axis setting'
  - -「Subordinate axis setting」value of main axis operation data is same as the main axis no.
  - - In case of the value of「Subordinate axis setting」of main axis operation data exceed settable axis No.
  - - An axis of helical interpolation is set.
- In case of 'degree' is set as item of main axis or sub axis, (Error code : 551(Main axis), 552(Sub axis))
- In case of center point which is designated as auxiliary point is same with start position and target position. (Error code : 553)
- In case of calculated radius of circular arc exceed 2147483647pls (Error code : 554)
- The operating method is “continuous” or “go on”.(error code : 556)
  If user executes ellipse interpolation, End operation must be set before use.
- Staring position and target position are different.(error code :558)
- Size of circular arc (Moving degree) is 0.(error code :559)

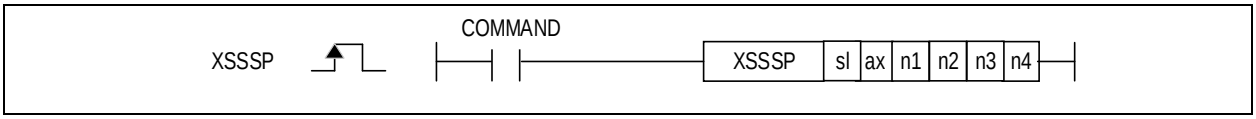
4.42.41 XSSSP / Position Specified Speed Synchronous

The basic operation of the command is the same as the speed synchronization, but when the set parameter position is reached, the speed synchronization ends.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSSSP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute direct start command : axis 1 ~ axis 8 ,9(encoder)	WORD
n1	Speed Synchronization main rate (-32,768 ~ 32,767)	INT
n2	Speed Synchronization subordinate rate (-32,768 ~ 32,767)	INT
n3	Speed Synchronization main setting : axis 1~ axis 8, 9(encoder)	WORD
n4	Speed Synchronization subordinate Position: -2,147,483,648 ~ 2,147,483,647)	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The position specified speed synchronization command is the same as the speed synchronization command. That is, at the set speed synchronization ratio, the same axis as the main axis movement pattern, the subordinate axis moves, and when the current position of the subordinate axis operation reaches the target position, the speed synchronization ends and stops immediately at that position.

(2) When the position specified speed synchronization command is executed, the subordinate axis is in the status of speed synchronization operation, and when the stop command is executed on the subordinate axis, the status of the speed synchronization operation of the subordinate axis is released.

(3) Ratio of Speed sync. is calculated as follows.
Speed synchronization ratio = Subordinate axis setting value/main axis setting value

(4) The operation direction of the sub-axis is determined by the sign of the speed synchronization ratio. If it is positive, it operates in the direction of the main axis, and if it is negative, it operates in the opposite direction of the operation of the main axis.The speed synchronization ratio can be changed even when the subordinate axis is in speed synchronization operation.

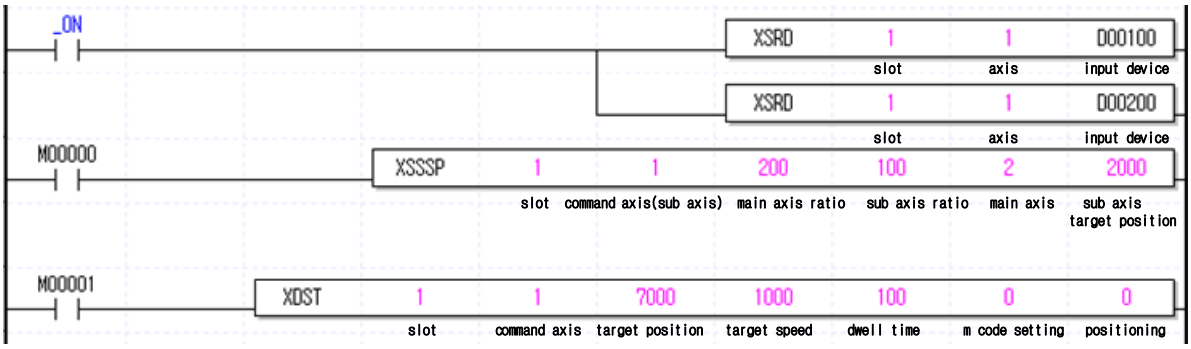
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

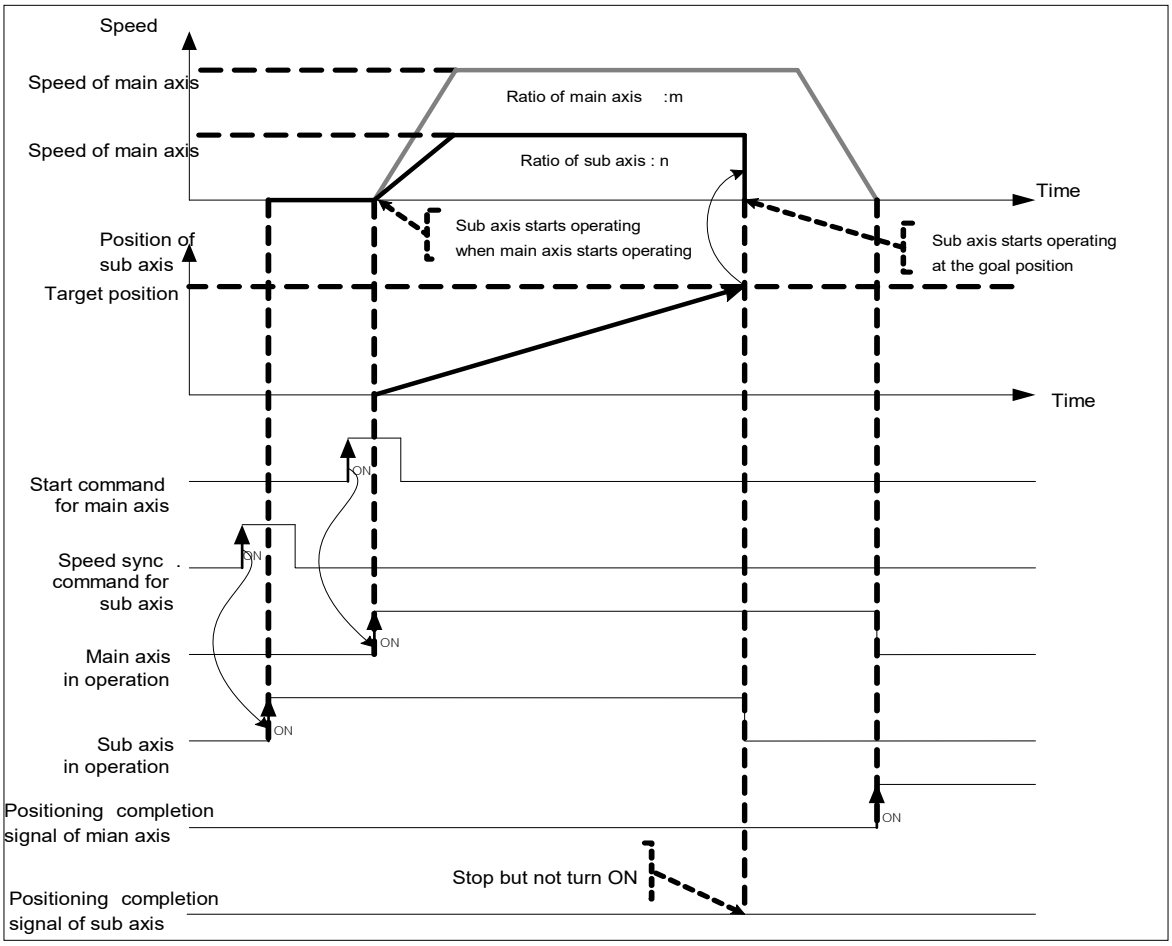
(a) Program that executes speed synchronous operation at the ratio of the main axis ratio:subordinate axis ratio 200:100 to the main axis of 2 axes, and executes the position-specified speed synchronization command to stop operation when the position reaches 2000 If M00001 is On while the homing of the positioning module installed in slot number 1 is determined.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XSSSP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*INT*), Num2:=(*INT*), Num3:=(*WORD*), Num4:=(*DINT*));

4) Caution

※ In the case below, position specified speed synchronization operation is not executed due to an error.

(1) The axis where the M code signal is on cannot execute the position specified speed synchronization command due to an error.(error code: 353)

(2) If the main axis and sub axis are set the same,, (Code: 355) will occur.

(1) The axis where the M code signal is on cannot execute the position specified speed synchronization command due to an error.(error code: 353) If the subordinate axis exceeds the speed limit value during position specified speed synchronous operation, deceleration stops with the basic parameter 'Dec. time of Emergent stop'.

(4) When changing the speed of the subordinate axis with the position specified speed synchronization command, be careful as the difference between the speeds before and after the change may cause shock to the machine and machine.

(5) A position specified speed synchronization command can be executed on the subordinate axis and an home return command can be executed on the main axis, but a position specified speed synchronization command cannot be executed on the subordinate axis while the main axis is in the home return operation.

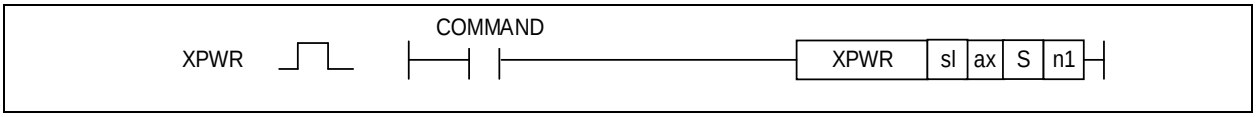
4.42.42 XPWR / Point Start Step Data Setting

This is the command to set the point step area for starting the point of this command to the value stored in the device.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XPWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	S	O	-	O	-	-	-	O	-	-	-	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of point operation step write command	WORD
S	The leading address of the device where the point operation step is stored.	WORD
n1	Number of writing point operation steps	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command sets the point operation step required when the positioning module performs point operation. Move the point operation step value to be used in the axis designated as ax of the positioning module designated by sl (slot number of the positioning module) from the CPU area designated as S to the ax axis of the positioning module.
Enable executing this command, if you use XPST command, the axis operates point operation.

(2) The number of point operation steps set in n1 is 1 to 20.

(3) The values read in the CPU area designated as S are as follows.

CPU area	Size	Point operation step
S	WORD	Point operation step 1
~		~
S+19	WORD	Point operation step 20

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

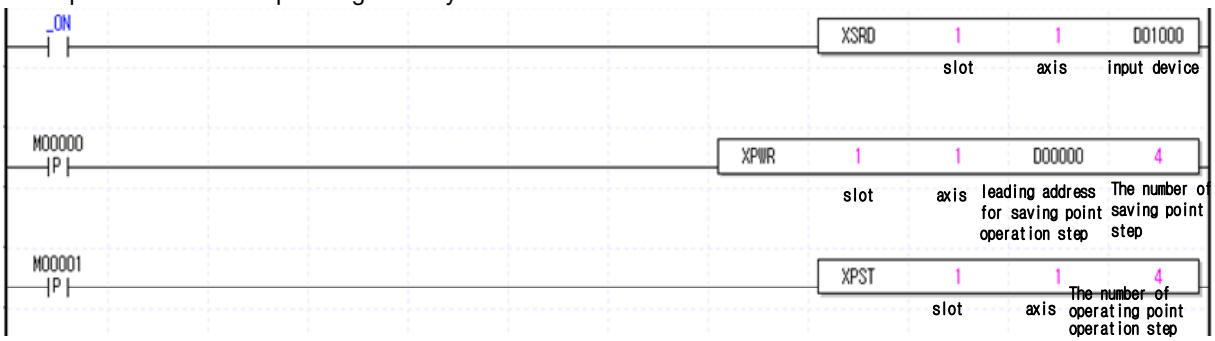
(a) If M00000 is On while the current axis is homing status, the point operation step write command XPWR is executed on axis 1.

At this time, the data stored in 4 words is used from the leading address of the point start step storage D00000.
(Point start step data 1 ~ 4 stored in D00000 ~ D00004 (WORD))

data	Device number	Point start step data
1	D00000	1
2	D00001	2
3	D00002	10
4	D00003	20

(b) Thereafter, when M00001 is ON, point operation commands XPST are performed with the following settings.

- Point step No.: Point operation steps 1, 2, 10, and 20 are executed from the 4 points operation points to be operated and the steps designated by the XPWR command.



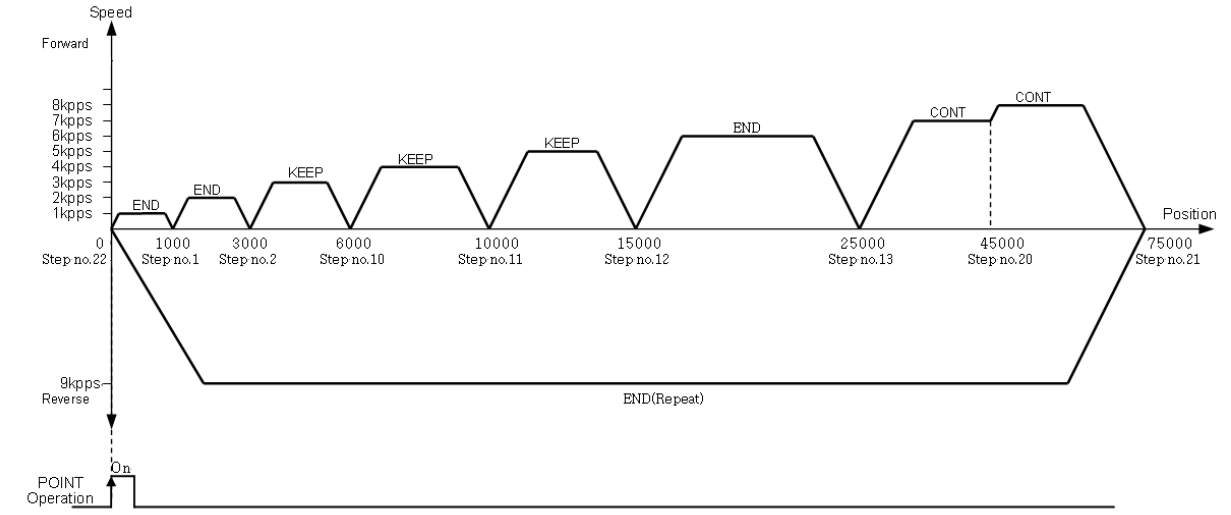
(c) Below is the 1-axis operation data set in XG-PM.
(Since keep/continuous/end operation is mixed, please refer to it when applying the operation method.)

■ Setting of XG-PM

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single,End	1000	1000	No.1	No.1	0	20
2	Absolute, Single axis position control	Single,End	3000	2000	No.1	No.1	0	20
10	Absolute, Single axis position control	Single,Keep	6000	3000	No.1	No.1	0	20
11	Absolute, Single axis position control	Single,Keep	10000	4000	No.1	No.1	0	20
12	Absolute, Single axis position control	Single,Keep	15000	5000	No.1	No.1	0	20
13	Absolute, Single axis position control	Single,End	25000	6000	No.1	No.1	0	20
20	Absolute, Single axis position control	Single, Continuous	45000	7000	No.1	No.1	0	0
21	Absolute, Single axis position control	Single, Continuous	75000	8000	No.1	No.1	0	0
22	Absolute, Single axis position control	Repeat,End	0	9000	No.1	No.1	0	0

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment
XPWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

(1) Before executing point operation(XPST), writing (XPWR) of point operation step must be done first.

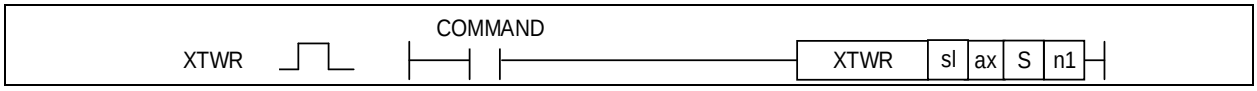
4.42.43 XTWR / Plural Teaching Data Setting

Plural teaching data setting area is a command to set teaching data. This command must be executed before executing multiple teaching commands.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XTWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	S	O	-	O	-	-	-	O	-	-	-	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of writing plural teaching data	WORD
S	The leading address of the device where the Plural teaching data is stored.	DWORD
n1	Amount of saving teaching data	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command sets the teaching data required when the positioning module execute plural teaching.

(2) Move the teaching data values to be used for plural teaching commands of the axis designated by ax of the positioning module designated by sl (slot number of the positioning module) from the CPU area designated by S to the ax axis of the positioning module by n1
If XTEAA instruction is used Enable executing this instruction, data teaching of the command axis is completed.

(3) The number of point operation steps set in n1 is 1 to 16.

(4) The values read in the CPU area designated as S are as follows.

CPU area	Size	Point operation step
S	DWORD	Teaching data 1
~		~
S+15	DWORD	Teaching data 16

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

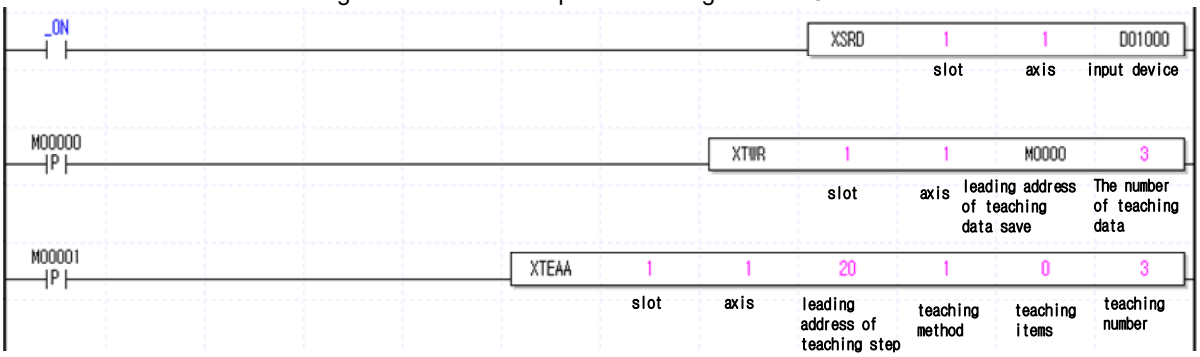
(1) LD: Ladder Diagram

(1) If M00000 is On while the current axis is ready, plural teaching data write command XTWR is executed on axis 1. At this time, the data stored in three DWORDs from the leading address M0000 of teaching data storage is used. (Plural teaching data 1 ~ 3 stored in M0000 ~ M0004 (DWORD))

Quantity	Device number	Teaching array data
1	M0000	2000
2	M0002	4000
3	M0004	6000

(b) Thereafter, when M00001 is ON, plural teaching commands XTEAA are executed with the following settings.

- Leading number of teaching step: From step 20, 3 steps, namely steps 20 to 22, are executed.
- Teaching method: ROM teaching is executed with “1” set.
- Teaching item: Plural teaching is executed with “0” set.(M0000~M0004(DWORD) set as XTWR)
- The number of Teaching: The number of steps for teaching is set to 3



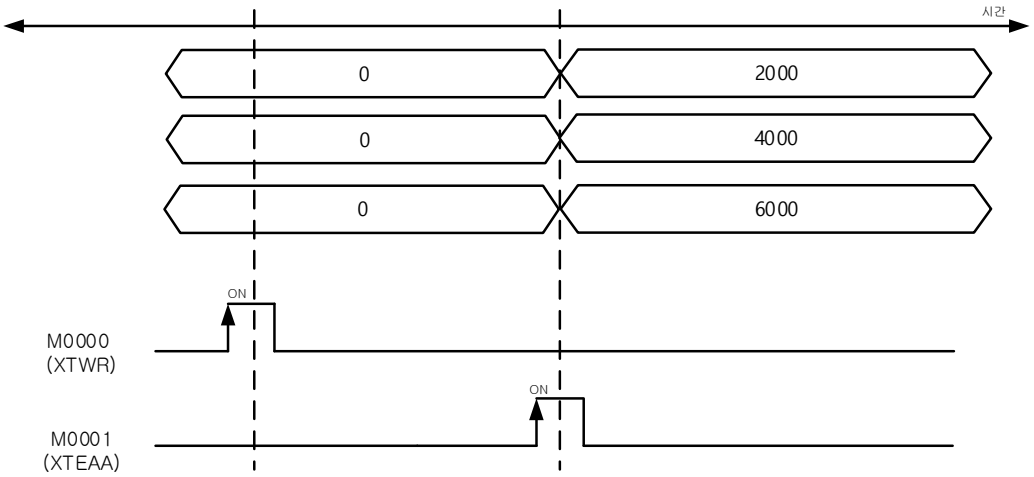
※ To read the status information of the axis, refer to the description of the XSRD instruction.

※ For details of the plural teaching command, refer to the description of the XTEAA command.

(2) Timer chart

※ Below is a timing chart for the example above.

- The current target position is set to 0.



(3) ST (Structure Text): Automatic program assignment

```
XTWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*), Num2:=(*WORD*));
```

4) Caution

(1) The plural teaching data must be set in the data setting area for teaching array before plural teaching command(XTEAA) executed.

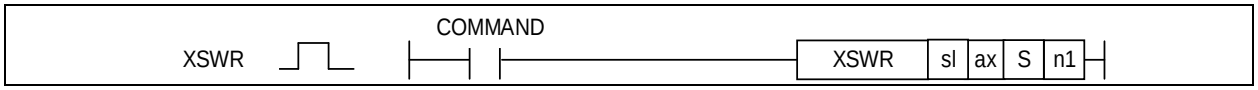
4.42.44 XSWR / Simultaneous Start Step Setting

This command sets the step data required when the positioning module execute simultaneous start.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	S	O	-	O	-	-	-	O	-	-	-	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
S	Name and number of the first device in the CPU where the synchronous start operation step is stored.	WORD
n1	Amount of saving teaching data(1~ 4)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command sets the step data required when the positioning module execute simultaneous start.

(2) Move the simultaneous start operation step value to be used in the axis designated as ax of the positioning module designated by sl (slot number of the positioning module) from n1 number of the CPU area designated as S to the positioning module.
If XSST instruction is executed during execution of this instruction, the simultaneous start of the command axes can be executed.

(3) The number of point operation steps set in n1 is 1 to 4.

(4) The values read in the CPU area designated as S are as follows.

CPU area	Size	Point operation step
S	WORD	Simultaneous start operation step 1
~		~
S+3	WORD	Simultaneous start operation step 4

2) Error

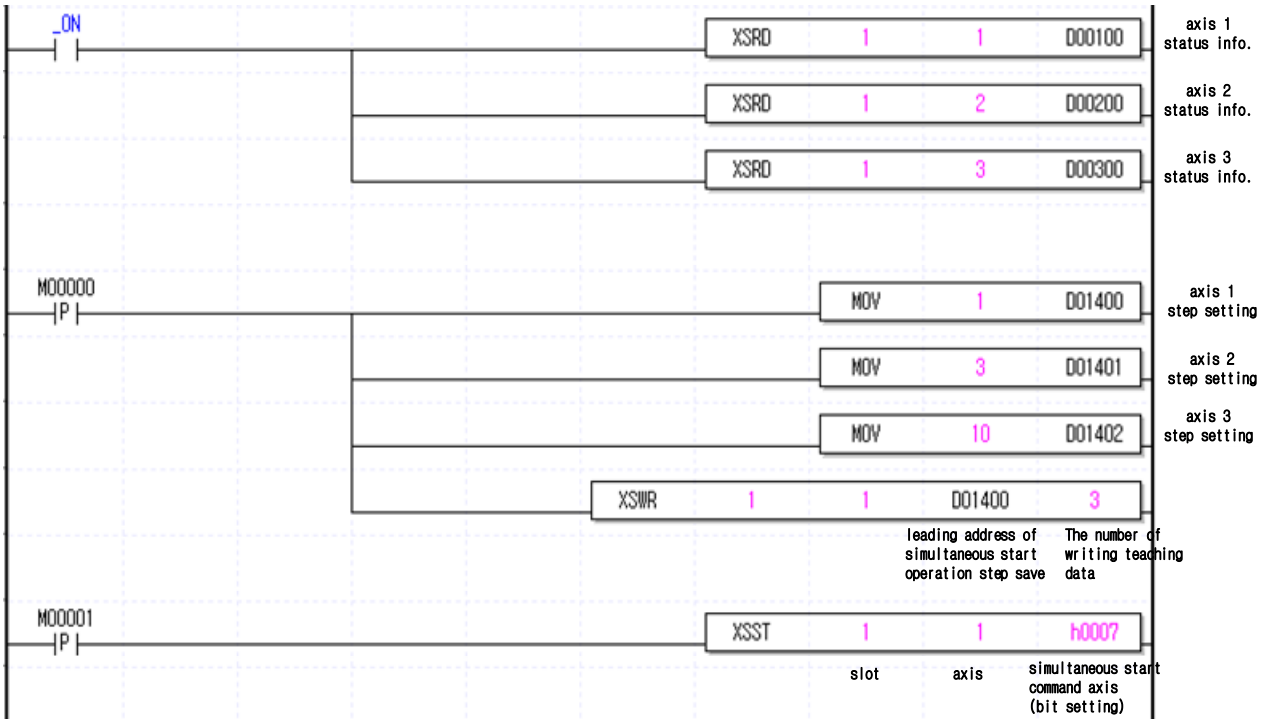
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

(a) If M00000 is turned on while the home is determined, the simultaneous start command is executed for the command axes 1, 2, and 3 axes.

(b) At this time, the operation setting value follows the operation data for step each axis in XG-PM below.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

<Setting items in XG-PM for simultaneous start>

▪ 1 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
1	Absolute, Single axis position control	Single, Continuous	1000	1000	No.1	No.1	0	0
2	Absolute, Single axis position control	Single,End	1800	800	No.1	No.1	0	100

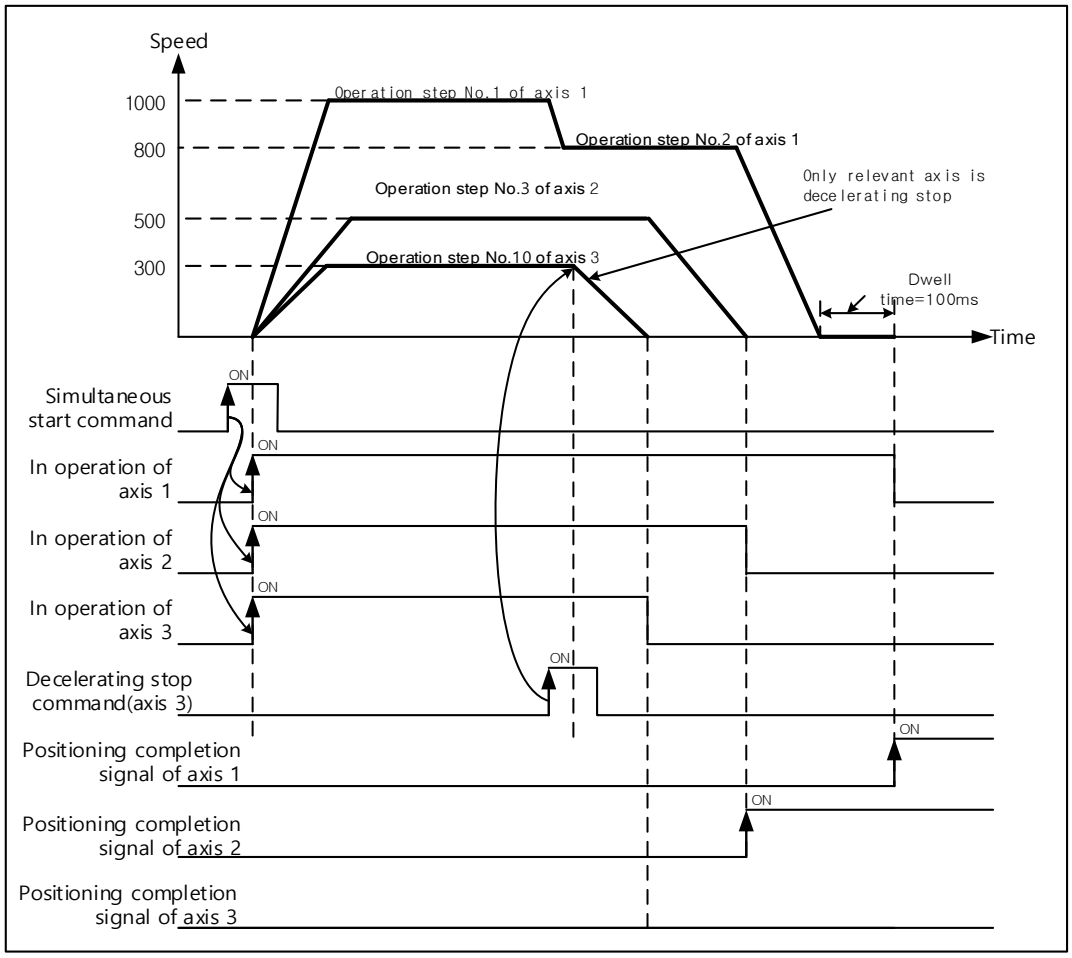
▪ 2 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
3	Absolute, Single axis position control	Single,End	900	500	No.2	No.2	0	0

▪ 3 Axis operation data

Step No.	Control method	Operation method	Target position [pls]	Operation Speed [pls/s]	Acc. No.	Deceleration Number	M code	Dwell time
10	Absolute, Single axis speed control	Single,End	1000	300	No.3	No.3	0	100

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XSWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

(1) The synchronous start step setting for each axis must be completed (XSWR) until the synchronous start command (XSST) is executed.

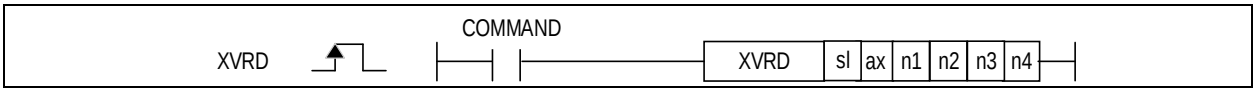
4.42.45 XVRD / Variable Data Read

This command is a command to read the desired data by directly designating the module's internal memory address such as command axis parameters, operation data and cam data.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XVRD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : axis 1 ~ axis 8	WORD
n1	Leading address of data in module internal memory to read	DWORD
n2	Offset between blocks (0 ~ 54217) * XGF-PNxB, XBF-PN0xB :0~65535	WORD
n3	Size of one block (1 ~ 128)	WORD
n4	No. of block to read (1 ~ 128)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is a command to read the data of “block size” set in n3 from the “read address” set in n1 of the positioning module internal memory among parameters, operation data and cam data into the CPU in WORD unit. If the number of “blocks” set in n4 is 2 or more, blocks that are separated from the “read address” by the “block offset” set in n2 are read in order of “number of blocks”-1 times.

(2) Max data size (Block size X No. of block) can be read with one command is 128 WORD.

(3) ” Variable data read“ can be executed in operation.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

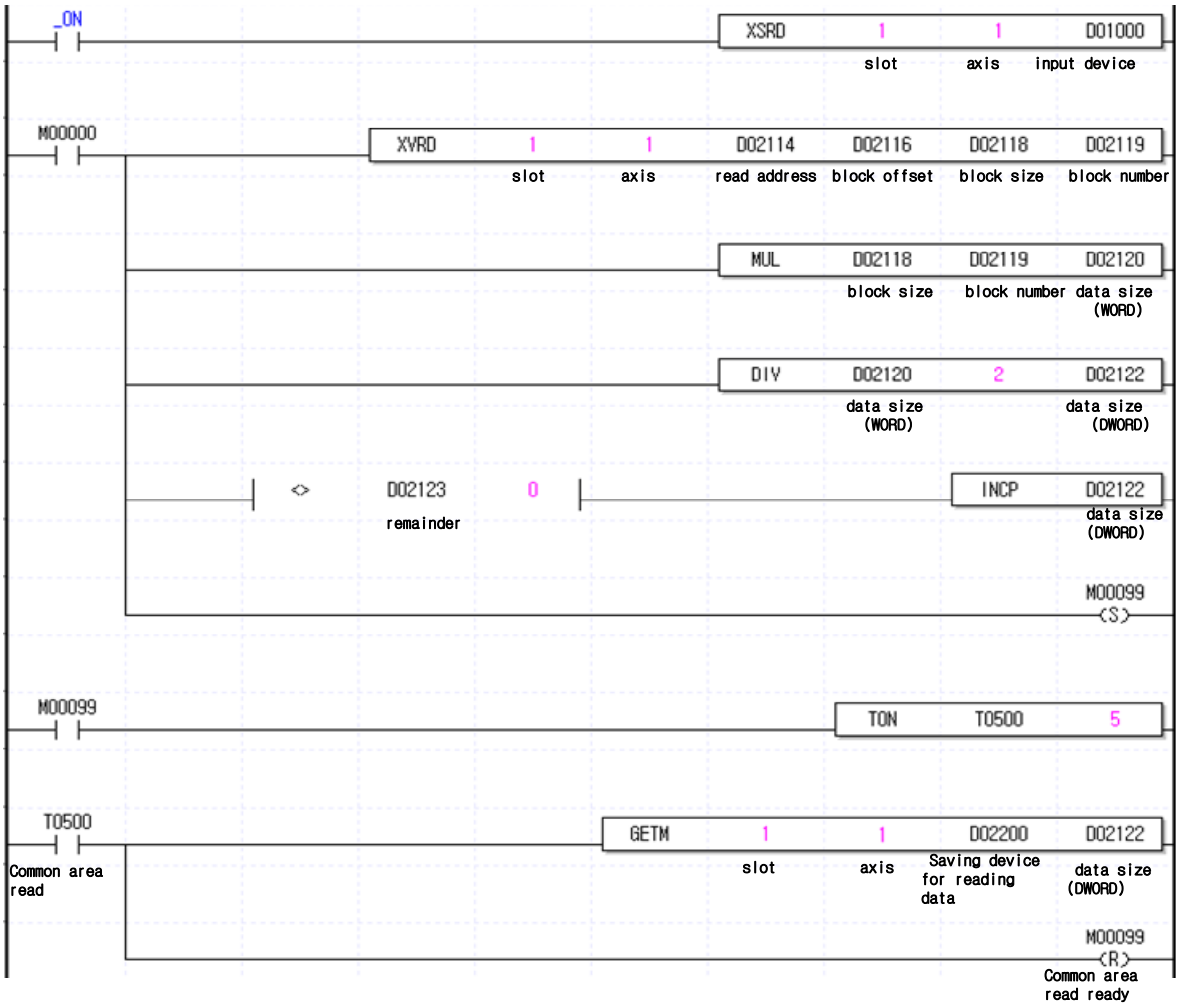
(1) LD: Ladder Diagram

(a) If M00000 is On while the axis is ready, a variable data read command is executed. Therefore ,It reads data starting '"Read address' set in D02114 by WORD unit into CPU. The number of data is D02118.

(b) If the number of “blocks” set in D02119 is 2 or more, blocks that are separated from the “read address“ set in D02114 by the “block offset” set in D02116 are read in order of “number of blocks”set in D02119 -1 times.

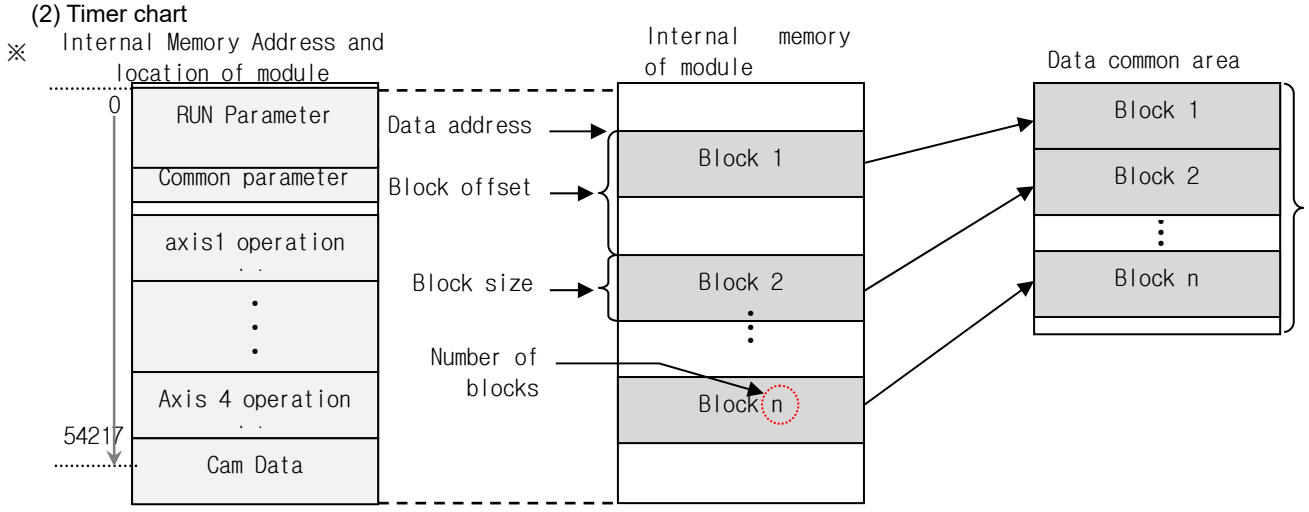
(c) Data size to be used for GETM is DWORD unit, so unit conversion is required. The data size (WORD) generated by the block size x number of blocks must be converted to the data size in DWORD units, and the conversion process of (DWORD) units is automatically calculated by MUL, DIV, and INCP instructions.

(c) If 5ms has elapsed since the contact M00000 (Variable Data Read Command (XVRD)) was executed, the T0500 contact is turned on and the data read from the data common area with the GETM command is saved as much as the data size specified from the start address D02200.



,

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XVRD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*), Num2:=(*DWORD*),
Num3:=(*WORD*), Num4:=(*WORD*));
```

4) Caution

※ You have to execute GETM command minimum 2ms after executing 'Variable data read' to save the read data in common

※ In the following case, error occurs and cannot execute 'Variable data read' command
Data setting error (Error code: 711)
- Read data size (Block size x No. of block) is 0 or higher than 128 WORD.
- Read data address [Read address + {block offset x (No. of block -1)} + Block size] is higher than last address value (54217)

※ If you execute Variable data read command in XGK PLC, Read data from positioning module is saved in common area. To save in device for using in PLC program, use GETM command [Read address: 0, data size: Read data size (DWORD)]
In XGK/XGR PLC, Read data is saved in register set in Function Block automatically.

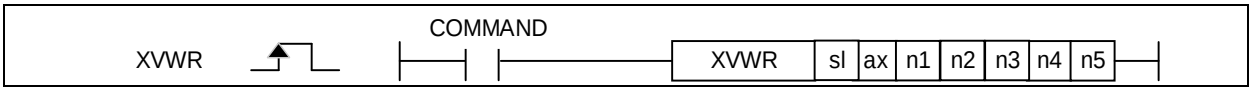
4.42.46 XVWR / Variable Data Write

This command is a command to write the desired data by directly designating the module's internal memory address such as command axis parameters, operation data and cam data.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XVWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Leading address where data to write is saved.	WORD
n2	Leading address to write module internal memory data	DWORD
n3	Offset between blocks (0 ~54217) * XGF-PNxB, XBF-PN0xB :0~65535	WORD
n4	Size of one block (1 ~ 128)	WORD
n5	No. of block to read (1 ~ 128)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Writes the data of “block size” from the “write address” position among the parameters, operation data, and cam data of the positioning module internal memory in the data set in the PLC program (in WORD units). In case 'No. of block' is higher than 2, writes blocks with interval of 'OFFSET' starting 'Write address' as many as 'CNT'-1.

(2) Max data size (Block size X No. of block) can be read with one command is 128 WORD.

(3)“Variable data write” command cannot be executed in operation.
But 'Read Variable Data' command can be executed to User CAM data in User CAM operation.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

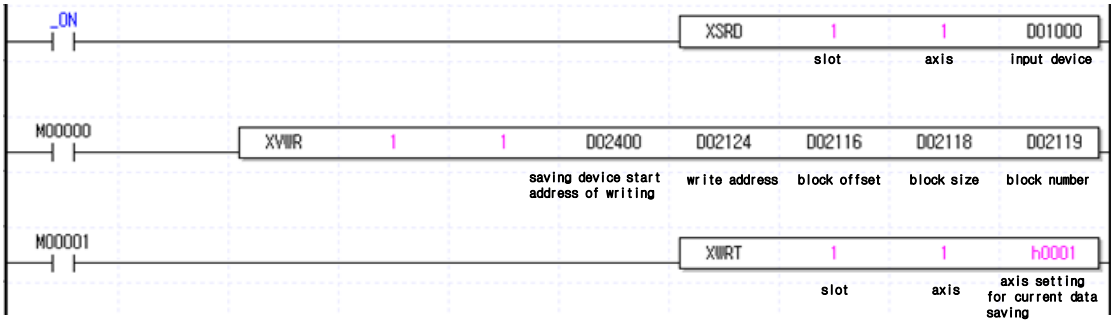
3) Example

(1) LD: Ladder Diagram

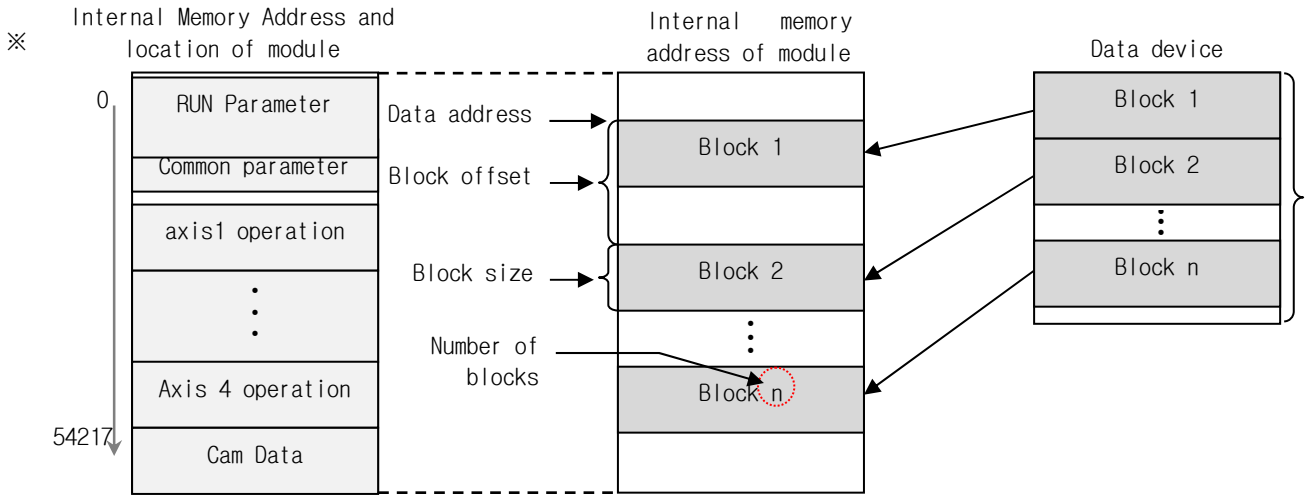
(a) If you turn M00000 on while the axis is ready, From the position set in D02124 among the parameters, operation data and cam data of the positioning module internal memory, the data of the “block size of D02128 is specified in PLC D02400 and written in WORD unit with the program.

(b) If the number of “blocks” set in D02119 is 2 or more, blocks that are separated from the “write address“ set in D02124 by the “block offset” set in D02116 are write in order of “number of blocks”set in D02119 -1 times.

(c) When the M0001 contact is On, the “Parameter/Operation Data Save” command (XWRT) is executed and the data changed by variable data writing is retained even after the power is cut off.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XVWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*DWORD*), Num3:=(*DWORD*), Num4:=(*WORD*), Num5:=(*WORD*));

4) Caution

※ In case you execute 'Variable data write', the changed value is kept during power on. So, to save the data, execute 'Parameter/operation data save (XWRT)' command.

※ In the following case, error occurs and cannot execute 'Variable data write' command

(1) Data range setting error (Error code: 711)

- Write data size (Block size x No. of block) is 0 or higher than 128 WORD
- Write data address [Write address + {block offset x (No. of block -1)} + Block size] is higher than last address value (54217)

(2) Block overlap error (Error code: 713)

- In case module internal block to write is overlapped each other(In case no. of block is higher than 2, block offset is smaller than block size).

(3) Execution inhibition error in operation (Error code: 712)

- When one axis of the positioning module is operating.

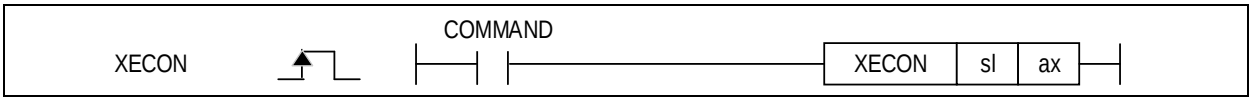
4.42.47 XECON / Servo Connection

This command is for communication connection between positioning module and servo drive disconnected by EtherCAT cable.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XECON	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute servo Connect command:1~8(real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to give connecting EtherCAT communication to positioning module.
(2) The connecting EtherCAT communication command is executed on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module Command.
(3) If the link up/down information is used as the input condition contact of the servo connection command, the servo connection command can be executed only when the cable is connected.
(4) In the program, the servo connection command is not executed for each axis, but only for one command axis of the 1 to 8 axes.
(5) Be careful when writing a program because the instruction execution time is long when connecting to the servo. (L7NH 8 axis standard execution time takes up to 2.4 seconds)
(6) If the servo drive is connected normally, the bit corresponding to the connected axis of the U device is set.

Axis	Signal direction: PLC CPU ← positioning module	
	Input Signal	Content
Axis 1	Uxx.00.0	Operation Ready of axis 1
Axis 2	Uxx.00.1	Operation Ready of axis 2
Axis 3	Uxx.00.2	Operation Ready of axis 3
Axis 4	Uxx.00.3	Operation Ready of axis 4
Axis 5	Uxx.00.4	Operation Ready of axis 5
Axis 6	Uxx.00.5	Operation Ready of axis 6
Axis 7	Uxx.00.6	Operation Ready of axis 7
Axis 8	Uxx.00.7	Operation Ready of axis 8

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

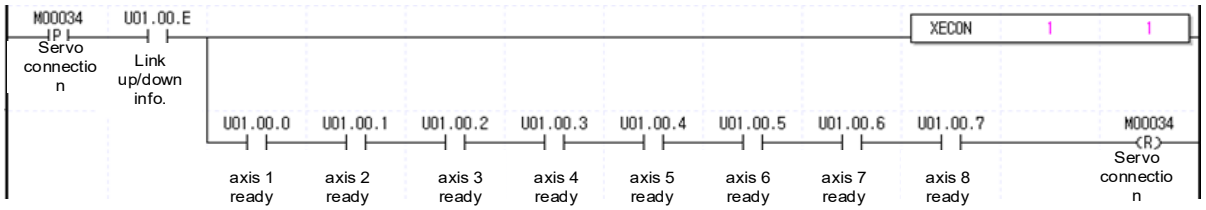
3) Example

(1) LD: Ladder Diagram

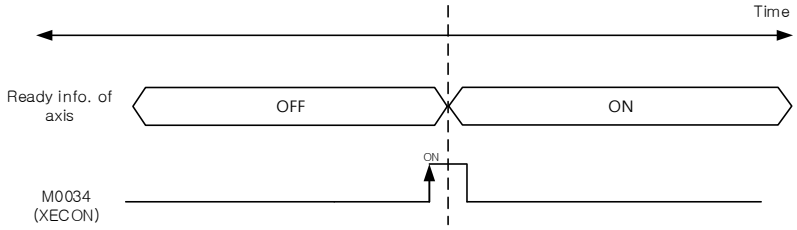
※ A program that connects the communication between the positioning module installed on slot number 1 and the servo drive.

(a) If M00034 is turned on while the servo power is on, the servo is connected to the 1-8 axes of the. module.

(b) When the servo is connected, the M00034 input contact is turned OFF.



(2) Timer chart



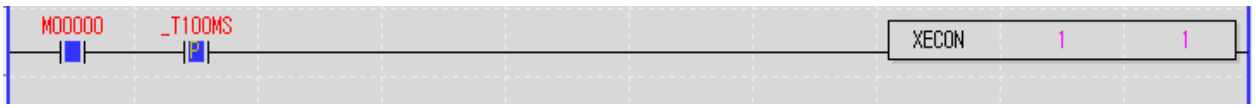
(3) ST (Structure Text): Automatic program assignment

```
XECON_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ If the servo connection command is used as follows, other command execution on the command axis (1 axis) may not be executed intermittently.

➔ Do not retry servo connection using TxxS flag
(Because different commands are executed on the same axis in the same scan.)



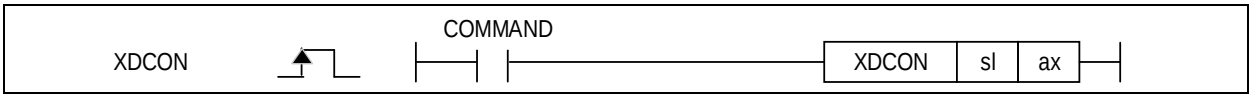
4.42.48 XDCON / Servo Disconnection

This command is for communication connection between positioning module and servo drive disconnected by EtherCAT cable.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XDCON	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute servo disconnect command:1~8(real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(2) This command is to disconnect communication between positioning module and servo drive.

(2) The disconnecting EtherCAT communication command is executed on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module Command.

(3) If the servo Disconnect connected normally, the bit corresponding to the connected axis of the U device is clear.

Axis	Signal direction: PLC CPU ← positioning module	
	Input Signal	Content
Axis 1	Uxx.00.0	Operation Ready of axis 1
Axis 2	Uxx.00.1	Operation Ready of axis 2
Axis 3	Uxx.00.2	Operation Ready of axis 3
Axis 4	Uxx.00.3	Operation Ready of axis 4
Axis 5	Uxx.00.4	Operation Ready of axis 5
Axis 6	Uxx.00.5	Operation Ready of axis 6
Axis 7	Uxx.00.6	Operation Ready of axis 7
Axis 8	Uxx.00.7	Operation Ready of axis 8

(4) In the program, the servo disconnection command is not executed for each axis, but only for one command axis of the 1 to 8 axes.

(5) The command axis, ax, is an axis commonly used for positioning command commands, and does not specify the command axis that is actually connected.

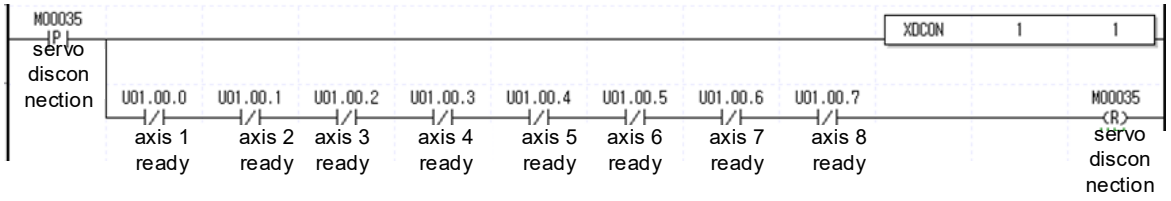
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

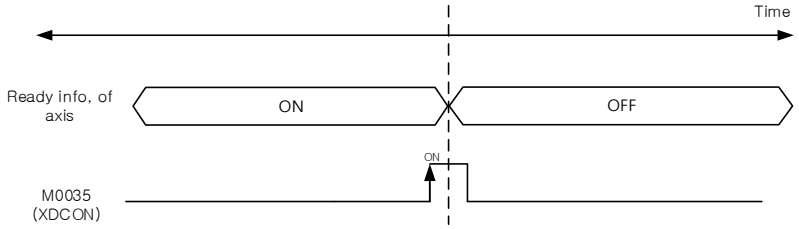
3) Example

(1) LD: Ladder Diagram

(a) If the module and servo drive are connected with the EtherCAT cable and the servo power is on, if M00035 is turned on, the servo connection with the 1-8 axes of the module will be disconnected.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XDCON_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ If the servo connection command is used as follows, other command execution on the command axis (1 axis) may not be executed intermittently.

➔ Do not retry servo disconnection using TxxS flag
(Because different commands are executed on the same axis in the same scan.)

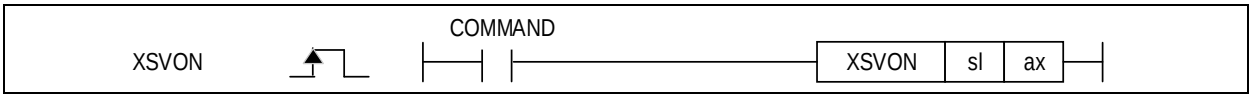
4.42.49 XSVON / Servo On

This command is executed while the positioning module and servo drive are connected, and is a command to turn on the servo.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XDCON	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute servo on command:1~8(real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The Servo On command is executed on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module).
(2) This command is only executed while the positioning module and servo drive are connected.
(3) The motor can be operated only when the servo is on.
(4) Servo on command must be executed for each axis.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

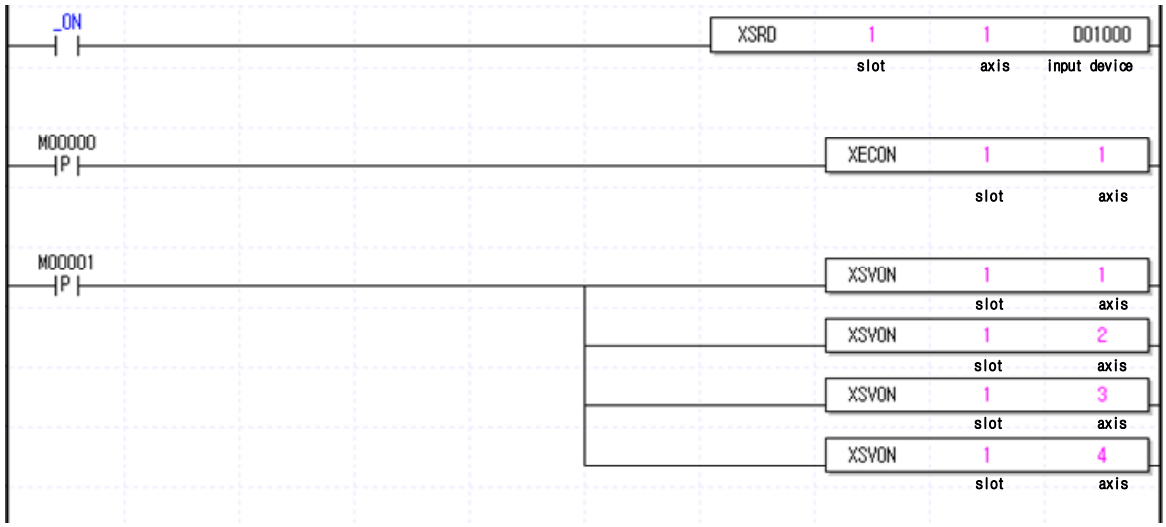
3) Example

(1) LD: Ladder Diagram

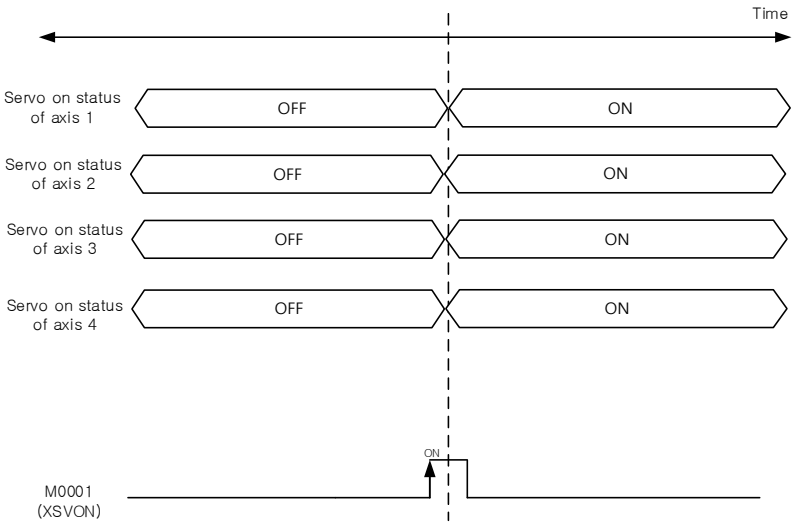
(a) If the module and servo drive are connected with the EtherCAT cable and the servo power is on and M00000 is turned on, the servo and the module currently connected by cable are connecting. Here, the axis set in XECON is nominal axis information.

(b) If M00001 is On when Servo is connected, Servo Drive of 1~4 axes will be converted to Servo On state.

(c) In the servo-on state, a dedicated command for the positioning module is executed and axis control is possible.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XSVON_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ Servo parameters cannot be written in Servo On state.
When using servo parameters, connect servos in the servo OFF state.

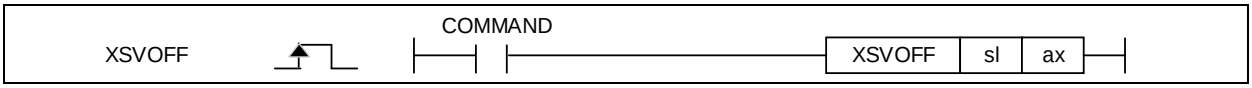
4.42.50 XSVOFF / Servo Off

This command is a command to "servo off" the servo drive of the corresponding axis among servo drives connected to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSVOFF	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute servo on command:1~8(real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command turns off the servo in the servo-on state connected to the positioning module.
(2) The Servo Off command is executed on the axis designated by ax of the positioning module designated by sl (slot number of the positioning module).
(3) When the servo is off, the motor cannot be operated.
(4) If the servo is off and the servo is connected, the servo parameters can be written.
(5) Servo Off command must be executed for each axis.

2) Error

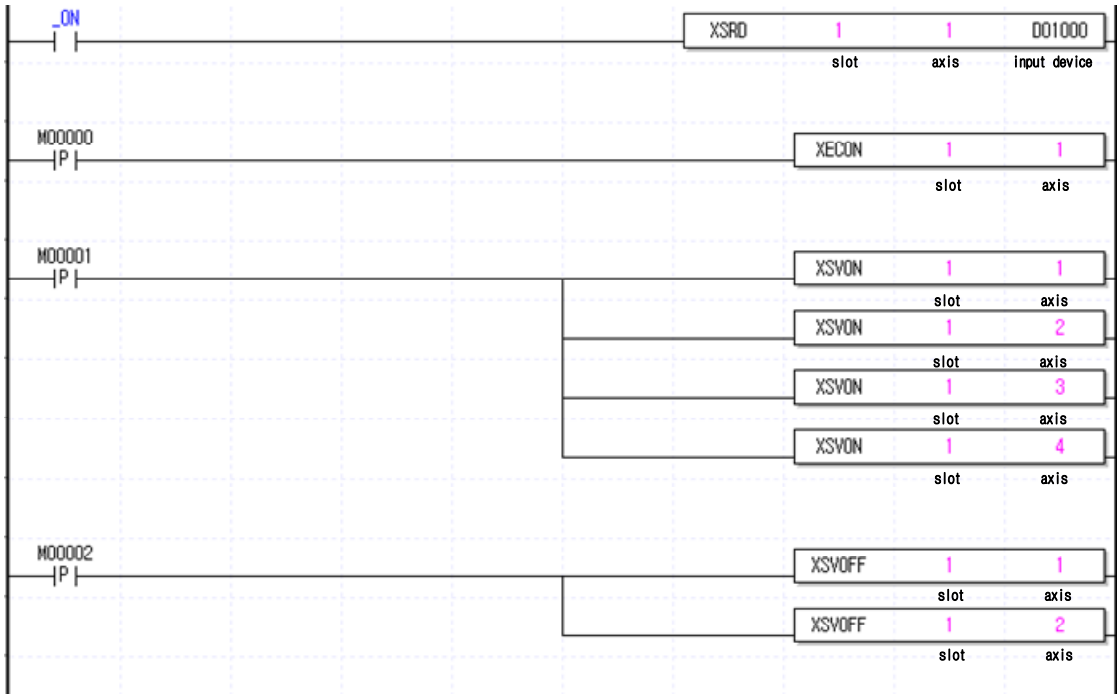
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

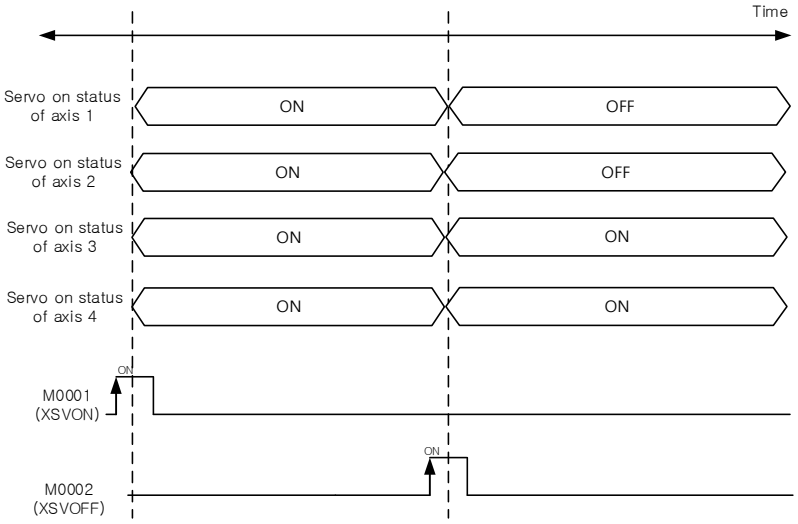
(1) LD: Ladder Diagram

(a) Servo is connected by M00000 input contact On, and 1~4 axis servo is turned on by M00001 input contact On.

(b) If M00002 is On while Servo is On, only 1~2 axes are turned OFF by XSVOFF.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XSVOFF_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));

4) Caution

※ Servo parameters cannot be written when the servo is off and the servo is disconnected.
When using servo parameters, execute the servo while it is connected and the servo is off.

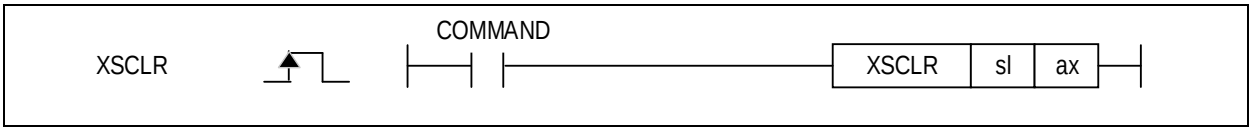
4.42.51 XSCLR / Servo Error Reset

This command is a command to "clear alarm" the servo drive of the corresponding axis among servo drives connected to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSCLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute servo error reset command:1~8(real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is a command to Servo error reset to positioning module.

(2) The Servo error reset command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).

(3) If the servo error reset command is executed without eliminating the cause of the servo drive alarm, the servo drive alarm may not be cleared. Therefore, the cause of the servo drive alarm must be eliminated and the servo error reset command must be executed.

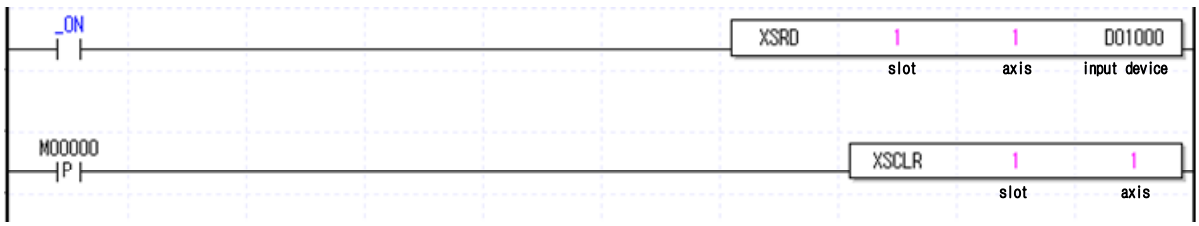
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

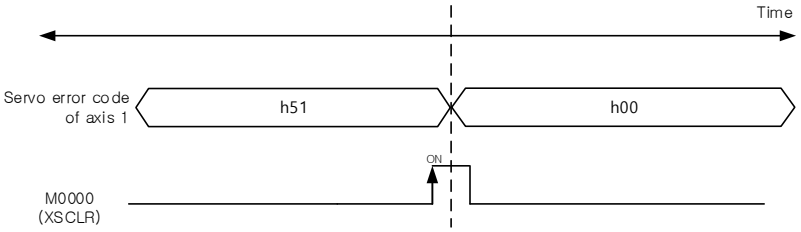
3) Example

(1) LD: Ladder Diagram

(a) A program to command Servo drive alarm reset to the axis 1 of the position module installed in slot number 1 when the input signal M00000 is On.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XSCLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

※ In the case of XGF-PN4B/XGF-PN8B, there are servo errors that cannot be reset depending on the type of error among EtherCAT servo drives, so please refer to the servo drive instruction manual.

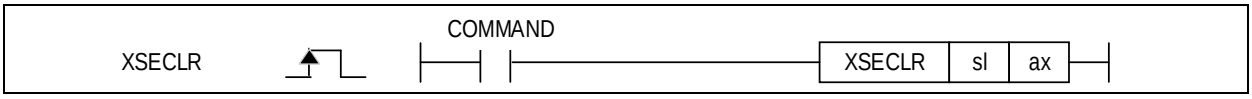
4.42.52 XSECLR / Servo Error History Reset

This command is a command to Error history reset of Servo drive in the corresponding axis among servo drives connected to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSECLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute servo error history reset command:1~8(real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command clears all the servo drive alarm histories that occurred in the relevant axis among servo drives.
(2) The Servo error history reset command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).
(3) The servo drive stores up to 10 servo alarm histories.

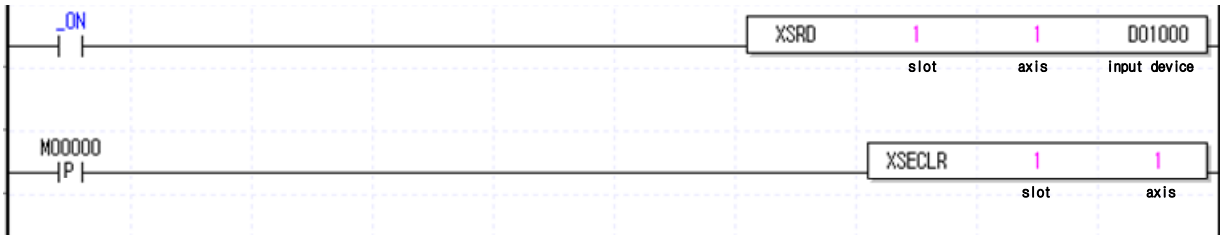
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

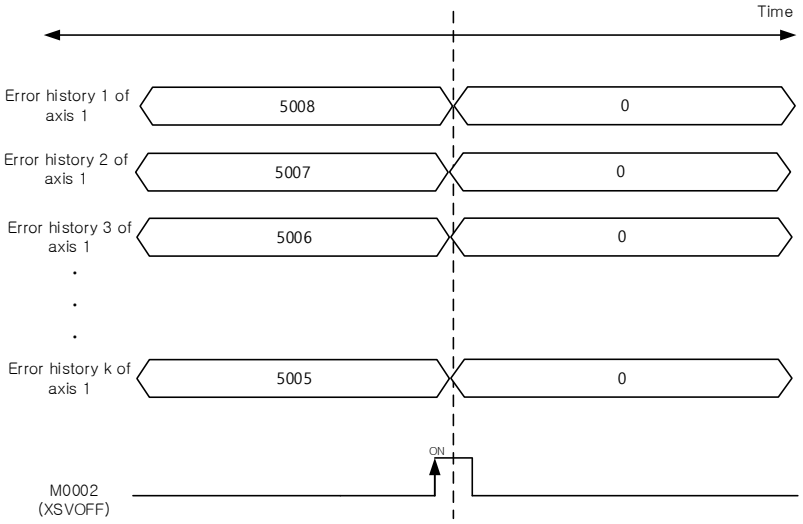
3) Example

(1) LD: Ladder Diagram

(a) A program to command Servo drive error history reset to the axis 1 of the position module installed in slot number 1 when the input signal M00000 is On.



(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XSECLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

4) Caution

(1) For XGF-PN4B/XGF-PN8B, servo error history reset is not supported.

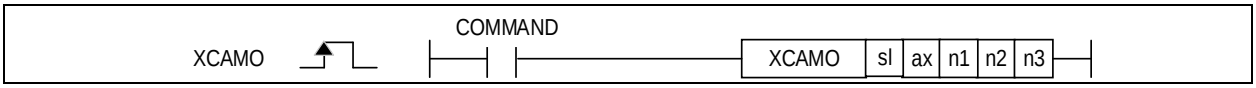
4.42.53 XCAMO / Main Axis offset-specified CAM Operation

The subordinate cam control is executed with the set cam data in synchronization from the position where the offset is applied to the position of the axis set as the main axis.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XCAMO	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Cam command axis: 1~8 (real axis)	WORD
n1	Main axis : 1~8 (real axis)	WORD
n2	Cam data block to apply to operation (1 ~ 9)	WORD
n3	Main axis position to start CAM operation of subordinate axis	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

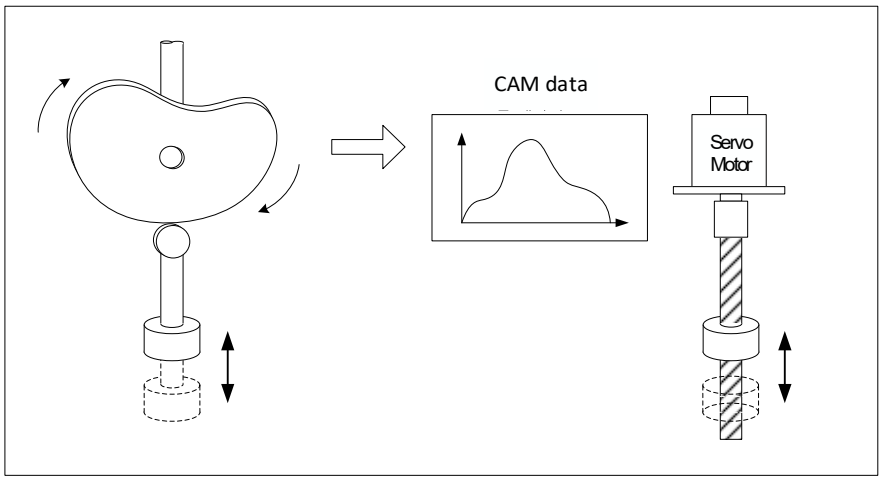
Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) Cam operation converts mechanical cam motion into cam data represented by cam curves, and executes cam axis control in synchronization with the position of the motor set as the main axis.

(2) It commands to operate CAM with CAM data of n2, with n1 axis as the main axis for the sub-axis designated as ax. At this time, the sub axis cam control designated by ax is applied after the main axis is moved by the offset specified by n3.

(3) Cam data can be set in the cam data in the project window of XG-PM and must be written to the positioning module before starting cam operation.



(4) In order to use user CAM operation, you have to set CAM block number 9.
(5) In case of user cam operation, user cam data can be changed by variable data write command even during operation.
(6) In the case of user cam operation, it is operated by setting the cam data in the device in the PLC program rather than setting the cam data in XG-PM, and the number of cam data is 30.
(7) For more information on user CAM operation setting, please refer to Chapter Use 9 User Cam Operation of the Module.
(8) CAM data point can be saved at the specified memory address of each axis by using 'Write Variable Data' (XVWR) command.
(Refer to chap 2 User CAM data memory address.)

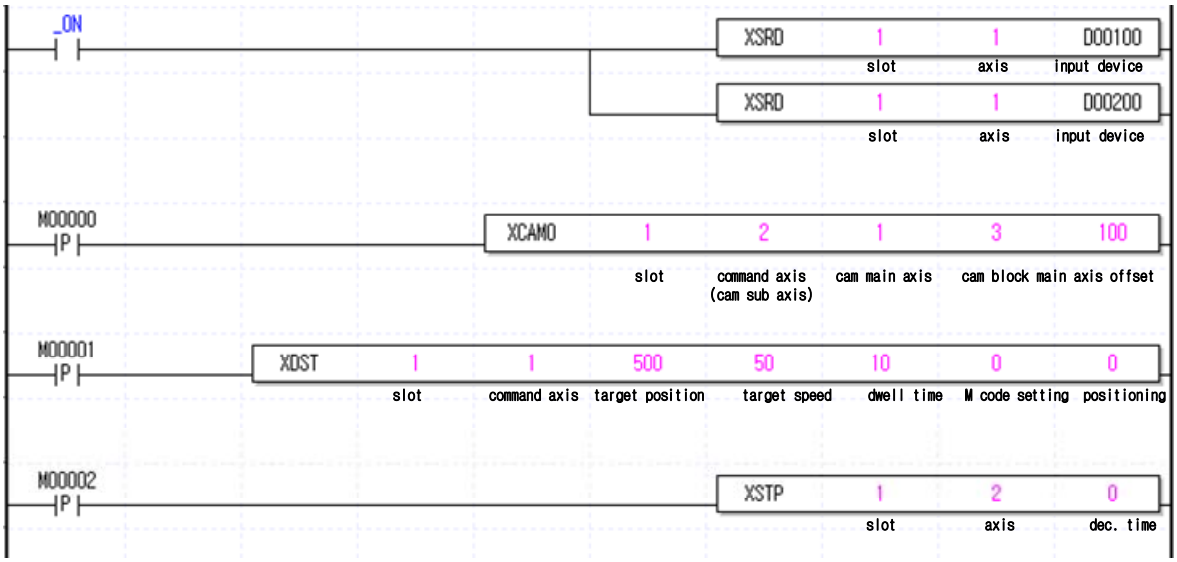
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

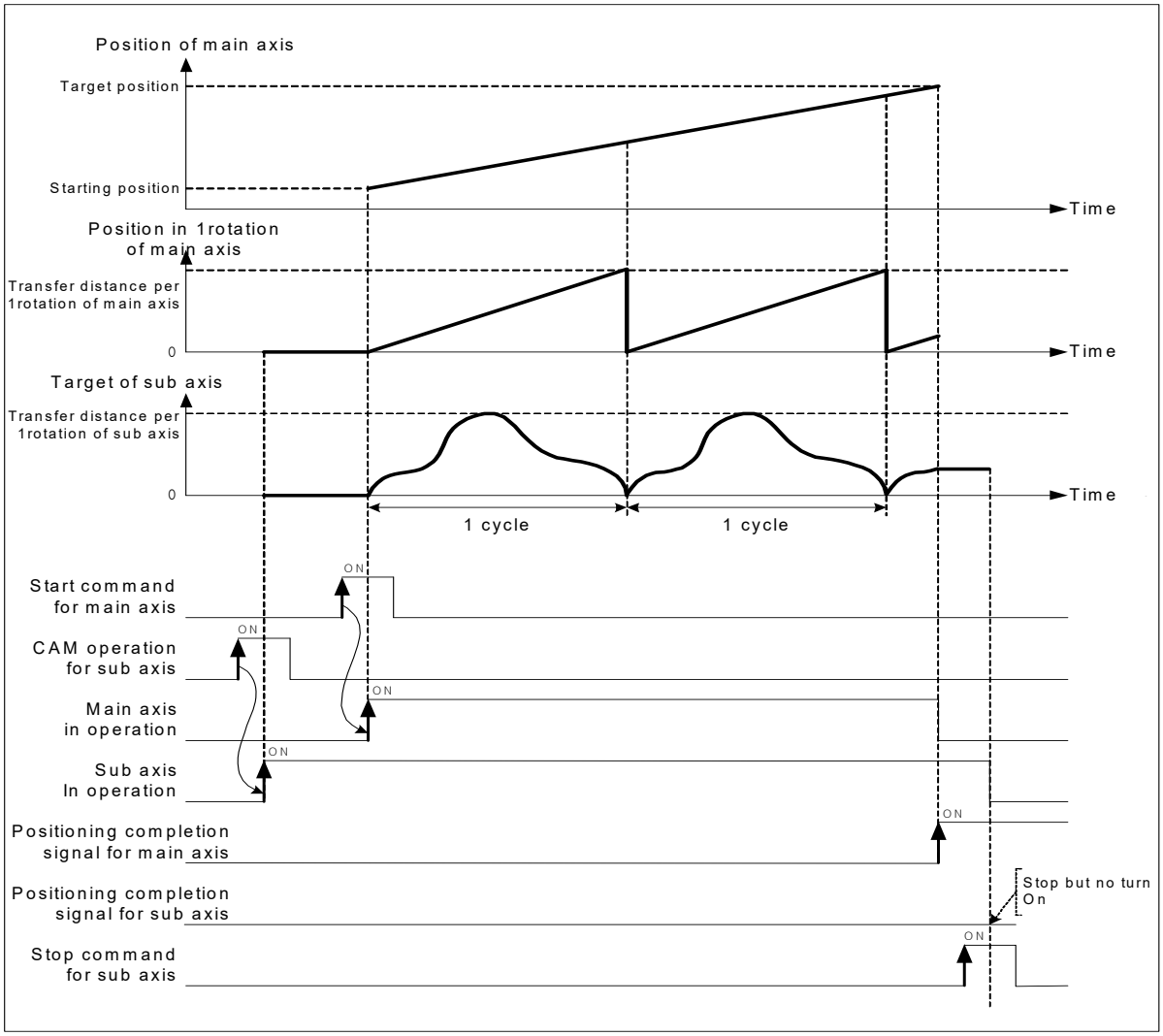
(1) LD: Ladder Diagram

(a) When M00000 is On, the cam control main/sub axis and main axis offset are set. Cam control sub axis/main axis setting is indicated in the state
(Cam control subordinate axis: axis 2, Main axis 1, cam control block 3 setting,main axis offset:100)
(b) When M00001 is turned on in the homing state, the main axis starts at the target position 500 at the target speed of 50, and when the target position is reached, positioning completion is end after 10 ms of dwell time.
(c) If you look at the position within one revolution of the main axis, when the operation of the main axis starts, the “current position within one rotation of the main axis” increases to the “number of pulses per revolution-1” set in the parameter, and then becomes 0 again. It repeats with the position value of 0 ~ “Number of pulses per revolution-1”.
(d) After moving by the main axis offset set in the XCAMO command, the subordinate axis executes cam control operation according to the set cam profile.
(e) When the M00002 contact is on, the sub axis cam control is released by the deceleration stop command.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XCAMO_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*DINT*));

4) Caution

(1) The time when the changed user cam data is reflected is after one cycle of the currently operating user cam data is completed.

(2) When set CAM block data after point unit setting, 'Ending position of main axis' must be set as positive multiple number of point unit. For example, if the unit of main axis is 'degree' and point unit is 10, 'Ending position of main axis' must be set as multiple number of 10 like 40, 90, 180, ….

※ CAM operation command may not be executed in the cases below.

- If execute CAM operation command in being On of M code, error (702) occurred.
- If the set main axis is not a settable axis or if the main axis setting is set equal to the command axis, an error (704) occurs.
- If speed of main axis is too fast and speed of sub axis exceeds speed limit, error (708) occurred.
- In the case that the speed of main axis exceeds the speed limit, error arises and it decelerate in」 Dec. time of emergent stop'.

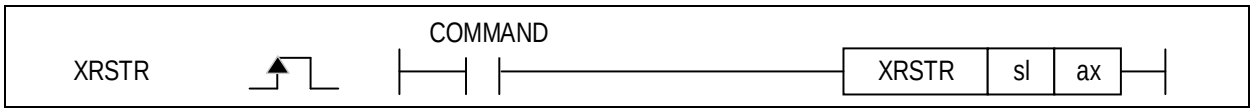
4.42.54 XRSTR / Restart

This command is used to restart the stopped axis using the deceleration stop during positioning operation to the previous set value.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XRSTR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This is the command that makes the servo restart with position data set up at previous operation after it stops with DEC. stop

(2) In case of decelerating stop due to the stop factor during positioning operation, operation can be resumed from the position stopped with the “restart” command to the target position with the previous operating conditions. However, restart is valid when the previous operation was “direct start” and “indirect start”

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

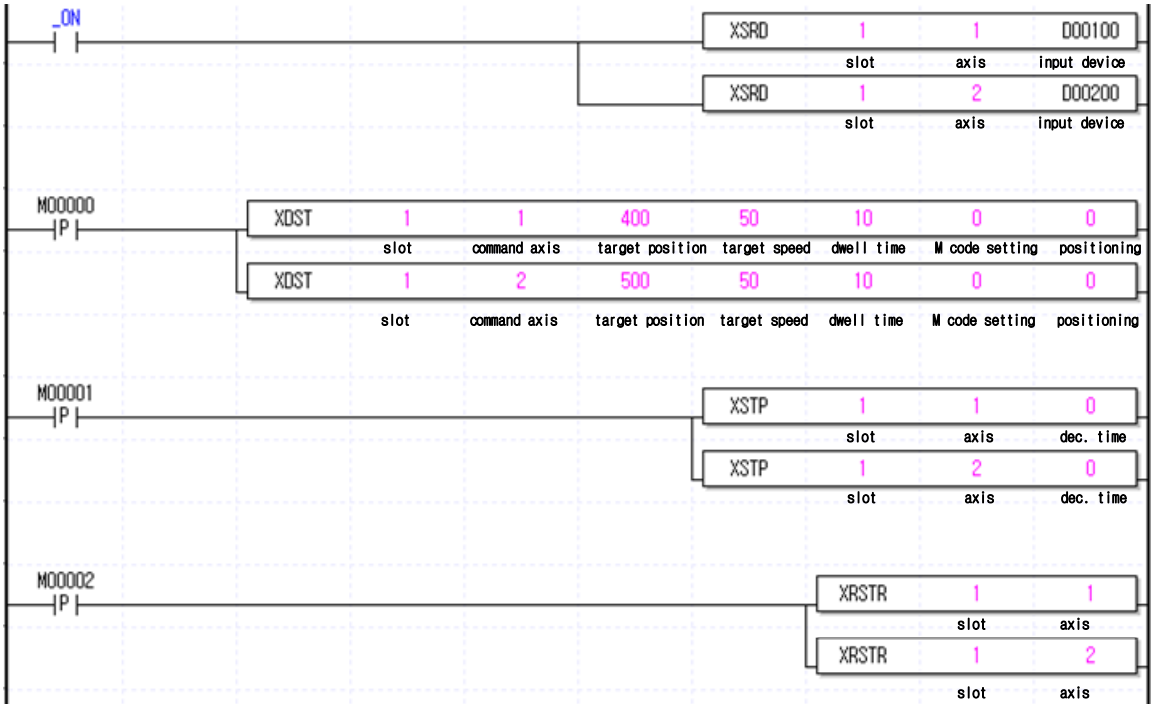
3) Example

(1) LD: Ladder Diagram

(a) Position control starts at the point where the home is determined and the current position is 1-axis: 100, 2-axis: 100.
When M00000 is On, position control is executed at the speed set as Axis 1: Target Position 400, Axis 2: Target Position 500.

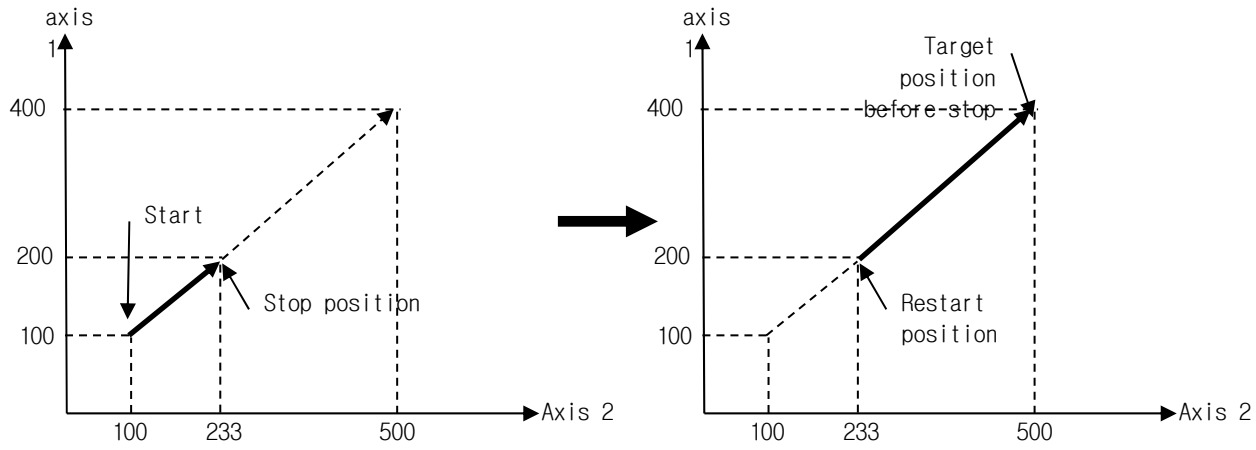
(b) When M00001 is On, the operation state is changed from position control to stop state by deceleration stop at the point of axis 1:200 and axis 2:233.

(c) When M00002 is On, axis 1 and axis 2 are restarted with the target position, speed, dwell time, M code and control word previously set by the XDST command, and positioning is completed when reaching the set target position.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



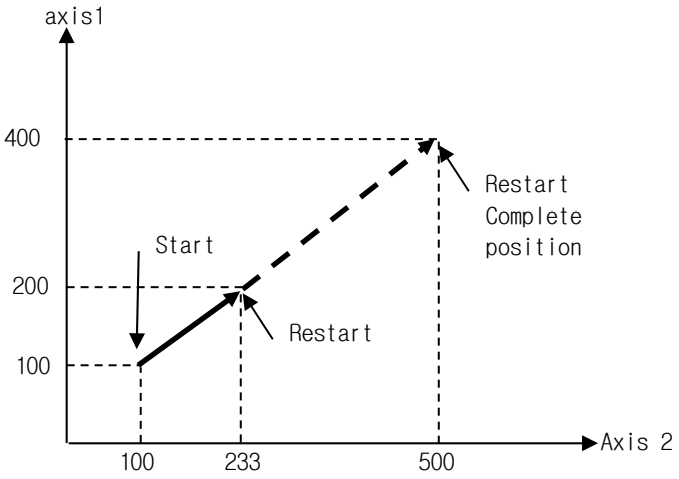
(3) ST (Structure Text): Automatic program assignment

```
XRSTR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*));
```

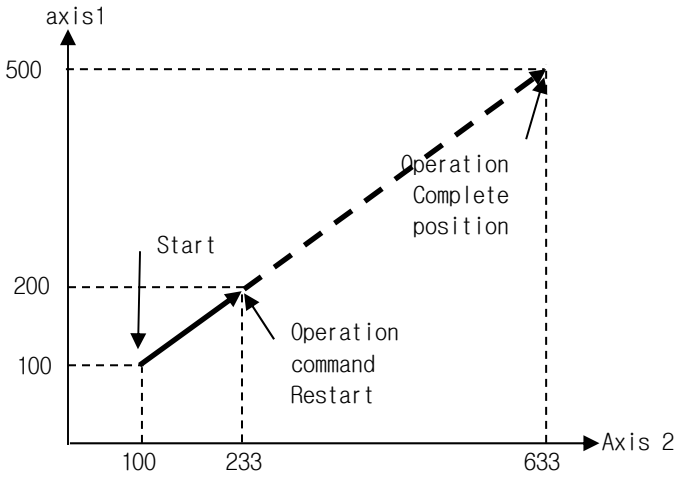
4) Caution

(1) It is unavailable to be executed when the axis is operating.
(2) If you start the axis with commands other than Restart after it stops with DEC. stop, Restart will not be executed
(3) Deceleration stop
When indirect start after deceleration stop, operate positioning as set operation step.
In case of using with mode, Signal 'On' of M code has to 'Off' for restart.
Turn off the M code On signal with the 「M code release (XMOF)」 command before starting.
(4) Restart after Internal/External emergency stop
In case of emergency stop, signal On of M code will automatically be Off,, therefore can operate positioning as set operation step, when it operate indirect start.

(5) Difference between a restart when the drive is stopped while driving in relative coordinates and a previous operation command.



< Restart after stop >



< Re-executing operation command after stop >

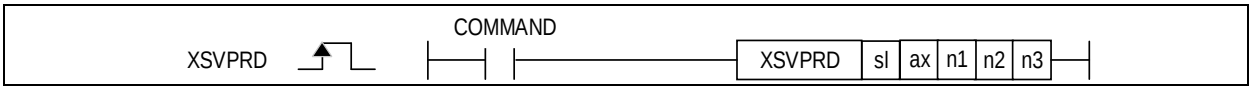
4.42.55 XSVPRD / Servo Parameter Read

This command is for reading the parameter (CoE Object) value of the servo drive connected to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSVPRD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Servo parameter Index (0x1000 ~ 0x9FFF)	WORD
n2	Servo parameter Subindex (0x00 ~ 0xFF)	WORD
n3	Servo parameter Length (Byte) (1~4)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is for reading the parameter (XGF-PN8B: CoE Object) value of the servo drive connected to the positioning module.

(2) Executes the command to read the parameter (CoE Object) value specified by n1, n2, n3 among the servo parameters of the command axis of the positioning module.

(3) It is available to be executed when the axis is operating.

(4) The n1 value is a parameter address for XGF-PN8A, and can be set as follows for XGF-PN4B/XGF-PN8B (XBF-PN04B/08B).

Module	Setting Value	Content
XGF-PN8A	0x100 ~ 0x400	Servo parameter address
XBF-PN04B/XBF-PN08B XGF-PN4B/XGF-PN8B	0x1000 ~ 0x1FFF	Communication Profile Area
	0x2000 ~ 0x5FFF	Manufacturer Specific Profile Area
	0x6000 ~ 0x9FFF	Standardized Device Profile Area

(5) n2 is not used in XGF-PN8A, and in case of XGF-PN4B/XGF-PN8B (XBF-PN04B/08B), the values that can be set in n2 are as follows.

Module	Setting Value	Content
XGF-PN8A	-	No use
XBF-PN04B/XBF-PN08B XGF-PN4B/XGF-PN8B	0x0 ~ 0xFF	Servo parameter Object Subindex

(6) In the case of XGF-PN8A, n3 is used to set the parameter type, and in the case of XGF-PN4B/XGF-PN8B

(XBF-PN04B/08B), it is used to set the data length.
The values that can be set for n3 are as follows.

Module	Setting Value	Content
XGF-PN8A	0~1	0:Integer, 1:Float
XGF-PN4B/XGF-PN8B	1~4	Servo parameter Object Byte Length

(7) When the servo parameter read command is executed, the positioning module reads data from the servo drive and stores it in the data common area. To save to device for use in PLC program, use GETM or GETMP command after executing the servo parameter read command.
The data common area address specified by the GETM or GETMP command are as follows.

Setting address	Content
0	Axis 1 Servo parameter index(lower) / Subindex (Upper)
1	Axis 1 Servo parameter data value
2	Axis 2 Servo parameter index(lower) / SubIndex (Upper)
3	Axis 2 Servo parameter data value
4	Axis 3 Servo parameter index(lower) / Subindex (Upper)
5	Axis 3 Servo parameter data value
6	Axis 4 Servo parameter index(lower) / Subindex (Upper)
7	Axis 4 Servo parameter data value
8	Axis 5 Servo parameter index(lower) / Subindex (Upper)
9	Axis 5 Servo parameter data value
10	Axis 6 Servo parameter index(lower) / Subindex (Upper)
11	Axis 6 Servo parameter data value
12	Axis 7 Servo parameter index(lower) / Subindex (Upper)
13	Axis 7 Servo parameter data value
14	Axis 8 Servo parameter index(lower) / Subindex (Upper)
15	Axis 8 Servo parameter data value

(8) If you want to check the index and subindex of the read servo parameters, set the read address of GETMP to 0, and set the number of data to read to 2.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

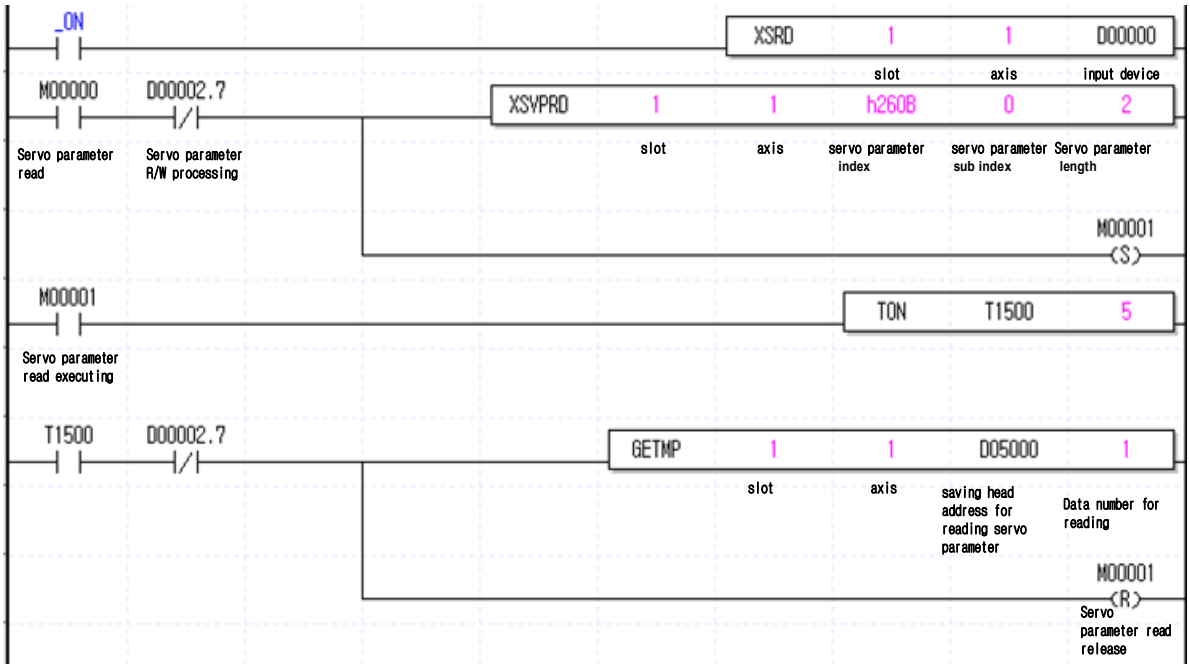
(1) LD: Ladder Diagram

(a) If M00000 is On while the axis is ready, the servo parameter READ command (XSVPRD) is executed.

(b) Read the h260b (DCLink voltage) parameter after the servo parameter read command is executed.

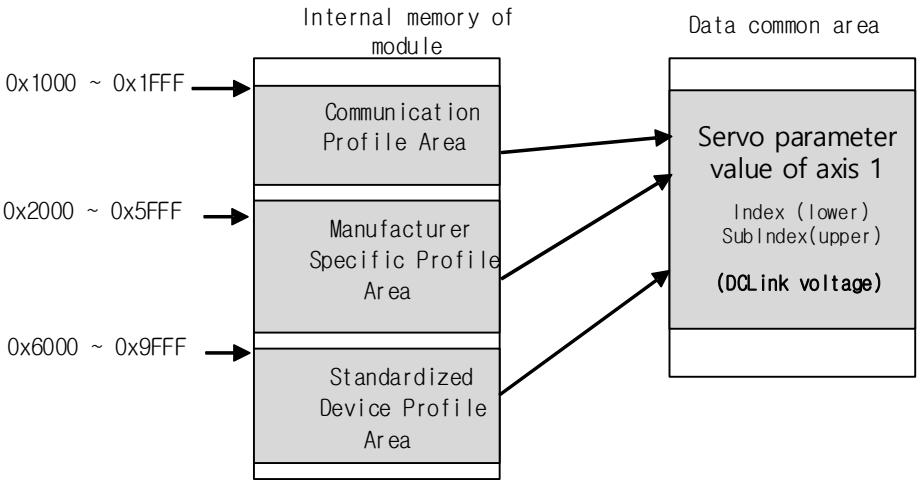
(c) When the status of Servo parameter R/W processing is Off after 5 ms after executing the servo parameter read command (Servo parameter read complete status), save the axis 1 servo parameter data value of the common area in D05000.

(c) When the status of Servo parameter R/W processing is Off after at least 4ms after executing the servo parameter read command, the GETM (or GETMP) instruction must be executed.After the data read from the module is updated in the data common area, the reflected value can be read.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XSVPRD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*), Num3:=(*WORD*));

4) Caution

(1) This action can be completed in multiple scans.

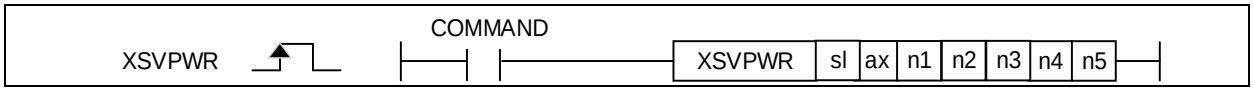
4.42.56 XSVPWR / Servo Parameter Write

This command is for changing the parameter (CoE Object) value of the servo drive connected to the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSVPWR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Servo parameter Index (0x2000 ~ 0x9FFF)	WORD
n2	Servo parameter Subindex (0x00 ~ 0xFF)	WORD
n3	Servo parameter Length (Byte) (1~4)	WORD
n4	Write data(Object change value among servo parameters)	DINT
n5	Write to PLC method setting (0:RAM teaching, 1:ROM teaching)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is for changing the parameter (CoE Object) of the servo drive connected to the positioning module.

(2) The values that can be set for n1 are as follows.

Setting Value	Content
0x2000 ~ 0x5FFF	Manufacturer Specific Profile Area
0x6000 ~ 0x9FFF	Standardized Device Profile Area

(3) The values that can be set for n2 are as follows.

Setting Value	Content
0x0 ~ 0xFF	Servo parameter Object Subindex

(4) The values that can be set for n4 are as follows.

Setting Value	Content
1 ~ 4	Servo parameter Object Byte Length

(5) The values that can be set for n5 are as follows.

Setting Value	Teaching method
0	RAM Teaching
1	ROM teaching

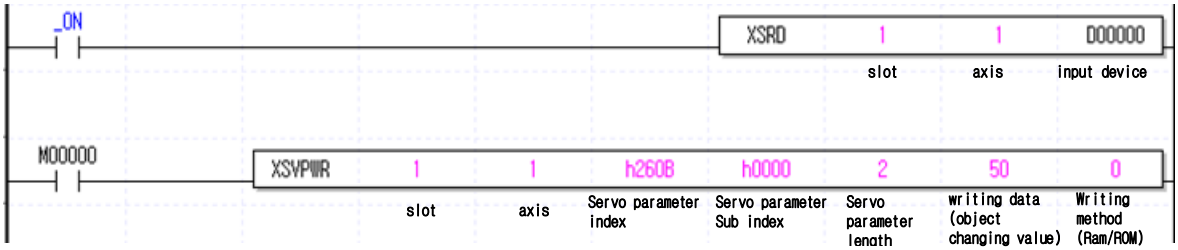
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

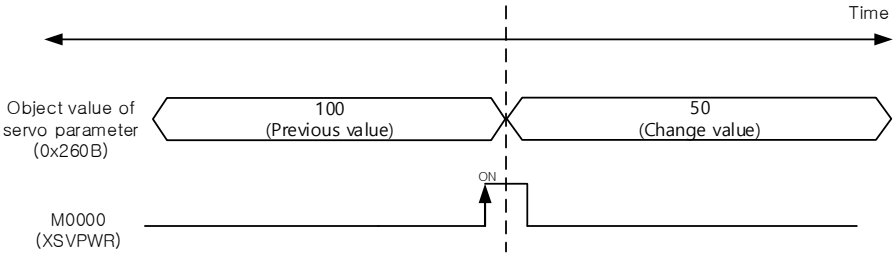
(1) LD: Ladder Diagram

(a) If M00000 is On while the axis is ready, the servo parameter write command (XSVPWR) is executed.
(b) After the servo parameter write command is executed, the h260b (DCLink voltage) parameter is changed to the specified value 50.
(c) When the power is turned off/on, it is set to write to RAM, and the changed value returns to the previous value.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XSVPWR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*),
 Num3:=(*WORD *), Num4:=(*DINT*), Num5:=(*WORD*));
```

4) Caution

(1) It is unavailable to be executed when the axis is operating.
(2) This action can be completed in multiple scans.

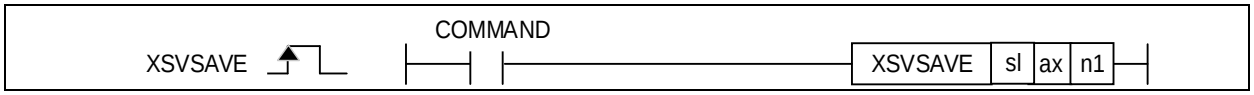
4.42.57 XSVSAVE / Servo parameter EEPROM Save

This command saves the parameters of the servo drive to the EEPROM inside the servo drive.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSVSAVE	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Axis to store servo parameters	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command saves the parameters of the servo drive connected to the positioning module to the EEPROM inside the servo drive .

(2) The command axis set in ax is separate from the axis storing the servo parameters.
Therefore, to save the servo parameter, the bit of the corresponding axis must be set to n1 in Set.

(3) Save the servo drive parameters of the axis set in n1

(4) Each bit of n1 value means each axis as below. To select the axis, set the bit of the axis to SET.

15 ~ 8 Bit	7Bit	6Bit	5Bit	4Bit	3Bit	2Bit	1Bit	0Bit
Do Not Use	Axis 8	Axis 7	Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

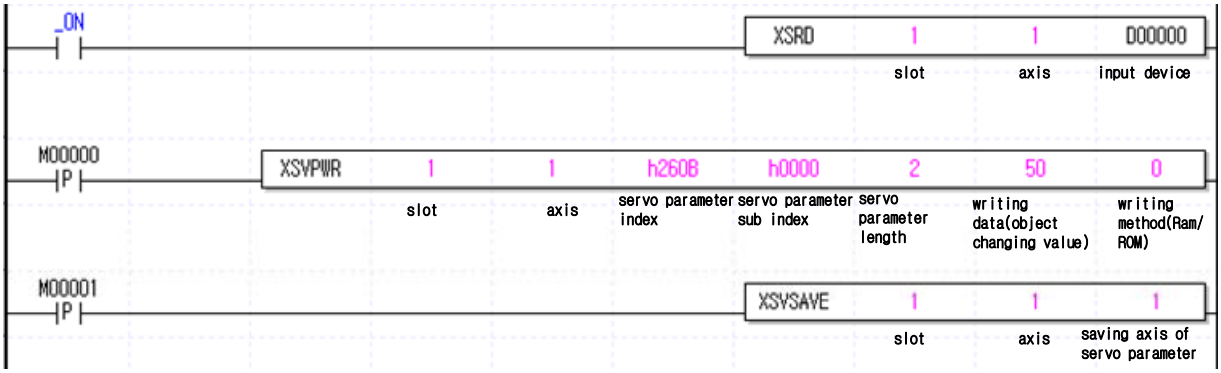
3) Example

(1) LD: Ladder Diagram

(a) If M00000 is On while the axis is ready, the servo parameter write command (XSVPWR) is executed.

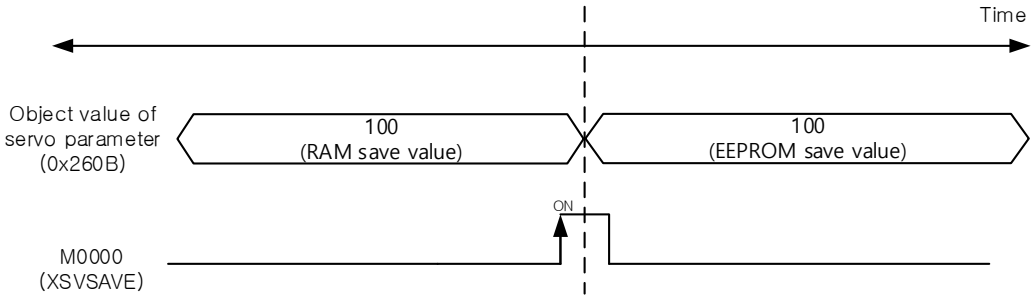
(b) After the servo parameter write command is executed, the h260b (DCLink voltage) parameter is changed to the specified value 50.

(c) When M00001 is On, the value previously stored in RAM on axis 1 is stored in the EEPROM of the servo.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XSVSAVE_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));
```

4) Caution

(1) It is unavailable to be executed when the axis is Servo on status.

(2) This action can be completed in multiple scans.

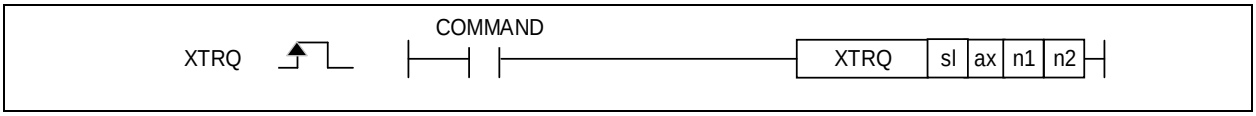
4.42.58 XTRQ / Torque Control Command

This command is executed by the "torque control" command and operates at the set torque until the "deceleration stop" command is input.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XTRQ	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Subordinate axis to execute cam command (1 ~ 8: axis 1 ~ axis 8)	WORD
n1	Torque values (unit:%, -32768 ~ 32767)	INT
n2	Torque Inclination (unit:ms, 0 ~ 65535ms)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This instruction is a Torque control command to the positioning module.
Torque control is executed by setting the torque value and torque slope.

(2) Set the torque value (%) to be operated in n1
The torque value operates as a percentage of the rated torque. (1 = 1% of rated torque)
For example, set 200 to perform torque control with 200% torque.

※ The allowable range of torque value depends on the type of servo drive connected.

(3) Generally, the target torque value is limited to the maximum torque setting.

(4) Set the time to reach the target torque at n2
When the command is executed, the torque increases to the torque value of the target torque at the set slope.

Auxiliary data	Setting Value	Content
Torque(%)	-32768 ~ 32767	Set the torque value that becomes the target value during torque control. The torque value operates as a percentage of the rated torque. (1 = 1% of rated torque)
Slope(ms)	0 ~ 65535	Set the slope to the target torque in hours.

(5) The direction is determined by the setting of the torque value, which is the auxiliary data of the torque command.
- Torque value is positive (+):Positioning operation in the forward direction (current position increasing direction)
- Torque value is negative (-):Positioning operation in the reverse direction (current position decreasing direction)

2) Error

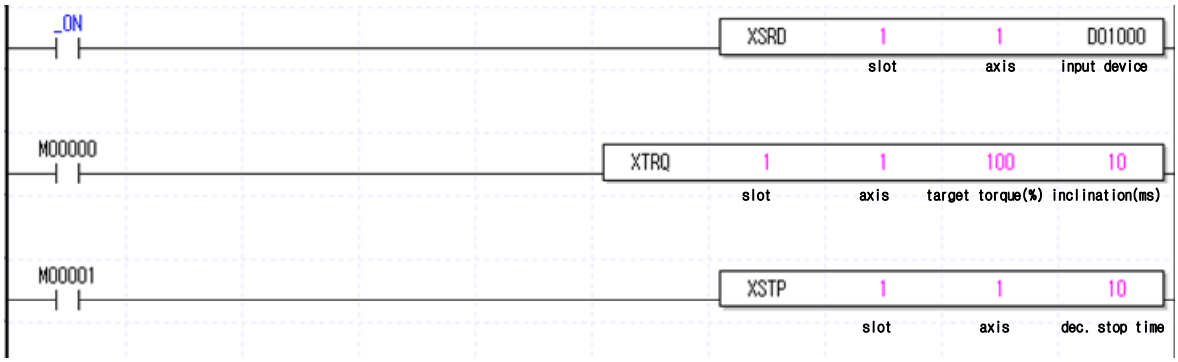
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

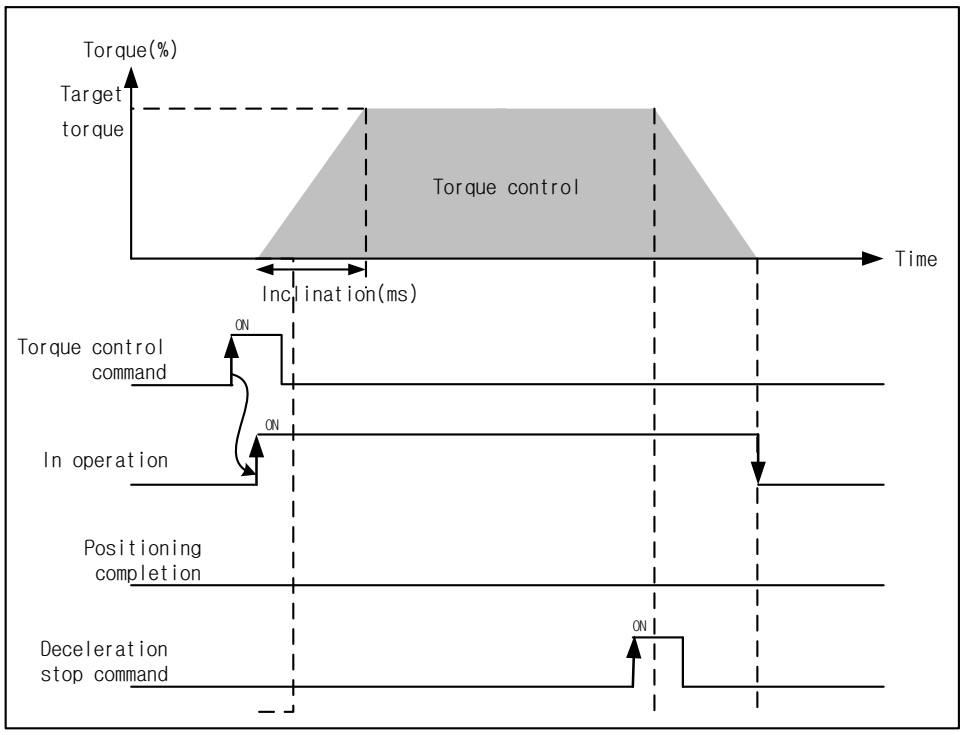
※ Program that stops torque control after reaching 100% torque for 10 ms time on 1 axis of the positioning module mounted in slot number 1.

(a) When M00000 is On while the axis is ready, torque control is executed with the set target torque and slope.
(b) When M00001 is On, the torque control is stopped by the deceleration stop command and stops.
(C) Therefore, the axis do not positioning completion.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment
XTRQ_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DWORD*), Num2:=(*INT*), Num3:=(*WORD*));

4) Caution

(1) It is unavailable to be executed when the axis is operating other than torque control.
(2) This action can be completed in multiple scans.

※ Torque control may not be executed in the case below.

- When a command is executed while in operation other than torque control (error code: 741)
- When a command is executed while M Code ON signal is On status (error code: 742)
- When a command is executed while in Servo off status (error code: 742)
- When the servo drive does not support the torque control mode (error code: 565)

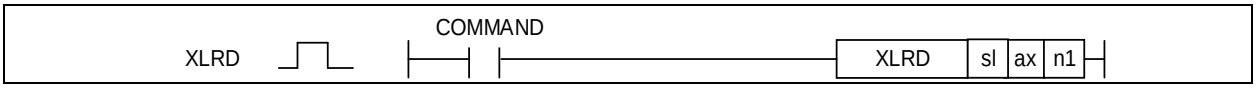
4.42.59 XLRD / Latch Position Data Read

This command is used to read the number of latch data and latch position data stored by the external latch command signal of the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XLRD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Leading address of device to save the latch data	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is used to read the number of latch data and latch position data stored by the external latch command signal of the positioning module.

(2) The values stored in the device area specified in n1 are as follows.

Device number	Size	Content
Device	WORD	Number of latch position data
Device +1	WORD	-
Device +2	DINT	Latch position data 1
Device +4	DINT	Latch position data 2
. . .	. . .	. . .
Device +18	DINT	Latch position data 9
Device +20	DINT	Latch position data 10

(3) The latch position data read command is a level command, and every scan is executed when the contact of the input condition is on.

(4) The latch setting command is a dedicated command for the network positioning module XBF-PN04B/08B, XGF-PN4B/8B.

(5) To use the latch function, the latch function enable/disable and latch mode must be set using the latch setting command. The auxiliary data used in latch setting command is as follows.

Item	Setting Value	Content
Latch enable/ Disable	0:Disable	The latch function is disabled. Even if a touch probe 1 signal is input, it is ignored.
	1:Enable	The latch function is enabled. When the touch probe 1 signal is input, it operates in the set trigger mode.
Latch mode	0: Single trigger	After the latch is allowed, the current position is latched on the first touch probe 1 signal input.
	1: Continuous trigger	After the continuous is allowed, the current position is latched for each touch probe 1 signal.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

※ This is an example program of reading latch data according to the latch setting (single/continuous trigger) of the touch probe 1 signal.

This is a program that reads the latch position data as much as the number of data stored in D02000 on the 1st axis of the positioning module installed in slot 1 and stores the latch data from device D02002.

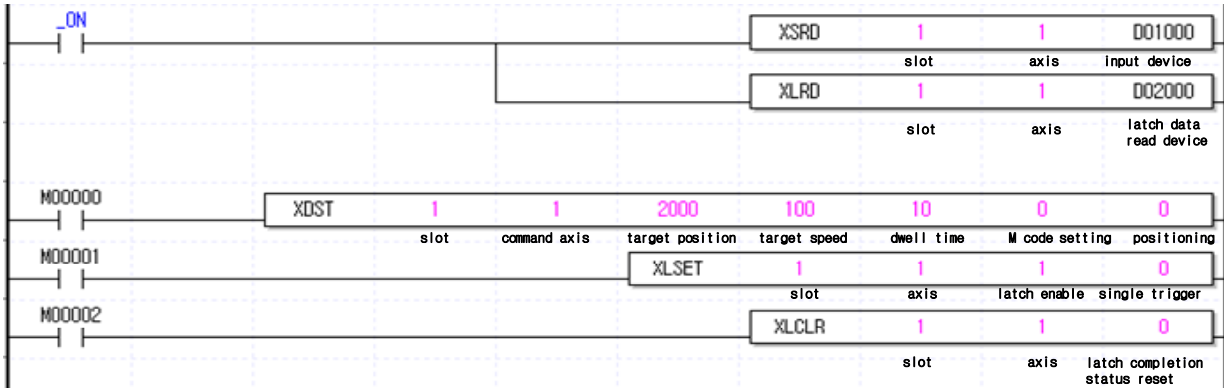
(a) If 00000 is On while the home is determined, position control is executed at the set target position/speed.

(b) After that, when M00001 is On, the latch function is activated in the single trigger mode (0), and then the latch function is operated on the first touch probe 1 signal. The latch function does not operate on the touch probe 1 signal that is input after triggering, and after the single reset function is allowed again with the latch reset command by the M00002 contact, the latch function operates again on the input touch probe 1 signal.

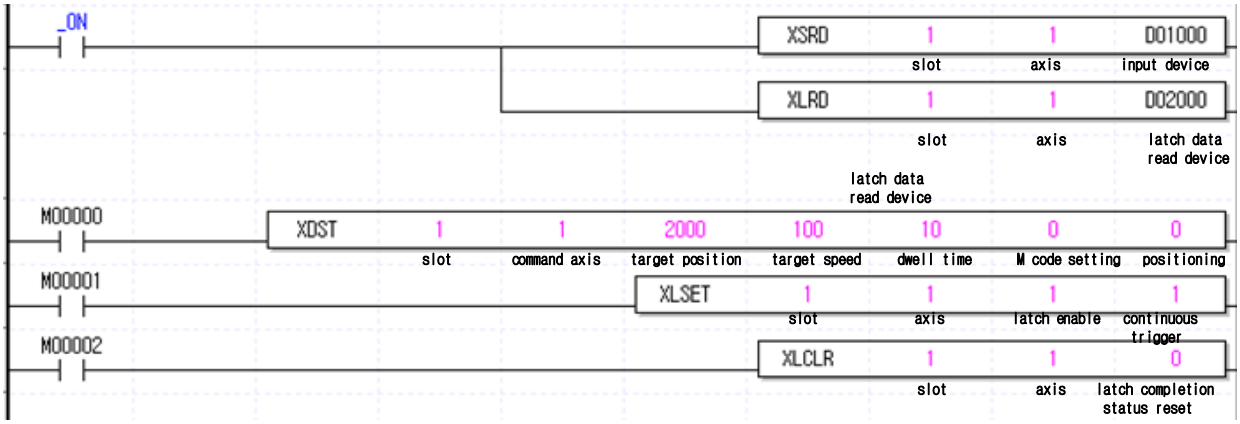
(C) In the continuous trigger mode (1), after the latch function is allowed, the latch function operates on all input touch probe 1 signals.

(D) The triggered data at this time is saved from the D2000 device set in the XLRD command.

※ Single trigger mode

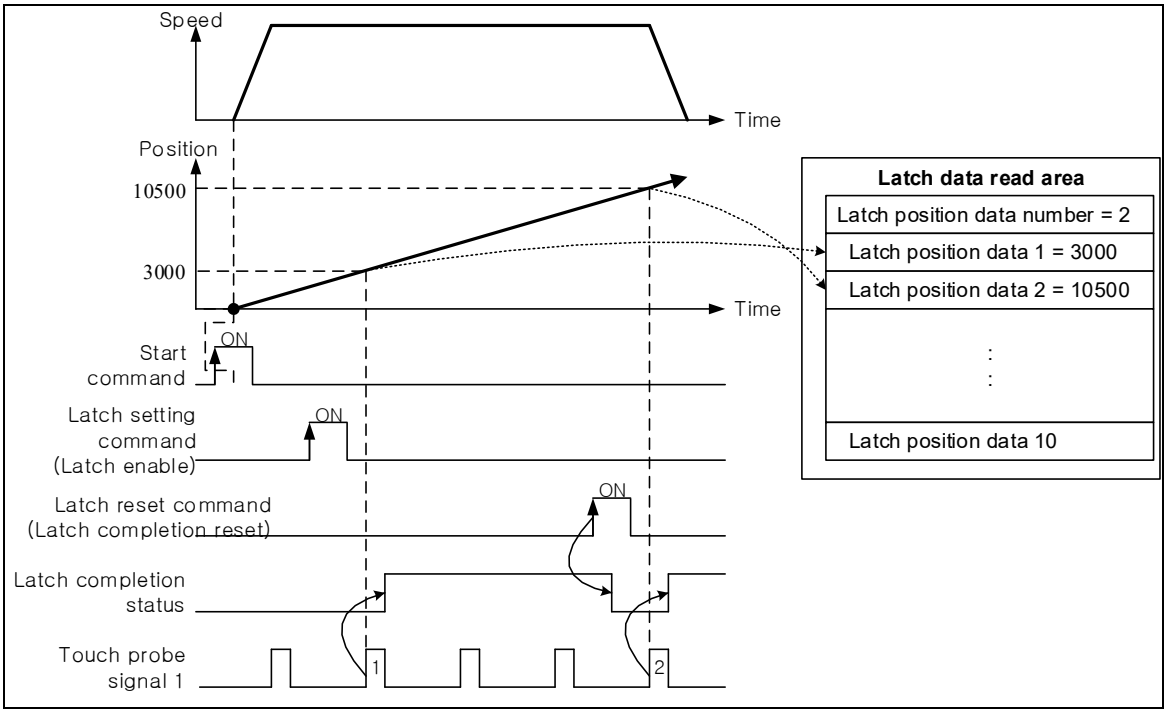


※ Continuous trigger mode

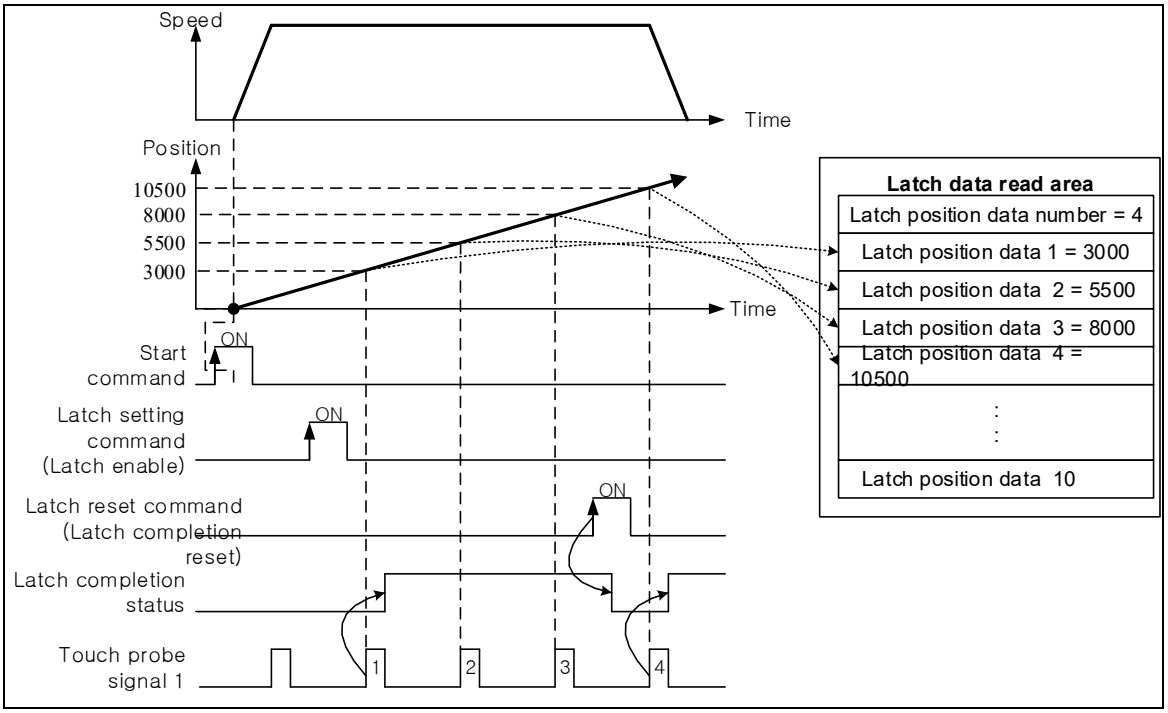


(2) Timer chart

※ Single trigger mode



※ Continuous trigger mode



(3) ST (Structure Text): Automatic program assignment

XLRD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) Up to 10 latch position data can be stored. When the latch position data exceeds 10, the oldest latch position data is deleted and the newly latched data is saved.
That is, the 10 latest latch position data is maintained.

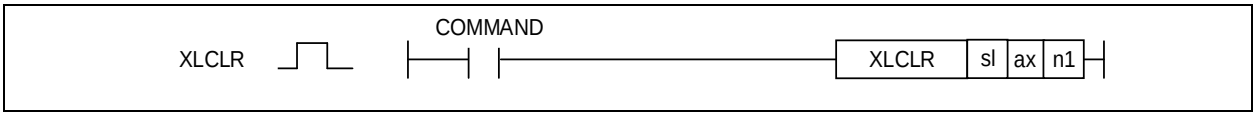
4.42.60 XLCLR / Latch Reset

This command is used to initialize the number of latched data stored in the positioning module, latch position data and latch completion status.

Available type	XGK					XGK-N			XBC				XBM	
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H(P)
	O	O	O	O	O	O	O	O	O	X	X	X	X	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XLCLR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of operation	WORD
n1	Latch reset item setting (0: Latch completion status reset) (1: Latch position data and latch completion status reset)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is used to initialize the number of latched data stored in the positioning module, latch position data and latch completion status.

(2) The following items are reset according to the latch reset item specified in n1.

- 0: Latch completion status reset
- 1: Latch position data and latch completion status reset(Values above 1" are treated the same as "1").

(3) If 1 is set to n1 and the latch reset command is executed, the latch position data is read with the latch position data read command (XLRD), and all the data becomes 0.

(4) The latch setting command is a dedicated command for the network positioning module XBF-PN04B/08B, XGF-PN4B/8B.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

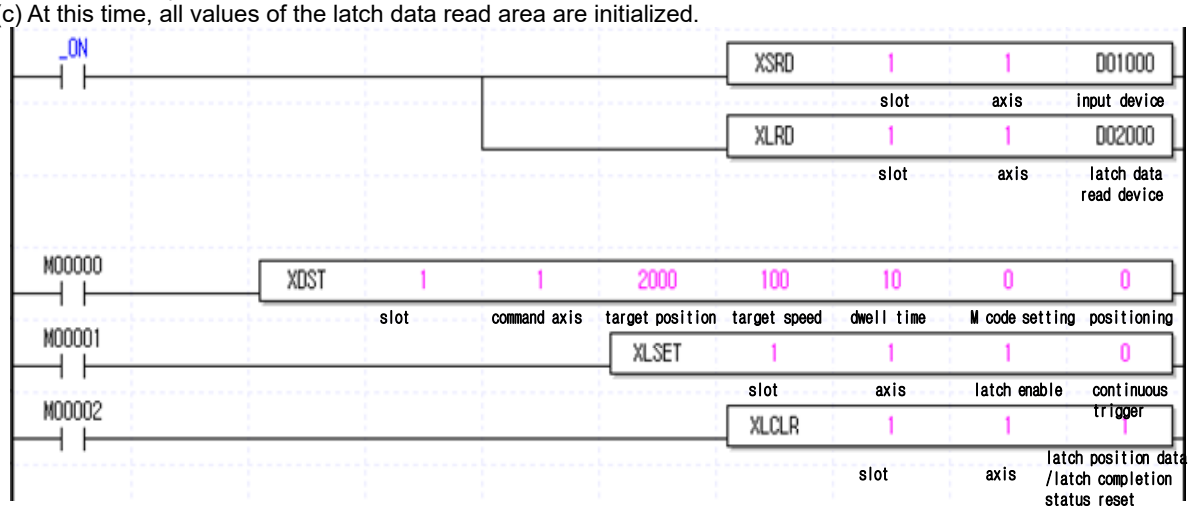
(1) LD: Ladder Diagram

※ This is an example program of reading latch data according to the latch setting of the touch probe 1 signal. This is an example in which the latch position data and the latch completion status are reset as the latch reset, and the latch completion status is set again by a new touch probe 1 signal.

(a) If 00000 is On while the home is determined, position control is executed at the set target position/speed.

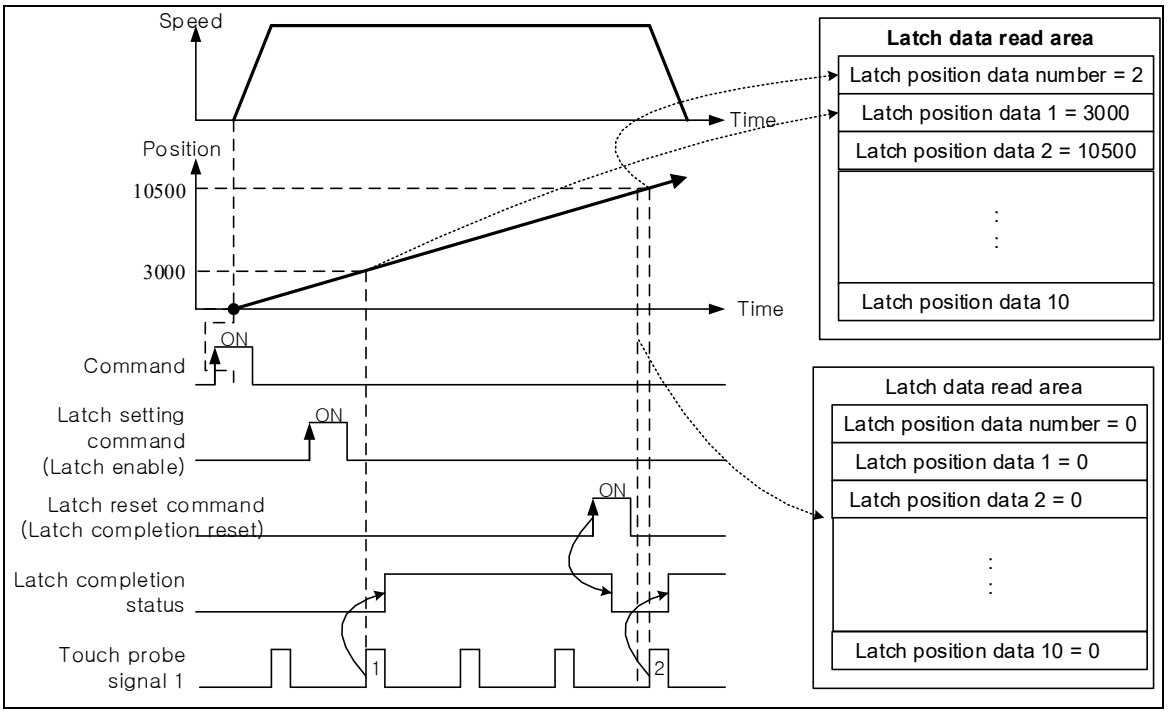
(b) After that, when M00001 is On, the latch function is activated in the single trigger mode (0), and then the latch function is operated on the first touch probe 1 signal. The latch function does not operate on the touch probe 1 signal input after triggering, and the latch position data and latch completion status are reset by the latch reset command by the M00002 contact.

(c) At this time, all values of the latch data read area are initialized.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XLCLR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*));

4) Caution

(1) This action can be completed in multiple scans.

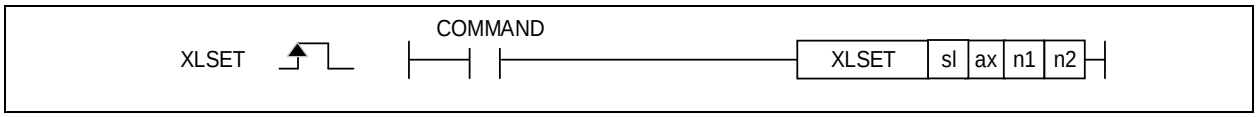
4.42.61 XLSET / Latch Setting

This command is used to enable/disable the external latch function of the positioning module or to set the latch mode.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XLSET	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Subordinate axis to execute cam command (1 ~ 8: axis 1 ~ axis 8)	WORD
n1	Latch enable/disable(0:disabled, 1:enable)	WORD
n2	Latch mode (0: single trigger, 1 : continuous trigger)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is used to enable/disable the external latch function of the positioning module or to set the latch mode.

(1) This command is used to enable/disable the external latch function of the positioning module or to set the latch mode.

(3) The operation according to the allow/prohibit latch items specified in n1 is as follows.
- 0:Latch disable
- 1: Latch enable(Values above 1" are treated the same as "1").

(4) The operation according to the latch mode item specified in n2 is as follows.
- 0: Single trigger(After the latch is allowed, the current position is latched on the first touch probe 1 signal input.)
- 1: Continuous trigger (latch is allowed, the current position is latched for each touch probe 1 signal.)
  (Values above 1" are treated the same as "1"

(5) This action can be completed in multiple scans.

(6) The latch setting command is a dedicated command for the network positioning module XBF-PN04B/08B, XGF-PN4B/8B.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

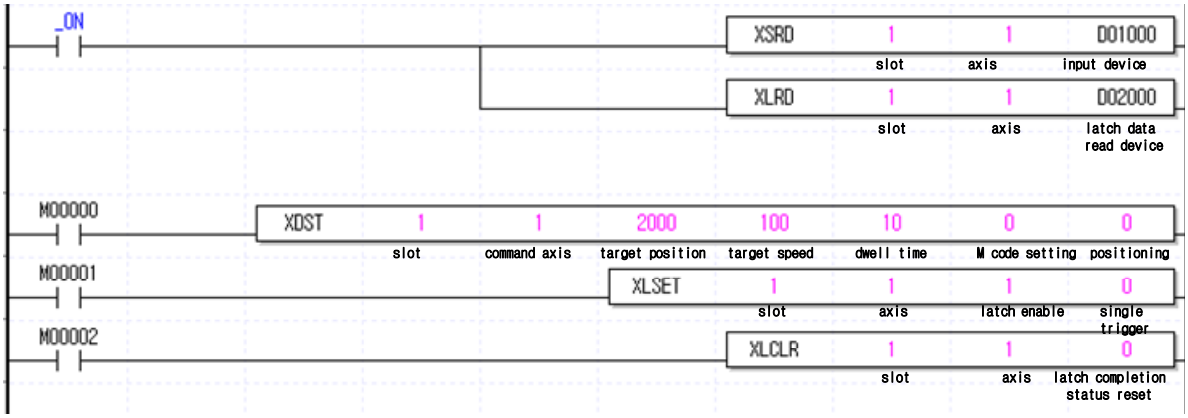
3) Example

(1) LD: Ladder Diagram

※ This is an example program of reading latch data according to the latch setting of the touch probe 1 signal.
This is an example in which the latch position data and the latch completion status are reset as the latch reset, and the latch completion status is set again by a new touch probe 1 signal.

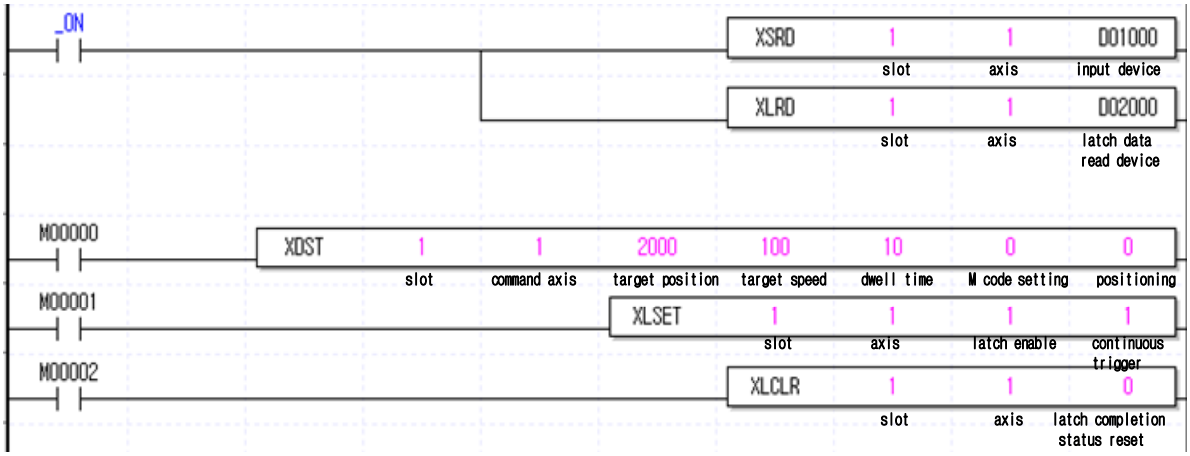
(a) If 00000 is On while the home is determined, position control is executed at the set target position/speed.
(b) After that, when M00001 is On, the latch function is activated in the single trigger mode (0), and then the latch function is operated on the first touch probe 1 signal. The latch function does not operate on the touch probe 1 signal that is input after triggering, and after the single reset function is allowed again with the latch reset command by the M00002 contact, the latch function operates again on the input touch probe 1 signal.
(C) In the continuous trigger mode (1), after the latch function is allowed, the latch function operates on all input touch probe 1 signals.
(D) The triggered data at this time is saved from the D2000 device set in the XLRD command.

※ Single trigger mode



※ To read the status information of the axis, refer to the description of the XSRD instruction.

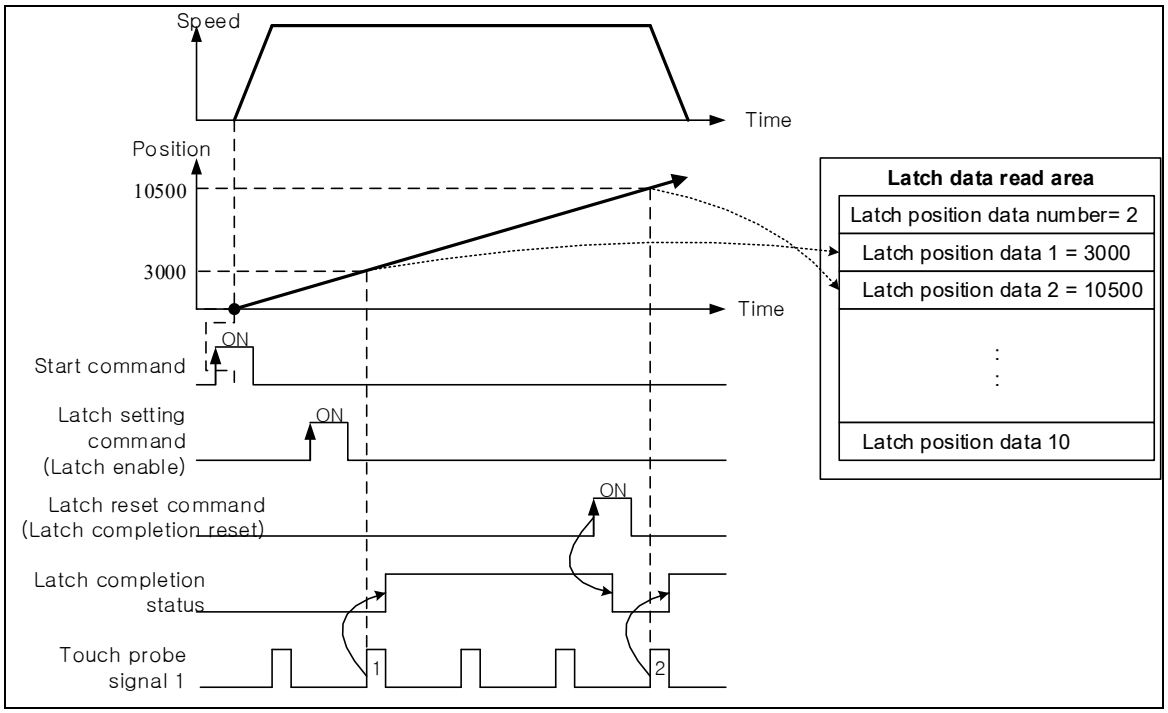
※Continuous trigger mode



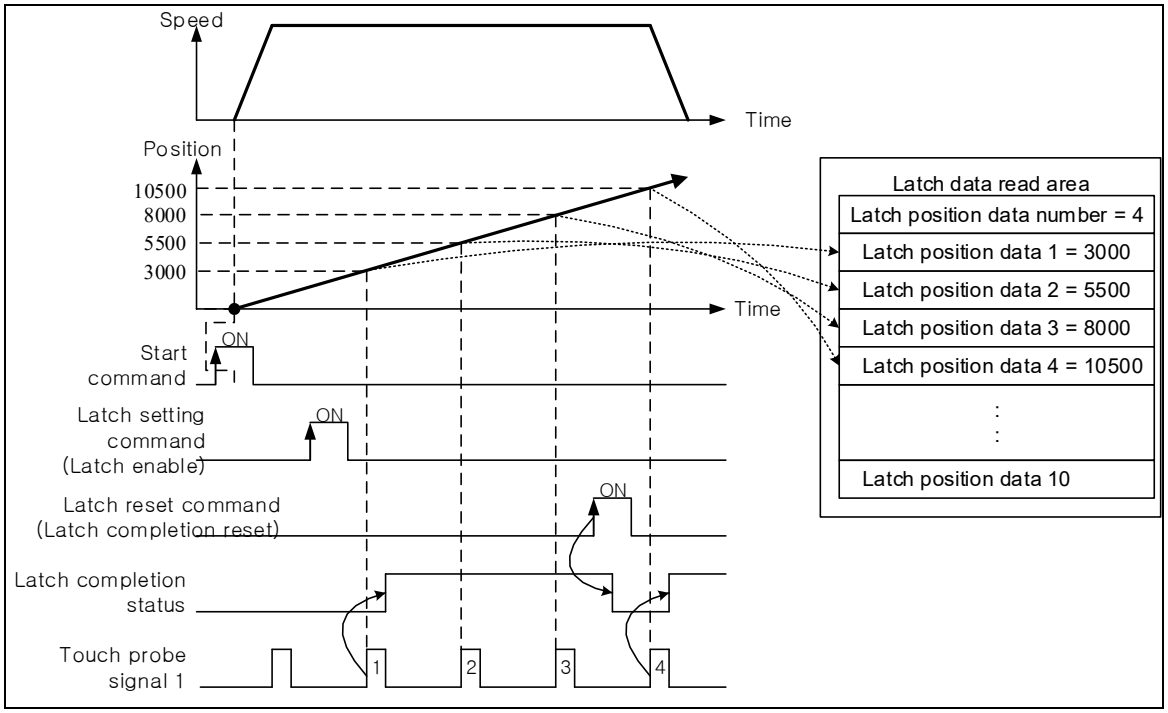
※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Single trigger mode



※ Continuous trigger mode



(3) ST (Structure Text): Automatic program assignment

XLSET_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*));

4) Caution

(1) The latch function is activated in the single trigger mode and then the latch function is operated on the first touch probe 1 signal.
The latch function does not operate on the input touch probe 1 signal after triggering, and the latch function operates again on the input touch probe 1 signal after a single trigger function is allowed again with the latch reset command.

(2) In the continuous trigger mode (1), after the latch function is allowed, the latch function operates on all input touch probe 1 signals.

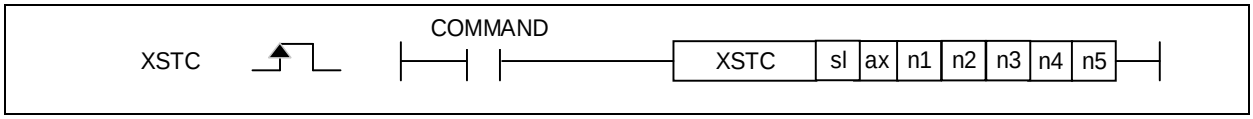
4.42.62 XSTC / Torque Synchronization

This command is That executes torque synchronization to the corresponding axis of the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSTC	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution (Slave Axis): 1 ~ 8(Real axis)	WORD
n1	Main axis torque rate	WORD
n2	Subordinate axis torque rate	WORD
n3	Main axis speed rate(XGF-PN8A dedicated)	WORD
n4	Subordinate axis speed rate(XGF-PN8A dedicated)	WORD
n5	Main axis setting (1~8: axis 1~axis 8, 9: encoder 1, 10: encoder 2)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is that executes torque synchronization to the corresponding axis of the positioning module.

(2) The torque Synchronization command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).

(3) The command execution axis performs torque synchronization with the axis set in n5 as the main axis.

(4) The command execution axis operates torque synchronous operation with the torque ratio set in n1, n2 and the speed ratio set in n3, n4.

- Subordinate axis torque = (n2/n1) * Main axis torque
- Subordinate axis torque synchronization speed = (n4/n3) * Main axis speed

2) Error

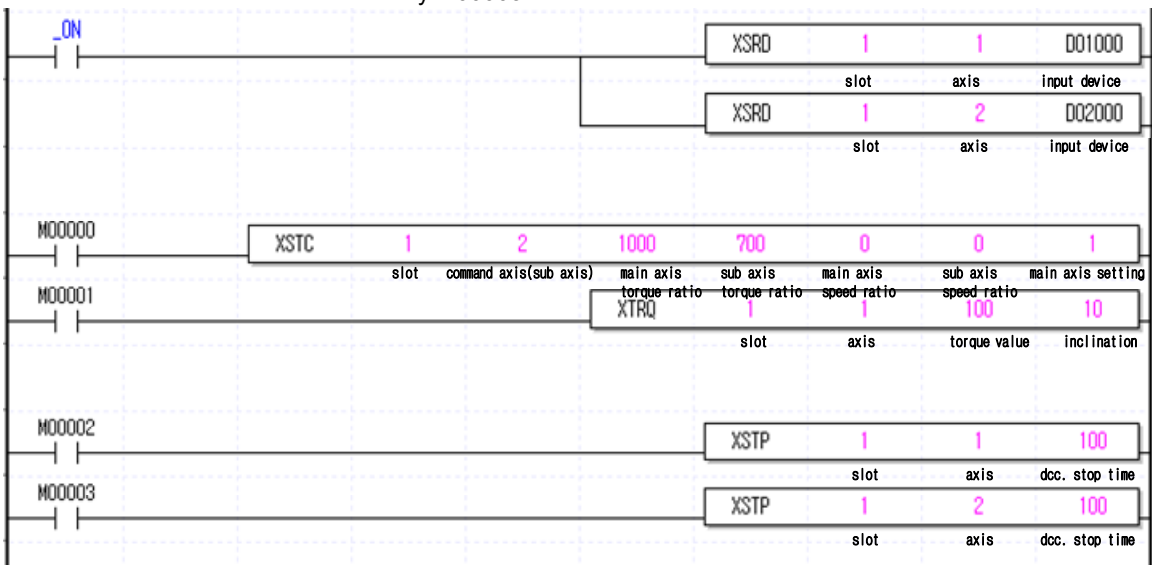
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

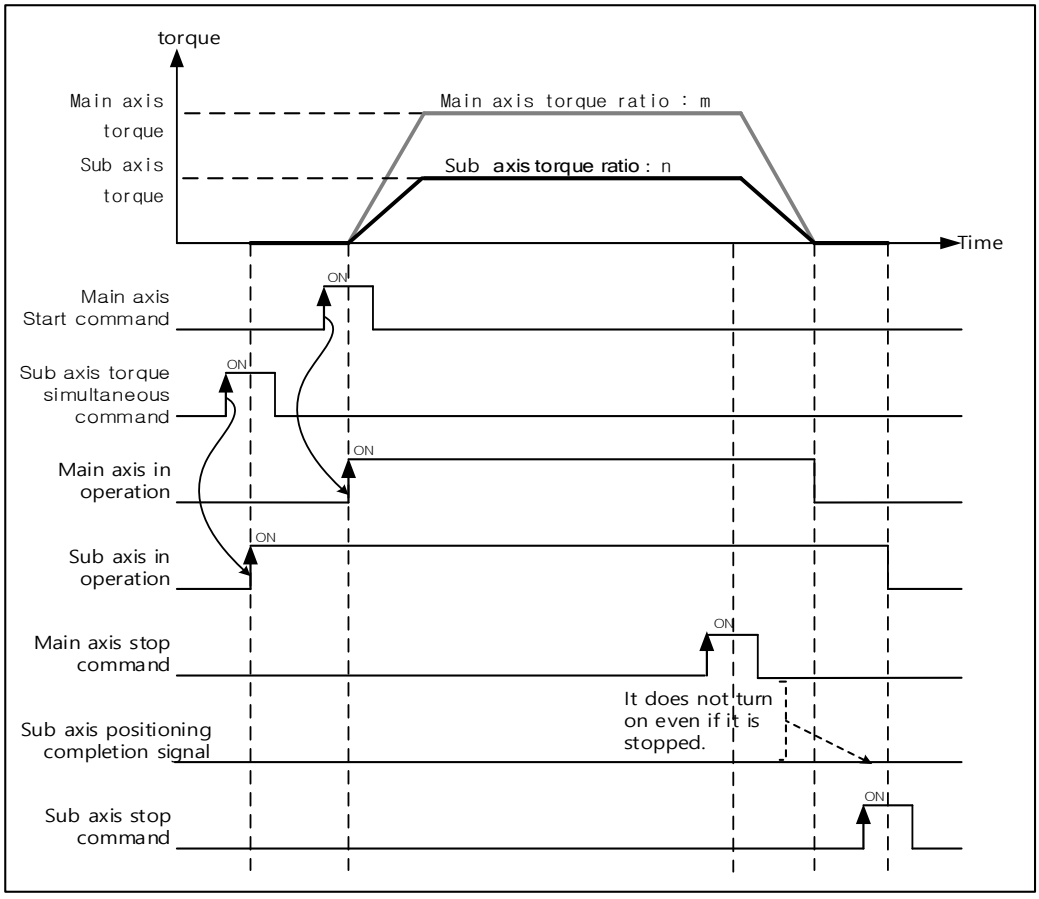
※The following is an example in which the torque synchronization of the subordinate axis is released after starting the torque synchronization by setting the torque ratio of the main axis/subordinate axis.

(A) If M00000 is turned on in the homing state, torque synchronization is set to the specified value for the subordinate axis.
(B) Then, when M00001 is On, torque starting of the main axis is executed.
(c) Even if the deceleration stop command of the main axis is given by M00002 contact, torque synchronization in the subordinate axis is not released.
(d) The torque synchronization status of the subordinate axis is canceled only when the deceleration stop command of the subordinate axis is executed by M00003 contact.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment
XSTC_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*),Num 3:=(*WORD*), Num4:=(*WORD*), Num5:=(*WORD*));

4) Caution

(1) Instruction parameters n3 and n4 are for XGF-PN8A only
- Subordinate axis torque synchronization speed = (n4/n3) * Main axis speed

(2) This action can be completed in multiple scans.

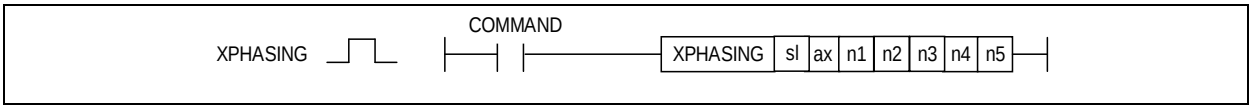
4.42.63 XPHASING / Phase Compensation

This command performs synchronous operation for the position of the main axis synchronized with the subordinate axis during synchronous control operation and the position of the main axis moved by virtual position movement (phase correction).

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XPHASING	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution (Slave Axis): 1 ~ 8(Real axis)	WORD
n1	Phase compensation (-2,147,483,648 ~ 2,147,483,647)	DINT
n2	Phase compensation speed(Relative speed to main axis speed)	DWORD
n3	Acc. time (0 ~ 2,147,483,647 ms)	DWORD
n4	deceleration time (0 ~ 2,147,483,647 ms)	DWORD
n5	Main axis (1~8: axis 1~axis 8, 9: encoder 1, 10: encoder 2)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is that executes phase compensation to the corresponding axis of the positioning module.

(2) Th axis specified by ax of the positioning module designated by sl (slot number of the positioning module) executes phase compensation operation using the phase compensation speed, acceleration time, and deceleration time set from n2 to n4 as much as the phase compensation amount specified by n1.

(3) The command execution axis executes phase compensation operation with the axis set in n5 as the main axis.

(4) It can be operated only when the axis is in speed synchronous operation or cam operation

(5) The phase compensation speed operates at a speed relative to the speed at which the current main axis is running.

(6) When the axis is an encoder, it operates using the speed limit value and acceleration/deceleration pattern of the subordinate axis when executing phase compensation control.

(7) Even if the phase compensation command is executed, the command position and the current position of the main axis are not changed, and the phase value is executed by correcting the main axis position value that the subordinate axis refers to in synchronous control operation.

(8) The main axis position referenced by the subordinate axis during synchronous operation is “actual main axis position + phase compensation control position”.

(9) If the command is executed again during the compensation operation, phase compensation is executed again by the amount of phase compensation at that point.
That is, the phase correction amount is additionally operated as a relative value.

(10) When re-executing with the phase compensation amount set to 0 during the compensation operation, the existing

phase compensation operation is immediately stopped.
(The status during the phase correction operation of status information is also turned off.)

(11) This action can be completed in multiple scans.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

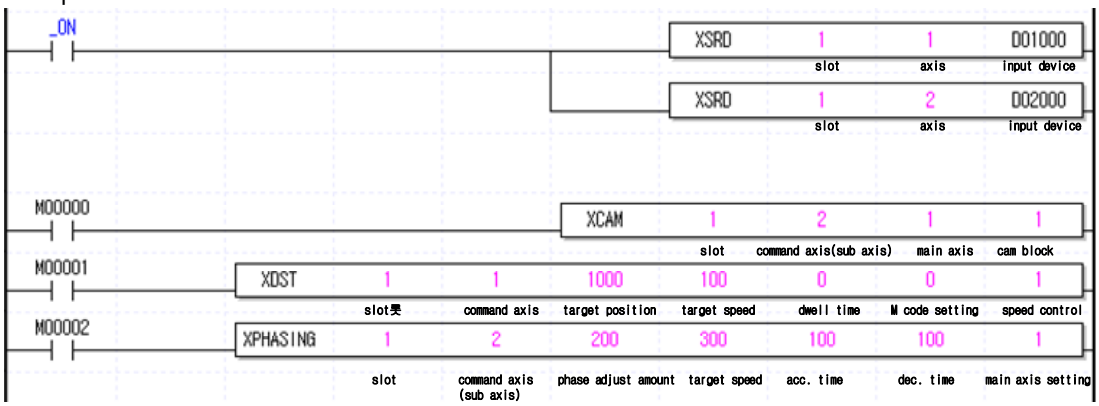
(1) LD: Ladder Diagram

※ The main axis is set to infinite length repetition and is an example of executing cam operation and phase compensation for the sub axis during speed control..

(a) When M00000 is turned on in the home determination state, the main axis is set to 1 axis in the 2 axes of the command axis (subordinate axis), and cam control is set.

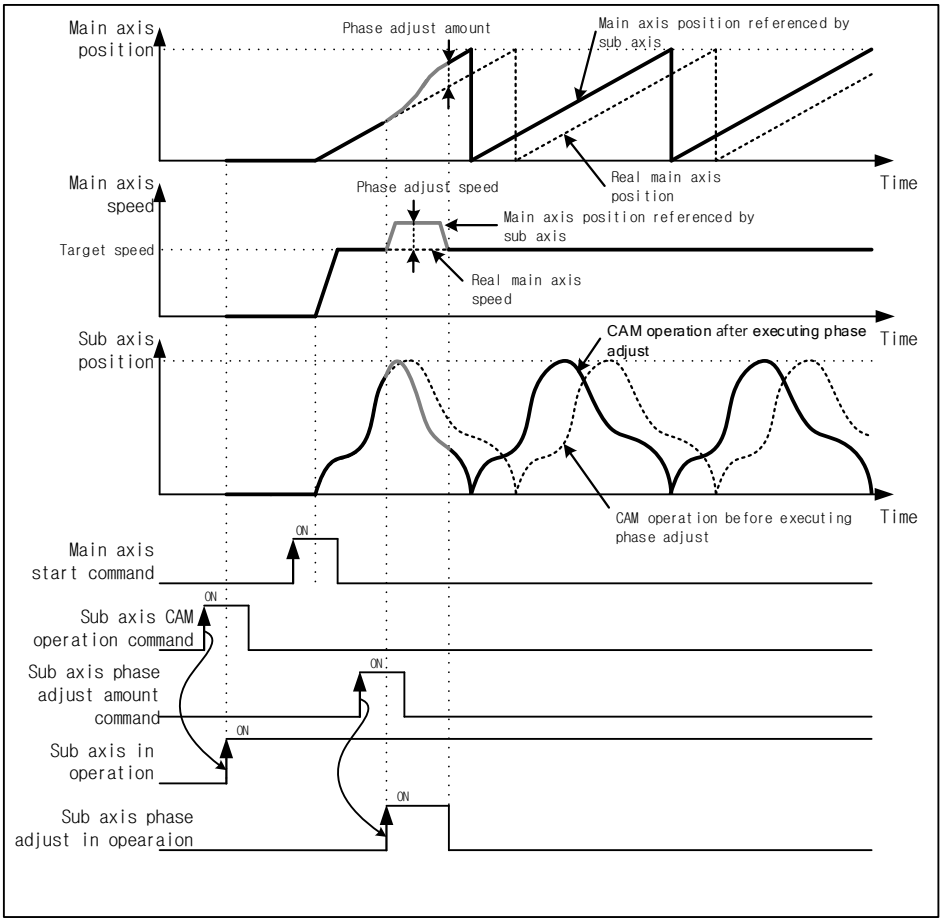
(b) If M00001 is On in this state, the direct start command of the main axis (1 axis) is executed with the set parameters.

(c) Then, by turning on M00002 contact, reference is made from the subordinate axis with a phase compensation command for the subordinate axis, and the phase control of the subordinate axis is executed for the main axis speed to execute cam control.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(3) Timer chart



(3) ST (Structure Text): Automatic program assignment
XPHASING_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), n1:=(*DINT*), n2:=(*DWORD*), n3:=(*DWORD*), n4:=(*DWORD*), n5:=(*WORD*));

4) Caution

※ Phase compensation control can be executed in the case below.

(1) If the phase compensation command is executed while the subordinate axis is not in synchronous control (speed synchronization, cam) operation, an error (771) occurs.
(2) If the main axis setting is not the main axis of the axis in synchronous operation, an error (772) occurs.
(3) If the phase compensation amount of the phase compensation command is set outside the pulse unit position expression range (-2,147,483,648 to 2,147,483,647), an error (773) occurs.
(4) An error (774) occurs when the speed setting value of the phase compensation command is less than or equal to or greater than the speed limit value.
(5) If the Acc. time setting value of the phase compensation command is outside the setting range (0 to 2,147,483,647 ms), an error (775) occurs.
(6) If the deceleration time setting value of the phase compensation command is outside the setting range (0 to 2,147,483,647 ms), an error (776) occurs.

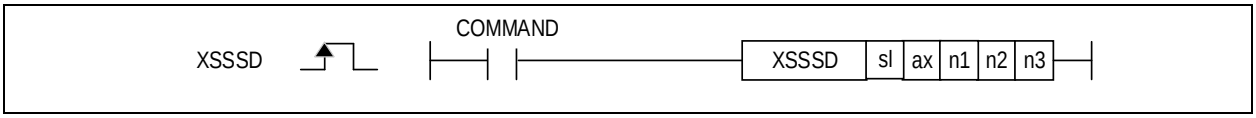
4.42.64 XSSSD / 32 bits Speed Synchronization

This command is basically the same as the speed synchronization command, and the main axis ratio and sub axis ratio are set to 32 bits instead of 16 bits.This command operates at the set speed synchronization ratio and the subordinate axis operates in the same way as the main axis operation pattern.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSSSD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Subordinate axis to execute Speed synchronization : 1 ~ 8(Real axis)	WORD
n1	Main axis setting value of speed synchronization ratio : -2147483648~2147483647	DINT
n2	Subordinate axis setting value of speed synchronization ratio : -2147483648~2147483647	DINT
n3	Main axis to executes speed synchronization: 1~10(1~8: real axis, 9~10: encoder1~2)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax, n3) for the axis depends on the number of control axes and encoder channel supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command gives a 32-bit speed synchronization command to the positioning module.
The values of the main axis ratio and the sub axis ratio can be set to a 32-bit integer range.

(2) Ratio of Speed sync. is calculated as follows.
Speed synchronization ratio = Subordinate axis setting value/main axis setting value

(3) The operation direction of the sub-axis is determined by the sign of the speed synchronization ratio. If it is positive, it operates in the direction of the main axis, and if it is negative, it operates in the opposite direction of the operation of the main axis. The speed synchronization ratio can be changed even when the subordinate axis is in speed synchronization operation.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

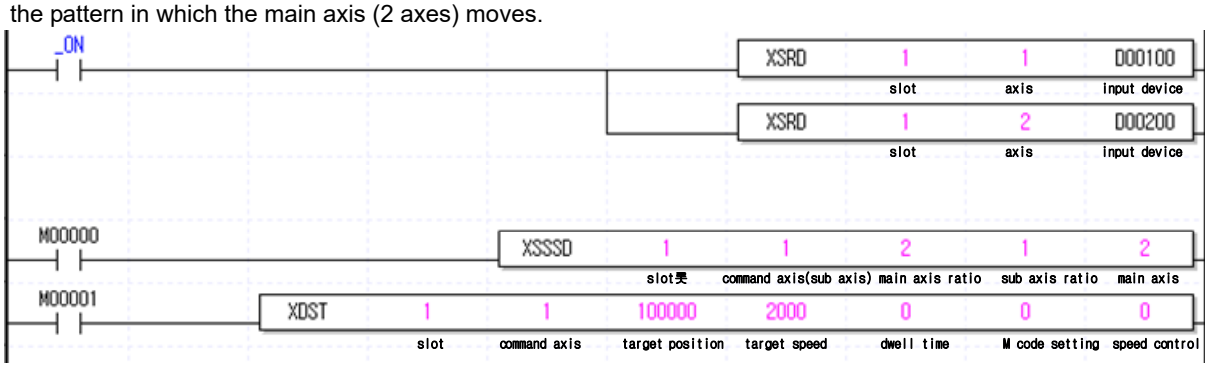
3) Example

(1) LD: Ladder Diagram

(a) When M00000 is On, the 32-bit speed synchronization command is executed at 1 axis for the subordinate axis, 2 axes for the main axis, and 1/2 the speed synchronization ratio (2 for the main axis setting value and 1 for the sub axis setting value).

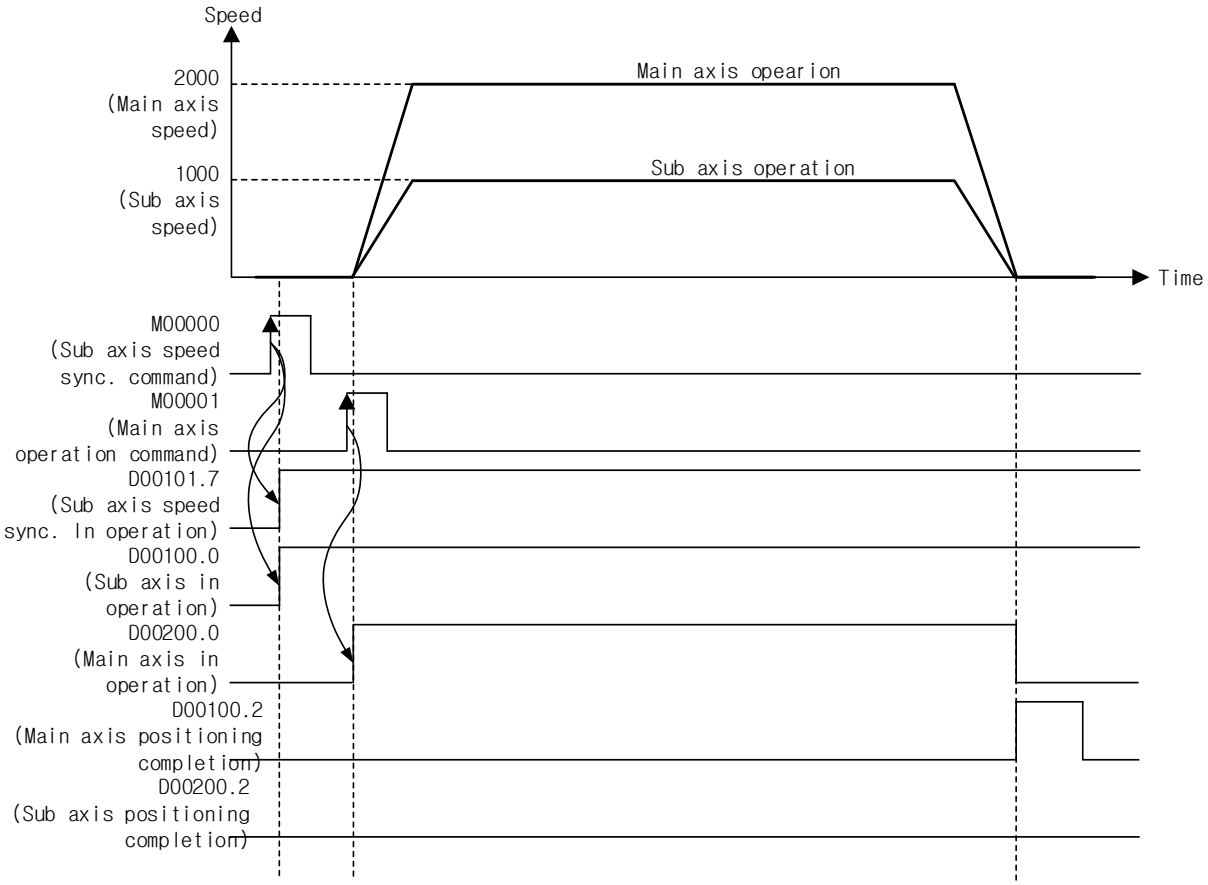
(b) When M00001 is On, the main axis (2 axes) moves to the set position (10000) at the set speed (2000).
At this time, the axis (1 axis) is 1000, which is 1/2 the speed of the main axis (2 axes), and operates the same as

the pattern in which the main axis (2 axes) moves.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XSSSD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*DINT*), Num3:=(*WORD*));

4) Caution

※ In the case below, speed synchronization Operating indication is not executed due to an error.

(1) The axis where the M code signal is on cannot execute the 32-bit speed synchronization command due to an error.(error code: 353). Before executing the speed synchronization command, execute the M code release (XMOF) command and change the M code to Off.

(2) If the speed of the subordinate axis exceeds the speed limit due to the 32-bit speed synchronization ratio, an error (code: 357) occurs on the subordinate axis. If the subordinate axis exceeds the speed limit value during speed synchronous operation, deceleration stops with the basic parameter 'Dec. time of Emergent stop'.

(3) When changing the speed of the subordinate axis with the 32-bit speed synchronization command, be careful as the difference between the speeds before and after the change may cause shock to the machine and machine.

(4) A speed synchronization command can be executed on the subordinate axis and an home return command can be executed on the main axis, but a speed synchronization command cannot be executed on the subordinate axis while the main axis is in the home return operation. However, when using LS Electric Servo (L7N/L7NH/L7NHF/PEGA series), the speed synchronization command can be executed on the subordinate axis even when the main axis is in the home return operation.

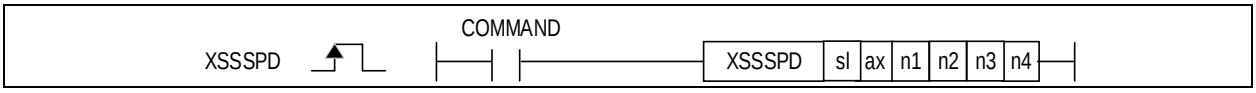
4.42.65 XSSSPD / 32-bit Position Specified Speed Synchronization

This command is basically the same as the positioning speed synchronization command, and when the parameter position set to 32 bits instead of 16 bits is reached, the speed synchronization is ended.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XSSSPD	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute direct start command : axis 1 ~ axis 8 ,9(encoder)	WORD
n1	Speed Synchronization main rate (-2147483648~2147483647)	DINT
n2	Speed Synchronization subordinate rate (-2,147,483,648 ~ 2,147,483,647)	DINT
n3	Speed Synchronization main setting : axis 1~ axis 8, 9(encoder)	WORD
n4	Speed Synchronization subordinate Position: -2,147,483,648 ~ 2,147,483,647)	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) The 32- bit position specified speed synchronization command is basically the same as the position specified speed synchronization command.
However, The values of the main axis ratio and the sub axis ratio can be set to a 32-bit integer range.

(2) When the 32-bit position specified speed synchronization command is executed, the subordinate axis is in the status of speed synchronization operation, and when the stop command is executed on the subordinate axis, the status of the speed synchronization operation of the subordinate axis is released.

(3) Ratio of Speed sync. is calculated as follows.
Speed synchronization ratio = Subordinate axis setting value/main axis setting value

(4) The operation direction of the sub-axis is determined by the sign of the speed synchronization ratio. If it is positive, it operates in the direction of the main axis, and if it is negative, it operates in the opposite direction of the operation of the main axis.
The speed synchronization ratio can be changed even when the subordinate axis is in speed synchronization operation.

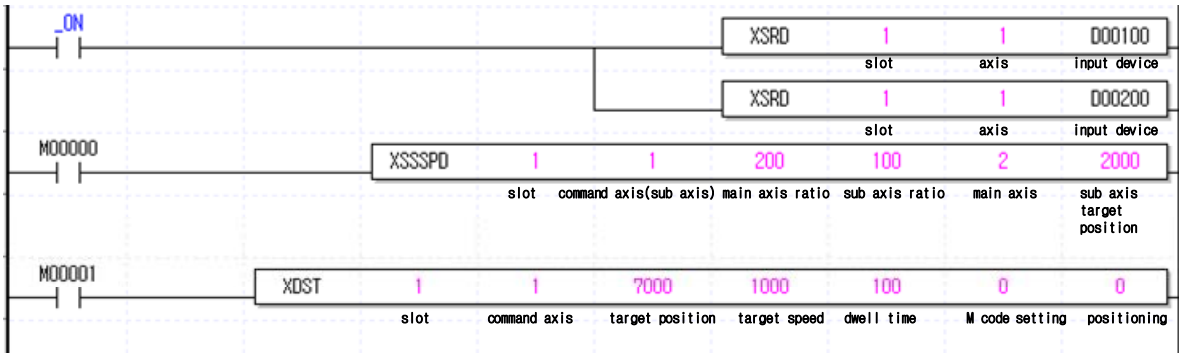
2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

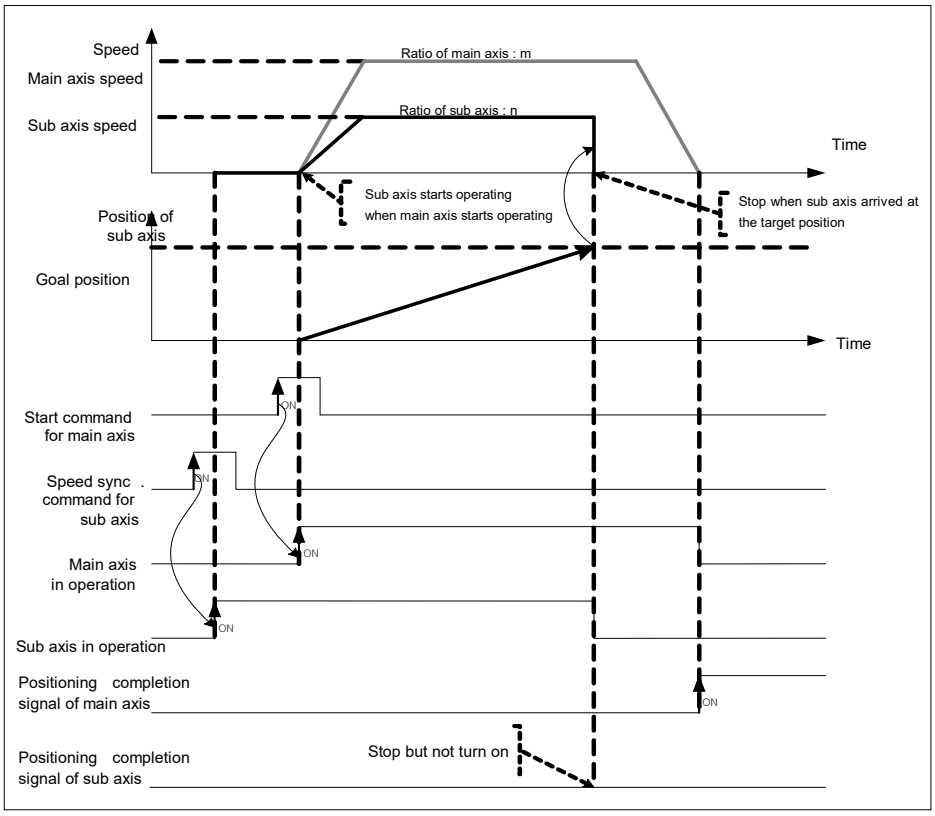
(a) A program that executes speed synchronous operation at the ratio of the main axis ratio:subordinate axis ratio 200:100 to the main axis of 2 axes, and executes the position-specified speed synchronization command to stop operation when the position reaches 2000 If M00001 is On while the homing of the positioning module installed in slot number 1 is determined.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XSSSD_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*DINT*), Num 3:=(*WORD*), Num4:=(*DINT*));

4) Caution

※ In the case below, position specified speed synchronization operation is not executed due to an error.

(1) The axis where the M code signal is on cannot execute the position specified speed synchronization command due to an error.(error code: 353)

(2) If the main axis and sub axis are set the same,, (Code: 355) will occur.

(3) An error (error code: 357) occurs if the speed of the subordinate axis exceeds the speed limit by the 32-bit position specified speed synchronization ratio. If the subordinate axis exceeds the speed limit value during position specified speed synchronous operation, deceleration stops with the basic parameter 'Dec. time of Emergent stop'.

(4) When changing the speed of the subordinate axis with the position specified speed synchronization command, be careful as the difference between the speeds before and after the change may cause shock to the machine and machine.

(5) A position specified speed synchronization command can be executed on the subordinate axis and an home return command can be executed on the main axis, but a position specified speed synchronization command cannot be executed on the subordinate axis while the main axis is in the home return operation.

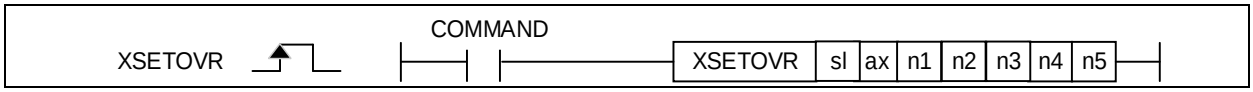
4.42.66 SETOVR / Speed/Acceleration/Deceleration Override

If you want to change the operation speed and acceleration/deceleration of the positioning control in operation, user may change the operation speed and acceleration/deceleration using the speed/acceleration/deceleration override command.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XSETOVR	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Speed override rate(or command speed)	DINT
n2	Accel. Time override rate(or command accel. time)	UDINT
n3	Decel. Time override rate(or command decel. time)	UDINT
n4	Unused (S-curve ratio (0=Trapezoid, 1~100=S-Curve ratio))	DINT
n5	Direction to operate (1~3: 1-forward direction,2- reverse direction,3- current direction)	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) If you want to change the operation speed, operation direction and acceleration/deceleration of the positioning control in operation, user may change the operation speed and acceleration/deceleration using the speed/acceleration/deceleration override command.

(2) It may be executed several times in operation.

(3) User may set speed override value as '%setting",“speed setting' on [Speed override] of common parameter.

※ Related parameter setting (common parameter)

Item	Setting Value	Content
SPD Override	0: % designate	Set the speed override setting value by %
	1:speed designate	Set the speed override setting value directly to the operating speed.

※ Auxiliary data of speed override command setting

Item	Setting Value	Content
SPD	1 ~ 65535 (1=0.01%)	If speed override is “%”, set the speed by % (If it is 100%, set 10000)
	1~ speed limit value	If speed override is “Exact number”, set the speed with exact number

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

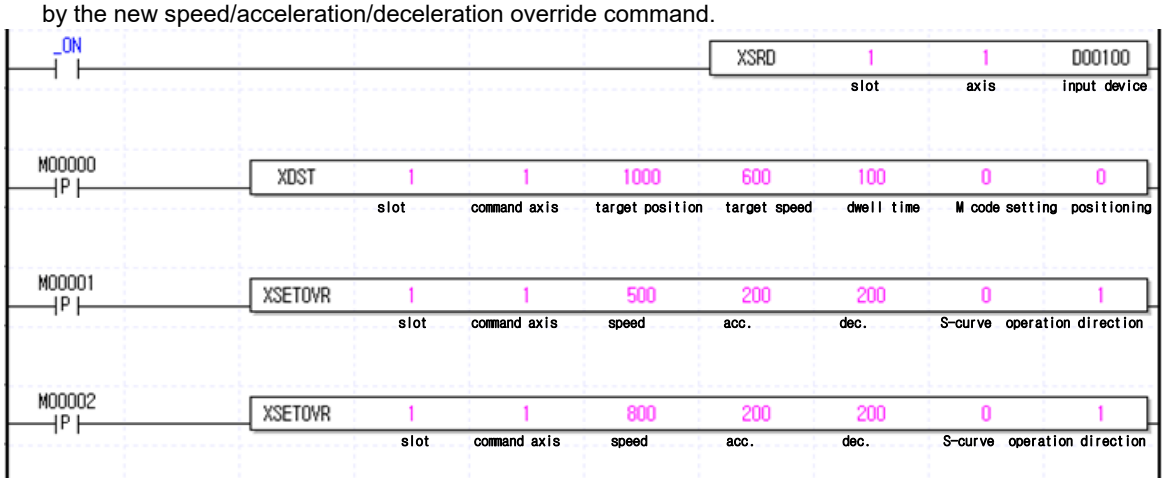
※ Below is an example of operation when speed/acceleration/deceleration override is executed multiple times.

(a) When 00000 is turned on while the home is determined, direct start executes on the command axis (1 axis).

(b) It operates at a target speed of 600 as long as the target position 1000, and positioning is completed after 100 ms of dwell time after reaching the target position. The control word is operated by position control and absolute coordinate setting.

(c) If M00001 is turned on in the constant speed section while the direct start is in operation, the speed override is executed in the specified acceleration/deceleration/operation direction at the current speed of 600->500 by the speed/acceleration/deceleration override command.

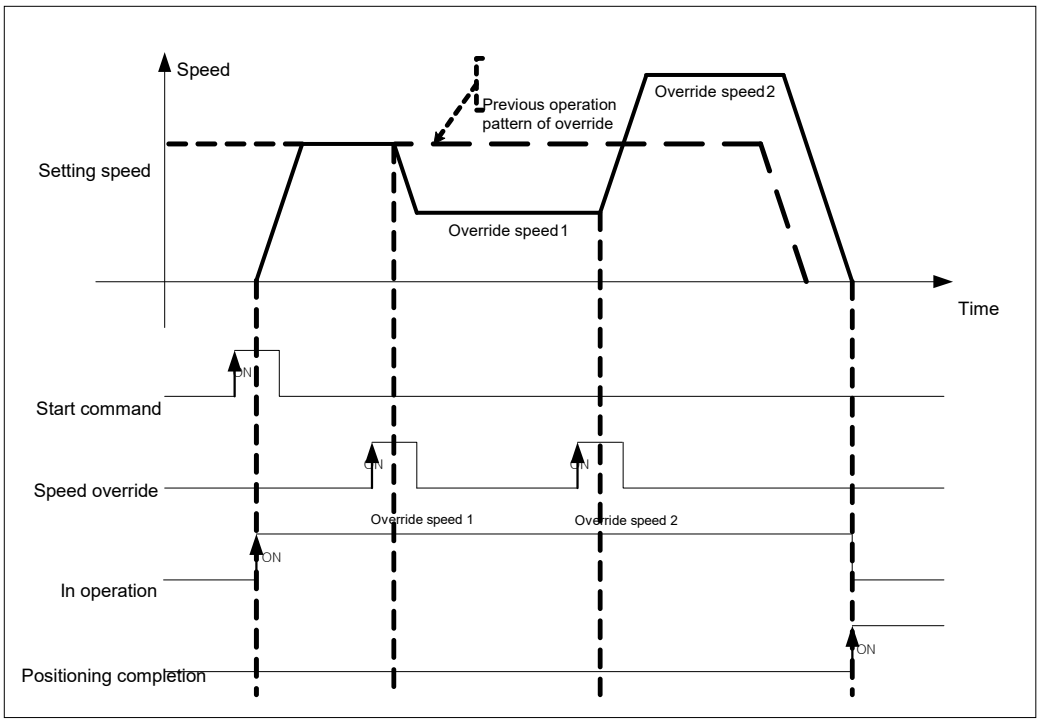
(d) If M00002 is additionally turned on while the speed/acceleration/deceleration is overridden once, the speed override is executed in the specified acceleration/deceleration/driving direction at the current speed 500->800 set by the new speed/acceleration/deceleration override command.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above. (MK type XSETOVR)



(3) ST (Structure Text): Automatic program assignment

XSETOVR_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*DINT*), Num2:=(*UDINT*), Num3:=(*UDINT*), Num4:=(*DINT*), Num5:=(*DINT*));

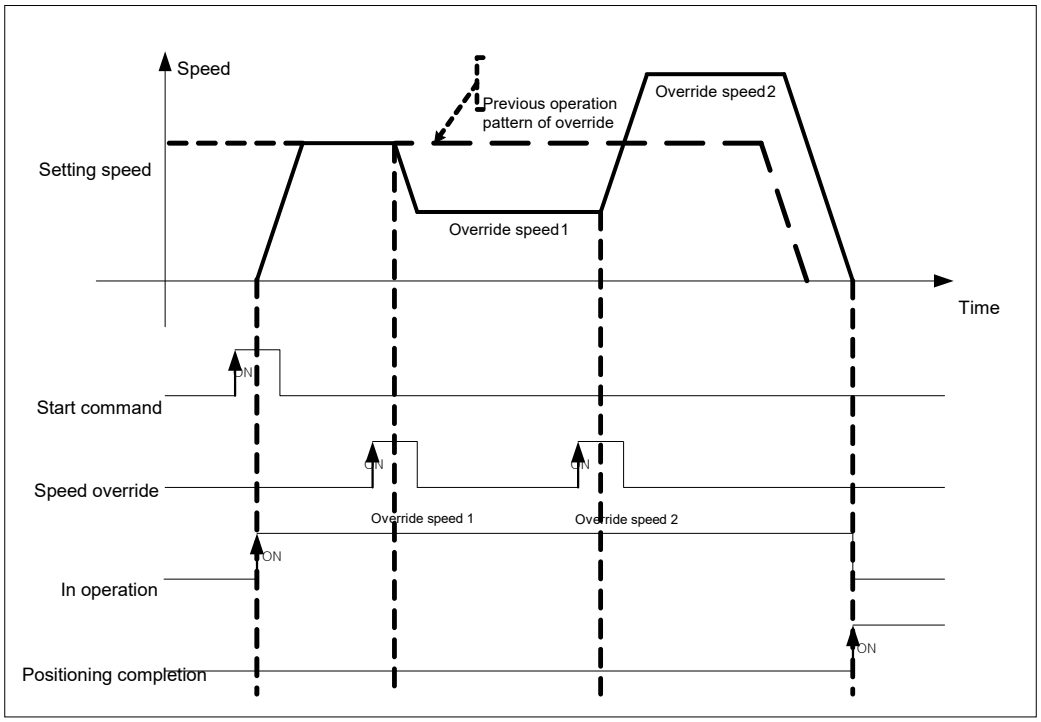
4) Caution

(1) For direction parameter n4, only 1 (forward), 2 (reverse), and 3 (current direction) can be set If n4 is set as the default 0, the command does not operate normally during operation.

(2) The command is the same as the IEC type command (XPM_SETOVR), but it differs depending on the input conditions.

- In the case of XPM_SETOVR in IEC type, the Content command is executed in real time when the parameter value is changed even when the input contact is continuously on. (Level method)
- In the case of MK type, since the instance memory does not exist in the CPU, it operates in the edge method, not the level method, and if you want to reflect this by changing the parameter condition, it is reflected when you make the input contact OFF/ON (edge condition).
  he corresponding timing chart is 3) – (2), and compare it with the IEC type command below.

※ (IEC type Level method timing chart)



※ In the cases below, speed override is not executed and previous operation is being kept.

- Execute speed override command on the subordinate axis of linear interpolation.(error code: 373). In linear interpolation,speed override must be executed on main axis.
- Override speed of linear interpolation for each axis need to be below speed limit.
- Execute speed override command on the subordinate axis of linear interpolation.(error code: 373). In linear interpolation, speed override must be executed on main axis.
- Execute speed override command on the subordinate axis of circular interpolation.(error code: 374). In circular interpolation,speed override must be executed on main axis.
- Execute speed override command on the subordinate axis of synchronous operation(error code: 375).
- Execute speed override command in deceleration area.(error code: 377)
- In the case that acc./dec. pattern of extended parameter is 'S-curve operation.(error code: 378)
- When entering a value greater than 0 or 3 in the operational direction(error code : 781)(1~3: 1-forward direction,2-reverse direction,3- current direction).
- In case of specifying negative speed value during position control operation (error code: 782)
- When the speed override of the common parameter is "% specified", when the command is executed with a value greater than 65535 for acceleration or deceleration (error code: 783)

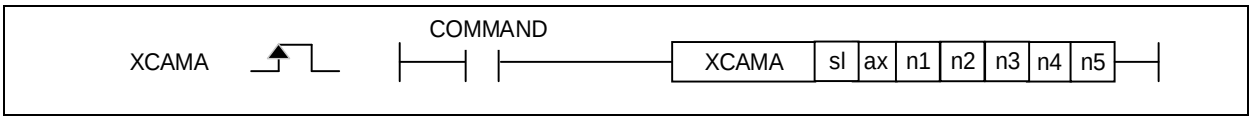
4.42.67 XCAMA / Absolute Position CAM Operation

The absolute position cam operation is a cam operation in which the main axis reference cam operation start position parameter is added to the main axis position offset cam operation function.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XCAMA	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution (Slave Axis): 1 ~ 8(Real axis)	WORD
n1	Main axis setting 1~ 8(real axis), 9: Encoder 1	WORD
n2	Cam data block to apply to operation (1 ~ 9)	WORD
n3	Cam operation start travel (-2147483648 ~ 2147483647)	DINT
n4	Main axis offset (-2147483648 ~ 2147483647)	DINT
n5	Subordinate axis offset (-2147483648 ~ 2147483647)	DINT

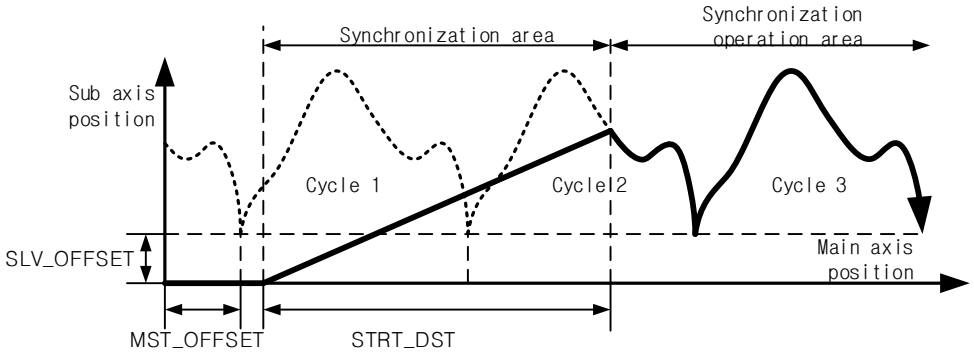
※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) When the absolute position cam operation command (XCAMA) is executed and the main axis starts operation, the operation is executed to the synchronous position until the main axis reaches the distance set in STRT_DST. The synchronous position is the position of the subordinate axis according to the cam data value set in the cam block from the position when the main axis moves as much as STRT_DST.
The synchronous position of the subordinate axis can be moved by SLV_OFFSET and MST_OFFSET values.
When the main axis reaches the distance set in STRT_DST, cam operation is performed with the cam data value set in the cam block.



(2) Encoder can be used as main axis of absolute position CAM run.
(3) Set different CAM block no. for each axis.
In addition, it is possible to execute CAM operation with the same CAM block.
(4) In order to use user CAM operation, you have to set CAM block number 9.
(5) By setting the start distance (STRT_DST), the position of the main axis where cam synchronization starts when the cam command is executed can be changed.
(6) If the starting distance is set to a small value, a shock may occur due to the rapid drive of the subordinate axis.
(7) By setting the main axis offset and sub axis offset, change the position where the sub axis starts cam operation.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

※ The following is an example of basic operation and release of absolute position cam control.

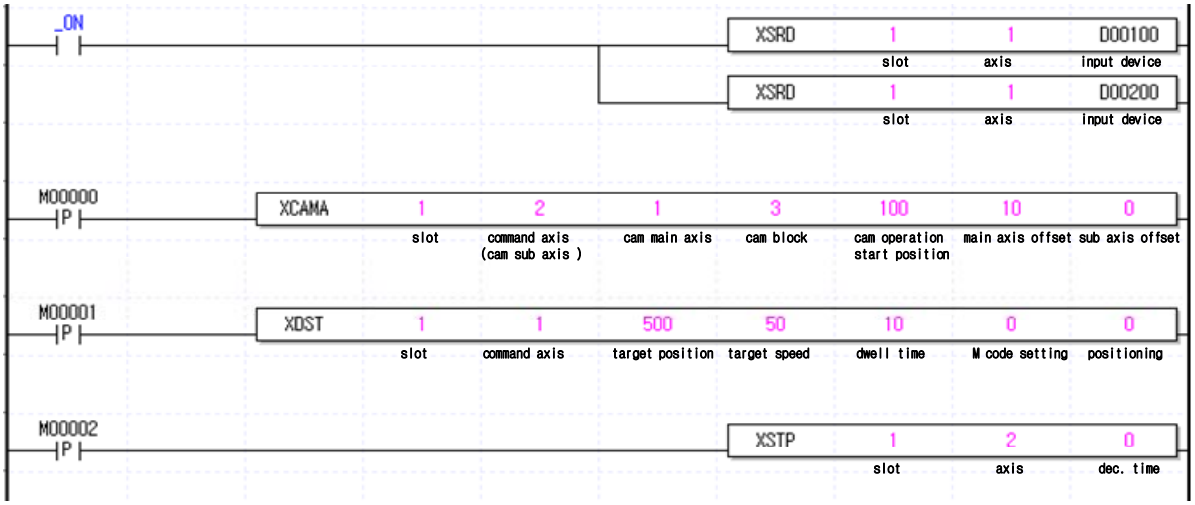
(a) When M00000 is On, the cam control main/sub axis , cam control start position, main axis/subordinate axis offset are set. Cam control sub axis/main axis setting is indicated in the axis state imformation. (Cam control subordinate axis: axis 2, Main axis 1, cam control block 3 setting,can control start position:100,main axis offset: 10,subordinate axis offset:0)

(b) When M00001 is turned on in the homing state, the main axis starts at the target position 500 at the target speed of 50, and when the target position is reached, positioning completion is end after 10 ms of dwell time.

(c) If you look at the position within one revolution of the main axis, when the operation of the main axis starts, the “current position within one rotation of the main axis” increases to the “number of pulses per revolution-1” set in the parameter, and then becomes 0 again. It repeats with the position value of 0 ~ “Number of pulses per revolution-1”.

(d) After the main axis/sub axis offset set in the XCAMA command is applied, the main axis moves to the starting distance of cam operation, and then the sub axis is cam controlled according to the set cam profile.

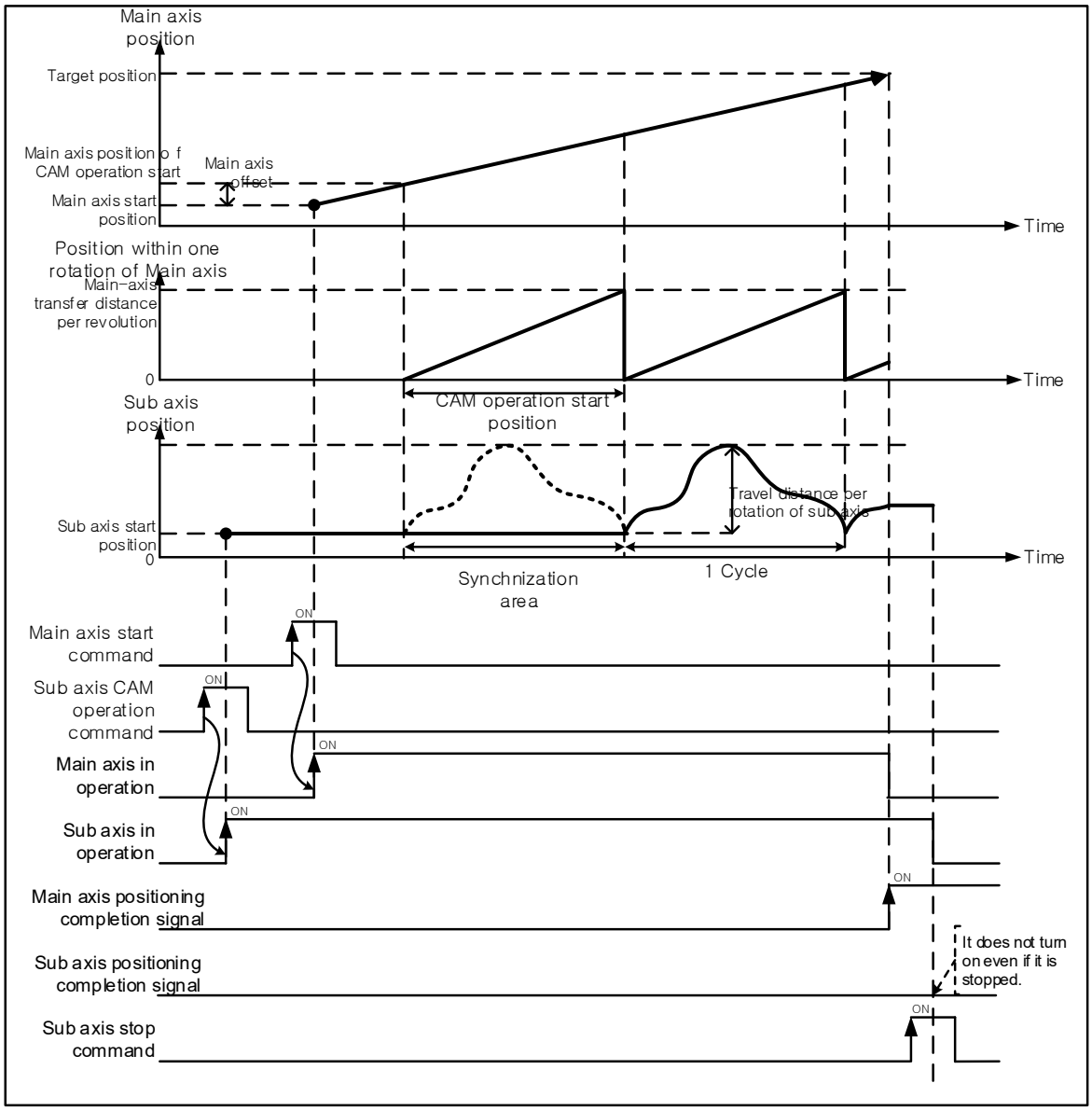
(e) When the M00002 contact is on, the sub axis cam control is released by the deceleration stop command.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

XCAMA_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(* WORD *), Num3:=(*DINT*), Num4:=(*DINT*), Num5:=(*DINT*));

4) Caution

※ Absolute position CAM operation command may not be executed in the cases below.

(1) If execute CAM operation command in being On of M code, error (code:702) arises. Make M code “OFF” with “M code release (XMOF)” command before use.

(2) If the current main axis is not connect to current network or main axis setting and command axis are the same axis, error (code:704) arises. Set the main axis among the axes currently connected to the network.

(3) If speed of main axis is too fast and speed of sub axis exceeds speed limit, error (code:708) arises. In this case, you have to lower the operation speed.

(4) In the case that the speed of main axis exceeds the speed limit, error arises and it decelerate in decel. time 1.

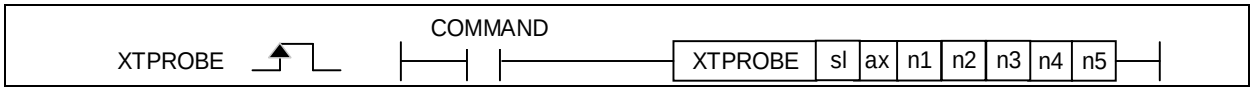
4.42.68 XTPROBE / Touch Probe

When the rising/falling edge of the touch probe 1 or touch probe 2 signal of the servo drive is triggered, the current position of the servo drive can be latched to read the position data latched by the instruction from the CPU. .

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XTPROBE	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution (Slave Axis): 1 ~ 8(Real axis)	WORD
n1	Signal to use as trigger input	WORD
n2	Trigger mode (0: single trigger, 1 : continuous trigger)	WORD
n3	Window mode (0: disable, 1: enable)	WORD
n4	Window mode enable area start position value (-2,147,483,648 ~ 2,147,483,647)	DINT
n5	Window mode enable area end position value (-2,147,483,648 ~ 2,147,483,647)	DINT

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of rangee	F110

1) Function

(1) This command is used to set the external touch probe function of the positioning module.
(2) The touch probe command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).
(3) The signal to be used as the <trigger input> specified in n1 can be specified as follows.
- 0: Touch probe 1 rising edge
- 1: Touch probe 2 rising edge
- 2: Touch probe 1 rising edge
- 3: Touch probe 2 falling edge
- 4: Touch probe 1 Index(Z) pulse
- 5: Touch probe 2 Index(Z) pulse

※ The rising or falling edge of each touch probe and the index(Z) pulse cannot be executed simultaneously.

(4) The operation according to the< Trigger mode> item specified in n2 is as follows.
- 0: Single trigger (after the trigger mode is setting, the current position is latched on the first touch probe 1 signal input.)
- 1: Continuous trigger (after the trigger mode is setting, the current position is latched for each touch prob e 1 signal.)
- Values above 1 are treated the same as “1”

(5) The operation according to the window mode item specified in n3 is as follows.
When window mode is enabled, it works only as a single trigger.
- 0:Window mode disable
- 1:Window mode enable

(6) The number of latch position data and latch position data can be read by the latch position data read com mand (XLRD)

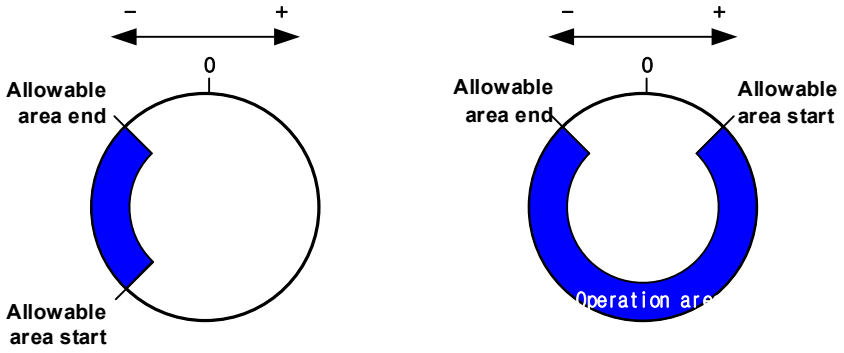
(7) When the touch probe or index (Z) pulse signal is turned on, the current position value of the servo drive i s saved as latch position data.

(8) When the touch probe or the index (Z) pulse signal is turned on and the latch is completed, information is stored in Bit 5: “Trigger Complete” bit of the axis information of the status information.
The “trigger complete” status bit remains on until reset by the trigger release command.

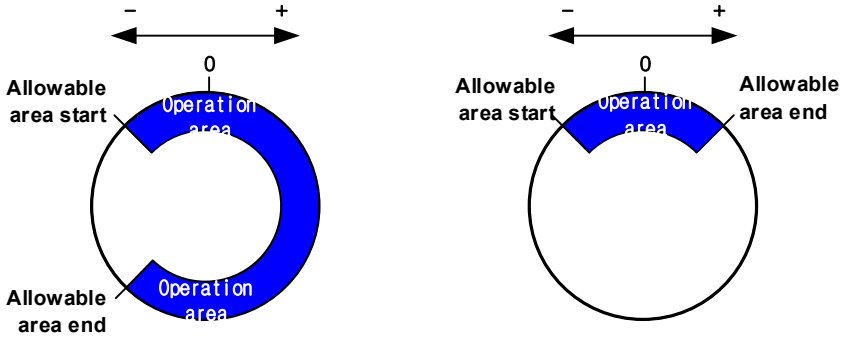
(9) When the latch mode is single trigger, if the trigger release command is executed after the latch function is activated on the first touch probe or index (Z) pulse signal, the trigger function can be used again on the next touch probe or index (Z) pulse signal. (It works the same when the touch probe setting command is executed again.

(10) specify the area where the latch (touch probe) function operates.
- If you specify the allowable area, it operates only within the designated area.
- In the case of infinite length repeat operation (rotary axis), the relationship of the latch (touch probe) operation area according to the start and end positions of the allowable area is as follows.

In case allowable area start position < Allowable area end position



In case allowable area start position > Allowable area end position



(13)To use the latch (touch probe) function, the following objects must be included in the PDO setting of the slave parameter.

Trigger input	RxPDO	TxPDO
Touch probe 1 rising edge	0x60B8:0 touch probe function	0x60B9:0 touch probe status 0x60BA:0 touch probe 1 forward direction position values
Touch probe 2 rising edge	0x60B8:0 ouch probe function	0x60B9:0 touch probe status 0x60BC:0 touch probe 2 forward direction position values
Touch probe 1 falling edge	0x60B8:0 touch probe function	0x60B9:0 touch probe status 0x60BB:0 touch probe 1 reverse direction position values
Touch probe 2 falling edge	0x60B8:0 touch probe function	0x60B9:0 touch probe status 0x60BD:0 touch probe 2 reverse direction position values

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

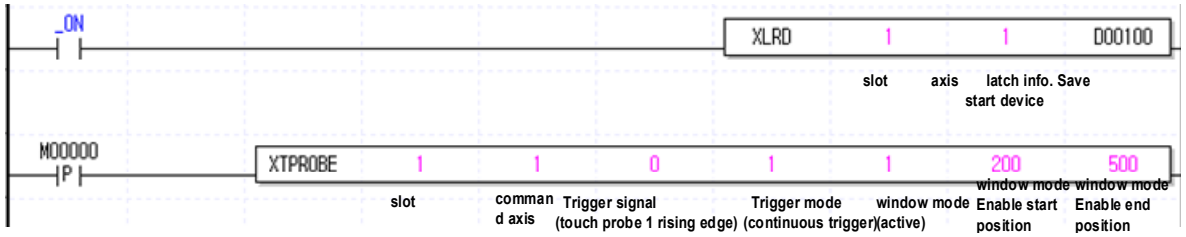
3) Example

(1) LD: Ladder Diagram

※ Below is a basic operation example used to set the external touch probe function.

(a) If M00000 is On while the axis is ready, the current value of the servo drive is latched by the value set in the touch probe read command.
(External touch probe 1 rising edge, continuous trigger, window mode enable, window mode enable start/end position setting)

(b) The position value of the servo parameter is saved in the start device (D100) area set in XLRD.

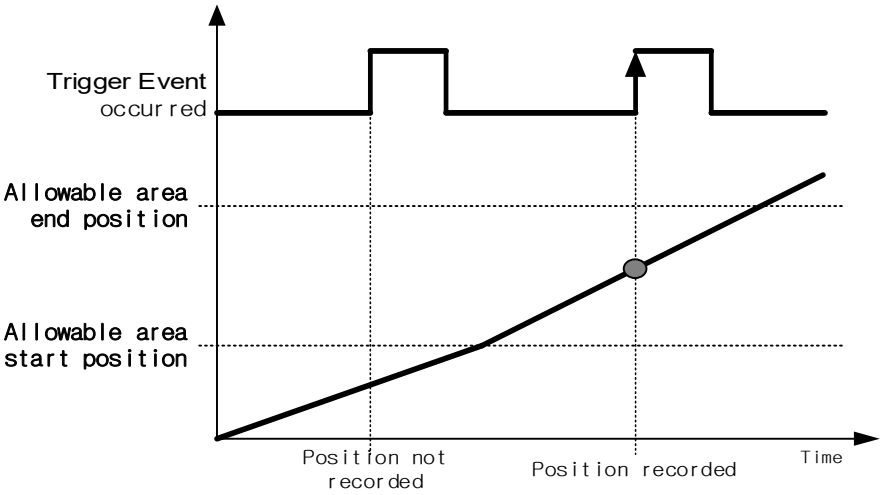


※ To read the latch information of the axis, refer to the description of the XLRD instruction.

Device number	Size	Content
Device	WORD	Number of touch probes enable (Fixed to 6)
Device +1	WORD	-
Device +2	DINT	Latch position data triggered on rising edge of touch probe 1
Device +4	DINT	Latch position data triggered on rising edge of touch probe 2
Device +6	DINT	Latch position data triggered on falling edge of touch probe 1
Device +8	DINT	Latch position data triggered on falling edge of touch probe 2
Device +10	DINT	Latch position data triggered on pulse of touch probe 1 index(Z)
Device +12	DINT	Latch position data triggered on pulse of touch probe 2 index(Z)
Device +14	DINT	Not used in touch probe commands
Device +16	DINT	
Device +18	DINT	
Device +20	DINT	

(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment
XTPROBE_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(* WORD *), Num3:=(*WORD*), Num4:=(*DINT*), Num5:=(*DINT*));

4) Caution

(1) The rising or falling edge of each touch probe and the index (Z) pulse cannot be executed simultaneously.

(2) This action can be completed in multiple scans.

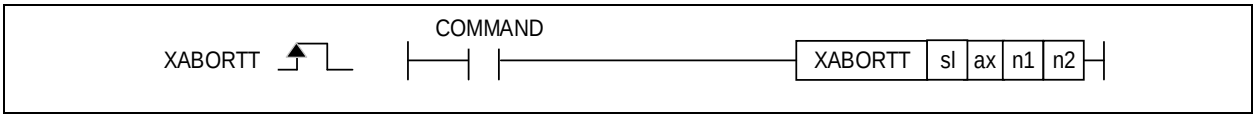
4.42.69 XABORTT / Trigger Off

This command is used to release the external (touch probe, etc.) trigger function of the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area														Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XTABORTT	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Subordinate axis to execute cam command (1 ~ 8: axis 1 ~ axis 8)	WORD
n1	Trigger reset signal	WORD
n2	Trigger reset item	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

(1) This command is used to release the external trigger function of the positioning module.
(2) The command release the trigger function on the axis specified by ax of the positioning module specified b y sl (slot number of the positioning module).
(3) The signal to be released for trigger specified in n1 can be specified as follows.
- 0: Touch probe 1 rising edge
- 1: Touch probe 2 rising edge
- 2: Touch probe 1 rising edge
- 3: Touch probe 2 falling edge
- 4: Touch probe 1 Index(Z) pulse
- 5: Touch probe 2 Index(Z) pulse

(4) The signal to be reset for trigger specified in n2 can be specified as follows.
- 0: Trigger completion status reset
- 1: Trigger position data and trigger completion status reset

2) Error

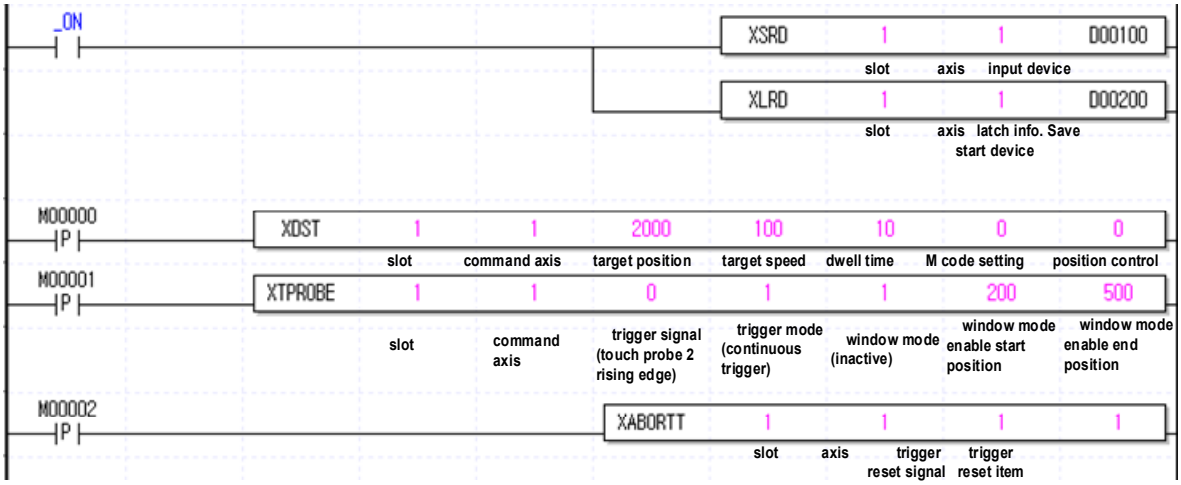
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

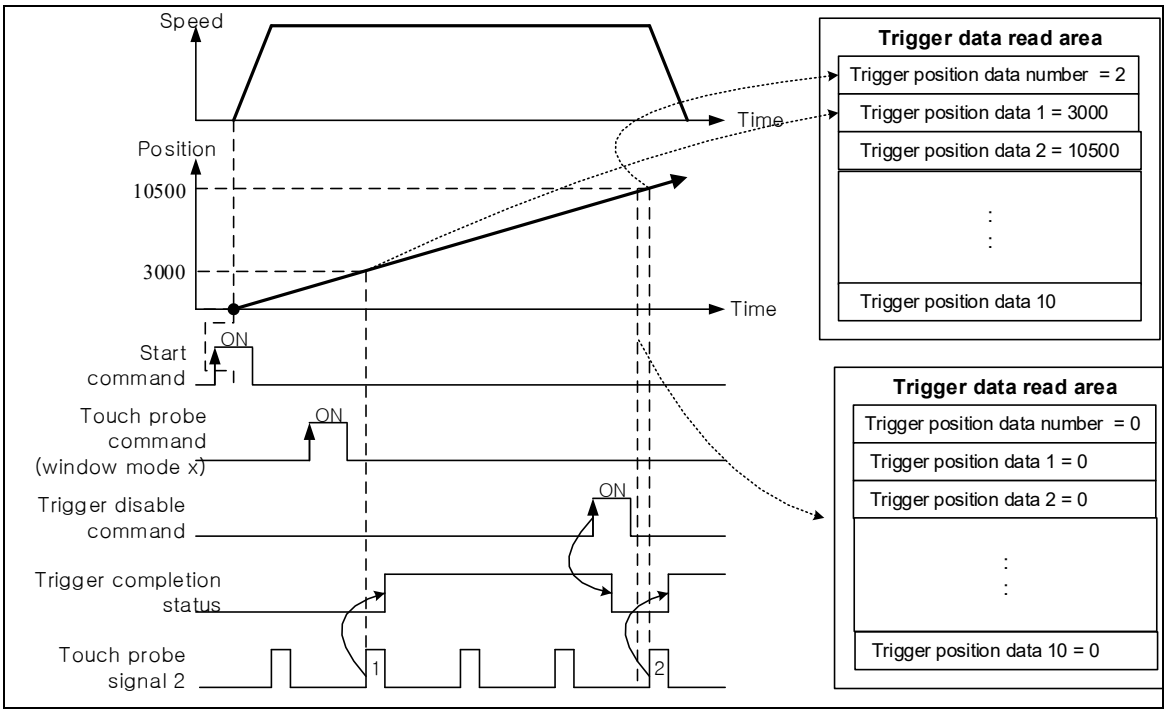
※ This is an example program of trigger off according to the latch setting of the touch probe 2 signal.

(a) If 00000 is On while the home is determined, position control is executed at the set target position/speed.
(b) After that, when M00001 is On, the trigger function is activated in the continuous trigger mode (0), and then the trigger function is operated on the first touch probe 2 signal.
(c) The trigger position data and trigger completion status are reset by the trigger reset command by the M00002 contact.
(d) At this time, all values of the latch data read area are initialized.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

XABORTT_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*WORD*), Num2:=(*WORD*),Num3:=(*WORD*));

4) Caution

(1) When the touch probe or the index (Z) pulse signal is turned on and the latch is completed, information is stored in Bit 5: “Trigger Complete” bit of the axis information of the status information. “Trigger complete” status bit remains on until reset by trigger release command (XABORTT).

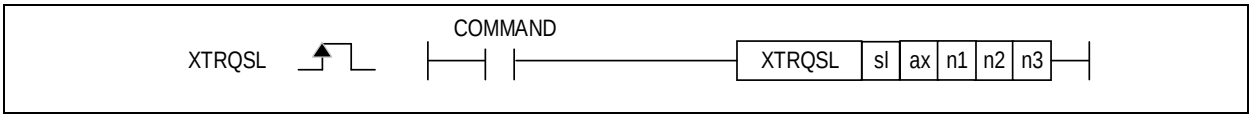
4.42.70 XTRQSL / Speed Limit Torque Control

This command is used to executes torque control at a speed below the limited speed of the positioning module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XTRQSL	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis of command execution : 1 ~ 8(Real axis)	WORD
n1	Torque values (unit:%, -32768 ~ 32767)	INT
n2	Torque Inclination (unit:ms, 0 ~ 65535ms)	WORD
n3	Speed limit (unit: rpm, 0~6000)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

If the synchronous ratio is positive, it operates in the direction of the main axis, and if it is negative, it operate s in the opposite direction of the main axis.

(2) The speed synchronous with position command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).

(3) Set the synchronization ratio at n1.
If the synchronous ratio is positive, it operates in the direction of the main axis, and if it is negative, it op erates in the opposite direction of the main axis.
For example, if the sync ratio is set to 0.5, when the main axis moves 3000, the sub axis moves 1500.

(4) This action can be completed in multiple scans.

2) Error

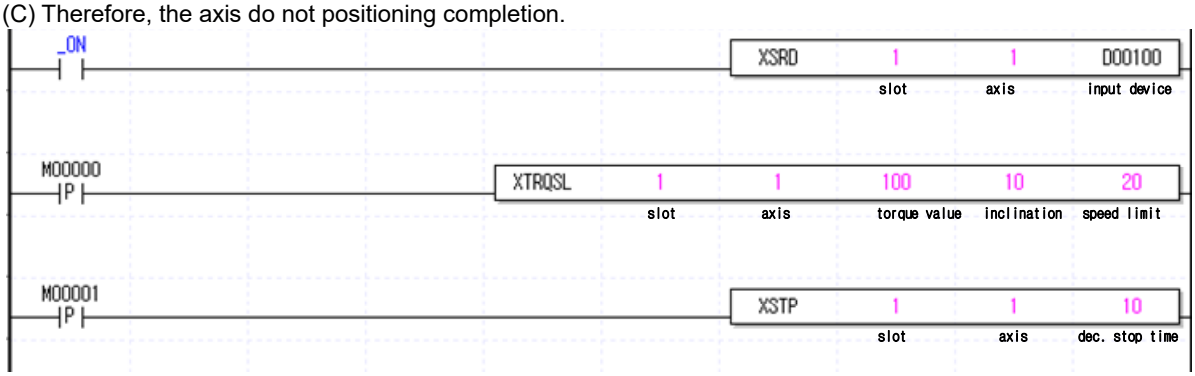
(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

(1) LD: Ladder Diagram

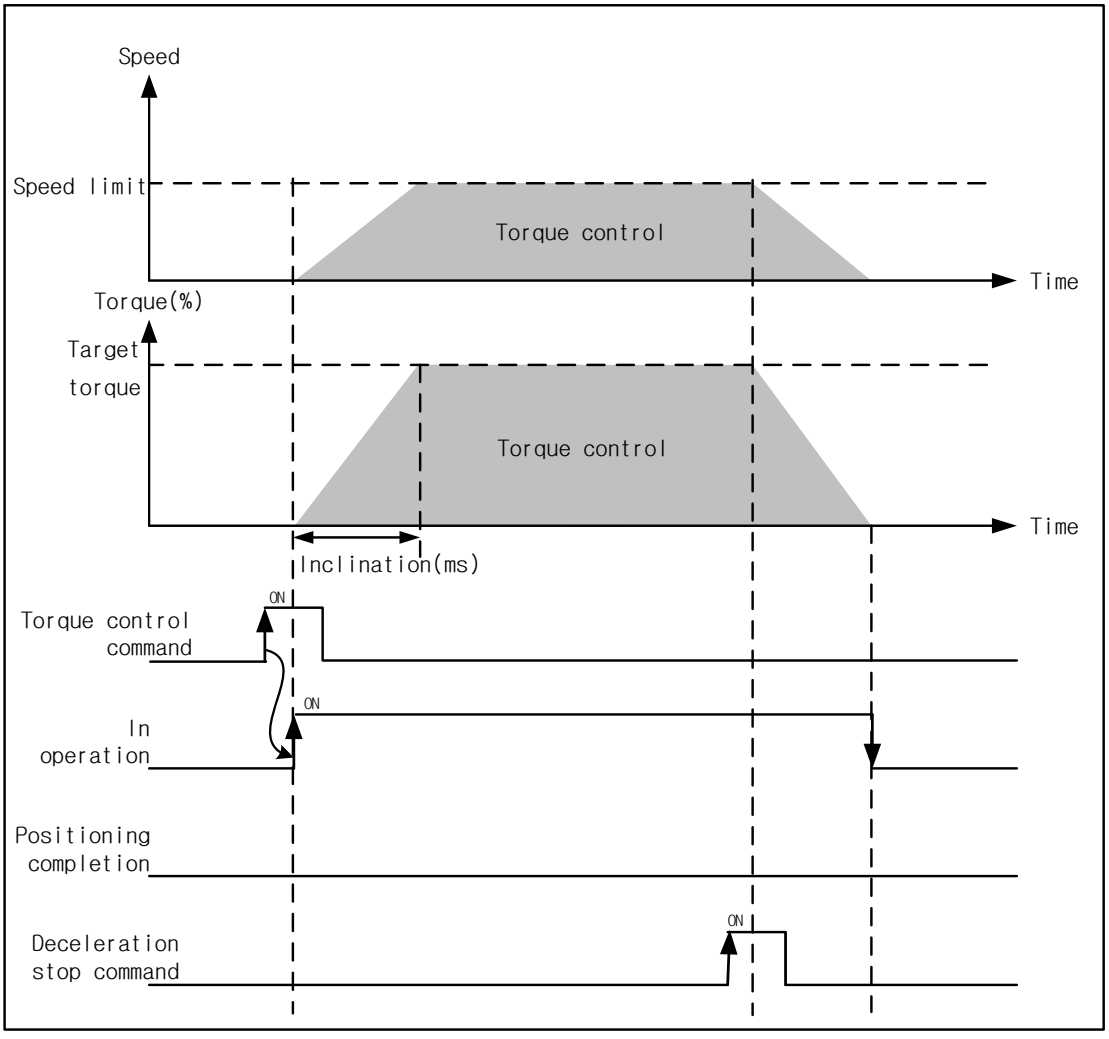
※ Axis 1 of the positioning module installed in slot number 1 reaches 100% torque for 10 ms time.
However, this is an example of a program in which the speed limit value is set to 20,which is used as the maximum value and then the torque control is stopped by the deceleration stop command.

(a) When M00000 is On while the axis is ready, torque control is executed with the set target torque and slope.
(b) When M00001 is On, the torque control is stopped by the deceleration stop command and stops.
(C) Therefore, the axis do not positioning completion.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment

```
XTRQSL_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*INT*), Num2:=(*WORD*),Num3:
=(*WORD*));
```

4) Caution

(1) This command only applies to the LS ELECTRIC servo drive family.

(2) It is unavailable to be executed when the axis is operating other than torque control.

※ Torque control may not be executed in the case below.

- When a command is executed while in operation other than torque control (error code: 741)
- When a command is executed while M Code ON signal is On status (error code: 742)
- When a command is executed while in Servo off status (error code: 742)
- When the servo drive does not support the torque control mode (error code: 565, XGF-PN8B)

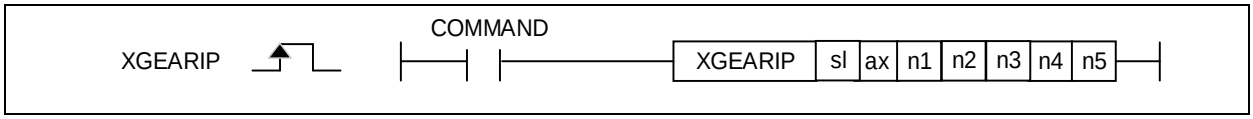
4.42.71 XGEARIP / Sync Position-specified Speed Synchronization

This command is a speed synchronization operation for the main axis (or encoder) and sub axis according to the same set ratio as the speed synchronization operation and you can specify the main axis distance at which the synchronization operation will start and the starting position at which the main axis and sub axis are synchronized.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	O	X	X	X	X	O	O	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R		error (F110)	Zero (F111)	Carry (F112)
XGEARIP	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n1	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n2	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n3	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n4	O	-	O	-	-	-	O	-	-	O	-	O	O	O				
	n5	O	-	O	-	-	-	O	-	-	O	-	O	O	O				



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
ax	Axis to execute direct start command : 1 ~ 8(Real axis)	WORD
n1	Synchronous ratio(Subordinate axis ratio/Main axis ratio)	REAL
n2	Main axis position to be synchronized	DINT
n3	Subordinate axis position to be synchronized	DINT
n4	Distance of main axis to start synchronous operation	DINT
n5	Control word (Main axis setting: 1~8: axis 1~axis 8, 9: encoder 1, 10: encoder 2)	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
error	ax value is out of range	F110

1) Function

If the synchronous ratio is positive, it operates in the direction of the main axis, and if it is negative, it operate s in the opposite direction of the main axis.

(2) The speed synchronous with position command is executed on the axis specified by ax of the positioning module specified by sl (slot number of the positioning module).

(3) Set the synchronization ratio at n1. If the synchronous ratio is positive, it operates in the direction of the m ain axis, and if it is negative, it operates in the opposite direction of the main axis.
For example, if the sync ratio is set to 0.5, when the main axis moves 3000, the sub axis moves 1500.

(4) This action can be completed in multiple scans.

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

3) Example

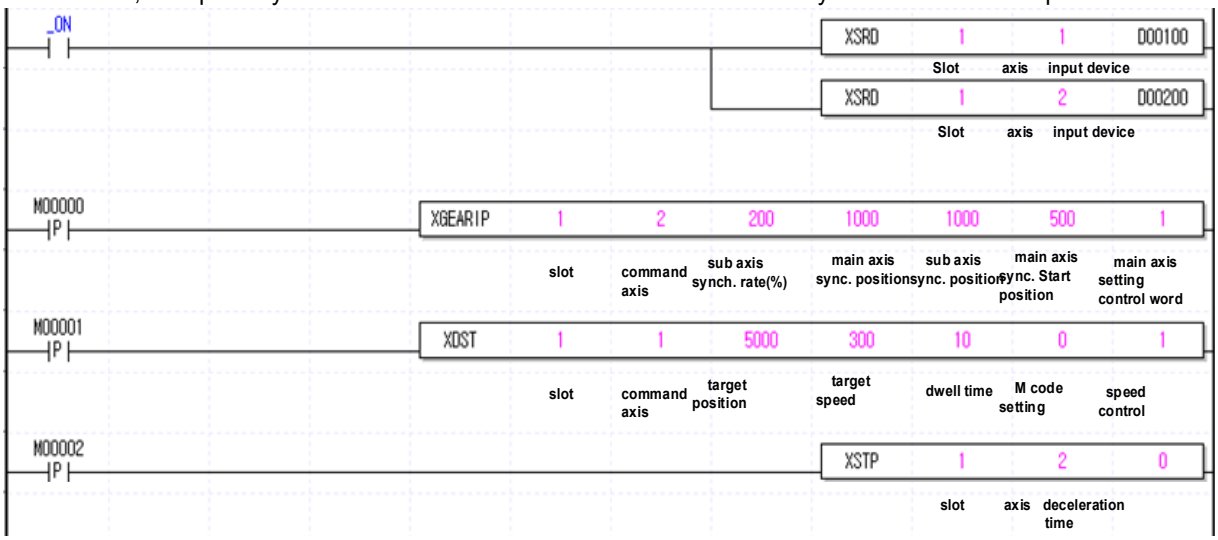
(1) LD: Ladder Diagram

The following is an example in which the subordinate axis stops after the sync position-specified speed synchronization operation.

- The main axis is 1 axis, The subordinate axis is 2 axis
- Main axis/subordinate axis synchronous ratio:2, Main axis synchronous position : 1,000 ,subordinate axis synchronous position : 1,000
- Distance of main axis to start synchronous operation : 500
- The subordinate axis synchronization starts at the 500 position (main axis synchronization position-main axis distance to start synchronous operation = 1000-500)

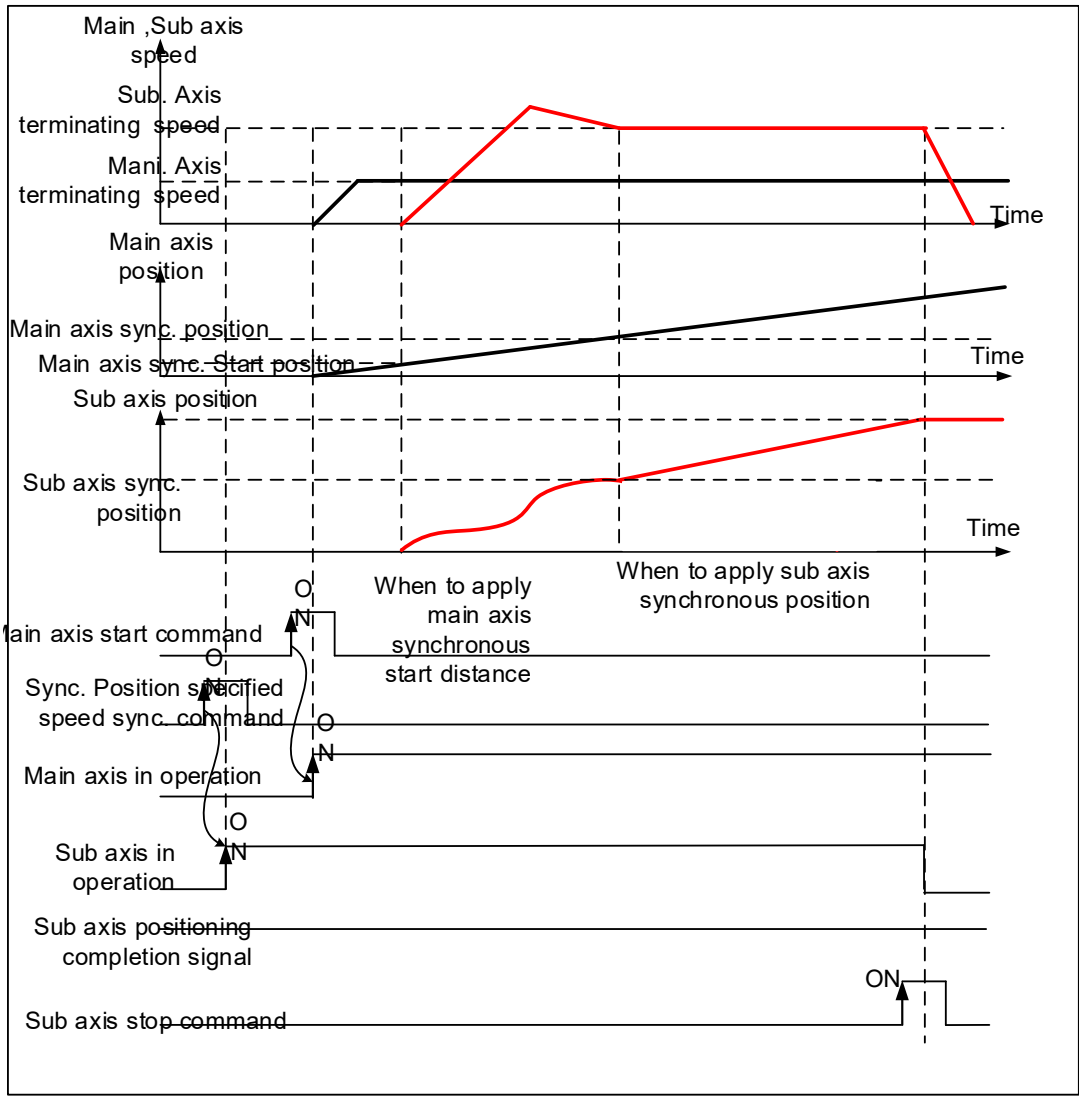
As of the time when the positions of the main axis and subordinate axis are 1000 respectively, the main axis/sub axis speed is twice the synchronous ratio and the sub axis is operated twice the main axis speed.

- Then, the speed synchronization of the subordinate axis is released by the deceleration stop command.



※ To read the status information of the axis, refer to the description of the XSRD instruction.

(2) Timer chart



(3) ST (Structure Text): Automatic program assignment
XGEARIP_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), ax:=(*WORD*), Num1:=(*REAL*), Num2:=(*DINT*),Num3:=(*DINT*), Num4:=(*DINT*), Num5:=(*WORD*));

4) Caution

(1) Not possible to carry out speed synchronization command in the state of M Code ON (ErrorCode:353)
(2) Not possible to carry out speed synchronization command in the state of Servo off(Error Code: 354).
(3) Setting a value other than the control word setting will cause an error.
Set the main axis setting of the speed synchronization command among the axes connected to the network other than the command axis or the encoder. Main axis is set by writing 1~8(Axis1 ~ Axis8), 9(Encoder 1) 10(Encoder 2) to the setting address.(: 355)
(4) Setting a value other than the control word setting will cause an error.
(5) The main axis ratio of speed synchronization command cannot be set to 0. Set a value between -32768 and 32767 excluding zero.(Error code: 356)
(6) The speed of Synchronous Start by Speed command cannot exceeds its speed limit.(Error Code: 357)
(7) Not possible to carry out speed synchronization command when when the main axis is in home return operation.(Error Code: 358)
(Except when the main axis is LS ELECTRIC L7N/L7NH/XIP)

4.43 Motion Control Instruction

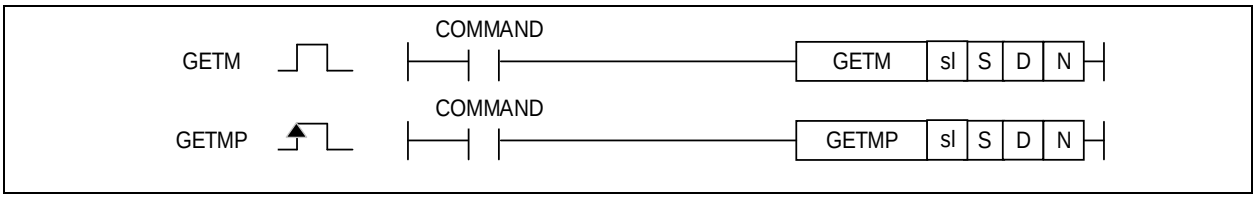
4.43.1 GETM, GETMP / Read from Motion (position) module

This instruction is used to read the data of motion module.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
GETM(P)	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	D	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	N	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with positioning module: h00xy	WORD
S	Start address of fixed area of motion module	WORD
D	Device name and number in CPU	DWORD
N	Number of data to read	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
PUT/GET error	1. When there is no module or motion module in the designated base / slot 2. If PUT/GET instruction is not completed correctly 3. If the max base range supported by each CPU is exceeded 4. When there is no address designated as S in the module installed in the specified slot 5. ax value is out of range	F0015~F0022

1) Function

(1) This instruction is used to read the data of motion module.

(2) Read N double word data from the memory (specified by S: address) of the motion module designated by sl (slot number of the special module) to the CPU area designated by D.

2) error

(1) If the area from the address designated by S to the number of N exceeds the corresponding block, an error occurs.
This error is currently blocked from being entered in XG5000.

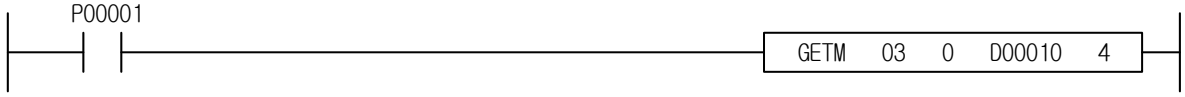
(2) When the module installed in the designated slot is not a motion module or the mounted module does not have the address designated as S, set the PUT/GET error (F0015 to F0022) and the operation error (F110) together. This is because the fixed area address may differ depending on the special module

(3) If there is no module in the designated slot, only PUT/GET error(F0015 to F0022) are set.

3) Example

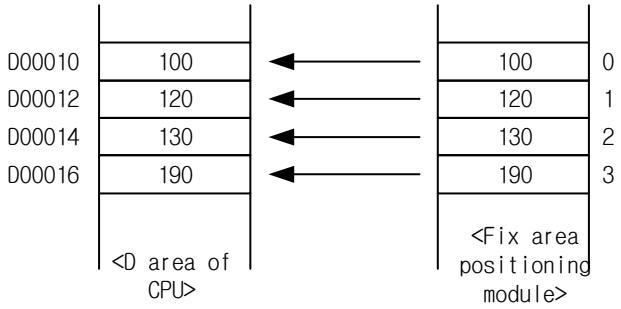
(1) LD: Ladder Diagram

- A program that reads and saves the data of 4 words from address 0 to address 3 in the fixed area of the motion module installed in slot 0, base 3 to D0010~ 00016



(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

GETM_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S:=(*WORD*), D:=(* DWORD*), N:=(*WORD*));

4) Caution

(1) When the status of Servo parameter R/W processing is Off after at least 4ms after executing the servo parameter read command, the GETM (or GETMP) instruction must be executed.After the data read from the module is updated in the data common area, the reflected value can be read.

(2) You have to execute GETM command minimum 2ms after executing 'Variable data read' to save the read data in common.

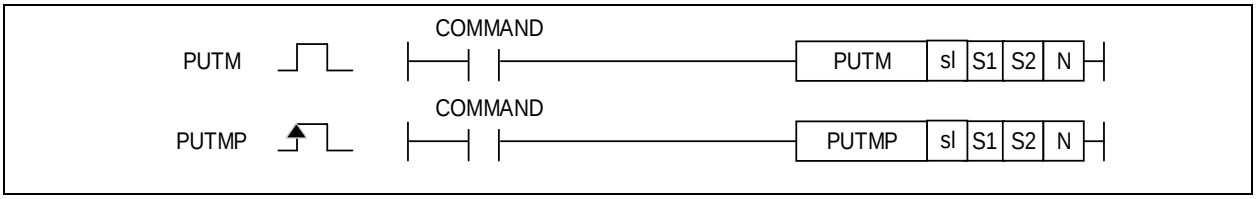
4.43.2 PUTM, PUTMP / Write to Motion(Position)

This instruction is used to write the data of motion module.

Supported Type	XGK					XGK-N			XBC(built-in)				□BM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	O

※ XBC-U and XBM can use the network location module (XBF-PNxxB) only in slots 2 and 3.

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
PUTM(P)	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	4~7	O	-	-
	S1	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	S2	O	-	O	-	-	-	O	-	-	O	-	O	O	O			
	N	O	-	O	-	-	-	O	-	-	O	-	O	O	O			



[Area setting]

Operand	Content	Data size
sl	Slot number where the motion module is installed	WORD
S1	Start address of fixed area of motion module	WORD
S2	Device name and number where the data to be saved in the motion module is stored	DWORD
N	The number of data to save	WORD

※ Operand setting range is based on XGF-PN8B. The setting range of the operand (ax) for the axis depends on the number of control axes supported by the product, so refer to the product's instruction manual.

[Flag Set]

Flag	Content	Device number
PUT/GET error	1. When there is no module or motion module in the designated base / slot 2. If PUT/GET instruction is not completed correctly 3. If the max base range supported by each CPU is exceeded 4. When there is no address designated as S in the module installed in the specified slot 5. ax value is out of range	F0015~F0022

1) Function

(1) This command is used to write data to a motion module.

(2) Writes N Double Word Data from S2 device on motion module's memory address (Designated as S1) installed on s1 slot.

2) Error

(1) If the area from the address designated by S to the number of N exceeds the corresponding block, an error occurs.
This error is currently blocked from being entered in XG5000.

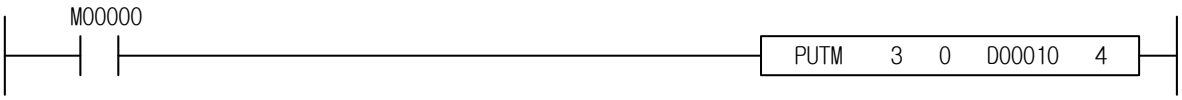
(2) When the module installed in the designated slot is not a motion module or the mounted module does not have the address designated as S, set the PUT/GET error (F0015 to F0022) and the operation error (F110) together. This is because the fixed area address may differ depending on the special module

(3) If there is no module in the designated slot, only PUT/GET error(F0015 to F0022) are set.

3) Example

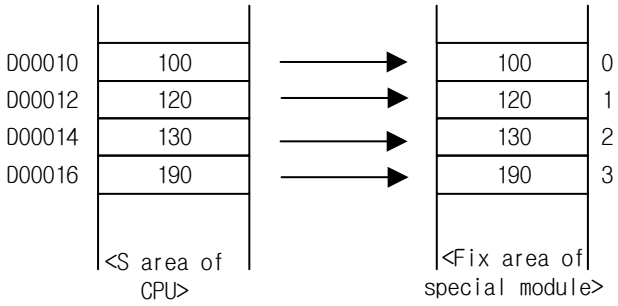
(1) LD: Ladder Diagram

- When input signal M00000 is On,this is a program to operate indirectly in step 0 of the X axis of the position module mounted on slot number 3.



(2) Timer chart

※ Below is a timing chart for the example above.



(3) ST (Structure Text): Automatic program assignment

PUTM_EN(EN:=(*BIT*), sl:=(*WORD_CONSTANT*), S1:=(*WORD*), S2:=(*DWORD*), N:=(*WORD*));

4) Caution

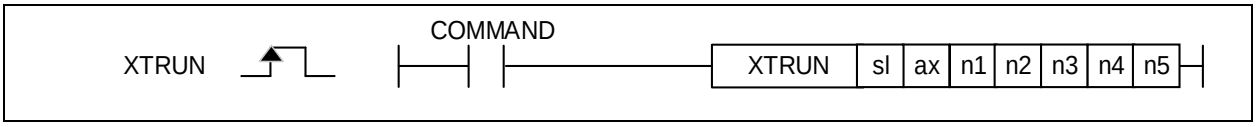
※ There are no special precautions for this command.

4.43.3 XTRUN / Motion Control module Test operation

In the STOP state of the module, a simple operation can be executed with a test operation command.

Supported Type	XGK					XGK-N			XBC(built-in)				XBM(built-in)			XBF
	U	H	A	S	E	UN	HN	SN	U	H	SU	E	S	H	V2(P)	PNxxB
	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X

Command		Applicable area													Step	Flag		
		PMK	F	L	T	C	S	Z	D.x	R.x	Constant	U	N	D	R	error (F110)	Zero (F111)	Carry (F112)
XTRUN	sl	-	-		-	-	-	-	-	-	O	-	-	-	-	O	-	-
	ax	O	-	O	-	-	-	O	-	-	O	-	-	O	O			
	n1	O	-	O	-	-	-	O	-	-	O	-	-	O	O			
	n2	O	-	O	-	-	-	O	-	-	-	-	-	O	O			
	n3	O	-	O	-	-	-	O	-	-	-	-	-	O	O			
	n4	O	-	O	-	-	-	O	-	-	-	-	-	O	O			
	n5	O	-	O	-	-	-	O	-	-	-	-	-	O	O			



[Area setting]

Operand	Content	Data size
sl	Base (x) and slot (y) number with motion module: h00xy	WORD
ax	Axis of command execution:1~32(axis 1~ axis 32), 37~40(axis 37~axis 40), 255(total axis)	WORD
n1	Command code	WORD
n2	Command auxiliary data 1	LREAL
n3	Command auxiliary data 2	LREAL
n4	Command auxiliary data 3	LREAL
n5	Command auxiliary data 4	LREAL

[Flag Set]

Flag	Content	Device number
error	ax value is out of rangee	F110

1) Function

(1) This command is a test operation command that can execute simple motion control operations such as EtherCAT Slave connection/disconnection, servo on/off, and position control to the motion control module.

(2) The n1 command is executed on the axis designated by ax of the motion control module designated by sl (slot number of the motion control module).

(3) Command code and command auxiliary data setting values are as follows.

Function	Command code	Auxiliary data 1	Auxiliary data 2	Auxiliary data 3	Auxiliary data 4
EtherCAT connection	1	-	-	-	-
EtherCAT disconnection	2	-	-	-	-
Servo On	3	-	-	-	-
Servo Off	4	-	-	-	-
Error reset	5	Type 0: Axis Error 1: Common Error	-	-	-
Homing	6	-	-	-	-
Position control(absolute)	7	Position	SPD	Acceleration speed	Deceleration speed
Position control(relative)	8	Position	SPD	Acceleration	Deceleration speed
Speed control	9	SPD	Acceleration speed	Deceleration speed	-
Stop	10	Deceleration speed		-	-

2) Error

(1) If you enter a value outside the setting range supported by the product, an error occurs (F110 is set).

(2) If the test command is executed while the motion control module is in the RUN state, a 0x002A error occurs in the motion control module.

Chapter 5 SFC (Sequential Function Chart)

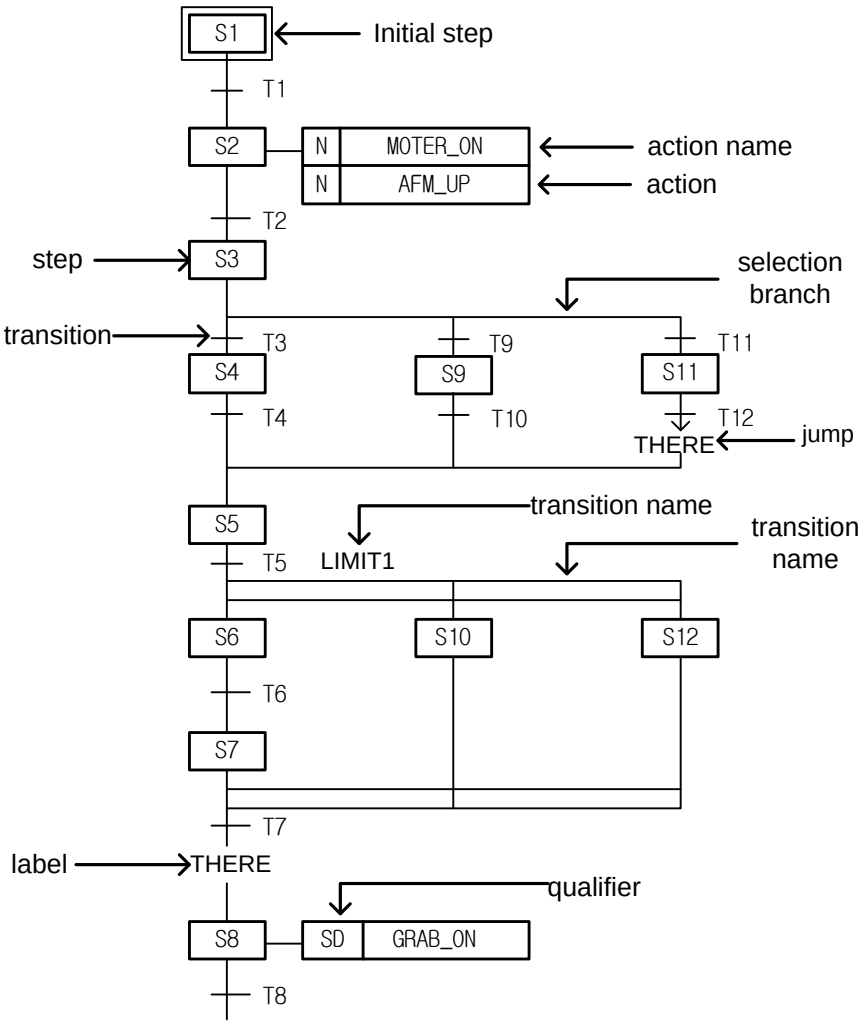
5.1 Overview

1) SFC is a structured language that extends an application program in the form of flow chart according to the processing sequence, using a PLC language.

2) SFC splits an application program into step and transition, and provides how to connect them each other. Each step is related to action and each transition is related to transition condition.

3) As SFC should contain the state information, only program and function block among program types are available to apply this SFC.

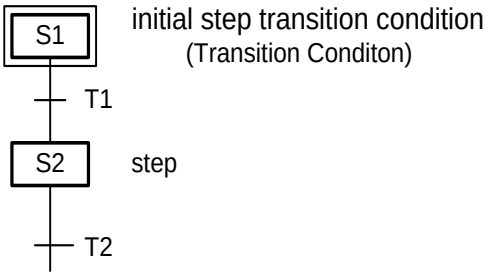
[Type]



5.2 SFC Structure

5.2.1 Step

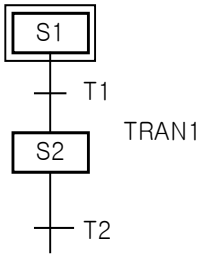
1) Step indicates a sequence control unit by connecting the action.
2) When step is in an active state, the attached content of action will be executed.
3) The initial step is one to be activated first.



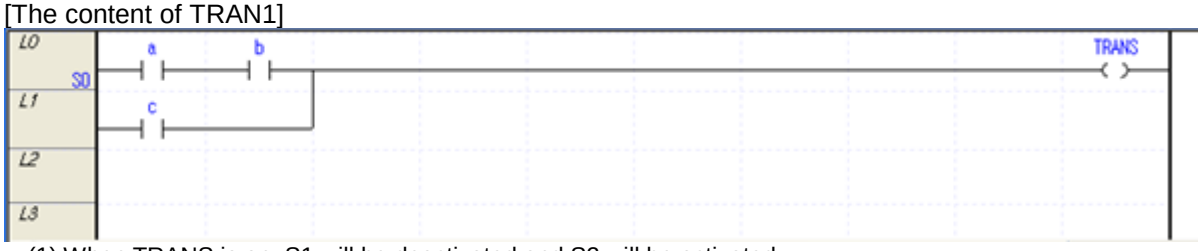
4) If a next transition condition of activated initial step (S1) is established, step 1 (S1) that is currently activated becomes deactivated and Step 2 (S2) connected to S1 becomes activated.

5.2.2 Transition

1) Transition indicates the execution condition between steps.
2) A transition condition should be described as a PLC language such as ST or LD.
3) The result of a transition condition should always be a BOOL type and the variable name should be TRANS for any transition.
4) In case that the result of transition condition is 1, the current step is deactivated and the next step is activated.
5) There must be a transition between step and step.



[The content of TRAN1]



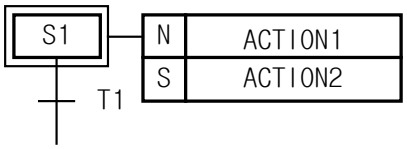
(1) When TRANS is on, S1 will be deactivated and S2 will be activated

(2) TRANS is the internally declared variable

(3) A transition condition of all transition should be output in TRANS variable.

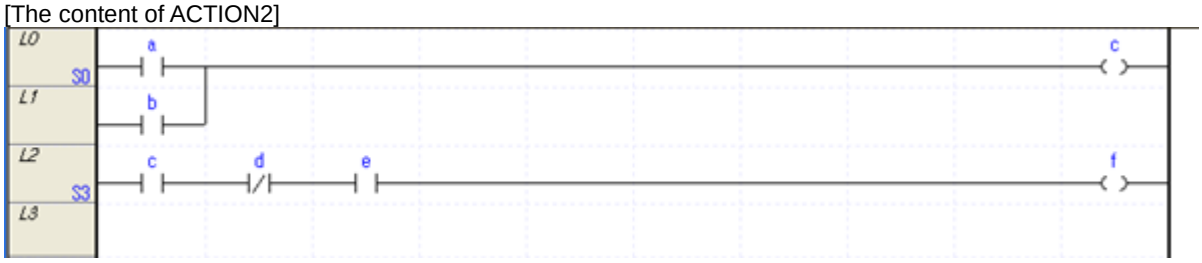
5.2.3 Action

1) Each step is able to connect up to two actions.
2) The step without action is regarded as a waiting action and it is required to wait until the next transition condition will be 1.
3) Action is composed of PLC language such as LD/SFC/ST and the action will be executed while the step is activated.
4) Action qualifier will be used to control action.
5) When action becomes deactivated state after activating, the contact output in action will be 0. However, S, R, function and function block output retain their state before they become non-activating.



[The content of ACTION1]

[The content of ACTION2]



(1) ACTION1 will be executed only when S1 is activated.
(2) ACTION2 will be executed until activated S1 meets R qualifier.
(3) It goes on executing even if S1 is deactivated.
(3) When action is deactivated, this action is Post Scanned and then passes to the next step.

Notes

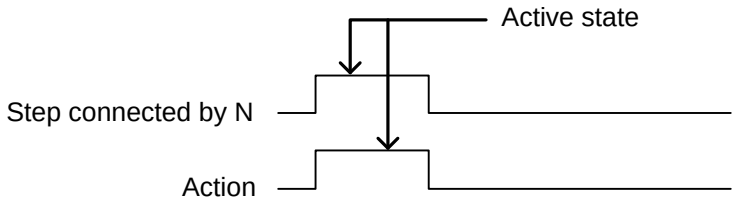
- Post Scan
  When action is deactivated, this action is scanned again.
  As it is scanned as if there were a contact (contact with the value of 0) in the beginning part of an action program, the program output, which is composed of contacts, will be 0.
  Function, function block, S, R output etc., are not included

5.2.4 Action Qualifier

1) Whenever action is used, action qualifier will be followed.
2) The action of step defines an executing point and time according to the assigned qualifier.
3) Types of action qualifier are as follows.

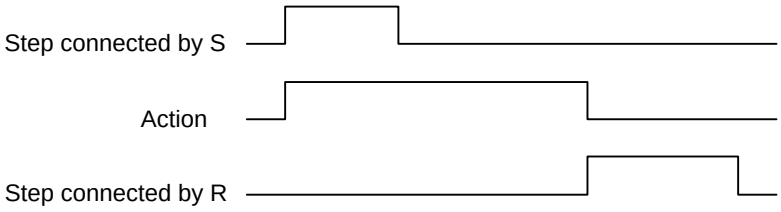
(1) N(Non-Stored)

Action is executed only when the step is activated.



(2) S(Set)

When the step is activated, the action is executed until the R Qualifier is executed.

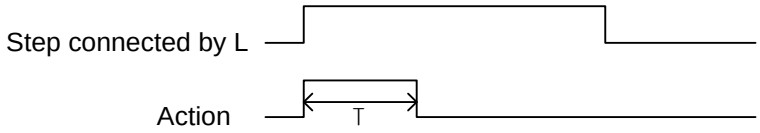


(3) R(Overriding Reset)

It terminates the execution of an action previously started with the S, SD, SL or DS qualifier.

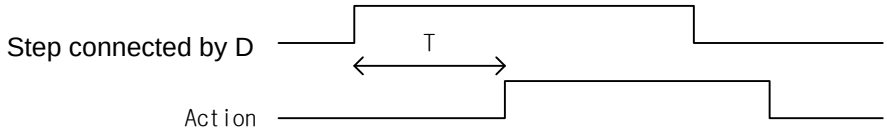
(4) L(Time Limited)

The action is executed until the specified time after the step is activated, or until the step is deactivated.



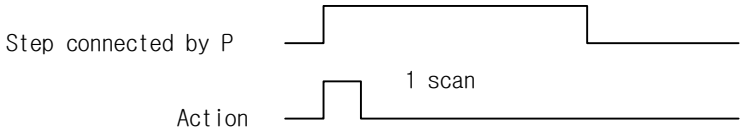
(5) D(Time Delayed)

The action is executed after the specified time has elapsed from when the step is activated until the step is deactivated.



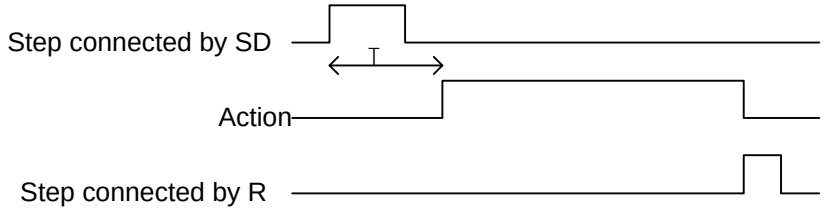
(6) P(Pulse)

The action is executed only when the step is activated.



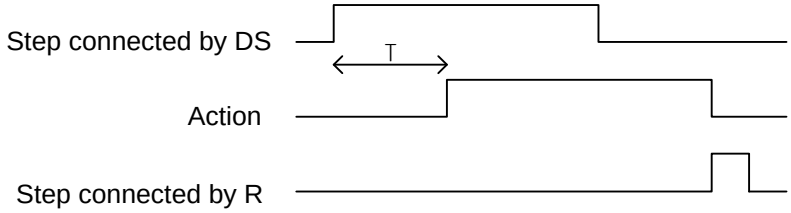
(7) SD(Stored & Time Delayed)

The action is executed after the specified time elapses after the step is activated until the R qualifier is executed. However, if the R qualifier is executed before the time has elapsed, the action is not executed.



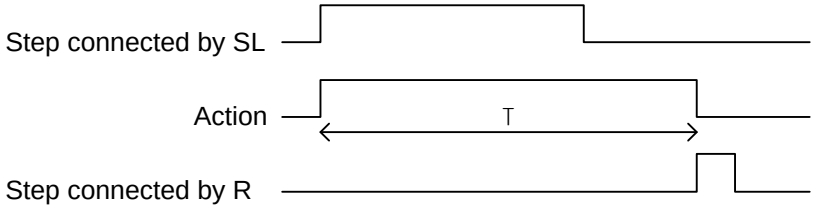
(8) DS (Delayed & Stored)

The action is executed after the specified time elapses after the step is activated until the R qualifier is executed. However, if the step is deactivated or the R qualifier is executed before the time has elapsed, the action is not executed.



(9) SL(Stored & Timed Limited)

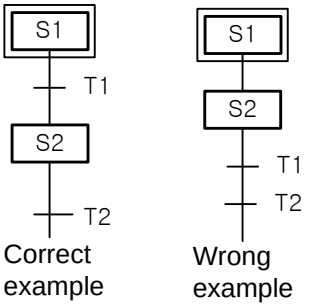
The action is executed until the specified time after the step is activated, or until the R qualifier is executed.



5.3 Extension Regulation FC Structure

5.3.1 Serial Connection

1) The two steps are not directly connected and are always separated by transitions.
2) The two transitions are not directly connected and are always separated by steps.

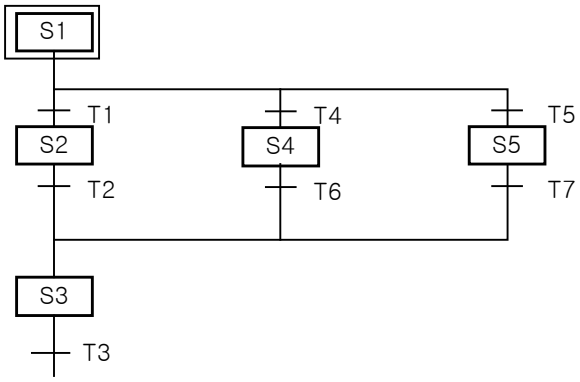


3) The transition between steps connected in series becomes active when the transition condition of the next connected transition becomes 1 while the upper step is activated.

5.3.2 Selection Branch

1) When connected to the selection branch, the next step is activated where the transition condition is 1 among the two or more transitions connected next with the upper step active. Then the same as serial connection

ex)



* When the transition condition of T1 is 1
  The order of activation will be S1 -> S2 -> S3.
* When the transition condition of T4 is 1
  The order of activation will be S1 -> S4 -> S3.
* When the transition condition of T5 is 1
  The order of activation will be S1 -> S5 -> S3.

If the transition condition is 1 at the same time, the leftmost transition is executed.

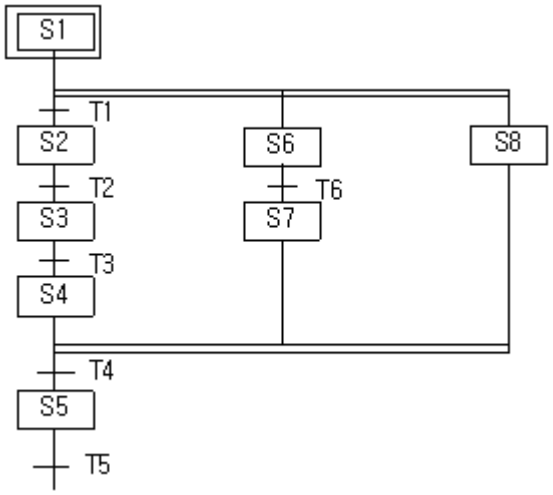
* When the transition conditions of T1 and T4 are 1 at the same time, it is activated in the order of S1 -> S2 -> S3.
* When the transition conditions of T4 and T5 are 1 at the same time, it is activated in the order of S1 -> S4 -> S3.

5.3.3 Parallel Branch

1) When connected by parallel branch, if the transition condition of the next connected transition becomes 1 while the upper step is active, all the steps connected under this transition become active. The execution of each branch is the same as the serial connection. At this time, the step in the active state will exist as many as the number of branches.

2) In the case of merging in parallel branch, if the transition condition of transition is 1 when all the last steps of each branch are active, the next connected step becomes active.

ex)



- If the transition condition T1 is 1 while S1 is active, S2, S6, and S8 are activated, and S1 is deactivated.

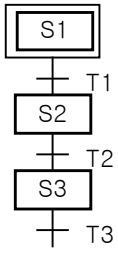
- If the transition condition T4 is 1 while S4, S7, and S8 are active, S5 is activated, and S4, S7, and S8 are deactivated.

* Active order
S1-+->S2--->S3--->S4-+->S5
+->S6--->S7-------+
+->S8-------------+

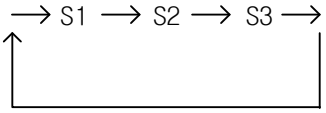
5.3.4 Jump

1) If the transition condition of the next connected transition becomes 1 after the last step of the SFC becomes active, the SFC initial step becomes active.

ex)



- * Active order

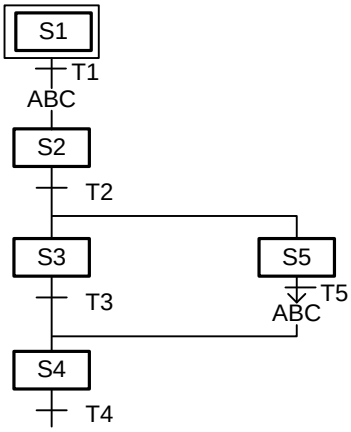


2) Jump allows you to go where you want.

3) Jumps can only be placed at the end of an SFC program or at the end of a selection branch.
It is not allowed to jump to the inside or outside of a parallel branch. it is allowed to jump within a parallel branch.

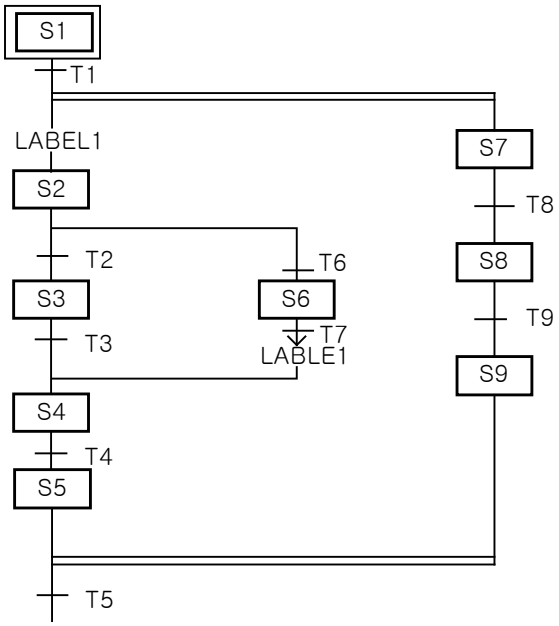
ex)

(1) Jump at the end of the selection branch

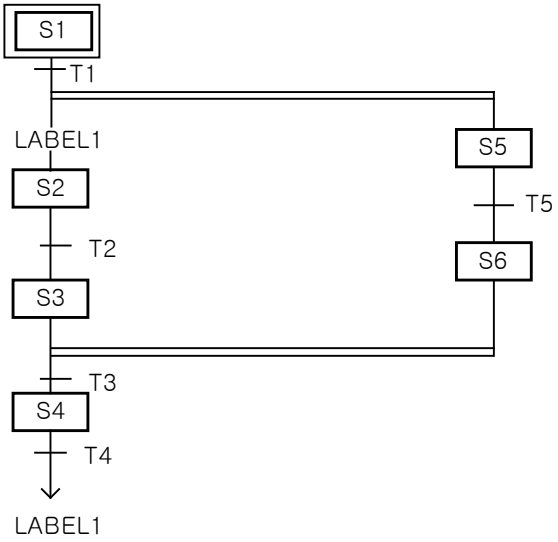


- After S5, S2 is activated.

(2) Jump in parallel branches



(3) It is not allowed to jump to the inside of a parallel branch.



Chapter 6 ST(Structured Text)

6.1 Overview

1) ST program can use any text editor and is portable.
2) Express complex formulas and algorithm.
3) Can be used easily by some one familiar with computer language

```
1
2
3  A := 10;
4  B := H0;
5  REAL_VAL := 1.4;
6  P0000.0 := TRUE;
7
8
9  IF  P0010 = 10 THEN
10     ADD(B, 10, B);
11 ELSE
12     B := 0;
13 END_IF;
14
15
16 VAR_INT_1 := 0;
17 FOR any_int_1 := 0 TO 5 DO
18     IF any_int_1 < 3 THEN
19         VAR_INT_1 := VAR_INT_1 + 1;
20     END_IF;
21 END_FOR;
22
23
```

6.2 Comments

1) There are two types in comments. One line comment and block comment.
2) One line comment uses “//”, that line is used as comment line.
3) Block comment uses text between “*” and “*”.

ex)

```
1 //one line comment
2 (*Block
3 comment
4 *)
5
```

6.3 Expression

1) Expression consists of operator and operand. Operands can be defined characters (numeric characters, strings, time characters), defined variables (named variables, direct variables), defined functions (functions, function blocks), or other expressions. Operator of ST is described in <Table 1>
2) The expression is calculated by applying the operators to the operands in the order defined by the operator priority in <Table 1>. The expression is calculated by applying the operators to the operands in the order defined by the operator priority in <Table 1>. This sequence continues until the calculation is over.

   ex) A+B*C: Multiplies B by C and adds the result to A.

No.	Calculation	Symbol	Priority
1	Enclosed in parentheses	(Expression)	High
2	Function calculation	Function name (parameter list) ex) ADD(X, Y, Z)	
3	Not Complement	- NOT	
4	Exponent	**	
5	Multiplication Division Remainder	* / MOD	
6	Addition Subtract	+ -	
7	Compare	<, >, <=, >=	
8	Same Not same	= <>	
9	Bool logical AND Bool logical AND	& AND	
10	Bool logical Exclusive OR	XOR	
11	Bool logical OR	OR	Low

<Table 1> Operator of ST language

3) Among same operations which have same order, operation in left of expression has higher order.

   Ex.) A+B-C: first adds A to B and subtracts C from the result.

4) If operator has two operands, left operand is executed firstly.

   Ex.) (A+B)*(C-D): first (A+B) is executed first then (C-D) is executed

5) When executing operation, the following condition is dealt with error.
   (1) Dividing by a value of 0

   Ex.) A/(B*C): in case result of B*C is 0, operation error occurs.
   (2) Operand is not applicable data type for operation.

   Ex.) ADD(1,2,3): since PLC can't decide data type of number, error occurs at compile
   (3) Result of arithmetic operation exceeds range of data type.

   ex) B*C: B*C: in case B, C is UINT type, if operation result is over 65,535, operation error occurs

Method	Characteristics			Example ADD(S1, S2, D);
	Allocate variables	Variable Sequence	Variable data	
Not fixed type	Impossible	Fixed	Fixed	Application Instruction ex) ADD(1, B, A);
- The order of the parameters used in the application command provides only a fixed type.				

<Table 2> how to use parameter of application instruction

Notes

- It device expressions have been added for bit devices such as word device expressions.
  (ex, P00003 => P0000.3, M0001A => M0001.A, …)
- Bit device of timer and counter is expressed as follows
  (ex, T000 => T000.Q, C010 => C010.Q, …)
- In case word and bit device are all available, default device is set as word device.
- When calculating expression, temporary variable is created. Temporary variables are used without initialization.
  (Ex, For A:=B+C;, result of B+C is saved in temporary variable and value of temporary variable is assigned to variable A.)
- Temporary variable is set at auto-allocation area. Therefore, an error occurs when the user automatically uses the device automatic allocation area.
  The user can solve the problem by setting the device auto-allocation area large.
- If an operation error occurs during operation expression, it is not saved in the assignment variable.
  (Ex, For A:=B/C;, if C is 0, operation error occurs and A keeps previous value.)
- Operation expression can't be used as parameter of application instruction.
  (Ex, A:= B+C/D; If ADD (B+C/D, 10, F); => Error (B+C/D not available))
  ADD(A, 10, F); => normal

6.3.1.+ Operator

1) + Operator is used to add two operands

2) Expression
result* := *expression1* + *expression2

Item	Description
Result	Variable or direct variable
expression1	ANY_NUM type
expression2	ANY_NUM type

Example	Description
Val1 := 20; Val2 := 4; Result := Val1 + Val2;	Instructs the user to find and add the values of the two variables on the right and assign the result to the variable Result. Result value becomes 24 Constant and variable can be used as operands (Val1, Val2).

Notes
- ANY_NUM includes ANY_REAL type and ANY_INT.
  For more details, refer to 3.2.2 Data Type tree diagram.
- Operation of LWORD, LINT, ULINT type is not supported.

6.3.2.- Operator

1) The subtraction operator (-) is used to subtract the value before and after the operator.

2) Expression
result* := *expression1* - *expression2

Item	Description
result	Variable or direct variable
expression1	ANY_NUM type
expression2	ANY_NUM type

Example	Description
Val1 := 20; Val2 := 4; Result := Val1 - Val2;	Subtracts right value(Val2) from left value(Val1) and inputs result. Result value becomes 16 Constant and variable can be used as operands (Val1, Val2).

Notes
Operation of LWORD, LINT, ULINT type is not supported.

6.3.3.* Operator

1) * Operator is used to multiply two operands

2) Expression
result* := *expression1* * *expression2

Item	Description
result	Variable or direct variable
expression1	ANY_NUM type
expression2	ANY_NUM type

Example	Description
In1 := 2 ; Result := 20 * In1 ;	Multiplies 20 by In1 values and inputs result. Result value becomes 40 Constant and variable can be used as operands (Val1, Val2).

Notes
Operation of LWORD, LINT, ULINT type is not supported.

6.3.4.* Operator

1) The division operator (/) divides the value to the left of the operator by the value to the right of the operator.

Division is calculated differently depending on whether the type of the variable used with the operator is integer or real. Real division outputs a real value, and integer division outputs an integer value. If operand is integer, result is also integer. If 5 (int) is divided by 3 (int), result is real but number less than decimal point is removed.

```
7 Result := 20 / INT_TYPE ;
8
9 Result1 := 20 / REAL_TYPE ;
7 Result = 6, INT_TYPE = 3
8
9 Result1 = 6.666666508e+000, REAL_TYPE = 3.000000000e+000
```

2) Expression
result* := *expression1* / *expression2

Item	Description
result	Variable or direct variable
expression1	ANY_NUM type
expression2	ANY_NUM type

Example	Description
In1 := 2 ; Result := 20 / In1 ;	Divide 0 by the value of the variable In1 and assign it to the Result value. Result value becomes 10 Constant and variable can be used as operands (Val1, Val2).

Notes
- If some value is divided by 0, operation error flag (_ERR) is On. In case of this, CPU keeps RUN mode.
- Operation of LWORD, LINT, ULINT type is not supported.

6.3.5. MOD Operator

1) The remainder of the operator is the result of dividing the value on the left side of the MOD operator by the value on the right side of the operator.

2) Expression

result* := *expression1* MOD *expression2

Item	Description
result	Variable or direct variable
expression1	ANY_NUM type
expression2	ANY_NUM type

Example	Description
In1 := 10 ; Result := 12 MOD In1 ;	Divide 12 by the value of the variable In1 and substitute the remaining 2 values for the Result values. Constant and variable can be used as operands (Val1, Val2).

Notes

- If some value is divided by 0, operation error flag (_ERR) is On. In case of this, CPU keeps RUN mode.
- Operation of LWORD, LINT, LWORD, LINT, ULINT type is not supported.

6.3.6. ** Operator

1) The exponent operator is the value of the ** operator's left multiplied by the multiplier of the operator's right.

2) Expression

result* := *expression1* ** *expression2

Item	Description
result	Variable or direct variable
expression1	ANY_REAL type
expression2	ANY_REAL type

Example	Description
In1 := 3 ; Result := 10 ** In1 ;	The result is multiplied by 10 as many times as the value of the variable (In1). Result value becomes 1000 Constant and variable can be used as operands (Val1, Val2).

Notes

Only LREAL type operation is available.

6.3.7. AND or & Operator

1) The binary operator (AND or &) compares the bits of two operands. If the bit corresponding to both operands is 1, the result bit is 1.

2) Expression

result* := *expression1 AND expression2 또는 ***result* := *expression1 & expression2***

Item	Description
result	Variable or direct variable
expression1	ANY_BIT type
expression2	ANY_BIT type

AND bit operation is as follows.

expression1	***expression2***	***result***
0	0	0
0	1	0
1	0	0
1	1	1

Example	Description
Result := h93 AND h3D ;	Since first bit and 5th bit of two operands are both 1, result is “h11”. Constant and variable can be used as operands (Val1, Val2).

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3.8. OR Operator

1) The binary operator OR compares bits between two operands. If either bit corresponding to the two operands is 1, the result bit is 1.

2) Expression

result* := *expression1 OR expression2

Item	Description
result	Variable or direct variable
expression1	ANY_BIT type
expression2	ANY_BIT type

OR bit operation is as follows.

expression1	***expression2***	***result***
0	0	0
0	1	1
1	0	1
1	1	1

Example	Description
Result := h93 OR h3D ;	The result value is “hBF” because there is at least one 1 in every bit position except the 7th bit.

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3.9. XOR Operator

1) The binary operator XOR compares bits between two operands. If either bit corresponding to both operands is 1 (both not 1), the result bit is 1.

2) Expression
result* := *expression1* XOR *expression2

Item	Description
result	Variable or direct variable
expression1	ANY_BIT type
expression2	ANY_BIT type

XOR bit operation is as follows.

expression1	***expression2***	***result***
0	0	0
0	1	1
1	0	1
1	1	0

Example	Description
Result := h93 XOR h3D;	Since the first bit of both operands is 1, the first bit of the result of the operation is 0. Result value is “hAE”.

Notes
Operation of LWORD, LINT, ULINT type is not supported.

6.3.10.= Operator

1) The comparison operator (=) compares two operands for equality

2) Expression
result* := *expression1* = *expression2

Item	Description
result	Variable or direct variable
expression1	ANY type
expression2	ANY type

= bit operation is as follows.

expression1	***expression2***	***result***
0	0	1
0	1	0
1	0	0
1	1	1

Example	Description
Val1 := 20; Val2 := 20 ; Result := Val1 = Val2 ;	The result of comparing two operands Val1 and Val2 is the same, and it is substituted into the variable Result. Result value becomes 1

Notes
Operation of LWORD, LINT, ULINT type is not supported.

6.3.11.<> Operator

1) The comparison operator (<>) compares two operands for inequality.

2) Expression

result* := *expression1* <> *expression2

Item	Description
result	Variable or direct variable
expression1	ANY type
expression2	ANY type

<> bit operation is as follows.

expression1	***expression2***	***result***
0	0	0
0	1	1
1	0	1
1	1	0

Example	Description
Val1 := 20; Val2 := 20 ; Result := Val1 <> Val2 ;	The result of comparing two operands Val1 and Val2 is not equal, and it is substituted into the variable Result. Result value becomes 0

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3. 12. > Operator

1) The relational operator (>) compares whether the operand on the left side of the operator is greater than the operand on the right side.

2) Expression

result* := *expression1* > *expression2

Item	Description
result	Variable or direct variable
expression1	ANY type
expression2	ANY type

> bit operation is as follows.

expression1	***expression2***	***result***
0	0	0
0	1	0
1	0	1
1	1	0

Example	Description
Val1 := 20; Val2 := 10 ; Result := Val1 > Val2 ;	The result of comparing whether the operand Val1 is greater than the operand Val2 is assigned to the variable Result. Result value becomes 1

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3. 13.< Operator

1) The relational operator (<) compares whether the operand before the <operator is less than the operand after the operator.

2) Expression

result* := *expression1* < *expression2

Item	Description
result	Variable or direct variable
expression1	ANY type
expression2	ANY type

< bit operation is as follows.

expression1	***expression2***	***result***
0	0	0
0	1	1
1	0	0
1	1	0

Example	Description
Val1 := 20; Val2 := 10 ; Result := Val1 < Val2 ;	The result of comparing whether the operand Val1 is less than the operand Val2 is assigned to the variable Result. Result value becomes 0

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3. 14. > = Operator

1) The relational operator (>=) compares whether the preceding operand is greater than or equal to the following operand.

2) Expression

result* := *expression1* >= *expression2

Item	Description
result	Variable or direct variable
expression1	ANY type
expression2	ANY type

>= bit operation is as follows.

expression1	***expression2***	***result***
0	0	1
0	1	0
1	0	1
1	1	1

Example	Description
Val1 := 20; Val2 := 20 ; Result := Val1 >= Val2 ;	The result of comparing whether operand Val1 is greater than or equal to operand Val2 is substituted into the variable Result. Result value becomes 1

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3.15. <= Operator

1) The relational operator (<=) compares whether the preceding operand is less than or equal to the following operand.

2) Expression

result* := *expression1* <= *expression2

Item	Description
result	Variable or direct variable
expression1	ANY type
expression2	ANY type

<= bit operation is as follows.

expression1	***expression2***	***result***
0	0	1
0	1	0
1	0	1
1	1	1

Example	Description
Val1 := 2; Val2 := 20 ; Result := Val1 <= Val2 ;	The result of comparing whether operand Val1 is less than or equal to operand Val2 is substituted into the variable Result. Result value becomes 1

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.3.16. NOT Operator

1) NOT operator inverts bit values

2) Expression

result* := *NOT expression

Item	Description
result	Variable or direct variable
expression	ANY_BIT type

Example	Description
Val1 = h000C; Result:= NOT Val1 ;	Invert the value of al1 and put it in the Result value. Result value is “hFFF3”.

Notes

Operation of LWORD, LINT, LWORD, LINT, ULINT type is not supported.

6.3.17.- Operator

1) The operator changes the sign.

2) Expression

result* := - *expression

Item	Description
result	Variable or direct variable
expression	ANY_NUM type

Example	Description
Val1 = 10; Result:= - Val1 ;	Invert the sign of al1 and put it in the Result value. Result value becomes -10

Notes

Operation of LWORD, LINT, ULINT type is not supported.

6.4 Instruction statement

1) Instruction of ST is described in <Table 3>.
2) Instructions are ended by a semicolon (;).

6.4.1. Assignment statement

The assignment statement consists of a variable on the left, an assignment statement operator (:=) following it, and finally an expression.

ex) A := B + C ;

6.4.2. Application Instruction statement

1) The application command input method is as follows.
   - The order in which input parameters are listed must be the same as the order of parameters in the application command.
   It is not possible to omit parameters. It is impossible to assign values to input parameters.
   ex) ADD(B, 10, DST);
2) Application commands cannot be used in expressions because they have no return type.

Notes

1. The application commands provided by ST are displayed in the Application Command dialog box in the ST edit window.
2. Ladder application commands (BREAK, CALL, END, FOR, INIT_DONE, JMP, NEXT, RET, SBRT, application commands with special symbols (<, >, …)) are not supported.
3. The string related application command has been changed from “$***” to “***_S”.
4. The pulse related application command has been changed from “***P” to “***_EN”.
5. The application command with the same name as the device name has been changed from “***” to “***_I”. (Change L2D => L2D_I)
6. Application instructions cannot be used in conditional expressions of selection statements (IF, CASE) and repeat statements (FOR, WHILE, REPEAT).

6.4. 3. Selection statement

1) There are two types of selection statements: IF statements and CASE statements.
2) The selection statement selects one (or group) of instruction statements that make up the selection statement while executing based on specific conditions.

(1) IF statement

(a) Executes a group of statements when the relevant boolean expression results in a value of 1 (true).

(b) If the condition is false, no Instruction statements are executed. However, with ELSE
The ELSE instruction statement group is executed. If ELSIF-related conditions are true
The ELSIF instruction statement group is executed.

(2) CASE statement

(a) It consists of list of groups of instruction statements and expression that calculates variable of INT type(“selector”).

(b) Each group's label can be set to one or more integers and a range of integer values.

(c) A group of statements within the range containing the calculated value of the selector is performed, and if any value of the selector does not apply in each case of the CASE statement, a group of statements following the ELSE is performed. If there is no ELSE, no statements are executed.

6.4. 4. Repeat statement

1) There are three types of loop statements: FOR, WHILE, and REPEAT.
2) A repeat statement is a group of related statements that is executed repeatedly.

(1) FOR statement

(a) It is used when the number of repetitions is predetermined.

(b) In the FOR statement, the sequence of statements is repeatedly executed up to END_FOR, and the number of repetitions is specified as a control variable of the FOR loop.

(c) Control variables, initial values and final values are represented by expressions of the same integer type (SINT, INT, DINT) and are not changed by repeated statements. The check for the end condition is checked at the start of each repeat, and if the initial value exceeds the final value, the sequence of statements is no longer executed.

(2) WHILE statement and REPEAT statement

(a) The WHILE statement repeats through the sequence of statements up to END_WHILE until the associated boolean expression is false.

(b) In the REPEAT statement, the sequence of statements until UNTIL is executed repeatedly (at least once) until the relevant boolean condition is true.

(c) The WHILE and REPEAT statements are not used to synchronize processes such as “wait loops” with externally determined end conditions.

(d) The EXIT statement is used to stop repetition before the end condition is satisfied. When an EXIT statement is used in a nested repeating structure, the EXIT is applied to the innermost loop where the EXIT is located. Therefore, control is passed to the statement after the first loop

terminator (END_FOR, END_WHILE, END_REPEAT) located after the EXIT statement.

(e) The WHILE and REPEAT statements are errors when they are used in algorithms where the loop termination condition is satisfied or the execution of the EXIT statement cannot be guaranteed.

No.	Instruction statement type	Yes
1	Assignment statement	A:=B; CV:= CV+1;
2	Application Instruction	ADD(SRC1, SRC2, DST);
3	Return	**RETURN**;
4	IF statement	D:=B*B -4*A*C; **IF** D<1.0 **THEN** NROOTS :=0; **ELSIF** D= 0.0 **THEN** NROOTS := 1; X1:= -B/(2.0*A); **ELSE** X1:= (-B+ D)/(2.0*A); X2:= (-B- D)/(2.0*A); **END_IF**;
5	CASE statement	TW := THUMBWHEEL; TW_ERROR := 0; **CASE** TW **OF** **1,5:** DISPLAY := OVEN_TEMP; **2:** DISPLAY := MOTOR_SPEED; **3:** DISPLAY := GROSS - TARE; **4, 6..10:** DISPLAY := 100; **ELSE** DISPLAY := 0 ; TW_ERROR := 1; **END_CASE**; M100 := DISPLAY;

6	FOR statement	J := 101;
		FOR I := 1 **TO** 100 **BY** 2 **DO**
		IF WORDS = 10 THEN
		J := I;
		EXIT;
		END_IF;
		END_FOR ;

7	WHILE statement	J := 1; SUM := 0; **WHILE** J <= 100 **DO** J := J+2; SUM := SUM + 1; **END_WHILE**;
8	REPEAT statement	J := 1; **REPEAT** J := J+2; **UNTIL** J >= 101 **END_REPEAT ;**
9	EXIT statement	**EXIT**;
10	Null/Space command statement	;
EXIT statement is used for all supported repeat statement (FOR, WHILE, REPEAT).		

<Table 3> ST language command statement

6.4. 5. IF statement

1) An IF statement is a branch statement that the program selects when it needs to select more than one.

2) Expression

IF *condition* **THEN** *statements* [**ELSE** *elsestatements*] **END_IF**

Or use it like this:

IF *condition* **THEN**
statements
[**ELSIF** *condition-n* **THEN**
elseifstatements] **. . .**
[**ELSE**
elsestatements]
END_IF

Item	Description
condition	If condition is TRUE, a statement following THEN is executed. If it is FLASE, it branches to ELSIF or ELSE.
statements	If condition is TRUE, one or more status statements are executed.
condition-n	N conditions can be used.
elseifstatements	If condition-n is TRUE, one or more status statements are executed.
elsestatements	If the previous condition or condition-n is FALSE, one or more status statements are executed.

Example	Description
IF Val1 <= 10 **THEN** Result := 10; **END_IF**;	If condition Val1 <= 10 is true, then a value of 10 is assigned to Result.

IF Val1 <= 10 **THEN**
Result := 10;
ELSE
Result := 20;
END_IF;
	If condition Val1 <= 10 is true, then a value of 10 is assigned to Result.
	If FALSE, 20 is assigned to Result.

IF Val1 <= 10 **THEN**
Result := 10;
ELSIF Val1 <= 20 **THEN**
Result := 20;
ELSE
Result := 30;
END_IF;
	If condition Val1 <= 10 is true, then a value of 10 is assigned to Result.
	If FALSE, the ELSIF conditions are executed.
	If the second condition Val1 <= 20 is true, then a value of 20 is assigned to Result.
	If FALSE, it executes the status statement below ELSE.
	In other words, a value of 30 is assigned to Result.

6.4. 6. CASE statement

1) Control of the program branches to the value of the expression following CASE. All expressions must be integer values (INT type). If the value of the expression does not included within the scope of the case list, the state statement after ELSE is executed. If there is no ELSE, no statement list in the case list is executed. If there are no other branch instructions, the program flows through all remaining statements.

2) Expression

CASE *expression* **OF**
case_list **:** *statement_list*
{ *case_list* **:** *statement_list*}
[**ELSE**
statement_list]
END_CASE

Item	Description
expression	Only INT type statements are available.
case_list	*case_list_element* {',' *case_list_element*} There are diverse statement like above
case_list_element	Only subrange or signed_integer is possible.
subrange	*signed_integer* **..** It is of the form signed_integer.
statement_list	Executed one or more status statements

Example	Description
CASE Val1 **OF** 1 **:** Result := 10 ; 2..5 **:** Result := 20 ; 7, 10 **:** Result := 30 ; **ELSE** Result := 40 ; **END_CASE ;**	If the value of Val1 is the integer value 1, the value of 10 is assigned to the Result variable. If the value is within 2~5, the value of 20 is assigned to the Result variable. If the value of Val1 is the integer value 7 or 10, the value of 30 is assigned to the Result variable. For any other value, a value of 40 is assigned to the Result variable.

6.4. 7. FOR statement

1) The FOR statement uses three control statements separated by delimiters to handle the cyclic process. The formula that initializes among the components of the FOR statement is executed first. If the TO formula is true (if the current counter value is less than or equal to the end value), the loop is executed once. Then, the value of counter is updated by the value of BY expression, and the conditional statement is checked again. The FOR statement is a loop that first performs a condition check. That is, it checks whether it is circulating before passing through the loop. Therefore, you may not perform a loop at all.

2) Expression

FOR *counter* **:=** *start* **TO** *end* [**BY** *step*] **DO**
statements
END_FOR

Item	Description
counter	It is an integer type (SINT, INT, DINT) variable. start, end, and step must all be of the same type.
start	initial value of counter
end	last value of counter
step	Displays the number of increments each time the counter variable loops. If not used, 1 is increased by default.
statements	It is one or more status statements executed as many as set by three control statements.

Example	Description
SUM := 0; **FOR** counter := 0 **TO** 10 **DO** SUM := SUM + 1; **END_FOR** ;	The counter variable is automatically incremented by 1 from 0 to 10. This program continuously adds the value of 1 to the SUM variable. The final SUM value is 11.
SUM := 0; **FOR** counter = 0 **TO** 10 **BY** 2 **DO** SUM := SUM + 1; **END_FOR** ;	The counter variable is incremented by 2 from 0 to 10. This program continuously adds the value of 1 to the SUM variable. The final SUM value is 6.

Notes

- Watchdog may occur when the scan time is long.
- BY part can be omitted. If omitted, the loop counter increments by 1 by default.
- If the initial value is greater than the last value, the FOR statement is not executed.
  In the same case, it is executed once.

6.4.8. WHILE statement

1) The WHILE statement repeats the loop until the conditional expression is false or zero. The WHILE statement is a loop that first performs a condition check. That is, it checks whether it is circulating before passing through the loop. Therefore, if the condition is not satisfied, the status statement in the WHILE statement may not be executed at all.

2) Expression

WHILE *condition* **DO**
statements
END_ WHILE

Item	Description
condition	If condition is TRUE, a statement following DO is executed. If it is FALSE, it exits the loop.
statements	If condition is TRUE, one or more status statements are executed.

Example	Description
Counter := 0 **WHILE** Counter < 20 **DO** Counter := Counter + 1; **END_WHILE** ;	If the condition that the counter variable is less than 20 is met, the status statement is executed. When the Counter variable becomes 20, the condition becomes FALSE and exits the loop.

Notes

The WHILE statement can fall into an infinite loop if the conditional expression is false or not zero. Watchdog may occur when the scan time is long. Therefore, be careful not to make the conditional formula always TRUE.

6.4.9. REPEAT statement

1) The REPEAT statement executes a looping statement that repeats until the conditional expression becomes TRUE. The REPEAT statement (after condition check loop) is determined by checking whether the loop repeats after the loop passes. So the loop executes at least once

2) Expression

REPEAT
statements

UNTIL *condition*

END_REPEAT

Item	Description
condition	It executes repeat if condition FALSE and it exits if condition is TRUE.
statements	Executes loop repeatedly until the condition is TRUE.

Example	Description
Counter := 0; **REPEAT** DO Counter := Counter + 1; **UNTIL** Counter > 20 **END_REPEAT** ;	First, the Counter variable is incremented by 1. If the condition that the Counter variable is greater than 20 is satisfied, the loop is ended, otherwise the status statement is executed. When the Counter variable becomes 21, the condition becomes TRUE and exits the loop.

Notes

The REPRAT statement can fall into an infinite loop if the conditional expression is not TRUE.
Watchdog may occur when the scan time is long.
Therefore, be careful not to make the conditional formula always FALSE.

6.4.10. EXIT statement

1) The EXIT statement is used to exit the loop (WHILE, FOR, REPEAT).

2) An error occurs when the EXIT statement is used outside of a loop statement.

3) Expression
EXIT

Example	Description
SUM := 0; **FOR** Counter := 0 TO 10 DO SUM := SUM + 1; **EXIT**; **END_FOR** ;	This is a FOR statement in which the Counter variable is automatically incremented by 1 from 0 to 10. However, it exits immediately using EXIT in the status statement. The Counter variable becomes 0, and the SUM variable becomes 1.

Counter := 0;
WHILE Counter < 20 DO
Counter := Counter + 1 ;
IF Counter = 10 **THEN**
EXIT;
END_IF;
END_WHILE ;
	If the condition that the counter variable is less than 20 is met, the status statement is executed. When the Counter variable becomes 20, the condition becomes FALSE and you can exit the loop. However, if the Counter variable is 10 by using the IF statement and the EXIT statement in the status statement, the loop statement is exited.

Counter := 0; **REPEAT DO** Counter := Counter + 1 ; **IF** Counter = 10 **THEN** **EXIT**; **END_IF**; **UNTIL** Counter > 20 **END_REPEAT** ;	First, the Counter variable is incremented by 1. If the condition that the Counter variable is greater than 20 is satisfied, the loop is ended, otherwise the status statement is executed. However, if the Counter variable is 10 by using the IF statement and the EXIT statement in the status statement, the loop statement is exited.

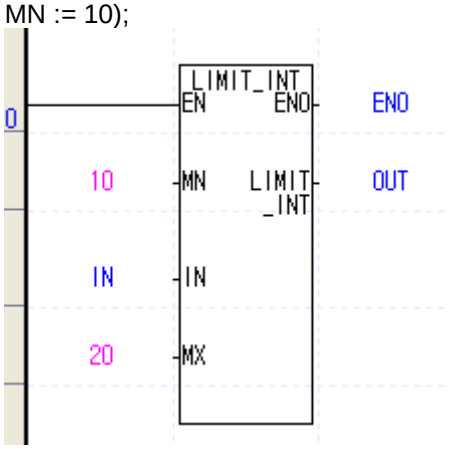
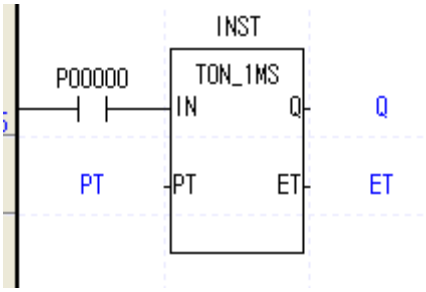
6.5 User function and function block

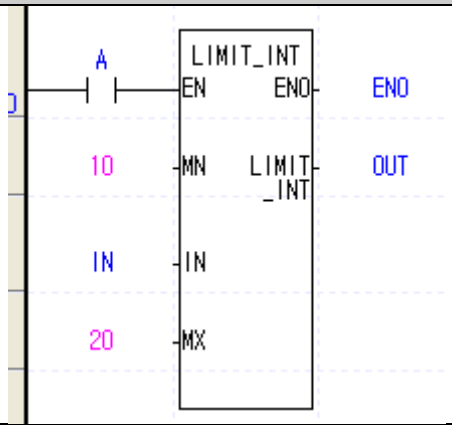
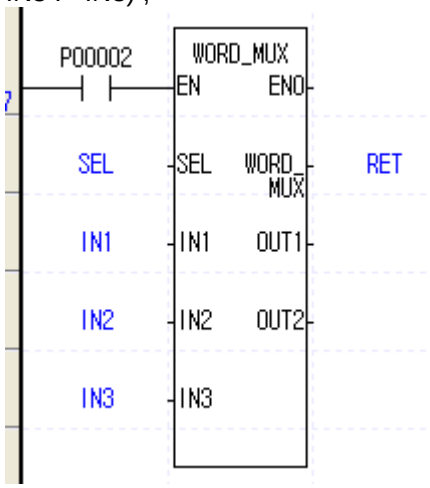
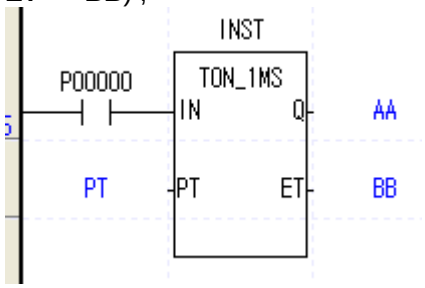
6.5. 1. How to use

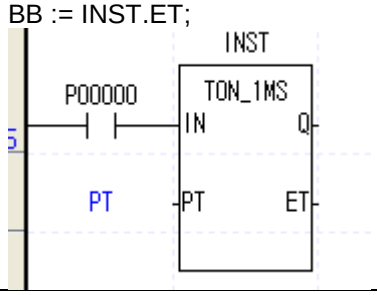
1) There are two types of user function and user function block input methods: standardized form and non-standardized form. Any form can be used depending on the situation.

(1) standardized form :

It is the type that displays the input and output parameter names of the user function and user function block.

Parameter	User function	User function block
Common	The parameter order can be used arbitrarily. OUT := LIMIT_INT(MN := 10, IN := IN, MX := 20); OUT := LIMIT_INT(MX := 20, IN := IN, MN := 10);  EN, ENO can be used or omitted OUT := LIMIT_INT(**EN := A,** MN := 10, IN := IN, MX := 20, **ENO => ENO**); ENOQ2) ;	The parameter order can be used arbitrarily. INST(IN := P0000.0, PT := PT, Q => Q, ET => ET) ; INST(PT := PT, IN := P0000.0, Q => Q, ET => ET) ;  However, in ST language, P0000 is a word type. Bit type should be indicated as P0000.0.

<table>
<tr><th>Parameter</th><th>User function</th><th>User function block</th></tr>
<tr><td></td><td> 
</td><td></td></tr>
<tr><td>Input</td><td>The symbol (:=) is used for input and input/output parameter assignment.
OUT := LIMIT_INT(MN := 10, IN := IN, MX := 20, ENO => ENO);</td><td>The symbol (:=) is used for input and input/output parameter assignment.
INST(IN := P0000.0, PT := PT, Q => Q, ET => ET) ;</td></tr>
<tr><td>Output</td><td>User function is assigned a return value if it is a function name
The symbol (=>) is used for other output/output parameter assignment.
OUT := LIMIT_INT(MN := 10, IN := IN, MX := 20, ENO => ENO);
However, output parameters that are not used as shown below can be omitted. (ENO, OUT1, OUT2 omitted)
RET := WORD_MUX(EN := P0000.0, SEL := SEL, IN1 := IN1, IN2 := IN2, IN3 := IN3) ;
 
</td><td>The symbol (=>)is used for all output parameter assignment
Output parameter assignment can be omitted.
INST(IN := P0000.0, PT := PT, Q => AA, ET => BB) ;
 

Without assigning output parameters, it can be used as follows.
INST(IN := P0000.0, PT := PT) ;
AA := INST.Q;
BB := INST.ET;
 
</td></tr>
</table>

Notes

User function block is used as instance name. That is, the user function block must be declared as a variable, and this variable name (instance name) must be used.

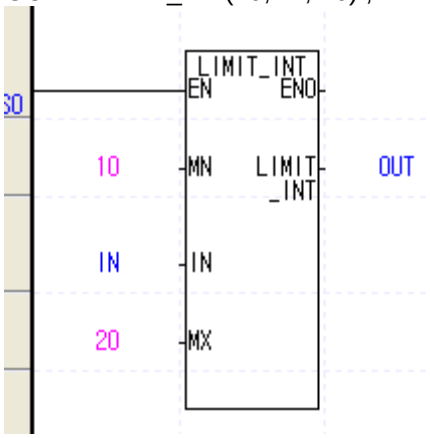
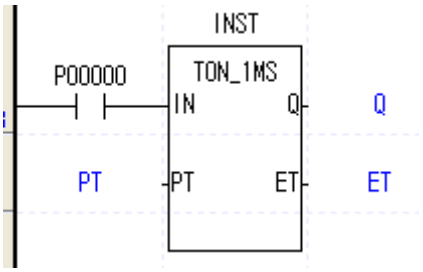
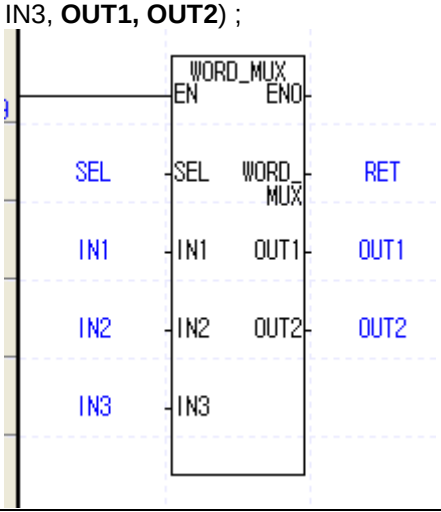
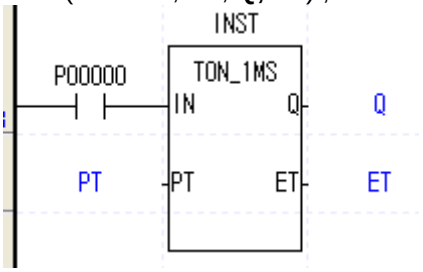
Ex) Using user function block

	Variable Kind	Variable	Type	Device	Latch	Used
1	VAR	INST	TON_1MS	D00000[AUTO]		☑
2	VAR	TON_1MS	TIMER0_1	T2000[AUTO]		☑

INST(IN := P0000.0, PT := PT, Q => AA, ET => BB) ;

(2) Non-standardized form

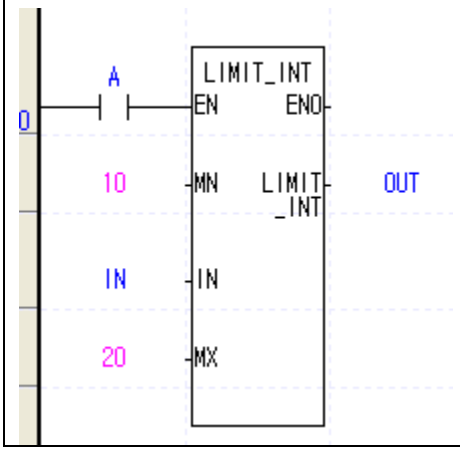
It is the form to omit input and output parameter names of user function and user function block.

Parameter	User function	User function block
Common	The order of all parameters cannot be changed All parameters cannot be omitted OUT := LIMIT_INT(10, IN, 20) ;  **EN and ENO cannot be used.**	The order of all parameters cannot be changed All parameters cannot be omitted. INST(P00000.0, PT, Q, ET) ;  **EN and ENO cannot be used.**
Input	The order of input parameters cannot be changed The standardized form cannot be mixed. OUT := LIMIT_INT(10, IN, **MX := 20**) ;	The order of input parameters cannot be changed INST(**PT , P0000.0**, Q, ET) ; The standardized form cannot be mixed. INST(P0000.0, **PT := PT**, Q, ET) ;
Output	User function is assigned a return value if it is a function name Enter the remaining output parameter assignments in order. **RET** := WORD_MUX(SEL,IN1, IN2, IN3, **OUT1, OUT2**) ;  	Enter the all output parameter assignments in order. INST(P0000.0, PT, **Q, ET**) ; 
Notes		

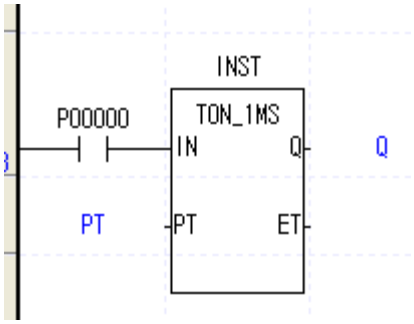
1. The input parameter EN is a condition for executing the user function. When using EN as follows, LIMIT function is executed only when A value is 1.
   OUT := LIMIT_INT(EN := A, MX := 20, IN := IN, MN := 10);
2. The ENO parameter is 1 when the user function is executed without error.
   OUT := LIMIT_INT(EN := A, MX := 20, IN := IN, MN := 10, ENO => ENO);

6.5. 2. Example

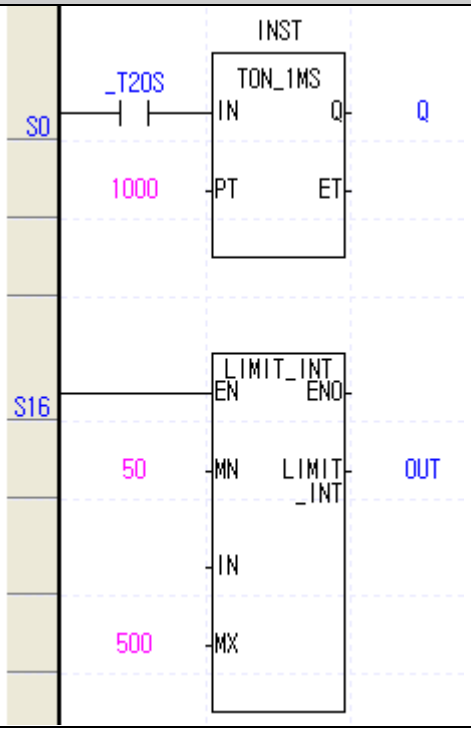
1) User function

LD example	ST example
	1) Standardized form Using EN OUT := LIMIT_INT(EN := A, MN := 10, IN := IN, MX := 20); EN disable OUT := LIMIT_INT(MN := 10, IN := IN, MX := 20); 2) Non-standardized form OUT := LIMIT_INT(10, IN, 20); EN, ENO cannot be used.

2) User function block

LD example	ST example
	1) Standardized form INST(IN := P0000.0, PT := PT, Q => Q); 2) Non-standardized form INST(P0000.0, PT, Q, TimeValue); Output variables cannot be omitted. Therefore, it is necessary to allocate the variable corresponding to the output parameter ET. (TimeValue)

3) Application

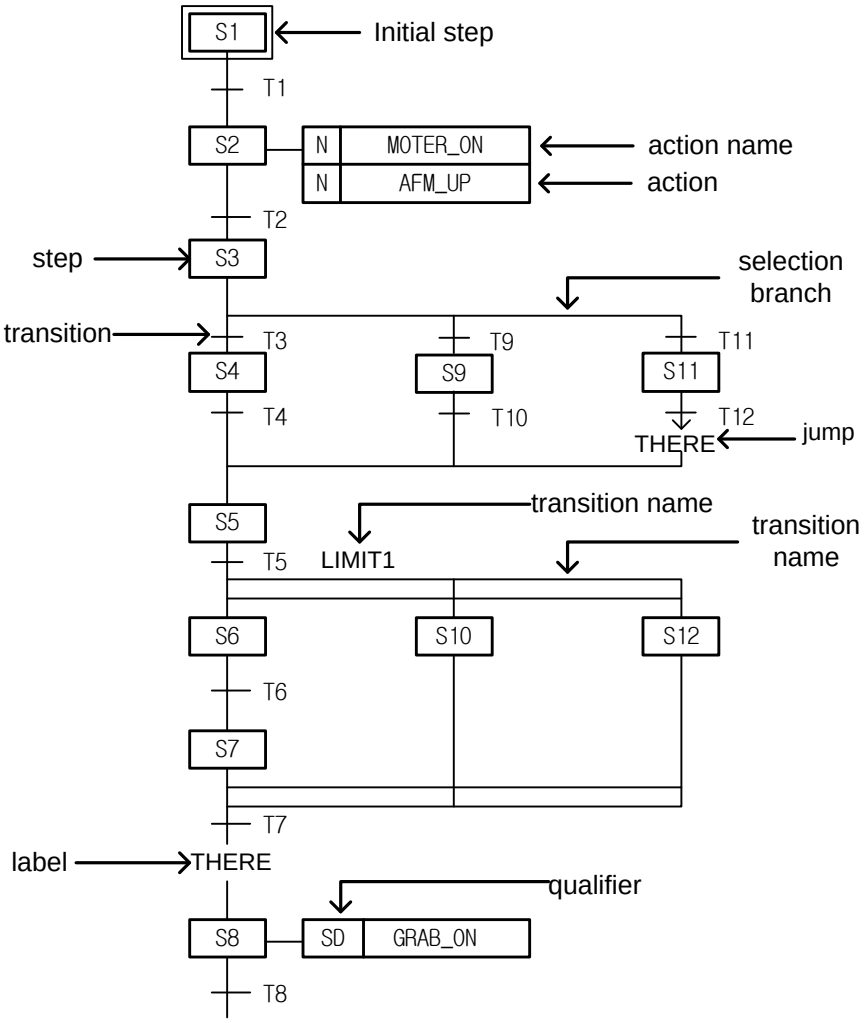
LD example	ST example
	INST(IN := _T20S, PT := 1000, Q => Q, ET => Current Value); OUT := LIMIT_INT(MN := 50, IN := current Value, MX := 500);

1) SFC is a structured language that extends an application program in the form of flow chart according to the processing sequence, using a PLC language.

2) SFC splits an application program into step and transition, and provides how to connect them each other. Each step is related to action and each transition is related to transition condition.

3) As SFC should contain the state information, only program and function block among program types are available to apply this SFC.

[Type]


S1
Initial step
T1
S2
N
MOTER_ON
action name
N
AFM_UP
action
T2
step
S3
selection
branch
transition
T3
T9
T11
S4
S9
S11
T4
T10
T12
THERE
jump
transition name
S5
transition
name
T5
LIMIT1
S6
S10
S12
T6
S7
T7
label
THERE
qualifier
S8
SD
GRAB_ON
T8

Appendix 1. Number Systems and Data Structure

1) Expression of number (data)

The PLC CPU stores and processes all information in On and Off or “1” and “0” states. Therefore, numerical operations are also calculated as numbers processed with 1s and 0s, that is, binary numbers.

On the other hand, decimal numbers are easy to understand and most widely used in everyday life. So, when writing or reading a value in PLC, it is necessary to convert from decimal to hexadecimal and from hexadecimal to decimal. This section describes the representation and correlation of decimal, binary, hexadecimal, and binary decimal (BCD) numbers.

(1) Decimal

The decimal number means “a number expressing the order and size (quantity) using symbols of 0 to 9”.

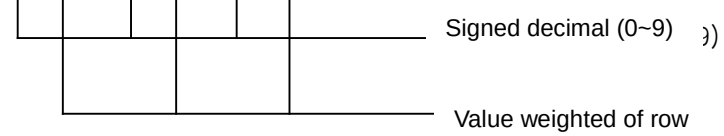
And 0, 1, 2, 3, 4,… After ..9, it is rounded to “10” and continues.

For example, if you look at the decimal 153 in terms of rows and “weight of rows”, they are as follows.

$$135=100+50+3$$

$$=1*100+5*10+3*1$$

$$=1*10^{2}+5*10^{1}+3*10^{0}$$



(2) Binary

Binary is a Base 2 number system, meaning that it uses 2 digits before needing to repeat them: “0 and 1. So after 0 and 1, it is rounded up to “10” and continues.

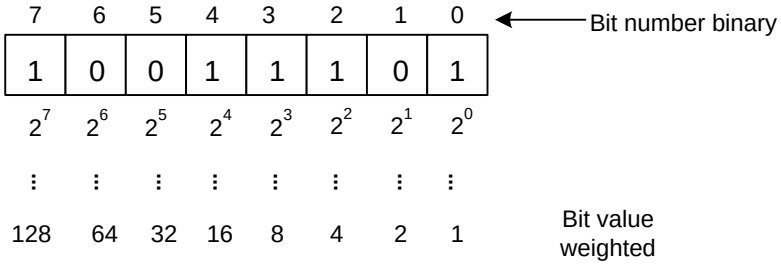
A single digit in Binary is known as a “Bit”.

Binary	Decimal
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
……	……

For example, the binary number can be converted to decimal as follows;

“10011101”

Let's put the bit number and bit weight from the right as we considered the row number and the weight of the row in decimal.



Let's consider the sum of the product of the weights of the codes of each bit, like a decimal number.

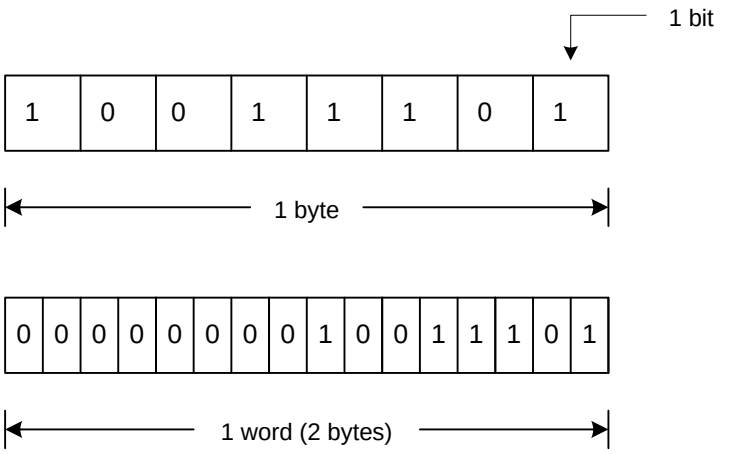
= 1×128+0×64+0×32+1×16+1×8+1×4+0×2+1×1

= 128+16+8+4+1

= 157

In other words, the binary number means that "the code is 1, the weight of bits is added" to the decimal number.

Generally 8 bits is 1 byte, and 16 bits (2 bytes) is 1 word.

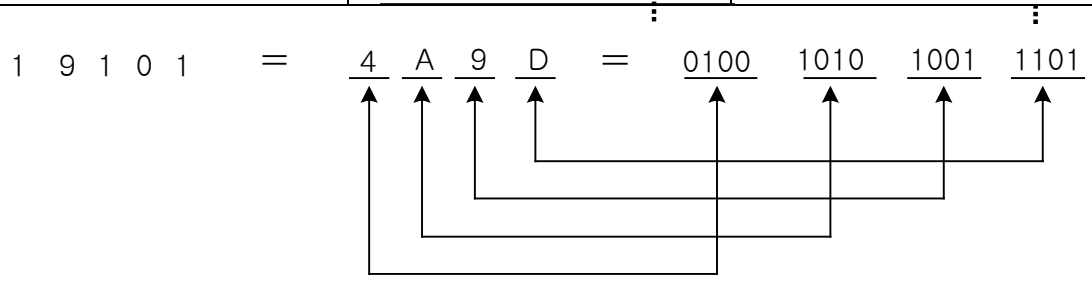


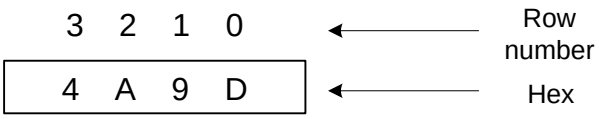
(3) Hexadecimal ---HEX

Hexadecimal numbers are numbers that indicate the order and size using symbols of “0 to 9, A to F” in the same way as decimal and binary numbers.

So after , 0, 1, 2, ·····D,E,F, it is rounded up to “10” and continues.

Decimal	Hexadecimal	Binary
0	0	0
1	1	1
2	2	10
3	3	11
4	4	100
5	5	101
6	6	110
7	7	111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111
16	10	10000
17	11	10001
18	12	10010
⋮	⋮	⋮





= (4) × 163 + (A) × 162 + (9) × 161 + (D) × 160

= 4 × 4096 + 10 × 2568 + 9 × 16 + 13 × 1

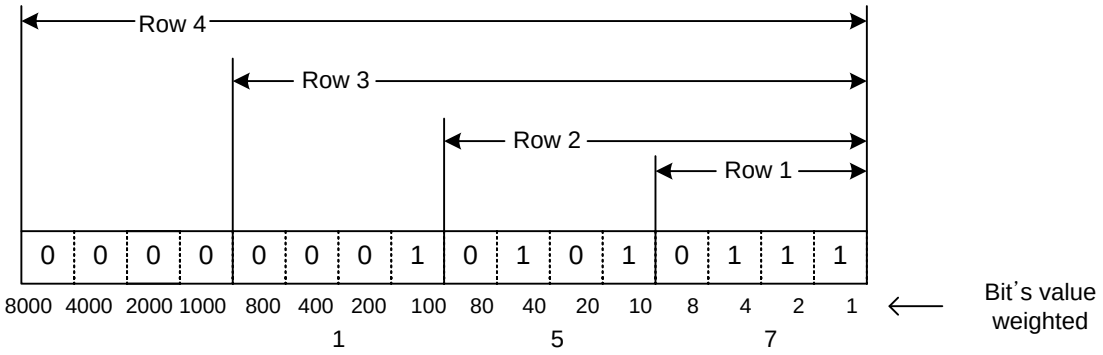
= 19101

One hexadecimal number corresponds to 4 bits of a binary number.

(4) Binary Coded Decimal ····· BCD

Binary decimal number means “number of each row of decimal number in binary number”.
For example, 157 in decimal can be represented as follows, so a binary decimal represents 0 to 9999 in decimal (maximum of 4 lines) in 16 bits.

Each bit's value weighted is as follows:



(5) Number systems

Binary coded Decimal (Binary coded Decimal) BCD	Binary (Binary) BIN	Decimal (Decimal)	Hexadecimal (Hexadecimal) H
00000000 00000000	00000000 00000000	0	0000
00000000 00000001	00000000 00000001	1	0001
00000000 00000010	00000000 00000010	2	0002
00000000 00000011	00000000 00000011	3	0003
00000000 00000100	00000000 00000100	4	0004
00000000 00000101	00000000 00000101	5	0005
00000000 00000100	00000000 00000100	6	0006
00000000 00000111	00000000 00000111	7	0007
00000000 00001000	00000000 00001000	8	0008
00000000 00001001	00000000 00001001	9	0009
00000000 00010000	00000000 00001010	10	000A
00000000 00010001	00000000 00001011	11	000B
00000000 00010010	00000000 00001100	12	000C
00000000 00010011	00000000 00001101	13	000D
00000000 00010100	00000000 00001110	14	000E
00000000 00010101	00000000 00001111	15	000F
00000000 00000110	00000000 00010000	16	0010
00000000 00000111	00000000 00010001	17	0011
00000000 00001000	00000000 00010010	18	0012
00000000 00001001	00000000 00010011	19	0013
00000000 00100000	00000000 00010100	20	0014
00000000 00100001	00000000 00010101	21	0015
00000000 00100010	00000000 00010110	22	0016
00000000 00100011	00000000 00010111	23	0017
00000001 00000000	00000000 01100100	100	0064
00000001 00100111	00000000 01111111	127	007F
00000010 01010101	00000000 11111111	255	00FF
00010000 00000000	00000000 11100000	1000	03E8
00100000 01000111	00000000 11111111	2047	07FF
01000000 10010101	00000000 11111111	4095	0FFF
10011001 10011001	00000111 00001111	9999	270F
	00100111 00010000	10000	2710
	01111111 11111111	32767	7FFF

2) Expression of integral number

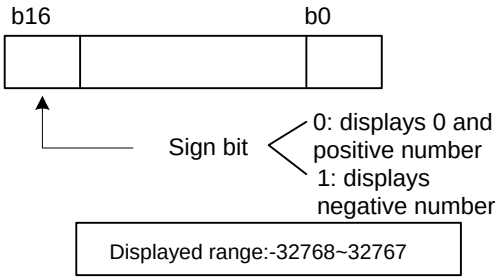
XGK instructions are based on signed operation system.

At this time, the integer display shows a positive number when the most significant bit (MSB) becomes 0, and a negative number if it is 1.

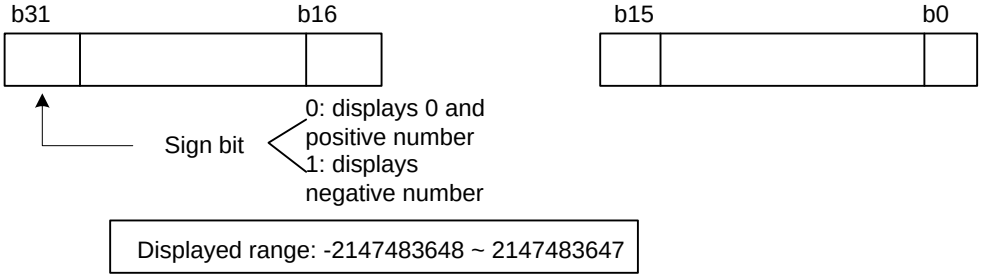
The highest bit expressing a negative or a positive number is called the Sign bit.

Since the position of MSB is different in 16 bit,32 bit,so pay attention to the position of Sign bit.

✸16 bit



✸ 32 bit



3) Expression of negative number

Ex) How to display - 0001

(1) 0001 is indicated excluding negative numbers (b15=1)

b15				b0
1	0	~	0	1

(2) Convert the result of (1). (b15 = excepted)

b15				b0
1	1	~	1	0

(3) Add 1 to the result of (1).

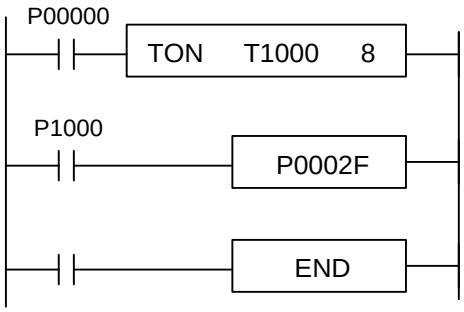
b15							b0
1	1				~	0	1

-0001 = hFFFF

Appendix 2. Measurement and Precision of Timer

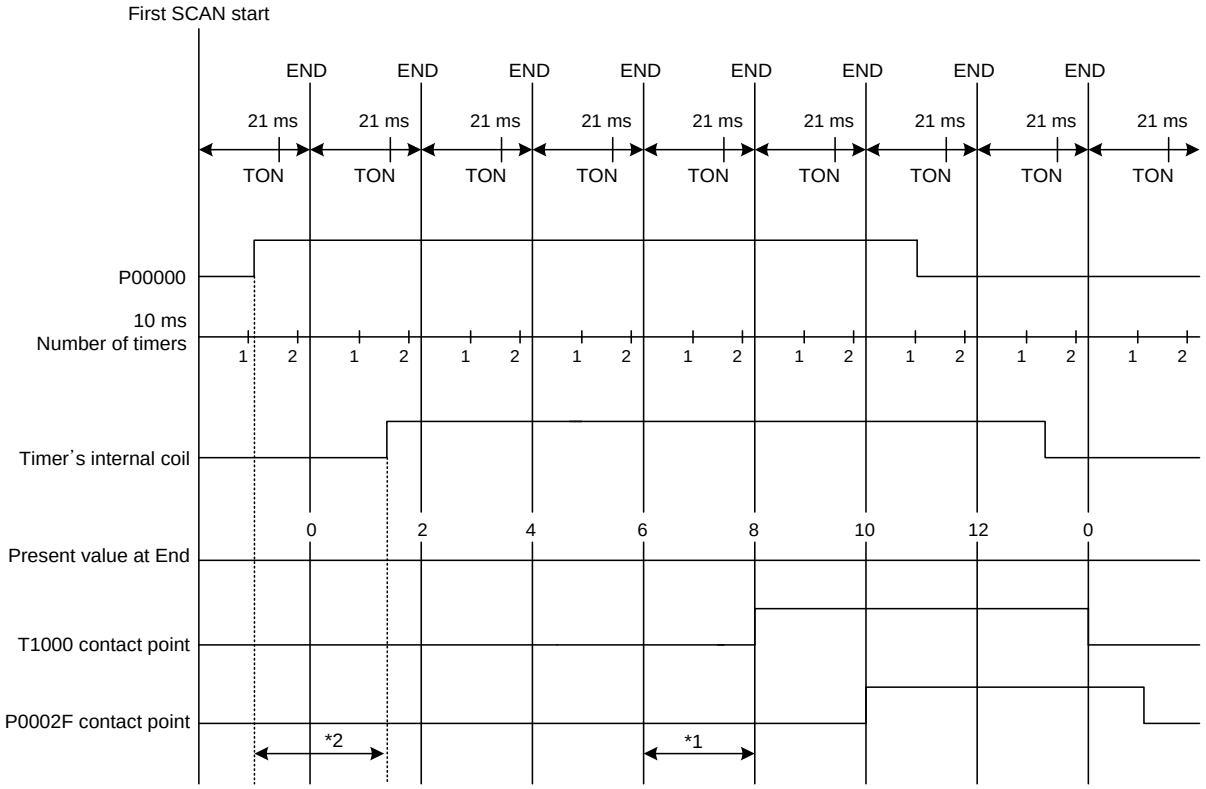
The timer internal coil is turned on/off when the command is executed, and the current value of the timer is updated and the contact is turned on/off after the end command is executed. In addition, if the input condition is Off, the internal coil of the timer is off, and the current value of the timer becomes 0 after the END instruction is executed, and the contact is also off.

Program Example



In 80ms after P00000 is On, contact point T1000 &P0002F will be On. (T1000 is 10ms timer)

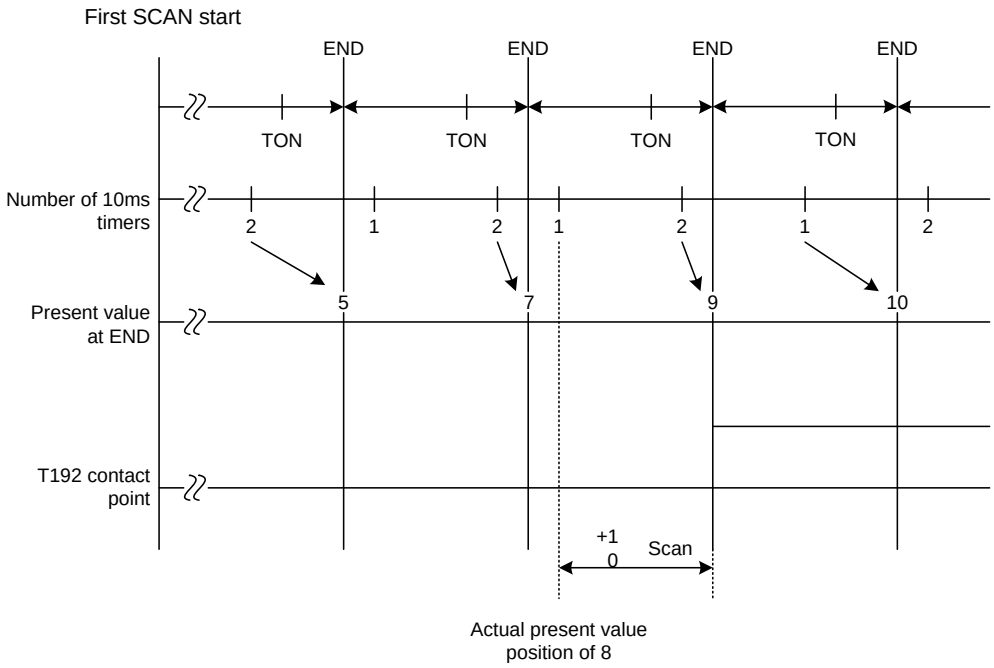
The precision of 100ms timer is identical to 10ms timer.



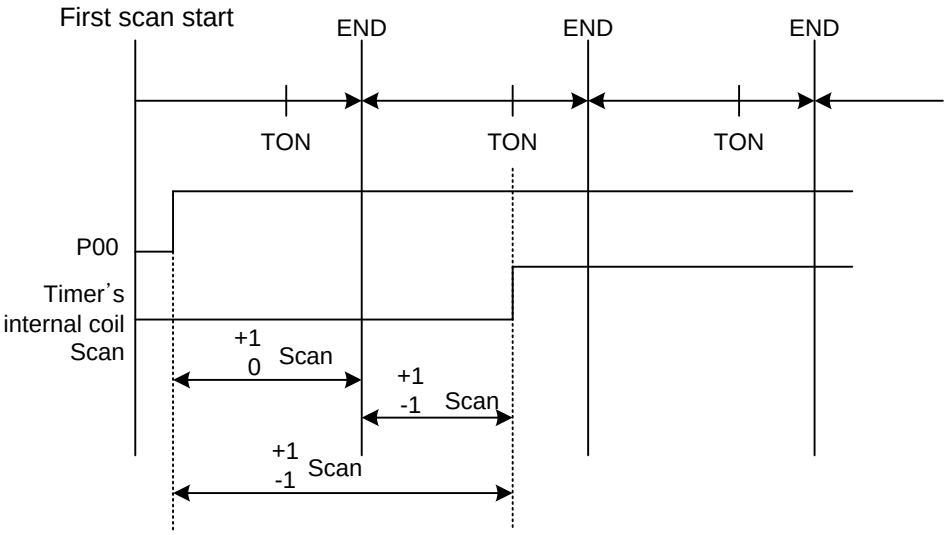
* 1 …10ms timer's coefficient tolerance(+1~0 Scanning time)
* 2 …Based on the tolerance caused by the time when timer input condition P00 is On and the position in programming timer output T192, the accuracy of 10ms times will be of +2~+1 scanning time.
(The precision of 100ms timer is also identical to 10ms timer.)

Supplement

* In case of 1



* In case of 2



Appendix 3. Special Relay(F) List

Device 1	Device 2	Type	Variable	Function	Description
F0000		DWORD	_SYS_STATE	Mode and state	Indicates PLC mode and operation status
	F00000	BIT	_RUN	RUN	RUN status.
	F00001	BIT	_STOP	STOP	STOP status.
	F00002	BIT	_ERROR	ERROR	ERROR status.
	F00003	BIT	_DEBUG	DEBUG	DEBUG status.
	F00004	BIT	_LOCAL_CON	Local control	Local control mode.
	F00005	BIT	_MODBUS_CON	Modbus mode	Modbus control mode.
	F00006	BIT	_REMOTE_CON	Remote mode	Remote control mode.
	F00008	BIT	_RUN_EDIT_ST	Edit during RUN	Downloading the editing program during RUN.
	F00009	BIT	_RUN_EDIT_CHK	Edit during RUN	Internal edit processing during RUN.
	F0000A	BIT	_RUN_EDIT_DONE	Edit done during RUN	Edit done during RUN.
	F0000B	BIT	_RUN_EDIT_END	Edit done during RUN	Edit done during RUN.
	F0000C	BIT	_CMOD_KEY	Operation mode	The operation mode has been changed by key.
	F0000D	BIT	_CMOD_LPADT	Operation mode	Operation mode changed by local PADT.
	F0000E	BIT	_CMOD_RPADT	Operation mode	Operation mode changed by remote PADT
	F0000F	BIT	_CMOD_RLINK	Operation mode	Operation mode changed by remote communication module.
	F00010	BIT	_FORCE_IN	Forced input	Forced input state.
	F00011	BIT	_FORCE_OUT	Forced output	Forced output state.
	F00012	BIT	_SKIP_ON	I/O SKIP	I / O SKIP is running.
	F00013	BIT	_EMASK_ON	Error mask	Error mask is running.
	F00014	BIT	_MON_ON	Monitor	The monitor is running.
	F00015	BIT	_USTOP_ON	STOP	Stopped by stop function.
	F00016	BIT	_ESTOP_ON	ESTOP	Stop by ESTOP function.
	F00017	BIT	_CONPILE_MODE	Compiling	Compiling is in progress.
	F00018	BIT	_INIT_RUN	Initializing	Initialization task is running.
	F0001C	BIT	_PB1	Program code 1	Program code 1 is selected.
	F0001D	BIT	_PB2	Program code 2	Program code 2 is selected.
	F0001E	BIT	_CB1	Compile code 1	Compilation code 1 is selected.
	F0001F	BIT	_CB2	Compile code 2	Compilation code 2 is selected.

Device 1	Device 2	Type	Variable	Function	Description
F0002		DWORD	_CNF_ER	System error	Reports the status of a system failure.
	F00020	BIT	_CPU_ER	CPU error	There is an error in the CPU configuration.
	F00021	BIT	_IO_TYER	Module type error	The module type does not match.
	F00022	BIT	_IO_DEER	Module detachment error	The module has been detached
	F00023	BIT	_FUSE_ER	Fuse error	The fuse has blown.
	F00024	BIT	_IO_RWER	Module I/O error	A problem occurred in the module I/O.
	F00025	BIT	_IP_IFER	Module interface error	There was a problem with the special / communication module interface.
	F00026	BIT	_ANNUM_ER	External device malfunction	A fault has been detected in the external device.
	F00028	BIT	_BPRM_ER	Basic parameter	There is a basic parameter error.
	F00029	BIT	_IOPRM_ER	IO parameter	There is a I/O configuration parameter error.
	F0002A	BIT	_SPPRM_ER	Special module parameter	The special module parameter is abnormal.
	F0002B	BIT	_CPPRM_ER	Communication module parameter	The communication module parameter is abnormal.
	F0002C	BIT	_PGM_ER	Program error	There is an error in the program.
	F0002D	BIT	_CODE_ER	Code error	There is an error in the program code.
	F0002E	BIT	_SWDT_ER	System watchdog	System watchdog worked.
	F0002F	BIT	_BASE_POWER_ER	Power error	The base power supply is error.
	F00030	BIT	_WDT_ER	Scan watchdog	The scan watchdog worked.
F0004		DWORD	_CNF_WAR	System warning	Reports the minor error status of the system.
	F00040	BIT	_RTC_ER	RTC error	there is abnormality in the module.
	F00041	BIT	_DBCK_ER	Backup error	There was a problem with the data backup.
	F00042	BIT	_HBCK_ER	Restart error	Hot restart is unavailable.
	F00043	BIT	_ABSD_ER	Abnormal operation stop	Stop by abnormal operation.
	F00044	BIT	_TASK_ER	Task conflict	The task is in conflict.
	F00045	BIT	_BAT_ER	Battery error	Battery condition is abnormal.
	F00046	BIT	_ANNUM_WAR	External device malfunction	An external device minor error has been detected.
	F00047	BIT	_LOG_FULL	Memory full	Log memory is full.
	F00048	BIT	_HS_WAR1	High speed link 1	High speed link - parameter 1 or more
	F00049	BIT	_HS_WAR2	High speed link 2	High speed link– parameter 2 or more
	F0004A	BIT	_HS_WAR3	High speed link 3	High speed link– parameter 3 or more
	F0004B	BIT	_HS_WAR4	High speed link 4	High speed link– parameter 4 or more
	F0004C	BIT	_HS_WAR5	High speed link 5	High speed link– parameter 5 or more
	F0004D	BIT	_HS_WAR6	High speed link 6	High speed link– parameter 6 or more
	F0004E	BIT	_HS_WAR7	High speed link 7	High speed link– parameter 7 or more
	F0004F	BIT	_HS_WAR8	High speed link 8	High speed link– parameter 8 or more
	F00050	BIT	_HS_WAR9	High speed link 9	High speed link– parameter 9 or more
	F00051	BIT	_HS_WAR10	High speed link 10	High speed link - parameter 10 or more

Device 1	Device 2	Type	Variable	Function	Description
	F00052	BIT	_HS_WAR11	High speed link 11	High speed link - parameter 11 or more
	F00053	BIT	_HS_WAR12	High speed link 12	High speed link - parameter 12 or more
	F00054	BIT	_P2P_WAR1	P2P parameter 1	P2P - parameter 1 error
	F00055	BIT	_P2P_WAR2	P2P parameter 2	P2P– parameter 2 error
	F00056	BIT	_P2P_WAR3	P2P parameter 3	P2P– parameter 3 error
	F00057	BIT	_P2P_WAR4	P2P parameter 4	P2P– parameter 4 error
	F00058	BIT	_P2P_WAR5	P2P parameter 5	P2P– parameter 5 error
	F00059	BIT	_P2P_WAR6	P2P parameter 6	P2P– parameter 6 error
	F0005A	BIT	_P2P_WAR7	P2P parameter 7	P2P– parameter 7 error
	F0005B	BIT	_P2P_WAR8	P2P parameter 8	P2P– parameter 8 error
	F0005C	BIT	_CONSTANT_ER	Fixed period error	Fixed period error
F0009		WORD	_USER_F	User contact point	Timer that can be used by the user
	F00090	BIT	_T20MS	20ms	Clock of 20ms cycle.
	F00091	BIT	_T100MS	100ms	Clock of 100ms cycle.
	F00092	BIT	_T200MS	200ms	Clock of 200ms cycle.
	F00093	BIT	_T1S	1s	Clock of 1s cycle.
	F00094	BIT	_T2S	2s	Clock of 2s cycle.
	F00095	BIT	_T10S	10s	Clock of 10s cycle.
	F00096	BIT	_T20S	20s	Clock of 20s cycle.
	F00097	BIT	_T60S	60s	Clock of 60s cycle.
	F00099	BIT	_ON	Always On	This bit is always On.
	F0009A	BIT	_OFF	Always Off	This bit is always Off.
	F0009B	BIT	_1ON	1scan On	Only the first scan is On.
	F0009C	BIT	_1OFF	1scan Off	Bit with only first scan Off state.
	F0009D	BIT	_STOG	Reversal	Reverses every scan
F0010		WORD	_USER_CLK	User CLOCK	User-settable CLOCK.
	F00100	BIT	_USR_CLK0	Repeat specified scan	Specified scan On/Off CLOCK 0
	F00101	BIT	_USR_CLK1	Repeat specified scan	Specified scan On/Off CLOCK 1
	F00102	BIT	_USR_CLK2	Repeat specified scan	Specified scan On/Off CLOCK 2
	F00103	BIT	_USR_CLK3	Repeat specified scan	Specified scan On/Off CLOCK 3
	F00104	BIT	_USR_CLK4	Repeat specified scan	Specified scan On/Off CLOCK 4
	F00105	BIT	_USR_CLK5	Repeat specified scan	Specified scan On/Off CLOCK 5
	F00106	BIT	_USR_CLK6	Repeat specified scan	Specified scan On/Off CLOCK 6
	F00107	BIT	_USR_CLK7	Repeat specified scan	Specified scan On/Off CLOCK 7

Device 1	Device 2	Type	Variable	Function	Description
F0011		WORD	_LOGIC_RESULT	Logic result	Indicates the logical result
	F00110	BIT	_LER	Operation error	On operation error On during 1 scan
	F00111	BIT	_ZERO	Zero flag	If the operation result is On.
	F00112	BIT	_CARRY	Carry flag	ON when carry occurs during operation
	F00113	BIT	_ALL_OFF	All Output Off	On when all outputs are OFF
	F00115	BIT	_LER_LATCH	Operation error latch	Continue On when operation error occurs
F0012		WORD	_CMP_RESULT	Comparison result	Indicates the comparison result.
	F00120	BIT	_LT	LT flag	If “less than” to On
	F00121	BIT	_LTE	LTE flag	If “less than or equal” to On
	F00122	BIT	_EQU	EQU flag	If “equal” to On
	F00123	BIT	_GT	GT flag	If “larger than” to On
	F00124	BIT	_GTE	GTE flag	If “If “larger than or equal” to On
	F00125	BIT	_NEQ	NEQ flag	If it is “not equal” to On
F0013		WORD	_AC_F_CNT	Instantaneous interruption	Indicates the number of instantaneous interruption occurrences.
F0014		WORD	_FALS_NUM	FALS number	Displays the number of FALS.
F0015		WORD	_PUTGET_ERR0	PUT/GET error 0	Main base PUT / GET error
F0016		WORD	_PUTGET_ERR1	PUT/GET error 1	Extension base 1-stage PUT/GET error
F0017		WORD	_PUTGET_ERR2	PUT/GET error 2	Extension base 2-stage PUT/GET error
F0018		WORD	_PUTGET_ERR3	PUT/GET error 3	Extension base 3-stage PUT/GET error
F0019		WORD	_PUTGET_ERR4	PUT/GET error 4	Extension base 4-stage PUT/GET error
F0020		WORD	_PUTGET_ERR5	PUT/GET error 5	Extension base 5-stage PUT/GET error
F0021		WORD	_PUTGET_ERR6	PUT/GET error 6	Extension base 6-stage PUT/GET error
F0022		WORD	_PUTGET_ERR7	PUT/GET error 7	Extension base 7-stage PUT/GET error
F0023		WORD	_PUTGET_NDR0	PUT/GET complete 0	Main Base PUT / GET Complete
F0024		WORD	_PUTGET_NDR1	PUT/GET complete 1	PUT/GET done in the extended base level 1
F0025		WORD	_PUTGET_NDR2	PUT/GET complete 2	PUT/GET done in the extended base level 2
F0026		WORD	_PUTGET_NDR3	PUT/GET complete 3	PUT/GET done in the extended base level 3
F0027		WORD	_PUTGET_NDR4	PUT/GET complete 4	PUT/GET done in the extended base level 4
F0028		WORD	_PUTGET_NDR5	PUT/GET complete 5	PUT/GET done in the extended base level 5
F0029		WORD	_PUTGET_NDR6	PUT/GET complete 6	PUT/GET done in the extended base level 6
F0030		WORD	_PUTGET_NDR7	PUT/GET complete 7	PUT/GET done in the extended base level 7
F0044		WORD	_CPU_TYPE	CPU type	Indicates information related to the CPU type.
F0045		WORD	_CPU_VER	CPU version	Indicates CPU version.
F0046		DWORD	_OS_VER	OS ver	Indicates OS version.
F0048		DWORD	_OS_DATE	OS date	Indicates the OS distribution date.

Device 1	Device 2	Type	Variable	Function	Description
F0050		WORD	_SCAN_MAX	Maximum scan time	Indicates maximum scan time after run.
F0051		WORD	_SCAN_MIN	Minimum scan time	Indicates minimum scan time after run.
F0052		WORD	_SCAN_CUR	Current scan time	Indicates current scan time.
F0053		WORD	_MON_YEAR	Month / Year	Indicates month and year data of PLC.
F0054		WORD	_TIME_DAY	Time / Day	Indicates time and day data of PLC.
F0055		WORD	_SEC_MIN	Second / Minute	Indicates second and minute data of PLC.
F0056		WORD	_HUND_WK	Hundred years / Weekday	Indicates hundred years and weekday data of PLC.
F0057		WORD	_FPU_INFO	FPU calculation result	Displays the result of floating-point calculation.
	F00570	BIT	_FPU_LFLAG_I	Incorrect operation error latch	Latch on Inaccurate Error
	F00571	BIT	_FPU_LFLAG_U	Underflow latch	Latches the error when underflow occurs.
	F00572	BIT	_FPU_LFLAG_O	Overflow latch	Latches the error when overflow occurs.
	F00573	BIT	_FPU_LFLAG_Z	Latches the error when zero divide occurs.	Latches the error when zero divide occurs.
	F00574	BIT	_FPU_LFLAG_V	Invalid operation latch	Latch when invalid operation.
	F0057A	BIT	_FPU_FLAG_I	Inaccurate error	Reported if incorrect error found
	F0057B	BIT	_FPU_FLAG_U	Underflow	Reported if underflow found.
	F0057C	BIT	_FPU_FLAG_O	Overflow	Reported if overflow found.
	F0057D	BIT	_FPU_FLAG_Z	Zero divide	Reported if divided by 0.
	F0057E	BIT	_FPU_FLAG_V	Invalid operation	Reported if operation invalid.
	F0057F	Bit	_FPU_FLAG_E	Input of irregular value	Reports when input of irregular value.
F0058		DWORD	_ERR_STEP	Error step	Saves error step.
F0060		DWORD	_REF_COUNT	Refresh	Increase when module Refresh.
F0062		DWORD	_REF_OK_CNT	Refresh OK	Increase when module Refresh is normal.
F0064		DWORD	_REF_NG_CNT	Refresh NG	Increase when module refresh is abnormal
F0066		DWORD	_REF_LIM_CNT	Refresh LIMIT	Increase when module refresh is abnormal (TIME OUT)
F0068		DWORD	_REF_ERR_CNT	Refresh ERROR	Increase when module refresh is abnormal
F0070		DWORD	_MOD_RD_ERR_CNT	Module READ ERROR	It increases when the module 1 word is read abnormally.
F0072		DWORD	_MOD_WR_ERR_CNT	Module WRITE ERROR	It increases when the module 1 word is write abnormally.
F0074		DWORD	_CA_CNT	Block service	Increase in module's block data service
F0076		DWORD	_CA_LIM_CNT	Block service LIMIT	Increase in block data abnormal service
F0078		DWORD	_CA_ERR_CNT	Block service ERROR	Increase in block data abnormal service
F0080		DWORD	_BUF_FULL_CNT	Buffer FULL	Increase when CPU internal buffer is full.
F0082		DWORD	_PUT_CNT	PUT count	It increases when performing PUT.
F0084		DWORD	_GET_CNT	GET count	It increases when performing GET.
F0086		DWORD	_KEY	Current key	Indicates the current state of the local key.
F0088		DWORD	_KEY_PREV	Previous key	Indicates the previous state of the local key.

Device 1	Device 2	Type	Variable	Function	Description
F0090		WORD	_IO_TYER_N	Mismatch slot	Module type mismatch slot number display
F0091		WORD	_IO_DEER_N	Detached slot	Display the slot number where the module has been detached
F0092		WORD	_FUSE_ER_N	Fuse disconnection slot	Indicates the slot number where the fuse blows
F0093		WORD	_IO_RWER_N	RW error slot	Module read / write error slot number display
F0094		WORD	_IP_IFER_N	IF error slot	Module interface error slot number display
F0096		WORD	_IO_TYER0	Module type 0 error	Main base module type error.
F0097		WORD	_IO_TYER1	Module type 1 error	Extension base 1-stage module type error
F0098		WORD	_IO_TYER2	Module type 2 error	Extension base 2-stage module type error
F0099		WORD	_IO_TYER3	Module type 3 error	Extension base 3-stage module type error
F0100		WORD	_IO_TYER4	Module type 4 error	Extension base 4-stage module type error
F0101		WORD	_IO_TYER5	Module type 5 error	Extension base 5-stage module type error
F0102		WORD	_IO_TYER6	Module type 6 error	Extension base 6-stage module type error
F0103		WORD	_IO_TYER7	Module type 7 error	Extension base 7-stage module type error
F0104		WORD	_IO_DEER0	Module detachment 0 error	Main base module Detach error.
F0105		WORD	_IO_DEER1	Module detachment 1 error	Extension base 1-stage module detach error.
F0106		WORD	_IO_DEER2	Module detachment 2 error	Extension base 2-stage module detach error.
F0107		WORD	_IO_DEER3	Module detachment 3 error	Extension base 3-stage module detach error.
F0108		WORD	_IO_DEER4	Module detachment 4 error	Extension base 4-stage module detach error.
F0109		WORD	_IO_DEER5	Module detachment 5 error	Extension base 5-stage module detach error.
F0110		WORD	_IO_DEER6	Module detachment 6 error	Extension base 6-stage module detach error.
F0111		WORD	_IO_DEER7	Module detachment 7 error	Extension base 7-stage module detach error.
F0112		WORD	_FUSE_ER0	Fuse disconnection 0 error	Main base fuse disconnection error
F0113		WORD	_FUSE_ER1	Fuse disconnection 1 error	Extension base 1-stage fuse disconnection error
F0114		WORD	_FUSE_ER2	Fuse disconnection 2 error	Extension base 2-stage fuse disconnection error
F0115		WORD	_FUSE_ER3	Fuse disconnection 3 error	Extension base 3-stage fuse disconnection error
F0116		WORD	_FUSE_ER4	Fuse disconnection 4 error	Extension base 4-stage fuse disconnection error
F0117		WORD	_FUSE_ER5	Fuse disconnection 5 error	Extension base 5-stage fuse disconnection error
F0118		WORD	_FUSE_ER6	Fuse disconnection 6 error	Extension base 6-stage fuse disconnection error
F0119		WORD	_FUSE_ER7	Fuse disconnection 7 error	Extension base 7-stage fuse disconnection error
F0120		WORD	_IO_RWER0	Module RW 0 error	Main base module read / write error
F0121		WORD	_IO_RWER1	Module RW 1 error	Module reading/writing error in the extended base level 1
F0122		WORD	_IO_RWER2	Module RW 2 error	Extension base 2-stage module read/ write error.
F0123		WORD	_IO_RWER3	Module RW 3 error	Extension base 3-stage module read/ write error.
F0124		WORD	_IO_RWER4	Module RW 4 error	Extension base 4-stage module read/ write

					error.
F0125		WORD	_IO_RWER5	Module RW 5 error	Extension base 5-stage module read/ write error.
F0126		WORD	_IO_RWER6	Module RW 6 error	Extension base 6-stage module read/ write error.
F0127		WORD	_IO_RWER7	Module RW 7 error	Extension base 7-stage module read/ write error.

Device 1	Device 2	Type	Variable	Function	Description
F0128		WORD	_IO_IFER_0	Module IF 0 error	Main base module interface error.
F0129		WORD	_IO_IFER_1	Module IF 1 error	Extension base 1-stage module interface error.
F0130		WORD	_IO_IFER_2	Module IF 2 error	Extension base 2-stage module interface error.
F0131		WORD	_IO_IFER_3	Module IF 3 error	Extension base 3-stage module interface error.
F0132		WORD	_IO_IFER_4	Module IF 4 error	Extension base 4-stage module interface error.
F0133		WORD	_IO_IFER_5	Module IF 5 error	Extension base 5-stage module interface error.
F0134		WORD	_IO_IFER_6	Module IF 6 error	Extension base 6-stage module interface error.
F0135		WORD	_IO_IFER_7	Module IF 7 error	Extension base 7-stage module interface error.
F0136		WORD	_RTC_DATE	RTC date	Displays the current date .
F0137		WORD	_RTC_WEEK	RTC weekday	Displays the current day of week
F0138		DWORD	_RTC_TOD	RTC time	Current time in RTC (ms unit)
F0140		DWORD	_AC_FAIL_CNT	Save the number of power off.	Saves the number of times the power cutoff.
F0142		DWORD	_ERR_HIS_CNT	Save the number of error count.	Saves the number of times an error occurred.
F0144		DWORD	_MOD_HIS_CNT	Save the number of mode change.	Saves the number of times the mode change.
F0146		DWORD	_SYS_HIS_CNT	History occurrence count	Saves the number of system history occurrences.
F0148		DWORD	_LOG_ROTATE	Log rotate	Saves log locate information.
F0150		WORD	_BASE_INFO0	Slot information 0	Main base slot information
F0151		WORD	_BASE_INFO1	Slot information 1	Extension base 1-slot information
F0152		WORD	_BASE_INFO2	Slot information 2	Extension base 2-slot information
F0153		WORD	_BASE_INFO3	Slot information 3	Extension base 3-slot information
F0154		WORD	_BASE_INFO4	Slot information 4	Extension base 4-slot information
F0155		WORD	_BASE_INFO5	Slot information 5	Extension base 5-slot information
F0156		WORD	_BASE_INFO6	Slot information 6	Extension base 6-slot information
F0157		WORD	_BASE_INFO7	Slot information 7	Extension base 7-slot information
F0158		WORD	_RBANK_NUM	Block number in use	Block number which is currently being used
F0159		WORD	_RBLOCK_STATE	Flash state	Flash block state
F0160		DWORD	_RBLOCK_RD_FLAG	Flash read	On when reading flash N block data
F0162		DWO	_RBLOCK_WR_	Write on flash	On when writing flash N block data

		RD	FLAG		
F0164		DWORD	_RBLOCK_ER_FLAG	Flash error	An error occurred during flash N block service.
F0178		DWORD	_OS_VER_PATCH	OS patch version	Displays OS version to two decimal places.
F09320		BIT	_FUSE_ER_PMT	Setting when a fuse error occurs	Continue running when a fuse error occurs
F09321		BIT	_IO_ER_PMT	Setting when I/O error occurs	Continue running when a IO module error occurs
F09322		BIT	_SP_ER_PMT	Setting when Special module error occurs	Continue running when Special module error occurs
F09323		BIT	_CP_ER_PMT	Setting when Communication module error occurs	Continue running when a communication module error occurs
F0934		DWORD	_BASE_EMASK_INFO	Base fault mask	Base fault mask information
F0936		DWORD	_BASE_SKIP_INFO	Base skip	Base Skip information
F0938		WORD	_SLOT_EMASK_INFO_0	Slot Fault Mask	Slot Fault Mask information(base 0)
F0939		WORD	_SLOT_EMASK_INFO_1	Slot Fault Mask	Slot Fault Mask information(base 1)
F0940		WORD	_SLOT_EMASK_INFO_2	Slot Fault Mask	Slot Fault Mask information(base 2)
F0941		WORD	_SLOT_EMASK_INFO_3	Slot Fault Mask	Slot Fault Mask information(base 3)
F0942		WORD	_SLOT_EMASK_INFO_4	Slot Fault Mask	Slot Fault Mask information(base 4)
F0943		WORD	_SLOT_EMASK_INFO_5	Slot Fault Mask	Slot Fault Mask information(base 5)
F0944		WORD	_SLOT_EMASK_INFO_6	Slot Fault Mask	Slot Fault Mask information(base 6)
F0945		WORD	_SLOT_EMASK_INFO_7	Slot Fault Mask	Slot Fault Mask information(base 7)
F0946		WORD	_SLOT_SKIP_INFO_0	Slot Skip	Slot Skip information(base 0)
F0947		WORD	_SLOT_SKIP_INFO_1	Slot Skip	Slot Skip information(base 1)
F0948		WORD	_SLOT_SKIP_INFO_2	Slot Skip	Slot Skip information(base 2)
F0949		WORD	_SLOT_SKIP_INFO_3	Slot Skip	Slot Skip information(base 3)
F0950		WORD	_SLOT_SKIP_INFO_4	Slot Skip	Slot Skip information(base 4)
F0951		WORD	_SLOT_SKIP_INFO_5	Slot Skip	Slot Skip information(base 5)
F0952		WORD	_SLOT_SKIP_INFO_6	Slot Skip	Slot Skip information(base 6)
F0953		WORD	_SLOT_SKIP_INFO_7	Slot Skip	Slot Skip information(base 7)
F1024		WORD	_USER_WRITE_F	Available contact point	Contact point available in program.
	F10240	BIT	_RTC_WR	RTC RW	Writing and reading data in RTC
	F10241	BIT	_SCAN_WR	Scan WR	Initializing the value of scan.

	F10242	BIT	_CHK_ANC_ERR	External critical error request	Request of fatal error detection from external device
	F10243	BIT	_CHK_ANC_WAR	External light error request	Request of minor error detection from external device
F1025		WORD	_USER_STAUS_F	User contact	User contact
	F10250	BIT	_INIT_DONE	Initialization completed	Indicates completion of initialization task
F1026		WORD	_ANC_ERR	External critical error information	Displays fatal error information of external devices
F1027		WORD	_ANC_WAR	External light error warning	Displays minor error information of external devices
F1034		WORD	_MON_YEAR_DT	Month / Year	Clock information data (month / year)
F1035		WORD	_TIME_DAY_DT	Time / Day	Clock information data (hour/day)
F1036		WORD	_SEC_MIN_DT	Second / Minute	Clock information data (second/minute)
F1037		WORD	_HUND_WK_DT	Hundred years / Weekday	Clock information data (hundred year/week)

Appendix 4. Execution Speed of Instruction

Unit : ns

Classification	Command	XGK-CPUE/S			XGK-CPUA/H		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Contact Point Instruction	LOAD	84	84		28	28	
	LOAD NOT	84	84		28	28	
	LOADP	252	252		84	84	
	LOADN	252	252		84	84	
	AND	84	84		28	28	
	AND NOT	84	84		28	28	
	ANDP	252	252		84	84	
	ANDN	252	252		84	84	
	OR	84	84		28	28	
	OR NOT	84	84		28	28	
	ORP	252	252		84	84	
	ORN	252	252		84	84	
Unite Instruction	AND LOAD	84	84		28	28	
	OR LOAD	84	84		28	28	
	MPUSH	84	84		28	28	
	MLOAD	84	84		28	28	
	MPOP	84	84		28	28	
Reverse	NOT	84	84		28	28	
M/C	MCS	84	84		28	28	
	MCSCLR	84	84		28	28	
Output	OUT	168	168		56	56	
	OUT NOT	168	168		56	56	
	SET	168	168		56	56	
	RST	168	168		56	56	
	OUTP	336	336		112	112	
	OUTN	420	420		140	140	
	FF	336	336		112	112	
S/C	LOAD Sxx.yy	252	2100		700	700	
	AND Sxx.yy	252	1932		644	644	
	OR Sxx.yy	252	2352		784	784	
	LOAD NOT S	252	2100		700	700	
	AND NOT S	252	1932		644	644	
	OR NOT S	252	2352		784	784	
	SET S	252	1260		420	420	
	OUT S	252	1932		644	644	
End	END	9000	9000[1)]		3000	3000[1)]	
Non-Process	NOP	84	84		28	28	
Timer	TON	6468	10626		2156	3542	
	TOFF	5040	7896		1680	2632	
	TMR	3192	10626		1064	3542	
	TMON	5712	8568		1904	2856	
	TRTG	6048	8568		2016	2856	
Counter	CTD	1722	4872		574	1624	
	CTU	1722	8148		574	2716	
	CTUD	3696	9240		1232	3080	
	CTR	1722	8610		574	2870	

Unit :ns

[1)] If using the timer, the execution time of timer is as added as number of timer.

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Data Transfer Instruction	MOV	252	252		84	84	
	MOVP	420	420		140	140	
	DMOV	252	252		84	84	
	DMOVP	420	420		140	140	
	RMOV	252	252		84	84	
	RMOVP	420	420		140	140	
	LMOV	420	1596		140	532	
	LMOVP	588	1764		196	588	
	MOV4	504	6426		168	2142	
	MOV4P	672	6594		224	2198	
	MOV8	504	6426		168	2142	
	MOV8P	672	6594		224	2198	
	CMOV	252	336		84	112	
	CMOVP	420	504		140	168	
	DCMOV	252	336		84	112	
	DCMOVP	420	504		140	168	
	GMOV	420	8358	11592	140	2786	3864
	GMOVP	588	8526	11760	196	2842	3920
	FMOV	420	4662	7308	140	1554	2436
	FMOVP	588	4830	7476	196	1610	2492
	BMOV	420	3108		140	1036	←
	BMOVP	588	3276		196	1092	←
	GBMOV	504	9618	17556	168	3206	5852
	GBMOVP	672	9786	17724	224	3262	5908
	$MOV	336	16674		112	5558	
	$MOVP	504	16842		168	5614	
Conversion Instruction	BCD	336	1722		112	574	
	BCDP	504	1890		168	630	
	DBCD	336	1806		112	602	
	DBCDP	504	1974		168	658	
	BIN	336	1680		112	560	
	BINP	504	1848		168	616	
	DBIN	336	1764		112	588	
	DBINP	504	1932		168	644	
	GBCD	420	9408	20580	140	3136	6860
	GBCDP	588	9576	20748	196	3192	6916
	GBIN	420	9324	19908	140	3108	6636
	GBINP	588	9492	20076	196	3164	6692
Data Type Conversion instruction	I2R	336	1638		112	546	
	I2RP	504	1806		168	602	
	I2L	336	4830		112	1610	
	I2LP	504	4998		168	1666	
	D2R	336	1554		112	518	
	D2RP	504	1722		168	574	
	D2L	336	4662		112	1554	
	D2LP	504	4830		168	1610	
	R2I	336	3150		112	1050	
	R2IP	504	3318		168	1106	
	R2D	336	3150		112	1050	
	R2DP	504	3318		168	1106	
	L2I	420	3234		140	1078	
	L2IP	588	3402		196	1134	
	L2D	420	3234		140	1078	
	L2DP	588	3402		196	1134	

Unit : ns

Appendix 4 Execution Speed of Instruction

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Comparison instruction	CMP	336	1764		112	588	
	CMPP	504	1932		168	644	
	DCMP	336	1764		112	588	
	DCMPP	504	1932		168	644	
	CMP4	504	6552		168	2184	
	CMP4P	672	6720		224	2240	
	CMP8	504	6552		168	2184	
	CMP8P	672	6720		224	2240	
	TCMP	420	17724		140	5908	
	TCMPP	588	17892		196	5964	
	DTCMP	420	20664		140	6888	
	DTCMPP	588	20832		196	6944	
Comparison instruction	GEQ	504	9198	15372	168	3066	5124
	GEQP	672	9366	15540	224	3122	5180
	GGT	504	9198	15372	168	3066	5124
	GGTP	672	9366	15540	224	3122	5180
	GLT	504	9198	15372	168	3066	5124
	GLTP	672	9366	15540	224	3122	5180
	GGE	504	9198	15372	168	3066	5124
	GGEP	672	9366	15540	224	3122	5180
	GLE	504	9198	15372	168	3066	5124
	GLEP	672	9366	15540	224	3122	5180
	GNE	504	9198	15372	168	3066	5124
	GNEP	672	9366	15540	224	3122	5180
Compare instruction(16 bit integer)	LOAD=	-	336		-	112	
	LOAD>	-	336		-	112	
	LOAD<	-	336		-	112	
	LOAD>=	-	336		-	112	
	LOAD<=	-	336		-	112	
	LOAD<>	-	336		-	112	
	AND=	336	336		112	112	
	AND>	336	336		112	112	
	AND<	336	336		112	112	
	AND>=	336	336		112	112	
	AND<=	336	336		112	112	
	AND<>	336	336		112	112	
	OR=	336	336		112	112	
	OR>	336	336		112	112	
	OR<	336	336		112	112	
	OR>=	336	336		112	112	
	OR<=	336	336		112	112	
	OR<>	336	336		112	112	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Compare instruction(32 bit integer)	LOADD=	-	504		-	168	
	LOADD>	-	504		-	168	
	LOADD<	-	504		-	168	
	LOADD<=	-	504		-	168	
	LOADD>=	-	504		-	168	
	LOADD<>	-	504		-	168	
	ANDD=	420	420		140	140	
	ANDD>	420	420		140	140	
	ANDD<	420	420		140	140	
	ANDD>=	420	420		140	140	
	ANDD<=	420	420		140	140	
	ANDD<>	420	420		140	140	
	ORD=	420	420		140	140	
	ORD>	420	420		140	140	
	ORD<	420	420		140	140	
	ORD>=	420	420		140	140	
	ORD<=	420	420		140	140	
	ORD< >	420	420		140	140	
Compare instruction(4 bit integer)	LOAD4=	-	6132		-	2044	
	LOAD4>	-	6132		-	2044	
	LOAD4<	-	6132		-	2044	
	LOAD4>=	-	6132		-	2044	
	LOAD4<=	-	6132		-	2044	
	LOAD4<>	-	6132		-	2044	
	AND4=	504	5964		168	1988	
	AND4>	504	5964		168	1988	
	AND4<	504	5964		168	1988	
	AND4>=	504	5964		168	1988	
	AND4<=	504	5964		168	1988	
	AND4<>	504	5964		168	1988	
	OR4=	504	6468		168	2156	
	OR4>	504	6468		168	2156	
	OR4<	504	6468		168	2156	
	OR4>=	504	6468		168	2156	
	OR4<=	504	6468		168	2156	
	OR4<>	504	6468		168	2156	
Compare instruction(8 bit integer)	LOAD8=	-	6132		-	2044	
	LOAD8>	-	6132		-	2044	
	LOAD8<	-	6132		-	2044	
	LOAD8>=	-	6132		-	2044	
	LOAD8<=	-	6132		-	2044	
	LOAD8<>	-	6132		-	2044	
	AND8=	504	5964		168	1988	
	AND8>	504	5964		168	1988	
	AND8<	504	5964		168	1988	
	AND8>=	504	5964		168	1988	
	AND8<=	504	5964		168	1988	
	AND8<>	504	5964		168	1988	
	OR8=	504	6468		168	2156	
	OR8>	504	6468		168	2156	
	OR8<	504	6468		168	2156	
	OR8>=	504	6468		168	2156	
	OR8<=	504	6468		168	2156	
	OR8<>	504	6468		168	2156	

Appendix 4 Execution Speed of Instruction

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Compare instruction(16 bit Group)	LOADG=	1848	8274	12684	616	2758	4228
	LOADG>	1848	8274	12684	616	2758	4228
	LOADG<	1848	8274	12684	616	2758	4228
	LOADG>=	1848	8274	12684	616	2758	4228
	LOADG<=	1848	8274	12684	616	2758	4228
	LOADG<>	1848	8274	12684	616	2758	4228
	ANDG=	420	8106	12516	140	2702	4172
	ANDG>	420	8106	12516	140	2702	4172
	ANDG<	420	8106	12516	140	2702	4172
	ANDG>=	420	8106	12516	140	2702	4172
	ANDG<=	420	8106	12516	140	2702	4172
	ANDG<>	420	8106	12516	140	2702	4172
	ORG=	420	8610	13020	140	2870	4340
	ORG>	420	8610	13020	140	2870	4340
	ORG<	420	8610	13020	140	2870	4340
	ORG>=	420	8610	13020	140	2870	4340
	ORG<=	420	8610	13020	140	2870	4340
	ORG<>	420	8610	13020	140	2870	4340
Real number comparison instruction(short)	LOADR=	-	1596		-	532	
	LOADR>	-	1596		-	532	
	LOADR<	-	1596		-	532	
	LOADR>=	-	1596		-	532	
	LOADR<=	-	1596		-	532	
	LOADR<>	-	1596		-	532	
	ANDR=	336	1428		112	476	
	ANDR>	336	1428		112	476	
	ANDR<	336	1428		112	476	
	ANDR>=	336	1428		112	476	
	ANDR<=	336	1428		112	476	
	ANDR<>	336	1428		112	476	
	ORR=	336	1932		112	644	
	ORR>	336	1932		112	644	
	ORR<	336	1932		112	644	
	ORR>=	336	1932		112	644	
	ORR<=	336	1932		112	644	
	ORR<>	336	1932		112	644	
Real number comparison instruction(long)	LOADL=	-	1764		-	588	
	LOADL>	-	1764		-	588	
	LOADL<	-	1764		-	588	
	LOADL>=	-	1764		-	588	
	LOADL<=	-	1764		-	588	
	LOADL<>	-	1764		-	588	
	ANDL=	504	1596		168	532	
	ANDL>	504	1596		168	532	
	ANDL<	504	1596		168	532	
	ANDL>=	504	1596		168	532	
	ANDL<=	504	1596		168	532	
	ANDL<>	504	1596		168	532	
	ORL=	504	2100		168	700	
	ORL>	504	2100		168	700	
	ORL<	504	2100		168	700	
	ORL>=	504	2100		168	700	
	ORL<=	504	2100		168	700	
	ORL<>	504	2100		168	700	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
String compare instruction	LOAD$=		8526		-	2842	
	LOAD$>		8526		-	2842	
	LOAD$<		8526		-	2842	
	LOAD$>=		8526		-	2842	
	LOAD$<=		8526		-	2842	
	LOAD$<>		8526		-	2842	
	AND$=	336	8358		112	2786	
	AND$>	336	8358		112	2786	
	AND$<	336	8358		112	2786	
	AND$>=	336	8358		112	2786	
	AND$<=	336	8358		112	2786	
	AND$<>	336	8358		112	2786	
	OR$=	336	8862		112	2954	
	OR$>	336	8862		112	2954	
	OR$<	336	8862		112	2954	
	OR$>=	336	8862		112	2954	
	OR$<=	336	8862		112	2954	
	OR$<>	336	8862		112	2954	
3 Operand compare instruction(16 bit integer)	LOAD=3	-	2268		-	756	
	LOAD>3	-	2268		-	756	
	LOAD<3	-	2268		-	756	
	LOAD>=3	-	2268		-	756	
	LOAD<=3	-	2268		-	756	
	LOAD<>3	-	2268		-	756	
	AND=3	420	2100		140	700	
	AND>3	420	2100		140	700	
	AND<3	420	2100		140	700	
	AND>=3	420	2100		140	700	
	AND<=3	420	2100		140	700	
	AND<>3	420	2100		140	700	
	OR=3	420	2604		140	868	
	OR>3	420	2604		140	868	
	OR<3	420	2604		140	868	
	OR>=3	420	2604		140	868	
	OR<=3	420	2604		140	868	
	OR<>3	420	2604		140	868	
3 Operand compare instruction(32 bit integer)	LOADD=3	-	2268		-	756	
	LOADD>3	-	2268		-	756	
	LOADD<3	-	2268		-	756	
	LOADD>=3	-	2268		-	756	
	LOADD<=3	-	2268		-	756	
	LOADD<>3	-	2268		-	756	
	ANDD=3	420	2100		140	700	
	ANDD>3	420	2100		140	700	
	ANDD<3	420	2100		140	700	
	ANDD>=3	420	2100		140	700	
	ANDD<=3	420	2100		140	700	
	ANDD<>3	420	2100		140	700	
	ORD=3	420	2604		140	868	
	ORD>3	420	2604		140	868	
	ORD<3	420	2604		140	868	
	ORD>=3	420	2604		140	868	
	ORD<=3	420	2604		140	868	
	ORD<>3	420	2604		140	868	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Increase/Decrease Instruction	INC	252	336	252	84	112	
	INCP	420	504	420	140	168	
	DINC	252	420	252	84	140	
	DINCP	420	588	420	140	196	
	INC4	336	6426	336	112	2142	
	INC4P	504	6594	504	168	2198	
	INC8	336	6426	336	112	2142	
	INC8P	504	6594	504	168	2198	
	DEC	252	336	252	84	112	
	DECP	420	504	420	140	168	
	DDEC	252	420	252	84	140	
	DDECP	420	588	420	140	196	
	DEC4	336	6426	336	112	2142	
	DEC4P	504	6594	504	168	2198	
	DEC8	336	6426	336	112	2142	
	DEC8P	504	6594	504	168	2198	
	INCU	252	672	252	84	224	
	INCUP	420	840	420	140	280	
	DINCU	252	714	252	84	238	
	DINCUP	420	918	420	140	306	
	DECU	252	672	252	84	224	
	DECUP	420	840	420	140	280	
	DDECU	252	714	252	84	238	
	DDECUP	420	918	420	140	306	
Rotate Instruction	ROL	252	588	252	84	196	
	ROLP	420	756	420	140	252	
	DROL	336	3444	336	112	1148	
	DROLP	504	3612	504	168	1204	
	ROL4	420	7014	420	140	2338	
	ROL4P	588	7182	588	196	2394	
	ROL8	420	6762	420	140	2254	
	ROL8P	588	6930	588	196	2310	
	ROR	252	588	252	84	196	
	RORP	420	756	420	140	252	
	DROR	336	3444	336	112	1148	
	DRORP	504	3612	504	168	1204	
	ROR4	420	7014	420	140	2338	
	ROR4P	588	7182	588	196	2394	
	ROR8	420	6762	420	140	2254	
	ROR8P	588	6930	588	196	2310	
	RCL	336	4200	336	112	1400	
	RCLP	504	4368	504	168	1456	
	DRCL	336	6216	336	112	2072	
	DRCLP	504	6384	504	168	2128	
	RCL4	420	9198	420	140	3066	
	RCL4P	588	9366	588	196	3122	
	RCL8	420	9114	420	140	3038	
	RCL8P	588	9282	588	196	3094	
	RCR	336	4116	336	112	1372	
	RCRP	504	4284	504	168	1428	
	DRCR	336	6216	336	112	2072	
	DRCRP	504	6384	504	168	2128	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Rotate Instruction	RCR4	420	9030		140	3010	
	RCR4P	588	9198		196	3066	
	RCR8	420	8946		140	2982	
	RCR8P	588	9114		196	3038	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Move Instruction	BSFT	504	3864		168	1288	
	BSFTP	672	4032		224	1344	
	BSFL	336	3108		112	1036	
	BSFLP	504	3306		168	1102	
	DBSFL	336	3444		112	1148	
	DBSFLP	504	3612		168	1204	
	BSFL4	420	7014		140	2338	
	BSFL4P	588	7182		196	2394	
	BSFL8	420	6762		140	2254	
	BSFL8P	588	6930		196	2310	
	BSFR	252	588		84	196	
	BSFRP	420	756		140	252	
	DBSFR	336	3444		112	1148	
	DBSFRP	504	3612		168	1204	
	BSFR4	420	6762		140	2254	
	BSFR4P	588	6930		196	2310	
	BSFR8	420	6762		140	2254	
	BSFR8P	588	6930		196	2310	
	WSFT	336	12138		112	4046	
	WSFTP	504	12306		168	4102	
	WSFL	420	21798	21420	140	7266	7140
	WSFLP	588	21966	21588	196	7322	7196
	WSFR	420	21714	21126	140	7238	7042
	WSFRP	588	21882	21294	196	7294	7098
	SR	0	0				
Exchange Instruction	XCHG	336	1512		112	504	
	XCHGP	504	1680		168	560	
	DXCHG	336	1848		112	616	
	DXCHGP	504	2016		168	672	
	GXCHG	420	7854	12264	140	2618	4088
	GXCHGP	588	8022	12432	196	2674	4144
	SWAP	252	1344		84	448	
	SWAPP	420	1512		140	504	
	GSWAP	336	4662	8484	112	1554	2828
	GSWAPP	420	4830	8652	140	1610	2884
BIN arithmetic	ADD	252	420		84	140	
	ADDP	420	588		140	196	
	DADD	252	462		84	154	
	DADDP	420	630		140	210	
	SUB	252	420		84	140	
	SUBP	420	588		140	196	
	DSUB	252	462		84	154	
	DSUBP	420	630		140	210	
	MUL	252	1722		84	574	
	MULP	420	1890		140	630	
	DMUL	252	3150		84	1050	
	DMULP	420	3318		140	1106	
	DIV	252	2436		84	812	
	DIVP	420	2604		140	868	
	DDIV	252	3864		84	1288	
	DDIVP	420	4032		140	1344	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
BIN arithmetic	ADDU	252	756		84	252	
	ADDUP	420	924		140	308	
	DADDU	252	798		84	266	
	DADDUP	420	966		140	322	
	SUBU	252	756		84	252	
	SUBUP	420	924		140	308	
	DSUBU	252	798		84	266	
	DSUBUP	420	966		140	322	
	MULU	252	1890		84	630	
	MULUP	420	2058		140	686	
	DMULU	252	3318		84	1106	
	DMULUP	420	3486		140	1162	
	DIVU	252	2604		84	868	
	DIVUP	420	2772		140	924	
	DDIVU	252	4032		84	1344	
	DDIVUP	420	4200		140	1400	
	RADD	252	1442		84	602	
	RADDP	420	1498		140	658	
	LADD	588	2870		196	1078	
	LADDP	756	2926		252	1134	
	RSUB	252	1442		84	602	
	RSUBP	420	1498		140	658	
	LSUB	588	2870		196	1078	
	LSUBP	756	2926		252	1134	
	RMUL	252	1948		84	1106	
	RMULP	420	2004		140	1162	
	LMUL	588	4186		196	2394	
	LMULP	756	4242		252	2450	
	RDIV	252	1974		84	1134	
	RDIVP	420	2030		140	1200	
	LDIV	588	4200		196	2660	
	LDIVP	756	4256		252	2716	
	$ADD	420	12768	35490	140	4256	11830
	$ADDP	588	12936	35658	196	4312	11886
	GADD	504	11046	15456	168	3682	5152
	GADDP	672	11214	15624	224	3738	5208
	GSUB	504	11046	15456	168	3682	5152
	GSUBP	672	11214	15624	224	3738	5208
BCD arithmetic	ADDB	420	2730		140	910	
	ADDBP	588	2898		196	966	
	DADDB	420	2856		140	952	
	DADDBP	588	3324		196	1108	
	SUBB	420	2730		140	910	
	SUBBP	588	2898		196	966	
	DSUBB	420	2856		140	952	
	DSUBBP	588	3324		196	1108	
	MULB	420	8316		140	2772	
	MULBP	588	8394		196	2798	
	DMULB	420	18648		140	6216	
	DMULBP	588	18816		196	6272	
	DIVB	420	7224		140	2408	
	DIVBP	588	7392		196	2464	
	DDIVB	420	8736		140	2912	
	DDIVBP	588	8904		196	2968	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Logic Operation	WAND	252	588		84	196	
	WANDP	420	756		140	252	
	DWAND	252	588		84	196	
	DWANDP	420	756		140	252	
	WOR	252	588		84	196	
	WORP	420	756		140	252	
	DWOR	252	588		84	196	
	DWORP	420	756		140	252	
	WXOR	252	588		84	196	
	WXORP	420	756		140	252	
	DWXOR	252	588		84	196	
	DWXORP	420	756		140	252	
	WXNR	252	672		84	224	
	WXNRP	420	840		140	280	
	DWXNR	252	672		84	224	
	DWXNRP	420	840		140	280	
	GWAND	504	11046	15456	168	3682	5152
	GWANDP	672	11214	15624	224	3738	5208
	GWOR	504	11046	15456	168	3682	5152
	GWORP	672	11214	15624	224	3738	5208
	GWXOR	504	11046	15456	168	3682	5152
	GWXORP	672	11214	15624	224	3738	5208
	GWXNR	504	11130	16128	168	3710	5376
	GWXNRP	672	11298	16296	224	3766	5432
System instruction	FALS	252	1344		84	448	
	DUTY						
	WDT						
	WDTP						
	OUTOFF						
	STOP						
Data processing instruction	BSUM	336	10836		112	3612	
	BSUMP	504	11004		168	3668	
	DBSUM	336	20496		112	6832	
	DBSUMP	504	20664		168	6888	
	BRST	420	6552		140	2184	
	BRSTP	588	6720		196	2240	
	ENCO	420	4284	15456	140	1428	5152
	ENCOP	588	4452	15624	196	1484	5208
	DECO	420	3444	10248	140	1148	3416
	DECOP	588	3612	10416	196	1204	3472
	DIS	420	5754	7896	140	1918	2632
	DISP	588	5922	8064	196	1974	2688
	UNI	420	6006	8148	140	2002	2716
	UNIP	588	6174	8316	196	2058	2772
	WTOB	420	8484	11676	140	2828	3892
	WTOBP	588	8652	11844	196	2884	3948
	BTOW	420	8400	12180	140	2800	4060
	BTOWP	588	8568	12348	196	2856	4116
	IORF						
	IORFP						
	SCH	504	6594	15120	168	2198	5040
	SCHP	672	6762	15288	224	2254	5096

	DSCH	504	6846	16548	168	2282	5516
	DSHP	672	7014	16716	224	2338	5572

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Data processing instruction	MAX	420	5208	9282	140	1736	3094
	MAXP	588	5376	9450	196	1792	3150
	DMAX	420	5628	10878	140	1876	3626
	DMAXP	588	5796	11046	196	1932	3682
	MIN	420	5292	9618	140	1764	3206
	MINP	588	5460	9786	196	1820	3262
	DMIN	420	5712	11214	140	1904	3738
	DMINP	588	5880	11382	196	1960	3794
	SUM	420	6006	9828	140	2002	3276
	SUMP	588	6174	9996	196	2058	3332
	DSUM	420	6468	11760	140	2156	3920
	DSUMP	588	6636	11934	196	2212	3978
	AVE	420	8736	14028	140	2912	4676
	AVEP	588	8874	14196	196	2958	4732
	DAVE	420	12600	23478	140	4200	7826
	DAVEP	588	12768	23646	196	4256	7882
	MUX	504	5376		168	1792	
	MUXP	672	5544		224	1848	
	DMUX	504	5628		168	1876	
	DMUXP	672	5796		224	1932	
	DETECT	504	5460	10248	168	1820	3416
	DETECTP	672	5628	10416	224	1876	3472
	RAMP						
	SORT						
	DSORT						

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Data table processing instruction	FIWR						
	FIWRP						
	FIFRD						
	FIFRDP						
	FILRD						
	FILRDP						
	FINS						
	FINSP						
	FDEL						
	FDELP						
Display instruction	SEG	420	13188	23898	140	4396	7966
	SEGP	588	13356	24066	196	4452	8022
String processing instruction	BINDA	336	15498	28938	112	5166	9646
	BINDAP	504	15666	29106	168	5222	9702
	DBINDA	336	25410	52290	112	8470	17430
	DBINDAP	504	25578	52488	168	8526	17496
	BINHA	336	8316		112	2772	
	BINHAP	504	8484		168	2828	
	DBINHA	336	12180		112	4060	
	DBINHAP	504	12336		168	4112	
	BCDDA	336	12096		112	4032	
	BCDDAP	504	12264		168	4088	
	DBCDDA	336	19824		112	6608	
	DBCDDAP	504	19992		168	6664	
	DABIN	336	6426	17346	112	2142	5782
	DABINP	504	6594	17514	168	2198	5838
	DDABIN	336	11172	3528	112	3724	1176
	DDABINP	504	11340	3696	168	3780	1232
	HABIN	336	11172		112	3724	
	HABINP	504	11340		168	3780	
	DHABIN	336	22512		112	7504	
	DHABINP	504	22680		168	7560	
	DABCD	336	15456		112	5152	
	DABCDP	504	15624		168	5208	
	DDABCD	336	30324		112	10108	
	DDABCDP	504	30492		168	10164	
	LEN	336	2520	7812	112	840	2604
	LENP	504	2688	7980	168	896	2660
	STR	420	34314		140	11438	
	STRP	588	34482		196	11494	
	DSTR	420	69720		140	23240	
	DSTRP	588	69888		196	23296	
	VAL	420	28938		140	9646	
	VALP	588	29106		196	9702	
	DVAL	420	60690		140	20230	
	DVALP	588	60858		196	20286	
	RSTR	420	273630		140	91210	
	RSTRP	588	273798		196	91266	
	LSTR	420	292824		140	97608	
	LSTRP	588	292992		196	97664	
	STRR	336	1050000		112	350000	
	STRRP	504	1050000		168	350000	
	STRL	420	1050000		140	350000	

	STRLP	588	1050000		196	350000	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
String processing instruction	ASCP	420	8232	23520	196	2800	7895
	ASC	588	8400	23685	140	2744	7840
	HEX	420	7098	20412	140	2366	6804
	HEXP	588	7266	20580	196	2422	6860
	RIGHT	420	18396	21630	140	6132	7210
	RIGHTP	588	18594	21798	196	6198	7266
	LEFT	420	17430	20664	140	5810	6888
	LEFTP	588	17598	20832	196	5866	6944
	MID	420	19026	22260	140	6342	7420
	MIDP	588	19194	22428	196	6398	7476
	REPLACE	420	33348		140	11116	
	REPLACEP	588	33516		196	11172	
	FIND	504	8904		168	2968	
	FINDP	672	9072		224	3024	
	RBCD	420	134820		140	44940	
	RBCDP	588	134988		196	44996	
	LBCD	420	153636		140	51212	
	LBCDP	588	153804		196	51268	
	BCDR	420	48972		140	16324	
	BCDRP	588	49140		196	16380	
	BCDL	420	80556		140	26852	
	BCDLP	588	80724		196	26908	

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Special function instruction	SIN	420	75798		140	25266	
	SINP	588	75966		196	25322	
	COS	420	73710		140	24570	
	COSP	588	73878		196	24626	
	TAN	420	155988		140	51996	
	TANP	588	156156		196	52052	
	RAD	420	13062		140	4354	
	RADP	588	13230		196	4410	
	DEG	420	13062		140	4354	
	DEGP	588	13230		196	4410	
	SQRT	420	6972		140	2324	
	SQRTP	588	7140		196	2380	
Data control instruction	LIMIT	504	1848		168	616	
	LIMITP	672	1986		224	662	
	DLIMIT	504	1932		168	644	
	DLIMITP	672	2100		224	700	
	DZONE	504	26796		168	8932	
	DZONEP	672	26964		224	8988	
	DDZONE	504	25704		168	8568	
	DDZONEP	672	25872		224	8624	
	VZONE	504	27510		168	9170	
	VZONEP	672	27708		224	9236	
	DVZONE	504	26418		168	8806	
	DVZONEP	672	26586		224	8862	
Time related Instruction	DATERD	252	5796		84	1932	
	DATERDP	420	5964		140	1988	
	DATEWR	252	5964		84	1988	
	DATEWRP	420	6132		140	2044	
	ADDCLK	420	8526		140	2842	
	ADDCLKP	588	8694		196	2898	
	SUBCLK	420	8610		140	2870	
	SUBCLKP	588	8778		196	2926	
	SECOND	336	6636		112	2212	
	SECONDP	504	6804		168	2268	
	HOUR	336	7098		112	2366	
	HOURP	504	7266		168	2422	
System instruction	FALS						
	DUTY						
	TFLK						
	WDT						
	WDTP						
	OUTOFF						
	STOP						
	ESTOP						
	INIT_DONE						

Unit : ns

Classification	Command	XGK-CPUS			XGK-CPUH		
		Non-executed	Executed N=1	Executed N=8 or X	Non-executed	Executed N=1	Executed N=8 or X
Branch Instruction	JMP						
	LABEL						
	CALL						
	CALLP						
	SBRT						
	RET						
Loop Instruction	FOR						
	NEXT						
	BREAK						
Flag	STC	168	168		56	56	
	CLC	168	168		56	56	
	CLE	168	168		56	56	
Interrupt related instruction	EI						
	DI						
	EI						
	DI						
	TDINT n						
	INT n						
Sign invert instruction	NEG	252	420		84	140	
	NEGP	420	588		140	196	
	DNEG	252	462		84	154	
	DNEGP	420	630		140	210	
	RNEG	252	1596		84	532	
	RNEGP	420	1764		140	588	
	LNEG	252	1932		84	644	
	LNEGP	420	2100		140	700	
	ABS	252	1428		84	476	
	ABSP	420	1596		140	532	
	DABS	252	1512		84	504	
	DABSP	420	1680		140	560	
File-related instruction	RSET						
	EBCMP						
	EERRT						
	EMOV						
	EDMOV						
	EBREAD						
	EBWRITE						
Special module related instruction	GET						
	GETP						
	PUT						
	PUTP						
	GETM						
	GETMP						
	PUTM						
	PUTMP						
PID related instruction	PIDRUN						
	PIDPRMT						
	PIDPAUSE						
	PIDINIT						

Warranty

1. Warranty Period

The product you purchased will be guaranteed for 18 months from the date of manufacturing.

2. Scope of Warranty

Any trouble or defect occurring for the above-mentioned period will be partially replaced or repaired. However, please note the following cases will be excluded from the scope of warranty.

(1) Any trouble attributable to unreasonable condition, environment or handling otherwise specified in the manual,
(2) Any trouble attributable to others' products,
(3) If the product is modified or repaired in any other place not designated by the company,
(4) Due to unintended purposes
(5) Owing to the reasons unexpected at the level of the contemporary science and technology when delivered.
(6) Not attributable to the company; for instance, natural disasters or fire

3. Since the above warranty is limited to PLC unit only, make sure to use the product considering the safety for system configuration or applications.

Environmental Policy

LS ELECTRIC Co., Ltd supports and observes the environmental policy as below.

Environmental Management

LS ELECTRIC considers the environmental preservation as the preferential management subject and every staff of LS ELECTRIC use the reasonable endeavors for the pleasurably environmental preservation of the earth.

About Disposal

LS ELECTRIC' PLC unit is designed to protect the environment. For the disposal, separate aluminum, iron and synthetic resin (cover) from the product as they are reusable.

www.lselectric.co.kr

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Specifications in this instruction manual are subject to change without notice due to continuous products development and improvement.

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