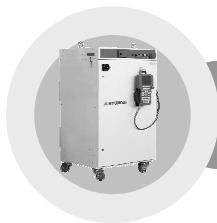




WARNING



**THE INSTALLATION SHALL BE
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Hi4a Controller Function Manual

Embedded PLC



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1

Overview



1. Overview

Embedded PLC

Embedded PLC of Hi4a controller is the function that embodies the commercial PLC function at the controller. Like the below diagram, it writes/edits the ladder program as executing the HRLadder as PC or Notebook connects to the controller or it downloads at the controller, and it can upload the ladder program that is executing at the controller. Also, monitoring of executed condition is possible at the controller. Please refer the HRLadder to the separate function operating manual.

When using BD430/BD431 and BD420 together, the embedded PLC controls entire devices with hard-wired I/O and fieldbus I/O. Also, it controls the line process PLC of upper parts and fieldbus I/O using the fieldbus slave function of BD420. (Hard-wired I/O is possible.)

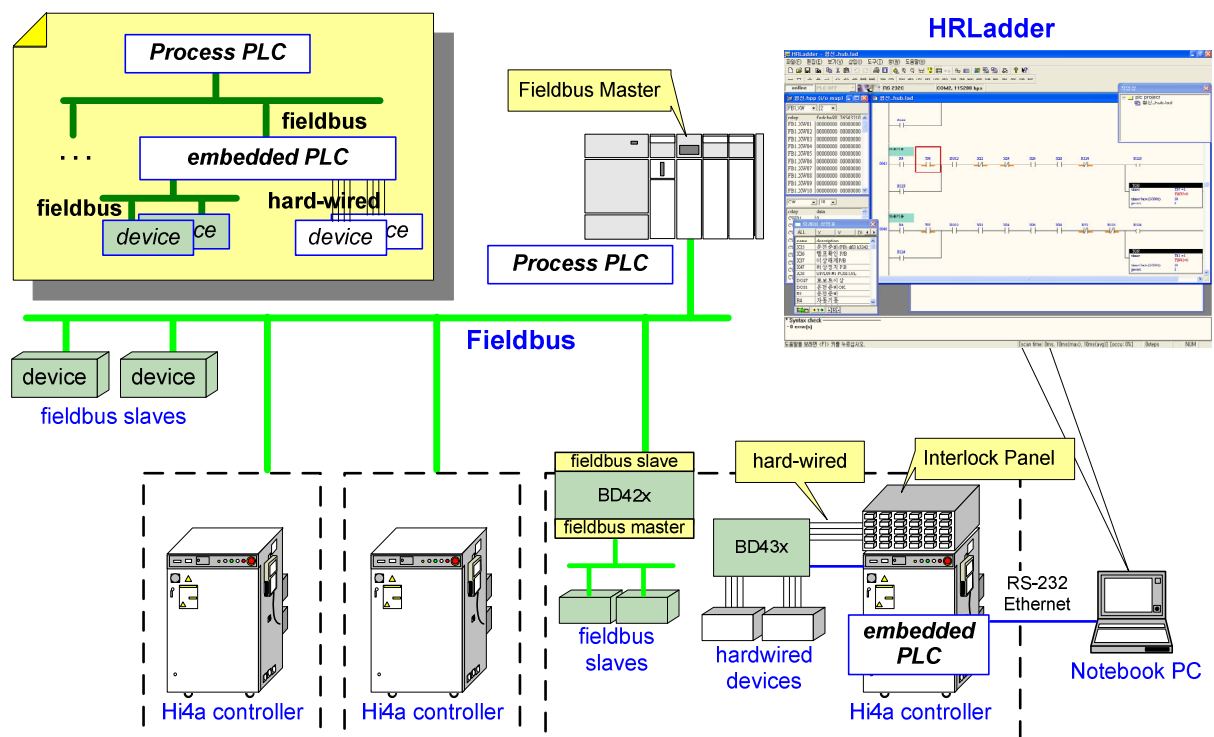


Figure 1.1 BD420 Fieldbus (Slave/Master)



2

**Controller
Setting**



2. Controller Setting

Embedded PLC

2.1. Enable/Disable of Embedded PLC function

In order to enable the function of embedded PLC, please set the dip switch DIP5 On of main CPU board (BD411/BD412).

In order to disable the function of embedded PLC, please set the dip switch DIP5 Off.

2.2. Selection of Embedded PLC operation mode

(1) Operation

If you press the 『[PF5]: Cond Set』 → 『[PF1]: AppliCnd』, 『8: Emb.PLC mode=<Stop,R-Stop,R-Run,Run>』 will be indicated and can select the operational mode using [SHIFT]+[←][→].

```
00:05:02 *** Condition set *** A:0 S:2
1: Cycle type =<1Step,1Cycle,Continu>
2: Step go/back max.speed(mm/s) =[200]
3: Func in step GO/BACK =<Off,On,1 On>
4: Speed rate=[100] GunStep=<DSBL,ENBL>
5: Robot lock =<DSBL,ENBL>
   Servo gun lock =<DSBL,ENBL>
6: Rec speed type=<Standard,[%],[mm/s]>
7: Interpolation base =<R-tool,S-tool>
8: Select user coordinate =[0]

Press [SHIFT]+[←][→] Key.
>
AppliCnd      End
```

```
00:05:09*Application Condition* A:0 S:2
1: Conveyor Oper=<Normal,Simulat.,Test>
2: Search range =[0,0]
3: Search reference Pt. record=<Off,On>
4: Spot welding =<Wd-On,Sq-On,SqOff>
5: Gun search Ref.point record=<Off,On>
6: Output(DO) signal clear =<DSBL,ENBL>
7: Shift register clear =<DSBL,ENBL>
8: Emb.PLC mode=<Stop,R-Stop,R-Run,Run>
9: Servo hand squeeze command =<Off,On>

Press [SHIFT]+[←][→] Key.
>
Cond Set
```

(2) Stop

It stops the embedded PLC operation.(DI,Y,R relay clears with Stop simultaneously.)

(3) R-Stop/R-Run

It's the Remote mode and it can select R-Stop and R-Run at HRLadder of connect PC at the controller.(DI,Y,R relay clears with R-Stop simultaneously.)

(4) Run

PLC is on the execution condition and the monitoring is possible at the HRLadder of PC.

2.3. Relay condition monitoring at controller TP

Monitoring is possible in condition of relay as 『[PF1]: Service』 → 『1: Monitoring』 → 『6: PLC Relay Data』 → 『1: PLC X Relay(External input)』 ~ 『11: PLC SW Relay(System memory)』 .

```

00:05:55 ** Service contents ** A:D S:2
1: Monitoring [R245]
2: Register setting
3: Variables
4: Program modify
5: File manager
6: Program conversion
7: System checking
8: Date setting (Day, Time)
9: Data gathering

Use [Number]/[Up]/[Down] and press [SET].
>
Previous Next

```

```

00:06:11 *** Monitoring *** A:D S:2
0: Monitor OFF
1: Axis data
2: DIO signal [R246]
3: Spot/Stud welding data [R247]
4: Conveyor data
5: Palletize data
6: PLC Relay data [R248]
7: Analog data
9: Servo hand data
10: Cooperation control data
11: System characteristic data

Use [Number]/[Up]/[Down] and press [SET].
>
Line Previous Next

```

```

00:06:20 ** PLC Relay data ** A:D S:2
1: PLC X Relay (External Input)
2: PLC Y Relay (External Output)
3: PLC R Relay (Auxiliary)
4: PLC K Relay (Nonvolatile)
5: PLC T Relay (Timer)
6: PLC C Relay (Counter)
7: PLC SP Relay (Special)
8: PLC DI Relay (PLC Output)
9: PLC DO Relay (PLC Input)
10: PLC MW Relay (Data Memory)
11: PLC SW Relay (System Memory)

Use [Number]/[Up]/[Down] and press [SET].
>
Line Choose Previous Next

```

```

00:06:44 *** A U T O *** A:D S:2
TC SR:100% 1Cycl
PN:xxx[ ] S/F:0/0

<<Relay>> FEDCBA98 76543210 Decimal
XW01(1~ ): [11101111 00000000] = (-4352)
XW02(17~ ): [11111110 10110011] = (-333)
XW03(33~ ): [11111000 01110000] = (-1936)
XW04(49~ ): [11111110 10110011] = (-333)
XW05(65~ ): [11101111 01110000] = (-4240)
XW06(81~ ): [11111110 10110011] = (-333)

>
Service Rel.WAIT Cond Set

```

2.4. Embedded Scan Time

It is indicated as the "scan time" at the lower part of status bar of HRLadder and the scan time automatically increases (10msec unit) if it can't be controlled within 10msec as increasing in number of steps.



3

**Input-Output
Block Diagram**



3. Input-Output Block Diagram

Embedded PLC

- Because the system memory is reserved for special usage, the use is constrained and the usage can change depending on the future version of the controller.

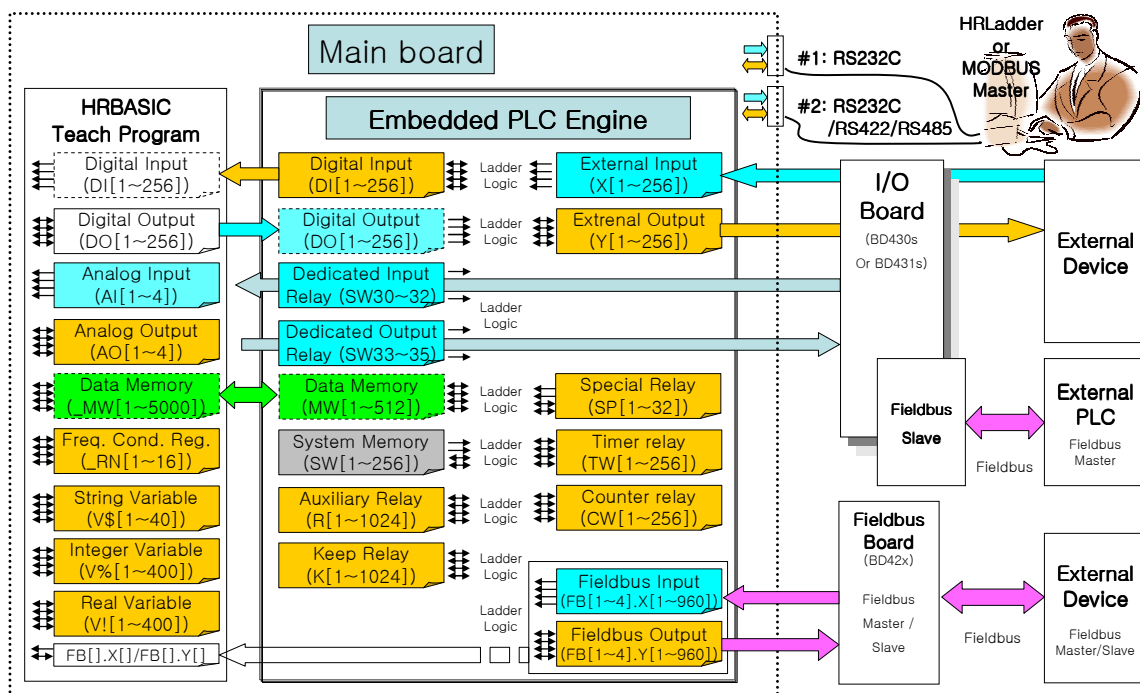


Figure 3.1 Input-output Block Diagram



4

Relay Specification



4. Relay Specification

Embedded PLC

4.1. Relay Points

Table 4-1 Relay Points

		Points	Relay(1bit)	No.	Relay(16/8bit)	No.
External Input-Output Relay (BD430, BD431)	Default	Input 32	X01~X32	1	XW01~XW02	2
					XB01~XB04	3
	Extension of each piece (64/64) Max.3	Output 32	Y01~Y32	4	YW01~YW02	5
					YB01~YB04	6
		Input 192	X33~X224	1	XW03~XW14	2
					XB05~XB28	3
		Output 192	Y33~Y224	4	YW03~YW14	5
					YB05~YB28	6
When installing BD471 (CC-Link), CC-Link I/O is selectively mapped to X, and Y relay. Depending on the CC-Link setting, maximum of 256 points can be mapped to each X1~X256 and Y1~Y256 respectively.						
Digital Input-Output Relay (Teach/Playback)	General	Input 256	DI001~DI256	7	DIW01~DIW16	8
					GI01~GI32	9
		Output 256	DO001~DO256	10	DOW01~DOW16	11
					GO01~GO32	12
Auxiliary Relay		1024	R0001~R1024	31	RW01~RW64	32
					RB01~RB128	33
Keep Relay		1024	K0001~K1024	34	KW01~KW64	35
					KB01~KB128	36
Special Relay		32	SP01~SP32	37	SPW01~SPW02	38
					SPB01~SPB04	39
Timer Relay		256	T01~T256	40	TW01~TW256	41
					TB01~TB512	42
Counter Relay		256	C001~C256	43	CW001~CW256	44
					CB001~CB512	45
Data Memory		8192	M001~M8192	46	MW001~MW512	47
					MB001~MB1024	48
System Memory		4096 (Reserved)	S001~S4096 (Reserved)	49	SW001~SW256	50
					SB001~SB512	51
Fieldbus Relay (DeviceNet/Profibus-DP)		Input 960	FB1.X001 ~ X960	55	FB1.XW01 ~ XW60	56
					FB1.XB01 ~ XB120	57
		Output 960	FB1.Y001 ~ Y960	67	FB1.YW01 ~ YW60	68
					FB1.YB01 ~ YB120	69
		Input 960	FB2.X001 ~ X960	58	FB2.XW01 ~ XW60	59
					FB2.XB01 ~ XB120	60
		Output 960	FB2.Y001 ~ Y960	70	FB2.YW01 ~ YW60	71
					FB2.YB01 ~ YB120	72
		Input 960	FB3.X001 ~ X960	61	FB3.XW01 ~ XW60	62
					FB3.XB01 ~ XB120	63
		Output 960	FB3.Y001 ~ Y960	73	FB3.YW01 ~ YW60	74
					FB3.YB01 ~ YB120	75
		Input 960	FB4.X001 ~ X960	64	FB4.XW01 ~ XW60	65
					FB4.XB01 ~ XB120	66
		Output 960	FB4.Y001 ~ Y960	76	FB4.YW01 ~ YW60	77
					FB4.YB01 ~ YB120	78

4.2. Relay explanation

It can select the data size(bit, byte, word) as 3 designated form of identified relay. When only, timer and counter show the identical territory as bit(T/C) and word(TW/CW), it has become active in the case of bit(T/C) is 0 of the value of TW/CW.

(1) External input-output relay : Input-output of real signals through BD430 and BD431.

(2) Digital input-output relay
: Used input-output signal at HRBASIC

(3) Fieldbus relay : Fieldsub signal to input-output through the BD42X board

Main board version	Below MV10.07~25	X001~X256, XW01~16, XB01~XB32
	Above MV10.07~26	X001~X960, XW01~60, XB01~XB120

(4) Auxiliary relay : Auxiliary relay to use at PLC program

(5) Keep relay : Nonvolatile relay that can preserve the ON/OFF condition when power is off.

(6) Special relay : Defined relay for special purpose

Relay Number	Description	Others
SP01	Continuously ON relay	Controller states
SP02	Continuously OFF relay	
SP03	When starting operation, relay becomes ON for one scan only.	Internal timer
SP04	0.1 second clock (0.05 second ON → 0.05 second OFF)	
SP05	0.2 second clock (0.1 second ON → 0.1 second OFF)	
SP06	1 second clock (0.5 second ON → 0.5 second OFF)	
SP07	ON when it cannot be converted in BCD calculation.	When executing TOD or FRD
SP08	It becomes ON when carrying the operation result.	When executing the arithmetic order
SP09	2 seconds clock (1 second ON → 1 second OFF)	Internal timer
SP10	4 seconds clock (2 seconds ON → 2 seconds OFF)	
SP09~SP32	Reserved	

- (7) Timer relay :
It's the relay for the Timer action and the point of contact is ON when the value is 0.
(preserve as power failure)
- (8) Counter relay :
It's the relay for Counter action and the point of contact is ON when the value is 0.
(preserve as power failure)
- (9) Data memory :
Use discretionally when saving and reading at practical instruction. (preserve as power failure)
- (10) System memory :
It is used for special usage, as follows, and the usage can be changed without notice to the user in the future.

No.	Description	Others
SW3	PLC execution mode (4: PLC OFF, 5: No program, 0:STOP, 1:R.STOP, 2:R.RUN, 3:RUN)	
SW4	Number of expansion IO board	
SW5	2nd + 1st of main SW version	20.03-10v → &H03 14
SW6	I/O version + 3rd of Main SW Version	20.03-10 → &H43 0A
SW10	Scan time	
SW11	Allocation time	
SW12	Maximum occupancy time	
SW13	Average occupancy time	
SW14	Total number of steps of ladder	
SW15	Ladder checksum (for ladder coincidence)	(since mv20.03-14)
SW20	Current program number of controller	
SW21	Current step number of controller	
SW22	Current function number of controller	
SW24	FB1~FB4 active	0 th ~3 rd bit
SW25	Read Hilscher condition information (1~4) (1:FB1 information, 2: FB2 information...)	(since mv20.03-10)
SW26	LSB: Hilscher COM GlobalBits (& 0x84 == 0 : master OK) MSB: Hilscher COM HostFlag (& 0x20 != 0 : slave OK)	
SW27	LSB: Error node number MSB: Error code	(Effective only for master)
SW28	Bus error counter	(Effective only for master)
SW29	DeviceNet: Bus OFF counter Profibus-DP: Time out counter	(Effective only for master)

4. Relay Specification

No.	Description	Others
SW30	Exclusive input 1	
SW31	Exclusive input 2	
SW33	Exclusive output 1	
SW34	Exclusive output 2	
SW37	LSB: Request for slave_diag every second for the designated node number	
SW38	Return value for slave_diag request	
SW39	StationStatus of slave_diag request result LSB: StationStatus1 MSB: StationStatus2	
SW40	Read robot location (0:None,1:Current value, 2:Directed value)	
SW41	X value of robot base coordinate	mm unit
SW42	Y value of robot base coordinate	mm unit
SW43	Z value of robot base coordinate	mm unit
SW44	RX value of robot base coordinate	0.1 deg unit
SW45	RY value of robot base coordinate	0.1 deg unit
SW46	RZ value of robot base coordinate	0.1 deg unit
SW60~69	Area for indirect addressing	-1:SW61, -2:SW62, ...
SW70	Operating time type (0:None, 1:Operating time, 2:Total operating time)	
SW71~SW72	Operating time (HH:MM:SS.CC)	10msec unit
SW73~SW74	Cycle time (HH:MM:SS.CC)	10msec unit
SW75	Number of cycle	
SW76~SW77	Welder 1 Welding time (HH:MM:SS.CC)	10msec unit
SW78	Welder 1 Number of welding	
SW79~SW80	Welder 2 Welding time (HH:MM:SS.CC)	10msec unit
SW81	Welder 2 Number of welding	
SW82~SW83	Welder 3 Welding time (HH:HMM:SS.CC)	10msec unit
SW84	Welder 3 Number of welding	
SW85~SW86	Welder 4 Welding time (HH:MM:SS.CC)	10msec unit
SW87	Welder 4 Number of welding	
SW88~SW89	Wait, DI standby time(HH:MM:SS.CC)	10msec unit
SW90~SW91	Timer standby time(HH:MM:SS.CC)	10msec unit

4.3. Timer & counter relay

(1) Timer and counter relay support only the down-counting.

- User can set up the timer based as the 0.01seconds unit.
- Timer value internally controls as the value of 16bit, it can be counted until $32767 \times 10 = 327.67$ seconds

(2) The value of timer / counter has the meaning as following.

Timer & Counter	Explanation
0	Point of contact ON (=counting completion)
-1	Point of contact OFF
Other	Point of contact OFF; timing & counting (in progress)

(3) When timer / counter relay become inactive,

- TON : Set the value of TW as -1.
- CTD : Continuously keep the value of CW .

(4) While timer / counter relay activates,.

- TON
If the value of TW is less than zero, it stores the initial value of TW with "timer base × preset. If the value of TW is bigger than zero, the value of TW decreases 1 every 10[msec]
- CTD
If the value of CW is less than zero, it stores the initial value of CW with the preset value. If the value of CW is bigger than zero, the value of CW decreases 1 when rising to the activation condition.



5

Instruction



5. Instruction

Embedded PLC

5.1. General Instructions

Table 5-1 General Instructions

Command				Description
No.	Mnemonic	Name	Symbol	
	RUNG	Rung		Shows rung
	BST	Branch Start		Start of branch
	BND	Branch End		End of branch
	NXB	Nested Branch		Duplication of branch
		Logic test command		If true after test result, rung is activated //(False: Deactivated)
1	XIC	Examine if Closed	- -	Test whether contact point is closed (A contact point)
2	XIO	Examine if Open	- -	Test whether contact point is open (B contact point)
3	INV	Inverting	- -	Result inverting of rung
4	EQU	Equal	- -	Test whether equal
5	NEQ	Not Equal	- -	Test whether not equal
6	LES	Less Than	- -	Test whether it is less than
7	GRT	Greater Than	- -	Test whether it is greater than
8	LEQ	Less Than or Equal	- -	Test less than or equal
9	GEQ	Greater Than or Equal	- -	Test greater than or equal
		Output command		
10	OTE	Output Energize	-()-	Output rung condition (Activate:ON/Deactivate:OFF)
11	OTL	Output Latch	-(L)-	If rung is activated, ON (high) is outputted
12	OTU	Output Unlatch	-(U)-	If rung is activated, OFF (low) is outputted
13	OSR	One Shot Rising	-(OSR)-	If rung is activated, ON is outputted during only one scan
14	RES	Reset	-(RES)-	If rung is activated, reset timer or counter
		Timer and counter command		
15	TON	Time On Delay	- -	Timer operates while rung is activated
16	CTD	Count Down	- -	Count down rung activation (Deactivate-Activate)
		Arithmetic calculation command		
17	ADD	Add	- -	If rung is activated, (+) calculation
18	SUB	Subtract	- -	If rung is activated, (-) calculation
19	MUL	Multiply	- -	If rung is activated, (x) calculation
20	DIV	Divide	- -	If rung is activated, (/) calculation
21	POW	Power	- -	If rung is activated, (^:power) calculation
		Data conversion command		
22	TOD	Convert int. to BCD	- -	If rung is activated, convert to BCD
23	FRD	Convert form BCD to int.	- -	If rung is activated, convert to integer.
24	SEG	7'Segment	- -	If rung is activated, convert to 7'segment value
		Move and copy command		
25	MOV	Move	- -	If rung is activated, copy one data
26	COP	Copy data	- -	If rung is activated, copy multiple sets of data
27	CCOP	Conditional Copy data	- -	Copying data according to the Rung condition
		Applied command		
28	ROT	Rotating Output	- -	If rung is activated, output in rotation

5.2. Possible Use of Operands

Table 5-2 Possible Use of Operands

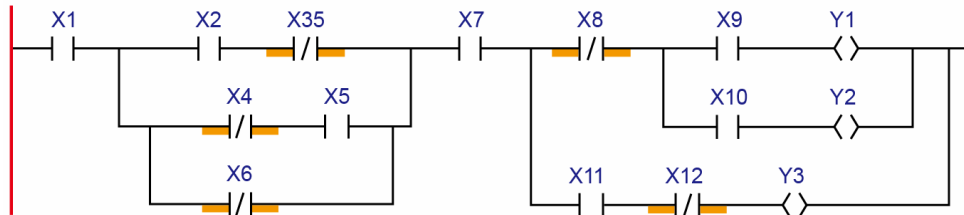
inst	relay arg	(FB.)X			(FB.)Y			DI			DO			R			K			SP			T			C			M, S			const (16bit)
		n	Bn	Wn	n	Bn	Wn	n	Gl	Wn	n	GO	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	
XIC			x	x		x	x		x	x		x	x		x	x		x	x		x	x		x	x		x	x		x	x	
XIO			x	x		x	x		x	x		x	x		x	x		x	x		x	x		x	x		x	x		x	x	
EQU	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
NEQ	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
LES	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
GRT	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
LEQ	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
GEQ	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
OTE		x	x	x		x	x		x	x	x	x	x		x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	
OTL		x	x	x		x	x		x	x	x	x	x		x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	
OTU		x	x	x		x	x		x	x	x	x	x		x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	
OSR		x	x	x		x	x		x	x	x	x	x		x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	
RES		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
TON	tm	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	bs	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
	pst	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
CTD	cnt	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	pst	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
ADD	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
	dst	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
SUB	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
	dst	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
MUL	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
	dst	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
DIV	sA	x			x			x			x			x			x			x			x			x			x			
	sB	x			x			x			x			x			x			x			x			x			x			
	dst	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
POW	sA	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
	sB	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
	dst	x	x	x	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
TOD	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	
	dst	x	x	x	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	
FRD	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	
	dst	x	x	x	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	
SEG	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	
	dst	x	x	x	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	
MOV	src	x			x			x			x			x			x			x			x			x			x			
	dst	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
COP	src	o			o			o			o			o			o			o			x			o			o			
	dst	x	x	x	o			o			x	x	x	o			o			o			x			x			o			
	len	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
CCOP	sA																															
	sB																															
	dst	x	x	x							x	x	x																			
ROT	len	x			x			x			x			x			x			x			x			x			x			
	st	x			x			x			x			x			x			x			x			x			x			
	cnt	x			x			x			x			x			x			x			x			x			x			
	tm	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	rep	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	
	out	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
ROT	rst	x	x	x	x			x			x	x	x	x			x			x			x			x			x			
	tmp	x	x	x	x			x			x	x	x	x			x			x			x			x			x			

- (1) 'X' Mark from above table shows that it can't be used.
- (2) 'u' mark from the above table shows that it is processed in unsigned value.
- (3) 'o' mark from the above table, can only use the version later than 2007.4.13.
- (4) N of relay refers to the bit number, Bn refers to byte (8bit) and Wn refers to word (16bit). But the byte (8bit) type name of DI or DO uses the same Gln (group input) and GOn (Group Output) as in HRBasic.
- (5) You can select the data size by the selection of relay type (B, W) by the command.
- (6) But for COP (Copy) and CCOP(Conditional copy data) command, the relay type of src and dst must be the same unless src is a constant.
- (7) When entering the value for bit, you can enter the value from the starting location of bit (B) or word (W). For example, you can enter the same format as XB3/2 or XW2/2 for X18.
- (8) Constant
There are binary, decimal and hexadecimal data. If it starts with &B, it means binary data. If it starts with &H, it means hexadecimal data. If the number without prefix, it means decimal data. Therefore, 125 can be entered in the same format as &H7D or &B01111101.
- (9) W and B (GI, GO) of all relay with 'u' mark in the table are processed as signed value. For example, when moving the B (8bit) to W (16bit) in the command of MOV, you must be careful because the signed bit is expanded. That is, when you move RB (-1=&HFF) to RW, it is not &H00FF (255) but 0xFFFF (-1). But TOD and FRD command related to BCD data and SEG command converting to 7 segment data will be processed in unsigned value.

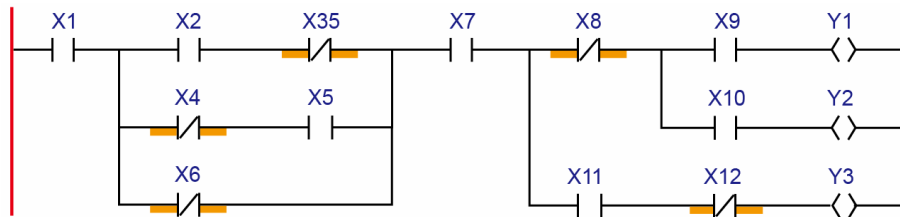
5.3. Relationship of Ladder diagram and mnemonic

- File prepared with ladder will automatically be converted and transmitted to the controller.

(1) Ladder diagram 1 :



Or editor symbol(branch gap) click can indicate as following.



(2) Mnemonic :

```
SOR XIC X1 BST XIC X2 XIO X3 NXB BST XIO X4 XIC X5 NXB XIO X6 BND BND
XIC X7 BST XIO X8 BST XIC X9 OTE Y1 NXB XIC X10 OTE Y2 BND
NXB XIC X11 XIO X12 OTE Y3 BND
```




6

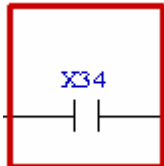
**Command
Description**



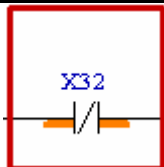
6. Command Description

Embedded PLC

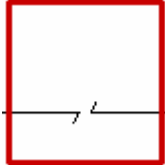
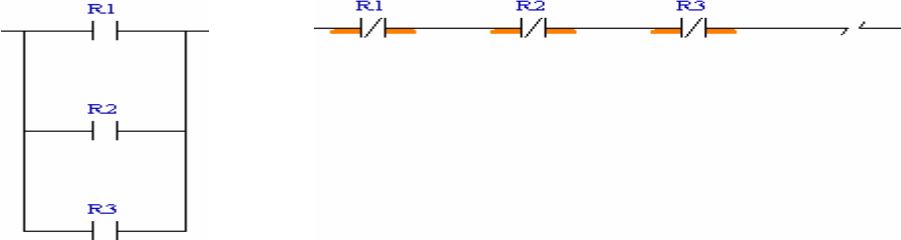
6.1. XIC(Examine if Closed):Close Test

Symbol																	
Relay combination	relay type inst	Input			Output			Timer			Counter			Memory			const (16bit)
		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	
	XIC		x	x		x	x		x	x		x	x	o	x	x	x
Description	If the parameter value is 1, rung is activated, and if 0, deactivated.																
Example	XIC(X2); XIC(DO2); XIC(Y2); XIC(DI2); XIC(R2); XIC(K2); XIC(SP1); XIC(T2); XIC(C2);																
Input method	You can enter XB3/2 or XW2/2 for X18.																

6.2. XIO(Examine if Open):Open Test

Symbol																		
Relay combination	relay type	Input			Output			Timer			Counter			Memory			const (16bit)	
		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)				
	inst	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	
	XIO			x	x			x	x			x	x			o	x	x
Description	If the parameter value is 0, rung is activated, and if 1, deactivated.																	
Example	XIO(X2); XIO(DO2); XIO(Y2); XIO(DI2); XIO(R2); XIO(K2); XIO(SP1); XIO(T2); XIO(C2);																	
Input method	YOU CAN ENTER XB3/2 OR XW2/2 FOR X18.																	

6.3. INV(Inverting) : Inverting

Symbol	
Description	This inverts the result of rung up to now (Activate$\leftrightarrow$Deactivate). Because this process changes to $/(A \times B) = /A + /B$ or $/(A + B) = A \times B$ according to De Morgan's Law, you can compose a simple AND logic without having to compose the OR logic with multiple branches. That is, because $(R1 + R2 + R3) = /(R1 \times R2 \times R3)$, the two logics provide the same results. 

6.4. EQU(Equal) : Equal Test

Symbol	EQU source aXB3 0 source b100																																																																																							
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th></th><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th></th></tr><tr><td rowspan="2">EQU</td><td>SA</td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td></td></tr><tr><td>SB</td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td></td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)				arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		EQU	SA	X			X			X			X			X				SB	X			X			X			X			X			
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																						
	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																										
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																								
EQU	SA	X			X			X			X			X																																																																										
	SB	X			X			X			X			X																																																																										
Parameter	sA: First relay to compare (or number) sB: Second relay to compare (or number)																																																																																							
Description	When the two values are equal, the rung is activated.(Contact point activation)																																																																																							
Example	EQU(XB3,100):When the value in XB3 is 100, the rung is activated. EQU(XB3,RW4):When the values in XB3 and RW4 are equal, the rung is activated.																																																																																							

6.5. NEQ(Not Equal) : Not Equal Test

Symbol	NEQ source aXB3 0 source b100																																																																																																						
Relay combination	<table><tr><td rowspan="3">inst</td><td>relay</td><td colspan="3">Input</td><td colspan="3">Output</td><td colspan="3">Timer</td><td colspan="3">Counter</td><td colspan="3">Memory</td><td rowspan="3">const (16bit)</td></tr><tr><td>type</td><td colspan="3">(FB.)X, DO</td><td colspan="3">(FB.)Y,DI,R,K,SP</td><td colspan="3">T</td><td colspan="3">C</td><td colspan="3">M(DM), S(SM)</td></tr><tr><td>arg.</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td></tr><tr><td>NEQ</td><td>SA</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td></td><td>SB</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	NEQ	SA	x			x			x			x			x					SB	x			x			x			x			x																			
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																					
	type		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																								
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																							
NEQ	SA	x			x			x			x			x																																																																																									
	SB	x			x			x			x			x																																																																																									
Parameter	sA: First relay to compare (or number) sB: Second relay to compare (or number)																																																																																																						
Description	When the two values are not equal, the rung is activated. (Contact point activation)																																																																																																						
Example	EQU(XB3,100):When the value of XB3 is not 100, rung is activated. EQU(XB3,RW4):When the value of XB3 is not equal to RW4, the rung is activated.																																																																																																						

6.6. LES(Less Than) : Less than Test

Symbol	LES source aXB3 0 source b100																																																																																																						
Relay combination	<table><tr><td rowspan="3">inst</td><td>relay</td><td colspan="3">Input</td><td colspan="3">Output</td><td colspan="3">Timer</td><td colspan="3">Counter</td><td colspan="3">Memory</td><td rowspan="3">const (16bit)</td></tr><tr><td>type</td><td colspan="3">(FB.)X, DO</td><td colspan="3">(FB.)Y,DI,R,K,SP</td><td colspan="3">T</td><td colspan="3">C</td><td colspan="3">M(DM), S(SM)</td></tr><tr><td>arg.</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td></tr><tr><td></td><td>LES</td><td>SA</td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td></tr><tr><td></td><td></td><td>SB</td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		LES	SA	X			X			X			X			X					SB	X			X			X			X			X																		
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																					
	type		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																								
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																							
	LES	SA	X			X			X			X			X																																																																																								
		SB	X			X			X			X			X																																																																																								
Parameter	sA: First relay to compare (or number) sB: Second relay to compare (or number)																																																																																																						
Description	When sA is less than sB, the rung is activated. (Contact point activation)																																																																																																						
Example	EQU(XB3,100):When the value of XB3 is less than 100, the rung is activated. EQU(XB3,RW4):When the value of XB3 is less than that of RW4, the rung is activated..																																																																																																						

6.7. GRT(Greater Than) : Greater than Test

Symbol	GRT source aXB3 0 source b100																																																																																																									
Relay combination	<table><tr><td rowspan="3">inst</td><td>relay</td><td colspan="3">Input</td><td colspan="3">Output</td><td colspan="3">Timer</td><td colspan="3">Counter</td><td colspan="3">Memory</td><td rowspan="3">const (16bit)</td></tr><tr><td>type</td><td colspan="3">(FB.)X, DO</td><td colspan="3">(FB.)Y,DI,R,K,SP</td><td colspan="3">T</td><td colspan="3">C</td><td colspan="3">M(DM), S(SM)</td></tr><tr><td>arg.</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td></tr><tr><td></td><td>GRT</td><td>SA</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>SB</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		GRT	SA	x			x			x			x			x						SB	x			x			x			x			x																				
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																								
	type		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																											
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																										
	GRT	SA	x			x			x			x			x																																																																																											
		SB	x			x			x			x			x																																																																																											
Parameter	sA: First relay to compare (or number) sB: Second relay to compare (or number)																																																																																																									
Description	When sA is greater than sB, the rung is activated. (Contact point activation)																																																																																																									
Example	EQU(XB3,100):When the value of XB3 is greater than 100, the rung is activated. EQU(XB3,RW4):When the value of XB3 is greater than that of RW4, the rung is activated.																																																																																																									

6.8. LEQ(Less Than or Equal) : Less than or Euqual Test

Symbol	LEQ source aXB3 0 source b100																
Relay combination	relay type inst Input (FB.)X, DO nBnWn Output (FB.)Y,DI,R,K,SP nBnWn Timer T nBnWn Counter C nBnWn Memory M(DM), S(SM) nBnWn const (16bit)																
	LEQ	SA	X				X				X			X			
		SB	X				X				X			X			
Parameter	sA: First relay to compare (or number) sB: Second relay to compare (or number)																
Description	When sA is less than or equal to sB, the rung is activated.(Contact point activation)																
Example	EQU(XB3,100):When the value of XB3 is less than or equal to 100, the rung is activated. EQU(XB3,RW4):When the value of XB3 is less than or equal to that of RW4, the rung is activated.																

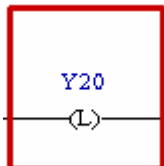
6.9. GEQ(Greater Than or Equal) : Greater than or Equal to Test

Symbol	GEQ source aXB3 0 source b100																																																																																																					
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th></th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td>GEQ</td><td>SA</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td></td><td>SB</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.		n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	GEQ	SA	x			x			x			x			x				SB	x			x			x			x			x																		
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																				
	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																								
arg.		n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																						
GEQ	SA	x			x			x			x			x																																																																																								
	SB	x			x			x			x			x																																																																																								
Parameter	sA: First relay to compare (or number) sB: Second relay to compare (or number)																																																																																																					
Description	When sA is greater than or equal to sB, the rung is activated. (Contact point activation)																																																																																																					
Example	EQU(XB3,100):When the value of XB3 is greater than or equal to 100, the rung is activated. EQU(XB3,RW4):When the value of XB3 is greater than or equal to that of RW4, the rung is activated.																																																																																																					

6.10. OTE(Output Energize) : General Output

Symbol	Y23																																																																							
Relay combination	<table><tr><th rowspan="2">relay type inst</th><th rowspan="2">arg.</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>(FB.)X, DO</th><th>(FB.)Y,DI,R,K,SP</th><th></th><th>T</th><th>C</th><th>M(DM), S(SM)</th><th></th></tr><tr><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td>n</td><td>Bn</td><td>Wn</td><td></td></tr><tr><td>OTE</td><td></td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr></table>	relay type inst	arg.	Input			Output			Timer			Counter			Memory			const (16bit)	(FB.)X, DO	(FB.)Y,DI,R,K,SP		T	C	M(DM), S(SM)		n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		OTE		x	x	x		x	x	x	x	x	x	x	x	x	x														
relay type inst	arg.			Input			Output			Timer			Counter			Memory				const (16bit)																																																				
		(FB.)X, DO	(FB.)Y,DI,R,K,SP		T	C	M(DM), S(SM)																																																																	
n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																										
OTE		x	x	x		x	x	x	x	x	x	x	x	x	x																																																									
Description	It outputs output signal according to the rung condition. That is, if the rung is activated, it outputs the output signal of On (high) and if deactivated, Off (low).																																																																							
Parameter example	Y2; DI2; R2; K2; SP1;																																																																							
Input method	You can enter YB3/2 or YW2/2 for Y18.																																																																							

6.11. OTL(Output Latch) : Latch Output

Symbol																	
Relay combination	relay type inst	Input	Output			Timer			Counter			Memory			const (16bit)		
		(FB,)X, DO	(FB,)Y,DI,R,K,SP			T			C			M(DM), S(SM)					
		arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		n	Bn
	OTL		x	x	x		x	x	x	x	x	x	x	x	x	x	x
Description	When the rung is activated, it outputs the output signal as On (high). But when the rung is not activated, the output does not change.																
Parameter example	Y2; DI2; R2; K2; SP1;																
Input method	You can enter YB3/2 or YW2/2 for Y18.																

6.12. OTU(Output Unlatch) : Unlatch Output

Symbol	Y21 (U)																	
Relay combination	relay type inst	Input	Output			Timer			Counter			Memory			const (16bit)			
		(FB,)X, DO	(FB,)Y,DI,R,K,SP			T			C			M(DM), S(SM)						
		arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		n	Bn	Wn
		OTU		x	x	x		x	x	x	x	x	x	x		x	x	x
Description	When the rung is activated, it outputs the output signal as Off (low). But when the rung is not activated, the output does not change.																	
Example	Y2; DI2; R2; K2; SP1;																	
Input method	You can enter YB3/2 or YW2/2 for Y18.																	

6.13. OSR(One Shot Rising) : One Shot Output

Symbol	Y22 (OSR)																																																																																
Relay combination	<table><tr><th rowspan="2">relay type</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>inst</th><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td>OSR</td><td></td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr></table>	relay type	Input			Output			Timer			Counter			Memory			const (16bit)	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			inst	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	OSR		x	x	x		x	x	x	x	x	x	x	x	x	x	x														
relay type	Input			Output			Timer			Counter			Memory			const (16bit)																																																																	
	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																				
inst	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																	
OSR		x	x	x		x	x	x	x	x	x	x	x	x	x	x																																																																	
Description	When the rung is activated, it is outputted in On (high) Rung for 1 scan cycle. That is, when the rung is switching from being deactivated to activated, it is turned On for 1 scan cycle.																																																																																
Parameter example	Y2; DI2; R2; K2; SP1;																																																																																
Input method	You can enter YB3/2 or YW2/2 for Y18.																																																																																

6.14. RES(Reset) : Reset

Symbol	T3 (RES)																
Relay combination	relay inst type arg.	Input (FB.)X, DO			Output (FB.)Y,DI,R,K,SP			Timer T			Counter C			Memory M(DM), S(SM)			const (16bit)
	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		
RES		x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Description	When the rung is activated, the output is cleared (-1).																
Parameter example	T2; C2;																

6.15. TON(Time On Delay) : Timer

Symbol	TON timerT2 =1 TW2=0 timer base(1/100s)100 preset2																																																																																																																				
Relay combination	<table><tr><th rowspan="3">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="3">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB)X, DO</th><th colspan="3">(FB)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td></td><td>tm</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>TON</td><td>bs</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td></tr><tr><td></td><td>pst</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB)X, DO			(FB)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		tm	x	x	x	x	x	x		x	x	x	x	x	x	x	x	TON	bs	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o		pst	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o															
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																																			
	type		(FB)X, DO			(FB)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																																						
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																																					
	tm	x	x	x	x	x	x		x	x	x	x	x	x	x	x																																																																																																					
TON	bs	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o																																																																																																					
	pst	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o																																																																																																					
Parameter	tm: This designates the timer relay number. bs: This sets the unit of timer (100 for 1 sec unit, 10 for 0.1 sec unit,) in relay or number. pst: This sets the preset value (Time=bs*pst[10msec]) in relay or number.																																																																																																																				
Description	After the set time (bs x pst) by calculating the time the rung is activated, the applicable timer relay is turned On (high). But when the rung is deactivated, immediately it is set to clear (-1). Reference) TW value is 10 msec unit.																																																																																																																				
Example	TON(T2,100,5):Set T2 to (100x5x10[msec]=5[sec]) sec timer, TON(T3,RW3,RW4):Set T3 as much as the value of (RW3)x(RW4) as timer																																																																																																																				

6.16. CTD(Count Down) : Counter

Symbol	CTD counter C2 =1 CW2=0 preset 100																																																																																																	
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td>CTD</td><td>cnt</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td></td><td>pst</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	CTD	cnt	x	x	x	x	x	x	x	x	x	x	x	x	x	x		pst	x	o	o	x	o	o	x	o	o	x	o	o	x	o															
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																
	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																				
arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																			
CTD	cnt	x	x	x	x	x	x	x	x	x	x	x	x	x	x																																																																																			
	pst	x	o	o	x	o	o	x	o	o	x	o	o	x	o																																																																																			
Parameter	cnt: This designates the counter relay number. pst: This sets the preset value as relay or number.																																																																																																	
Description	This counts down the rise of the rung (From deactivation to activation). When the applicable CW value is 0, the applicable counter is turned On (high) and stops counting. When the rung is activated and the applicable CW value is negative, the pst value is designated to CW. Reference) Even when the rung is deactivated, CW is not cleared (-1).																																																																																																	
Example	CTD(C2,100):This sets C2 to count down 100 CTD(C3,RW3):This sets C3 to count down as much as value (RW3)																																																																																																	

6.17. ADD(Add) : Add

Symbol	ADD source aXB30 source b50 destinationRW30																																																																																																																			
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y, DI, R, K, SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th></th><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td rowspan="3">ADD</td><td>sA</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td>sB</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y, DI, R, K, SP			T			C			M(DM), S(SM)				arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	ADD	sA	x			x			x			x			x			sB	x			x			x			x			x			dst	x	x	x	x			x			x			x		x															
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																																		
	type	(FB.)X, DO			(FB.)Y, DI, R, K, SP			T			C			M(DM), S(SM)																																																																																																						
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																																				
ADD	sA	x			x			x			x			x																																																																																																						
	sB	x			x			x			x			x																																																																																																						
	dst	x	x	x	x			x			x			x		x																																																																																																				
Parameter	sA: First relay (or number) for calculation sB: Second relay (or number) for calculation dst: Relay to save the result																																																																																																																			
Description	When the rung is activated, sA is added to sB to save to dst. If there is an overflow in the calculation result, set to SP8=1.																																																																																																																			
Example	ADD(XB3,RB2,RW3): (RW3)=(XB3)+(RB2) ADD(XB3,RB2,RB2): (RB2)=(XB3)+(RB2) ADD(XB3,50,RW3): (RW3)=(XB3)+50																																																																																																																			

6.18. SUB(Subtract) : Subtract

Symbol	SUB source aXB30 source b50 destinationRW30															
Relay combination	relay type inst Input Output Timer Counter Memory const (16bit) (FB.)X, DO (FB.)Y,DI,R,K,SP T C M(DM), S(SM) nBnWn nBnWn nBnWn nBnWn nBnWn nBnWn	sA sB dst x x x x x x x x x x x x x x x x x x														
Parameter	sA: First relay (or number) for calculation sB: Second relay (or number) for calculation dst: Relay to save the result															
Description	When the rung is activated, subtract sB from sA to save to dst.															
Example	SUB(XB3,RB2,RW3): (RW3)=(XB3)-(RB2) SUB(XB3,RB2,RB2): (RB2)=(XB3)-(RB2) SUB(XB3,50,RW3): (RW3)=(XB3)-50															

6.19. MUL(Multiply) : Multiply

Symbol	MUL source aXB3 0 source b50 destinationRW3 0																																																																																																						
Relay combination	<table><tr><th rowspan="3">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="3">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td rowspan="3">MUL</td><td>sA</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>sB</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	MUL	sA	x			x			x			x			x				sB	x			x			x			x			x				dst	x	x	x	x			x			x			x			x
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																					
	type		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																								
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																							
MUL	sA	x			x			x			x			x																																																																																									
	sB	x			x			x			x			x																																																																																									
	dst	x	x	x	x			x			x			x			x																																																																																						
Parameter	sA: First relay (or number) for calculation sB: Second relay (or number) for calculation dst: Relay to save the result																																																																																																						
Description	When the rung is activated, multiply sB to sA to save to dst. If there is an overflow in the calculation result, set to SP8=1.																																																																																																						
Example	MUL(XB3,RB2,RW3): (RW3)=(XB3)x(RB2) MUL(XB3,RB2,RB2): (RB2)=(XB3)x(RB2) MUL(XB3,50,RW3): (RW3)=(XB3)x50																																																																																																						

6.20. DIV(Divide) : Divide

Symbol	DIV source aXB3 0 source b50 destinationRW3 0																																																																																																						
Relay combination	<table><tr><th rowspan="3">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="3">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y, DI, R, K, SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td rowspan="3">DIV</td><td>sA</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>sB</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y, DI, R, K, SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	DIV	sA	x			x			x			x			x				sB	x			x			x			x			x				dst	x	x	x	x			x			x			x			x
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																					
	type		(FB.)X, DO			(FB.)Y, DI, R, K, SP			T			C			M(DM), S(SM)																																																																																								
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																							
DIV	sA	x			x			x			x			x																																																																																									
	sB	x			x			x			x			x																																																																																									
	dst	x	x	x	x			x			x			x			x																																																																																						
Parameter	sA: First relay (or number) for calculation sB: Second relay (or number) for calculation dst: Relay to save the result																																																																																																						
Description	When the rung is activated, divide sA by sB to save to dst. IF sB is 0 or there is an overflow in the calculation result, set to SP8=1.																																																																																																						
Example	DIV(XB3,RB2,RW3): (RW3)=(XB3)/(RB2) DIV(XB3,RB2,RB2): (RB2)=(XB3)/(RB2) DIV(XB3,50,RW3): (RW3)=(XB3)/50																																																																																																						

6.21. POW(Power) : Power

Symbol	POW source aXB3 source b3 destinationRW3																																																																																																						
Relay combination	<table><tr><th rowspan="3">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="3">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td rowspan="3">POW</td><td>sA</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>o</td></tr><tr><td>sB</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>o</td></tr><tr><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td><td>o</td><td>o</td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	POW	sA	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	o	sB	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	o	dst	x	x	x	x	o	o	x	o	o	x	o	o	x	o	o	x
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																					
	type		(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																								
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																							
POW	sA	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	o																																																																																						
	sB	x	o	o	x	o	o	x	o	o	x	o	o	x	o	o	o																																																																																						
	dst	x	x	x	x	o	o	x	o	o	x	o	o	x	o	o	x																																																																																						
Parameter	sA: First relay (or number) for calculation sB: Second relay (or number) for calculation dst: Relay to save the result																																																																																																						
Description	When the rung is activated, multiply sA to the power of sB to save to dst. If there is an overflow in the calculation result, set to SP8=1.																																																																																																						
Example	POW(2,3,RW3): (RW3)=2^3=2*2*2=8 POW(XB3,RB2,RW3): (RW3)=(XB3)^(RB2) POW(XB3,RB2,RB2): (RB2)=(XB3)^(RB2) POW(XB3,3,RW3): (RW3)=(XB3)^3																																																																																																						

6.22. TOD(Convert to BCD) : Convert to BCD

Symbol	TOD sourceXB3 0 destinationRB2 0																																																																																																						
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB,)X, DO</th><th colspan="3">(FB,)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th></th><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td rowspan="2">TOD</td><td>src</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>u</td></tr><tr><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td>u</td><td>u</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>u</td><td>u</td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB,)X, DO			(FB,)Y,DI,R,K,SP			T			C			M(DM), S(SM)				arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	TOD	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	u	dst	x	x	x	x	u	u	x	x	x	x	x	x	x	u	u	x																
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																					
	type	(FB,)X, DO			(FB,)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																																									
	arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																																							
TOD	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	u																																																																																						
	dst	x	x	x	x	u	u	x	x	x	x	x	x	x	u	u	x																																																																																						
Parameter	src: Source relay (or number) dst: Destination relay																																																																																																						
Description	When the rung is activated, src value is converted to BCD to be saved to dst. This command is convenient when using a device to display the value in 7 segment with BCD format. If dst is the byte (B) format, it converts to 2 digits and if word (W) format, 4 digits. If the Src value is higher than the number of converted digits, set to SP7=1.																																																																																																						
Example	TOD(XB3,RB2):This converts the value of XB3 to BCD and saves it to RB2. If (XB3)=&H7B(123), save &H23(35) to RB2, Because &H7B(123)>&H63(99). set to SP7=1.																																																																																																						

6.23. FRD(Convert form BCD to Integer) : Covert to Integer

Symbol	FRD sourceXB30 destinationRB30																																																																																						
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td>FRD</td><td>src</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>x</td><td>u</td><td>u</td><td>u</td></tr><tr><td></td><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td>u</td><td>u</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>u</td><td>u</td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	FRD	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	u		dst	x	x	x	x	u	u	x	x	x	x	x	x	x	u	u	x
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																					
	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)																																																																									
arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																								
FRD	src	x	u	u	x	u	u	x	u	u	x	u	u	x	u	u	u																																																																						
	dst	x	x	x	x	u	u	x	x	x	x	x	x	x	u	u	x																																																																						
Parameter	src: Source relay (or number) dst: Destination relay																																																																																						
Description	When the rung is activated, BCD value of src is converted to integer and saved in dst. This command can be conveniently used to receive the CAM switch value that is outputted in BCD format as input. If src value is not BCD, set to SP7=1. Also if src is word (W) format and dst in byte (B) format, the maximum value of src that can be converted is &H9999. Because the converted result of the integer exceeds the byte range &Hff with 9999(&H270F), it causes an overflow. In this case set to SP7=1.																																																																																						
Example	FRD(XB3,RB2):This converts the value of XB3 (BCD) to integer to save it in RB2. If (XB3)=&H23(35), save &H35(53) to RB2.																																																																																						

6.24. SEG(7'Segment) : Convert to 7' Segment Value

Symbol	SEG sourceXB3 0 destinationRW3 0															
Relay combination	relay inst type arg. Input (FB.)X, DO nBnWn Output (FB.)Y,DI,R,K,SP nBnWn Timer T nBnWn Counter C nBnWn Memory M(DM), S(SM) nBnWn const (16bit) u	src dst x														

6.25. MOV(Move) : Move

Symbol	MOV source55 destinationRB2 0																																																																																				
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y, DI, R, K, SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td>MOV</td><td>src</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td></td><td>dst</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td>x</td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y, DI, R, K, SP			T			C			M(DM), S(SM)			arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	MOV	src	x			x			x			x			x				dst	x	x	x	x			x			x			x		x
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																			
	type	(FB.)X, DO			(FB.)Y, DI, R, K, SP			T			C			M(DM), S(SM)																																																																							
arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn																																																																						
MOV	src	x			x			x			x			x																																																																							
	dst	x	x	x	x			x			x			x		x																																																																					
Parameter	src: Source relay (or number) dst: Destination relay																																																																																				
Description	If the rung is activated, src value is copied to dst. If src is word (W) format and dst is byte (B) format, only lower byte of src value is copied to dst.. Then, because all data of internal PCB is processed as signed data, if src is byte (B) format and value is -1(&Hff), it is copied to dst as word (W) format, and then copied to -1(&HFFFF). (&H00ff becomes the value of 255.)																																																																																				
Example	MOV(XB3,RB2):Copy value of XB3 to RB2. MOV(55,RB2):Copy 55 to RB2. MOV(-30,RB2):Copy -30 to RB2.																																																																																				

6.26. COP(Copy data) : Copy

Symbol	COP source XB2 0 destination YB3 0 length 3																																																																																																																									
Relay combination	<table><tr><th rowspan="2">inst</th><th>relay</th><th colspan="3">Input</th><th colspan="3">Output</th><th colspan="3">Timer</th><th colspan="3">Counter</th><th colspan="3">Memory</th><th rowspan="2">const (16bit)</th></tr><tr><th>type</th><th colspan="3">(FB.)X, DO</th><th colspan="3">(FB.)Y,DI,R,K,SP</th><th colspan="3">T</th><th colspan="3">C</th><th colspan="3">M(DM), S(SM)</th></tr><tr><th></th><th>arg.</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td></td><td>src</td><td>0</td><td></td><td></td><td>0</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>0</td><td></td><td></td><td>0</td></tr><tr><td>COP</td><td>dst</td><td>x</td><td>x</td><td>x</td><td>0</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>0</td><td></td><td></td><td>x</td></tr><tr><td></td><td>len</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td></td></tr></table>	inst	relay	Input			Output			Timer			Counter			Memory			const (16bit)	type	(FB.)X, DO			(FB.)Y,DI,R,K,SP			T			C			M(DM), S(SM)				arg.	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn		src	0			0			x			x			0			0	COP	dst	x	x	x	0			x			x			0			x		len	x	0	0	x	0	0	x	0	0	x	0	0	x	0	0																	
inst	relay		Input			Output			Timer			Counter			Memory			const (16bit)																																																																																																								
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COP	dst	x	x	x	0			x			x			0			x																																																																																																									
	len	x	0	0	x	0	0	x	0	0	x	0	0	x	0	0																																																																																																										
Parameter	src: Source relay or value to fill (const) dst: Destination relay len: Length relay (or number)																																																																																																																									
Description	When the rung is activated, the number of values within len from the src location is copied to det location. If src is a number, it is filled with src value of len from the dst. In this case if dst is bit format and number of src is 0, it is filled with OFF, and if not 0, with ON. If src is a relay, the data type of src and dst must be the same. That is, if src is a bit, dst must also be bit, if src is byte (B), dst must also be byte (B), and if src is word (W), dst must be word (W). If src+len is larger than maximum number of src relay, or if dst+len is larger than maximum number of dst relay, it is copied only up to the maximum number of relay..																																																																																																																									
Example	Example of copying as many as designated) COP(X2,Y3,4): Y3=X2, Y4=X3, Y5=X4, Y6=X5 COP(XB2,YB3,3): YB3=XB2, YB4=XB3, YB5=XB4 COP(XW2,YW3,2): YW3=XW2, YW4=XW3 Example of filling with designated value (const)) COP(0,Y3,4): Y3=OFF, Y4=OFF, Y5=OFF, Y6=OFF COP(1,Y3,4): Y3=ON, Y4=ON, Y5=ON, Y6=ON COP(25,Y3,4): Y3=ON, Y4=ON, Y5=ON, Y6=ON COP(25,YB3,3): YB3=25, YB4=25, YB5=25 COP(&H55AA,YW3,2): YW3=&H55AA, YW4=&H55AA COP(0,MW3,50): MW3=0, MW4=0, MW5=0, MW6=0, ~, MW52=0																																																																																																																									

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[illegible]

6.28. ROT(Rotating Output) : Rotating Output

Symbol	ROT start relay MW51 0 count 6 timer relay T5 1 repeat time(1/100s) 200 out relay MW58 0 reset relay X3 0 temp relay MW60 0																																																																																																																																																										
Relay combination	<table><tr><th rowspan="2">inst</th><th rowspan="2">relay type</th><th colspan="3">Input (FB,X,DO)</th><th colspan="3">Output (FB,Y,D,I,R,K,SP)</th><th colspan="3">Timer T</th><th colspan="3">Counter C</th><th colspan="3">Memory M(DM), S(SM)</th><th rowspan="2">const (16bit)</th></tr><tr><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th><th>n</th><th>Bn</th><th>Wn</th></tr><tr><td rowspan="6">ROT</td><td>st</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td></tr><tr><td>cnt</td><td>x</td><td></td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>tm</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>rep</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td><td>0</td><td>0</td><td>x</td></tr><tr><td>out</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>rst</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td></td><td>tmp</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr></table>	inst	relay type	Input (FB,X,DO)			Output (FB,Y,D,I,R,K,SP)			Timer T			Counter C			Memory M(DM), S(SM)			const (16bit)	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	n	Bn	Wn	ROT	st	x			x			x			x			x			x	cnt	x			x	x	x	x			x			x	x	x	x	tm	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	rep	x	0	0	x	0	0	x	0	0	x	0	0	x	0	0	x	out	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	rst	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		tmp	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
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ROT	st	x			x			x			x			x			x																																																																																																																																										
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	tm	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																																																																																																																																										
	rep	x	0	0	x	0	0	x	0	0	x	0	0	x	0	0	x																																																																																																																																										
	out	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																																																																																																																																										
	rst	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																																																																																																																																										
	tmp	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																																																																																																																																										
Parameter	st: Start relay cnt: Count relay (or number) tm: Timer relay (1/100sec unit) rep: Relay (or number) designating repeat time out: Relay to output result rst: Relay to rest output condition tmp: Relay to output where the value is for calculation and show the relay																																																																																																																																																										
Description	When the rung is activated, this repeatedly outputs the non zero value of relay value within the cnt range from the st relay for the rept time to out relay. If signal is inputted to rst relay, 0 is filled in as many as the cnt number from the st relay and the timer value is rest to rep value to output 0 to out relay. Even though this command has only one device to output the error number, there are many types of error. Therefore you can conveniently use this function to output the occurred error number during the designated time.																																																																																																																																																										
Example	----- (Error condition1) ----- MOV(21,MW51)--- ----- (Error condition2) ----- MOV(22,MW52)--- ----- (Error condition3) ----- MOV(23,MW53)--- ----- (Error condition4) ----- MOV(24,MW54)--- ----- (Error condition5) ----- MOV(25,MW55)--- ----- (Error condition6) ----- MOV(26,MW56)--- ----- ROT(MW51,6,T5,200,MW58,X3,MW60)--- ----- TOD(MW58,YB3)----- In the above logic, when one or more error occur in the error condition 1~6, the error number is saved to MW51~MW56 and the error number generated by ROT command is saved in MW58 for 2 seconds. With TOD command, it is converted to BCD value to be sequentially displayed in the display device connected to YB3. If, a signal is inputted to X3 connected to the external error reset, the content of MW51~MW56 where the error number is saved is cleared to 0. Also MW58 and MW60 are cleared to 0 to display 0 on the display device.																																																																																																																																																										



- **Head Office**

Tel. 82-52-202-7901 / Fax. 82-52-202-7900
1, Jeonha-dong, Dong-gu, Ulsan, Korea

- **A/S Center**

Tel. 82-52-202-5041 / Fax. 82-52-202-7960

- **Seoul Office**

Tel. 82-2-746-4711 / Fax. 82-2-746-4720
140-2, Gye-dong, Jongno-gu, Seoul, Korea

- **Ansan Office**

Tel. 82-31-409-4945 / Fax. 82-31-409-4946
1431-2, Sa-dong, Sangnok-gu, Ansan-si, Gyeonggi-do, Korea

- **Cheonan Office**

Tel. 82-41-576-4294 / Fax. 82-41-576-4296
355-15, Daga-dong, Cheonan-si, Chungcheongnam-do, Korea

- **Daegu Office**

Tel. 82-53-746-6232 / Fax. 82-53-746-6231
223-5, Beomeo 2-dong, Suseong-gu, Daegu, Korea

- **Gwangju Office**

Tel. 82-62-363-5272 / Fax. 82-62-363-5273
415-2, Nongseong-dong, Seo-gu, Gwangju, Korea

- **본사**

Tel. 052-202-7901 / Fax. 052-202-7900
울산광역시 동구 전하동 1번지

- **A/S 센터**

Tel. 82-52-202-5041 / Fax. 82-52-202-7960

- **서울 사무소**

Tel. 02-746-4711 / Fax. 02-746-4720
서울특별시 종로구 계동 140-2번지

- **안산 사무소**

Tel. 031-409-4959 / Fax. 031-409-4946
경기도 안산시 상록구 사동 1431-2번지

- **천안 사무소**

Tel. 041-576-4294 / Fax. 041-576-4296
충남 천안시 다가동 355-15번지

- **대구 사무소**

Tel. 053-746-6232 / Fax. 053-746-6231
대구광역시 수성구 범어 2동 223-5번지

- **광주 사무소**

Tel. 062-363-5272 / Fax. 062-363-5273
광주광역시 서구 농성동 415-2번지