07-3 Basic instruction

last modified by Stone Stone

on 2022/06/14 16:53

Table of Contents

Matrix input instructions 3
MTR/Matrix input 3
Convenient instructions 5
ABSD/BIN 16-bit data absolute method 5
DABSD/BIN 32-bit data absolute method 7
SER/16-bit data search 9
DSER/32-bit data search 11
ALT/Bit device output inversion 12
INCD/BIN 16-bit data relative method 14
RAMP/Control ramp signal 17
ROTC/Rotary table proximity control 20
STMR/Special function timer 22
TTMR/Demonstration timer 25
TRH/Conversion of wet and dry bulb temperature and humidity 27
External IO instructions 30
ARWS/Arrow switch 30
DSW/Numeric key input 33
HKY/Hexadecimal numeric key input 35
DHKY/32 system numeric key input 38
PR/ASCII code printing 41
SEGD/Numeric key input 43
SEGL/7SEG code hour and minute display 45
TKY/Numeric key input 48
DTKY/Numeric key input 50

Matrix input instructions

MTR/Matrix input

MTR

The instruction to read the input signal (switch) of 8 points multiply by n columns in the time division method of 8 input and (N) output (transistor).

-[MTR (S) (D1) (D2) (N)]

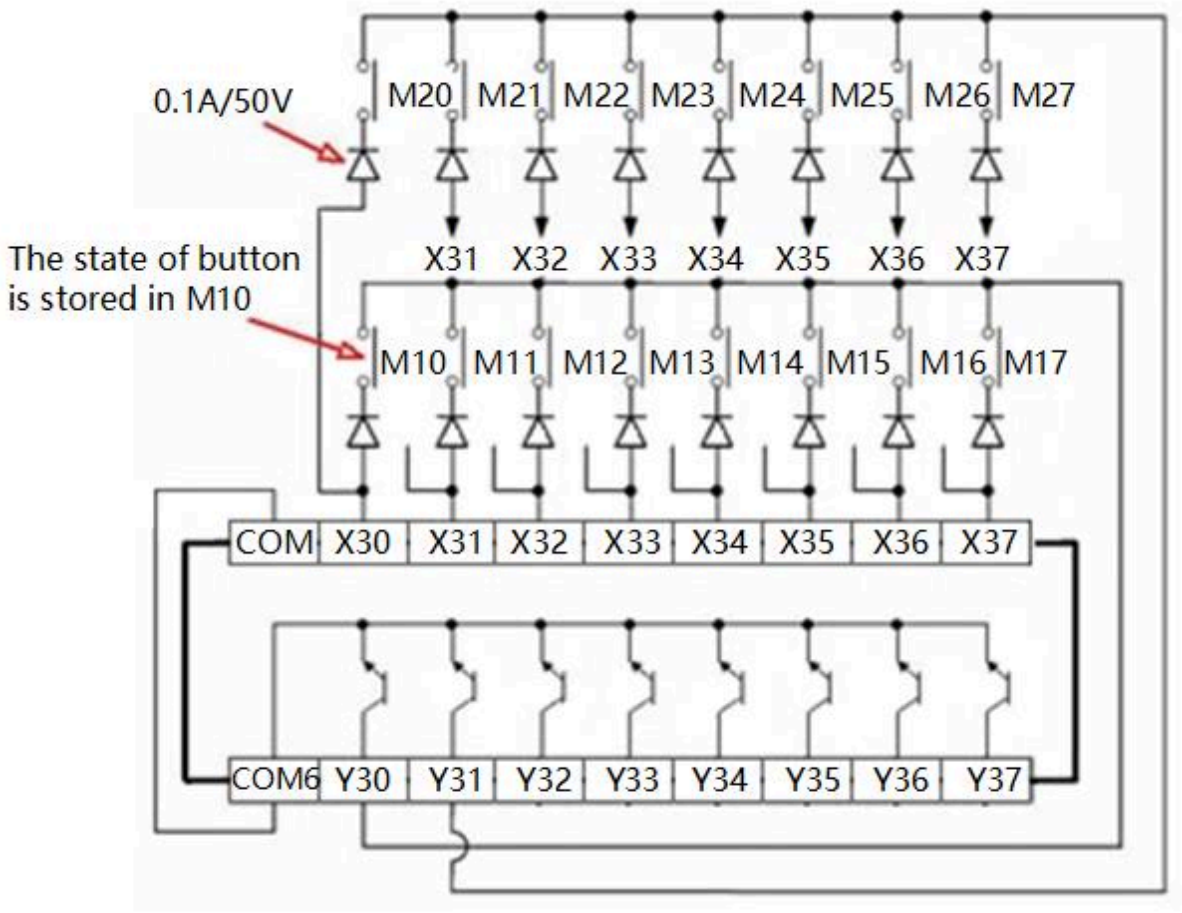
Content, range and data type

Parameter	Content
(S)	The start device (X) number X000, X010, X020 of the row signal input of the matrix is up to the final input X number. 8 consecutively occupied.
(D1)	The starting device (Y) number of the column signal output of the matrix is Y000, Y010, Y020... to the final output Y number. 8 consecutively occupied
(D2)	The start device (Y, M, S) number of the ON output destination address is Y000, Y010, Y020..., M000, M010, M020..., S000, S010, S020... until the f 8*(N) continuously, and the others occupy 10*(N) continuously.
(N)	Set the number of columns in the matrix input.

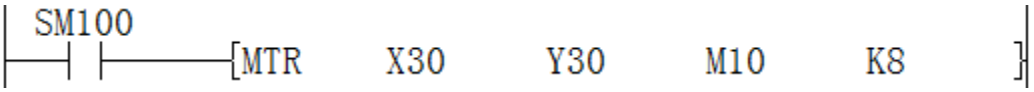
Device used

Instruction	Parameter	Devices							Offset modification	Pulse extension
		X	Y	M	S	SM	K	H	[D]	XXP
MTR	Parameter 1	●								
	Parameter 2		●							
	Parameter 3		●	●	●	●				
	Parameter 4						●	●		

Features



This instruction generally uses the normally ON contact SM100.



According to the example in the figure:

M10 will turn ON when Y30 and X30 are connected, M14 will be ON when Y30 and X34 are connected, M26 will be ON when Y31 and X36 are connected

(D2) is recommended to use a minimum of 0, mainly when using an address such as M4, the first start is M4, and then it will continue to occupy M11, which is inconvenient to calculate and view, so it is recommended to use a software with a minimum of 0 element.

Special device used

Devices	Content
SM229	SM229 will turn ON after one cycle of execution is completed

#Note: The MTR instruction can only run one instruction at the same time.

Error code

Error code	Content
4085H	The read address of (S) and (N) exceeds the device range (S) use the numbered device whose low bit is not 0

4086HA	The write address of (D1) and (D2) exceeds the device range
	(D2) use the numbered device whose low bit is not 0
4084H	(N) is not in the range of 2 to 8
4089H	Multiple MTR instructions are executed at the same time

Convenient instructions

ABSD/BIN 16-bit data absolute method

ABSD

Create multiple output modes corresponding to the current counter (BIN 16-bit value).

-[ABSD (S1) (S2) (D) (N)]

Content, range and data type

Parameter

(S1) start device number storing the data table**Content**

(rising edge point and falling edge point)

(S2) counter number used for monitoring of the current value compared to the data table

(D) the number of points of the output start device

(N) number of table rows and output bit device points

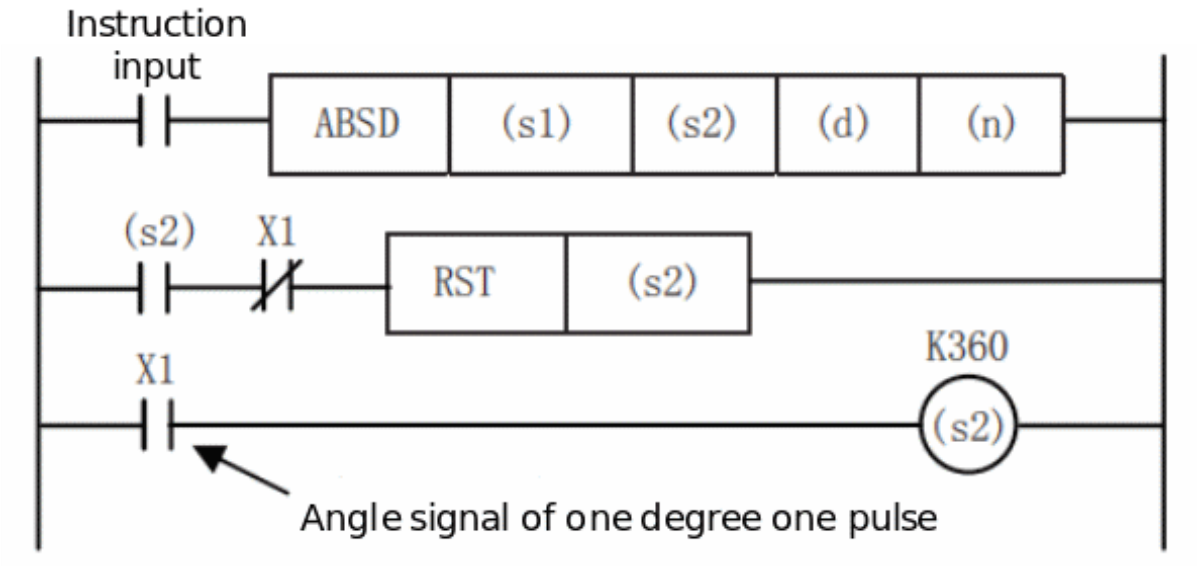
Device used

Instruction	Parameter	Devices																	Offset modification	Pulse expansion
		Y	M	S	SM	D.b	KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP	
ABSD	Parameter 1						●	●	●	●	●	●	●	●	●			●		
	Parameter 2											●						●		
	Parameter 3	●	●	●	●	●												●		
	Parameter 4						●	●	●	●	●	●	●	●	●	●	●	●		

Features

Take the turntable to rotate 1 revolution (0 to 360 degrees) to control the output ON/OFF as an example. (1 degree, 1 pulse angle signal)

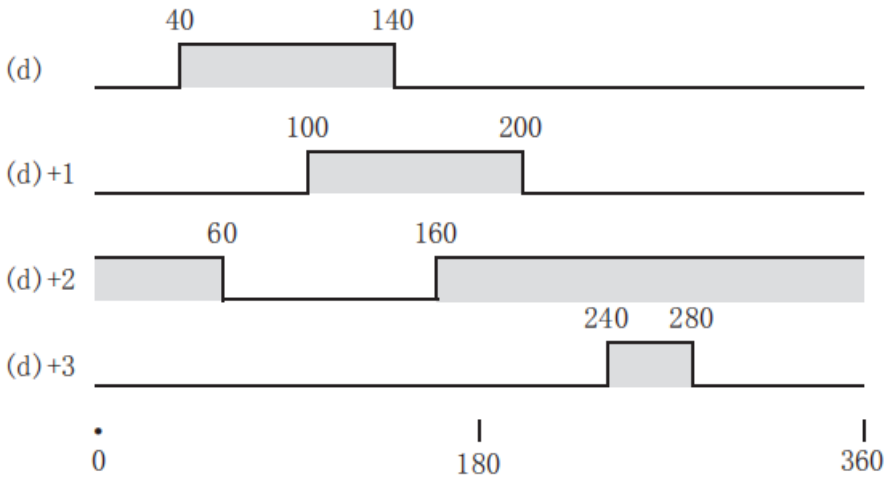
Compare the data table of row (N) starting from (S1) (row (N) multiply by 2 points) with the current value of the counter (S2), from (D) to continuous (N) in the course of one revolution The output is ON/OFF control up to the point.



Use the transfer instruction to write the following data into (S1) to (S1)+2(N)-1 in advance. For example, the rising edge point data stores 16-bit data to even-numbered devices in advance, and the falling edge point data stores 16-bit data to odd-numbered devices in advance.

Rising edge point		**Falling edge point**		**Object output**
-	**Data value (example)**	**-**	**Data value (example)**	
(S1)	40	(S1)+1	140	(D)
(S1)+2	100	(S1) +3	200	(D) +1
(S1) +4	160	(S1) +5	60	(D) +2
(S1) +6	240	(S1) +7	280	(D) +3
...	-	...	-	...
(S1)+2(N)-2		(S1)+2(N)-1		(D) +N-1

If the instruction input is set to ON, (D) is the start, (N) point is the output mode as shown below. Each rising edge point and falling edge point can be individually changed by rewriting the data from (S1) to (S1)+2(N)-1.



#Note:

When specifying the number of bit devices in (S1), the device number should be a multiple of 16 (0, 16, 32, 64...), and only K4 should be specified for the number of bits.

The number of target output points is determined by the value of (N). (1≤(N)≤64)

Even if the instruction input is turned off, the output does not change.

Error code

Error code	Content
4084H	When the value specified in (N) exceeds the range of 1 to 64
4085H	When the device specified in the read application instruction (S1), (S2)and (N) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (D) exceeds the corresponding device range

Example

Refer to the example in the function description.

DABSD/BIN 32-bit data absolute method

DABSD

Create multiple output modes corresponding to the current counter (BIN 32-bit value).

-[DABSD (S1) (S2) (D) (N)]

Content, range and data type

Parameter	Content
(S1)	start device number storing the data table (rising edge point and falling edge point)
(S2)	counter number used for monitoring of the current value compared to the data table
(D)	the number of points of the output start device
(N)	number of table rows and output bit device points

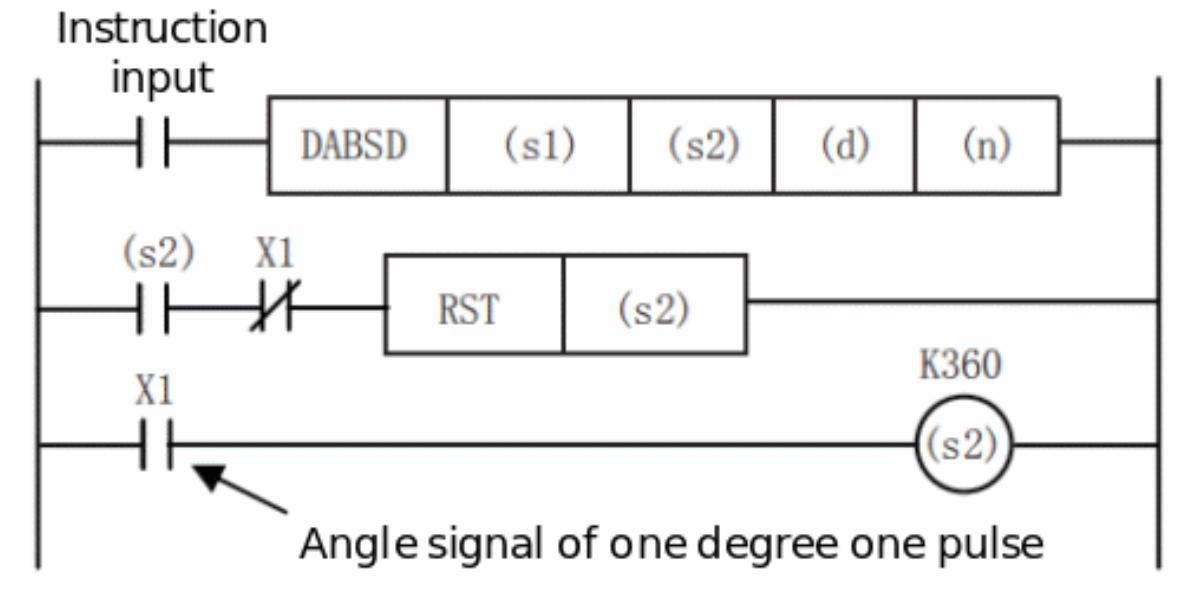
Device used

Instruction	Parameter	Devices																			Offset modification	Pulse fixation
		Y	M	S	SM	D.b	KnX	KnY	KnM	KnS	T	C	D	R	SD	LC	HSC	K	H	[D]	XXP	
DABSD	Parameter 1						●	●	●	●	●	●	●	●	●	●	●			●		
	Parameter 2											●				●	●			●		
	Parameter 3	●	●	●	●	●														●		
	Parameter 4						●	●	●	●	●	●	●	●	●	●	●	●	●	●		

Features

Take the turntable to rotate 1 revolution (0 to 360 degrees) to control the output ON/OFF as an example. (1 degree, 1 pulse angle signal)

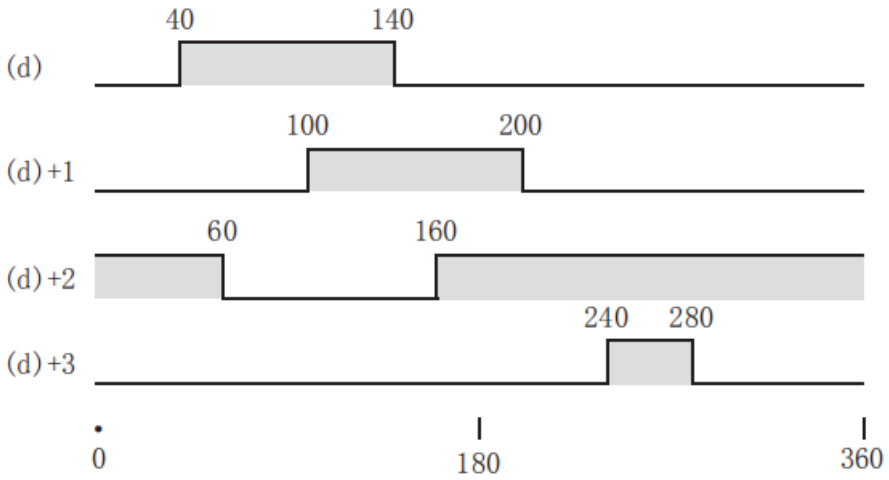
Compare the data table of row (N) starting from (S1) (row (N) × 4 points) with the current value of the counter (S2), from (D) to continuous (N) in the course of one revolution The output is ON/OFF control up to the point.



Use the transfer instruction to write the following data into (S1), (S1)+1 to (S1)+4(N)-2, (S1)+4(N)-1 in advance. For example, the rising edge point data stores 32-bit data to even-numbered devices in advance, and the falling edge point data stores 32-bit data to odd-numbered devices in advance.

Rising edge point		**Falling edge point**		**Object output**
-	**Data value (example)**	**-**	**Data value (example)**	
(S1)+1, (S1)	40	(S1)+3, (S1)+2	140	(D)
(S1)+5, (S1)+4	100	(S1) +7, (S1) +6	200	(D) +1
(S1) +9, (S1) +8	160	(S1)+11, (S1)+10	60	(D) +2
(S1) +13, (S1) +12	240	(S1) +15, (S1) +14	280	(D) +3
...	-	...	-	...
(S1)+4(N)-3, (S1)+4(N)-4		(S1)+4(N)-1, (S1)+4(N)-2		(D) +N-1

If the instruction input is set to ON, (D) is the start, (NN) point is the output mode as shown below. Each rising edge point and falling edge point can be individually changed by rewriting the data from (S1) to (S1)+2(N)-1.



#**Note:** The high-speed counter can be specified in the DABSD instruction. When a high-speed counter is specified, the current value of the counter will have a response delay due to the scan cycle in the output mode.

When specifying the number of bit devices in (S1), the device number should be a multiple of 16 (0, 16, 32, 64...), and only K8 should be specified for the number of bits.

The number of target output points is determined by the value of (N). (1≤(N)≤64)

Even if the instruction input is turned off, the output does not change.

Error code

Error code	Content
4084H	When the value specified in (N) exceeds the range of 1 to 64
4085H	When the device specified in the read application instruction (S1), (S2)and (N) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (D) exceeds the corresponding device range

Example

Refer to the example in the function description.

SER/16-bit data search

SER(P)

Search the same data and the maximum and minimum values from the data table.

-[SER (S1) (S2) (D) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S1)	Search for the start device number of the same data, maximum value, and minimum value	-	Signed BIN 16 bit	ANY16
(S2)	Search for the value of the same data or its storage destination device number	-	Signed BIN 16 bit	ANY16
(D)	Search for the same data, maximum value, minimum value and store the start device number	-	Signed BIN 16 bit	ANY16
(N)	Search the number of same data, maximum and minimum	1 to 256	Signed BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices											Offset modification	Pulse extension
		KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
SER	Parameter 1	●	●	●	●	●	●	●	●	●			●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●	●

Parameter 3	●	●	●	●	●	●	●	●			●	●
Parameter 4	●	●	●	●	●	●	●	●	●	●	●	●

Features

For (S1) as the first (N) data, search for the same data as the BIN 16-bit data of (S2), and store the result in (D) to (D)+4.

In the case of the same data, the number of the same data, the first/final position, and the maximum and minimum positions of the same data are stored in the device with the first 5 points (D).

If there is no identical data, the number of identical data, the first/final position, and the maximum and minimum positions of the same data are stored in the device with the first 5 points (D). However, in (D) is the first 3 points of the device (the number of the same data, the first \\ final position), 0 is stored.

• The structure and data examples of the search result table are as follows. (N=10)

The searched device (s1)	The value of the searched data (s1)	Comparison data (S2) value	Data location	search results		
				Maximum value (d) +4	Consistent (d)	Minimum value (d+3)
(s1)	K100	K100	0		○(First time)	
(s1)+1	K111		1			
(s1)+2	K100		2		○	
(s1) +3	K98		3			
(s1) +4	K123		4			
(s1) +5	K66		5			○
(s1) +6	K100		6		○ (final)	
(s1) +7	K95		7			
(s1) +8	210		8	○		
(s1) +9	K88		9			

• The search result table based on the above example is shown below.

Device number	Content	Search result items
(d)	3	Number of identical data
(d) +1	0	The position of the same data (first time)
(d) +2	6	The position of the same data (last time)
(d) +3	5	The final position of the minimum
(d) +4	8	The final position of maximum

#**Note:** Perform algebraic size comparison. (-10<2)

When there are multiple minimum and maximum values in the data, the positions behind each are stored.

If driven by this instruction , the search result (d) occupies 5 points of (d), (d)+1, (d)+2, (d)+3, (d)+4. Be careful not to overlap with the device used for machine control.

Error code

Error code	Content
4084H	When the value specified in (N) exceeds the range of 0 to 256
4085H	When the device specified in read application instruction (S1), (S2), (D) and (N) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (D) exceeds the corresponding device range

Example

Refer to the example in the function description.

DSER/32-bit data search

DSER(P)

Search the same data and the maximum and minimum values from the data table.

-[DSER (S1) (S2) (D) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S1)	Search for the start device number of the same data, maximum value, and minimum value	-	Signed BIN 32 bit	ANY32
(S2)	Search for the value of the same data or its storage destination device number	-	Signed BIN 32 bit	ANY32
(D)	Search for the same data, maximum value, minimum value and store the start device number	-	Signed BIN 32 bit	ANY32
(N)	Search the number of same data, maximum and minimum	1 to 128	Signed BIN 32 bit	ANY32

Device used

Instruction	Parameter	Devices													Offset modification	Pulse extension
		KnX	KnY	KnM	KnS	T	C	D	R	SD	LC	HSC	K	H	[D]	XXP
DSER	Parameter 1	●	●	●	●	●	●	●	●	●	●	●			●	●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Parameter 3	●	●	●	●	●	●	●	●	●	●	●			●	●
	Parameter 4	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Features

For (S1)+1, (S1) as the initial (N) data, search for the same data as the BIN 32-bit data of (S2)+1, (S2), and store the result in (D)+1, (D) to (D) +9, (D) +8.

In the case of the same data, the number of the same data, the first/final position and the maximum and minimum values are stored in a 5-point BIN 32-bit data device starting with (D)+1 and (D) position.

In the case of no identical data, the number of identical data, the first/final position and the maximum and minimum values are stored in the device with (D)+1 and (D) as the starting BIN 32-bit data with 5 points position. However, 0 is stored in the 32-bit 3-point device (the number of the same data, the first\\last position) with (D)+1 and (D) as the starting BIN.

• The structure and data examples of the search result table are as follows. (N=10)

The searched device (S1)	The value of the searched data (S1)	Comparison data (S2) value	Data location	search results		
				Maximum value (d) +4	Consistent (d)	Minimum value (d+3)
(S1)+1, (S1)	K100	K100	0		○ (First time)	
(S1)+3, (S1)+2	K111		1			
(S1)+5, (S1)+4	K100		2		○	
(S1) +7, (S1) +6	K98		3			
(S1) +9, (S1) +8	K123		4			
(S1)+11, (S1)+10	K66		5			○
(S1) +13, (S1) +12	K100		6		○ (final)	
(S1) +15, (S1) +14	K95		7			
(S1) +17, (S1) +16	210		8	○		
(S1) +19, (S1) +18	K88		9			

• The search result table based on the above example is shown below.

Device number	Content	Search result items
(d)+1, (d)	3	Number of identical data
(d)+3, (d)+2	0	The position of the same data (first time)
(d) +5, (d) +4	6	The position of the same data (last time)
(d) +7, (d) +6	5	The final position of the minimum
(d) +9, (d) +8	8	The final position of maximum

#**Note:** Perform algebraic size comparison. (-10<2)

When there are multiple minimum and maximum values in the data, the positions behind each are stored.

If driven by this instruction , the search result (d) occupies [(d)+1, (d)], [(d)+3, (d)+2,], [(d)+5, (d)+ 4], [(d)+7, (d)+6], [(d)+9, (d)+8] 5 points. Be careful not to overlap with the device used for machine control.

Error code

Error code	Content
4084H	When the value specified in (N) exceeds the range of 0 to 128
4085H	When the device specified in read application instruction (S1), (S2), (D) and (N) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (D) exceeds the corresponding device range

Example

Refer to the example in the function description.

ALT/Bit device output inversion

ALT(P)

If the input turns ON, the bit device is inverted (ON→OFF).

-[ALT (d)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(d)	Alternate output device number	-	Bit	ANY16_BOOL

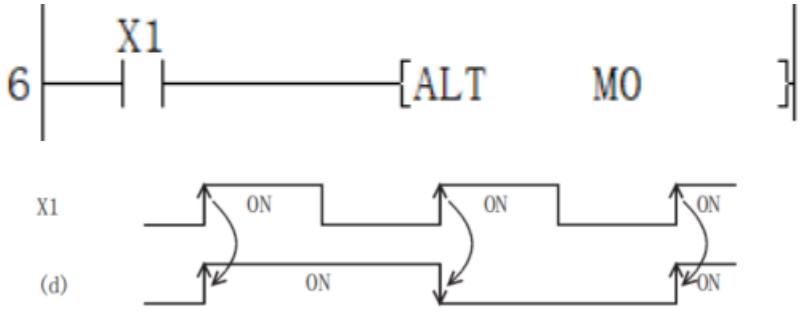
Device used

Instruction	Parameter	Devices					Offset modification	Pulse extension
		Y	M	S	SM	D.b	[D]	XXP
ALT	Parameter 1	●	●	●	●	●	●	●

Features

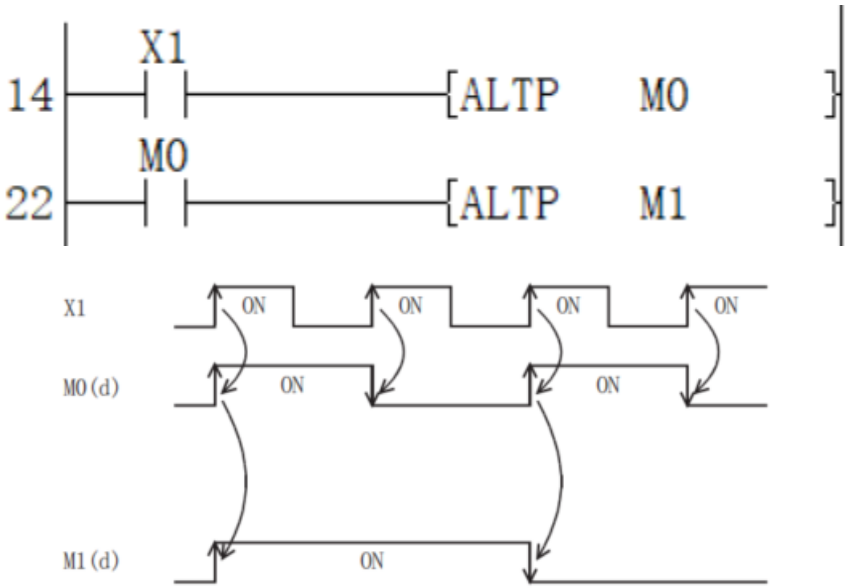
Alternating output (level 1)

Each time the instruction input changes from OFF→ON, the bit device specified in (d) is turned OFF→ON inverted.



Divided frequency output (through alternate output (2 levels))

Combine multiple ALTP instructions to perform frequency division output.



#**Note:** If you program with the ALT instruction, the action will be reversed every operation cycle. To reverse the action by the instruction ON→OFF, use the ALT instruction (pulse execution type) or set the instruction contact to LDP (pulse execution type).

Error code

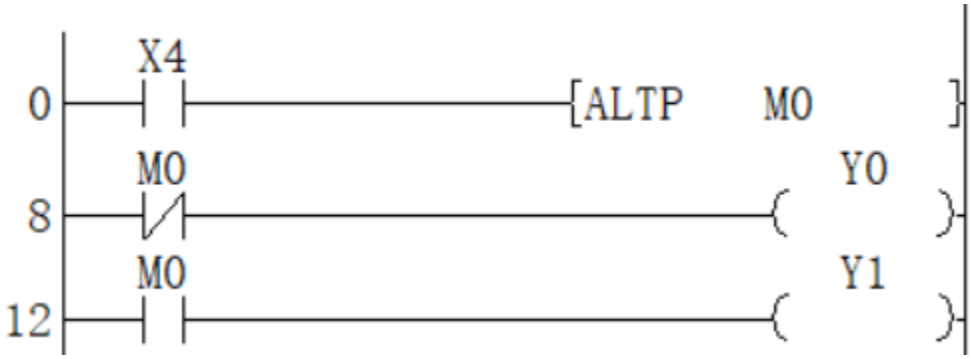
Error code	Content
4085H	When the device specified in the read application instruction (d) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (d) exceeds the corresponding device range

Example

(1) Start/stop via an input.

1) After pressing the button X4, start the action of output Y1 and stop the action of Y0.

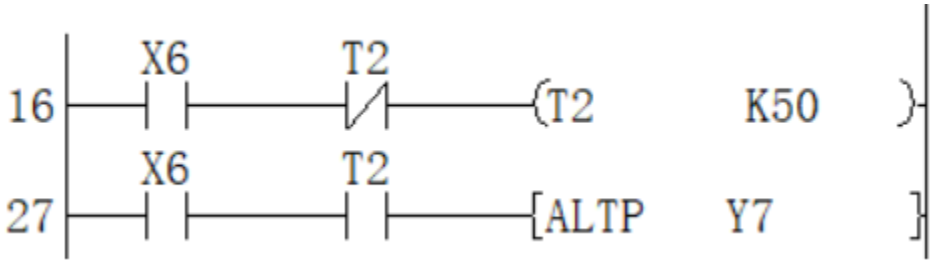
2) After pressing the button X4 again, stop the action of output Y1 and start the action of Y0.

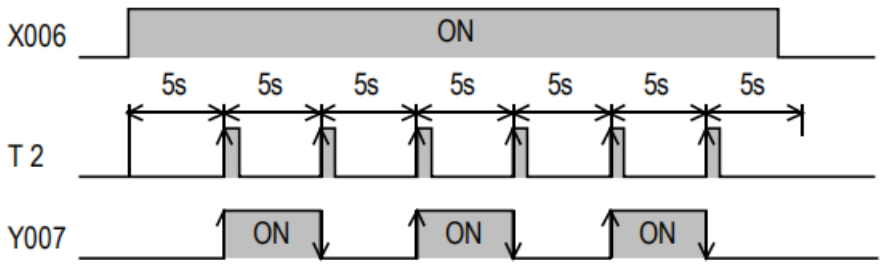


(1) Flashing action

1) When input X6 is ON, the contact of timer T2 will act instantaneously every 5 seconds.

2) The contact of T2 makes the output Y7 alternately ON/OFF every time it is ON.





INCD/BIN 16-bit data relative method

INCD

Use a pair of counters to create multiple output modes.

-[INCD (S1) (S2) (D) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S1)	The start device number storing the set value	-	Signed BIN 16 bit	ANY16
(S2)	The start number of counter for current value monitoring	-	Signed BIN 16 bit	ANY16
(D)	The start bit device number of output	-	Bit	ANY16_BOOL
(N)	Number of output bit device points	1 to 64	Signed BIN 16 bit	ANY16

Device used

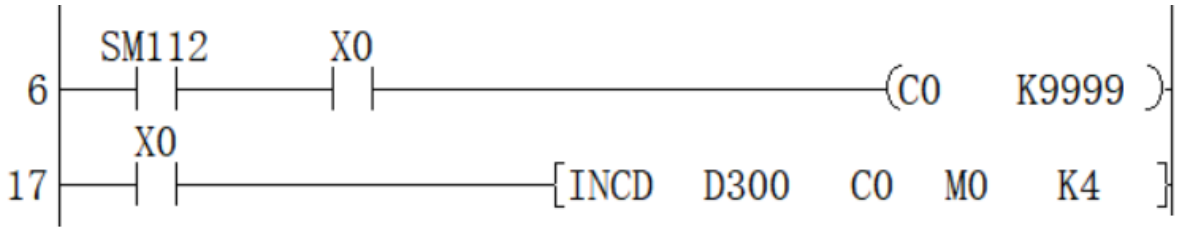
Instruction	Parameter	Bit Devices					Word Devices											Offset modification	Pulse extension
		Y	M	S	SM	D.b	KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
INCD	Parameter 1						●	●	●	●	●	●	●	●	●			●	
	Parameter 2											●						●	
	Parameter 3	●	●	●	●	●												●	
	Parameter 4						●	●	●	●	●	●	●	●	●	●	●	●	

Features

Compare the data table of row (N) starting from (S1) (row (N) × 2 points occupied) with the current value of the counter (S2), reset if they match, and control the output on/off in turn.

Example

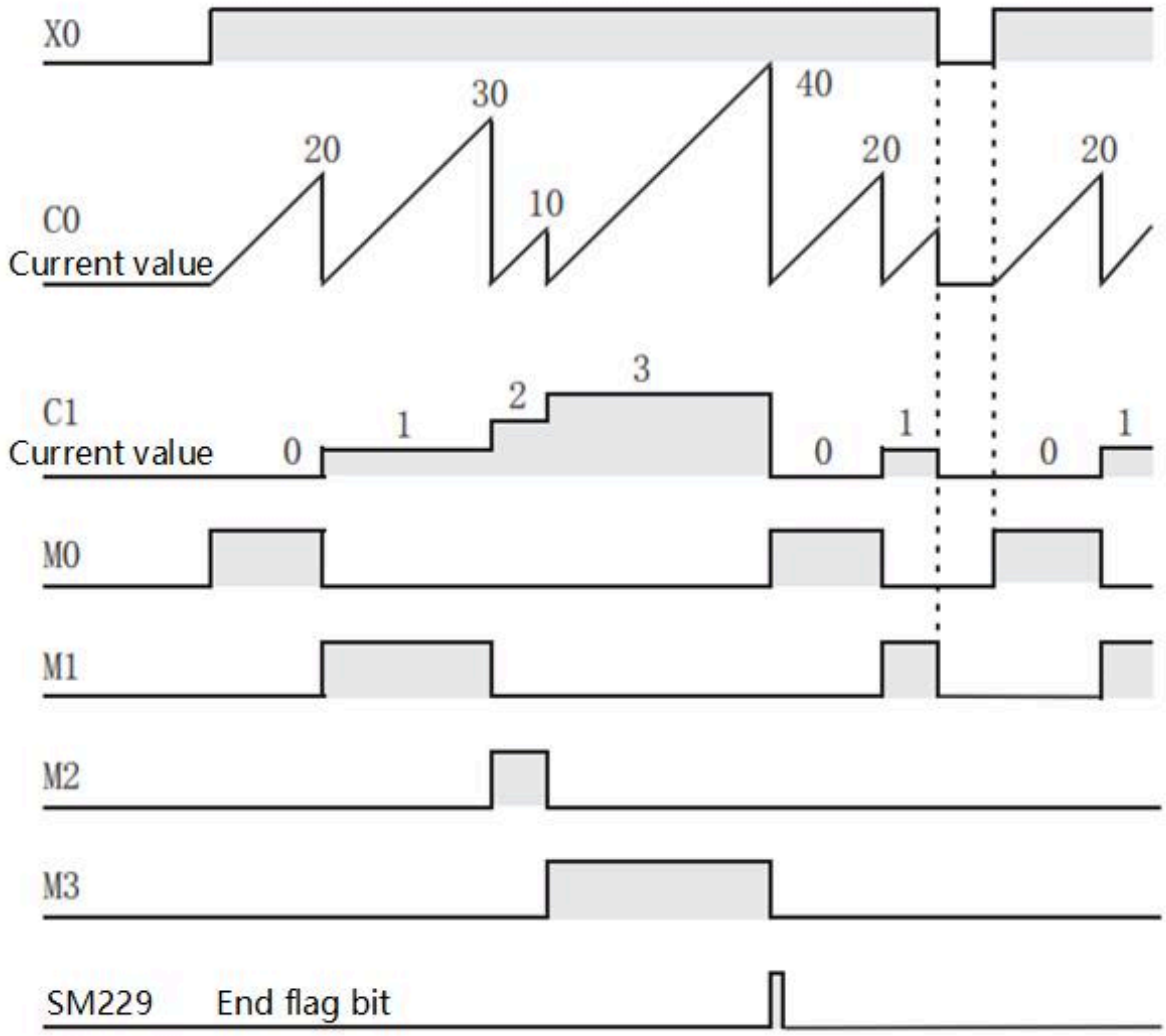
The operation is explained by the following circuit example. (S2) Take up 2 points. C0 and C1 are equivalent to this in the following timing chart.



• It is assumed that the following data is written using the transfer instruction in advance.

Storage device		Output	
-	Data value (example)	-	Example
(S1)	D300=20	(D)	M0
(S1)+1	D301=30	(D) +1	M1
(S1)+2	D302=10	(D) +2	M2
(S1) +3	D303=40	(D) +3	M3
...	....	...	...
(S1)+(N)-1	-	(D) +N-1	-

Timing diagram



If the instruction contact turns on, the M0 output turns on.

The output (M0) is reset when the current value of C0 reaches the comparison value D300, the count value of the process counter C1 is +1, and the current value of the counter C0 is also reset.

The next output M1 turns ON.

Compare the current value of C0 with the comparison value D301. When the comparison value is reached, the output M1 is reset, the count value of the process counter C1 is +1, and the current value of the counter C0 is also reset.

Compare the same to the point (K4) specified in (N). (1≤(N)≤64)

After the final process specified in (N) is completed, the execution end flag SM229 turns ON for 1 operation cycle. SM229 is the instruction execution end flag used in multiple instructions, so it should be used as a contact after the instruction to execute the end flag dedicated to the instruction.

Return to the beginning and repeat output.

#**Note:** In (S1), when specifying the device number by specifying the digits of the bit device, the device number should be a multiple of 16 (0, 16, 32, 64...).

Up to 4 INCD instructions can be driven simultaneously in the program.

Error code

Error code	Content
4084H	When the value specified in (N) exceeds the range of 1 to 64
4085H	When the device specified in read application instruction (S1), (S2), (D) and (N) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (S2) and (D) exceeds the corresponding device range
4089H	The number of instruction drives exceeds the limit.

Example

Refer to the example in the function description.

RAMP/Control ramp signal

RAM(P)

Obtain data that changes between the start (initial value) and end (target value) two values specified (N) times.

-[RAMP (S1) (S2) (D) (N)]

Content, range and data type

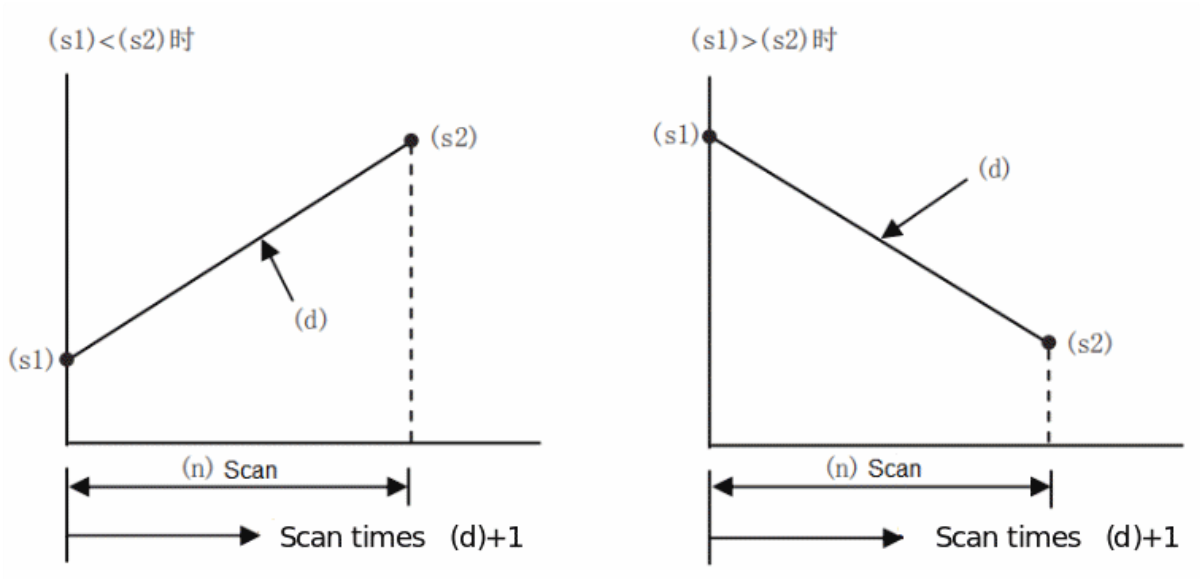
Parameter	Content	Range	Data type	Data type (label)
(S1)	The device number that stores the initial value of the set ramp	-	Signed BIN 16 bit	ANY16
(S2)	The device number that stores the set ramp target value	-	Signed BIN 16 bit	ANY16
(D)	The device number that stores the current value data of ramp	-	Signed BIN 16 bit	ANY16
(N)	Ramp transition time (scan period)	1-32767	Signed BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices											Offset modification	Pulse extension
		KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
RAMP	Parameter 1	●	●	●	●	●	●	●	●	●			●	
	Parameter 2	●	●	●	●	●	●	●	●	●			●	
	Parameter 3					●	●	●	●	●			●	
	Parameter 4	●	●	●	●	●	●	●	●	●	●	●	●	

Features

Specify the start value (S1) and the value to end (S2) in advance. If the instruction input is turned ON, the value divided by the number of times specified in (N) will be added to (S1) in sequence in each operation cycle The value of is stored in (D). This instruction and analog output can be combined to output soft start/stop instructions.

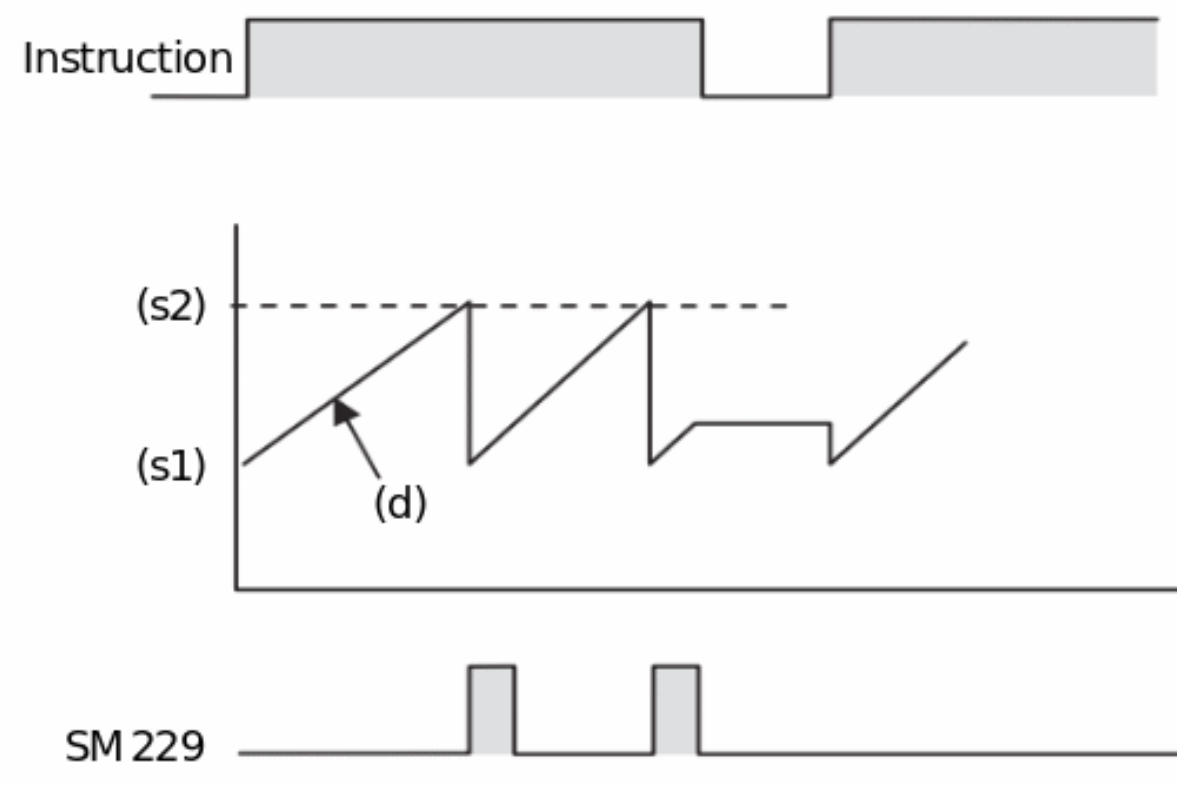


(D)+1 stores the number of scans (0→N times).

The time from the start to the end value requires operation cycle×(N) scan.

If the input instruction is turned OFF during operation, it will be in the execution interrupt state ((D): current value data retention. (D)+1 scan times clear), if it is turned ON again, (D) will be cleared (S1) Restart the action.

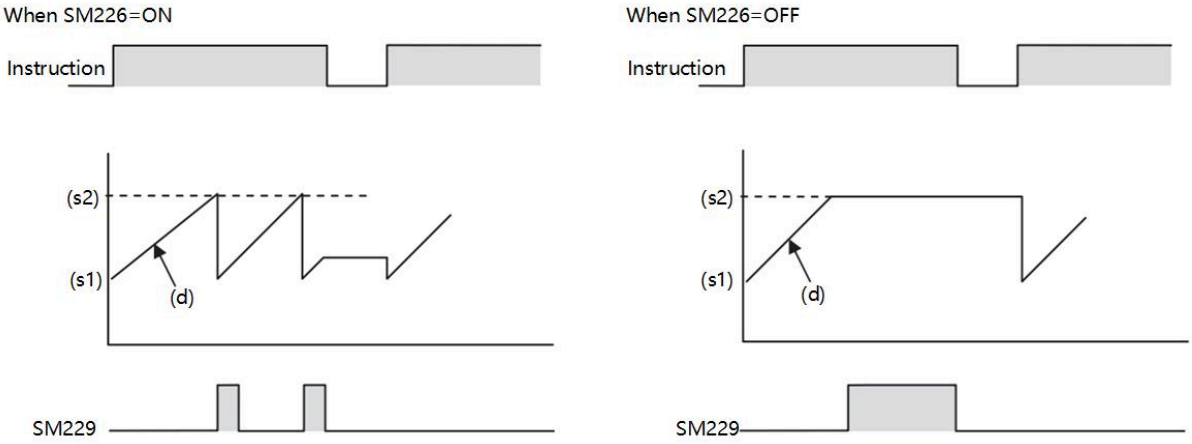
After the transition is completed, the instruction execution completed flag SM229 will act, and the value of (D) will return to the value of (S1).



In the case of obtaining the calculation result at a certain time interval (constant scan mode), write the specified scan time to SD120 (a value slightly longer than the actual scan time), and turn on SM120. For example, when the value is specified as 20 ms and N=100 times, the value of (D) changes from (S1) to (S2) in 2 seconds.

The value of the constant scan mode can also be set by the parameter setting of the engineering tool (the constant scan execution interval setting of the CPU parameter).

According to the ON/OFF action of the mode flag SM226, the content of (D) is changed as shown below.

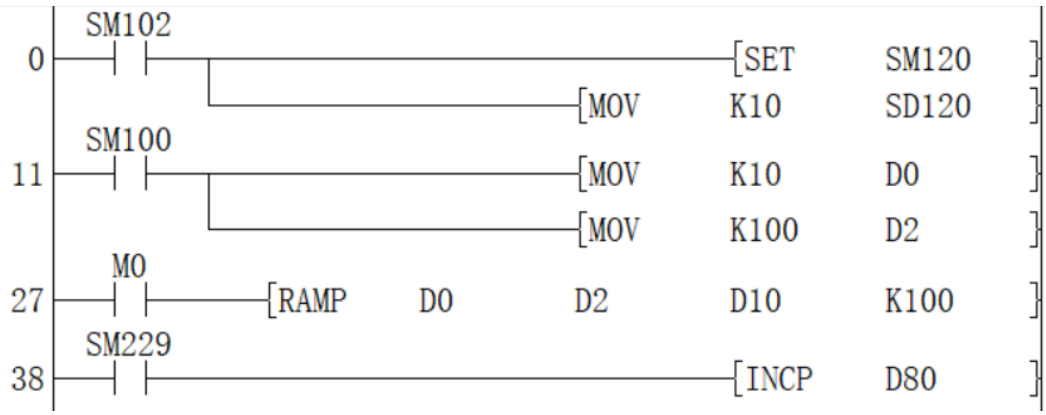


#Note: When the power failure retention device (retention area) is specified in (D), the instruction input remains ON. When the CPU module is set to RUN (start), clear (D) in advance.

Error code

Error code	Content
4084H	When the value specified in (N) exceeds the specified range of 1 to 32767
4085H	When the device specified in read application instruction (S1), (S2), (D) and (N) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (D) exceeds the corresponding device range

Example



As in the above procedure, turn SM120 ON, and the program will run with a constant scan cycle (the value in SD120 is 10ms). When M0=ON, it changes from 10 to 100 within 100×10ms.

ROTC/Rotary table proximity control

ROTC

In order to take out the items on the rotating table, take out the window according to the requirements, and make the rotating table rotate nearby.

-[ROTC (S) (N1) (N2) (D)]

Content, range and data type

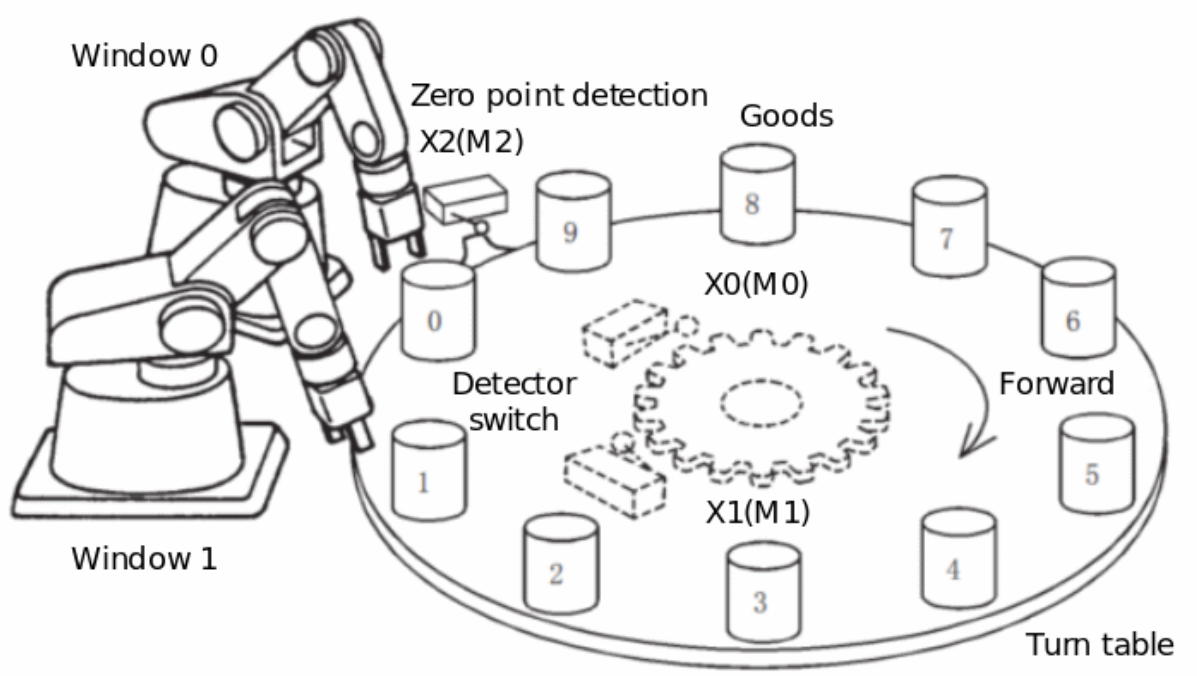
Parameter	Content
(S)	The specified register of the calling condition (pre-set acco
(N1)	Number of divisions
(N2)	Singular in low speed zone
(D)	The specified bit of the calling condition (constitutes an int advance from the input signal (X))

Device used

Instruction	Parameter	Devices																Offset modification	Pulse extension
		Y	M	S	SM	D.b	KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
ROTC	Parameter 1												●	●	●			●	
	Parameter 2						●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 3						●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 4	●	●	●	●	●												●	

Features

In order to take out the items on the rotating table divided into N1 (=10) as shown in the figure below, take out the inserted window as required, and rotate the rotating table nearby under the condition of N2 or (S), (D) . If the following operating conditions are specified, (D)+3 to (D)+7 can be used for forward/reverse, high-speed/low-speed/ stop output.



Set up the switch X2 that is used to detect the two-phase shape (X0, X1) of the forward/reverse rotation of the rotary table and window 0. Replace X0 to X2 with (d) to (d) +2 internal contacts. The start device number specified in X or (d) can be arbitrary.

(S) is a counter, which counts how many items come to window 0.

(S)+1 set the number of the window to be called.

(S)+2 sets the number of the recalled item.

Specify the number of divisions (N1) and low-speed operation section (N2) of the rotary table.

#**Note:** If the instruction input is turned ON to drive the instruction, the result of (D)+3 to (D)+7 will be automatically obtained. If the instruction input is turned off, (D)+3 to (D)+7 will turn off.

As an example, when the rotation detection signal ((D) to (D)+2) is set to 10 actions within 1 division interval, the division number setting, calling window number setting, and article number setting should all be 10 Times the value. In this way, the setting value of the low-speed section can be set to the middle value of the number of divisions, etc.

When the instruction input is ON and the 0 point detection signal (M2) is turned ON, the content of the counting register (S) is cleared to 0. It is necessary to perform this clear operation in advance before starting operation.

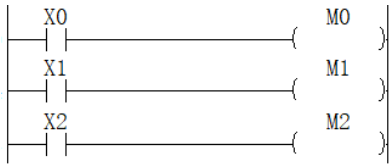
ROTC instructions can drive up to 4.

Error code

Error code	Content
4084H	When the value specified in (N1) exceeds the range of 2 to 32767
	When the value specified in (N2) exceeds the range of 0 to 32767
	When the values specified in (N1) and (N2) meet the condition of (N1)<(N2)
	When one of (S), (S)+1 and (S)+2 is negative.
	When one of (S), (S)+1 and (S)+2 is (N1) or more.
4085H	When the device specified in read application instruction (S1), (N1), (N2) and (D) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (S2) and (D) exceeds the corresponding device range
4089H	The number of instruction drives exceeds the limit.

Example

**   **

Variable	Features	Instructions
D200	Used as a counting register	The 3 units are pre-set by the user program
D201	Call window number setting	
D202	Call work piece number setting	
M0	Phase A signal	 The user program executes before each scan of this statement:
M1	Phase B signal	
M2	Zero point detection signal	
M3	High speed forward rotate	When X0 is ON, the result of M3 to M7 could be automatically obtained.
M4	Low speed forward rotate	
M5	Stop	When X0 is OFF, M3 to M7 are all OFF.
M6	Low speed reverse rotate	
M7	High spped reverse rotate	

STMR/Special function timer

STMR

Use the 4 points starting from the device specified in (D) to perform 4 types of timer output.

-[STMR (S1) (S2) (D)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S1)	Timer number used: T0 to T511 (100ms timer)	-	Device Name	ANY16
(S2)	Timer setting value	1-32767	Signed BIN 16 bit	ANY16

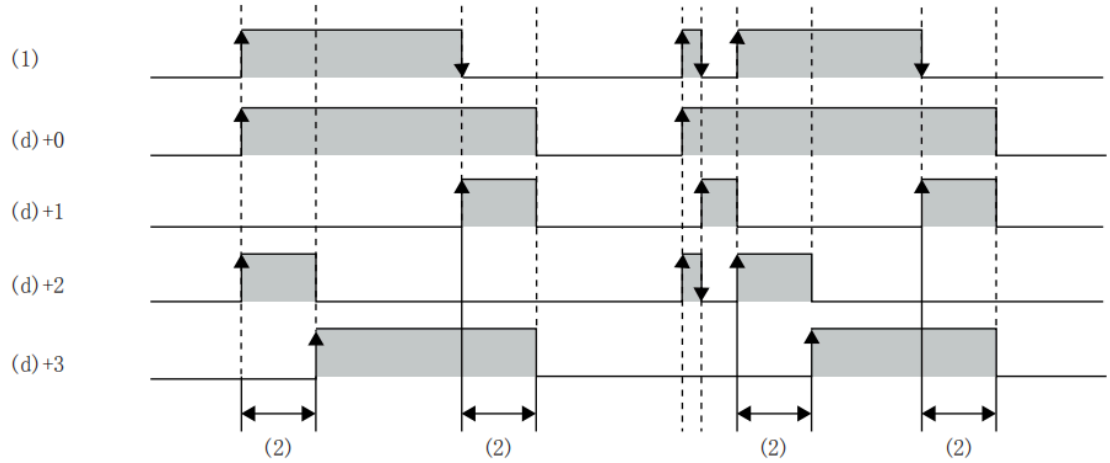
(D)	The start bit number of the output (occupies 4 points)	-	Bit	ANYBIT_ARRAY

Device used

Instruction	Parameter	Devices																		
		Y	M	S	SM	D.b	KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	E	[D]	XXP
STMR	Parameter 1										●								●	
	Parameter 2						●	●	●	●	●	●	●	●	●	●	●		●	
	Parameter 3	●	●	●	●	●													●	

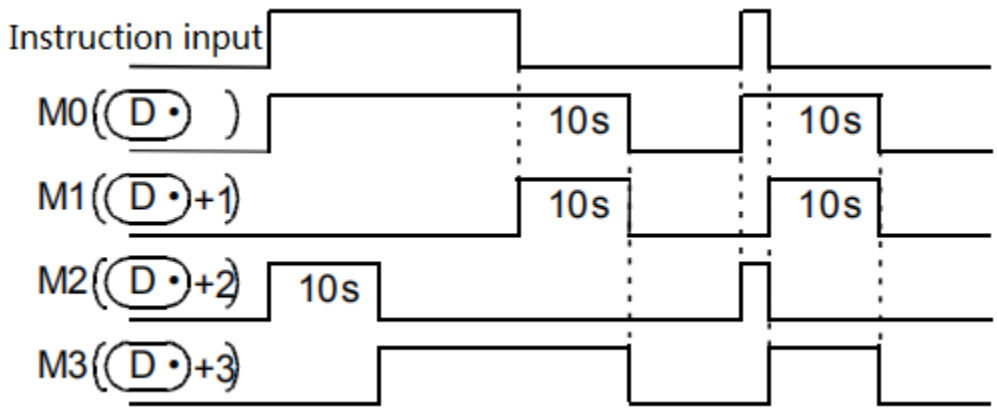
Features

Use the 4 points starting from the device specified in (d) to perform 4 types of timer output.

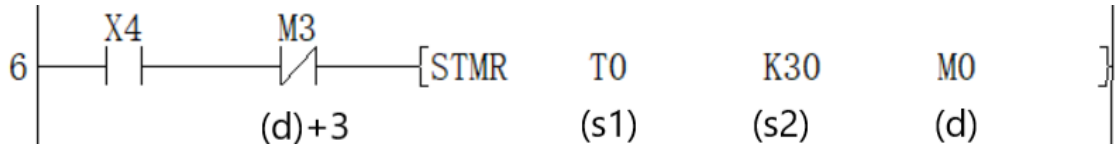


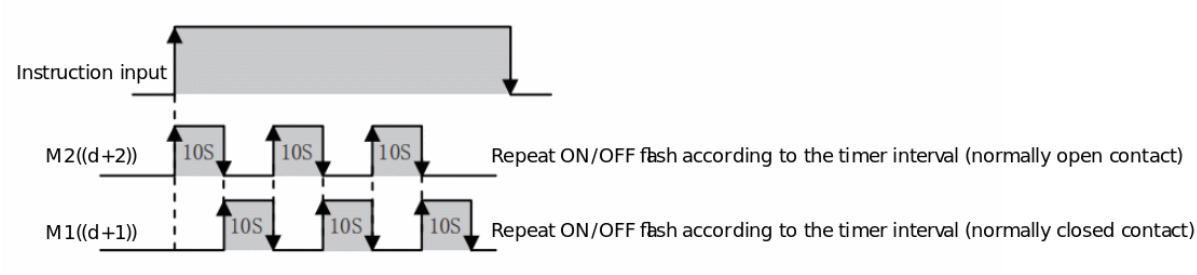
(1)：STMR指令的指令
(2)：(s2)中指定的设置值

1. STMR instruction instruction
2. The setting value specified in (S2)



The blink will be in (d)+3 normally closed contact through the following program which turns on/off the STMR instruction (T10 is allocated in (s1), K100 is allocated in (s2), and M0 is allocated in (d)) Output to (d)+1, (d)+2.





The setting value of (S2) can be specified in the range of 1 to 32767 (1 to 3276.7 seconds).

#**Note:** The timer number specified by this instruction cannot be reused with other general circuits (OUT instructions, etc.). In the case of repetition, the timer action cannot be executed correctly.

The timer specified in (S1) is regarded as a 100ms timer, starting from the rising edge of the instruction contact.

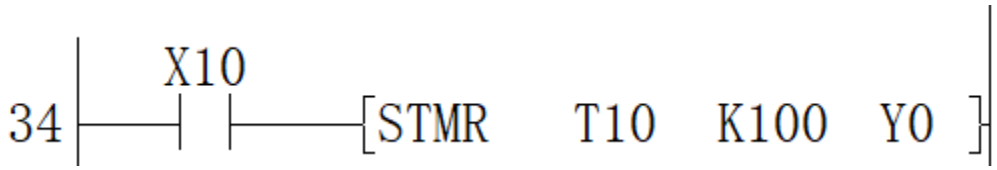
Occupy the device specified in 4 points (D) at the beginning. Be careful not to overlap with the device used for machine control.

When the instruction contact is turned off, (D), (D)+1, (D)+3 will turn off after the set time. (D) +2 and timer (S1) are reset immediately.

Error code

Error code	Content
4084H	When the value specified in (S2) is less or equal to 0
4085H	When the device specified in the read application instruction (S2) and (d) exceeds the corresponding device range

Example

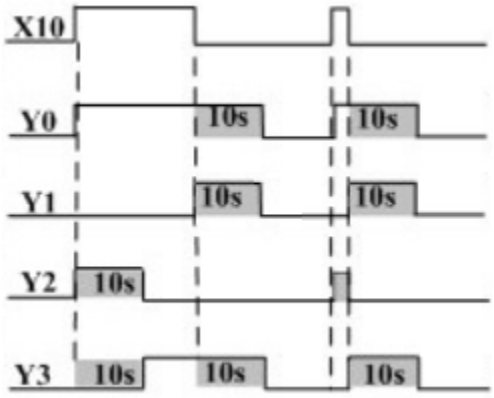


Y0: When X10 changes from Off→On, Y0=On, when X10 changes from On→Off, Y0=Off after a delay of 10 seconds.

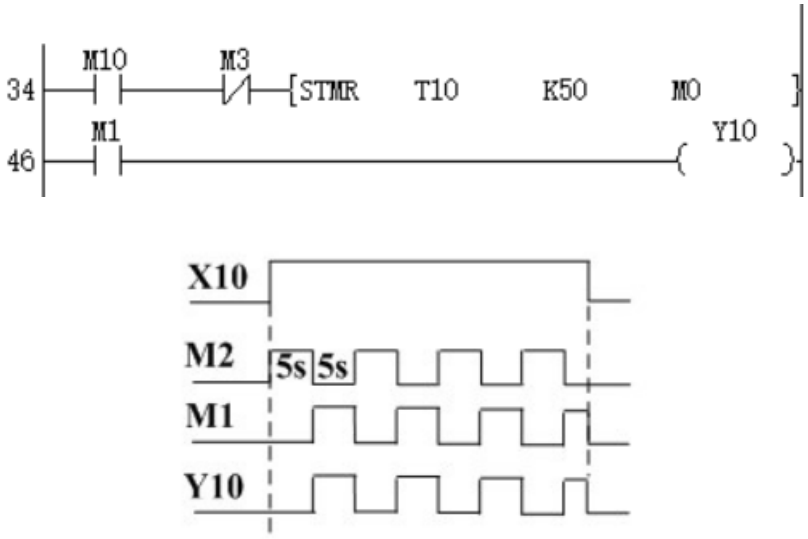
Y1: When X10 changes from On→Off, make Y1=On output once for 10 seconds.

Y3: When X10 changes from Off to On, Y3=On after 10 seconds of delay. When X10 changes from On to Off, Y3=Off after 10 seconds of delay.

Y2: When X10 changes from Off to On, output Y2=On once for 10 seconds.



If the component (d)+3 is introduced into the instruction stream, the oscillator output can be easily realized (this function can also be realized by the ALT instruction), as shown in the following figure:



TTMR/Demonstration timer

TTMR

Test the time when the TTMR instruction is ON. It is used when adjusting the timer setting time with buttons.

-[TTMR (D) (S)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(D)	Device for storing teaching data	-	Signed BIN 16 bit	ANY16
(S)	Multiplying ratio of teaching data	0-2	Signed BIN 16 bit	ANY16

Device used

Instruction	Parameter	Devices												Offset modification	Pulse extension
		KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	E	[D]	XXP

TTMR	Parameter 1					●	●	●	●	●				●
	Parameter 2	●	●	●	●	●	●	●	●	●	●	●		●

Features

Measure the pressing time of the execution instruction (button) in seconds, multiply it by the magnification (10^S) specified in (s) and store it in the device specified in (d).

For the time stored in (d), when the hold time is $\tau 0$ (unit: second), the actual value of (d) is as follows according to the magnification specified in (s).

(s)	Magnification	(D)
K0	$\tau 0$	(D) ×1
K1	$10\tau 0$	(D)×10
K2	$100\tau 0$	(D) ×100

(s)	(d)	(d)+1 (unit: 100 milliseconds)
K0 (unit: second)	$1\times\tau 0$	(d)+1 =(d)×10
K1 (unit: 100 milliseconds)	$10\times\tau 0$	(d)+1 =(d)
K2 (unit: 10 milliseconds)	$100\times\tau 0$	(d)+1 =(d)/10

#**Note:** If the instruction contact turns from ON→OFF, the current value of the hold time (d)+1 is cleared, and the teaching time (d) does not change.

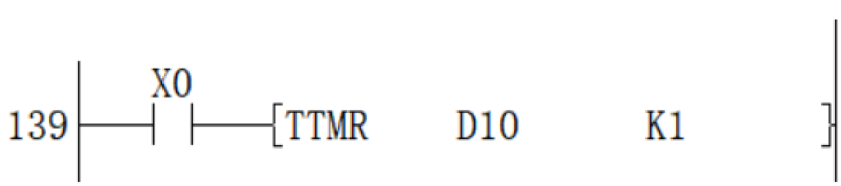
Occupy the device specified in the 2 teaching time (d) at the beginning. Be careful not to overlap with the device used for machine control.

Error code

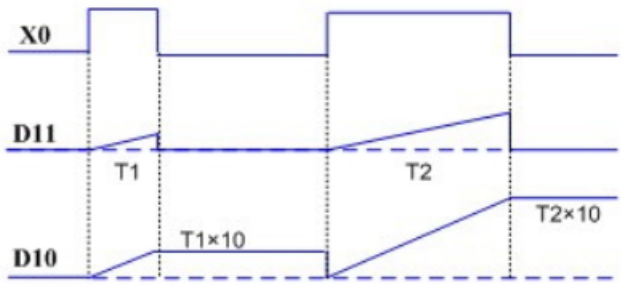
Error code	Content
4084H	When the value specified in (N) exceeds the range of 0 to 2
4085H	When the device specified in read application instruction (D) and (S) exceeds the corresponding device range
4086H	When the device specified in the write application instruction (D) exceeds the corresponding device range

Example

Example 1



When X0 is closed, D10=D11; when X0 is opened, the value of D10 remains unchanged, while D11 becomes 0.



Example 2

Use the TTMR instruction to write 10 sets of setting time, write the setting value into D10 to D19 in advance, reorganize the timer bit 100ms type timer, so 1/10 of the teaching data is the actual operating time (seconds)

Connect the 1-digit DIP switch to X10 to X13, use the BIN command to convert the setting value of the DIP switch into BIN value and store it in Z0

X0 is On, store the time (seconds) in D100

M100 demonstrates a scan cycle pulse generated by the release of the timer button X0

Use the setting number of the DIP switch as an indirect specified pointer, and then transfer the content of D100 to D10Z0 (D10 to D19)

TRH/Conversion of wet and dry bulb temperature and humidity

TRH

This instruction completes the conversion of dry bulb temperature, wet bulb temperature and corresponding humidity.

-[TRH (d1) (s) (d2) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(d1)	humidity	0 to 100	Single precision floating point	ANYREAL_32
(s)	Dry bulb temperature	-	Single precision floating point	ANYREAL_32
(d2)	Wet bulb temperature	-	Single precision floating point	ANYREAL_32
(N)	mode	0 to 1	Signed BIN 32 bit	ANY32

Device used

Instruction	Parameter	Devices											Offset modification	Pulse extension
		KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
TRH	Parameter 1					●	●	●	●	●			●	
	Parameter 2					●	●	●	●	●			●	

Parameter 3				●	●	●	●	●				●
Parameter 4	●	●	●	●	●	●	●	●	●	●	●	●

Features

(N) There are two modes to choose from:

Mode 0: Calculate the corresponding humidity by wet bulb temperature and dry bulb temperature.

Mode 1: Calculate the corresponding wet bulb temperature by dry bulb temperature and humidity.

The conversion process formula is as follows:

Assuming that the wet bulb temperature is A, the dry bulb temperature is B, and the corresponding current humidity is C, the three meet the following conditions:

$$EXP\{(A\times 17.27)/(A+237.36)\}\times 611=x \qquad (1)$$

$$EXP\{(B\times 17.27)/(B+237.36)\}\times 611=y \qquad (2)$$

$$z=x-C\times y/100 \qquad (3)$$

$$A=B-z/65.566 \qquad (4)$$

#Note:

● The wet bulb temperature is not greater than the dry bulb temperature. When the two are the same, the humidity reaches the maximum 100%.

● The unit of dry and wet bulb temperature is (℃).

● The general value range of dry bulb is between 0 to 100℃, the command does not judge its range, so pay special attention when using this command.

Error code

Error code	Content
4084H	The value specified in (N) is out of the following range. 0 to 1
	The value specified in (d1) is out of the following range. 0 to 100
	A negative value is specified in (s).
	A negative value is specified in (d2).
4085H	The output result of (d1)(s)(d2)(N) in the read application instruction exceeds the device range
4086H	The output result of (d1)(d2) in the writing application instruction exceeds the device range

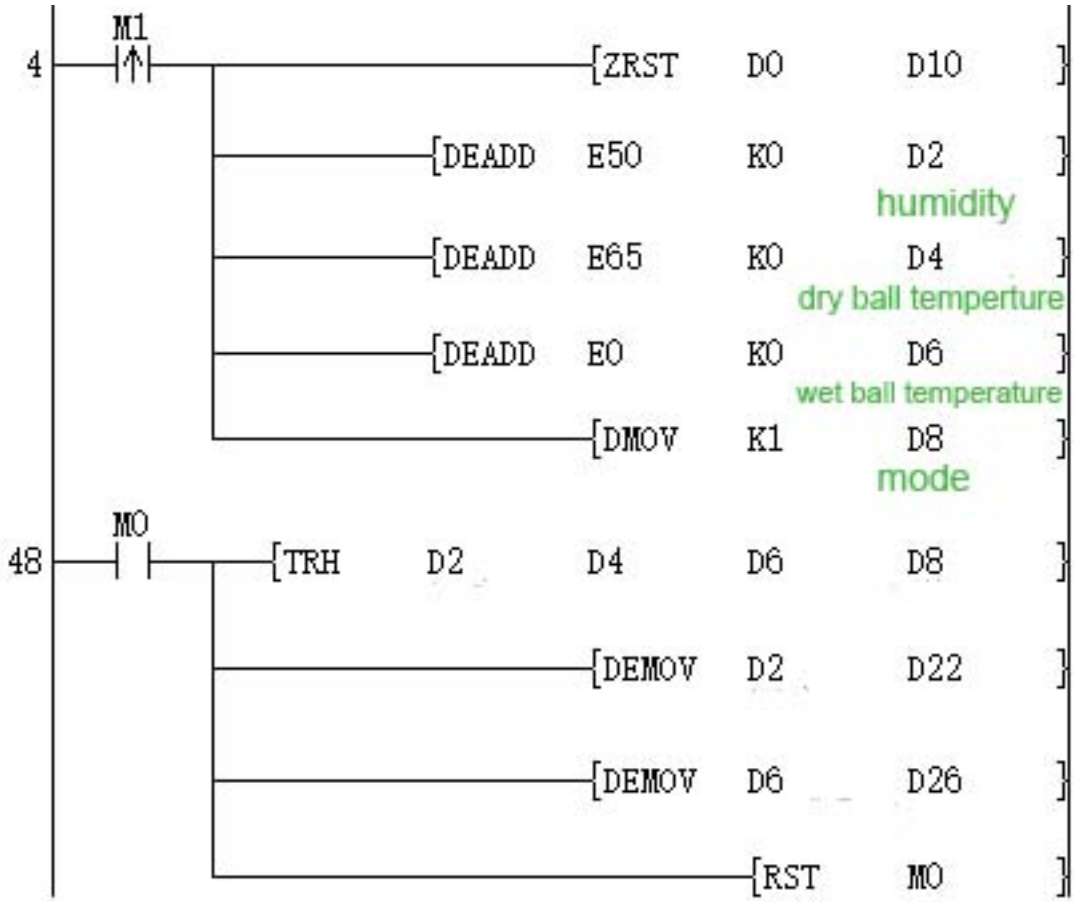
Dry and wet bulb humidity comparison table

Dry/wet ball temperature and humidity conversion table

A \ C (B)		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
10.0	2.55	3.06	3.58	4.09	4.58	5.07	5.54	6.02	6.49	6.95	7.41	7.86	8.29	8.73	9.16	9.59	10.00
11.0	3.24	3.78	4.32	4.85	5.37	5.88	6.38	6.87	7.36	7.84	8.31	8.77	9.24	9.69	10.13	10.57	11.00
12.0	3.94	4.50	5.06	5.62	6.15	6.68	7.21	7.72	8.23	8.72	9.21	9.70	10.17	10.64	11.10	11.56	12.00
13.0	4.62	5.21	5.79	6.38	6.93	7.49	8.04	8.57	9.09	9.61	10.12	10.62	11.12	11.59	12.07	12.54	13.00
14.0	5.30	5.92	6.53	7.13	7.72	8.29	8.85	9.42	9.96	10.50	11.02	11.54	12.05	12.55	13.05	13.52	14.00
15.0	5.98	6.62	7.26	7.89	8.50	9.10	9.68	10.26	10.83	11.38	11.93	12.47	12.99	13.50	14.02	14.51	15.00
16.0	6.64	7.32	7.99	8.64	9.28	9.90	10.51	11.11	11.69	12.27	12.83	13.38	13.93	14.47	14.98	15.50	16.00
17.0	7.31	8.02	8.72	9.39	10.05	10.70	11.34	11.95	12.56	13.16	13.73	14.31	14.87	15.42	15.95	16.48	17.00
18.0	7.98	8.72	9.43	10.13	10.82	11.50	12.15	12.80	13.42	14.03	14.64	15.23	15.80	16.37	16.93	17.46	18.00
19.0	8.64	9.40	10.15	10.89	11.59	12.29	12.97	13.64	14.28	14.92	15.54	16.15	16.75	17.33	17.90	18.45	19.00
20.0	9.30	10.09	10.87	11.63	12.37	13.09	13.79	14.49	15.16	15.81	16.45	17.07	17.69	18.28	18.87	19.44	20.00
21.0	9.95	10.78	11.59	12.38	13.14	13.89	14.61	15.33	16.02	16.69	17.35	17.99	18.62	19.24	19.84	20.43	21.00
22.0	10.60	11.47	12.31	13.12	13.92	14.69	15.44	16.17	16.88	17.58	18.26	18.92	19.56	20.19	20.81	21.41	22.00
23.0	11.25	12.14	13.02	13.86	14.68	15.48	16.26	17.02	17.75	18.46	19.16	19.84	20.50	21.15	21.77	22.40	23.00
24.0	11.89	12.83	13.73	14.61	15.46	16.28	17.08	17.86	18.61	19.35	20.06	20.76	21.44	22.11	22.75	23.39	24.00
25.0	12.53	13.51	14.44	15.35	16.22	17.08	17.90	18.70	19.48	20.24	20.97	21.68	22.38	23.06	23.73	24.37	25.00
26.0	13.18	14.18	15.15	16.09	16.99	17.87	18.73	19.54	20.34	21.13	21.88	22.62	23.33	24.02	24.70	25.36	26.00
27.0	13.82	14.86	15.83	16.84	17.76	18.67	19.55	20.39	21.21	22.01	22.79	23.53	24.26	24.98	25.67	26.35	27.00
28.0	14.46	15.53	16.57	17.57	18.54	19.46	20.37	21.24	22.08	22.90	23.70	24.46	25.20	25.94	26.64	27.33	28.00
29.0	15.10	16.21	17.28	18.31	19.31	20.26	21.20	22.09	22.95	23.79	24.61	25.39	26.15	26.90	27.61	28.32	29.00
30.0	15.73	16.88	17.99	19.05	20.08	21.07	22.02	22.94	23.82	24.68	25.51	26.31	27.10	27.85	28.58	29.30	30.00
31.0	16.37	17.56	18.70	19.80	20.85	21.87	22.84	23.78	24.69	25.57	26.42	27.24	28.04	28.82	29.56	30.29	31.00
32.0	17.00	18.22	19.41	20.54	21.62	22.67	23.67	24.63	25.56	26.47	27.33	28.17	28.99	29.76	30.54	31.27	32.00
33.0	17.63	18.90	20.12	21.28	22.40	23.47	24.50	25.48	26.43	27.35	28.24	29.10	29.93	30.73	31.51	32.27	33.00
34.0	18.26	19.58	20.83	22.02	23.18	24.28	25.32	26.33	27.31	28.25	29.15	30.03	30.87	31.69	32.49	33.25	34.00

A: Dry ball temperature B: Wet ball temperature C: Humidity

Example



External IO instructions

ARWS/Arrow switch

ARWS

Use the arrow switches for digit movement and increase or decrease of digit values to input data instructions.

-[ARWS (S) (D1) (D2) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S)	The start device number that input	-	BIN16 bit	ANY_BOOL
(D1)	The word device number storing BCD conversion data	-	BIN16 bit	ANY_BOOL
(D2)	The start bit device (Y) that connect the display of the 7-segment digital tube	0 to 9999	BIN16 bit	ANY16_S
(N)	Specify the number of digits displayed by the 7-segment digital tube (Setting range: K0 to K3)	0 to 3	BIN16 bit	ANY16_S

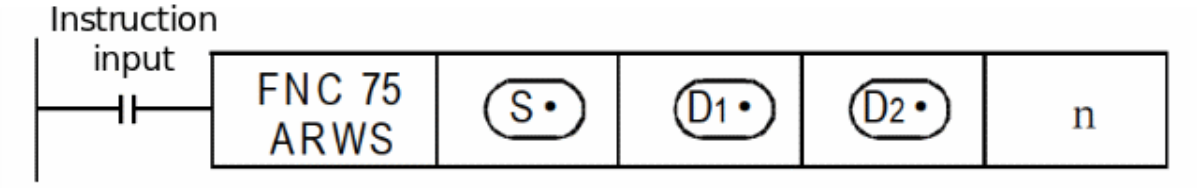
Device used

Instruction	Parameter	Devices													Offset modification	Pulse extension
		X	Y	M	S	SM	D.b	T	C	D	R	SD	K	H	[D]	XXP
ARWS	Parameter 1	●	●	●	●	●	●								●	
	Parameter 2							●	●	●	●	●			●	
	Parameter 3		●												●	
	Parameter 4												●	●		

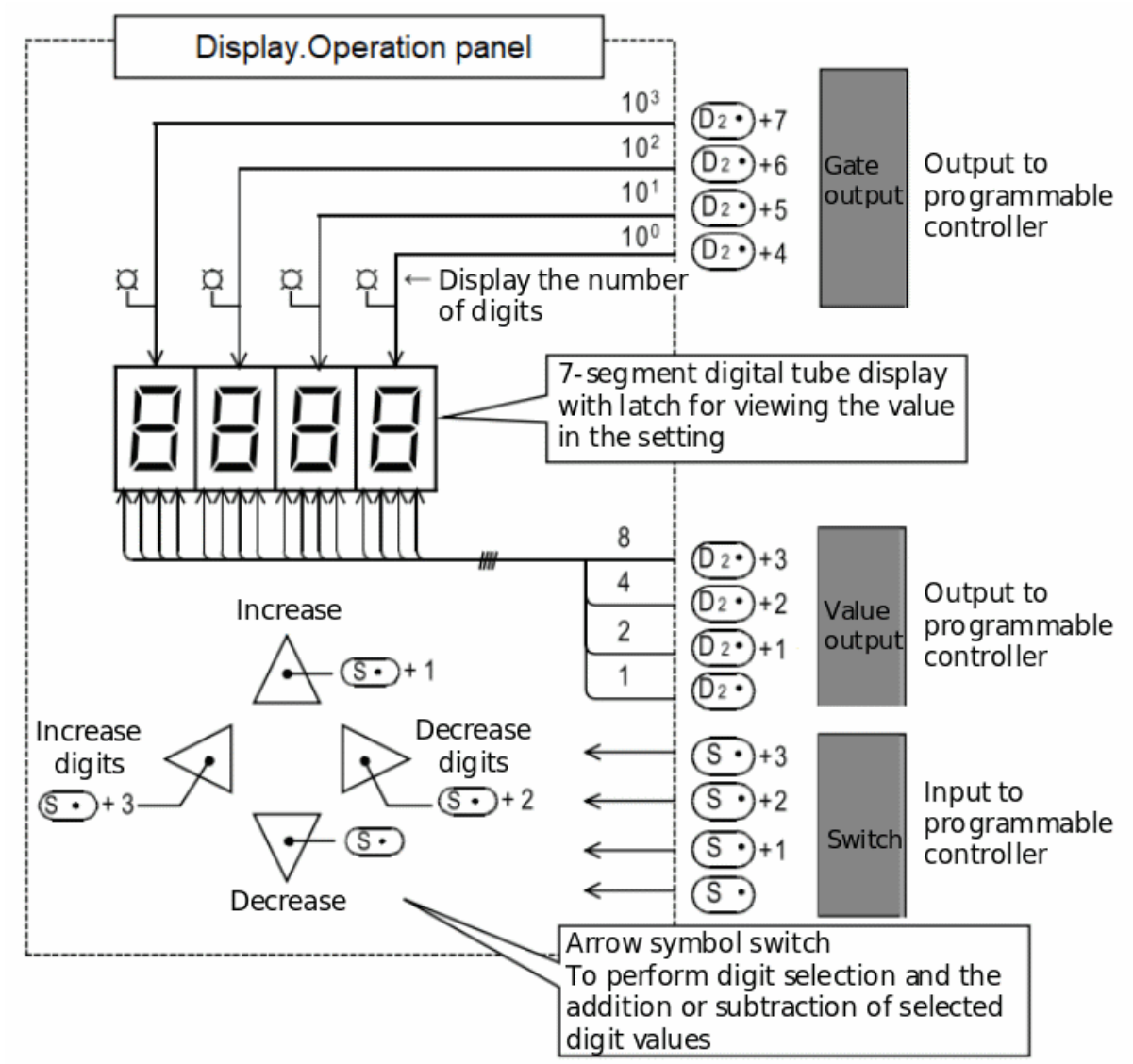
Features

16-bit operation (ARWS). The 16-bit BIN value from 0 to 9999 is stored in D+1. For the sake of convenience, the following description is displayed in BCD conversion.

When the instruction input is ON, the ARWS instruction will operate as shown below



Display and operation part of the content



(1) The digit specification of n displayed by the 7-segment digital tube with BCD code

A 4-digit (10^3 digit) is used as an example in the following operation description, .

(2) The action of the digit selection switch (S+2, S+3)

1) The action when input S+2 with reduced digits is ON.Each time the switch is pressed, the number of digits specification is changed according to $10^3 \rightarrow 10^2 \rightarrow 10^1 \rightarrow 10^0 \rightarrow 10^3$.

2) The action when the input S+3 with increased digits is ON. Each time the switch is pressed, the number of digits specification is changed according to $10^3 \rightarrow 10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3$.

(3) The action of the LED for displaying the selected digits (D2+4 to D2+7). The specified number of digits can be displayed by LED by strobe signal D2+4 to D2+7.

(4) The operation of the data change switch in units of digits (S, S+1). The data is changed for the number of digits specified by the "digit selection switch" above.

1) Increase the action when the input is ON. Each time the switch is pressed, the content of D1 changes according to 0→1→2→...→8→9→0→1.

2) Reduce the action when the input is ON. Each time the switch is pressed, the content of D1 changes according to 0→9→8→7...1→0→9.

These contents can be displayed in the 7-segment digital tube display.

As shown above, through a series of operations, you can write the target value into D1 while viewing the 7-segment display.

#**Note:**

1. The setting of parameter n

Please refer to the parameter setting of SEGL (FNC 74) instruction. The setting range is 0 to 3.

2. The output format of the programmable controller, please use a transistor output type programmable controller.

3. About scan time (operation cycle) and display timing

The ARWS instruction is executed synchronously with the scan time (operation cycle) of the programmable controller.

In order to perform a series of displays, the scan time of the programmable controller needs to exceed 10ms.

When it is less than 10ms, please use the constant scan mode and run with a scan time longer than 10ms.

4. Number of occupied points of the device

The input of the device s occupies 4 points.

The output of the device d2 occupies 8 points.

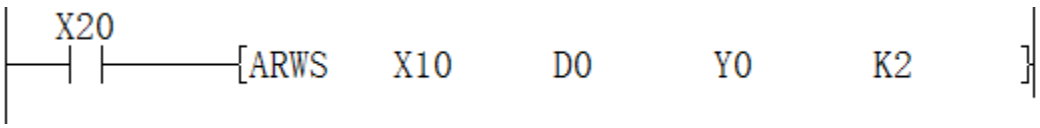
5. Restrictions on the times of the uses of instructions

Only one ARWS instruction can be used in the program.

Error code

Error code	Content
4084H	The data input in the application instruction (d1) and (d2) exceeds the specified range
4085H	The output result of the read application instruction (s), (d1) and (d2) exceeds the device range
4086H	The output result of the write application instruction (d1) and (d2) exceeds the device range

Example



The corresponding hardware wiring is shown in the figure below, and the PLC should be transistor output type:

(1) The digital tube in the figure shows the value of D0. Press X10 to X13 to modify the value. The value of D0 can only be between 0 and 9999.

(2) When X20 is ON, the cursor position is thousands. Each time the back key (X12) is pressed, the specified position is switched in the order of "thousands → hundred → ten → pieces → thousand"; if the forward key (X13) is pressed, the switching sequence is reversed; the cursor position is determined by the strobe pulse signal (YO04 to YOO7) LED indication of connection.

(3) For the cursor position, each time you press the increment key (X11), the content of the position changes by 0 → 1→ 2→.....8→9→0→1, and when you press the decrement key (X10), press 0 →9→8→7→..... 1→0→9 changes, the modified value takes effect immediately.

DSW/Numeric key input

DSW

This instruction is to read the state of the matrix type setting switch, with 4 BCD setting switches as a group, and store the setting value in the specified unit after reading it. Up to 2 groups of setting switches can be read.

-[DSW (S) (D1) (D2) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S)	The start device (X) number connected to the digital switch (occupies 4 points)	-	Bit	ANY_BOOL
(D1)	The start device (Y) number that strobe signal outputed (occupies 4 points)	-	Bit	ANY_BOOL
(D2)	The device number that stores the value of the digital switch (occupies n points)	0 to 9999	Signed BIN16	ANY16_S
(N)	Number of groups of digital switches (4 digits a group) (n=1 or 2)	1 to 2	Signed BIN16	ANY16_S

Device used

Instruction	Parameter	Devices									Offset modification	Pulse extension
		X	Y	T	C	D	R	SD	K	H	[D]	XXP
DSW	Parameter 1	●									●	
	Parameter 2		●								●	
	Parameter 3			●	●	●	●	●			●	
	Parameter 4								●	●		

Features

This instruction is to read the state of the matrix type setting switch, with 4 BCD setting switches as a group, and store the setting value in the specified unit after reading it. Up to 2 groups of setting switches can be read.

(1) About the input value (d1)

4 digits from 0 to 9,999 could be read.

Data is saved in BIN (binary number) value.

The first group is saved in (d2), and the second group is saved in (d2)+1.

(2) specification of the number of groups n

1.When using 4 digits/1 group×1 [n=K1] pass the strobe signal

From (s) to [(s)+3], sequentially read the BCD 4-digit digital switches connected in (d1) to [(d1)+3], and save the value as BIN value in (d2).

2.When using 4 digits/1 group×2 [n=K2] pass the strobe signal

From (s) to [(s)+3], sequentially read the BCD 4-digit digital switches connected in (d1) to [(d1)+3], and save the value as BIN value in (d2).

Through the strobe signal (d1) to [(d1)+3], read the BCD 4-digit digital switch connected in (s)+4 to [(s)+7] in turn, and save its value as a BIN value To (d2)+1.

#**Note:**

(1) When the instruction contact is OFF

Even if it is OFF, the content of (d2) does not change, but from (d1) to [(d1)+3] all become OFF.

(2) Occupied points of the device

1) When using 4 digits 2 groups (n=K2), 2 points starting from (d2) are occupied.

2) When it is 4 digits and 1 group (s), 4 points are occupied, and when it is 4 digits and 2 groups, 8 points are occupied.

(3) When connecting a digital switch with less than 4 digits

For unused digits, the strobe signal <output for specified digits> (d1) does not need to be wired, but even if there are unused digits, its output is already occupied by this instruction, so it cannot be used for other purposes. Be sure to leave unused output empty.

(4) It is recommended to use transistor output type

In order to read the value of the digital switch continuously, be sure to use a transistor output type programmable controller.

(5) About digital switches

Please use a digital switch of BCD output type.

(6) About the read timing of keyboard input

In order to prevent reading omissions caused by the filter delay of keyboard input, please use the “Constant Scan Mode” and “Timer Interrupt” functions flexibly.

(7) The limit number of instructions

A maximum of two can be used at the same time

Related device

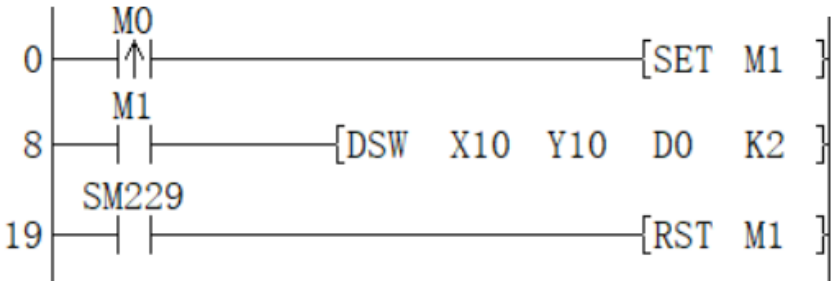
Devices	Name	Content
SM229	End of instruction execution	After a reading cycle is over, SM229 will be set for a scan cycle

Error code

Error code	Content
4084H	The data input in the application instruction and (d2) exceeds the specified range
4085H	The output result of the read application instruction (s) and (d2) exceeds the device range
4086H	The output result of the write application instruction (d1) and (d2) exceeds the device range
4089H	The number of application instructions exceeds the limit

Example

Program



Wiring diagram

1. DSW operates while M1 (digital switch read input) is ON.
2. DSW will operate until the end of one cycle of operation and the instruction execution end flag (SM229) turns ON.

HKY/Hexadecimal numeric key input

HKY

Use the keyboard (16 keys) of 0 to F to input, set the numerical value (0 to 9) and operating conditions (A to F function keys) and other instructions for data input.

When the extended function is ON, the hexadecimal number of the 0 to F keys could be used for keyboard input.

-[HKY (s) (d1) (d2) (d3)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The start bit device (X) number that input 16-key (occupies 4 points)	-	Bit	ANY_BOOL
(d1)	The start device (Y) number that outputs (occupies 4 points)	-	Bit	ANY_BOOL
(d2)	The device number that stores the value input from the 16 keys	0 to 9999	BIN16 bit	ANY16_S
(d3)	The start bit device number whose key is ON (occupies 8 points)	-	BIN16 bit	ANY16_S

Device used

Instruction	Parameter	Devices											Offset modification	Pulse extension
		X	Y	M	S	SM	D.b	T	C	D	R	SD	[D]	XXP
HKY	Parameter 1	●											●	
	Parameter 2		●										●	
	Parameter 3							●	●	●	●	●	●	
	Parameter 4		●	●	●	●	●						●	

Features

16-bit operation (HKY)

Scan the input [S to S+3] and column output [D1 to D1+3] signals connected with 16 keys (0 to F), press the 0 to 9 keys, the value will be saved in D2, and the keyboard detection will be output to D3 +7 in.

In addition, after pressing the A to F keys, the key information corresponding to the keyboard [D3 to D3+5] is ON, and the keyboard detection is output to D3+6.

(1) About using the keys 0 to 9 to input the values D3, D3+7

If it is more than 9,999, overflow from the high digit. The entered value is stored in D2 as BIN (binary number).

When any key from 0 to 9 is pressed, the keyboard detection output D3+7 is ON.

(2) Information about A to F keys D3 to D3+6

Corresponding to the A to F keys, the first 6 o'clock of D3 is ON. When any key from A to F is pressed, the keyboard detection output D3+6 is ON.

Keyboard	Key information
A	D3
B	D3+1
C	D3+2
D	D3+3
E	D3+4
F	D3+5

Extensions

After SM167 is ON and the extended function becomes valid, the data of the hexadecimal keys from 0 to F is saved in BIN mode.

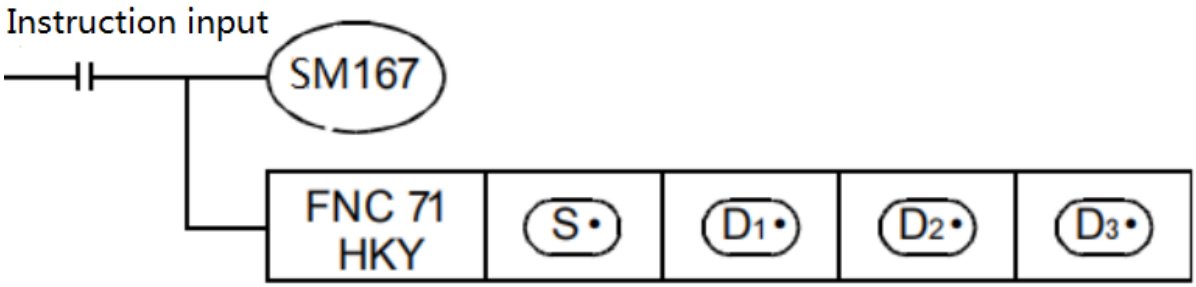
Except for the following, it is the same as the above-mentioned [Function and Operation Description].

The hexadecimal data input using the 0 to F keys is written into D2 as it is.

(1) Regarding the numerical input using the 0 to F keys D2

When it is FFFF or more, overflow from the upper digits.

For example, when inputting 1→2→3→B→F, “23BF" is saved in D2 in BIN mode. When F is input, 1 overflows.



#Note

1. Restrictions on the number of uses of instructions

HKY instructions, only one of them can be used in the program.

2. When the keyboard is pressed simultaneously

When multiple keys are pressed at the same time, the key pressed first is effective.

3. When the instruction contact is OFF

Even if it is OFF, the content of D2 does not change, but D3 to D3 +7 all become OFF.

4. Number of occupied points of the device

When 16 keys are connected, 4 points from the start device S of input (X) are occupied.

When 16 keys are connected, 4 points from the start device D1 of output (Y) are occupied.

It occupies 8 points from the start device D3 for key information output.

Please do not to overlap with the devices used in other controls of the machine.

D3 to D3+5: A to F key key information

D3+6: Keyboard detection output of A to F keys

D3+7: 0-9 key keyboard detection output

5. About the read timing of keyboard input

HKY instruction is executed synchronously with the operation cycle of the programmable controller.

It takes 8 operation cycles to complete a series of keyboard scans.

In order to prevent reading omissions caused by the filter delay of keyboard input, please use the [Constant Scan Mode] and [Timer Interrupt] functions flexibly.

6. Output form

Please use a transistor output type programmable controller.

Related device

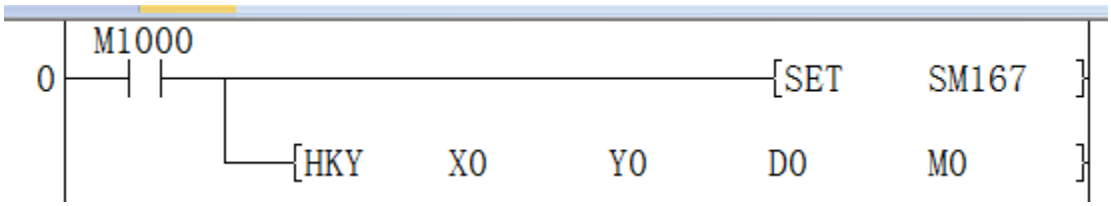
Devices	Name	Content
SM229	End of instruction execution	OFF: (d1) to (d1)+3 is being scanned, or the instruction is not executed ON: (d1) to (d1)+3 cyclic output operation (1 to 4 digit scan) and then turn ON

Error code

Error code	Content
4085H	The output result of the read application instruction (s) and (d2) exceeds the device range
4086H	The output result of the write application instruction (d1), (d2) and (d3) exceeds the device range

Example

Program



Wiring diagram

When inputting [1]→[2]→[3]→[B]→[F], save "23BF" in D0 in BIN mode.

When [F] is input, [1] overflows.

DHKY/32 system numeric key input

DHKY

Use the keyboard (16 keys) of 0 to F to input, set numerical value (0 to 9) and operating conditions (A to F function keys) and other instructions for data input.

When the extended function is ON, the hexadecimal number of 0 to F key can be used for keyboard input.

-[DHKY (s) (d1) (d2) (d3)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The start bit device (X) number that input 16-key (occupies 4 points)	-	Bit	ANY_BOOL
(d1)	The start device (Y) number that outputs (occupies 4 points)	-	Bit	ANY_BOOL
(d2)	The device number that stores the value input from the 16 keys	0 to 99999999	BIN32 bit	ANY32_S

(d3)	The start bit device number whose key is ON (occupies 8 points)	-	BIN16 bit	ANY16_S	

Device used

Instruction	Parameter	Devices													Offset modification	Pulse extension
		X	Y	M	S	SM	D.b	T	C	D	R	SD	LC	HSC	[D]	XXP
DHKY	Parameter 1	●													●	
	Parameter 2		●												●	
	Parameter 3							●	●	●	●	●	●	●	●	
	Parameter 4		●	●	●	●	●								●	

Features

32-bit operation (DHKY)

Scan the input [S to S+3] and column output [D1 to D1+3] signals connected with 16 keys (0 to F), press the 0 to 9 keys, and the value will be saved in [D2+1, D2] , The keyboard detection is output to D3+7.

In addition, after pressing the A to F keys, the key information corresponding to the keyboard [D3 to D3+5] is ON, and the keyboard detection is output to D3+6.

(1) Regarding the use of keys from 0 to 9 to input values [D2+1, D2], D3+7

If it is 99,999,999 or more, overflow from the high digit.

The entered value is stored in [D2+1, D2] as BIN (binary number).

When any key from 0 to 9 is pressed, the keyboard detection output D3+7 is ON.

(2) Button information about A to F keys D3 to D3+6

For keyboard press information, please refer to 16-bit operation (HKY) on the previous page

extensions

After SM167 is ON and the extended function becomes valid, the data of the hexadecimal keys from 0 to F is saved in BIN mode.

Except for the following, it is the same as the above-mentioned “Function and Operation Description”.

The hexadecimal data input using the 0 to F keys are written in [D2+1, D2] as they are.

(1) Regarding the numerical input using 0 to F keys [D2+1, D2]

-When it is FFFFFFFF or more, overflow from the upper digits.

For example, when inputting [9]→[2]→[3]→[B]→[F]→[A]→[F], save "923BFAF" in [D2+1, D2] in BIN mode.

#Note

1. Restrictions on the number of uses of instructions

Only one of the DHKY instructions can be used in the program.

2. When the keyboard is pressed simultaneously

When multiple keys are pressed at the same time, the key pressed first is effective.

3. When the instruction contact is OFF

Even if it is OFF, the content of D2 does not change, but D3 to D3 +7 all become OFF.

4. Number of occupied points of the device

When 16 keys are connected, 4 points from the start device S of input (X) are occupied.

When 16 keys are connected, 4 points from the start device D1 of output (Y) are occupied.

It occupies 8 points from the start device D3 for key information output.

Please be careful not to overlap with the devices used in other controls of the machine.

D3 to D3+5: A to F key key information

D3+6: Keyboard detection output of A to F keys

D3+7: 0-9 key keyboard detection output

5. About the read timing of keyboard input

The DHKY instruction is executed synchronously with the operation cycle of the programmable controller.

It takes 8 operation cycles to complete a series of keyboard scans.

In order to prevent reading omissions caused by the filter delay of keyboard input, please use the “Constant Scan Mode” and “Timer Interrupt” functions flexibly.

6. Output form

Please use a transistor output type programmable controller.

Related device

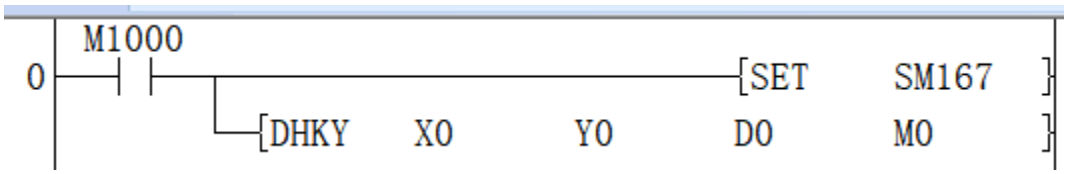
Devices	Name	Content
SM229	End of instruction execution	OFF: (d1) to (d1)+3 is being scanned, or the instruction is not executed ON: (d1) to (d1)+3 cyclic output operation (1 to 4 digit scan) and then turn ON

Error code

Error code	Content
4085H	The output result of the read application instruction (s) and (d2) exceeds the device range
4086H	The output result of the write application instruction (d1), (d2) and (d3) exceeds the device range

Example

Program



.Wiring diagram

When inputting 1→2→3→B→F→5→7→6, save "123BF576" in BIN to [D1,D0].

PR/ASCII code printing

PR

This instruction is to output ASCII data in parallel to the output (Y).

-[PR (s) (d)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Start number of the device storing ASCII code data		String (ASCII code only)	ANY_ASC
(d)	The start number Y of output ASCII code data	-	Bit	ANY_BOOL

Device used

Instruction	Parameter	Devices						Offset modification	Pulse extension
		Y	T	C	D	R	SD	[D]	XXP
PR	Parameter 1		●	●	●	●	●	●	
	Parameter 2	●						●	

Features

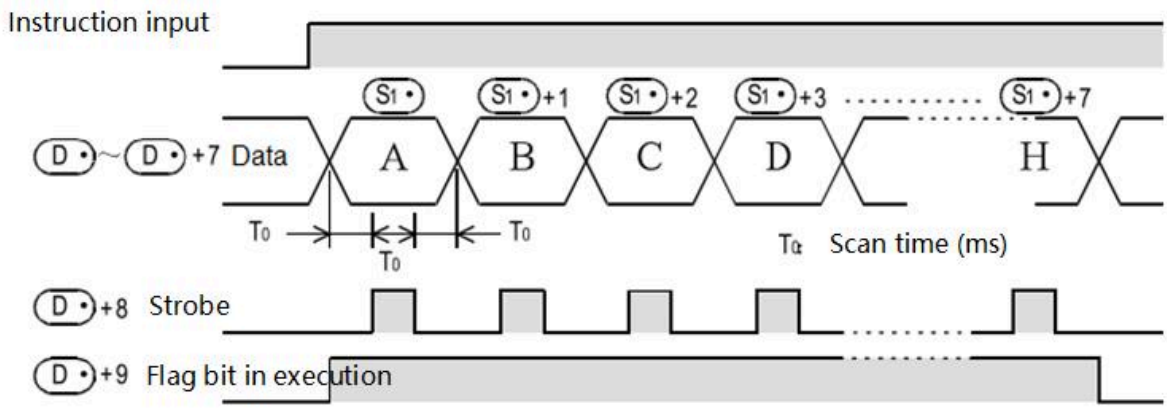
The ASCII code stored in the lower 8 bits (1 byte) of (S) to (S)+7 is output to (D) to (D)+7 character by character in a time division manner.

The ASCII code saved in is shown below, and the following timing diagram is based on this example.

The sequence of sending starts from (S) = "A", and ends with (S) + 7 = "H" for this purpose, sending eight bytes.

(S•)	(S•)+1	(S•)+2	(S•)+3	(S•)+4	(S•)+5	(S•)+6	(S•)+7
A(H41)	B(H42)	C(H43)	D(H44)	E(H45)	F(H46)	G(H47)	H(H48)

Timing diagram



The type of output signal

- D•~D•+7 : Send output D• Low bit D•+7 High bit
- D•+8 : Strobe signal
- D•+9 : Flag bit in execution Operate by the sequence diagram above

Related device

Devices	Name	Content
SM227	PR mode	OFF: 8 bytes serial output (fixed to 8 characters) ON: 16 bytes serial output (1 to 16 characters)

#Note:

1. Instruction input and instruction action

Instruction input=ON: Even if the instruction is continuously ON or the pulse instruction is executed, as long as the output of one cycle ends, the execution ends.

SM229 only works when SM227=ON.

instruction input=OFF: all outputs are OFF.

2. Relationship with scan time (operation time)

The instruction is executed synchronously with the scan time.

When the scan time is short, you can use the constant scan mode to drive; when the scan time is longer, you can use the timer interrupt drive.

3. About the output of the programmable controller

Please use a transistor output type programmable controller.

4. When 00H (NUL) exists in the data (when SM227=ON)

After the instruction is executed, the remaining data is not output.

In addition, SM229 maintains an operation cycle ON.

5. Restrictions on the number of uses of instructions

Only one PR instruction can be used in the program.

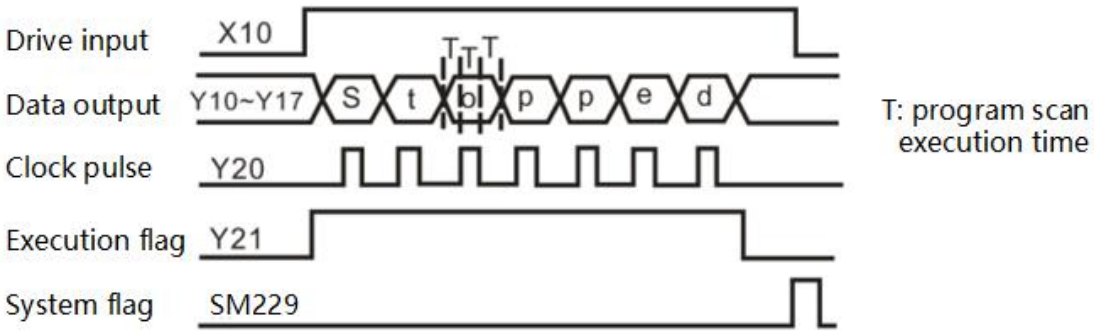
Error code

Error code	Content
4085H	The output result of the read application instruction (s) exceeds the device range
4086H	The output result of the write application instruction (d) exceeds the device range

Example

Program

If the ASCII code in D200 to D203 is "Stopped", the corresponding output port signal and its timing are as follows:



SEGD/Numeric key input

SEGD(P)

Instruction to light up the 7-segment digital tube (1 digit).

-[SEGD (s) (d)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	Decoded start word device	-32767 to 32767	Bit	ANY_BOOL
(d)	Word device number for storing 7-segment display data	-32767 to 32767	Bit	ANY_BOOL

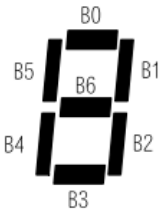
Device used

Instruction	Parameter	Devices												Offset modification	Pulse extension
		KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	E	[D]	XXP
SEGD	Parameter 1	●	●	●	●	●	●	●	●	●	●	●		●	●
	Parameter 2		●	●	●	●	●	●	●	●				●	●

Features

Decode the low 4-digit (1 digit) of 0 to F (hexadecimal number) of (S) into 7-segment display data and save it in the low 8-digit of (d).

1.7-segment code decode table

(S·)					Seven segment code	(D·)											Display
HEX	b3	b2	b1	b0		B15	···	B8	B7	B6	B5	B4	B3	B2	B1	B0	
0	0	0	0	0		—		—	0	0	1	1	1	1	1	1	0
1	0	0	0	1		—		—	0	0	0	0	0	1	1	0	1
2	0	0	1	0		—		—	0	1	0	1	1	0	1	1	2
3	0	0	1	1		—		—	0	1	0	0	1	1	1	1	3
4	0	1	0	0		—		—	0	1	1	0	0	1	1	0	4
5	0	1	0	1		—		—	0	1	1	0	1	1	0	1	5
6	0	1	1	0		—		—	0	1	1	1	1	1	0	1	6
7	0	1	1	1		—		—	0	0	1	0	0	1	1	1	7
8	1	0	0	0		—		—	0	1	1	1	1	1	1	1	8
9	1	0	0	1		—		—	0	1	1	0	1	1	1	1	9
A	1	0	1	0		—		—	0	1	1	1	0	1	1	1	A
B	1	0	1	1		—		—	0	1	1	1	1	1	0	0	b
C	1	1	0	0		—		—	0	0	1	1	1	0	0	1	C
D	1	1	0	1		—		—	0	1	0	1	1	1	1	0	d
E	1	1	1	0		—		—	0	1	1	1	1	0	0	1	E
F	1	1	1	1		—		—	0	1	1	1	0	0	0	1	F

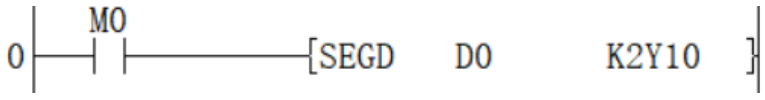
↑
The start of the bit device, or the lowest bit of the word device is B0

#**Note:** Number of occupied points of the device: The low 8 bits of the output of the device (S) are occupied, and the high 8 bits do not change.

Error code

Error code	Content
4085H	The output result of the read application instruction (s) and (d) exceeds the device range
4086H	The output result of the write application instruction (d) exceeds the device range

Example



When M0 is set, the lower 4 bits of the data in D0 are decoded and output to the Y10 to Y17 ports. The corresponding table for translation is shown in the above table (7-segment code decoding table). The table does not need to be prepared by the user, and the comparison table is already available in the PLC system.

SEGL/7SEG code hour and minute display

SEGL

Control 1 or 2 groups of 4-digit 7-segment digital tube display instructions with latch.

-[SEGL (S) (D) (N)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(S)	Start word device for BCD conversion	0 to 9999	BIN16 bit	ANY16
(D)	The starting Y number to be output	-	Bit	ANY_BOOL
(N)	Parameter number [Setting range: K0(H0) to K7(H7)]	0 to 7	BIN16/32 bit	ANY16_U

Device used

Instruction	Parameter	Devices												Offset modification	Pulse extension
		Y	KnX	KnY	KnM	KnS	T	C	D	R	SD	K	H	[D]	XXP
SEGL	Parameter 1		●	●	●	●	●	●	●	●	●	●	●	●	
	Parameter 2	●												●	
	Parameter 3											●	●		

Features

Convert the 4-bit value of (S) into BCD data, and use the time-division method to sequentially output each 1 digit to a 7-segment digital tube with BCD decoding. (S) is valid when BIN data in the range of 0 to 9999.

The parameter (N) should be set as follows based on the positive and negative logic on the programmable controller side and the positive and negative logic on the 7-segment side.

Programmable controller output logic	Data input	Strobe signal	Parameter n	
			4 digits in 1 group	4 digits in 2 groups
Negative logic	Negative logic (consistent)	Negative logic (consistent)	0	4
		Positive logic (inconsistent)	1	5
	Positive logic (inconsistent)	Negative logic (consistent)	2	6
		Positive logic (inconsistent)	3	7
Positive logic	Positive logic (consistent)	Negative logic (consistent)	0	4
		Positive logic (inconsistent)	1	5
	Negative logic (inconsistent)	Negative logic (consistent)	2	6
		Positive logic (inconsistent)	3	7

(1) When using 4 digits in 1 group (N=K0 to 3)

After converting the 4-digit value of (S) from BIN→BCD, use the time division method to output each digit in turn from (D) to (D)+3. In addition, the strobe signal output (D)+4 to (D)+7 is also output in a time-division manner, locked to the 7-terminal display of the first group of 4 digits

(2) When using 4 digits in 2 groups (N=K4 to 7)

1) 4-digit group 1

After converting the 4-digit value of (S) from BIN→BCD, use the time division method to output each digit in turn from (D) to (D)+3. The strobe signal output (D)+4 to (D)+7 is output in time-division manner in turn, locked to the 7-segment display of the first group of 4 digits.

2) 4-digit group 2

After converting the 4-digit value of (S)+1 from BIN+BCD, use the time division method to output each digit in turn from (D)+10 to (D)+13. The strobe signal output (D)+4 to (D)+7 is output in a time-division manner in turn, locked to the 7-segment display of the second group of digits.

#Note:

1. About the time required to update the 7-segment 4-digit display

The time required to update the 4-digit display (1 group or 2 groups) is 12 times the scan time (operation time).

2. Action when command input is OFF

When the command input is ON, the action is repeated. However, if the command contact turns off during an action, the action will be interrupted. When it is ON again, it will start from the original action.

3. Occupied points of the device

When using 4 digits in 1 group: 1 point from the start device specified in S is occupied.

Occupy 8 points from the start device specified in D. Even when the number of bits is small, the occupied points cannot be used for other purposes.

When using 4 digits 2 groups: 2 points from the start device specified in S are occupied.

Occupy 12 points from the start device specified in D. Even when the number of bits is small, the occupied points cannot be used for other purposes.

4. About scan time (operation cycle) and display timing

The SEGL instruction is executed synchronously with the scan time (operation cycle) of the programmable controller.

In order to perform a series of displays, the scan time of the programmable controller needs to exceed 10ms.

When it is less than 10ms, please use the constant scan mode and run with a scan time longer than 10ms.

5. Regarding the output format of the programmable controller

Please use a transistor output type programmable controller.

6. Limit number of instructions

This instruction can be used at most 2 at the same time.

Related device

Devices	Name	Content
SM229	End of instruction execution	After the processing is completed, SM229 is ON for one scan cycle

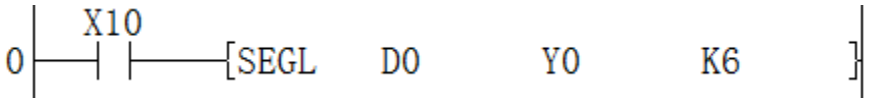
Error code

Error code	Content
4084H	The data input in the application instruction (N) exceeds the specified range
4085H	The output result of the read application instruction (S) exceeds the device range

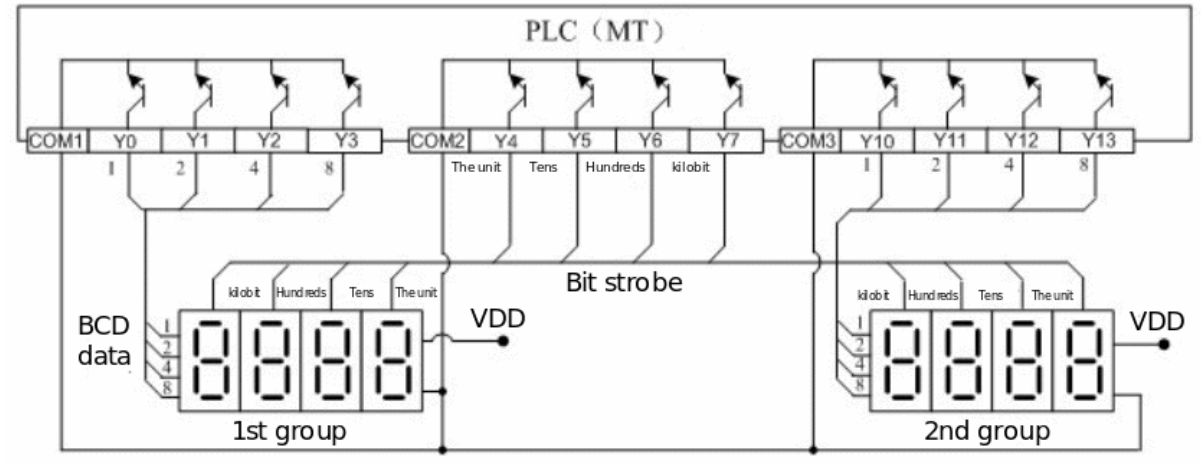
4086H	The output result of the write application instruction (D) exceeds the device range
4089H	The number of application instructions exceeds the limit

Example

Program



The corresponding hardware wiring is shown in the following figure. The content of D0 is displayed on the first group of digital tubes, and the content of D1 is displayed on the second group of digital tubes. If the reading of D0 or D1 exceeds 9999, the program will run into an error:



The digital tube used in the wiring diagram has its own display data latch, 7-segment decoding and driving, and 7-segment digital of negative logic type (when the input port is low, it means that the input data is 1, or is strobed) Show tube. During display processing, PLC's Y4 to Y7 ports will scan automatically, and only one port is ON each time as a bit strobe signal. At this time, the data on Y0 to Y3 ports is the BCD code data sent to the corresponding bit. When the bit strobe signal turns from ON→OFF, it is latched into the latch in the digital tube. After internal decoding and driving, the digital tube displays the number. The PLC system cyclically processes Y4 to Y7 in turn, until all 4 bits are processed. In the same way, Y10 to Y13 are the data output ports of the second group of 4-digit digital tubes, which share the bit strobe lines of Y4 to Y7. The processing methods are the same, and the display processing of the two groups is performed at the same time. In the example, if D0=K2468 and D1=K9753, the first group will display 2 4 6 8 and the second group will display 9 7 5 3.

It takes 12 scan cycles to complete a display refresh. After the processing is completed: According to the positive and negative logic of the programmable controller, the positive and negative logic of the seven-segment code, etc., select according to the following principles:

For a group of 4 digits, N=0 to 3. When two groups of 4 digits, N= 4 to 7.

Display group number	**Group 1**				**Group 2**			
Y data output polarity	PNP		NPN		PNP		NPN	
Strobe and data polarity	Identical	Opposite	Identical	Opposite	Identical	Opposite	Identical	Opposite
the value of N	0	1	2	3	4	5	6	7

TKY/Numeric key input

TKY

Use the keyboard (number keys) of 0 to 9 to input instructions for setting data such as timers and counters.

-[TKY (s) (d1) (d2)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The start bit device that input the numeric key (occupies 10 points)	-	Bit	ANY_BOOL
(d1)	Word device number for storing data	0 to 9999	Signed BIN16	ANY16_S
(d2)	The start bit device number whose key start bit device is ON (occupies 11 points)	-	Bit	ANY_BOOL

Device used

Instruction	Parameter	Devices														Offset modification	Pulse extension
		X	Y	M	S	SM	D.b	KnY	KnM	KnS	T	C	D	R	SD	[D]	XXP
TKY	Parameter 1	●	●	●	●	●	●									●	
	Parameter 2							●	●	●	●	●	●	●	●	●	
	Parameter 3		●	●	●	●	●									●	

Features

Input [(s) to +9] to the connected number keys and press the keyboard, save the input value in (d1), and output in (d2) to +10

Keyboard input information and detected keyboard output.

(1) About the input value (d1)

If it is more than 9,999, overflow from the high digit.

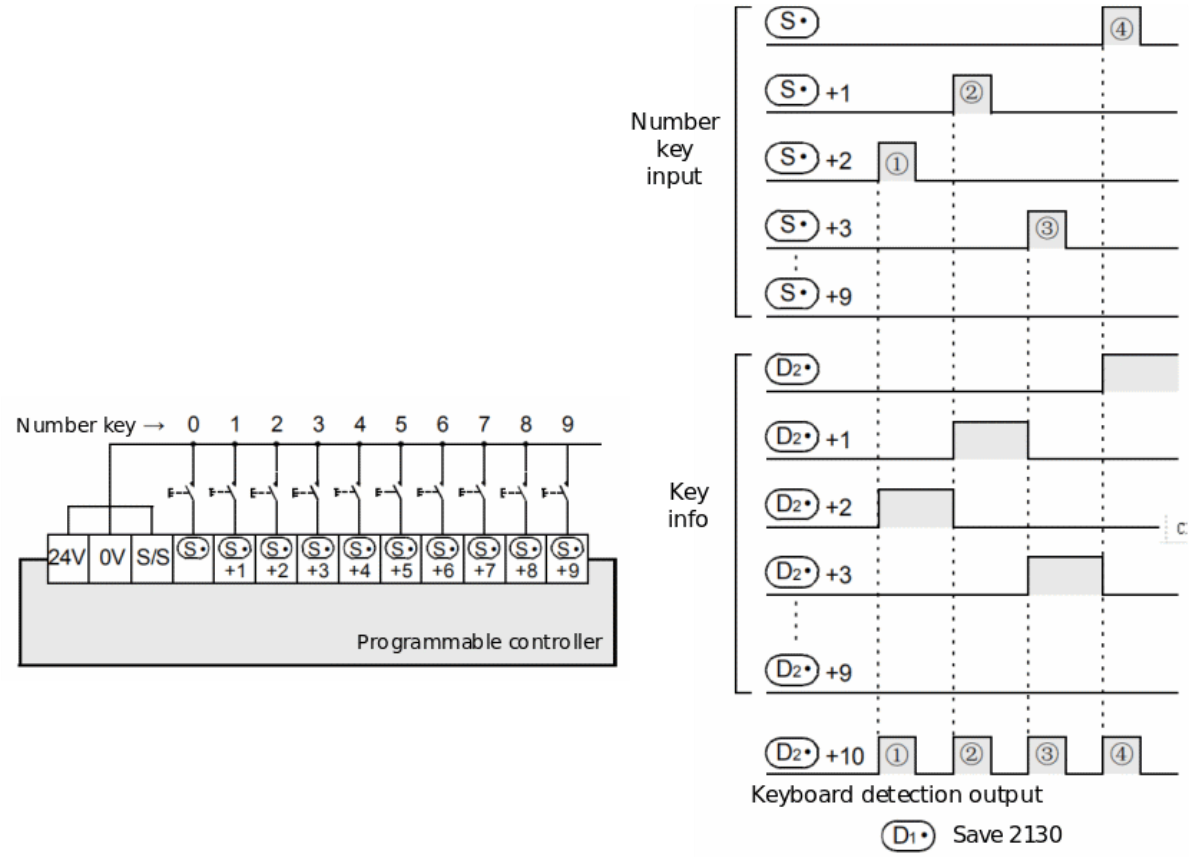
The entered value is saved in BIN (binary number).

After pressing the number keys in the order of ①, ②, ③, ④, it is stored as 2130 in (d1).

(2) About (d2) to 10 of key information

(d2) to 9 key information, according to the pressed key ON/OFF.

When any key from 0 to 9 is pressed, the keyboard detection output of (d2) +10 is ON.



#Note:

1. When the keyboard is pressed simultaneously

When multiple keys are pressed at the same time, only the key pressed first is effective.

2. When the instruction contact is OFF

Even if it is OFF, the content of (d2) will not change, but (d2) to (d2)+10 will be OFF.

3. Occupied points of the device

Connect the input of the number keys, occupying 10 points from (s).

Even when the number key is not connected (not used), since (d2) is already occupied, it cannot be used for other purposes.

It occupies 11 points from the start device (d2) for key information output.

Please be careful not to overlap with the devices used in other controls of the machine.

(D2) to (d2)+9: Turn ON according to the input of number keys 0 to 9.

(D2)+10: It is ON when any key between 0 to 9 is pressed. (Keyboard detection output)

4. Restrictions on the number of uses of instructions

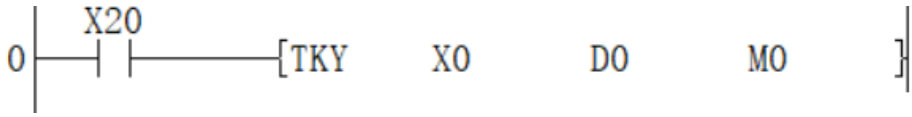
Only one of the TKY instruction or DTKY instruction can be used in the program.

Error code

Error code	Content

4085H	The output result of the read application instruction (s) exceeds the device range
4086H	The output result of the write application instruction (d) exceeds the device range

Example

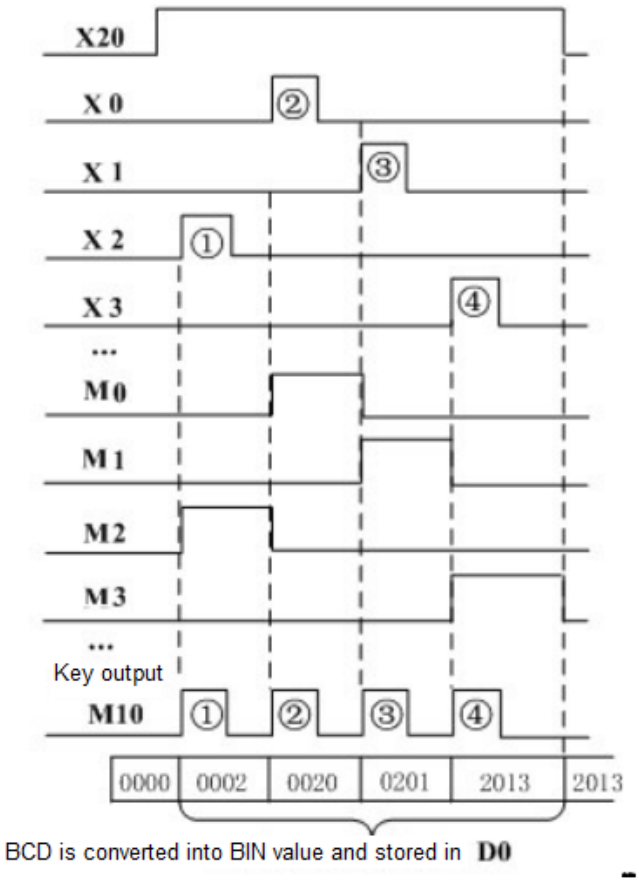


To input the number "2013", press the keys 2, 0, 1, 3 (X2, X0, X1, X3) in order. The operation of the PLC internal variables is shown in the figure below.

According to the parameter setting in the instruction, X0toX11 correspond to 0to9 numeric keys; M0toM9 correspond to the state of the keys; when any key is pressed, the key output unit M10 will be set;

The key value (such as 2013) is converted to BIN format and stored in the specified D1 unit D0; (D0=0x7DD), even if the power flow of the drive turns OFF, D0 will not change;

When multiple keys are pressed, the first detected key is valid; when the input number exceeds 4 digits, the first input number changes overflow, leaving only the last 4 numbers input.



DTKY/Numeric key input

DTKY

Use the 4 points starting from the device specified in (d) to perform 4 types of timer output.

-[STMR (s1) (s2) (d)]

Content, range and data type

Parameter	Content	Range	Data type	Data type (label)
(s)	The start bit device that input the numeric key (occupies 10 points)	-	Bit	ANY_BOOL
(d1)	Word device number for storing data	0 to 99999999	Signed BIN32	ANY32_S
(d2)	The start bit device number whose key start bit device is ON [occupies 11 points]	-	Bit	ANY_BOOL

Device used

Instruction	Parameter	Devices																Offset modification	Pulse extension
		X	Y	M	S	SM	D.b	KnY	KnM	KnS	T	C	D	R	SD	LC	HSC	[D]	XXP
DTKY	Parameter 1	●	●	●	●	●	●											●	
	Parameter 2							●	●	●	●	●	●	●	●	●	●	●	
	Parameter 3		●	●	●	●	●											●	

Features

Input [(s) to +9] to the connected number keys and press the keyboard, save the input value in (d1), and output in (d2) to +10

Keyboard input information and detected keyboard output.

(1) About the input value (d1)

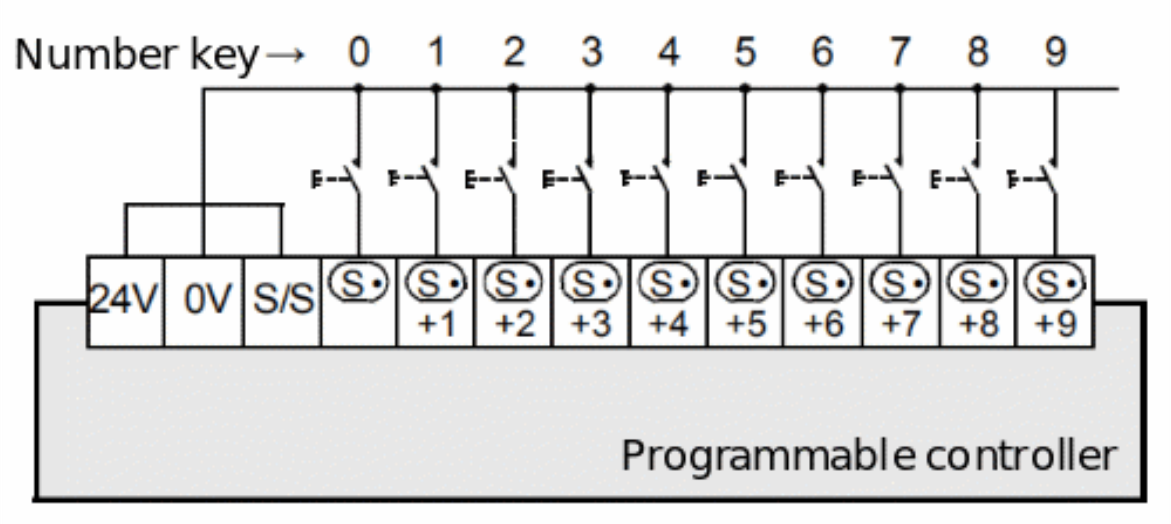
If it is more than 9,999, overflow from the high digit.

The entered value is saved in BIN (binary number).

(2) (d2) to 10 of key information

(d2) to +9 key information, according to the pressed key ON/OFF.

When any key from 0 to 9 is pressed, the keyboard detection output of (d2) +10 is ON.



#Note:

1. When the keyboard is pressed simultaneously

When multiple keys are pressed at the same time, only the key pressed first is effective.

2. When the command contact is OFF

Even if it is OFF, the content of (d2) will not change, but (d2) to (d2)+10 will be OFF.

3. Occupied points of the device

Connect the input of the number keys, occupying 10 points from (s).

Even when the number key is not connected (not used), since (d2) is already occupied, it cannot be used for other purposes.

It occupies 11 points from the start device (d2) for key information output.

Please be careful not to overlap with the devices used in other controls of the machine.

(D2) to (d2)+9: Turn ON according to the input of number keys 0 to 9.

(D2)+10: It is ON when any key between 0 to 9 is pressed. (Keyboard detection output)

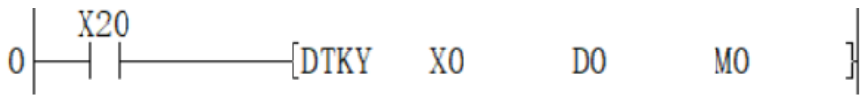
4. Restrictions on the number of uses of instructions

Only one of the TKY instruction or DTKY instruction can be used in the program.

Error code

Error code	Content
4085H	The output result of the read application instruction (s) and (d1) exceeds the device range
4086H	The output result of the write application instruction (d1) and (d2) exceeds the device range

Example



When X20 is on, if you want to input the number "20205689", press 2, 0, 2, 0, 5, 6, 8, 9 (X2, X0, X2, X0, X5, X6, X10, X11) in sequence , Then (the value in (D1,D0) is 20205689)