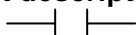



<b>TimeRy Power Software Specifications</b>






First Edition 1999-03-08  
Seventh Edition 1999-07-10

# TimeRy Power Function description of the function block

## Index

0. Element type and number range	.....	page 3
1. Element description for ladder	.....	page 4
A.  (Normal open)	.....	page 5
B.  (Normal)	.....	page 6
C. Output types —[ ,   ,   , P	.....	page 6
D. “ON” differential and “OFF” differential contact ‘s function for timing and ON/OFF state	.....	page 7
(1). “ON” differential contact (D)		
(2). “OFF” differential contact (d)		
E. Combination for the normal open , normal close and the element connection line	.....	page 10
F. Scan sequence for ladder and function block	.....	page 11
2. Function block description	.....	page 12
A. COUNTER Block	.....	page 12
(1).Counter function mode selection1 : with overtaking (N=1)		
(2).Counter function mode selection2 : without overtaking (N=2)		
(3).Counter function mode selection3 : with overtaking, power down retain (N=3)		
B. TIMER Block	.....	page 15
(1). Timer function mode selection 1 : On-delay timer 1 (N = 1)		
(2). Timer function mode selection 2 : On-delay timer 2 (N = 2)		
(3). Timer function mode selection 3 : Off-delay timer 1 (N = 3)		
(4). Timer function mode selection 4 : Off-delay timer 2 (N = 4)		
(5). Timer function mode selection 5 : Flash timer 1 (N = 5)		
(6). Timer function mode selection 6 : Flash timer 2 (N = 6)		
(7). Timer function mode selection 7 : Flash timer 3 (N = 7)		
C. RTC Block	.....	page 23
(1). Every day action function		
(2). Interval time action function		
(3). Summer/Winter time switch		
D. Analog compare Block	.....	page 26
(1). (N=1) When (Preset value - Reference value) $\leq$ Vcurrent $\leq$ (Preset value + Reference value) , then Y Turn On $\Downarrow$ ( A2 - R.RRv) $\leq$ A1 $\leq$ ( A2 + R.RRv) , then Y Turn On		
(2). (N=2) When Vcurrent $\leq$ Preset value , then Y Turn On $\Downarrow$ A1 $\leq$ A2 , then Y Turn On		
(3). (N=3) When Vcurrent $\geq$ Preset value , then Y Turn On $\Downarrow$ A1 $\geq$ A2 , then Y Turn On		
(4). (N=4) When Reference value $\leq$ Vcurrent $\leq$ preset value , then Y Turn On $\Downarrow$ R.RRv $\leq$ A1 $\leq$ A2 , then Y Turn On		
(5). (N=5) When Reference value $\geq$ Vcurrent , then Y Turn On $\Downarrow$ R.RRv $\geq$ A1 $\geq$ A2 , then Y Turn On		
(6). (N=6)When Reference value $\leq$ Vcurrent, then Y Turn On $\Downarrow$ R.PRv $\leq$ A2		
(7). (N=7)When Reference value $\geq$ Vcurrent, then Y Turn On $\Downarrow$ R.PRv $\geq$ A2		
E. Other functions		
(1). S-R Relay   (2)Pulse Relay With Reset		

## 0. Element type and number range

				P			No.
Input Contact					I	i	I1~IC / i1~iC
Output Contact & Relay	Q	Q	Q	Q	Q	q	Q1~Q8 / q1~q8
Auxiliary Contact & Relay	M	M	M	M	M	m	M1~MF / m1~mF
RTC Contact	R				R	r	R1~R8 / r1~r8
Counter Contact	C				C	c	C1~C8 / c1~c8
Timer Contact	T			T	T	t	T1~TF / t1~tF
Analog compare output Contact	G				G	g	G1~G4 / g1~g4

	Differential "ON"	Differential "OFF"	
Differential Contact	D	d	

Open element	" "	
Short element	"_"	



For element connection line

Symbol	Function and description
-	Horizontal line to next column
-	Vertical and horizontal line to upper row and next column
+	Vertical and horizontal line to upper and down row and next column
-	Vertical and horizontal line to down row and next column

Element combination logic

Logic	Example for the Combination	Equation	Remark
and	I1- I2- I3- [Q1	$Q1 = (I1 \text{ and } I2) \text{ and } I3$	When the I1,I2,I3 anyone is OFF , the Q1 is OFF
or	I1- --- --- [Q1 I2+ I3+ I4-	$Q1 = ((I1 \text{ or } I2) \text{ or } I3) \text{ or } I4$	When the I1,I2,I3,I4 anyone is ON , the Q1 is ON

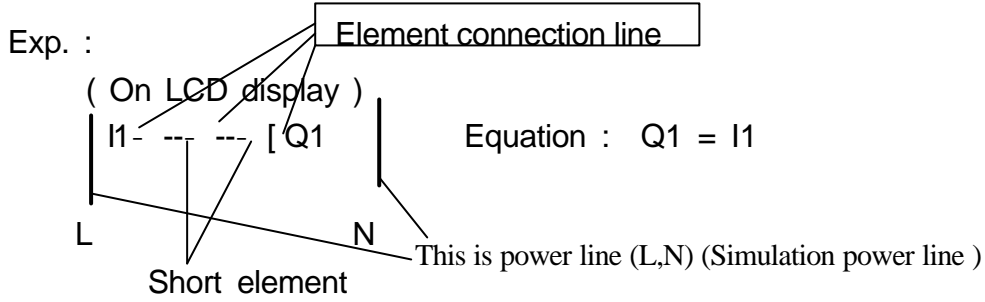
# 1. Element description for ladder

	Output	Contact		I1~IC / i1~iC
	-[ ,? ,? ,P			No.
Input Contact		I	i	I1~IC / i1~iC
		The state comes from the TimeRy Power input terminal block		
Output Relay	Q			Q1~Q8
		The state sends to the TimeRy Power output terminal block		
Output Contact		Q	q	Q1~Q8 / q1~q8
		The state comes from the output relay ( -[ Q )		
Auxiliary Relay	M			M1~MF
		The state sends to the auxiliary contact		
Auxiliary Contact		M	m	M1~MF / m1~mF
		The state comes from the auxiliary relay ( -[ M )		
“ON” Differential Contact		D		D
“OFF” Differential Contact			d	d
RTC Contact		R	r	R1~R8 / r1~r8
		The state comes from the function block output in same number		
Counter Contact		C	c	C1~C8 / c1~c8
		The state comes from the function block output in same number		
Timer Contact		T	t	T1~TF / t1~tF
		The state comes from the function block output in same number		
Analog compare output Contact		G	g	G1~G4 / g1~g4
		The state comes from the function block output in same number		

For function block input condition or enable condition

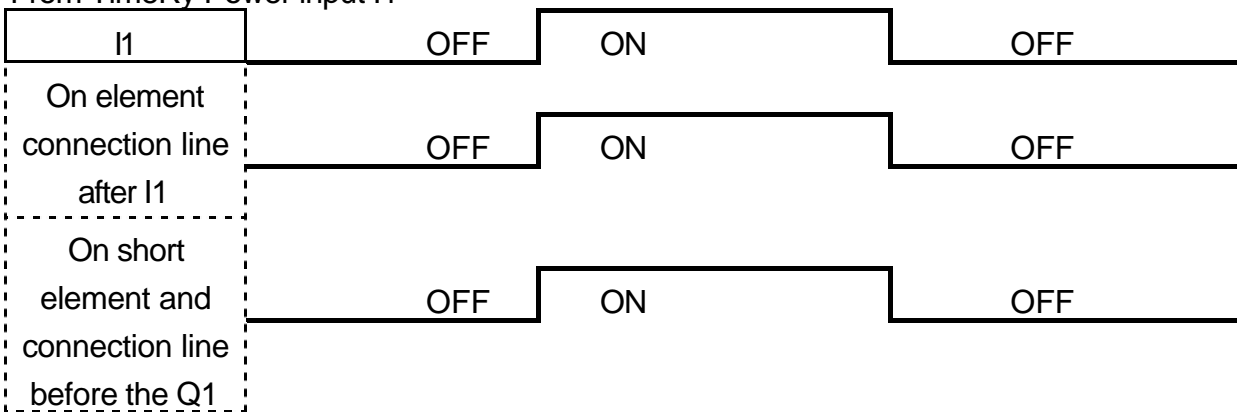
	P	-[ ]		
RTC Enable Relay		R	This relay turn ON to enable the indicated RTC function into execution mode	R1~R8
Counter Pulse input Relay		C	This relay turn ON/OFF to generate the pulse for the indicated Counter function	C1~C8
Timer Enable Relay		T	This relay turn ON to enable the indicated Timer function into execution mode	T1~TF
Enable Analog compare output Relay		G	This relay turn ON to enable the indicated Analog compare function into execution mode	G1~G4
Clock Pulse generator	T		This relay turn ON to enable the indicated Timer(N=7) Pulse timer function into execution mode	T1-TE

A.  (Normal open) : I , Q , M , R , C , T and G 's function for timing and ON/OFF state

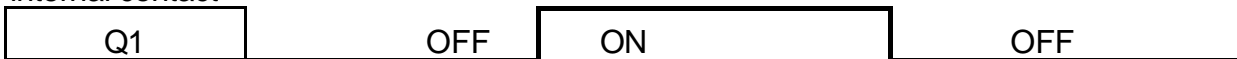


The timing chart and state for I , Q , M , R , C , T and G contact


From TimeRy Power input I1



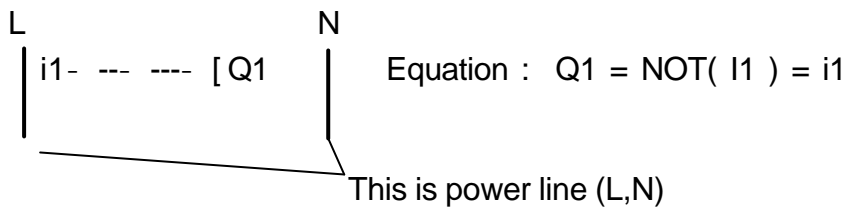
To TimeRy Power output relay Q1 and used for internal contact



Remark : The state of the "I1" is transferred through the element connection line and the short element to the Q1

**B.**  (Normal close) : i , q , m , r , c , t and g 's function for timing and ON/OFF state

Exp. :



The timing chart and state for i , q , m , r , c , t and g contact

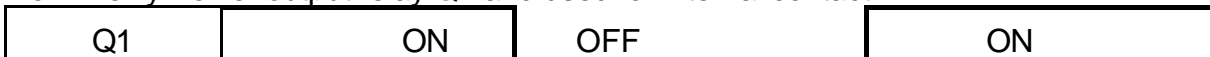
From TimeRy Power input I1



From TimeRy Power input I1 and inverse to i1




To TimeRy Power output relay Q1 and used for internal contact



Remark : The state of the "I1" is inversed and transferred through the element connection line and the short element to the Q1

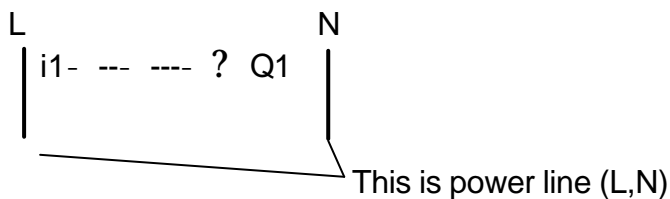
**C.** Output types  , ? , P

 (Normal output)

Exp : Refer to A.  + (Normal Open)

? (Set Relay)

Exp : (On LCD display)

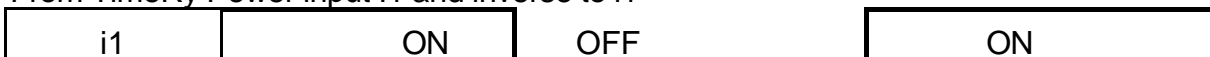


The timing chart and state for i , q , m , r , c , t and g contact

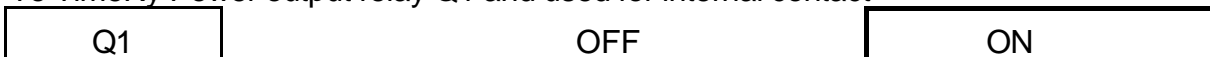
From TimeRy Power input I1



From TimeRy Power input I1 and inverse to i1

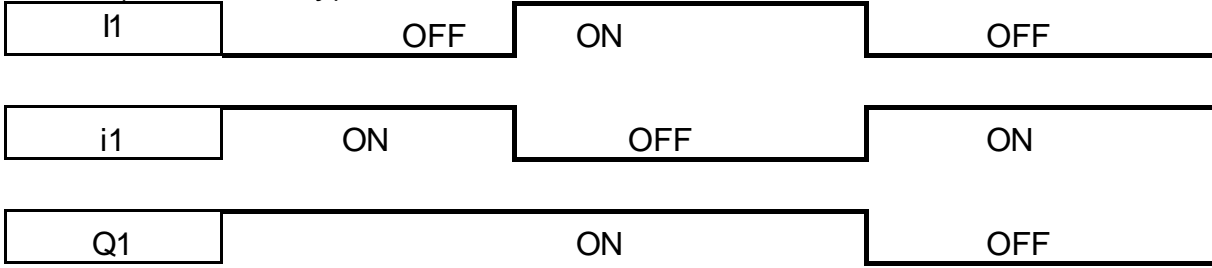


To TimeRy Power output relay Q1 and used for internal contact

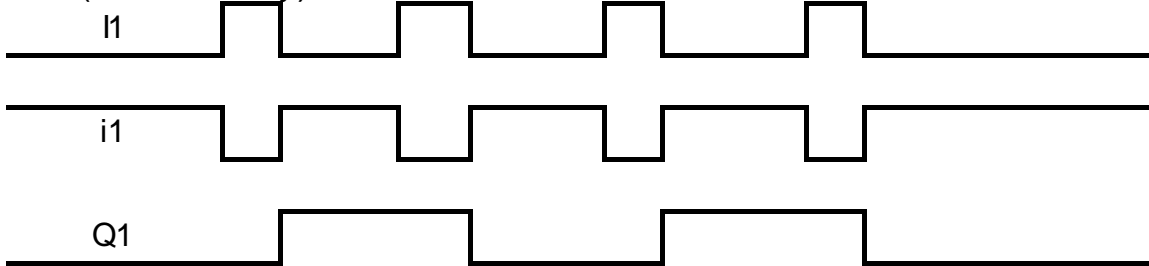


Remark : The state of the "I1" is inverted and transferred through the element connection line and the short element to set the Q1 "ON".

↓ (Reset Relay)



P (Pulse Relay)



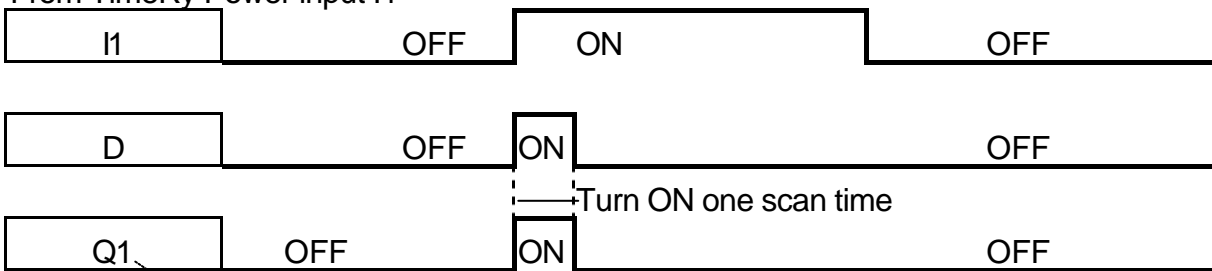
**D.** "ON" differential contact (D)

Exp. a :

$$I1 - D - \dots [Q1] \quad \text{Equation : } Q1 = d(I1)/d(t)$$

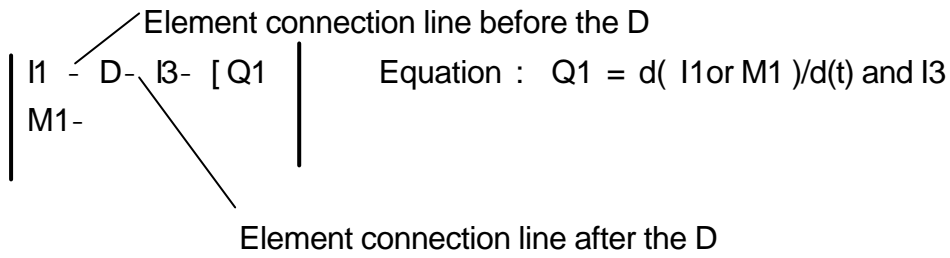
The timing chart and state for "ON" differential contact

From TimeRy Power input I1



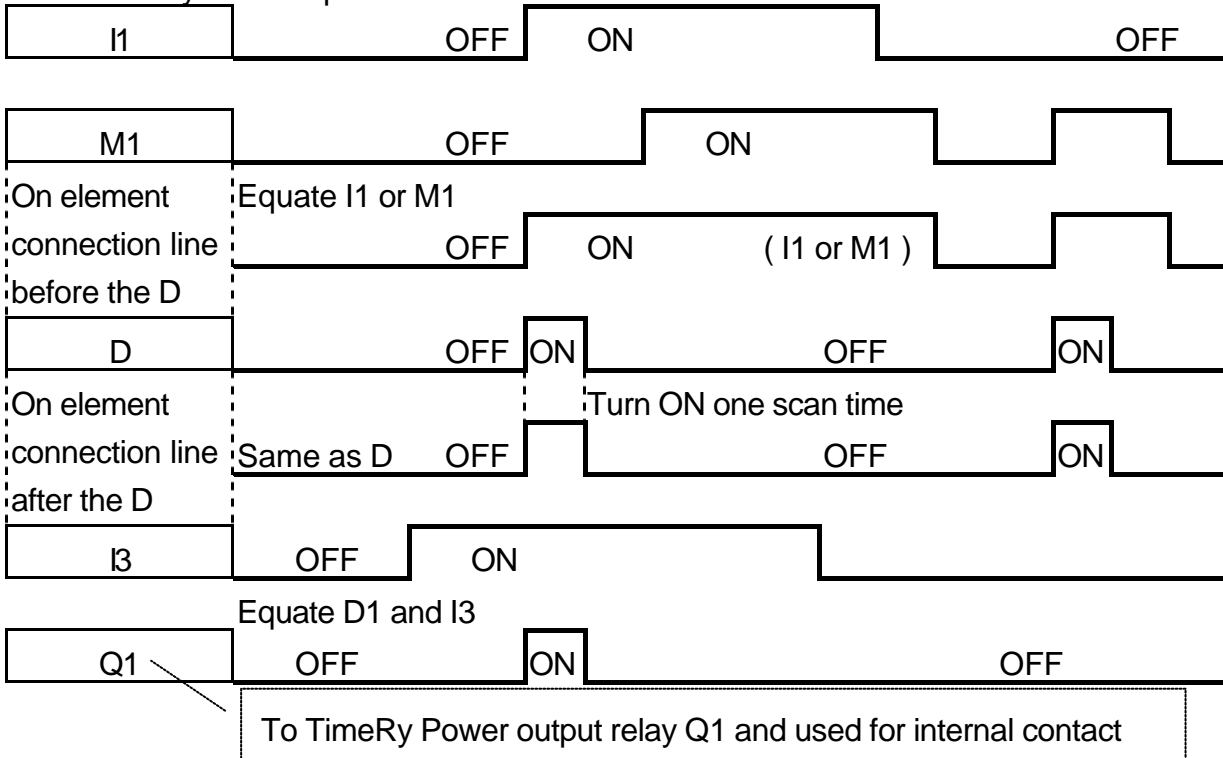
To TimeRy Power output relay Q1 and used for internal contact

Exp. b :



(1)The timing chart and state for “ON” differential contact

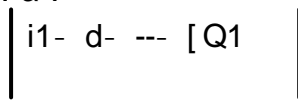
From TimeRy Power input I1





(2) "OFF" differential contact (d)

Exp. a :



$$\text{Equation : } Q1 = d( \text{NOT}( I1 ) ) / d(t) = d( i1 ) / d(t)$$

The timing chart for "OFF" differential contact

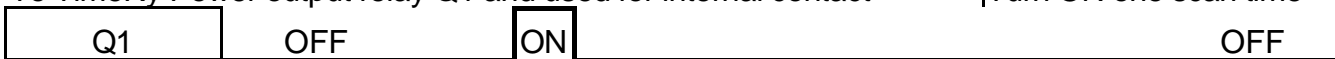
From TimeRy Power input I1



From TimeRy Power input I1 and inverse to i1



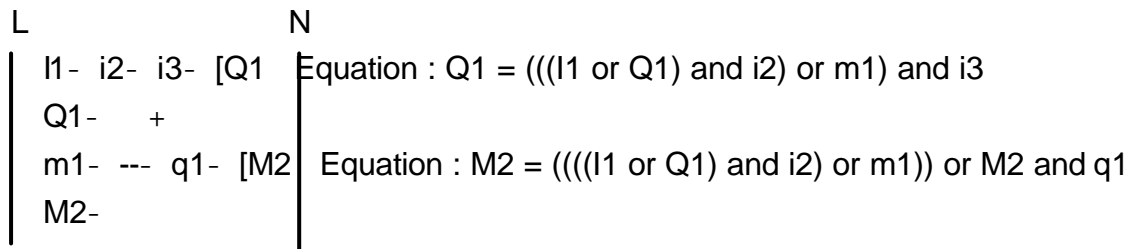
To TimeRy Power output relay Q1 and used for internal contact



Turn ON one scan time

**E.** Combination for the normal open , normal close and the element connection line

Exp. :



The timing chart and state

From TimeRy Power input I1



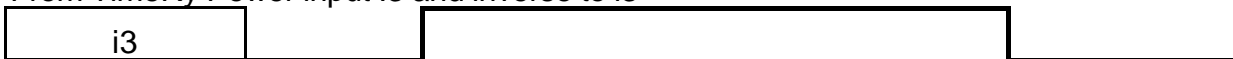
From output relay Q1



From TimeRy Power input I2 and inverse to i2



From TimeRy Power input I3 and inverse to i3



From Auxiliary relay M1 and inverse to m1



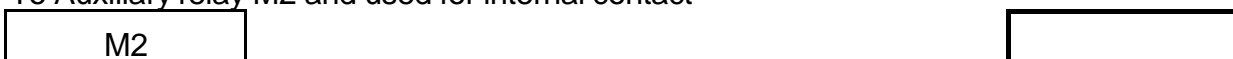
From Auxiliary relay M2



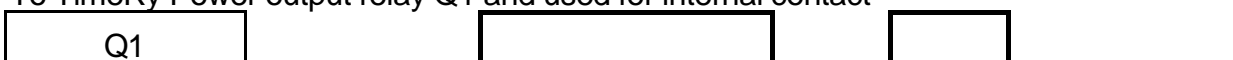
From output relay Q1 and inverse to q1



To Auxiliary relay M2 and used for internal contact

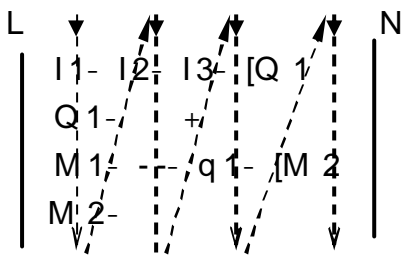


To TimeRy Power output relay Q1 and used for internal contact



**F. Scan sequence for ladder and function block**

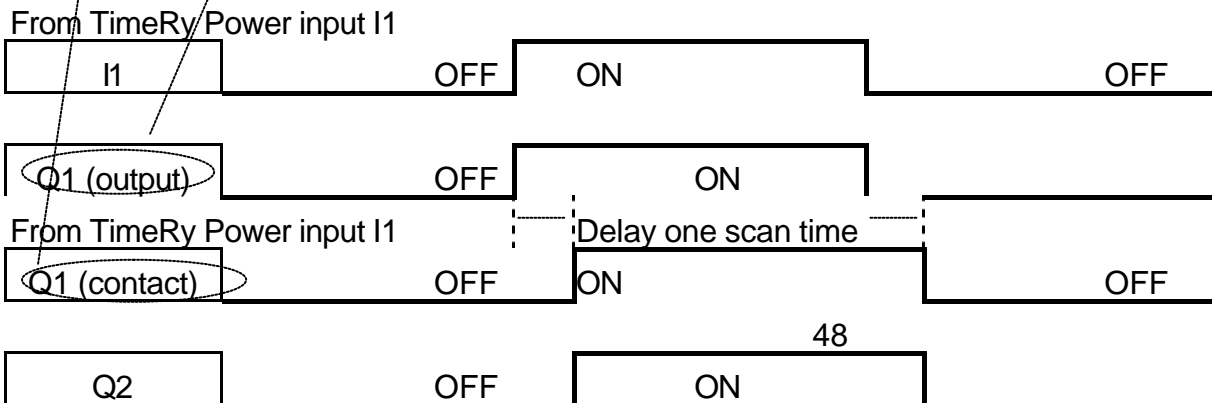
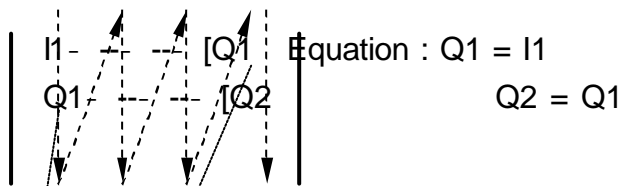
The scan sequence is showed as below :



One column by one column is scanned as above method independently until last row? When all columns had be scanned completely , Then the function block will be scanned?

Remark :

1. Because the scan method and sequence is show as above , the different design as below will cause one scan output delay ?



## 2. Function block description

### A. COUNTER Block

LCD Display

+N	+
X2   CCCC	
PPPP +Y	
X3-	+

The count pulse comes from the Counter pulse input relay ( C1 ~ C8 ) in the LADDER

X2 is contact number ( I1 ~ g4 ) for the Count direction set

OFF : Up count

ON : Down count

X3 is contact number ( I1 ~ g4 ) for the Counter reset input

ON : Clear counter current value & Turn off Y

OFF : Remain counting

Y is the COUNTER number (C1 ~ C8) and the status of this Counter

N=1, Counter without overtaking and without power down retain current value

N=2, Counter with overtaking and without power down retain current value

N=3, Counter without overtaking and with power down retain current value

N=4, Counter with overtaking and with power down retain current value

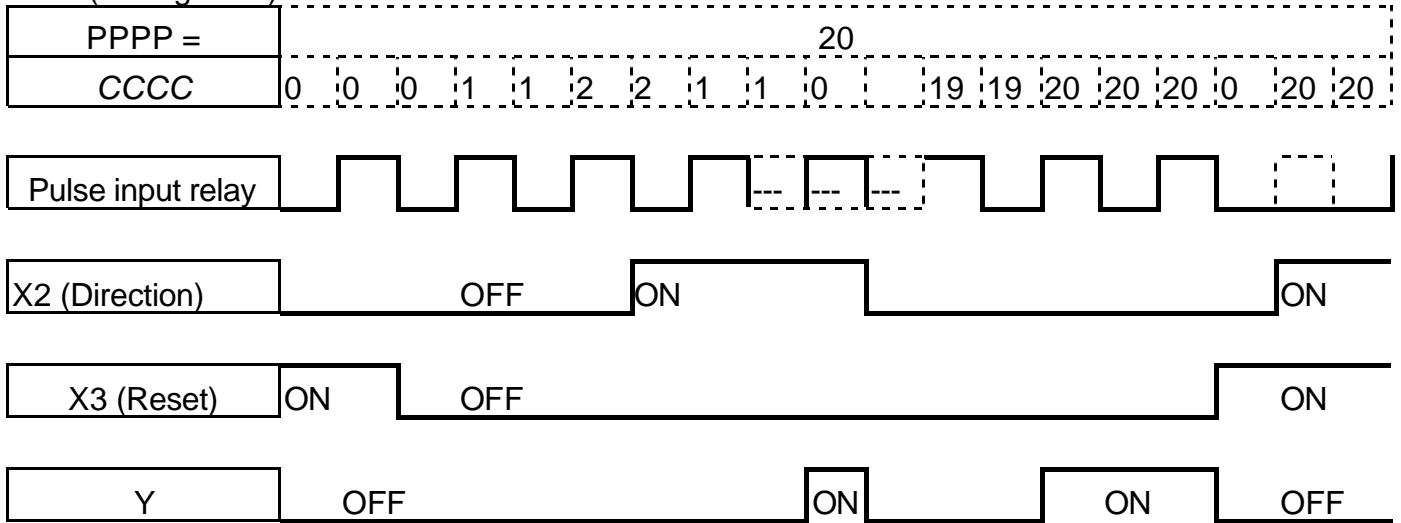
( This status will send to the LADDER as this counter's contact status

CCCC is the Counter current value ( 0000 ~ 9999 )

PPPP is the Counter Preset value ( 0000 ~ 9999 )

# (1) Counter function mode selection 1: (without overtaking)

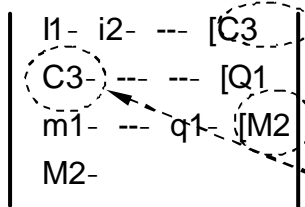
(Timing chart)



Remark : When the reset signal is "ON" in up count mode , the Current value will be cleared to "0"  
 When the reset signal is "ON" in down count mode , the Current value will be set to preset value

EXP. :

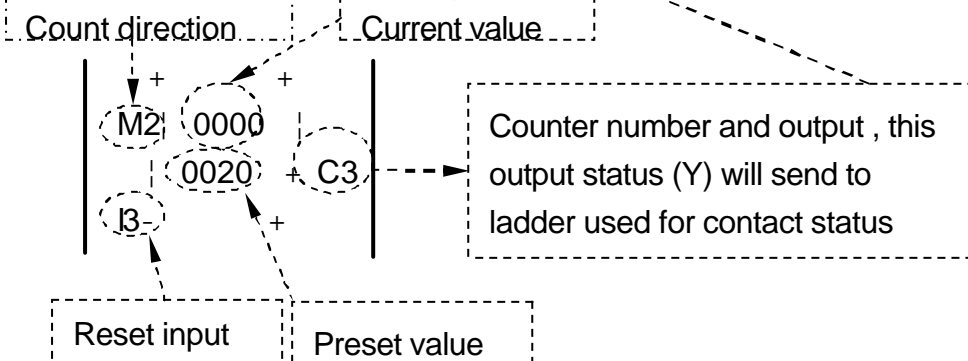
In the LADDER design as :



This relay is used as the pulse input relay of the counter C3 ,  
 The ON/OFF signal will increase or decrease the value of the counter C3

$$\text{Equation : } M2 = (\text{not } (M1) \text{ or } M2) \text{ and not}(Q1) \\ = m1 \text{ or } M2 \text{ and } q1$$

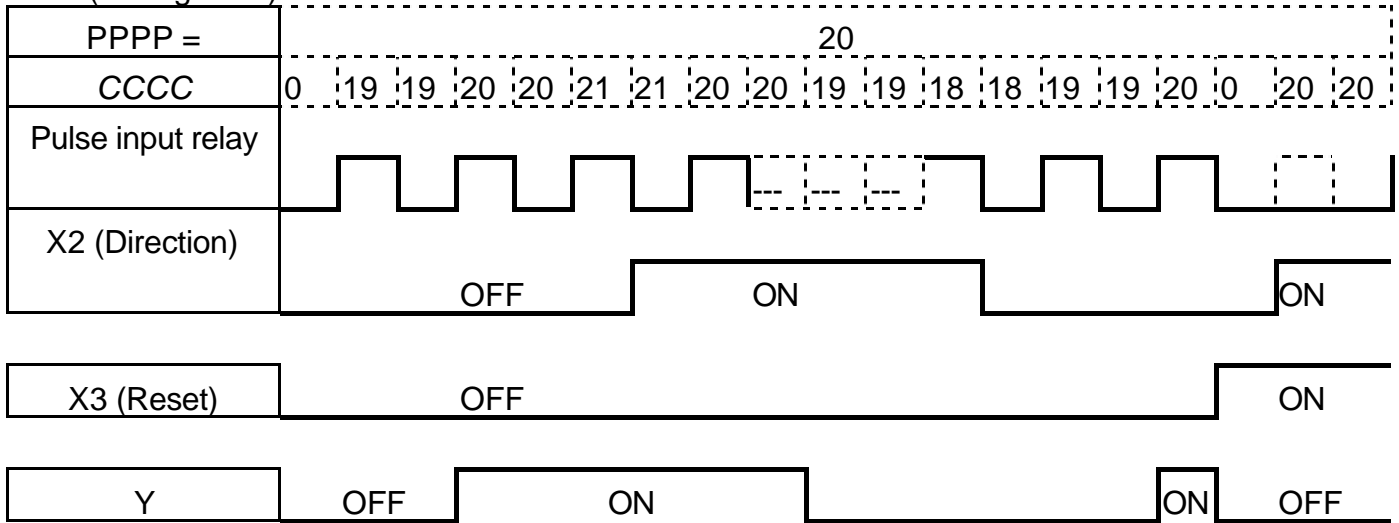
In the FUNCTION Block design as :



Counter number and output , this output status (Y) will send to ladder used for contact status

**(2)Counter function mode selection 2: (with overtaking)**

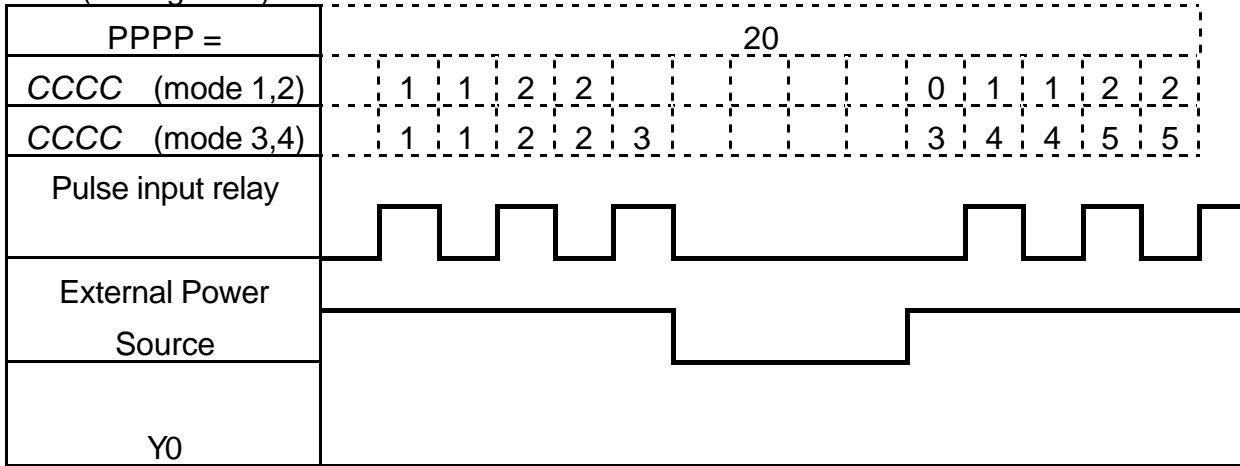
(Timing chart)



Remark : When the reset signal is "ON" in up count mode , the Current value will be cleared to "0"  
 When the reset signal is "ON" in down count mode , the Current value will be set to preset value

**(3)Difference between Counter function mode selection 1,2 and 3,4: (current value power down reset vs. power down retain)**

(Timing chart)



## B. TIMER Block

LCD Display

+ N	+
Z   CCCC	
PPPP +Y	
X3-	+

The enable Time signal comes from the Timer enable relay (T1 ~ TF) in the LADDER

Z is the input for the time base selection

1 : 0.0 ~ 999.9 sec

2 : 0 ~ 9999 sec

3 : 0 ~ 9999 min

X3 is contact number ( I1 – g4 ) for the Timer reset input  
( in function mode 1 , 5 ,7unused )

ON : Clear timer current value and Turn off Y

OFF : Non action

Y is the TIMER number (T1 ~ TF) and status of this Timer

N is the timer function mode selection

N = 1 : On-delay timer mode 1

2 : On-delay timer mode 2

3 : Off-delay timer mode 1

4 : Off delay timer mode 2

5 : Flash timer mode 1

6 : Flash timer mode 2

7: Flash timer mode 3

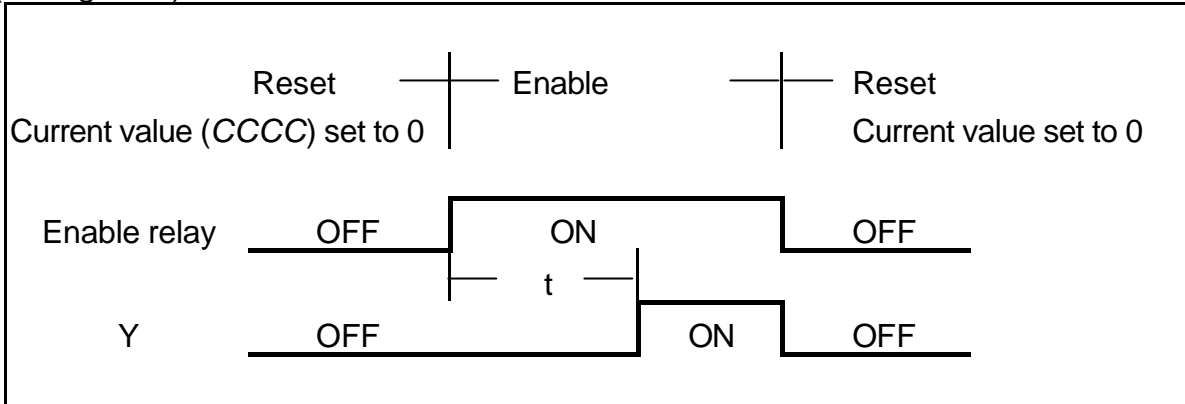
CCCC is the TIMER current value ( 0000 ~ 9999 or 000.0 ~ 999.9 )

PPPP is the Timer Preset value ( 0000 ~ 9999 or 000.0 ~ 999.9 )

( Set by user )

**(1). Timer function mode selection 1 : On-delay timer 1 ( N = 1 )**

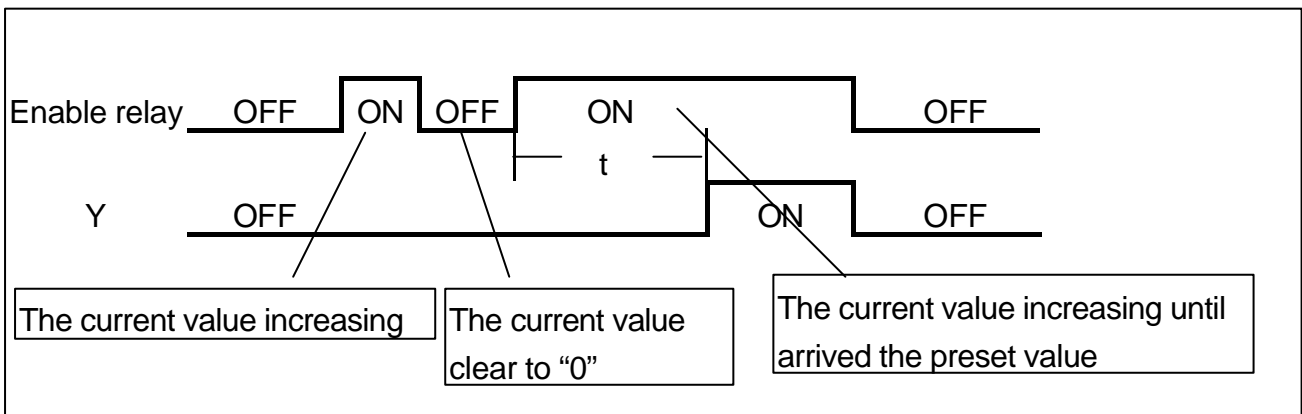
(Timing chart)



In this mode , X3 is no function

“t” is the time interval decided by the preset value (PPPP) , The current value CCCC is increased and stop when arrived preset value.

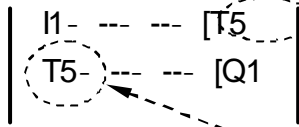
Note :





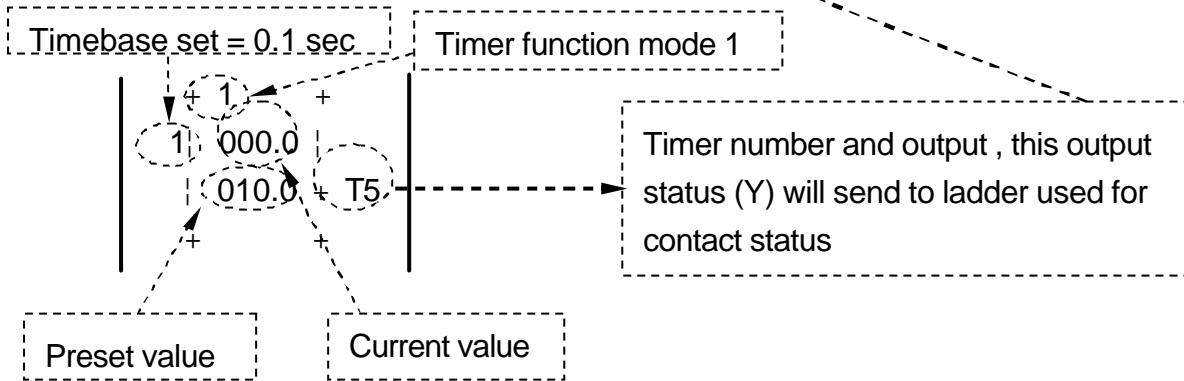
EXP. :

In the LADDER design as :

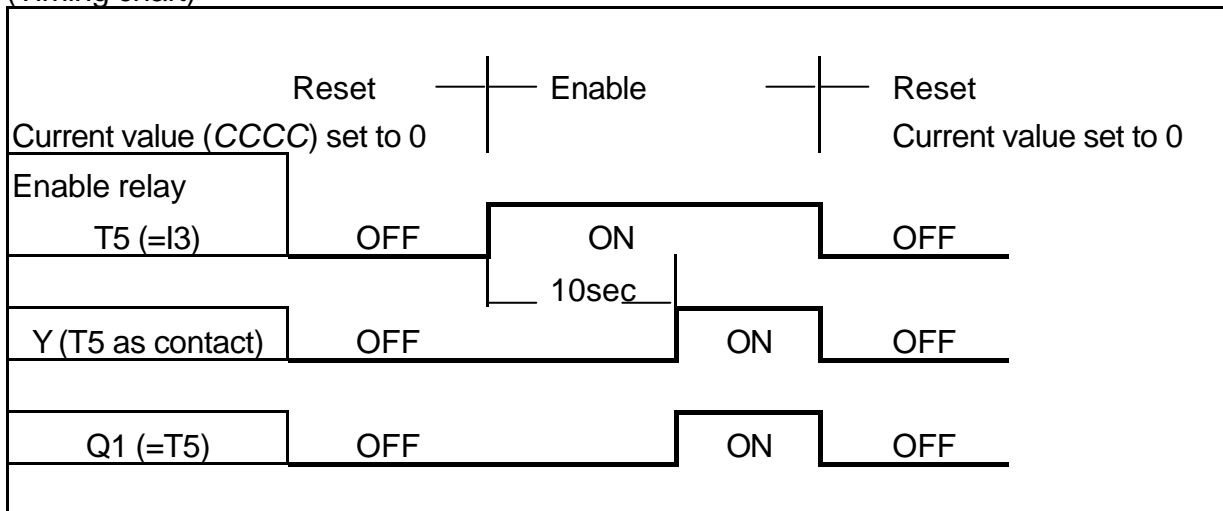


This relay is used as the enable relay of the timer T5 , The ON signal will enable the counter C3

In the FUNCTION Block design as :

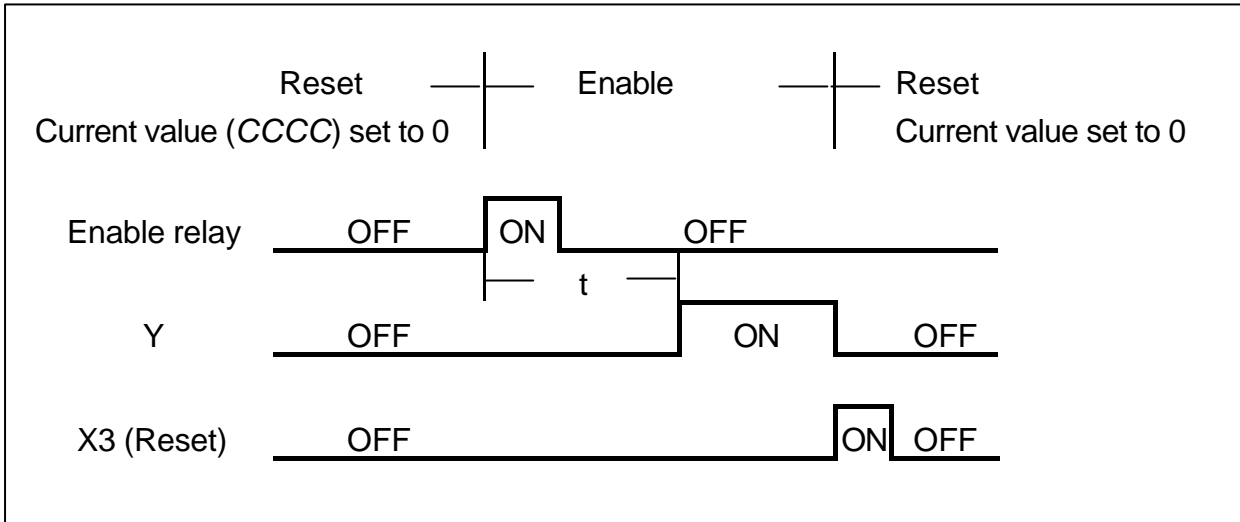


(Timing chart)



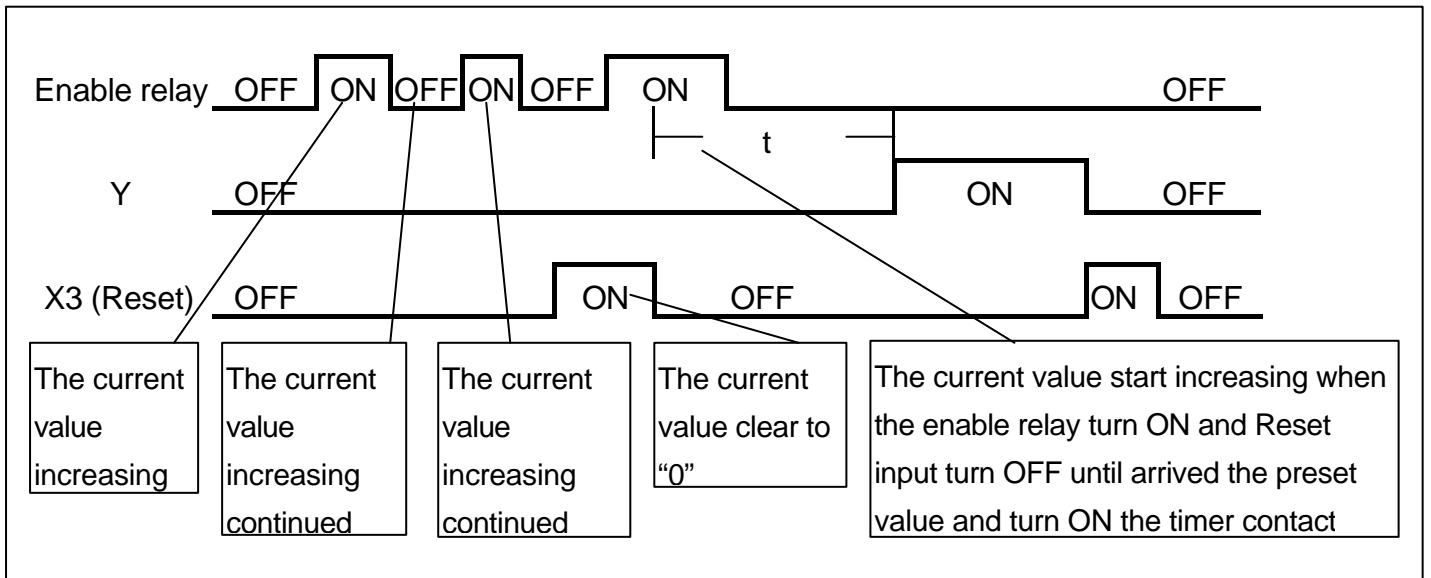
**(2). Timer function mode selection 2 : On-delay timer 2 ( N = 2 )**

EXP. : (Timing chart)



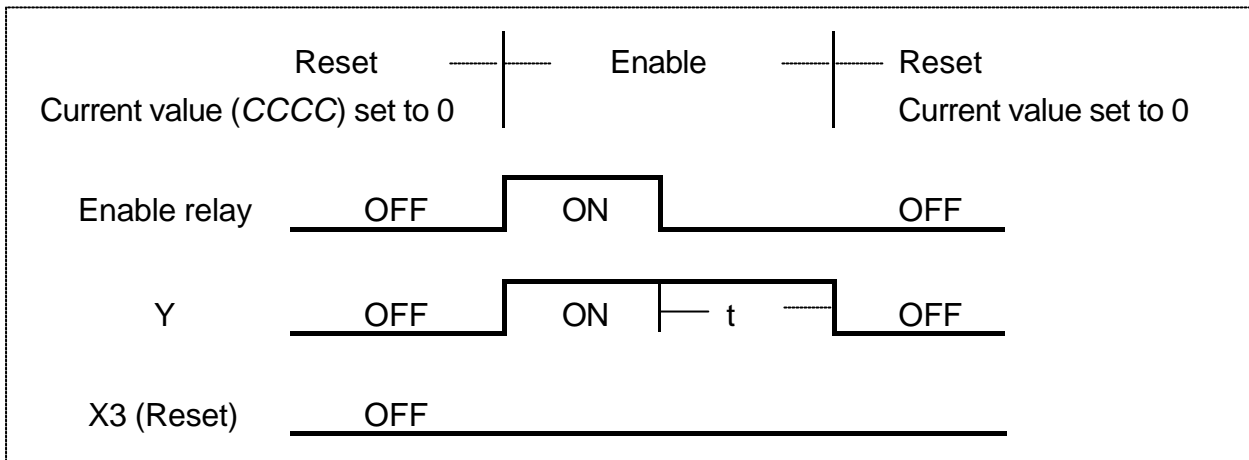
“t” is the time interval decided by the preset value (PPPP) , The current value CCCC is increased and stop when arrived preset value.

Note :



**(3). Timer function mode selection 3 : OFF-delay timer 1 ( N = 3 )**

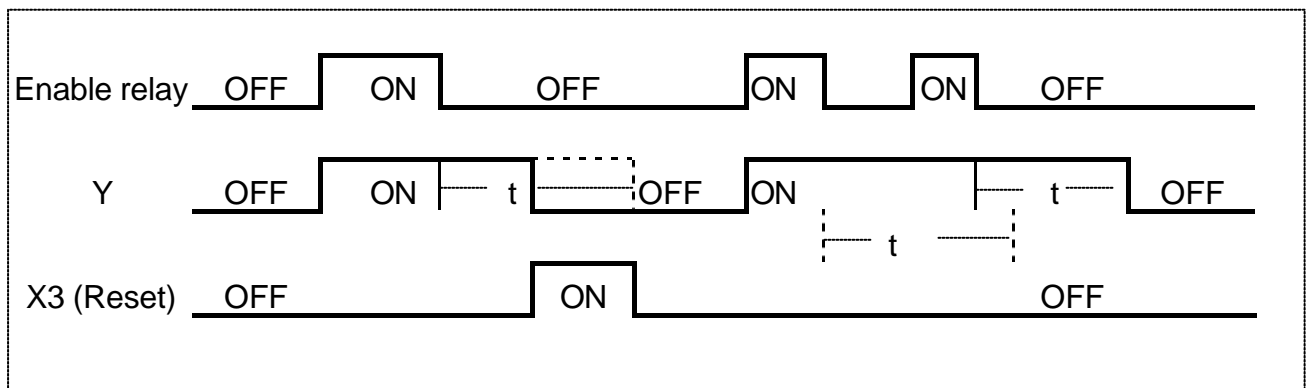
EXP. : (Timing chart)



“t” is the time interval decided by the preset value (PPPP) , The current value CCCC is increased and stop when arrived preset value.

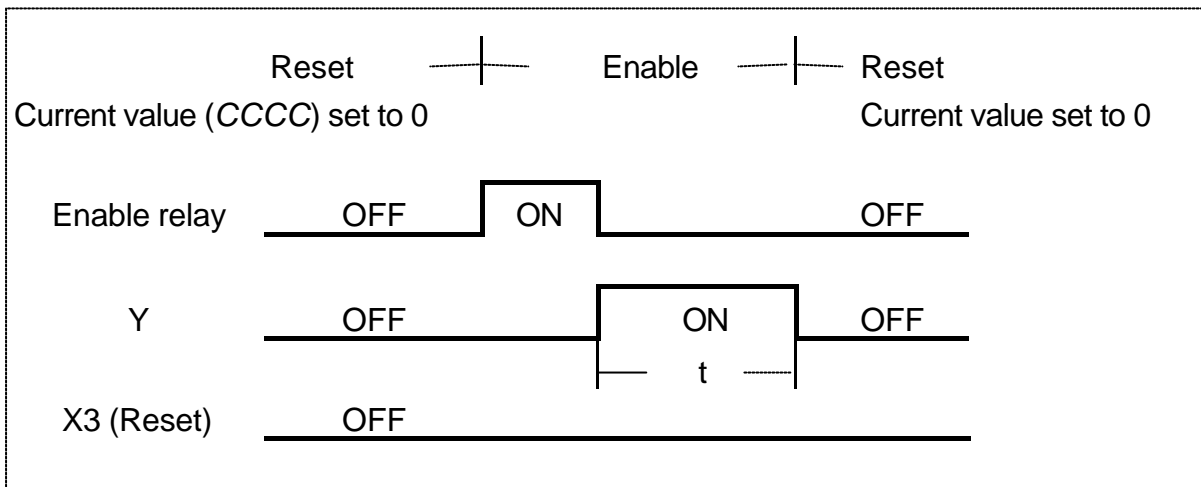
When the Reset input turns ON, The Y is turned OFF immediately, and the current value is clear to 0. When the current value is creasing, The enable relay signal from Off to ON will clear the current value.

Note :



**(4). Timer function mode selection 4 : OFF-delay timer 2 ( N = 4 )**

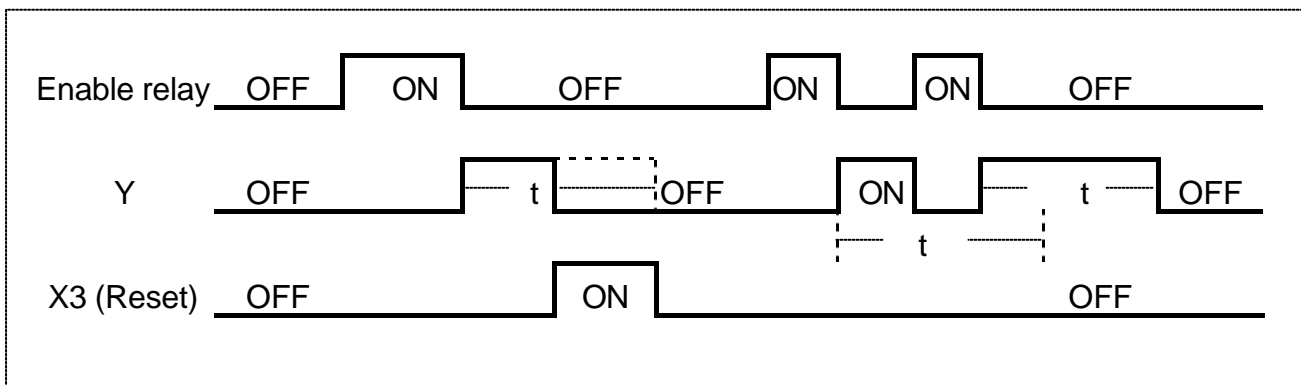
EXP. : (Timing chart)



“t” is the time interval decided by the preset value (PPPP) , The current value CCCC is increased and stop when arrived preset value.

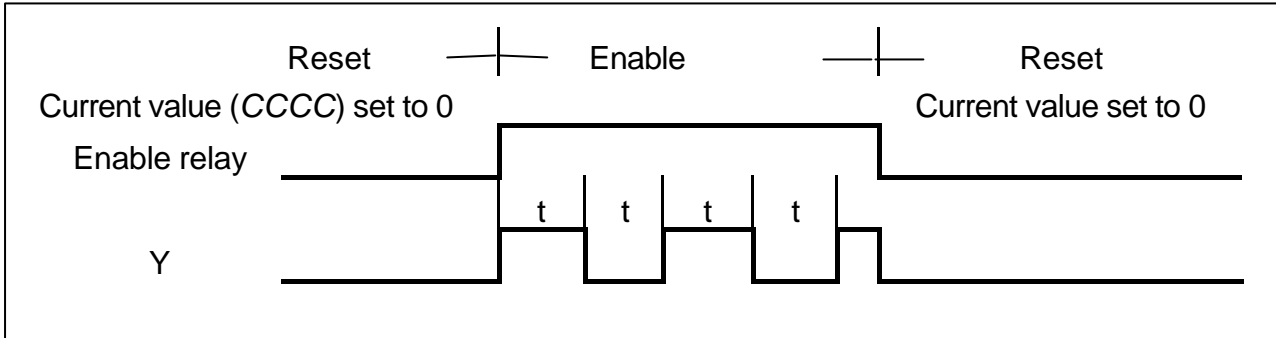
When the Reset input turns ON, The Y is turned OFF immediately , and the current value is clear to 0. When the current value is creasing , The enable relay signal from Off to ON will clear the current value.

Note :



**(5). Timer function mode selection 5 : Flash timer 1 ( N = 5 )**

EXP. : (Timing chart)

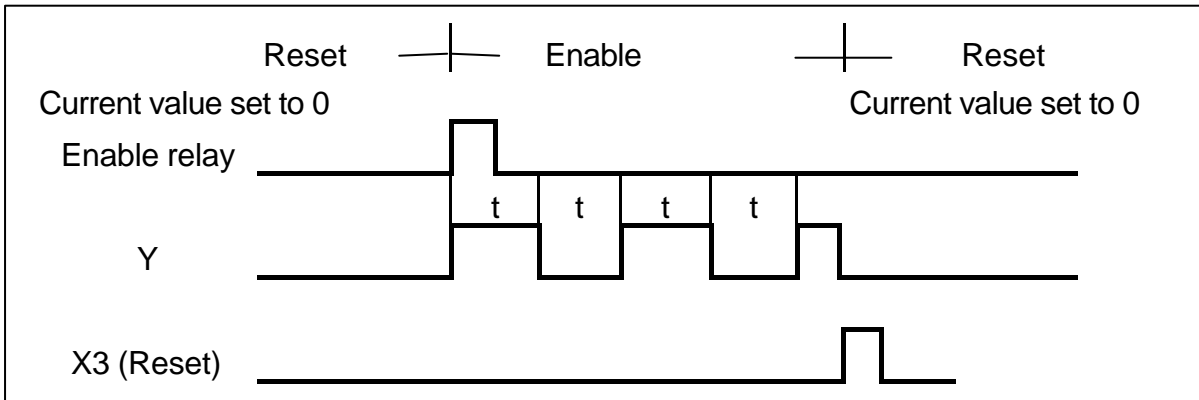


In this mode , X3 is no function

“t” is the time interval decided by the preset value(PPPP). The current value CCCC is increased and stop when arrived preset value. Then change the “Y” status and clear the current value CCCC , and do this action loop until the Enable relay signal changes to OFF.

**(6). Timer function mode selection 6 : Flash timer 2 ( N = 6 )**

EXP. : (Timing chart)

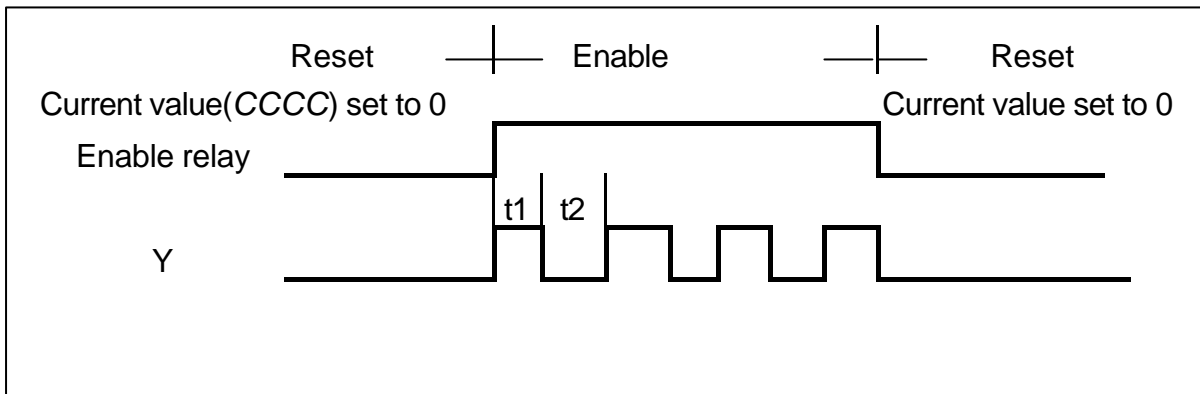


“t” is the time interval decided by the preset value (PPPP) . The current value CCCC is increased and stop when arrived preset value. Then change the “Y” status and clear the current value CCCC , and do this action loop until the reset signal changes to ON.

When the Reset input turns ON, The Y is turned OFF immediately , and the current value is clear to 0. When the current value is creasing , The enable relay signal from Off to ON will clear the current value.

**(7). Timer function mode selection 7 : Flash timer 3 (N = 7)**

EXP. : (Timing chart)



In this mode, there are two continuous timers should be edit to implement t1, t2 time base. After edit first timer, using ESC key to change edit another timer.

## C. RTC Block

### LCD Display

+WW-WW+
Z  CC : CC
OO : OO +Y
+ FF : FF +

The enable RTC signal comes from the RTC enable relay (R1 ~ R8) in the LADDER

Z is the input for the RTC function selection

- 1 : every day for WW:WW setting
- 2 : interval for WW:WW setting

Y is the RTC number (R1 ~ R8) and status of this RTC

WW-WW is the Weekly setting ( MO , TU , WE , TH , FR , SA , SU )

CC:CC is the current time ( Hour : Minute )

OO:OO is the ON time ( Hour : Minute )

FF:FF is the OFF time ( Hour : Minute )

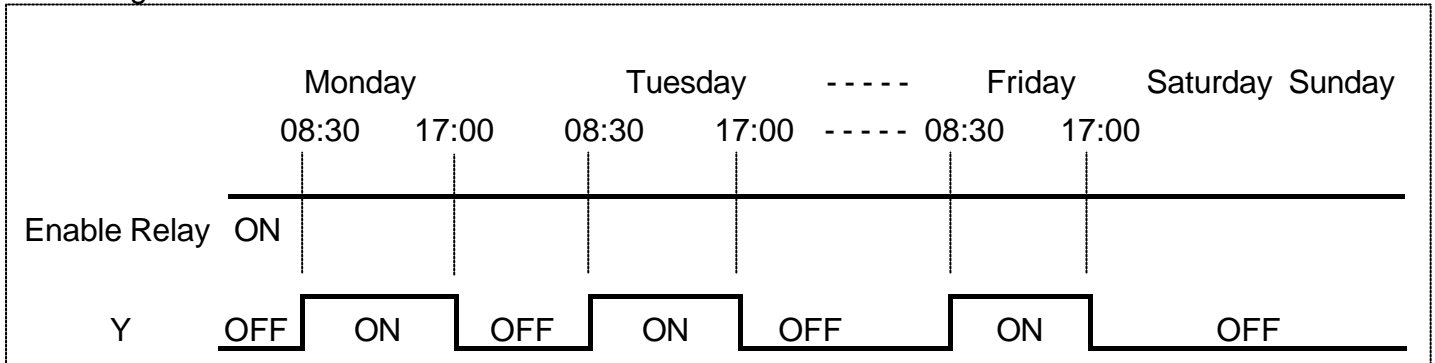
- a. When the RTC Enable Relay is OFF , The Y is hold to OFF in any condition
- b. When the RTC Enable Relay is ON :

**(1) Every day action function**

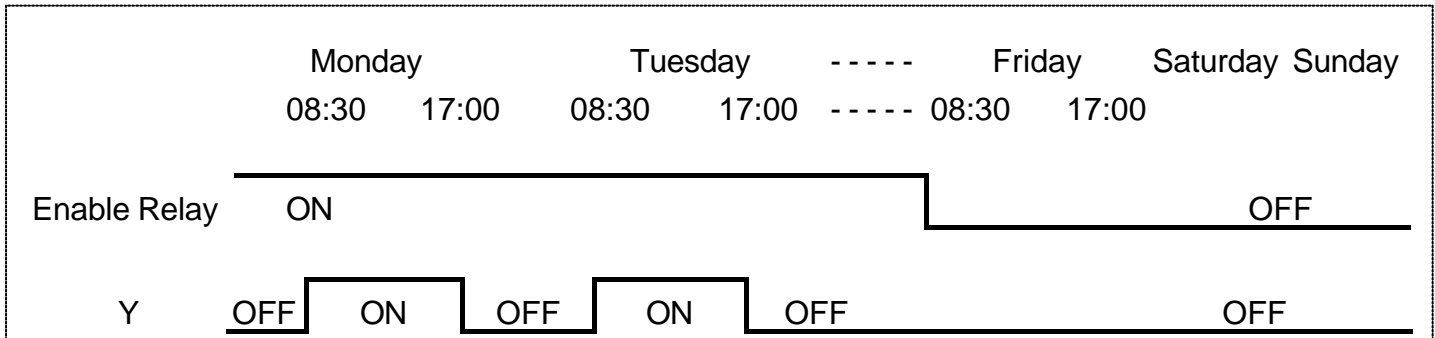
Exp. 1 :

Z	1 (every day)
WW-WW	MO-FR
OO:OO	08:30
FF:FF	17:00

Timing chart :



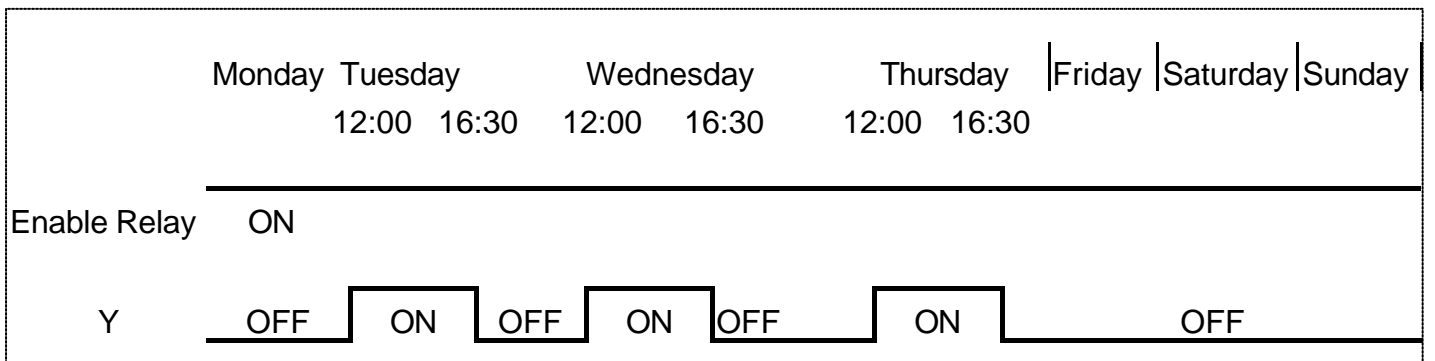
Note :



Exp. 2 :

Z	1 (every day)
WW-WW	TU-TH
OO:OO	12:00
FF:FF	16:30

Timing chart :



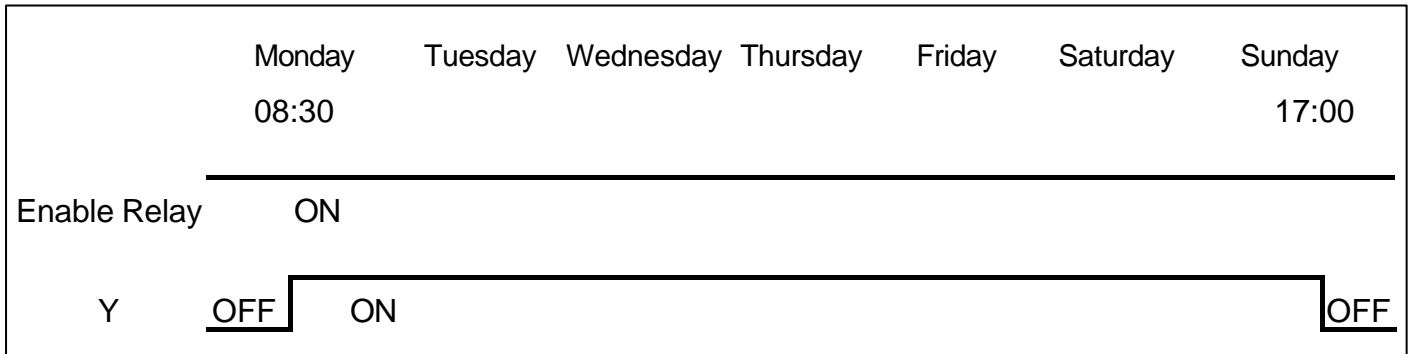


**(2). Interval time action function**

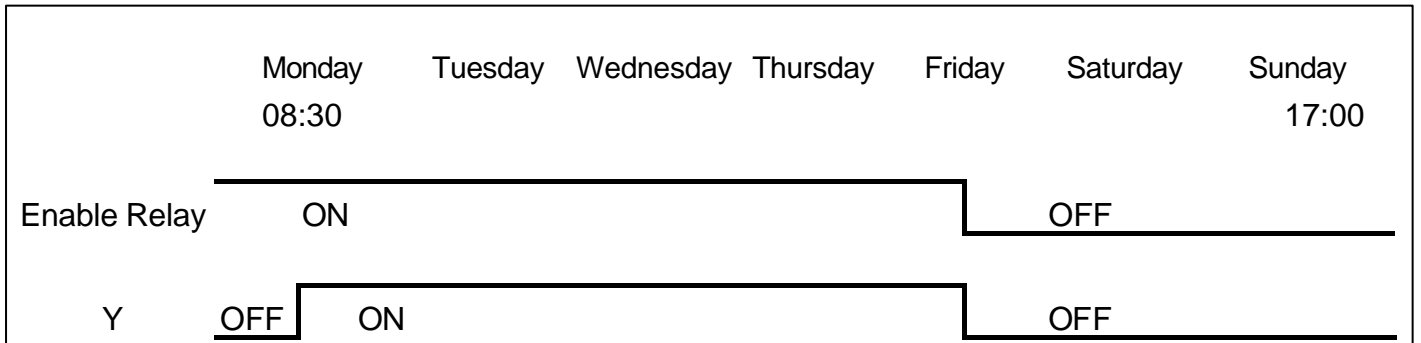
Exp. 1 :

Z	2 (interval)
WW-WW	MO-SU
OO:OO	08:30
FF:FF	17:00

Timing chart :



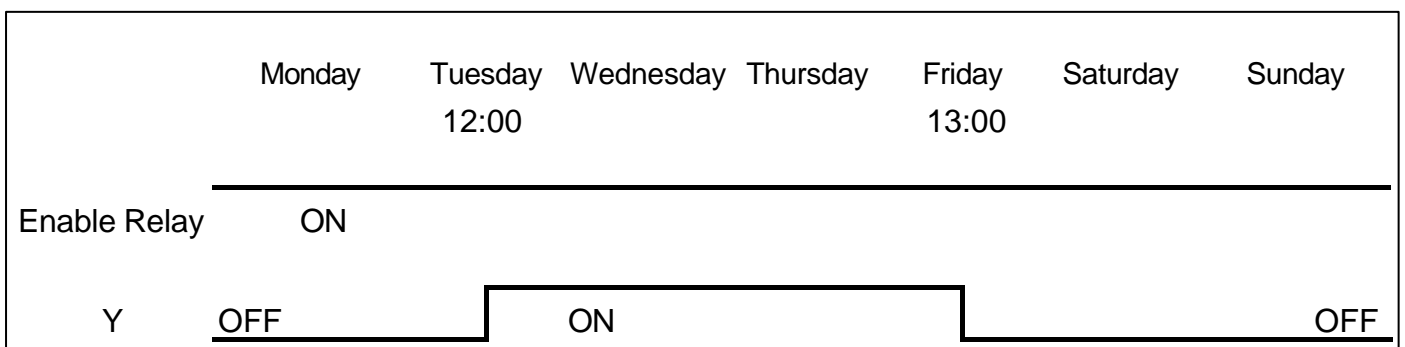
Note :



Exp. 2 :

Z	2 (interval)
WW-WW	TU-FR
OO:OO	12:00
FF:FF	13:00

Timing chart :



## D. Analog compare Block

LCD Display

+ N	+
C.CC v	
P.PP v + Y	
+ R.RR v +	

<p>The enable Analog compare output signal comes from the enable relay (G1 ~ G4) in the LADDER</p> <p>Y is the Analog compare number (G1 ~ G4) and status of this Block</p>
<p>N is the Analog compare function selection</p> <p>When the enable analog compare output relay turns ON and</p>
<p>N= 1 : When (Preset value - Reference value) <math>\leq V_{current} \leq</math> (Preset value + Reference value) , then Y Turn On</p> <p>▷ ( P.PP v - R.RRv ) <math>\leq</math> C.CC v <math>\leq</math> ( P.PP v + R.RRv ) , then Y Turn On</p> <p>▷ ( A2 - R.RRv ) <math>\leq</math> A1 <math>\leq</math> ( A2 + R.RRv ) , then Y Turn On</p>
<p>N= 2 : When <math>V_{current} \leq</math> Preset value , then Y Turn On</p> <p>▷ C.CC v <math>\leq</math> P.PP v , then Y Turn On</p> <p>▷ A1 <math>\leq</math> A2 , then Y Turn On</p>
<p>N= 3 : When <math>V_{current} \geq</math> Preset value , then Y Turn On</p> <p>▷ C.CC v <math>\geq</math> P.PP v , then Y Turn On</p> <p>▷ A1 <math>\geq</math> A2 , then Y Turn On</p>
<p>N= 4 : When Reference value <math>\leq V_{current} \leq</math> Preset value , then Y Turn On</p> <p>▷ R.RRv <math>\leq</math> C.CC v <math>\leq</math> P.PP v , then Y Turn On</p> <p>▷ R.RRv <math>\leq</math> A1 <math>\leq</math> A2 , then Y Turn On</p>
<p>N= 5 : When Reference value <math>\geq V_{current} \geq</math> Preset value , then Y Turn On</p> <p>▷ R.RRv <math>\geq</math> C.CC v <math>\geq</math> P.PP v , then Y Turn On</p> <p>▷ R.RRv <math>\geq</math> A1 <math>\geq</math> A2 , then Y Turn On</p>
<p>N= 6: When Reference value <math>\leq V_{current}</math> , then Y Turn On</p> <p>▷ R.RRv <math>\leq</math> A1</p>
<p>N= 7: When Reference value <math>\leq V_{current}</math> , then Y Turn On</p> <p>▷ R.RRv <math>\leq</math> A2</p>
<p>In mode 1~5:</p> <p>C.CC is the Current value (This value gets form A1 input)</p> <p>P.PP is the Preset value (This value gets form A2 input)</p>
<p>R.RR is the Reference value (This value gets from user key in)</p>

(1). N=1 : When  $(\text{Preset value} - \text{Reference value}) \leq V_{\text{current}} \leq (\text{Preset value} + \text{Reference value})$  ,  
then Y Turn On (N=1)

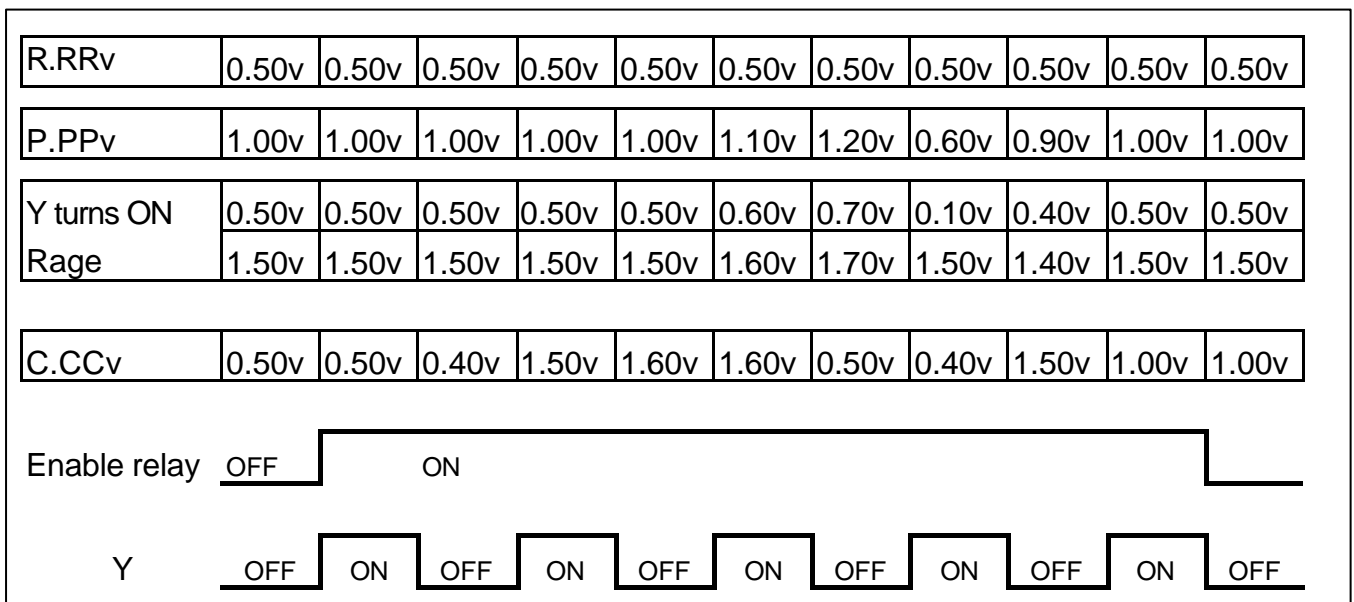
$\text{P} (P.PPv - R.RRv) \leq C.CCv \leq (P.PPv + R.RRv)$  , then Y Turn On

$\text{P} (A2 - R.RRv) \leq A1 \leq (A2 + R.RRv)$  , then Y Turn On

Exp. :

Enable relay	ON	
N	1	When $V_{\text{current}} = \text{Preset value} \pm \text{Reference value}$ , then Y Turn On
R.RRv	0.50v	
P.PPv (A2)	1.00v	
C.CCv (A1)	0.50 ~ 1.50v	$P.PPv \pm R.RRv = 1.00v - 0.50v \sim 1.00v + 0.50v = 0.50 \sim 1.50v$
Y	ON	

Timing chart?

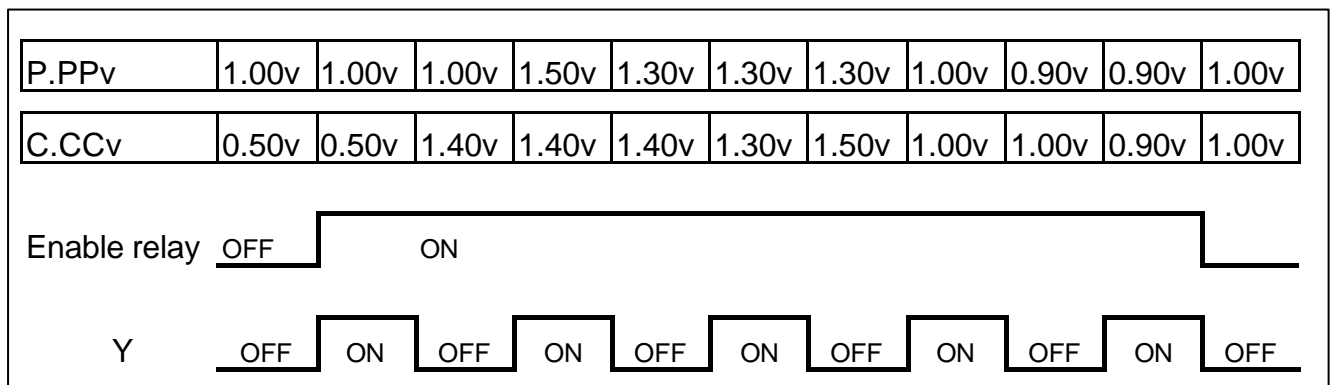


- (2). N=2 : When  $V_{current} \leq \text{Preset value}$  , then Y Turn On  
 $\exists C.CCv \leq P.PPv$  , then Y Turn On  
 $\exists A1 \leq A2$  , then Y Turn On

Exp. :

Enable relay	ON	
N	2	When $V_{current} \leq \text{Preset value}$ , then Y Turn On
P.PPv (A2)	1.00v	
C.CCv (A1)	0.50	
Y	ON	

Timing chart :

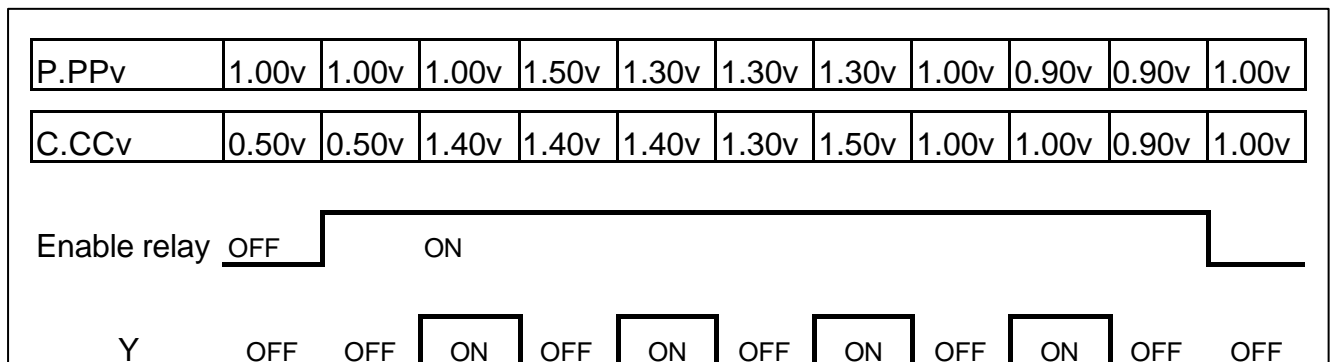


- (3). N=3 : When  $V_{current} \geq \text{Preset value}$  , then Y Turn On  
 $\exists C.CCv \geq P.PPv$  , then Y Turn On  
 $\exists A1 \geq A2$  , then Y Turn On

Exp. :

Enable relay	ON	
N	3	When $V_{current} \geq \text{Preset value}$ , then Y Turn On
P.PPv (A2)	1.00v	
C.CCv (A1)	0.50	
Y	ON	

Timing chart :

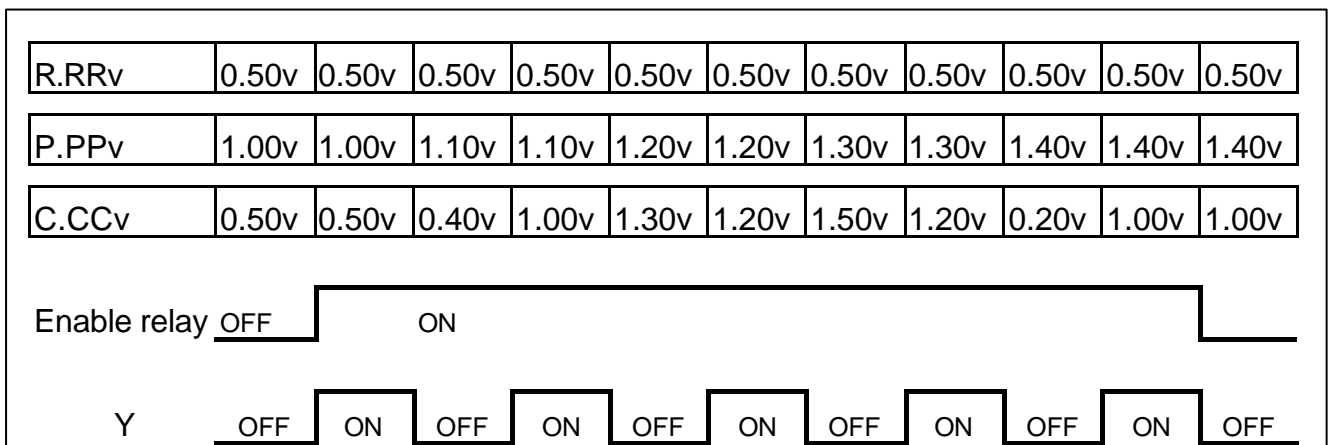


- (4). N=4 : When Reference value  $\leq V_{\text{current}} \leq$  Preset value , then Y Turn On  
 $\exists R.RRv \leq C.CCv \leq P.PPv$  , then Y Turn On  
 $\exists R.RRv \leq A1 \leq A2$  , then Y Turn On

Exp. :

Enable relay	ON	
N	4	When Reference value $\leq V_{\text{current}} \leq$ Preset value , then Y Turn On
R.RRv	0.50v	
P.PPv (A2)	1.00v	
C.CCv (A1)	0.50 ~ 1.00v	$R.RRv (=0.05v) \leq C.CCv \leq P.PPv (=1.00v)$
Y	ON	

Timing chart :

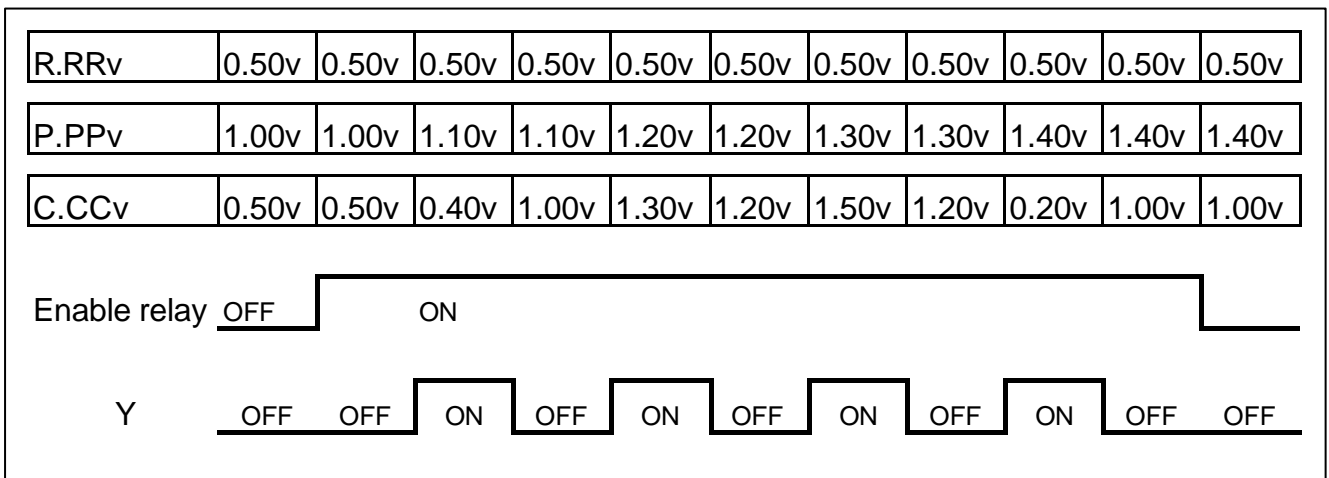


- (5). N=5 : When Reference value  $\geq V_{current} \geq$  Preset value , then Y Turn On  
 $\exists R.RRv \geq C.CCv \geq P.PPv$  , then Y Turn On  
 $\exists R.RRv \geq A1 \geq A2$  , then Y Turn On

Exp. :

Enable relay	ON	
N	5	When Reference value $\geq V_{current} \geq$ Preset value , then Y Turn On
R.RRv	0.50v	
P.PPv (A2)	1.00v	
C.CCv (A1)	0.50 ~ 1.00v	R.RRv (=0.05v) $\geq$ C.CCv $\geq$ P.PPv (=1.00v)
Y	ON	

Timing chart :



- (6). N=6,7 : When Reference value  $\leq V_{current}$  , then Y Turn On  
mode 6  $\exists R.RRv \leq A1$   
mode 7  $\exists R.RRv \leq A2$

Exp. :

Enable relay	ON	
N	6	When Reference value $\leq V_{current}$ (A1), then Y Turn On
N	7	When Reference value $\leq V_{current}$ (A2), then Y Turn On
R.RRv	1.00v	
C.CCv	2.00v	R.RRv (=1.00v) $\leq$ C.CCv (2.00v) Y Turn ON
C.CCv	0.50v	R.RRv (=0.05v) $\geq$ C.CCv (0.50v) Y Turn ON