CT Series Multi-function Batch counting/Counter/Timer

Features:

⊙Max counting speed can reach to 10K cps
⊙Coefficent can be set 0.001～99.999
⊙Universal input , “NPN” or “PNP” input can be selected by software
⊙Can be used as a timer,9 types of timing mode can be select
⊙Max. counting/length counting alarm is 2 loops,one alarm for batch counting
⊙Can be applied to the measuring & controlling in light industry, machinery,packing,food industry

For your safe, please read the below content carefully before you use the timer/counter!

Safe Caution

※ For your safety, please read the below content carefully before you use the meter !

Please comply with the below important points:

⚠ Warning An accident may happen if the operation does not comply with the instruction.

⚠ Notice An operation that does not comply with the instruction may lead to product damage.

※ The instruction of the symbol in the manual is as below:
⚠ An accident danger may happen in a special condition.

⚠ Warning

1. A safety protection equipment must be installed or please contact with us for the relative information if the product is used under the circumstance such as nuclear control, medical treatment equipment ,automobile, train, airplane, aviation, entertainment or safety equipment, etc. Otherwise, it may cause serious loss, fire or person injury.
2. Apanel must be installed, otherwise it may cause creepage (leakage).
3. Do not touch wire connectors when the power is on, otherwise you may get an electric shock.
4. Do not dismantle or modify the product, If you have to do so, please contact with us first. Otherwise it may cause electric shock and fire.
5. Please check the connection number while you connect the power supply wire or input signal, otherwise it may cause fire.

⚠ Caution

1. This product cannot be used outdoors. Otherwise the working life of the product will become shorter, or an electric shock accident may happen.
2. When you connect wire to the power input connector or signal input connectors, the moment of the No.20AWG (0.50 mm2) scrwew tweaked to the connector is 0.74n.m-0.9n.m. Otherwise the connectors may be damaged or get fire.
3. Please comply with the rated specifications. Otherwise it may cause fire after the working life of the product becomes shorter.
4. Do not use water or oil base cleaner to clean the product. Otherwise it may cause electric shock or fire, and damage the product.
5. This product should be avoid working under the circumstance that is flammable, explosive, moist, under sunshine, heat radiation and vibration.
6. In this unit it must not have dust or deposit, otherwise it may cause fire or mechanical malfunction.
7. Do not use gasoline, chemical solvent to clean the cover of the product because such solvent can damage it. Please use some soft cloth with water or alcohol to clean the plastic cover.

1.Code Illustration

CT□□□－M C □ □ □

- Communication Function: Blank: No RS485 8: With RS485
- 1:1 Preset 2:2 Preset
- Display digit: 6:6 digit
- Alarm Output: B: 1 Output C: 2 Output
- Control Output: R: Relay Output S: SSR Output M: Relay&SSR Output
- Power Supply: Blank: Switching Power F:24VCD Power
- Dimension(mm): 3:36H×72W×80L 4:48H×48W×90L 7:72H×72W×90L
- CT Series Timer/Counter Multi-function Meter

＊24 Power Supply is also available as special order. Please indicate your requirement in your order

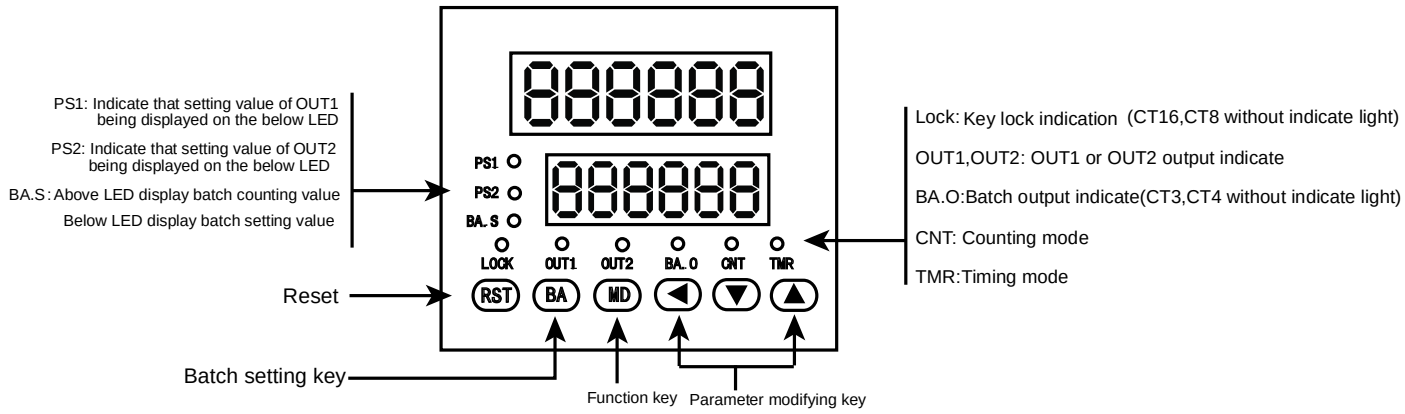
2.Ordering Code

S/N	Code	Panel(mm)	SSR synchronous output	Display digit	Alarm output	Batch output
1	CT3-MC62(CT6Y-2P)	36H×72W	1	6 Digits	2	No
2	CT3-MB61(CT6Y)	36H×72W	1	6 Digits	1	No
3	CT4-MC62(CT6S-2P)	48H×48W	1	6 Digits	2	No
4	CT4-MB61(CT6S)	48H×48W	1	6 Digits	1	No
5	CT7-MC62(CT6-2P)	72H×72W	2	6 Digits	2	1 SSR
6	CT7-MB61(CT6)	72H×72W	1	6 Digits	1	1 SSR
7	CT8-RC62	48H×96W	No	6 Digits	2	1 Relay
8	CT8-RB61	48H×96W	No	6 Digits	1	1 Relay
9	CT16-RC62	80H×160W	No	6 Digits	2	1 Relay
10	CT16-RB61	80H×160W	No	6 Digits	1	1 Relay

3. Technical Specification

Power Supply		AC 85-265V 50/60Hz
Allowable Voltage Range		90~110% of rated voltage(AC power)
Count Speed of INA, INB		Selectable 1/30/1k/5k/10 kcps
Min.input Signal width	Counter	Reset input: Selectable 1ms or 20ms
	Timer	INA, INHIBIT, RESET, BATCH RESET: Selectable 1ms or 20ms
Input		Selectable voltage input or No-voltage input ［Voltage input］Input impedance:5.4kΩ, “H” level:5-30VDC, “L” level:0-2VDC, “L” level: Max.2VDC, ［No-voltage input］Short-circuit impedance:Max.1k,Residual voltage:Max.2VDC, OPen-circuit impedance:Min.100kΩ
One-shot output		10/50/100/200/500/1000/2000/5000ms
Control Output	Contact Point Capacity	NO:250VAC 3A at resistive load, NC:250VAC 2A at resistive load
	Solid State Relay Capacity	Max.30VDC, Max.100mA
Memory retention		10 years(When using non-volatile semiconductor memory)
External sensor power		12VDC ±10%,Max.100mA
Time accuracy	Repeat error Set error Voltage error Temperature error	Power On Start:Max.±0.01% 0.05sec Signal Start:Max.±0.01% 0.03sec
Insulation resistance		Min.100MΩ(at 500VDC)
Dielectric strength		2000VAC 50/60Hz for 1 minute
Noise strength		± 2kV the square wave noise(pulse width:1㎲) by the noise simulator
Vibration	Mechanical	0.75mm amplitude at frequency of 10~55Hz in each of X,Y,Z directions for 1 hour
	Malfunction	0.5mm amplitude at frequency of 10~55Hz in each of X,Y,Z directions for 10 minutes
Shock	Mechanical	300m/s² (Approx.30G) in X,Y,Z directions for 3 times
	Malfunction	100m/s² (Approx.10G) in X,Y,Z directions for 3 times
Relay life cycle	Mechanical	Min.10,000,000 times
	Electrical	Min.100,000 times(NO:250VAC 3A at resistive load,NC:250VAC 2A at resistive load)
Ambient temperature		-10 ~ +50℃(at non-freezing status)
Storage temperature		-25 ~ +65℃(at non-freezing status)
Ambient humidity		35~85% RH

4.Panel Indication

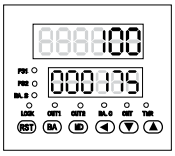


5.Operation Procedure:

5.1.Change of the setting value of Counter

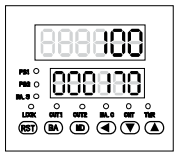
How to change in the preset type: To change the preset value from 175 to 180.

(1)

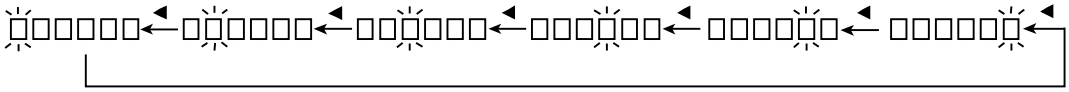


Under measuring status, press ◄ to enter setting value modify status , press ◄ continuously , select digit “5” to make it flicker

(2)

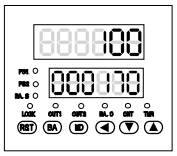


Change “5” to “0” by pressing ▼ or ▲ 5 times



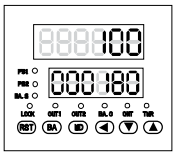
∴ Under measuring status , press ◄ key to enter the setting value modify status , the selected digit always flickers from right to left.

(3)



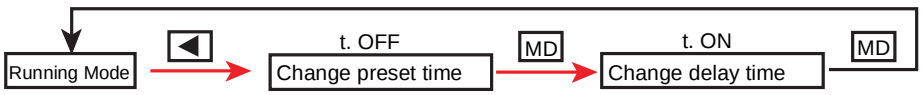
Press ◄ key to select data “7” flickering .

(4)



Press ▲ once,change “7” to “8”,then press MD to confirm and return to measuring status .

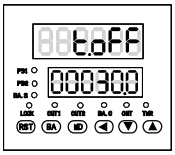
5.2 Change the setting value of the timer



In the status of changing preset value, if no press any key during 60 seconds, the timer will return to Running Mode.

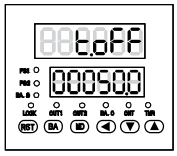
How to change t. OFF time from 30 sec. to 50 sec., t.ON setting from 40 sec. to 20 sec. (Output mode: FLK, Timer range: 0.1s-99999.9s)

(1)

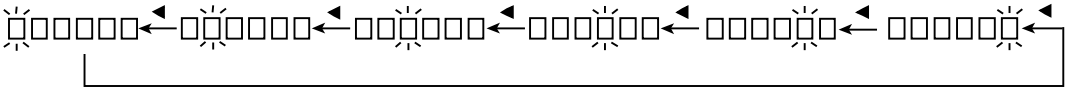


Press ◄ key to enter the status of changing preset time. Make the data “3” flicker by pressing ◄ key twice.

(2)

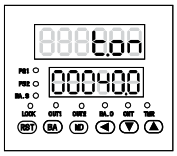


Change “3” to “5” by pressing ▲ key twice. Pressing MD key to complete t.OFF time setting then enter the status of changing t.ON time.



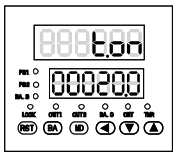
∴In timing status ,press ◄ to enter setting value modify status .The order of the data selected to flicker is from right to left .

(3)



Press ◄ key twice to move the flickering digit to “4” .

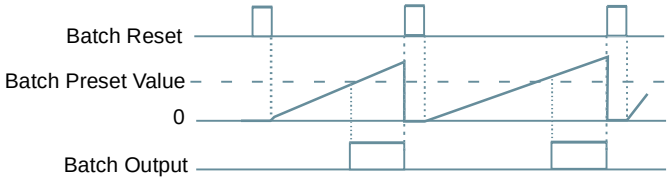
(4)



Press ▼ key twice to change “4” to “2”. Pressing MD key to complete the setting , then return to RUN mode.

6.Batch Counting and Batch Preset

6.1.Batch Output Action



◆Batch counting

※ When the Batch counting value is up counting , it can only be reset by the external batch reset signal .
※ When counting value beyond 999999, it will turn to zero , and start to count again
※ Batch counting are not influenced by RST key or external reset signal

(1) Batch counting under counting mode

When counting alarm output No. reaches to the preset batch value , batch alarm output .
When it is batch control output , this up counting time interval will be more than 10ms .

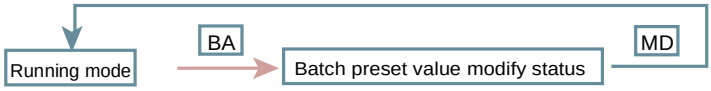
(2) Batch counting under timing mode

When timing alarm output No. reaches to the preset batch value , batch alarm output .

Under FLK output mode , when the batch counting value is increasing , preset time of Toff and Ton will pass .

※ Batch output function
If batch output is ON , it will keep “ON” status till batch reset signal comes .
If batch output is ON , the meter power off and on power again , batch output should keep “ON” status till external reset signal comes.

◆The setting of batch preset value



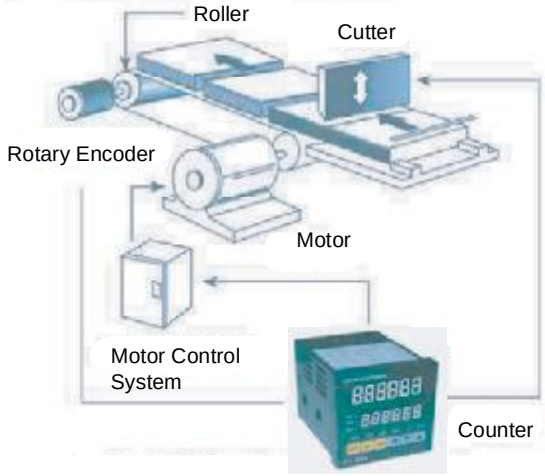
※ Under running status press BA key to enter batch preset value modify status .

The way of modifying the batch preset value is the same as that of setting counting value , press ◀ key to select the needing revised data and make it flicker .
Press ▲ ▼ key to modify the value . Press MD to complete the setting and return to measuring mode .
When enter batch preset value modify mode , the above LED is displaying the present batch counting value .

※ When batch preset value beyond batch counting value, change the batch preset value equal to or smaller than the batch counting value , batch counting output.

For Example:Pulse number is a number of pulse generated by rotary encoder, L is the measured length, Prescale value is equal to L divides P.

To use counter and rotary to control length



$$\text{Prescale Value} = \frac{\pi \times \text{Diameter of the roller (D)}}{\text{Pulse number per 1 revolution of the encoder}}$$

$$= \frac{3.1416 \times 22}{1000}$$

$$= 0.069\text{mm/pulse}$$

Set 0.069 of prescale value at prescale value ste mode.

The diameter of the roller connected to the rotary encoder is 22mm.
The pulse number per 1 revolution of the encoder is 1000 pcs.

8.Lock Key Setting

Lock Key function is used for avoiding key mis-pressing.
L.OFF (LOCK OFF): Cancel Lock Key function.
LOC.1(LOCK LEVEL1): Lock RST Key
LOC.2(LOCK LEVEL2): Lock◀ and ▲and ▼ Key.
LOCK.3(LOCK LEVEL3): Lock RST and ◀ and ▲and ▼ Key.

9. Counting function mode setting

Press MD key to display the next mode. (Ⓜ key: Use the ▲ or ▼ key to change the setting)

Setting mode	How to set (▲ ,▼)
Input mode (in)	→ U → d → Ud-A → Ud-b → Ud-C ※When "U"or "d" of input mode is set, "S, t, d" of output mode will not be displayed.
Maximum counting speed (CPS)	→ 1 → 30 → 1K → 5K → 10K ※ Counting speed is deteriminded one by one (1:1) duty ratio of INA or INB input signal, and it is applied to both INA or INB. ※When using setting "d" in output mode,5kcps and 10kcps are ont indicated in the display.
Output mode (out)	● Up or Down inut mode → F → n → C → r → K → P → 9 → A ● Up/Down- A, B, C inut mode → F → n → C → r → K → P → 9 → A → S → t → d ※When setting output mode as "F, n", if counting value reaches the preset value, output will be held. So there is no "OUT2 output time" in function setting mode. ※If the maximum counting speed is 5kcps or 10kcps, when you change output mode to "d", the maximum counting speed will be changed to 1Kcps.
OUT2 output time (out2)	→ 10 → 50 → 100 → 200 → 500 → 1000 → 2000 → 5000 Unit: ms ※ There is no "OUT1 output time" in single preset model, "OUT2 output time" will be shown as "OUT output time(out t) ".
OUT1 output time (out1)	→ 10 → 50 → 100 → 200 → 500 → 1000 → 2000 → 5000 → HoLd Unit: ms
Input logic (S, G)	PnP : Voltage input nPn : No- voltage input Use ▲ or ▼ to select PnP or nPn
Min.reset time (rSt)	1 ⇄ 20 Unit: ms ※ Min. external RESET signal width
Decimal point (dP)	● 6 Digit → ------ → ------ → ------ → ------ ※ Decimal point setting is applied to counting value and setting value at the same.
Prescale value (SCL)	※ ◀ Key: Shift the flickering digit ※ ▲ ,▼ Key: Change the prescale value ※Prescale value: It is actual value of length and position, liquid measure from counting input of 1 pulse. ※ Set range of prescale value 6 Digit: 0.001 ~ 99.999
Memory retention (dAtA)	CLEr ⇄ rEC ※CLEr : Power reset for counting value. (Reset counting value when power off) rEC : Memorize counting value (Memorize counting value when power off)
Lock key (LoCK)	→ L.oFF → LoC.1 → LoC.2 → LoC.3
Counter/Timer (C-t)	CoUn ⇄ t, mE ※CoUn : Counter t, mE : Timer

※ If select F or N mode , when counting value reaches the preset value , output will maintain , therefore there is no “OUT2 output time” menu in function setting mode.

※ If select S,T or D mode , input mode can only choose Ud-A,B or C mode .If input mode choose Up/Down mode , output mode can select any mode except S , T , D

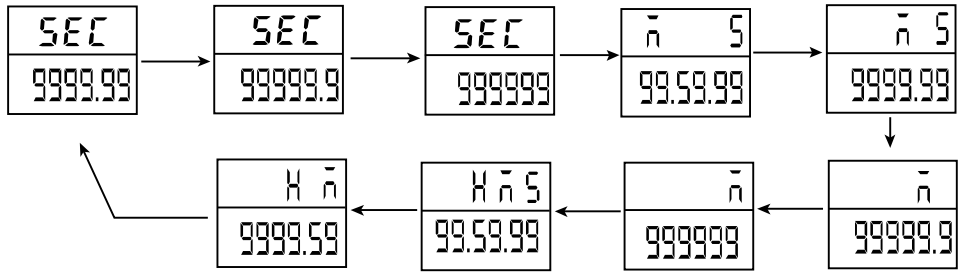
※ When select D output mode , if counting frequecy more than 1Kcps ,for there is a responding time of the relay , it may cause the output action abnormal , so please choose SSR output .

※ When max. counting speed is 5kcps or 10kcps , if change the output mode to “D” mode , counting speed turn to 1k cps automatically .

※ In function setting mode , external input signal still can be recognized , when exit the function setting mode , display value and output will reset automatically .

10.Timing function mode setting

Press MD key to display the next mode **(Use the ▲ or ▼ key to Change the setting)**

Setting mode	How to set
Time range (SEC / Min / HOUR)	
UP/DOWN mode (U-d)	U ⇄ d ※Up : Time proceeds from 0(zero) to the set value Down : Time proceeds from the set value to 0(zero)
Output mode (oUt)	ond → ond.1 → ond.2 → FLK → FLK.1 → FLK.2 → INt → INt.1 → oFd
Output time (oUtt)	10 → 50 → 100 → 200 → 500 → 1000 → 2000 → 5000 → Hold ※It is operation time of control output according to output mode. Unit: ms
Input logic (SIG)	PnP : Voltage input nPn : No-voltage input Use ▲ or ▼ to select PnP or nPn
Input signal time (In-t)	1 ⇄ 20 Unit: ms Min. INA, INHIBIT, RESET, BATCH RESET signal width
Lock key(Lock) (LoCK)	LoFF → LoC.1 → LoC.2 → LoC.3
Counter/Timer (C-t)	CoUn ⇄ tIME ※ CoUn : Counter tIME : Timer

※When it is in the function setting mode, input signal and output are still going on, but they will be reset when the counter exits the setting mode.

※In case of output mode is FLK, INT, INT1, OFD, there is no output time setting in the function setting mode.

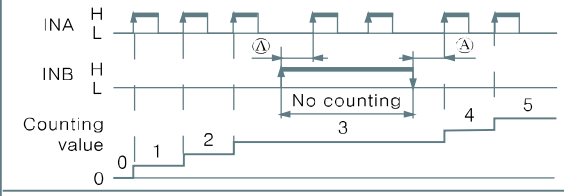
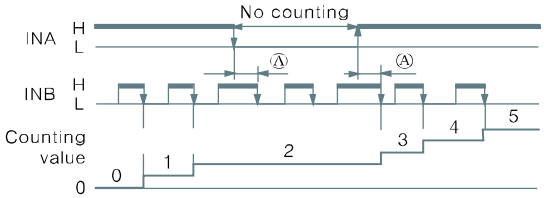
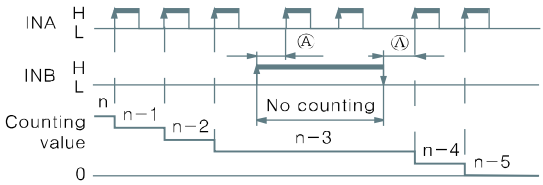
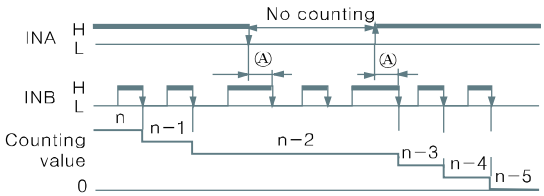
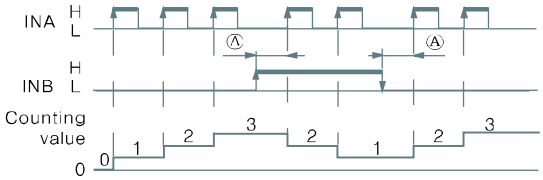
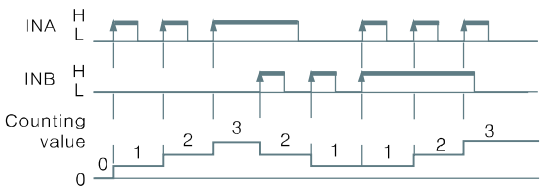
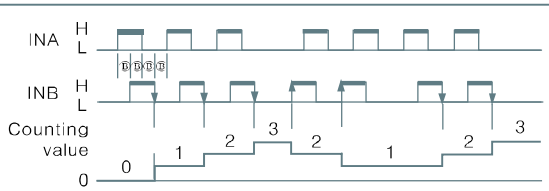
※When in the function setting mode, if no key is touched for 60 sec., the timer will return to RUN mode.

11. Timing Range

Time range	Function setting mode	
	Timing display	Preset display
0.01s to 9999.99s	SEC	9999.99
0.1s to 99999.9s	SEC	99999.9
1s to 999999s	SEC	999999
0.01s to 99m 59.99s	m S	99.59.99
0.1s to 999m 59.9s	m S	999.59.9
0.1m to 99999.9m	m	99999.9
1m to 999999m	m	999999
1s to 99h 59m 59s	H m S	99.59.59
1m to 9999h 59m	H m	9999.59

12. Input operation mode for counter

※Ⓐ : Over Min. signal width, Ⓑ : Over 1/2 of Min. signal width.

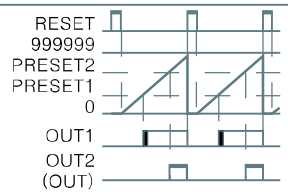
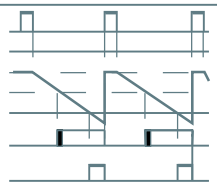
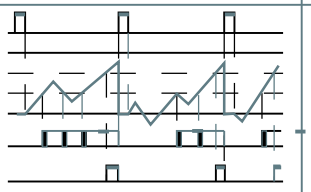
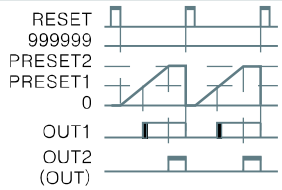
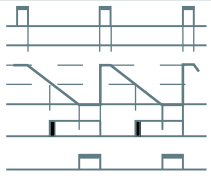
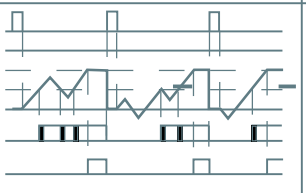
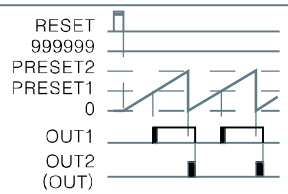
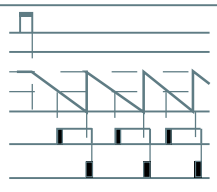
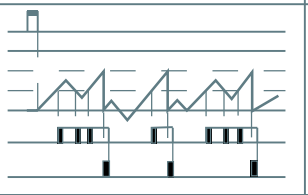
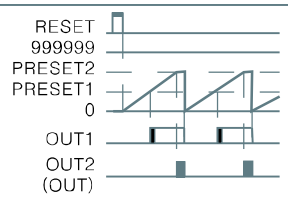
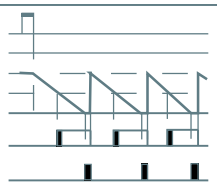
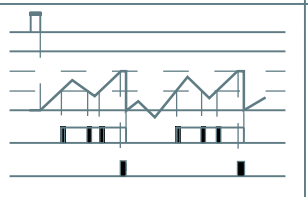
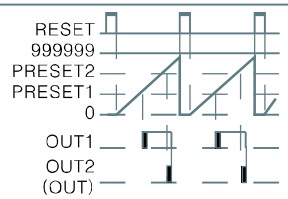
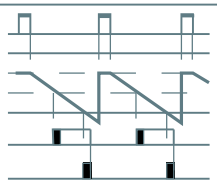
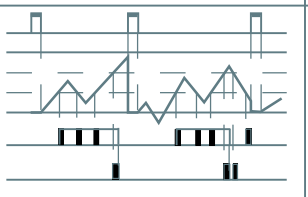
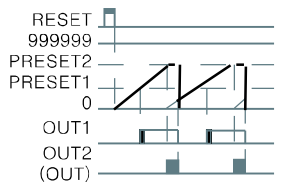
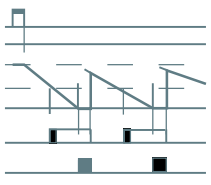
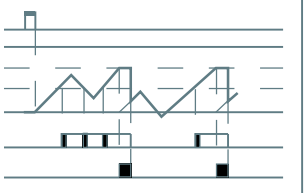
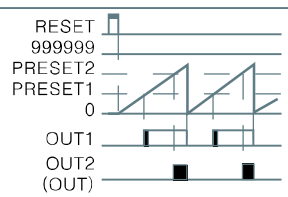
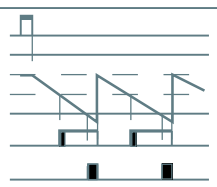
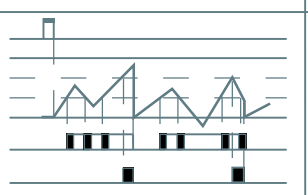
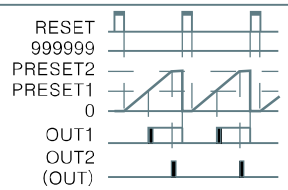
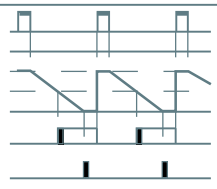
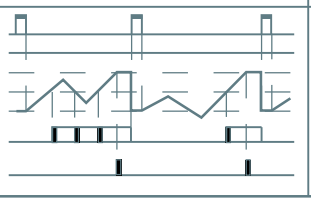
Input mode	Counting chart	Notice
U (UP)		※INA : Counting input ※INB : Inhibit input (Limit counting input of INA) ※When INB changes from L to H, up count signals on INA will not be accepted.
		※INA : Inhibit input (Limit counting input of INB) ※INB : Counting input ※When INA changes from H to L, up count signals on INB will not be accepted.
d (DOWN)		※INA : Counting input ※INB : Inhibit input (Limit counting input of INA) ※When INB changes from L to H, down count signals on INA will not be accepted. ※n=Preset value
		※INB : Counting value input ※INA : Inhibit input (Limit counting input of INB) ※n=Preset value ※When INA changes H to L, down count signals on INB will not be accepted.
Ud-A (Up/Down−A) Command input		※INA : Counting input ※INB : Command input for Up/Down counting ※When INB is L, count increases. When INB is H, count decreases.
Ud-b (Up/Down−B) Individual input		※INA : Up count input ※INB : Down count input ※When INA and INB are applied L to H at same time, the count remains unchanged.
Ud-C (Up/Down−C) Phase difference input		※When using A, B phase of encoder and connecting to INA, INB, Please set counter input mode(in) as phase difference input(Ud-C).

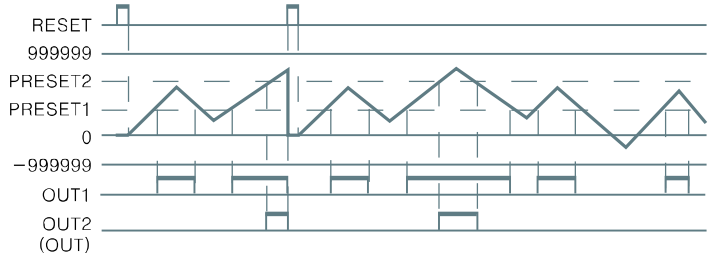
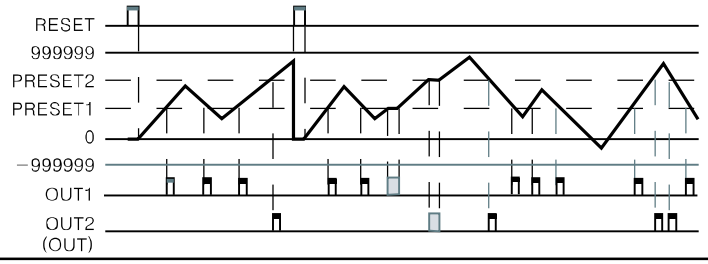
When you use an encoder and connect its phase A and Phase B output to the INA and INB input of the counter, please set the mode of the counter as Ud-C.

Input type / Code	Voltage input (PNP)	Contact input (NPN)
H	5–30VDC	Short circuit
L	0–2VDC	Open

13.Output operation mode(Counter)

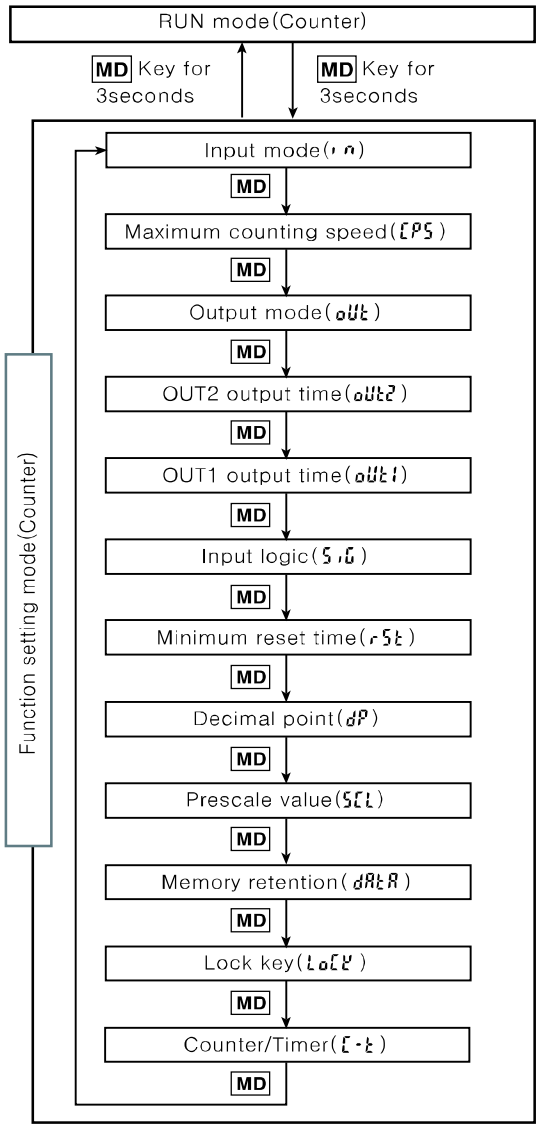
One-shot output (OUT1 output) / Self holding output — One-shot output (OUT2 output) — Self holding output — Coincidence output

Output mode	Input mode: Up	Input mode: Down	Input mode: Up/Down A, B, C	Operation
F (F)				※After Counting up, the display value increases or decreases until the reset signal is applied, and hold outputs will be held.
n (N)				※After counting up, display value and hold output will be held until reset signal is applied.
C (C)				※The display value will be Reset Start at the same time counting up. ※The hold output of OUT1 turns off after one-shot time of OUT2. ※The one-shot output of OUT1 operates regardless to OUT2.
r (R)				※After one shot Time of OUT2, display value will be Reset start counting operation starts again. ※The hold output of OUT1 turns off after one-shot time of OUT2. ※The one-shot output of OUT1 operates regardless to OUT2.
K (K)				※After counting up, the display value increases or decreases until the reset signal is applied. ※The hold output of OUT1 turns off after one-shot time of OUT2. ※The one-shot output of OUT1 operates regardless to OUT2.
P (P)				※After counting up, display value is held for the one-shot time of OUT2, Counter operation starts again at the same time of OUT2 output is ON and count value will be Reset start. ※The hold output of OUT1 turns off after one-shot time of OUT2. ※The one-shot output of OUT1 operates regardless to OUT2.
q (Q)				※After counting up, display value increases or decreases for the one-shot time of OUT2. ※The hold output of OUT1 turns off after one-shot time of OUT2. ※The one-shot output of OUT1 operates regardless to OUT2.
A (A)				※After counting up, display value and the hold output of OUT1 is held until applying the reset signal. ※The one-shot output of OUT1 operates regardless to OUT2. ※OUT2 returns automatically after one shot time.

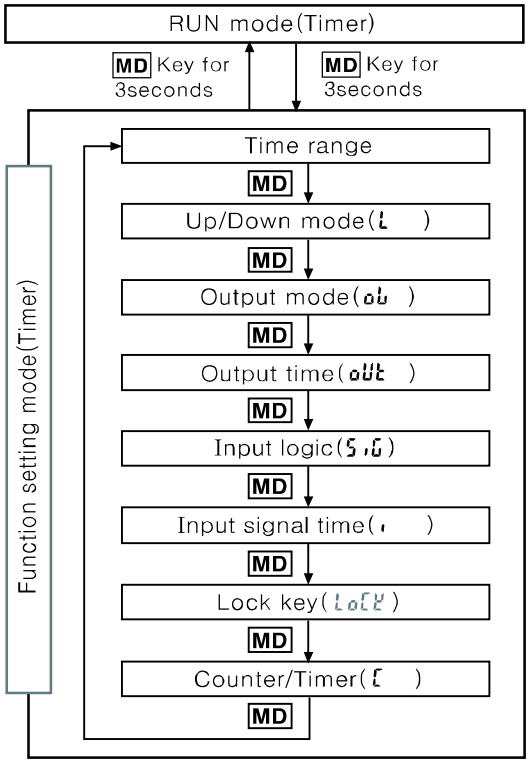
Output mode	Up/Down – A, B, C	Operation
S (S)		※OUT1 and OUT2 keeps ON status in following condition ; Display value ≧ Preset 1 Display value ≧ Preset 2
t (T)		※OUT1 keeps ON status when display value is smaller than Preset 1 value, but if Preset 2 is "0", OUT1 keeps ON status ※OUT2 keeps ON status when display value is equal or larger than Preset 2.
d (D)		※When display value is equal to set value(Preset 1, Preset 2) only, OUT1 or OUT2 output keeps ON status ※When set 1kcps for counting speed, solid state contact output should be used.

14. Operation Mode Changing

◎ Operation mode in Counter



◎ Operation mode in Timer

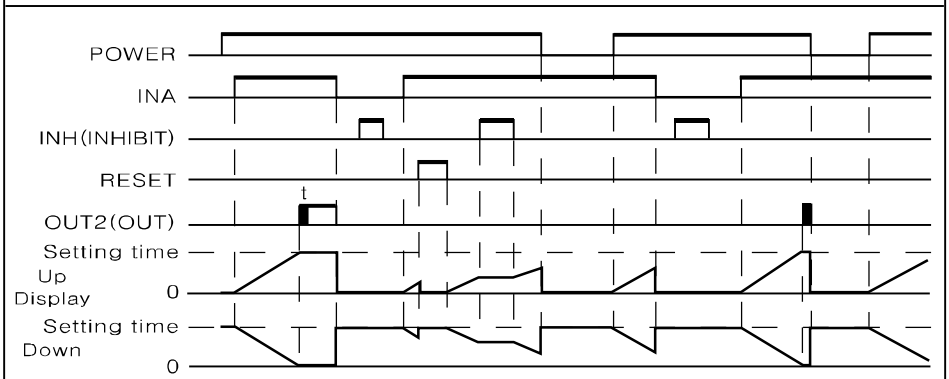
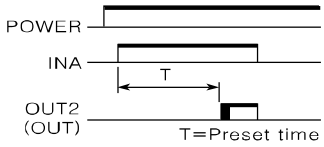
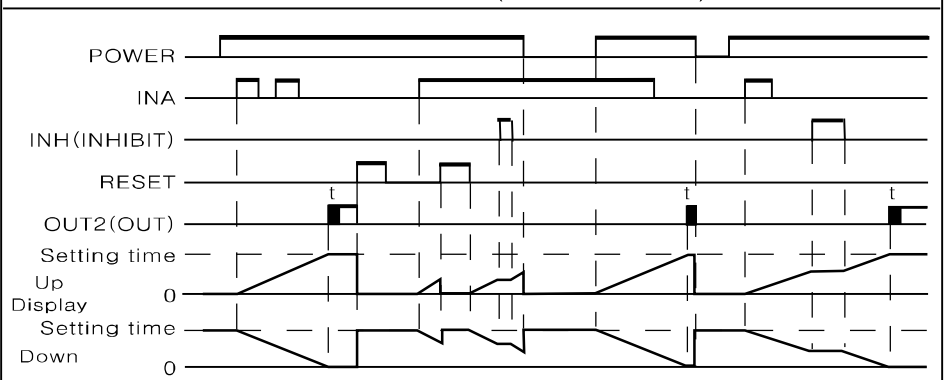
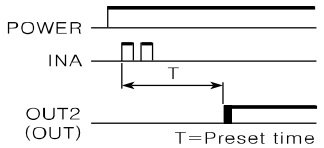
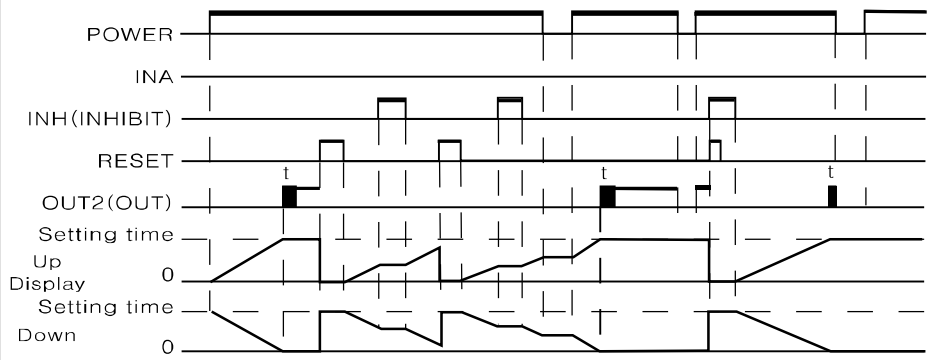
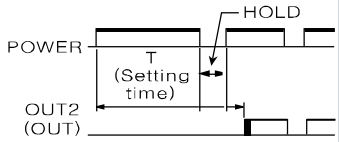
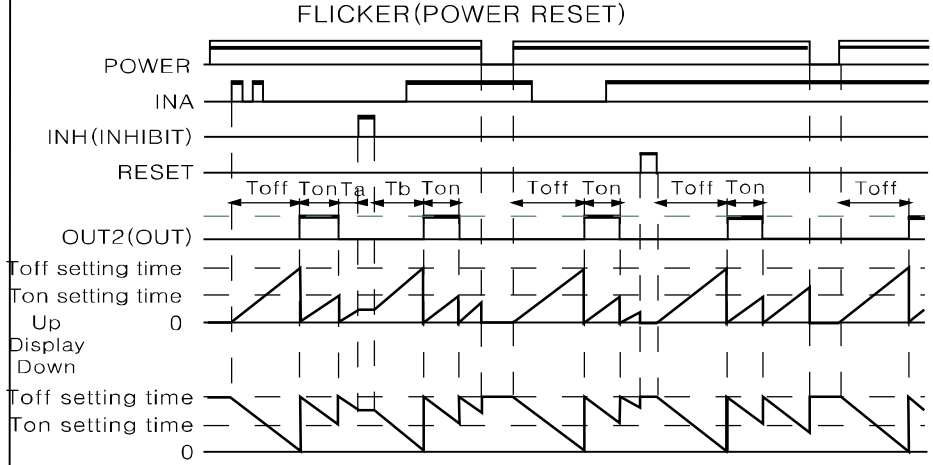
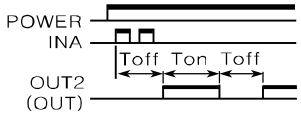


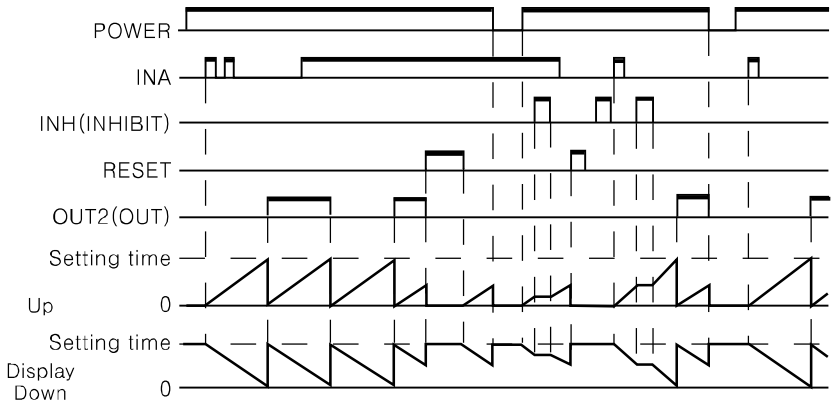
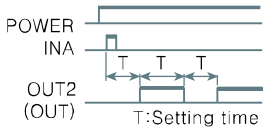
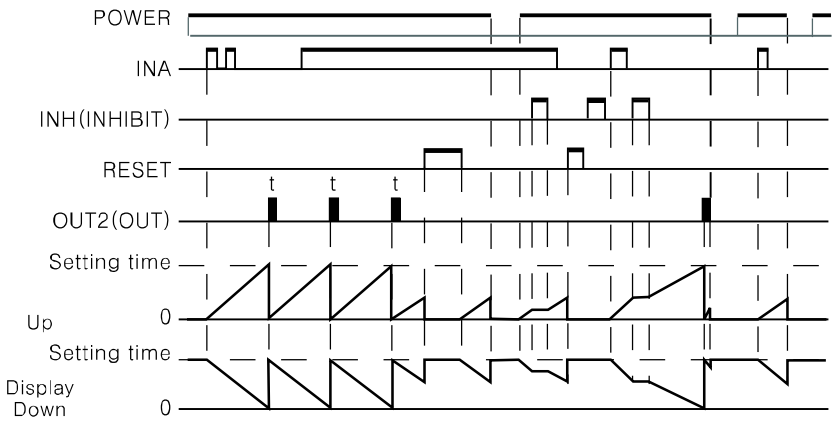
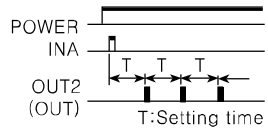
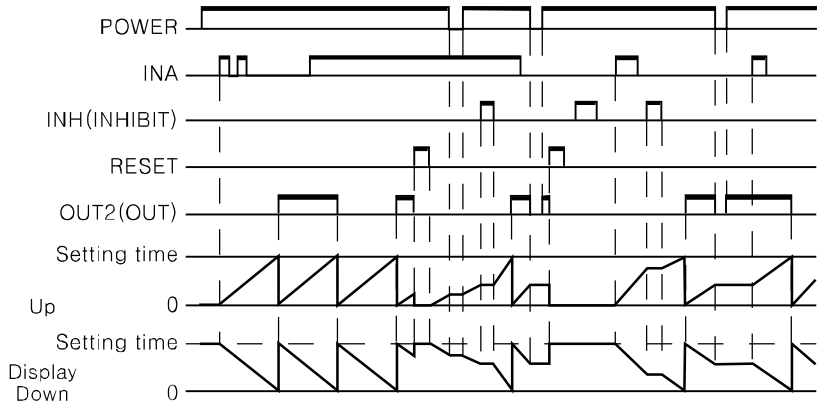
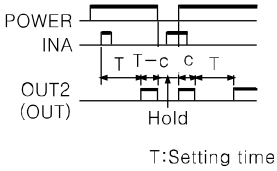
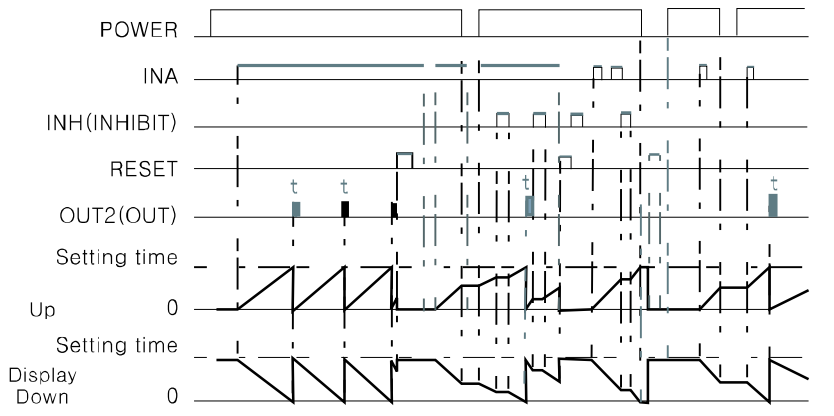
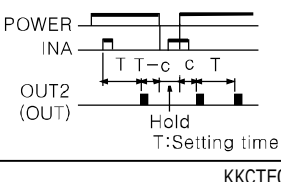
- Pressing MD for over 3sec., it will enter into Timer or Counter function setting mode
- Pressing MD for over 3sec.,it will return to Timer RUN or Counter RUN mode.
- When using this unit as a counter, you can change its mode to Timer(t) in Counter/Timer setting.
- If no keys are touched for over 60sec.,it will return to Timer RUN mode or Counter RUN mode.

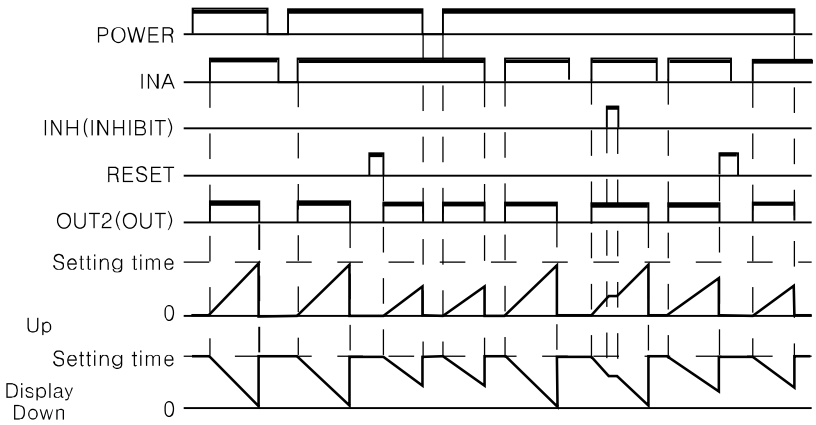
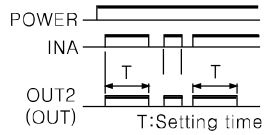
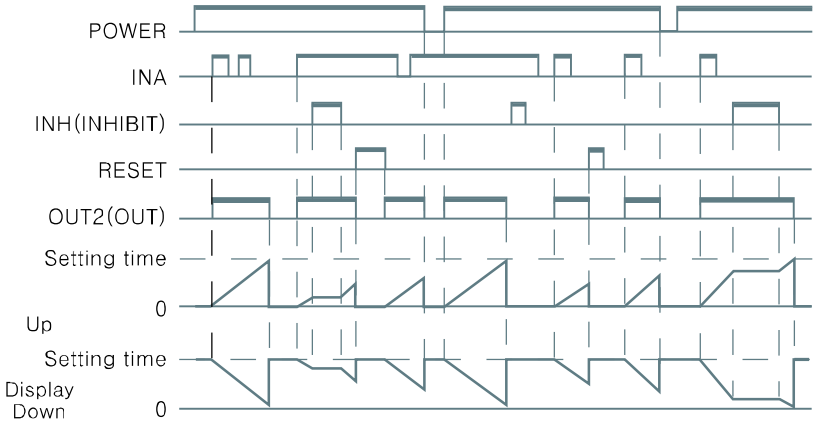
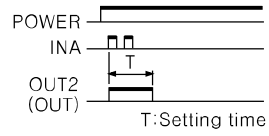
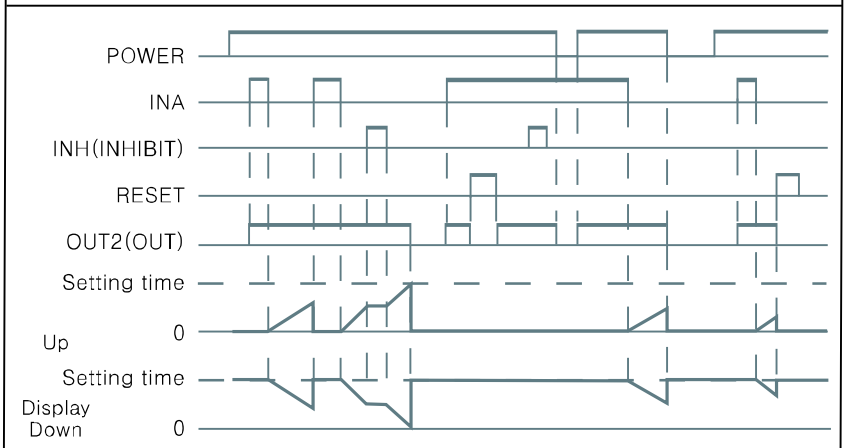
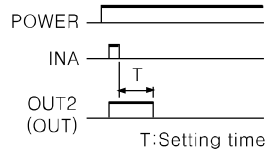
▣ Output operation mode(Timer)

One−shot output (t=One−shot output time) — Self−holding output

Hold output

Output mode	Time chart	Operation
ond (OND)	SIGNAL ON DELAY(POWER RESET) 	1)Time starts when INA signal turns on. When INA signal turns off, time resets. 2)Time starts when power turns on and when reset turns off during INA signal on. 3)Control output operates as hold or one−shot time. 
ond.1 (OND.1)	SIGNAL ON DELAY 1(POWER RESET) 	1)Time starts when INA signal turns on, if INA signal is applied repeatedly, only initial signal is recognized. 2)Time starts when power turns on and when reset turns off during INA signal on. 3)Control output operates as hold or one−shot time. 
ond.2 (OND.2)	POWER ON DELAY(POWER HOLD) 	1)Time starts when power turns on. (There is no INA function) 2)Time resets when reset turns on. Time starts when reset turns off. 3)Control output operates as hold output or one−shot output. 
FLK (FLK)	FLICKER(POWER RESET) 	1)Time starts when INA signal turns on. If INA signal is applied repeatedly, only initial signal is recognized. 2)Time starts when power turns on and when reset turns off during INA signal on. 3)Control output operates as hold output, output turns off for the Toff time and turns on for the Ton time repeatedly. 4)The Ton time and the Toff time must be set individually. 5)In case of using the contact output, min. setting time must be set over 100ms. 

Output mode	Time chart	Operation
FLK.1 (FLK.1)	FLICKER 1(POWER RESET) **Hold output** 	1)Time starts when INA signal turns on. If INA signal is applied repeatedly, only initial signal is recognized. 2)Time starts when power turns on and when reset turns off during INA signal on. 3)Control output operates as hold output. In case of using the contact output, min. setting time must be set over 100ms. 
	One-shot output 	1)Time starts when INA signal turns on, if INA signal is applied repeatedly, only initial signal is applied. 2)Time starts when power turns on and when reset turns off during INA signal on. 3)Control output operates as one-shot. In case of using the contact output, min. setting time must be set over 100ms. 
FLK.2 (FLK.2)	FLICKER 2(POWER HOLD) **Hold output**  ※EEPROM:10 years	1)Time starts when INA signal turns ON. If INA signal is applied repeatedly, only initial signal is recognized. 2)Control output operates as hold output when reaches to the set time. 3)Time starts when power turns ON and when reset turns OFF during INA signal on. 4) In case of using the contact output, min. setting time must be set over 100ms. 
	One-shot output  ※EEPROM:10 years	1)Time starts when INA signal turns ON. If INA signal is applied repeatedly, only initial signal is recognized. 2)Control output operates as one-shot output when reaches to the set time. 3)Time starts when power turns ON and when reset turns OFF during INA signal on. 4)In case of using the contact output, min. setting time must be set over 100ms. 

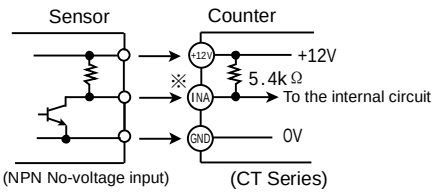
Output mode	Time chart	Operation
int (INT)	INTERVAL(POWER RESET / SIGNAL RESET) 	1)During INA is ON, time starts and control output turns on. When time reaches to set value, display value and control output will be reset automatically. 2)When INA is OFF, time resets. 3)During INA signal on Power OFF:Processing time and control output Reset Power ON:Time Reset Reset ON:Processing time and control output Reset Rset OFF:Time Reset 
int.1 (INT.1)	INTERVAL 1(POWER RESET) 	1)Control output turns ON and time starts when INA signal turns ON. 2)If INA signal is applied repeatedly, only initial signal is recognized. 3)When reaches to set value, display value and control output are reset automatically. 4)Time starts when power turns ON and when reset turns OFF during INA signal on. 5)Time processes normally while INA signal keeps ON status. 
ofd (OFD)	SIGNAL OFF DELAY(POWER RESET) 	1)If INA is ON, control output remains ON. 2)When INA signal is OFF, time processes. 3)When time reaches to set value, display value and control output will be reset automatically. 

15.Input connections

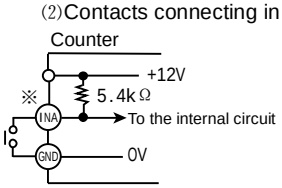
1、Input logic:No-voltage input(NPN)

(1) Solid state relay input

●Standard snesor: NPN output sensor



(2)Contacts connecting in

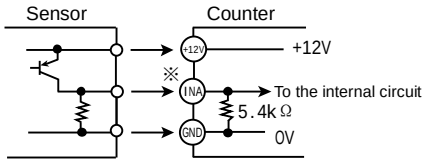


Counting speed:setting to 1 or 30cps (counter)

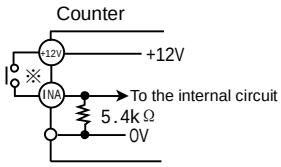
2、Input logic:voltage input(PNP)

(1) Solid state relay input

● Standard sensor: PNP output sensor

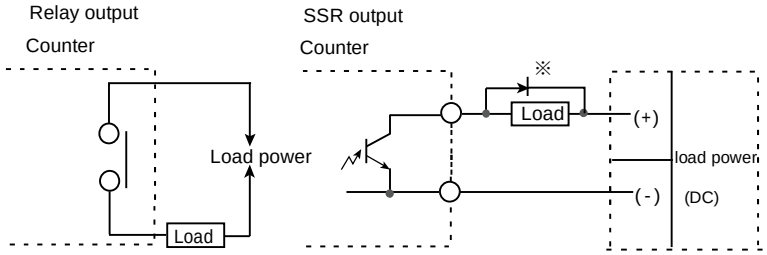


(2)Contacts connecting in



Counting speed:setting to 1 or 30cps (counter)

16.Output Connecting



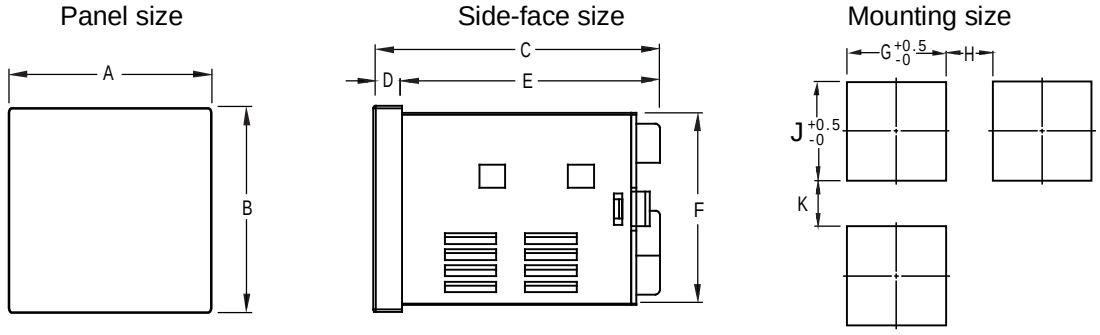
SSR output

1.Adopt proper load and power,output of the SSR can't be too large ,capacity (30VDC.100mA)

2.Make sure the power supply not connected inversally

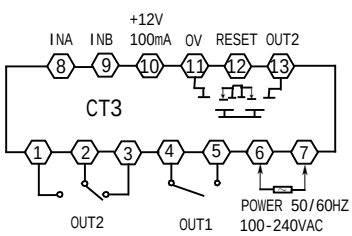
3.When adopt inductive load (such as relay),
Filter circuit (such as diode,rheostat)should be connected between the two ends of the load .

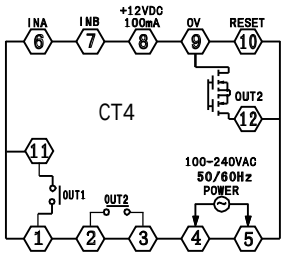
17. Dimension & Mounting size(mm)

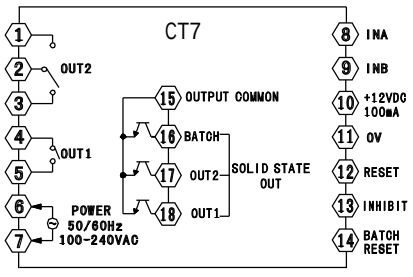


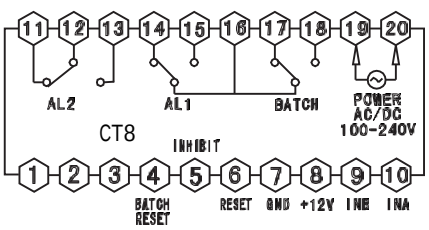
Model	A	B	C	D	E	F	G	H(Min)	J	K(Min)
CT3 :(36*72)	72	36	85.5	6	79.5	30.5	67	25	31	25
CT4 :(48*48)	48	48	101	10	91	45	45.5	25	45.5	25
CT7 :(72*72)	72	72	100	10	90	67.5	68	25	68	25
CT8 :(48*96)	96	48	100	6	94	45	91.5	25	45.5	25
CT16:(160*80)	160	80	102	10	92	76	154	30	76.5	30
Remark	Unit：(mm) Tolerance+0.5%(Special indicated model is not included)									

18. Connecting Drawing

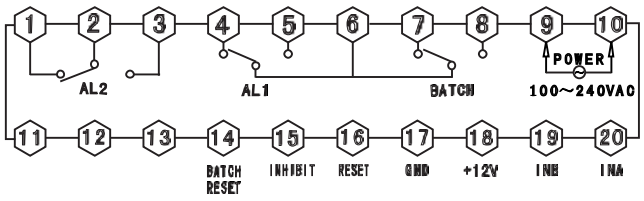








CT16



Please refer to the connection drawing on the meter if any changes.

Communication Protocol of the Counter

1. Type and Format of the Communication Data

This series adopt Asynchronous communication interface (SCI) , the electrical level for the interface comply with the standard RS485 protocol .

The data frame format of MODBUS RTU Protocol is : one start bit , 8 data bit , without check , one stop bit .Baud rate of communication transfer data is 4800bit/s or 9600bits/s

Data flame format

start bit	data bit	check bit	stop bit
1	8	without	1

2.Transter Process of the Communication Message

When the communication order be sent to the slave unit from the master unit , if the slave unit receive oder which coincides with the address sent from the master unit be checked CRC checking and order fromat without error ,then slave unit will carry out the corresponding operation and feedback the running result .

2-1. Address of the meter (1 byte)

It is included in the address area , the range is :1-247 . The master unit selects the slave unit by input the slave unit address to order address area . When the slave unit feedback a data , it put its own address to the address area of the feeded back message , so that the master unit will learn which slave unit responsed . (Each address of the equipment in a bus must be unique)

2-2 . Function code (1 byte)

It is included in the function code of the message . When be sent to slave unit from the master unit , the function code will tell the slave unit which operations should be carried out . When slave unit responses , function code will instruct normal response or error (abnormal response). About normal response , the slave unit just feedback the received function code . When it is abnormal response , the slave unit will set the highest bit of received function code to 1 , then feedback .

Definition of the function code

Function code	Definition	Operation
0x03	Read register	Read the data of single or several register
0x10	Write multi-register	Write n pcs of 32-bit binary data into n pcs of successive registers

2-3. Data area

It is included data area of the message , length of the data is different with function code .

3.Order Format of Master Unit & Feedback Message Format from Slave Unit

3-1. Read Multi-register

For example: Master unit send order reading the data of OUT2 alarm value register

Oder format	Master unit send order		
Address area	Meter address		0X01
Function area	Function code		0X03
Data area	Address of the begin register	High bit	0X00
		Low bit	0X05
	Quantity of read register	High bit	0X00
		Low bit	0X01
error detect area	CRC checking code	Low bit	0X94
		High bit	0X0B

Message format	Feedback message from slave unit		
Address area	Meter address		0X01
Function area	Function code		0X03
Data area	Byte No. of the data		0X04
	OUT2 register data(32-digit data , low bit in front , high bit at behind)	Low bit 1	0XC0
		Low bit 2	0X5A
		High bit 1	0XFB
		High bit 2	0X34
error detect area	CRC checking code	Low byte	0XA4
		High byte	0XC7

Note：The above example is to read the order and format of a single register data .When need to read multiple registers at a time , it only need to fix the first adress of the register and the needing read register No.s (read/write order from low bit to high bit) , then can read successive register data of multiple address . When feedback a data , low bit of it will be in front , and high bit lists behind .

3-2.Write Multi-register

For example：Master unit sends an order writing 1000.000 into OUT2 alarm register of the slave un

Order format	Master unit sends order		
Address area	Meter address		0X01
Function area	Function code		0X10
Data area	Address of the begin register	High byte	0X00
		Low byte	0X05
	Read quantity of the register	High byte	0X00
		Low byte	0X01
	Byte No.s of the write data		0X04
	OUT2 register dara read to write in (32-digit , low bit in front , high bit at behind)	Low bit 1	0X40
		Low bit 2	0X42
		High bit 1	0X0F
		High bit 2	0X00
error detect area	CRC checking code	Low byte	0X83
		High byte	0X87

message format	Feedback message from slave unit		
Address area	Meter address		0X01
Function area	Function code		0X10
Data area	Address of the begin register	High byte	0X00
		Low byte	0X05
	Quantity of write register	High byte	0X00
		Low byte	0X01
error detect area	CRC checking code	Low byte	0X11
		High byte	0XC8

4. Communication erro shooting

When the meter detects an error excepted for CRC checking code , it will feedback an error message to master unit .The slave unit set the high bit of the received function code to 1, then feedback the meter address and error code as error message

4-1. Error code format feedback from slave unit

Address code	Function code (highest position)	Erro code	CRC checking code low byte	CRC checking code low byte
one byte	one byte	one byte	one byte	one byte

4-2.Erro code

0X01	Function code error	Received function code can not be supported by the meter
0X02	Register address error	Received register address exceeds the range of the meter register address
0X03	Quantity of register error	Received register quantity exceeds register quantity of the meter
0X04	Data value error	Received data value exceeds the data range of the corresponding address

5.Parameter address of the meter

No.	Register address	Register name	Data type	Value range	Function	Remark
0	0x0001	Counting value PV	long	-----	R	Reserve 3 decimal point
1	0x0002	Batch counting value BV	Unsigned long	-----	R	
2	0x0003	Alarm status	Unsigned long	-----	R	
3	0x0004	OUT1alarm value (PS1)	Unsigned long	1~999999000	R/W	Reserve 3 decimal point
4	0x0005	OUT2 alarm value (PS2)	Unsigned long	1~999999000	R/W	Reserve 3 decimal point
5	0x0006	BA.O alarm value (BA.S)	Unsigned long	1~999999	R/W	
6	0x0007	scale coefficient SCL	Unsigned long	0.00001-9999.99	R/W	Reserve 5 decimal point
7	0x0008	Start value W	long	-99999-999999	R/W	Reserve 3 decimal point
8	0x0009	Meter status 1	Unsigned long	-----	R/W	
9	0x000A	Meter status 2	Unsigned long	-----	R/W	
10	0x000B	Meter status 3	Unsigned long	-----	R/W	
11	0x000C	Meter status 4	Unsigned long	-----	R/W	

*PV , PS1 , PS2 are defaulted to reserve 3 decimal point . The actual value=feedback data or write data/1000.If the register feedback data PV＝1 ,actual PV value＝0.001 .Similarly write 1000000 into PS2 register. Actual setting value of OUT2 (PS2)=1000.0000
（Effective display digit of the decimal point can be set by the DP menu of the meter)

6. Alarm status（address:0x0003）

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
Reservation								BA.O alarm output flag							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
OUT2 alarm output flag								OUT1 alarm output flag							

6-1、Bit0-Bit7 OUT1 alarm output flag: 0x00：OUT1 no alarm output， 0x01：OUT1 has alarm output

6-2、Bit8-Bit15 OUT2 alarm output flag: 0x00：OUT2 no alarm output， 0x01：OUT2 has alarm output

6-3、Bit16-Bit23 BA.O alarm output flag: 0x00： BA.O no alarm output， 0x01：BA.O has alarm output

7.Register of the meter status 1（address:0x0009）

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
OUT2 output delay time setting unit								OUT1 output delay time setting unit							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
OUT output mode setting unit								SIG logic level selection for input terminal							

7-1、Bit0-Bit7：SIG input logic level select unit（value range 0x00 - 0x01）

Bit0-Bit7=0x00： NPN input mode，signal input by connecting the internal 7.4K resistance to the 12V auxiliary power supply

Bit0-Bit7=0x01： PNP input mode，signal input by connecting the internal 5.4K resistance to the public ground terminal .

7-2、Bit8-Bit15：OUT output mode select unit of the meter（value range be detemined the present status)

Bit8—Bit15 output mode							
Bit8—Bit15	output mode	Bit8—Bit15	output mode	Bit8—Bit15	output mode	Bit8—Bit15	output mode
0x00	F	0x01	N	0x02	C	0x03	R
0x04	K	0x05	P	0x06	Q	0x07	A
0x08	S	0x09	T	0x0a	D		
Remark:Before set output mode to mode D,please make sure CP ≤ 1KHZ , or it will feedback an error code							

7-3、Bit16—Bit31：OUT1 ,OUT2 alarm output delay time select unit（value range : 0x00- 0x08)

Bit16 — Bit23 corresponding to OUT1output delay time			
Bit16—Bit23	Delay time	Bit16—Bit23	Delay time
0x00	10mS	0x01	50mS
0x02	100mS	0x03	200mS
0x04	500mS	0x05	1000mS
0x06	2000mS	0x07	5000mS
0x08	HOLD		
Remark:Bit16—Bit23 value range（0-8）			

Bit24 — Bit31 corresponding to OUT2 output delay time			
Bit24—Bit31	Delay time	Bit24—Bit31	Delay time
0x00	10mS	0x01	50mS
0x02	100mS	0x03	200mS
0x04	500mS	0x05	1000mS
0x06	2000mS	0x07	5000mS
Remark:Bit24—Bit31 value range（0-7）			

8.Register of the meter status 2（address:0x000A）

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
IN input mode select								DATA power off data save							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
DP display decimal point select								RST effective pulse width selection of input controlling signal							

8-1、Bit0-Bit7：RSTeffective pulse width selection of input controlling signal(value range:0x00- 0x01)

Bit0-Bit7=0x00: Effective pulse width of input controlling signal is 20 ms .

Bit0-Bit7=0x01 :Effective pulse width of input controlling signal is 1 ms .

8-2、Bit8-Bi15：DP display decimal point select（value range:0x00 - 0x03）

Bit8—Bit15	Decimal point	Bit8—Bit15	Decimal point	Bit8—Bit15	Decimal point	Bit8—Bit15	Decimal point
0x00	without	0x01	1	0x02	2	0x03	3

8-3、Bit16-Bit23：DATA power off data save select（value range: 0x00 - 0x01）.

Bit16-Bit23=0x00：The present counting value clear to zero when power off .

Bit16 - Bit23=0x01 : Save the present counting value when power off , if power on again the counting value begins with the saved value .

8-4、Bit24-Bit31： IN input mode select（value range : 0x00 - 0x04）

Bit24—Bit31	Input mode	Bit24—Bit31	Input mode	Bit24—Bit31	Input mode	Bit24—Bit31	Input mode
0x00	U	0x01	D	0x02	UD-A	0x03	UD-B
0x04	UD-C						

9.Register of the meter status 3（address：0x000B）

Bit31	Bit30	Bit29	Bit28	Bit27	Bit26	Bit25	Bit24	Bit23	Bit22	Bit21	Bit20	Bit19	Bit18	Bit17	Bit16
CPS high limit select unit of the counting frequecy								ADD communication address setting unit of the meter							
Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
BAUD communication baud rate setting unit								LOCK key lock level select unit							

9-1、Bit0-Bit7：LOCK key lock level（value range : 0x00 - 0x03 ）

Bit8—Bit15	Lock level	Bit8—Bit15	Lock level	Bit8—Bit15	Lock level	Bit8—Bit15	Lock level
0x00	L.OFF	0x01	LOC.1	0x02	LOC.2	0x03	LOC.3

9-2、Bit8-Bit15：BAUD communication baud rate setting unit（value range: 0x00 - 0x01）

Bit8-Bit15=0x00 ： Baud rate =9600Bit/S（9600）

Bit8-Bit15=0x01 ： Baud rate =4800Bit/S（4800 ）

9-3、Bit16-Bit23：ADD communication address setting unit of the meter (value range: 0x01 - 0xf7）

9-4、Bit24-Bit31：CPS counting frequency high limit select unit（value range determined by the output mode）.

Bit24—Bit31	Frequency high limit	Bit24—Bit31	Frequency high limit	Bit24—Bit31	Frequency high limit	Bit24—Bit31	Frequency high limit
0x00	1HZ	0x01	30HZ	0x02	1KHZ	0x03	5KHZ
0x04	10KHZ						
Remark：when output moce is mode D , the value range of Bit24 — Bit31 is (0x00 - 0x02)，otherwise the value range is （ 0x00 - 0x04 ）							

10.Data error code

10-1 .Data error code: when it is checked no error of order format , meter address , function code and CRC checking , and when the master unit write error data to a register of the slave unit，the slave unit will feedback a corresponding error code .
The reflection are as follows :

Error code	Definition	Error code	Definition
0x14	OUT1 alarm value (PS1) error	0x15	OUT2 alarm value (PS2) error
0x16	BA.O alarm value (BA.S) error	0x17	SCL coefficient value error
0x18	W start value error	0x19	SIG input logic selection error
0x1A	OUT output mode selection error	0x1B	OUT1 output delay time selection error
0x1C	OUT2 output delay time selection error	0x1D	RST the min reset time selection error
0x1E	DP decimal point selection error	0x1F	DATA storage counting value selection error
0x20	IN counting input mode selection error	0x21	LOCK key lock function selection error
0x22	BAUD communication baud rate selection error	0x23	ADD communication address of the meter setting error
0x24	CPS the max counting speed selection error	0x25	
0x26		0x27	

Caution：When write data into the meter by commmunication interface，the writen times of each register is limited . CT series can be writen at least 1000000 times . If writen times more than the limit , it may cause damage to the register unit .