

Autonics COUNTER/TIMER CT SERIES

M A N U A L



CTS Series CTY Series CTM Series

Thank you very much for selecting Autonics products. For your safety, please read the following before using.

Caution for your safety

- *Please keep these instructions and review them before using this unit.
- *Please observe the cautions that follow:
- Warning** Serious injury may result if instructions are not followed.
- Caution** Product may be damaged, or injury may result if instructions are not followed.
- *The following is an explanation of the symbols used in the operation manual.
- ⚠caution: Injury or danger may occur under special conditions.

Warning

- In case of using this unit with machineries(Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it requires installing fail-safe device, or contact us for information required. It may result in fatal damage, fire or human injury
- This unit must be mounted on Panel. It may give an electric shock.
- Do not connect terminals when it is power on. It may give an electric shock.
- Do not disassemble and modify this unit, when it requires. If needs, please contact us. It may give an electric shock and cause a fire.

Caution

- This unit shall not be used outdoors. It might shorten the life cycle of the product or give an electric shock.
- When wire connection, AWG 20(0.50mm²) should be used and screw bolt on terminal block with 0.74N-m to 0.90N-m strength. It may result in malfunction or fire due to contact failure.
- Please observe specification rating. It might shorten the life cycle of the product and cause a fire.
- Do not use the load beyond rated switching capacity of Relay contact. It may cause insulation failure, contact melt, contact failure, relay broken, fire etc.
- In cleaning the unit, do not use water or an organic solvents. It might cause an electric shock or fire that will result in damage to the product.
- Do not use this unit at place where there are flammable or explosive gas, humidity, direct ray of the sun, radiant heat, vibration, impact etc. It may cause explosion.
- Do not inflow dust or wire dregs into inside of this unit. It may cause a fire or mechanical trouble.

Ordering information

CT	6	M	-	2P	4	T	Communication	Blank	None
							T	RS485	
							Power supply	4	100~240VAC 50/60Hz
Output	2	24VAC 50/60Hz / 24~48VDC							
	2P	Dual preset							
Size	1P	Single preset							
	I	Indicator							
Digit type	S	DIN W48×H48mm							
	Y	DIN W72×H36mm							
	M	DIN W72×H72mm							
Item	4	9999(4 Digit)							
	6	999999(6 Digit)							
	CT	Counter/Timer							

*4 Digits does not exist in the indicator type.

Specifications

*Upgraded or added functions is seen in the shaded part of ordering information.

Series	CTS	CTY	CTM
Digit	4	6	6
Model	Dual Preset: CT4S-2P□□, Single Preset: CT4S-1P□□, Indicator: CT4S-I□□□	Dual Preset: CT6S-2P□□, Single Preset: CT6S-1P□□, Indicator: CT6S-I□□□	Dual Preset: CT6Y-2P□□, Single Preset: CT6Y-1P□□, Indicator: CT6M-I□□□
Digit Size	Count value: 11mm, Preset value: 8mm	Count value: 10mm, Preset value: 7mm	Count value: 13mm, Preset value: 9mm
Power Supply	AC Power: 100~240VAC 50/60Hz, AC/DC Power: 24VAC 50/60Hz / 24~48VDC	100~240VAC 50/60Hz, 24VAC 50/60Hz / 24~48VDC	
Power consumption	AC Power: Max. 12VA, AC/DC Power: AC: Max. 10VA / DC: Max. 8W	AC: Max. 10VA / DC: Max. 8W	
Input	Selectable voltage input or No-voltage input. Voltage input: input impedance is 5.4kΩ, 'H' level: 5~30VDC, 'L' level: 0~2VDC. No-voltage input: short-circuit impedance: Max. 1kΩ, Residual voltage: Max. 2VDC.		
One-shot output	Selectable 0.01s to 99.99s		
Control output	Without com. Contact output: Dual preset: SPST(1a)2EA, Single preset: SPDT(1c)1EA. Solid state output: Dual preset: 1NPN open collector, Single preset: 1NPN open collector. Com. Contact output: Dual preset: SPST(1a)2EA, Single preset: SPDT(1c)1EA. Solid state output: Dual preset: SPST(1a)2EA, Single preset: SPDT(1c)1EA. Capacity Contact output: 250VAC 5A resistive load, 250VAC 3A resistive load, 250VAC 5A resistive load. Solid state output: 30VDC Max. 100mA Max.		
External sensor power	12VDC ±10%, 100mA Max.		
Memory retention	10years(When using non-volatile semiconductor memory type)		
Timer	Repeat error, Set error, voltage error, Temperature error—Power ON Start: Max. ±0.01% ±0.05 sec, Signal Start: Max. ±0.01% ±0.03 sec		
Insulation resistance	Min. 100MΩ(500VDC Megger)		
Dielectric strength	2,000VAC 50/60Hz for 1minute		
Noise strength(AC Power)	±2kV the square wave noise(pulse width:1µs) by the noise simulator		
Vibration	Mechanical: 0.75mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 1 hour, 0.5mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 10 minutes		
Shock	Mechanical: 300m/s ² (Approx. 30G) 3 times at X, Y, Z direction, Malfunction: 100m/s ² (Approx. 10G) 3 times at X, Y, Z direction		
Relay Life cycle	Mechanical: Min. 10,000,000 times, Electrical: Min. 100,000 times		
Protection	IP65(Front panel only)		
Environment	Ambient temperature: -10~55°C, Storage temperature: -25~65°C, Ambient humidity: 35~85%RH, Storage humidity: 35~85%RH		
Approval	CE, UL		
Weight	Approx. 159g, Approx. 149g, Approx. 253g		

*Environment resistance is rated at no freezing or condensation.

Communication specification

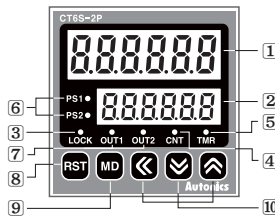
Protocol	Modbus RTU(16bit CRC)
Connection method	RS485
Application standard	Compliance with EIA RS485
Number of connections	31, it is available to set address 1~127
Communication method	Half Duplex
Synchronous method	Asynchronous
Communication distance	within max. 800meter
Communication speed	2,400/4,800/9,600/19,200/38,400bps(Factory default: 9,600bps)
Response waiting time	5~99ms(Factory default: 20ms)
Start bit	1bit(Fixed)
Data bit	8bits(Fixed)
Parity bit	None, Even, Odd(Factory default: None)
Stop bit	1, 2bit(Factory default: 2bit)

Upgraded functions

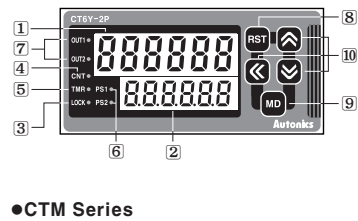
- Available to set the decimal point position of preset value to 5 decimal place.
- Built-in Modbus communication function. (Communication model)
- Available to set the One-Shot output time per 10ms. (0.01sec to 99.99sec)
- Increase contact capacity to 5A(CTS, CTM series).
- Available to set Count Start Point.(Initial value)
- Improved visibility with high luminance LED.
- Improved to select memory protection function in the indicator.
- Added BATCH counter function.(CTM series)
- Added Counter UP-1(Up-1)/UP-2(Up-2)/dn-1(Down-1)/dn-2(Down-2) input modes.
- Added Counter Total(TOTAL)/Hold(HOLD) operation modes in the indicator.
- Added Timer Total(TOTAL)/Hold(HOLD)/On Time Display(On Time Display) operation modes in the indicator.
- Added Timer Int.2(INT2)/NFD(NFD)/NFD.1(NFD.1)/NFD.2(INTG) output modes.
- Added Timer range 999.999s / 9999m59s / 99999.9h.

Front panel identification

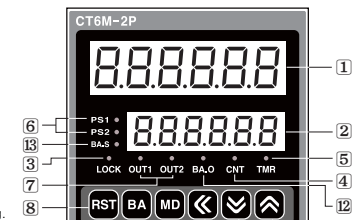
CTS Series



CTY Series



CTM Series



Count indicator(Red LED)

- Run mode: Count mode—Indicates count value. Timer mode—Indicates time progressing.
- Function setting mode: Indicates setting value.

Preset value indicator (Yellow-Green LED)

- Run mode: Indicates preset value.
- Function setting mode: Indicates setting value 1.

Key Lock

- Lights when setting key lock.

The operation of counter indicator

- The operation of timer indicator: TMR LED flashes when the timer is operating. TMR LED lights when the operating time stops.

Check preset value and display change of it

- PS1 LED lights when checking or changing the setting value 1.
- PS2 LED lights when checking or changing the setting value 2.

Output(OUT1, OUT2) indicator

- OUT1 lights when output1 is on.
- OUT2 lights when output2 is on.

Reset key

- By pressing **RST** key in Run mode, the count value is initialized and output is returned.
- By pressing **RST** key in BATCH counter mode, BATCH count value resets.

Mode key

- By pressing **MD** key for 3sec (parameter setting)/ 5sec (communication) in RUN mode, it moves to function setting mode.
- By pressing **MD** key in function setting mode, select function setting mode and pressing **MD** key over 3 sec., it moves to Run mode.
- By pressing **MD** key over 1 sec. in function setting checking mode, it moves to Run mode.

Set key

- ⊖ To enter into setting value(PS1, PS2) change status and shift digit of setting value(PS1,PS2).
- ⊕ To decrease setting value in setting value change mode, change setting value in function setting mode, move down checked value in function setting check mode.
- ⊖ To increase setting value in setting value change mode, change setting value in function setting mode, move up checked value in function setting check mode. By pressing **MD** key over 1 sec. in Run mode, enters into function setting check mode.

BATCH key

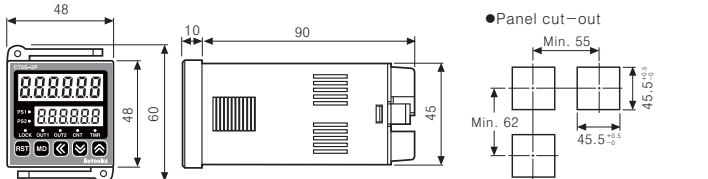
- By pressing **MD** key in run mode, enters into BATCH counter indication mode.

BATCH output indicator(Red LED)

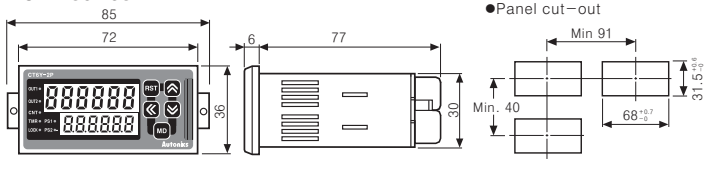
- Lights when checking and changing BATCH setting value.

Dimensions

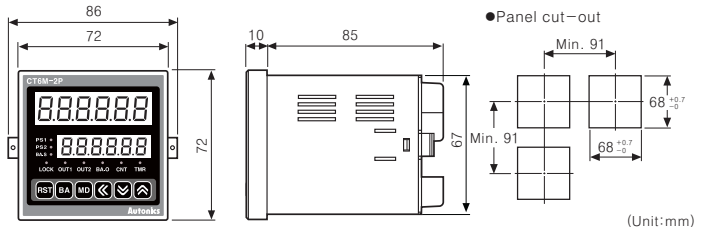
CTS series



CTY series



CTM series

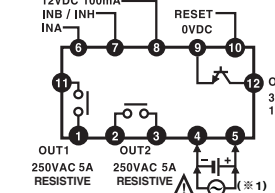


Guide for connection

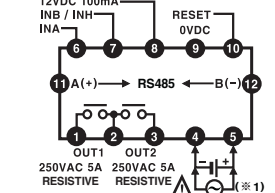
1. Connections

1-1. CTS series

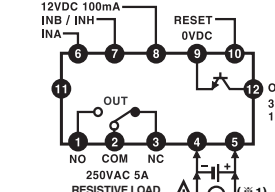
A. CT[S]-2P□



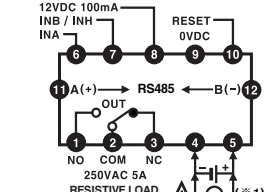
B. CT[S]-2P□T



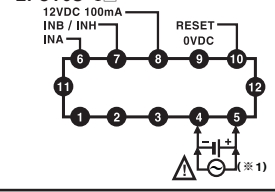
C. CT[S]-1P□



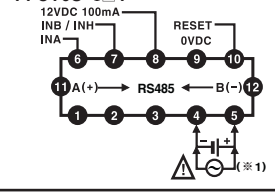
D. CT[S]-1P□T



E. CT6S-I□



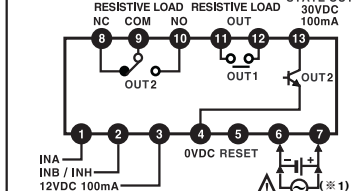
F. CT6S-I□T



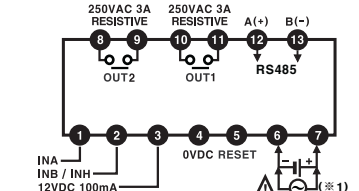
Be careful that connections are different between model with communication and model without communication when wiring.

1-2. CTY series

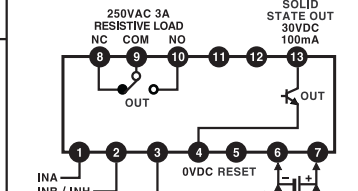
A. CT6Y-2P□



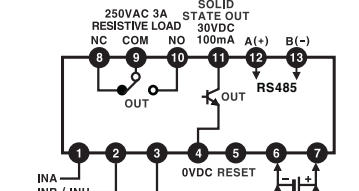
B. CT6Y-2P□T



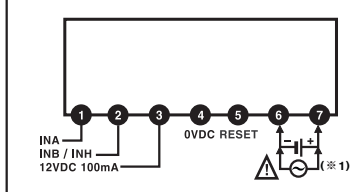
C. CT6Y-1P□



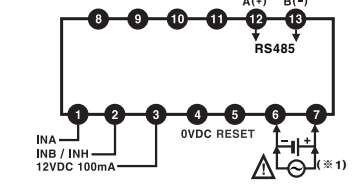
D. CT6Y-1P□T



E. CT6Y-I□

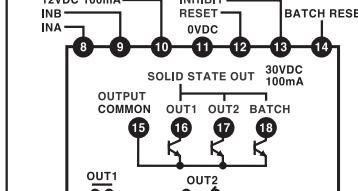


F. CT6Y-I□T

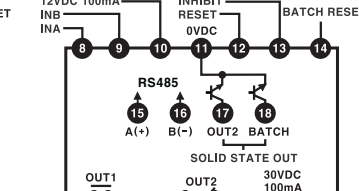


1-3. CTM series

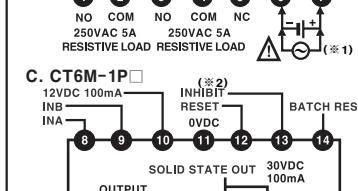
A. CT6M-2P□



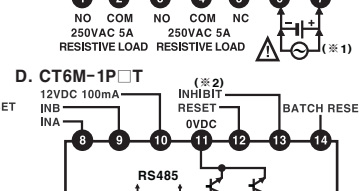
B. CT6M-2P□T



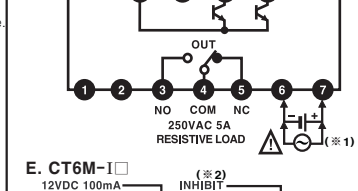
C. CT6M-1P□



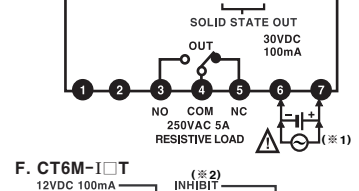
D. CT6M-1P□T



E. CT6M-I□



F. CT6M-I□T



* (1) Source

- AC Power: 100~240VAC 50/60Hz
- AC/DC Power: 24~48VDC, 24VAC 50/60Hz

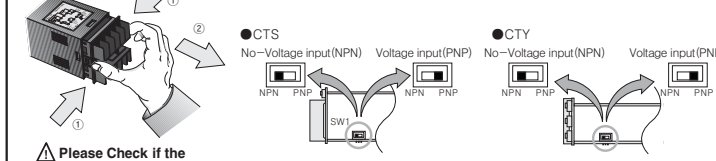
* (2) INHIBIT Signal

- Counter operation: If INHIBIT signal is applied, count input will be prohibited.
- Timer operation: If INHIBIT signal is applied, time progressing will stop. (HOLD)

2. Input and output connections

2-1. Input logic Selection[No-voltage input(NPN)/Voltage input(PNP)]

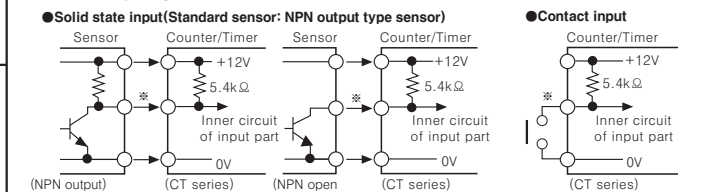
- The power must be cut off.
- Squeeze toward ① and pull toward ② as shown in picture. (CTS/CTY Series)



- Select input logic by using input logic switch(SW1) inside Counter/Timer.
- Please assembly opposite way of the case detachment.
- Then apply the power to Counter/Timer.

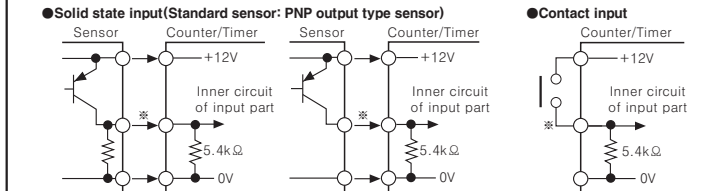
2-2. Input connection

A. No-voltage input(NPN)



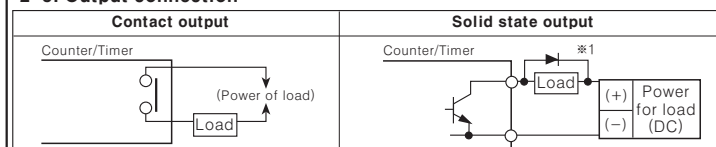
* INA, INB/INH, RESET, INHIBIT, BATCH RESET input part

B. Voltage input(PNP)



* INA, INB/INH, RESET, INHIBIT, BATCH RESET input part

2-3. Output connection

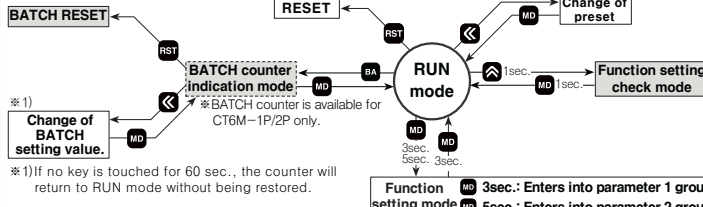


Caution
Use proper load not to exceed the capacity.

Caution
Use proper load and power for load not to exceed ON/OFF capacity(30VDC Max. 100mA max.) of solid state output. Be sure not apply reverse polarity of power.
*1: When using inductive load(Relay etc), surge absorber(Diode, Varistor etc) must be connected between both sides of the load.

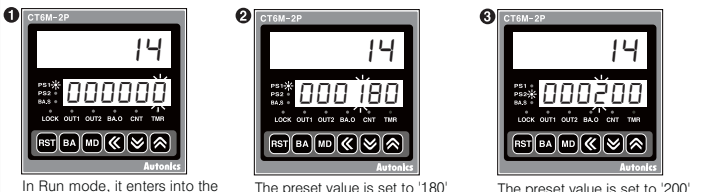
Basic operations and constitution (Counter/Timer/Communication)

1. Operations and functions



1-1. Change of preset (Counter/Timer)

Even if changing the preset value, input operation and output control will continue. In addition, the preset value could be set to 0 and 0 preset value turns ON. According to output mode, preset value could not be set to 0. (When setting to 0, preset value "0" will flash 3 times.)



In Run mode, it enters into the preset value setting mode using **MD** key. 'PS1' LED lights and first digit of preset value flashes. The preset value is set to '180' using **MD** and **MD** keys, then press **MD** key to enter into the PS2 setting mode. The preset value is set to '200' using **MD** and **MD** keys, then press **MD** key to complete PS2 setting and return to Run mode.

1-2. Function setting check mode

Setting value of function setting mode can be confirmed using the **MD** and **MD** keys.

1-3. Switching display function in preset indicator

Setting value 1 (PS1) and setting value 2 (PS2) are displayed each time pressing **MD** key in dual preset model. (In timer, it is available for OND, OND 1 or OND 2 output mode.)

1-4. Reset

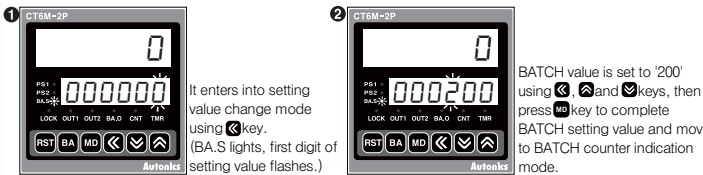
In Run mode or function setting mode, if pressing **RST** key or applying the signal to the RESET terminal on the back side, present value will be initialized and output will maintain off status.

2. BATCH Counter (For CT6M-1P/CT6M-2P model only)

In BATCH counter indication mode, 'BATCH counter value' is displayed in count indicator and 'BATCH counter setting value' is displayed in preset indicator.

2-1. Change of BATCH setting value

If pressing **MD** key in Run mode, it will enter into BATCH counter indication mode.



2-2. BATCH Counting operation

BATCH counting value is increasing until BATCH RESET signal applied. BATCH counting value will be circulated when it is over 999999.

- BATCH counting operation in Counter: Counts the number of reaching setting value of CT6M-1P or reaching dual setting value of CT6M-2P.
- BATCH counting operation in Timer: Counts the number of reaching setting time. (In case of 'FLK' output mode, count the number of reaching T.off setting time and T.on setting time.)

2-3. BATCH output

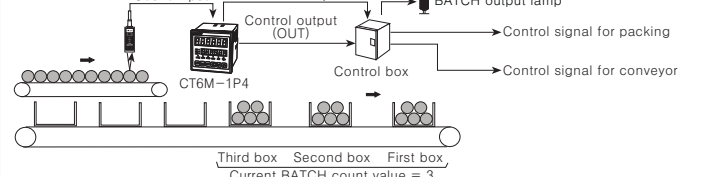
- If input signal is applied while changing BATCH setting value, counting operation and output control will be performed.
- If BATCH count value equals to BATCH setting value, BATCH output will be ON and maintain ON status until BATCH reset signal is applied.
- When the power is cut off then resupplied in status of BATCH output is ON, BATCH output maintains ON status until BATCH reset signal is applied.

2-4. BATCH reset

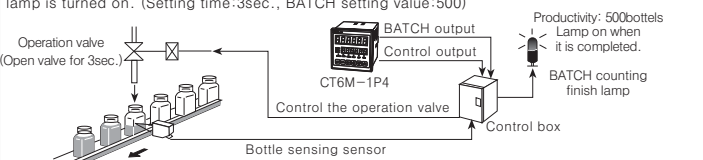
- If pressing reset button or applying the signal to BATCH RESET terminal on the back side panel, BATCH counting value could be reset.
- When BATCH reset is applied, BATCH counting value maintains at 0 and BATCH output maintains in the OFF status.

2-5. Application of BATCH Counter function

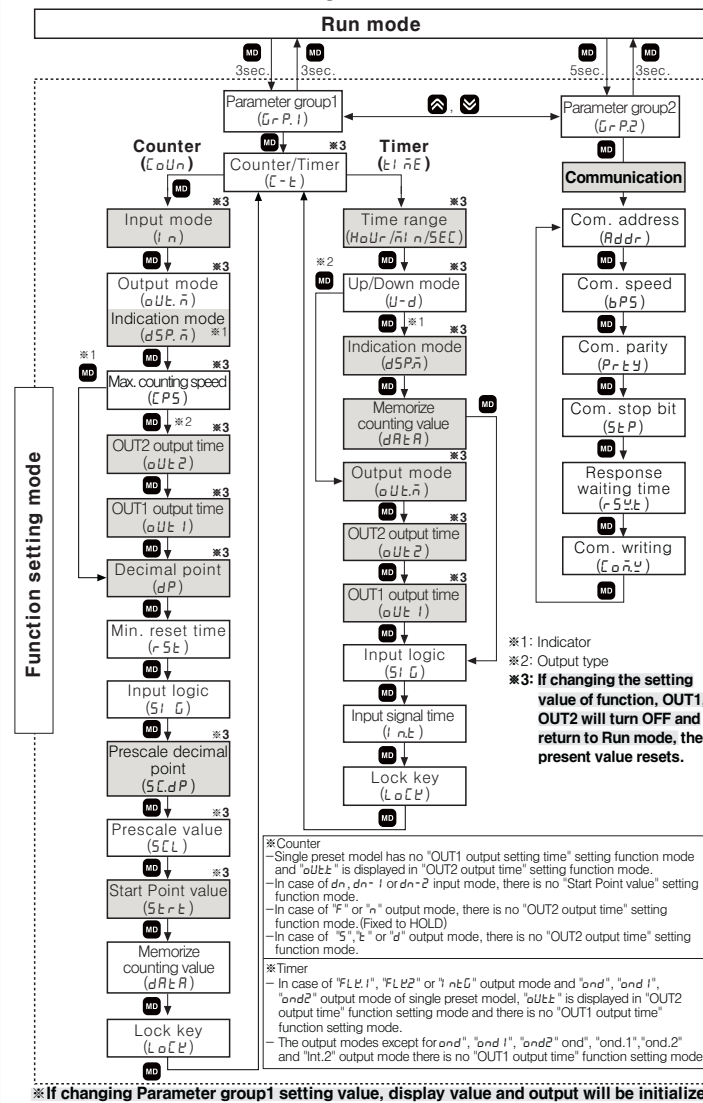
A. Counter
In case, put 5 products in a box then pack the boxes when they reaches to 200.
-Counter preset setting value="5", BATCH setting value="200"
-When the count value of counter reaches to the preset value "5", the control output (OUT) will be on, and at this time the count value of the BATCH counter will be increased by "1". The control box which received the control output (OUT) repeatedly controls conveyor to move the full box and to place the next empty box for standby. When the BATCH count value reaches to "200", BATCH output will be ON. Then the control box stops conveyor and provides a control signal for packing.



B. Timer
Fills milk into the bottle for 3sec. (setting time) When 500 bottles are filled, BATCH counting finish lamp is turned on. (Setting time: 3sec., BATCH setting value: 500)



3. Flow chart for function setting mode



Counter mode

1. Parameter setting

Setting mode	How to set	
Counter/Timer (C-T)	$C o U n \leftrightarrow T i m e r$	* $C o U n$: COUNTER * $T i m e r$: TIMER
Input mode (I n)	$U d - C \leftrightarrow U P - 1 \leftrightarrow U P - 2 \leftrightarrow d n - 1 \leftrightarrow d n - 2 \leftrightarrow U d - R \leftrightarrow U d - b$	
Output mode (o U t)	$F \leftrightarrow n \leftrightarrow C \leftrightarrow r \leftrightarrow B \leftrightarrow P \leftrightarrow q \leftrightarrow R$	* In case that output mode is "F", "n", there is no "OUT2 output time" setting mode. (Fixed to HOLD)
Indication mode (d S P n)	$H o l d \leftrightarrow t o t a l \leftrightarrow$	* In case of the indicator, indicate mode selection (d S P n) is displayed. * It is added that the function which can set the preset value when selecting HOLD. (Refer to 4. Counter operation of the indicator.)
Max. counting speed (C P S)	$30 \leftrightarrow 12 \leftrightarrow 5 \leftrightarrow 10 \leftrightarrow$	* Counting speed is that of one by one (1:1) duty ratio of INA or INB input signal, and it is applied in INA and INB at the same time. * In case of setting "d" in output mode, you can choose from 1 cps, 30 cps or 1k cps.
OUT2 output time (o U t 2)	$3 \leftrightarrow$	* To shift flashing digit position of OUT2 output time value. * Set OUT2 one-shot output time. * Setting range: 0.01 to 99.99 sec. * It does not appear if F or n output mode is selected.
OUT1 output time (o U t 1)	$3 \leftrightarrow$	* To shift flashing digit position of OUT1 output time value. * Set OUT1 one-shot setting time. * Time range: 0.01 to 99.99 sec., Hold * To change OUT1 output time value. * Hold is displayed by pressing MD key 4 times.
Decimal point (d P)	\cdot	* 6Digit type * 4Digit type * Setting the decimal point is applied same to counting value and setting value.
Min. reset time (r 5 t)	$1 \leftrightarrow 20$ Unit: ms	* Set the min. external RESET signal width.
Input logic (S i G)	$n P n$: No-Voltage input $P n P$: Voltage input	* Check input logic value (PNP, NPN).
Prescale decimal point (S C d P)	\cdot	* 6Digit type * 4Digit type * Prescale decimal point position is not set below the decimal point setting digits (d P).
Prescale value (S C L)	$3 \leftrightarrow$	* To shift the flashing digit. * Setting range of prescale value: 6Digit type: 0.00001-99999.9, 4Digit type: 0.001-999.9 * Refer to 5. Prescale function.
Start Point Value (S t r t)	$3 \leftrightarrow$	* To shift the flashing digit. * Setting range of Start Point value (Connected with decimal point setting): 6Digit type: 0.00000-99999, 4Digit type: 0.000-9999 * Refer to 6. Start Point function.
Memory protection (d R t R)	$L r \leftrightarrow r E C$	* $L r$: Initializes count value when power is off. * $r E C$: Memorizes count value at the moment of power off.
Lock key (L o C k)	$L o F F \leftrightarrow L o C 1$ $L o C 2 \leftrightarrow L o C 3$	* $L o F F$: Cancellation of the lock mode. * $L o C 1$: Locks MD key. * $L o C 2$: Locks MD , MD keys. * $L o C 3$: Locks MD , MD , MD keys.

*1: Explanation of decimal point and prescale decimal point setting
-Decimal point setting: Set decimal point of the display value on front indicator.
-Prescale decimal point setting: Set prescale decimal point of counting regardless of decimal point of display value on front indicator.

2. Input operation mode

Input mode	Count chart	Operation
UP (Up)		* If INA is counting input, INB is inhibition input. * If INB is counting input, INA is inhibition input.
UP-1 (Up-1)		* Counts when INA input signal is up. (↑)
UP-2 (Up-2)		* Counts when INA input signal is down. (↓)
dn (Down)		* If INA is counting input, INB is inhibition input. * If INB is counting input, INA is inhibition input.
dn-1 (Down-1)		* Count when INA input signal is up. (↑)
dn-2 (Down-2)		* Counts when INA input signal is down. (↓)
Ud-R (Up/Down-A)		* INA: Counting input * INB: Counting command input
Ud-b (Up/Down-B)		* INA: Up counting input * INB: Down counting input
Ud-C (Up/Down-C)		* When both INA and INB are applied to L->H, it will remain previous counting value. * When use A, B phase of encoder with connecting to INA, INB, please set counter input mode (I n) as phase different input (Ud-C).

* @signal width should be over min. signal width and \textcircled{b} signal width should be over a half min. signal width. If not, ± 1 counting error could be occurred.

Input type	Voltage input	No-Voltage input	Counting speed	Min. signal width	Counting speed	Min. signal width
H	5-30VDC	Short circuit	1cps	500ms	5kcps	0.1ms
L	0-2VDC	Open	30cps	16.7ms	10kcps	0.05ms
			1kcps	0.5ms		1cps=1Hz

3. Output operation mode

Output mode	Up, Up-1, 2	Down, Down-1, 2	Up/Down-A, B, C	Operation
F (F)				After count-up, counting display value increases or decreases until reset signal is applied and hold output is maintained.
N (N)				After count-up, counting display value and hold output are maintained until reset signal is applied.
C (C)				When count-up, counting display value will be reset and count simultaneously. OUT1 hold output will be off after OUT2 one-shot time. The one-shot output time of OUT1 one-shot output time is operated regardless of OUT2 output.
R (R)				After OUT2 one-shot time, counting display value will be reset and count simultaneously. OUT1 hold output will be off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.
L (L)				After count-up, counting display value increases or decreases until RESET input is applied. OUT1 hold output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.
K (K)				After count-up, counting display value is maintained while OUT2 output is on. Counting value is internally reset and counts simultaneously. When OUT2 output is off, displays counting value while OUT2 is ON, and it increases or decreases. OUT1 hold output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.
P (P)				After count-up, counting display value increases or decreases during OUT2 one-shot time. OUT1 hold output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.
Q (Q)				After count-up, counting display value increases or decreases until reset signal is applied. OUT1 one-shot output time is operated regardless of OUT2 output.
A (A)				After count-up, counting display value and OUT1 hold output are maintained until RESET input is applied. OUT1 one-shot output time is operated regardless of OUT2 output.
S (S)				OUT1 and OUT2 keeps ON status in following condition: Counting display value \geq PRESET1 Counting display value \geq PRESET2
t (t)				OUT1 output is off: Counting display value \geq PRESET1 OUT2 keeps ON status in following condition: Counting display value \geq PRESET2
d (d)				When counting display value is equal to setting value (PRESET1, PRESET2) only, OUT1 or OUT2 output keeps ON status. When setting 1k cps for counting speed, solid state contact output should be used.

* The single preset type output (OUT) is operated as OUT2 of dual preset type.
* The dual preset model OUT1 output is operated as one-shot or hold output. (except S (S), t (t) or d (d) output mode)
* OUT2 output could be set to 0 in all modes and 0 value output turns ON.
* OUT2 output could not set to 0 in C (C), R (R), P (P) or Q (Q) output mode.

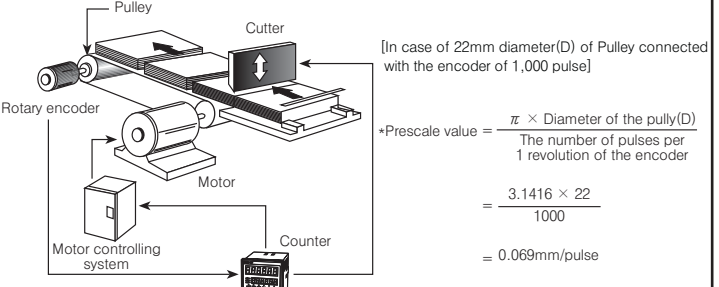
4. Counter operation of the indicator

Indicate mode (d S P n)	In case of input mode is Up (Up, Up-1, Up-2)	In case of input mode is Down (Down, Down-1, Down-2)	Operation
total (TOTAL)			Count value increases or decreases until RESET input is applied. When reaching max. count value or min. count value, it will be reset and count simultaneously.
Hold (HOLD)			Count value increases or decreases until RESET input is applied, count value indicator flashes when reaching preset value (Up count) or 0 (Down count).

* In case of the input mode is Command input (Ud-R), Individual input (Ud-b), Phase difference input (Ud-C). * In case of UP/DOWN (Ud-R, Ud-b, Ud-C) mode among input modes, indication mode (d S P n) of the configuration is not displayed.

5. Prescale function

This function is to set and indicate calculated unit for actual length, liquid measure, position etc. It is called "Prescale value" for measured length, measured liquid, measured position, etc per 1 pulse. For example, P is the number of pulses per 1 revolution of a rotary encoder and L is the desired length to be measured. Prescale value is [(the desired length (L)) / (the number of pulses (P) per 1 revolution of the rotary encoder)]. It is the length per 1 pulse of a rotary encoder.



[In case of 22mm diameter (D) of Pulley connected with the encoder of 1,000 pulse]

$$\text{Prescale value} = \frac{\pi \times \text{Diameter of the pulley (D)}}{\text{The number of pulses per 1 revolution of the encoder}}$$

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

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

In decimal point position setting (d P) of function setting mode, select below 1 decimal place (-----). Select "-----" in prescale decimal point position setting (S C d P) of function setting mode, and set prescale setting value (S C L) to "0.069". It could be available to control conveyor position per 0.1mm.

6. Start Point function

This function is that setting Start Point value in counter operation mode. -In case of "dn", "dn-1" or "dn-2" in timer input mode, it is not available. -When reset is applied, the present value is initialized to Start Point. -After count up in "C", "n", "P" or "Q" output mode, preset value starts at Start Point value.

Timer mode

1. Parameter setting

Setting mode	How to set
Counter/Timer (C-t)	CoUn ← t i n E * CoUn: COUNTER t i n E: TIMER
Timer range (HoUr / n / s / EC)	<p>6Digit type</p> <p>SEC: 0.001s~999.999s, 0.01s~9999.99s, 0.1s~99999.9s, 1s~999999s, 0.01s~99m59.99s</p> <p>HoUr: 0.1h~99999.9h, 0.1s~99m59.9s</p> <p>n / s: 1m~9999h59m, 1s~99h59m59s, 999999m, 99999.9m, 9999m59s</p> <p>4Digit type</p> <p>SEC: 0.001s~9.999s, 0.01s~99.99s, 0.1s~999.9s, 1s~9999s, 1s~99m59s</p> <p>HoUr: 1h~9999h, 1m~99h59m, 9999m, 999.9m</p>
UP/DOWN mode (U-d)	UP ↔ dn * UP: Time proceeds from 0 to the setting value. dn: Time proceeds from the setting value to 0.
Indication mode (dSP,n)	t o t R L ↔ HoLd ↔ o n t . d * Used for the indicator only. * It is added that the feature which set the setting time when selecting HoLd or o n t . d (Refer to 3. Timer operation for the indicator).
Memory protection (dRtR)	CLr ↔ r EC * Used for the indicator only. * CLr: Initializes time value when power is off. * r EC: Memorizes time value at the moment of power off.
Output mode (oUt.n)	o n d ↔ o n d . 1 ↔ o n d . 2 ↔ F L K 1 ↔ F L K 2 ↔ F L K 3 ↔ i n t 1 ↔ i n t 2 ↔ n F d . 1 ↔ n F d . 2 ↔ o F d . 1 ↔ o F d . 2 ↔ i n t G
OUT2 output time (oUt2)	<p>☑ key: To shift flashing digit position of OUT2 output time value.</p> <p>☑ key: To change OUT2 output time value.</p> <p>* Set OUT2 one-shot output time.</p> <p>* Setting range: 0.01~99.99sec.</p> <p>* HoLd is displayed by pressing ☑ key 4 times.</p>
OUT1 output time (oUt1)	<p>☑ key: To shift flashing digit position of OUT1 output time value.</p> <p>☑ key: To change OUT1 output time value.</p> <p>* Set OUT1 one-shot output time.</p> <p>* Setting range: 0.01~99.99sec., Hold</p> <p>* HoLd is displayed by pressing ☑ key 4 times.</p>
Input logic (SiG)	n P n : No-Voltage input * Check input logic value (PNP, NPN). P n P : Voltage input
Input signal time (I n t)	<p>1 ↔ 20 * CTS/CTY: Set min. external INA, INH, RESET signal width.</p> <p>* CTM: Set min. external INA, RESET, INHIBIT, BATCH RESET signal width.</p>
Lock key (LoCt)	<p>LoFF ↔ LoC.1 * LoFF: Cancellation of the lock mode</p> <p>LoC.1: Locks ☑ key.</p> <p>LoC.2: Locks ☑, ☑, ☑ keys.</p> <p>LoC.3: Locks ☑, ☑, ☑, ☑ keys.</p>

2. Output operation mode

Output mode	Time chart	Operation
o n d (OND)		<p>1) Time starts when INA signal turns on.</p> <p>When INA signal turns off, time resets.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) Control output operates as hold or one-shot output.</p>
o n d . 1 (OND.1)		<p>1) Time starts when INA signal turns on, if INA signal is applied repeatedly, only initial signal is recognized.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) Control output operates as hold or one-shot output.</p>
o n d . 2 (OND.2)		<p>1) Time starts when power turns on. (There is no INA function.)</p> <p>2) Time resets when reset turns on. Time starts when reset turns off.</p> <p>3) Control output operates as hold or one-shot output.</p> <p>4) It memorizes display value at the moment of power off.</p>
F L K (FLK)		<p>1) Time starts when INA signal turns on.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) Control output operates as hold output, output turns off for the T.off time and turns on for the T.on time repeatedly.</p> <p>Ta + Tb = T.off setting time</p> <p>4) The T.on time and T.off time must be set individually.</p> <p>5) In case of using the contact output, min. setting time must be set over 100ms.</p>

F L K 1 (FLK.1)		<p>1) Time starts when INA signal turns on.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) Control output operates as hold output.</p> <p>4) In case of using the contact output, min. setting time must be set over 100ms.</p>
F L K 2 (FLK.2)		<p>1) Time starts when INA signal turns ON and the display value at the moment when power is off is memorized.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) Control output operates as hold output.</p> <p>4) Control output will be reversed when it reaches to setting time. (At the initial start, OUT2 control output is OFF.)</p> <p>5) In case of using the contact output, min. setting time must be set over 100ms.</p>
i n t (INT)		<p>1) Control output turns ON and time starts when INA signal turns ON.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) When it reaches setting time, indication value and control output are reset automatically.</p> <p>4) Control output is ON when time is progressing.</p> <p>5) INA input is ignored while time is progressing.</p>
i n t . 1 (INT.1)		<p>1) Control output turns ON and time starts when INA signal turns ON.</p> <p>2) When INA signal is on:</p> <p>Power ON Time Start is operated</p> <p>Power OFF Time Start is operated</p> <p>3) When it reaches setting time1, display value resets and OUT2 output is ON during T2 (HOLD) or t2 output time.</p> <p>* Output turns Off when reaching the setting time even if one-shot time is longer than setting time.</p>
i n t . 2 (INT.2)		<p>1) Time starts when INA input is ON and Resets when INA input is OFF.</p> <p>2) INA input is ON, OUT1 output is ON during T1 (HOLD) or t1.</p> <p>3) When it reaches setting time1, display value resets and OUT2 output is ON during T2 (HOLD) or t2 output time.</p> <p>* Output turns Off when reaching the setting time even if one-shot time is longer than setting time.</p>
o F d (OFD)		<p>1) If INA is ON, control output remains ON. (except when power is off and reset is on)</p> <p>2) When INA signal is OFF, time progresses.</p> <p>3) When it reaches setting time, indication value and control output are reset automatically.</p>
n F d (NFD)		<p>1) When INA input is ON, output is ON and time is progressing, then output is OFF after On_Delay time.</p> <p>2) When INA input is OFF, output is ON and time is progressing, then output is OFF after Off_Delay time.</p> <p>3) If INA input is OFF within On_Delay time, step 2 starts again.</p> <p>4) If INA input is ON within Off_Delay time, step 1 starts again.</p>
n F d . 1 (NFD.1)		<p>1) When INA input turns ON, time progresses and output turns ON after On_Delay time.</p> <p>2) When INA input turns OFF, time progresses and output turns OFF after Off_Delay time.</p> <p>3) If INA input turns OFF within On_Delay time, output will turn ON and step 2 operate.</p> <p>4) If INA input turns ON within Off_Delay time, output will turn OFF and step 1 operate.</p>
i n t G (INTG)		<p>1) Time is progressing while INA input is ON.</p> <p>2) Time progress stops while INA input is OFF.</p> <p>3) When it reaches the setting time, output is ON.</p>

3. Timer operation for the indicator

t o t R L (TOTAL)		<p>1) Time starts when INA input is ON.</p> <p>2) Setting value is initialized when Reset input is ON.</p> <p>3) Time progress stops when INHIBIT input is ON.</p> <p>4) Resets when power is OFF.</p>
H o L d (HOLD)		<p>1) Time starts when INA input is ON.</p> <p>2) Setting value is initialized when Reset input is ON.</p> <p>3) Time progress stops while INHIBIT input is ON.</p> <p>4) Display value at the moment of power OFF is memorized.</p>
o n t . d (On Time Display)		<p>* ON time indicate mode of INA input</p> <p>1) Time reset start operates when INA input turns ON.</p> <p>2) Time progress stops while INA input is OFF.</p> <p>3) When time reaches setting time, display value will stop and flash.</p> <p>4) When reset input is applied, display value is initialized.</p> <p>5) Resets when power is OFF.</p>
		<p>* ON time indicate mode of INA input</p> <p>1) Time reset start operates when INA input turns ON.</p> <p>2) Time progress stops while INA input is OFF.</p> <p>3) When time reaches setting time, display value will stop and flash.</p> <p>4) If progress time is greater than setting time when INA input turns off, display value flashes and operation stops until reset signal is applied.</p>

4. Timer '0' time setting

4-1. Available output operation mode to set '0' time setting	<p>o n d , o n d . 1 , o n d . 2 , n F d , n F d . 1</p>
4-2. Operation according to output mode (at 0 time setting)	<p>A. OND (Signal ON Delay) mode (o n d)</p> <p>● Setting time1 is set to 0</p> <p>● Setting time2 is set to 0</p>
	<p>B. OND.1 (Signal ON Delay 1) mode (o n d . 1)</p> <p>● Setting time1 is set to 0</p> <p>● Setting time2 is set to 0</p>
	<p>C. OND.2 (Signal ON Delay 2) mode (o n d . 2)</p> <p>● Setting time1 is set to 0</p> <p>● Setting time2 is set to 0</p>
	<p>D. NFD (ON-OFF Delay) mode (n F d)</p> <p>● Off_Delay setting time is set to 0</p> <p>● ON_Delay setting time is set to 0</p>
	<p>E. NFD.1 (ON-OFF Delay 1) mode (n F d . 1)</p> <p>● Off_Delay setting time is set to 0</p> <p>● ON_Delay setting time is set to 0</p>

5. Setting value1 (PS1) is greater than Setting value2 (PS2)

In OND (o n d), OND.1 (o n d . 1) or OND.2 (o n d . 2) output mode

—UP mode: If setting value1 of timer is greater than setting value2, OUT1 will not turn ON.

—DOWN mode: If setting value1 of timer is greater than setting value2, OUT1 will turn ON immediately when start signal is applied.

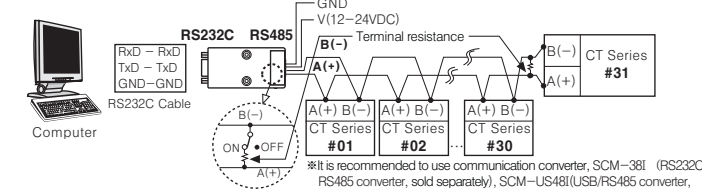
1. Communication mode

1. Parameter setting

(**Ⓜ** key: To select setting mode. **Ⓜ** or **Ⓜ** key: To change setting value)

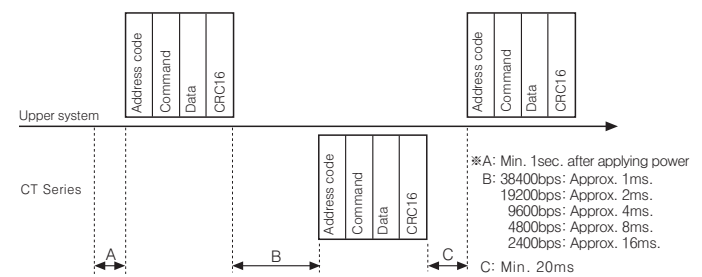
Setting mode	Explanation
Com. address (Addr)	Ⓜ : To shift flashing digits of Com. address. *Setting range of com. address: 1~127 Ⓜ : To change the flashing digits. *If same address is applied during multi-com., it will not be working correctly.
Com. speed (bps)	24 ↔ 48 ↔ 96 ↔ 192 ↔ 384 *2400/4800/9600/19200/38400bps
Com. parity (Prty)	nonE → EUE → odd *nonE: None EUE: Even number odd: Odd number
Com. stop bit (StP)	1 → 2
Response waiting time (rStt)	*Setting range according to com. speed. 2400bps: 16ms~99ms 4800bps: 8ms~99ms 9600bps: 5ms~99ms 19200bps: 5ms~99ms 38400bps: 5ms~99ms
Com. write (CnW)	*EnA: Permits com. write(Enable) d: 5A: Prohibits com. write(Disable)

2. Application of system organization



3. Communication control ordering

- The communication method is MODBUS RTU (PI-MBUS-300-REV.J).
- After 1sec. of power supply into the high order system, it starts to communicate.
- Initial communication will be started by the high order system. When a command comes out from the high order system, CT series will respond.



4. Communication command and block

The format of query and response

4-1. Read Coil Status(Func 01 H), Read Input Status(Func 02 H)

1)Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

2)Response(Slave)

Slave Address	Function	Byte Count	Data			Error Check(CRC 16)	
			High	Low	High	Low	Low
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

4-2. Read Holding Registers(Func 03 H), Read Input Registers(Func 04 H)

1)Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

2)Response(Slave)

Slave Address	Function	Byte Count	Data			Error Check(CRC 16)	
			High	Low	High	Low	Low
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

4-3. Force Single Coil(Func 05 H)

1)Query(Master)

Slave Address	Function	Coil Address		Force Data		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

2)Response(Slave)

Slave Address	Function	Coil Address		Force Data		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

4-4. Preset Single Register(Func 06 H)

1)Query(Master)

Slave Address	Function	Register Address		Preset Data		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

2)Response(Slave)

Slave Address	Function	Register Address		Preset Data		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

4-5. Preset Multiple Registers(Func 10 H)

1)Query(Master)

Slave Address	Function	Starting Address		No. of Register		Data		Data		Error Check(CRC 16)		
		High	Low	High	Low	High	Low	High	Low	High	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

2)Response(Slave)

Slave Address	Function	Starting Address		No. of Register		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

4-6. Application

Read Coil Status(Func 01 H) Master reads OUT2 00002(0002H) ~ 00003(0002H), OUT1 output status(ON:1, OFF:0) from the Slave(Address 01).

1)Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
01 H	01 H	00 H	01 H	02 H	02 H	02 H	0B H

On slave side OUT2 00003(0002H): OFF, OUT1 00002(0001H): ON

2)Response(Slave)

Slave Address	Function	Byte Count	Data			Error Check(CRC 16)	
			High	Low	High	Low	Low
01 H	01 H	01 H	00 H	02 H	00 H	49 H	

Read Input Register (Func 04 H)

Master reads preset value 21004(03EBH)~21005(03ECH) of counter/timer, Slave (Address 15).

1)Query(Master)

Slave Address	Function	Starting Address		No. of Points		Error Check(CRC 16)	
		High	Low	High	Low	Low	High
0F H	04 H	03 H	E2 H	00 H	02 H	00 H	95 H

In case that the present value is 123456(0001 E240 H) in slave side 31004(03EBH): E240 H, 31005(03ECH): 0001 H

2)Response(Slave)

Slave Address	Function	Byte Count	Data			Error Check(CRC 16)	
			High	Low	High	Low	Low
0F H	04 H	04 H	E2 H	40 H	00 H	01 H	28 H

5. Modbus Mapping Table

5-1. Reset/Output

No(Address)	Func	Explanation	Setting range	Notice
00001(0000)	01/05	Reset	0:OFF 1:ON	
00002(0001)	01	OUT2 output	0:OFF 1:ON	
00003(0002)	01	OUT1 output	0:OFF 1:ON	
00004(0003)	01	BATCH output	0:OFF 1:ON	For BATCH output mode
00005(0004)	01/05	BATCH resets	0:OFF 1:ON	For BATCH output mode

5-2. Terminal input status

No(Address)	Func	Explanation	Setting range	Notice
10001(0000)	02	INA input status	0:OFF 1:ON	Terminal input status
10002(0001)	02	INB input status	0:OFF 1:ON	Terminal input status
10003(0002)	02	INHIBIT input status	0:OFF 1:ON	Terminal input status
10004(0003)	02	RESET input status	0:OFF 1:ON	Terminal input status
10005(0004)	02	BATCH RESET input status	0:OFF 1:ON	Terminal input status

5-3. Product Information

No(Address)	Func	Explanation	Factory specification	Notice
30001~30100	04	Reserved	-	
30101(0064)	04	Product number H	-	Model ID
30102(0065)	04	Product number L	-	
30103(0066)	04	Hardware version	-	
30104(0067)	04	Software version	-	
30105(0068)	04	Model no. 1	"CT"	
30106(0069)	04	Model no. 2	"6M"	
30107(006A)	04	Model no. 3	"-2"	
30108(006B)	04	Model no. 4	"PT"	
30109(006C)	04	Reserved	-	
30110(006D)	04	Reserved	-	
30111(006E)	04	Reserved	-	
30112(006F)	04	Reserved	-	
30113(0070)	04	Reserved	-	
30114(0071)	04	Reserved	-	
30115(0072)	04	Reserved	-	
30116(0073)	04	Reserved	-	
30117(0074)	04	Reserved	-	
30118(0075)	04	Coil Status Start Address	0000	
30119(0076)	04	Coil Status Quantity	-	
30120(0077)	04	Input Status Start Address	0000	
30121(0078)	04	Input Status Quantity	-	
30122(0079)	04	Holding Register Start Address	0000	
30123(007A)	04	Holding Register Quantity	-	
30124(007B)	04	Input Register Start Address	0064	
30125(007C)	04	Input Register Quantity	-	

5-4. Monitoring data

No(Address)	Func	Explanation	Setting range	Notice
31001(03E8)	04	BA.O LED display status	0:OFF 1:ON	Bit 5
		OUT2 LED display status	0:OFF 1:ON	Bit 6
		OUT1 LED display status	0:OFF 1:ON	Bit 7
		BA.S LED display status	0:OFF 1:ON	Bit 10
31002(03E9)	04	LOCK LED display status	0:OFF 1:ON	Bit 11
		PS2 LED display status	0:OFF 1:ON	Bit 12
		PS1 LED display status	0:OFF 1:ON	Bit 13
		TMR LED display status	0:OFF 1:ON	Bit 14
31003(03EA)	04	CNT LED display status	0:OFF 1:ON	Bit 15
31002(03E9)	04	Present value of BATCH counter	0~999999	For BATCH output model
31003(03EA)	04	Present value of counter/timer	Counter 6Digit type:~99999~999999 4Digit type:~999~9999 Timer: Within time setting range	Use counter and timer in common
31005(03EC)	04	Display unit	Counter: decimal point of display value Timer: Time range	Counter: 40058 Data Timer: 40102 Data
31007(03EE)	04	PS(2) setting value	Counter 6Digit type:~99999~999999 4Digit type:~999~9999 Timer: Within time setting range	Use counter and timer in common
31008(03EF)	04	PS1 setting value	Counter 6Digit type:~99999~999999 4Digit type:~999~9999 Timer: Within time setting range	Use counter and timer in common
31009(03F0)	04	PS1 setting value	Counter 6Digit type:~99999~999999 4Digit type:~999~9999 Timer: Within time setting range	Use counter and timer in common
31010(03F1)	04	Setting value of BATCH counter	0~999999	Use counter and timer in common
31011(03F2)	04	Checking the input logic	0: NPN, 1:PNP	
31012(03F3)	04	Checking the input logic	0: NPN, 1:PNP	
31013(03F4)	04	Checking the input logic	0: NPN, 1:PNP	

*Date format of 31001(03E8) address bit

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
CNT	TMR	PS1	PS2	Lock	BA.S	-	-	OUT1	OUT2	BA.O	-	-	-	-	-
0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	0	0	0 or 1	0 or 1	0 or 1	0	0	0	0	0

*2Words data format: Upper data has high number address.

ex) 31004: Present Value(Low Word), 31005: Present Value(High Word)

5-5. Preset value setting group

No(Address)	Func	Explanation	Setting range	Notice
40001(0000)	03/06/16	PS2 setting value	Counter 6Digit type: 0~999999 4Digit type: 0~9999 Timer: within time setting range	Use counter and timer in common
40002(0001)	03/06/16	PS setting value	Counter 6Digit type: 0~999999 4Digit type: 0~9999 Timer: within time setting range	
40003(0002)	03/06/16	PS1 setting value	Counter 6Digit type: 0~999999 4Digit type: 0~9999 Timer: within time setting range	Use counter and timer in common
40004(0003)	03/06/16	BATCH counter setting value	0~999999	
40005(0004)	03/06/16	BATCH counter setting value	0~999999	Use counter and timer in common
40006(0005)	03/06/16	BATCH counter setting value	0~999999	

5-6. Function setting mode_Counter group

No(Address)	Func	Explanation	Setting range	Notice
40051(0032)	03/06/16	Counter/Timer(L~E)	0: CoUn 1: EtAE	Use counter and timer in common
40052(0033)	03/06/16	Input mode(l n)	0: UP 1: UP-1 2: UP-2 3: d 4: dn-1 5: dn-2 6: UD-R 7: UD-b 8: UD-C	
40053(0034)	03/06/16	Indication mode(dR 5A)	0: t o t RL 1: HoL d	For the indicator
40054(0035)	03/06/16	Output mode(oUt a)	0: F 1: n 2: E 3: r 4: F 5: P 6: r 7: A 8: S 9: t 10: d	
40055(0036)	03/06/16	Maximum counting speed (SPS)	0: 1 2: 1E 3: 1D 4: 10E 1: 30 3: 5E	
40056(0037)	03/06/16	OUT2(OUT) output time	0001~9999 Unit: x10ms	
40057(0038)	03/06/16	OUT1 output time	0001~9999 Unit: x10ms	
40058(0039)	03/06/16	Decimal point (dP)	0: - - - - - 2: - - - - - 4: - - - - - 4Digit type: 0: - - - - - 1: - - - - - 3: - - - - - 5: - - - - -	
40059(003A)	03/06/16	Min. reset time(rStt)	0: 1 1: 20 Unit: ms	
40060(003B)	03/06/16	Prescale decimal position (SCl)	1: - - - - - 3: - - - - - 5: - - - - - 4Digit type: 1: - - - - - 2: - - - - - 3: - - - - -	
40061(003C)	03/06/16	Prescale value(SCl)	0: 00000 1: 99999 4Digit type: 0: 00 1~9999	Connected with prescale decimal point position
40062(003D)	03/06/16	Start value(Stt)	0: 00000 1: 99999 4Digit type: 0: 000 1~999	