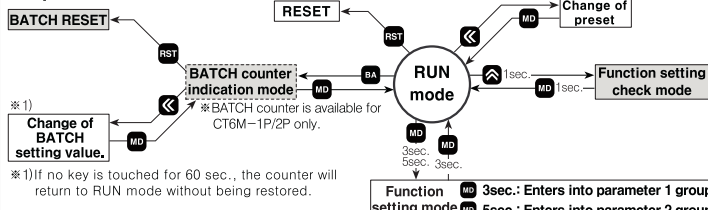




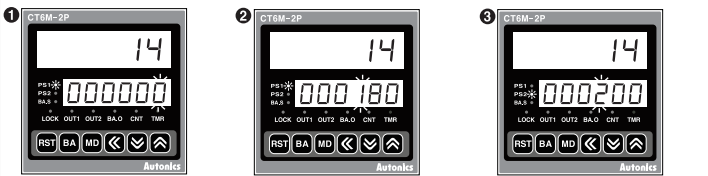
# Basic operations and constitution(Counter/Timer/Communication)

## 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 the output of 0 preset value turns ON. According to the 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 **BA** and **MD** keys, then press **MD** key to enter into the PS2 setting mode. The preset value is set to '200' using **BA** and **MD** keys, then press **MD** key to complete PS2 setting mode 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

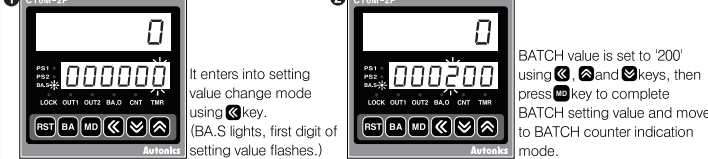
In Run mode or function setting mode, if pressing **RST** key or applying the signal to the RESET terminal on the back side, present value will be initialized and output will maintain off status. When selecting voltage input (PNP), short no.10 and no.12 terminals, or when selecting no-voltage input (NPN), short no.11 and no.12 terminals to reset.

## 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.



BATCH counting value is increasing until BATCH RESET signal applied. BATCH counting value will be circulated when it is over 999999. 1) BATCH counting operation in Counter: Counts the number of reaching setting value of CT6M-1P or reaching dual setting value of CT6M-2P. 2) 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

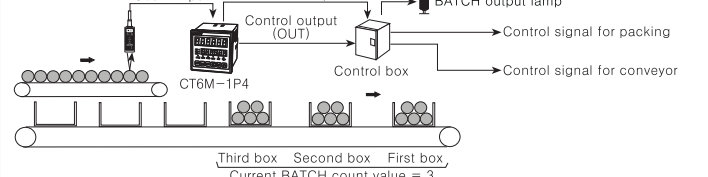
If input signal is applied while changing BATCH setting value, counting operation and output control will be performed. If BATCH count value equals to BATCH setting value, BATCH output will be ON and maintain ON status until BATCH reset signal is applied. When the power is cut off then resumed in status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

### 2-4. BATCH reset input

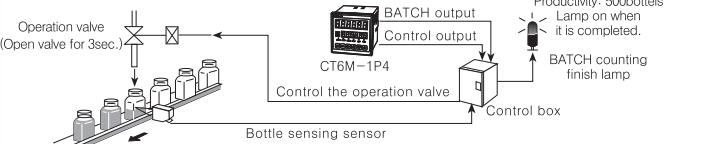
If pressing reset button or applying the signal to BATCH RESET terminal on the back side panel, BATCH counting value will be reset. When selecting voltage input (PNP), short no.10 and no.14 terminals, or when selecting no-voltage input (NPN), short no.11 and no.14 terminals to reset. When BATCH reset is applied, BATCH counting value maintains at 0 and BATCH output maintains in the OFF status.

### 2-5. Application of BATCH Counter function

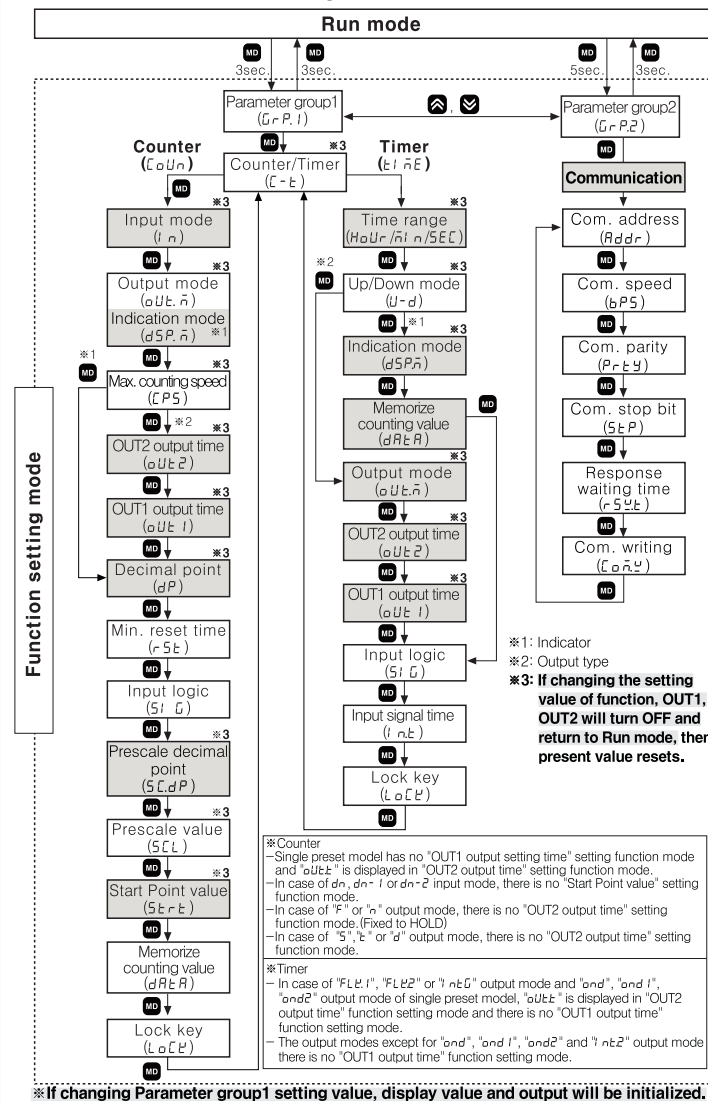
**A. Counter**  
In case, put 5 products in a box then pack the boxes when they reaches to 200. Counter preset setting value="5", BATCH setting value="200". When the count value of counter reaches to the preset value "5", the control output(OUT) will be on, and at this time the count value of the BATCH counter will be increased by "1". The control box which is 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   | Notes   |
|-------------------------------|--|---|
| Counter/Timer (C-T)           | COUNT → T/Timer  | * C: COUNTER, T: TIMER  |
| Input mode (I-n)              | UP-C ↔ UP-P-1 ↔ UP-P-2 ↔ dn ↔ dn-1 ↔ dn-2 ↔ Ud-R ↔ Ud-b                      | * "UP", "UP-1", "UP-2" or "dn", "dn-1", "dn-2" input mode<br>* In case that output mode is "F", "n", there is no "OUT2 output time" setting mode. (Fixed to HOLD)   |
| Output mode (OUT-n)           | Ud-R, "Ud-b", "Ud-C" input mode<br>F → n → C → r → B → P → Q → R → S → t → d | * If output mode is set to "d" when max. counting speed is set to 5Kcps, 10Kcps, max. counting speed is automatically set to 30cps. (Factory default setting)   |
| Indication mode (dSP-n)       | Hold ↔ t o t R L   | * In case of the indicator, indicate mode selection (dSP-n) is displayed. * It is the added function to set the preset value when selecting Hold. (Refer to 4. Counter operation of the indicator.)               |
| Max. counting speed (CPS)     | 30 → 1K → 5K → 10K   | * Max. counting speed is when duty ratio of INA or INB input signal is 1:1, and it is applied in INA and INB at the same time. * In case of setting "d" in output mode, you can choose from 1cps, 30cps or 1kcps. |
| OUT2 output time (OUT2-t)     | 0 → 0.01 → 99.99   | * 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 (OUT1-t)     | 0 → 0.01 → 99.99   | * Set OUT1 one-shot setting time. * Setting range: 0.01 to 99.99 sec., Hold * Hold is displayed by pressing key 4 times.  |
| Decimal point (dP)            | 0 → 1 → 2 → 3 → 4 → 5 → 6  | * 6Digit type<br>* 4Digit type<br>* Setting the decimal point is applied same to counting value and setting value.  |
| Min. reset time (rSt)         | 1 → 20 Unit: ms  | * Set the min. external RESET signal width.   |
| Input logic (SiG)             | nPn: No-Voltage input<br>PNP: Voltage input                                  | * Check input logic value(PNP, NPN).  |
| Prescale decimal point (SCdP) | 0 → 1 → 2 → 3 → 4 → 5 → 6  | * 6Digit type<br>* 4Digit type<br>* Prescale decimal point position can not set below the decimal point setting digits (dP).  |
| Prescale value (SCt)          | 0 → 0.00001 → 99999.9  | * Setting range of prescale value<br>6Digit type: 0.00001 to 99999.9<br>4Digit type: 0.001 to 999.9<br>* Refer to 5. Prescale function.   |
| Start point value (StPt)      | 0 → 0.00001 → 99999.9  | * Setting range of Start Point value (Connected with decimal point setting)<br>6Digit type: 0.00001 to 99999.9<br>4Digit type: 0.000 to 9999<br>* Refer to 6. Start Point function.                               |
| Memory protection (dRtR)      | CLr ↔ rEC  | * CLr: Initializes count value when power is off.<br>* rEC: Memorizes count value at the moment of power off.   |
| Lock key (LoLk)               | LoFF ↔ LoL1<br>LoL2 ↔ LoL3   | * LoFF: Cancellation of the lock mode. (Front Lock LED OFF)<br>LoL1: Locks key. (Front Lock LED ON)<br>LoL2: Locks keys. (Front Lock LED ON)<br>LoL3: Locks keys. (Front Lock LED ON)                             |

\* 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. (↑)<br>* INA: Counting input<br>* INB: Inhibition input   |
| UP-2 (Up-2)      |             | * Counts when INA input signal is down. (↓)<br>* INA: Counting input<br>* INB: Inhibition input   |
| 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. (↑)<br>* INA: Counting input<br>* INB: Inhibition input  |
| dn-2 (Down-2)    |             | * Counts when INA input signal is down. (↓)<br>* INA: Counting input<br>* INB: Inhibition input   |
| Ud-R (Up/Down-A) |             | * INA: Counting input<br>* INB: Counting command input<br>* When INB is L, counting Up. * When INB is H, counting Down.                       |
| Ud-b (Up/Down-B) |             | * INA: Up counting input<br>* INB: Down counting input<br>* When both INA and INB are applied to L→H, it will remain previous counting value. |
| Ud-C (Up/Down-C) |             | * 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 @ signal width should be over a half min. signal width. If not, ±1 counting error will occur.

| Input type | Voltage input (PNP) | No-Voltage input (NPN) | 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 | Input mode      | Operation  |
|-------------|-----------------|--|
| F (F)       | Up, Up-1, 2     | After count-up, counting display value increases or decreases until reset signal is applied and retained output is maintained.   |
| N (N)       | Down, Down-1, 2 | After count-up, counting display value and retained output are maintained until reset signal is applied.   |
| C (C)       | Up/Down-A, B, C | When count-up, counting display value will be reset and count simultaneously. OUT1 retained 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)       | Up/Down-A, B, C | After OUT2 one-shot time, counting display value will be reset and count simultaneously. OUT1 retained output will be off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.   |
| L (L)       | Up/Down-A, B, C | After count-up, counting display value increases or decreases until RESET input is applied. OUT1 retained output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.   |
| K (K)       | Up/Down-A, B, C | 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 retained output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output. |
| P (P)       | Up/Down-A, B, C | After count-up, counting display value increases or decreases during OUT2 one-shot time. OUT1 retained output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.  |
| Q (Q)       | Up/Down-A, B, C | After count-up, counting display value increases or decreases during OUT2 one-shot time. OUT1 retained output is off after OUT2 one-shot time. OUT1 one-shot output time is operated regardless of OUT2 output.  |
| A (A)       | Up/Down-A, B, C | After count-up, counting display value and OUT1 retained output are maintained until RESET input is applied. OUT1 one-shot output time is operated regardless of OUT2 output.  |

| Output mode | Input mode      | Operation   |
|-------------|-----------------|---|
| S (S)       | Up/Down-A, B, C | OUT1 and OUT2 keeps ON status in following condition: Counting display value ≥ PRESET1<br>Counting display value ≥ PRESET2  |
| t (t)       | Up/Down-A, B, C | OUT1 output is off: Counting display value ≥ PRESET1<br>OUT2 keeps ON status in following condition: Counting display value ≥ PRESET2   |
| d (d)       | Up/Down-A, B, C | When counting display value is equal to setting value (PRESET1, PRESET2) only, OUT1 or OUT2 output keeps ON status. When setting 1kcps 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 retained output. (except S, t, (T), or (d) output mode)  
\* OUT1 output could be set to 0 in all modes and 0 value output turns ON.  
\* OUT2 output could not set to 0 in C(L), R(-), P(P) or Q(R) output mode.

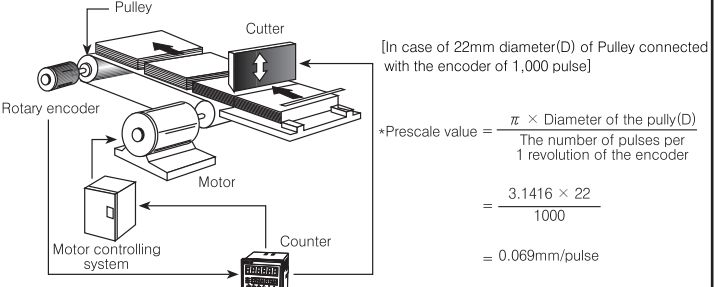
### 4. Counter operation of the indicator

| Indicate mode (dSP-n) | Count chart | 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   |
|-----------------------|-------------|--|--|---|
| t o t R L (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), indication mode (dSP-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.



To control conveyor position in 0.1mm, set the decimal point to tenth place (-----) in decimal point setting mode (dP) and set the prescale decimal point to thousandth place (-----) in prescale decimal point setting mode (SCdP). Then set prescale value "0.069" in prescale setting mode (SCt).

### 6. Start Point function

Start Point value works as initial value when counting 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", "R", "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 ← ti nE<br>* CoUn: COUNTER<br>ti nE: TIMER  |
| Timer range (HoUr / n / SEC) | <p><b>6Digit type</b></p> <p>999999 → 999999 → 999999 → 999999 → 999999 → 999999</p> <p>0.001s to 999.999s, 0.01s to 9999.99s, 0.1s to 99999.9s, 1s to 999999s, 0.01s to 99m59.99s</p> <p>HoUr → 999999 → 999999 → 999999 → 999999 → 999999</p> <p>0.1h to 99999.9h, 0.1s to 999m59.9s</p> <p>H n → 999999 → 999999 → 999999 → 999999 → 999999</p> <p>1m to 9999h59m, 1s to 99h59m59s, 1m to 999999m, 0.1m to 99999.9m, 1s to 9999m59s</p> <p><b>4Digit type</b></p> <p>9999 → 9999 → 9999 → 9999 → 9999</p> <p>0.001s to 9.999s, 0.01s to 99.99s, 0.1s to 999.9s, 1s to 9999s, 1s to 99m59s</p> <p>HoUr → 9999 → 9999 → 9999 → 9999</p> <p>1h to 9999h, 1m to 99h59m, 9999m, 999.9m</p> |
| UP/DOWN mode (U-d)           | UP ↔ dn<br>* UP: Time proceeds from 0 to the setting value.<br>dn: Time proceeds from the setting value to 0.  |
| Indication mode (dSPn)       | to tRL ↔ HoLd ↔ ont.d<br>* Used for the indicator only.<br>* It is added that the feature which set the setting time when selecting HoLd or ont.d (Refer to 3. Timer operation for the indicator).   |
| Memory protection (dRtR)     | CLr ↔ rEC<br>* Used for the indicator only.<br>* CLr: Initializes time value when power is off.<br>* rEC: Memorizes time value at the moment of power off.   |
| Output mode (oUt.n)          | ond ↔ ond.1 ↔ ond.2 ↔ FLK.1 ↔ FLK.2 ↔ i n t.1<br>i n t.1 ↔ nFd.1 ↔ nFd.2 ↔ oFd.1 ↔ i n t.2 ↔ i n t.1   |
| OUT2 output time (oUt.2)     | <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 to 99.99sec.</p> <p>* HoLd is displayed by pressing ☑ key 4 times.</p>  |
| OUT1 output time (oUt.1)     | <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 to 99.99sec., Hold</p> <p>* HoLd is displayed by pressing ☑ key 4 times.</p>  |
| Input logic (SiG)            | nPn: No-Voltage input * Check input logic value (PNP, NPN).<br>PnP: Voltage input  |
| Input signal time (I n t)    | <p>1 ↔ 20 [Unit: ms]</p> <p>* 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 (LoCk)              | <p>LoFF ↔ LoC.1</p> <p>LoC.1: Locks ☑ key. (Front Lock LED ON)</p> <p>LoC.2: Locks ☑ ☑ keys. (Front Lock LED ON)</p> <p>LoC.3: Locks ☑ ☑ ☑ keys. (Front Lock LED ON)</p>   |

## 2. Output operation mode

| Output mode   | Time chart | Operation  |
|---------------|------------|--|
| ond (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 retained or one-shot output.</p>   |
| ond.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 retained or one-shot output.</p>  |
| ond.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 retained or one-shot output.</p> <p>4) It memorizes display value at the moment of power off.</p>   |
| FLK (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 retained 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> |

|               |  |   |
|---------------|--|---|
| FLK.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 retained output.</p> <p>4) In case of using the contact output, min. setting time must be set over 100ms.</p>  |
| FLK.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 retained output.</p> <p>4) Control output will be reversed when it reaches 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> |
| INT.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 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>   |
| INT.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>   |
| oFd (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 processes.</p> <p>3) When it reaches setting time, indication value and control output are reset automatically.</p>  |
| nFd (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>   |
| nFd.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>   |
| INTG (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>  |

\*Power Reset: There is no memory protection. (Initializes the display value and the output status when re-supplying the power.)  
Power Hold: There is memory protection. (It memorizes the status of power off. When re-supplying the power, it returns the memorized display value and the output status.)

## 3. Timer operation for the indicator

|                         |  |  |
|-------------------------|--|--|
| to tRL (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>   |
| HoLd (HOLD)             |  | <p>1) Time starts when INA input is ON.</p> <p>2) Time progress stops when INHIBIT 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>  |
| ont.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 progress stops and power is off, the display value is initialized.</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> |
|                         |  | <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 progress stops and power is off, the display value is memorized.</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

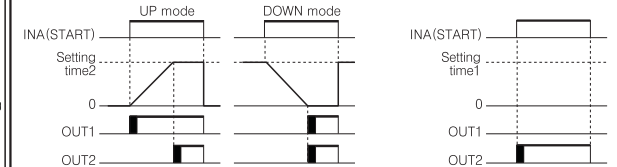
### 4-1. Available output operation mode to set '0' time setting

ond, ond.1, ond.2, nFd, nFd.1

### 4-2. Operation according to output mode (at 0 time setting)

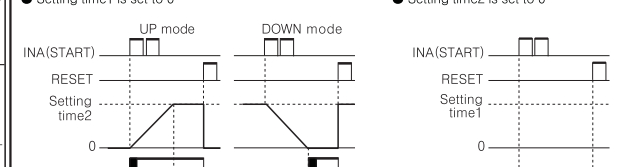
#### A. OND (Signal ON Delay) mode (ond)

● Setting time1 is set to 0 ● Setting time2 is set to 0



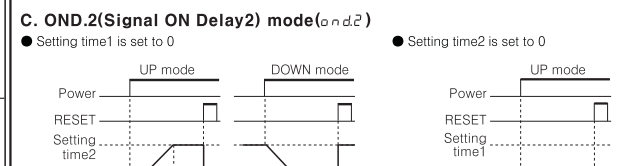
#### B. OND.1 (Signal ON Delay 1) mode (ond.1)

● Setting time1 is set to 0 ● Setting time2 is set to 0



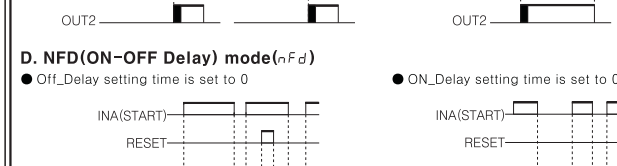
#### C. OND.2 (Signal ON Delay 2) mode (ond.2)

● Setting time1 is set to 0 ● Setting time2 is set to 0



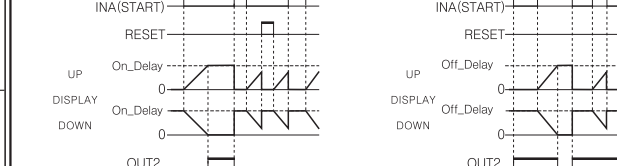
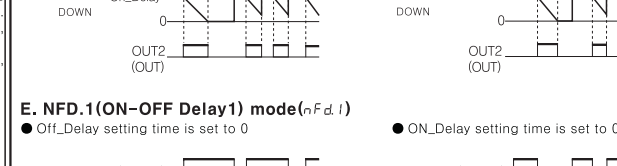
#### D. NFD (ON-OFF Delay) mode (nFd)

● Off\_Delay setting time is set to 0 ● ON\_Delay setting time is set to 0



#### E. NFD.1 (ON-OFF Delay 1) mode (nFd.1)

● Off\_Delay setting time is set to 0 ● ON\_Delay setting time is set to 0



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

In OND (ond), OND.1 (ond.1) or OND.2 (ond.2) output mode

-UP mode: When the timer setting value1 is greater than the setting value 2, OUT1 output does not turn ON.

-DOWN mode: When the timer setting value 1 is greater than the setting value 2, OUT1 output does not turn ON.

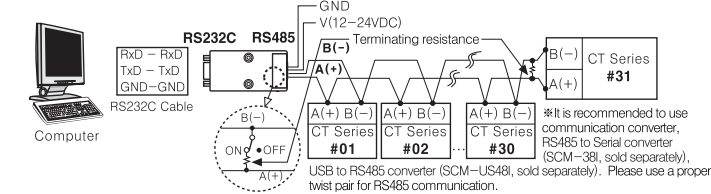
If the setting value 1 is same as the setting value 2 and START signal is applied, OUT1 output turns ON immediately.

## Communication mode

### 1. Parameter setting

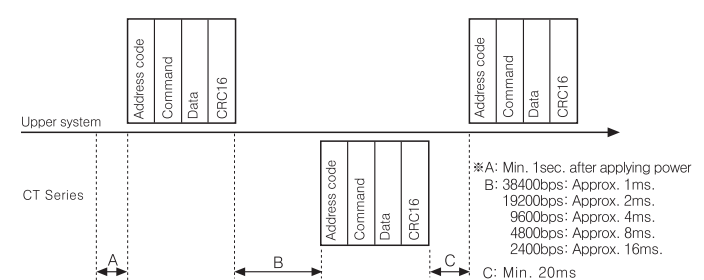
| Setting mode                 | How to set  |
|------------------------------|---|
| Com. address (Addr)          | Ⓜ: To shift flashing digits of Com. address. *Setting range of com. address: 1 to 127<br>Ⓜ: To change the flashing digits. *If the same address is applied during multi-com., it will not work correctly. |
| Com. speed (bPS)             | 24 ← 48 ← 96 ← 192 ← 384 *2400/4800/9600/19200/38400bps   |
| Com. parity (Prty)           | nonE → EUE → odd *nonE: None<br>EUE: Even number<br>odd: Odd number   |
| Com. stop bit (StP)          | 1 ← 2   |
| Response waiting time (rStt) | Ⓜ: To shift flashing digits position of com. response waiting time.<br>Ⓜ: To change the flashing digits position value.   |
| Com. write (CnW)             | E n A → d i 5 R *E n A: Permits com. write(Enable)<br>d i 5 R: 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  |       | Error Check(CRC 16) |       |
|---------------|----------|------------------|-------|-----------------|-------|-------|-------|---------------------|-------|
|               |          | High             | Low   | High            | Low   | High  | Low   | Low                 | High  |
| 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) to 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 | 00 H          | 02 H | 0B 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 | D0 H | 49 H                | 49 H |

##### Read Input Register (Func 04 H)

Master reads preset value 21004(03EBH) to 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             | EB 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): 001H

##### 2) Response(Slave)

| Slave Address | Function | Byte Count | Data |      |      | Error Check(CRC 16) |      |      |
|---------------|----------|------------|------|------|------|---------------------|------|------|
|               |          |            | High | Low  | High | Low                 | Low  | High |
| 0F H          | 04 H     | 04 H       | E2 H | 40 H | 00 H | 01 H                | E2 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 model |
| 00005(0004)  | 01/05 | BATCH resets | 0:OFF 1:ON    | For BATCH output model |

### 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                    | Setting range | Notice   |
|----------------|------|--------------------------------|---------------|----------|
| 30001 to 30100 | 04   | Reserved                       | -             | -        |
| 30101(0064)    | 04   | Product number L               | -             | Model ID |
| 30102(0065)    | 04   | Product number H               | -             | -        |
| 30103(0066)    | 04   | Hardware version               | -             | -        |
| 30104(0067)    | 04   | Software version               | -             | -        |
| 30105(0068)    | 04   | Model no. 1                    | -             | "CT"     |
| 30106(0069)    | 04   | Model no. 2                    | -             | "GM"     |
| 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                                    |
|              |      | B.A.S LED display status       | 0:OFF 1:ON  | Bit 10                                   |
|              |      | 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                                   |
|              |      | CNT LED display status         | 0:OFF 1:ON  | Bit 15                                   |
| 31002(03E9)  | 04   | Present value of BATCH counter | 0 to 999999   | For BATCH output model                   |
| 31004(03EB)  | 04   | Counter                        | 6Digit type: -99999 to 999999<br>4Digit type: -999 to 9999<br>Timer: Within time setting range          | Use counter and timer in common          |
| 31005(03EC)  | 04   | Present value of counter/timer | Counter: decimal point of display value<br>Timer: Time range  | Counter: 40058 Data<br>Timer: 40102 Data |
| 31006(03ED)  | 04   | Display unit                   | Counter: decimal point of display value<br>Timer: Time range  | Counter: 40058 Data<br>Timer: 40102 Data |
| 31007(03EE)  | 04   | PS(2) setting value            | Counter: 6Digit type: -99999 to 999999<br>4Digit type: -999 to 9999<br>Timer: Within time setting range | Use counter and timer in common          |
| 31008(03EF)  | 04   | PS1 setting value              | Counter: 6Digit type: -99999 to 999999<br>4Digit type: -999 to 9999<br>Timer: Within time setting range | Use counter and timer in common          |
| 31009(03F0)  | 04   | PS1 setting value              | Counter: 6Digit type: -99999 to 999999<br>4Digit type: -999 to 9999<br>Timer: Within time setting range | Use counter and timer in common          |
| 31010(03F1)  | 04   | Setting value of BATCH counter | 0 to 999999   | Use counter and timer in common          |
| 31011(03F2)  | 04   | Setting value of BATCH counter | 0 to 999999   | Use counter and timer in common          |
| 31012(03F3)  | 04   | Checking the input logic       | 0: NPN, 1: PNP  |  |
| 31013(03F4)  | 04   | Checking the input logic       | 0: NPN, 1: PNP  |  |

### 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 to 999999<br>4Digit type: 0 to 9999<br>Timer: within time setting range | Use counter and timer in common |
| 40002(0001)  | 03/06/16 | PS setting value            | Counter: 6Digit type: 0 to 999999<br>4Digit type: 0 to 9999<br>Timer: within time setting range | Use counter and timer in common |
| 40003(0002)  | 03/06/16 | PS1 setting value           | Counter: 6Digit type: 0 to 999999<br>4Digit type: 0 to 9999<br>Timer: within time setting range | Use counter and timer in common |
| 40004(0003)  | 03/06/16 | BATCH counter setting value | 0 to 999999   | Use counter and timer in common |
| 40005(0004)  | 03/06/16 | BATCH counter setting value | 0 to 999999   | Use counter and timer in common |
| 40006(0005)  | 03/06/16 | BATCH counter setting value | 0 to 999999   | Use counter and timer in common |

### 5-6. Function setting mode\_Counter group

| No.(Address) | Func     | Explanation                           | Setting range  | Notice  |
|--------------|----------|---------------------------------------|--|---|
| 40051(0032)  | 03/06/16 | Counter/Timer(-t)                     | 0: CoUn 1: t AE  | Use counter and timer in common                                     |
| 40052(0033)  | 03/06/16 | Input mode(i n)                       | 0: UP 5: dn-2<br>1: UP-1 6: UD-R<br>2: UP-2 7: UD-b<br>3: dn 8: UD-C<br>4: dn-1  |   |
| 40053(0034)  | 03/06/16 | Indication mode(i n)                  | 0: t o RL 1: HoLd  | For the indicator   |
| 40054(0035)  | 03/06/16 | Output mode(oUt n)                    | 0: F 4: b 8: S<br>1: n 5: P 9: t<br>2: C 6: A 10: d<br>3: r 7: A                 |   |
| 40055(0036)  | 03/06/16 | Maximum counting speed (cPS)          | 0: 1 2: 1E 4: 10E<br>1: 3D 3: 5E   |   |
| 40056(0037)  | 03/06/16 | OUT2(OUT) output time                 | 000 i to 9999 Unit: ×10ms  |   |
| 40057(0038)  | 03/06/16 | OUT1 output time                      | 000 i to 9999 Unit: ×10ms  |   |
| 40058(0039)  | 03/06/16 | Decimal point (dP)                    | 0: - - - - - 2: - - - - - 4: - - - - -<br>1: - - - - - 3: - - - - - 5: - - - - - | 4Digit type: 0: - - - - -<br>1: - - - - - 2: - - - - - 3: - - - - - |
| 40059(003A)  | 03/06/16 | Min. reset time(-St)                  | 0: 1 1: 2D   | Unit: ms  |
| 40060(003B)  | 03/06/16 | Prescale decimal point position (SCL) | 1: - - - - - 3: - - - - - 5: - - - - -<br>2: - - - - - 4: - - - - - 6: - - - - - | 4Digit type: 1: - - - - - 2: - - - - - 3: - - - - -                 |
| 40061(003C)  | 03/06/16 | Prescale value(SCL)                   | 6Digit type: 0.0000 1 to 999999<br>4Digit type: 0.00 1 to 9999                   | Connected with prescale decimal point position                      |
| 40062(003D)  | 03/06/16 | Start value(St-rt)                    | 6Digit type: 0.0000 1 to 999999<br>4Digit type: 0.00 1 to 9999                   | Connected with decimal point position of display value              |
| 40063(003E)  | 03/06/16 | Memory protection(dRtR)               | 0: CLr 1: rEC  |   |
| 40065(0040)  | 03/06/16 | Memory protection(dRtR)               | 0: LoFF 2: LoC2<br>1: LoC1 3: LoC3   | Use counter and timer in common                                     |
| 40066(0041)  | 03/06/16 | Lock key(LoCt)                        | 0: LoFF 2: LoC2<br>1: LoC1 3: LoC3   | Use counter and timer in common                                     |

### 5-7. Function setting mode\_Timer group

| No.(Address) | Func     | Explanation                   | Setting range  | Notice                          |
|--------------|----------|-------------------------------|--|---------------------------------|
| 40101(0064)  | 03/06/16 | Count/Timer(-t)               | 0: CoUn 1: t AE  | Use counter and timer in common |
| 40102(0065)  | 03/06/16 | Time range (HoUr/n/SEC)       | 4Digit type<br>0: 0.001s to 9.999s 5: 0.1m to 999.9m<br>1: 0.01s to 99.99s 6: 1m to 9999m<br>2: 0.1s to 999.9s 7: 1m to 99h59m<br>3: 1s to 9999s 8: 1h to 9999h<br>4: 1s to 99m59s<br>6Digit type<br>0: 0.001s to 999.999s 6: 1s to 9999m59s<br>1: 0.01s to 9999.99s 7: 0.1m to 99999.9m<br>2: 0.1s to 99999.9s 8: 1m to 999999m<br>3: 1s to 999999s 9: 1s to 99h59m59s<br>4: 0.01s to 99m59.99s 10: 1m to 9999h59m<br>5: 0.1s to 99m59.99s 11: 0.1h to 99999.9h |                                 |
| 40103(0066)  | 03/06/16 | Up/Down mode (U-d)            | 0: ond 5: FLt2 9: oFd<br>1: ond 6: nt 10: nFd<br>2: ond2 7: nt 11: nFd 1<br>3: FLt 8: nt2 12: ntG<br>4: FLt 1  | Use counter and timer in common |
| 40104(0067)  | 03/06/16 | Output mode (oUt n)           | 0: ond 5: FLt2 9: oFd<br>1: ond 6: nt 10: nFd<br>2: ond2 7: nt 11: nFd 1<br>3: FLt 8: nt2 12: ntG<br>4: FLt 1  | Use counter and timer in common |
| 40105(0068)  | 03/06/16 | OUT2(OUT) output time (oUt 2) | 000 i to 9999, 0: HOLD   | Unit: ×10ms                     |
| 40106(0069)  | 03/06/16 | OUT1 output time (oUt 1)      | 000 i to 9999, 0: HOLD   | Unit: ×10ms                     |
| 40107(006A)  | 03/06/16 | Input signal time (i nE)      | 0: i 1: 2D   | Unit: ms                        |
| 40108(006B)  | 03/06/16 | Memory protection (dRtR)      | 0: CLr 1: rEC  | Use counter and timer in common |
| 40109(006C)  | 03/06/16 | Lock key (LoCt)               | 0: LoFF 1: LoC1 2: LoC2 3: LoC3  | Use counter and timer in common |
| 40110(006D)  | 03/06/16 | Indication mode (dSP n)       | 0: t o RL 1: HoLd 2: o n t d   | For the indicator               |

### 5-8. Function setting mode\_Communication group

| No.(Address) | Func     | Explanation                  | Setting range                   | Notice        |
|--------------|----------|------------------------------|---------------------------------|---------------|
| 40151(0096)  | 03/06/16 | Com. address (Addr)          | 1 to 127                        |               |
| 40152(0097)  | 03/06/16 | Com. speed (bPS)             | 0: 24 1: 48 2: 96 3: 192 4: 384 | Unit: ×100bps |
| 40153(0098)  | 03/06/16 | Com. parity (Prty)           | 0: nonE 1: EUE 2: odd           |               |
| 40154(0099)  | 03/06/16 | Stop bit (StP)               | 0: 1 1: 2                       |               |
| 40155(009A)  | 03/06/16 | Response waiting time (-Stt) | 05 to 99                        | Unit: ms      |
| 40156(009B)  | 03/06/16 | Com. writing (CnW)           | 0: EnR 1: d 5R                  |               |

## 6. Exception processing

## &lt;