

# Multifunction LCD Digital Timer TC-Pro480 Series



## User's Manual

Ver:3.0



# Multifunction LCD Digital Timer

## TC-Pro480xxx

- Highly visible display with backlit negative transmissive LCD
- Visual alert when output status changes
- PNP/NPN switchable DC-voltage input
- Finger-safe terminals(screw terminal block models)
- Three-language instruction manual
- Applied to connect PC and HMI

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## Model Number Structure

### ■ List of Models

Output type	Supply voltage	Model	
		Standard	Communication
Contact output	100~240 VAC	TC-Pro480SRA (-D)	TC-Pro480CRA (-D)
	24 VDC/24 VAC	TC-Pro480SRD (-D)	TC-Pro480CRD (-D)
Transistor output	100~240 VAC	TC-Pro480STA (-D)	TC-Pro480CTA (-D)
	24 VDC/24 VAC	TC-Pro480STD (-D)	TC-Pro480CTD (-D)

Note: The model with communication must be used with cable.

### ■ Model Number Legend

TC-Pro 480       -  

1    2    3    4

**1. Communication**

S: Standard (no communication)

C: Communication

**2. Output type**

R: Contact

T: Transistor

**3. Supply voltage**

A: 100V~240VAC

D: 24VDC、24VAC

**4. Mounting method**

None: Flush mounting

D: DIN track mounting

### ■ Accessories (Order Separately)

Name	Models
9-pin Female D-sub cable for RS-232 connector, 1.5m Cable	CAB-090A232
9-pin Female D-sub cable for RS-485 connector, 1.5m Cable	CAB-090A485
9-pin Female D-sub cable for RS-422 connector, 1.5m Cable	CAB-090A422
9-pin male D-sub adapter for CAB-090A232/CAB-090A485/CAB-090A422	ADP-090401
9-pin Female D-sub cable for RS-232 connector, 1.5m Cable	CAB-090B232
9-pin Female D-sub cable for RS-485 connector, 1.5m Cable	CAB-090B485
9-pin Female D-sub cable for RS-422 connector, 1.5m Cable	CAB-090B422
Mounting Track	0F-A
Panel Protective Cover	SVF-A
Communication Protective Cover	TTL-11

Note : CAB-090A232/485/422 is used for Flush mounting products

CAB-090B232/485/422 is used for DIN track mounting products

# Specifications

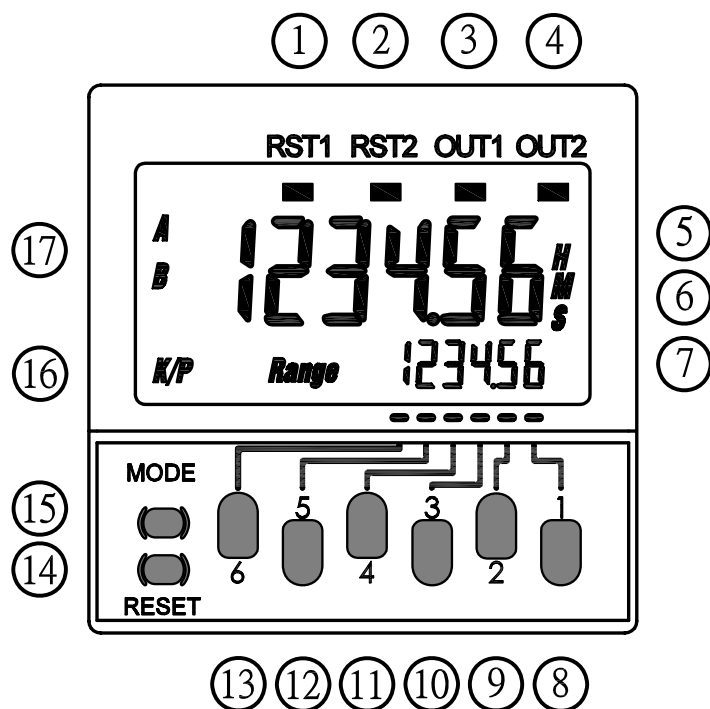
## ■ Ratings

Item	TC-Pro480□□□-□
Classification	Digital timer
Rated supply voltage	100~240VAC (50/60Hz), 24VAC (50/60Hz), 24VDC (permissible ripple: 20% (p-p) max.)
Operating voltage range	85% to 110% rated supply voltage(24VDC; 90% to 110%)
Power consumption	Approx. 6.2VA at 264VAC, Approx. 5.1VA at 26.4VAC, Approx. 2.4W at 24VDC
Mounting method	Flush mounting, DIN track mounting
External connections	Screw terminals
Terminal screw tightening torque	0.5 N•m Max.
Display	7-segment, LCD display Present value: 9-mm-high characters, white Set value: 4-mm-high characters, white
Digits	6 digits, PV/SV (-99,999~999,999)
Time range	999.999s (0.001-s unit), 9999.99s (0.01-s unit), 99999.9s (0.1-s unit) 999999s (1-s unit), 9999min59s (1-s unit), 99999.9min (0.1-min unit), 999999min (1-min unit), 9999h59min (1-min unit), 99999.9h (0.1-h unit), 999999h (1-h unit)
Timer mode	Elapsed time (UP), Remaining time (down) (selectable)
Input signals	Signal, reset, gate
Input method	※ No-voltage input/voltage input (switchable) ◆ No-voltage input ON impedance: 1kΩ max. (leakage current: 5~20 mA when 0Ω) ON residual voltage: 3V max. OFF impedance: 100kΩ min. ◆ Voltage Input High(logic) level: 4.5 to 30 VDC Low(logic) level: 0 to 2 VDC (Input resistance: approx. 4.7 kΩ)
Signal, Reset, Gate	Minimum input signal width: 1 or 20 ms (selectable, same setting for all inputs)
Power reset	Minimum power-opening time: 0.5 s (except for A-3, b-1 and F mode)
Reset system	Power reset (except for A-3, b-1 and F mode), external and manual reset
Sensor waiting time	Approx. 250 ms (control output is turned OFF and no input is accepted during sensor waiting time)
Output modes	A, A-1, A-2, A-3, b, b-1, d, E, F, Z, ton or toff etc.
One-shot output time	0000.01~9999.99s
Output method	Contact / transistor output
Control output	SPDT contact output: 5A at 250 VAC, resistive load (cosΦ=1) Minimum applied load: 10 mA at 5 VDC (failure level: P, reference value) Transistor output: NPN open collector, max. 100mA at 30 VDC Residual voltage: 1.5 VDC max. (approx. 1V) Output category according to EN60947-5-1 for timers with Contact outputs (AC-15; 250V 3A / AC-13; 250V 5A / DC-13; 30V 0.5A) Output category according to EN60947-5-2 for timers with Transistor outputs (DC-13; 30V 100 mA) NEMA B300 Pilot Duty, 1/4 HP 5-A resistive load at 120 VAC, 1/3 HP 5-A resistive load at 240 VAC
External power supply	12VDC (15%), 80mA
Key protection	Yes
Memory backup	EEPROM (overwrites: 100,000 times min.) that can store data for 10 years min.
Ambient temperature	Operating: -10 to 55°C (with no icing or condensation) Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity	25% to 85%
Case color	Flush mode: black, DIN track mode: gray-black
Attachments	Waterproof packing, flush mounting adapter

## ■ Characteristics

Item	TC-Pro480□□□-□	
Life expectancy	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min. (5 A at 250 VAC, resistance load)	
EMC	(EMI) Emission Enclosure: Emission AC mains: (EMS) Immunity ESD: Immunity RF-interference: Immunity Conducted Disturbance: Immunity Burst: Immunity Surge: Immunity voltage Dip/interruption:	EN61326 EN55011 EN55011 EN61326 EN61000-4-2 EN61000-4-3 EN61000-4-6 EN61000-4-4 EN61000-4-5 EN61000-4-11
Weight	Approx. 168g	

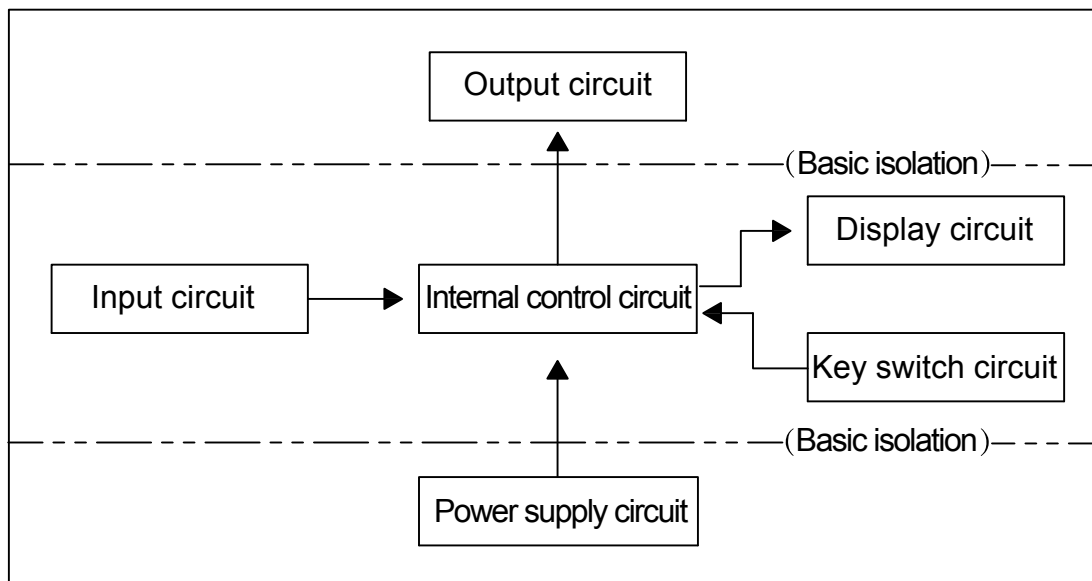
## Nomenclature



- |   |  |
|---|--|
| ① ② Reset Indicator   | ⑩ The Third Setting Key                              |
| ③ ④ Control Output Indicator  | ⑪ The Fourth Setting Key                             |
| ⑤ Present Value (character height: 9 mm)  | ⑫ The Fifth Setting Key                              |
| ⑥ Time Unit Display (If the time range is 0 min, 0.0 min, 0 h, 0.0 h, 0h0 min, this display flashes to indicate timing operation) | ⑬ The Sixth Setting Key                              |
| ⑦ Set Value (character height: 4 mm)  | ⑭ Reset Key (resets present value and output)        |
| ⑧ The First Setting Key   | ⑮ Mode Key (changes modes and setting items)         |
| ⑨ The Second Setting Key  | ⑯ Key Protection Indicator (the preset value is OFF) |
|   | ⑰ Set Value (Range) A, B Display                     |

## Connection

### ■ Block Diagram



### ■ I/O Functions (Timer/Twin Timer)

Input	Start signal	Stops timing in A-2 and A-3 (power ON delay) modes Starts timing in other modes
	Reset	Reset present value (In elapsed time mode, the present value returns to 0; in remaining time mode, the present value returns to the set value) Count inputs are not accepted and control output turns OFF while reset input is ON. Reset indicator is lit while reset input is ON.
	Gate	Inhibits timer operation
Outputs	Control output (OUT)	Outputs take place according to designated operating mode when timer reaches corresponding set value.

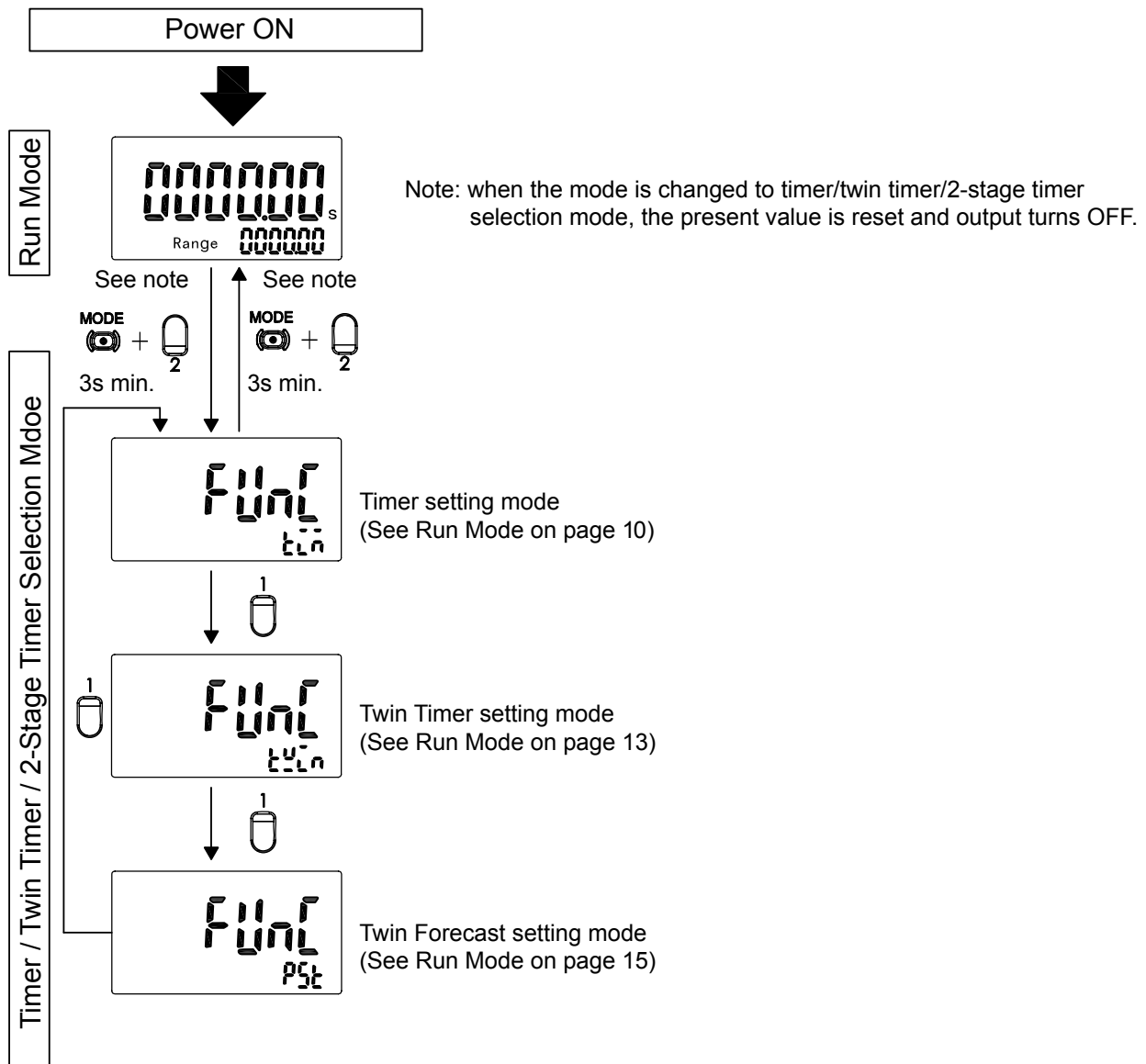
### ■ I/O Functions (2-Stage Timer)

Inputs	Start signal		Starts timing
	Reset		Resets present value (the present value returns to 0) Timing inputs are not accepted and control output turns OFF while reset input is ON. Reset indicator is lit while reset input is ON.
	Gate		Inhibits timer operation
Outputs	Forecast value setting	Control output (OUT2)	Turn ON when the present value reaches the set value.
		Forecast output (OUT1)	Turn ON when the present value reaches the forecast value. The forecast value=set value-forecast set value
	Absolute value setting	Control output 2 (OUT2)	Turn ON when the present value reaches the set value 2.
		Control output 1 (OUT1)	Turn ON when the present value reaches the set value 1.

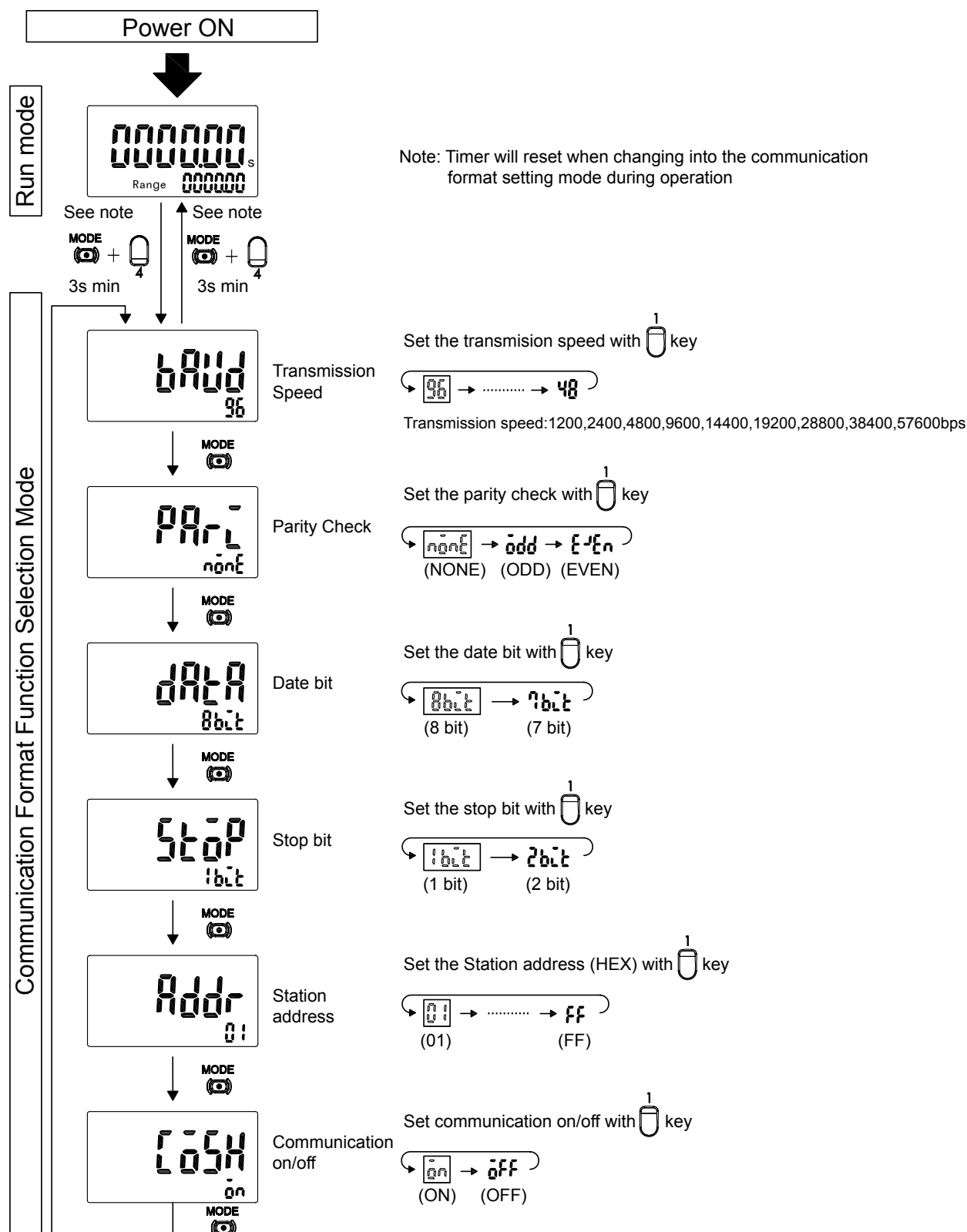
Note: Two control outputs can be used.

# Operating Procedures

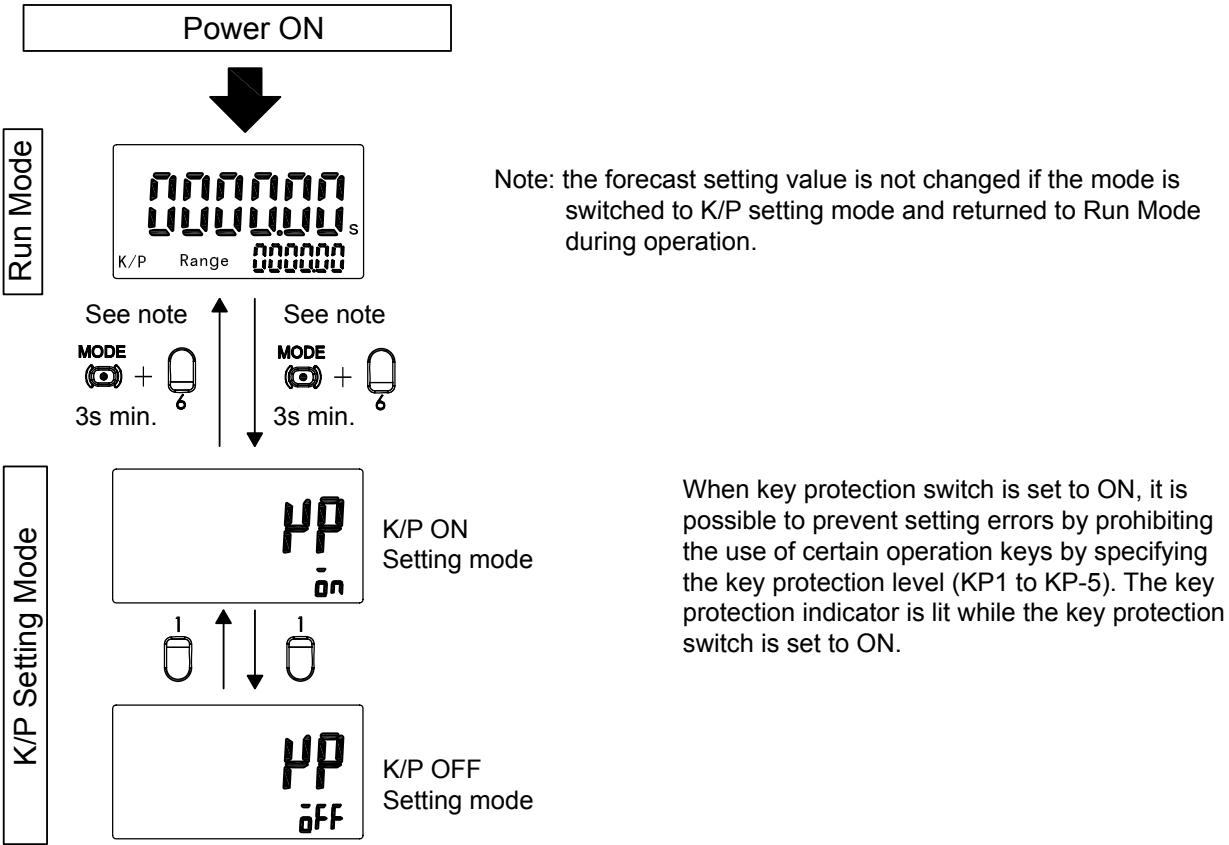
## ■ Timer/Twin Timer/2-stage Timer Selection Mode



## ■ Communication Format Function Selection Mode

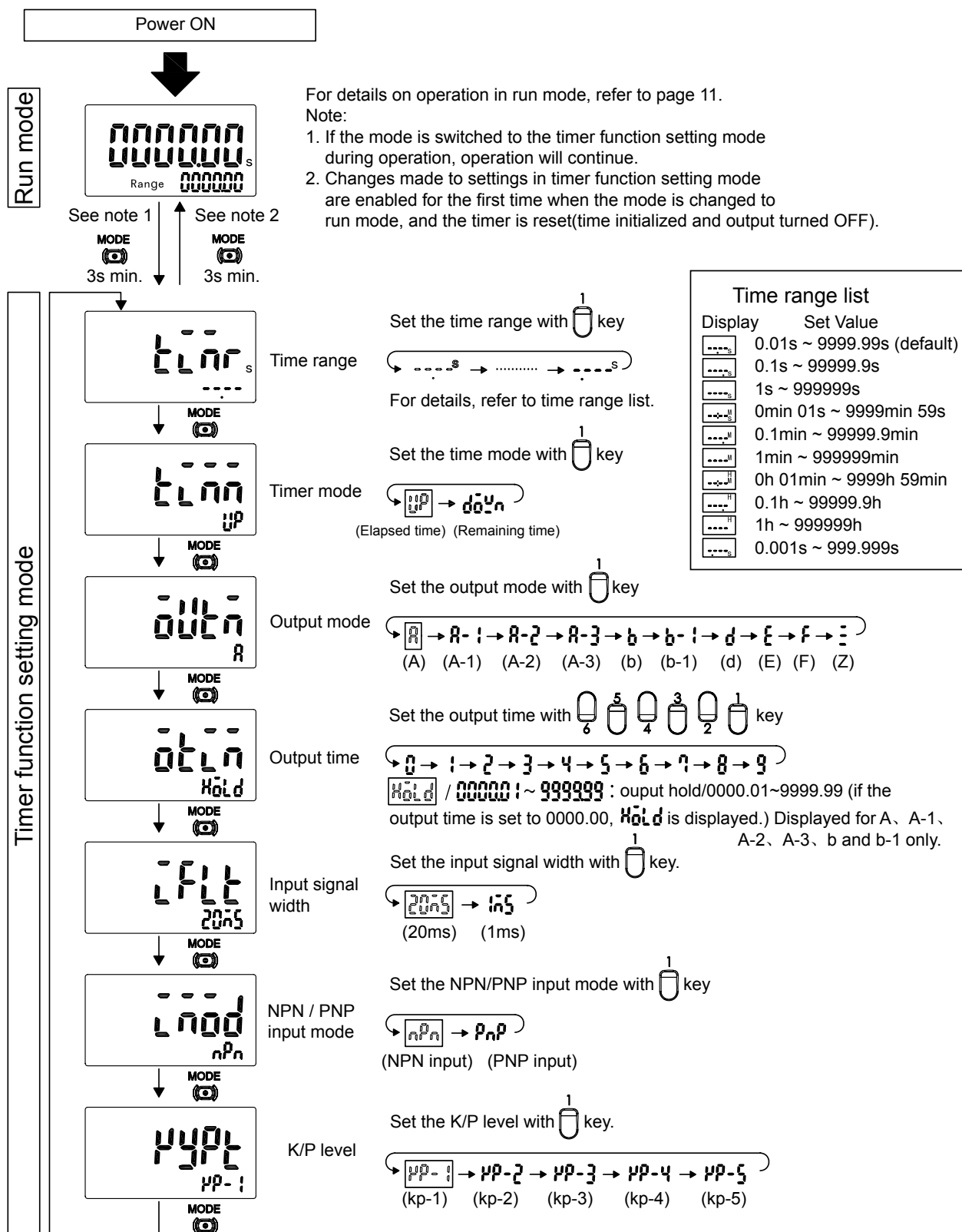


■ Key Protection Setting Mode



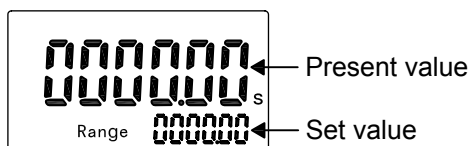
# Timer Function

## ■ Setting for Timer Function

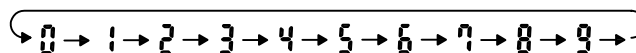


## ■ Operation in Run Mode

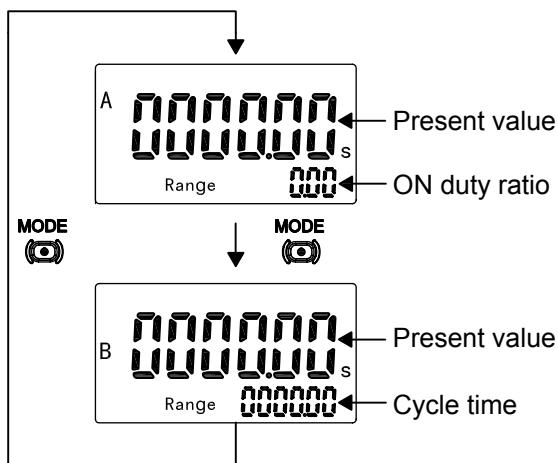
When the output mode is not Z.



Set the six digital values with the corresponding

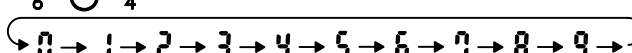


When the output mode is Z.

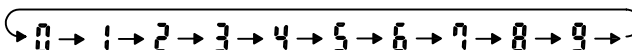


Set ON duty ratio with the corresponding keys

( can not be used)



Set each digit for the cycle time with the corresponding



### Present value and Set value (output mode≠Z)

These items are displayed when the power is turned ON. The present value is displayed in the main display and the set value is displayed in the sub-display. The values displayed will be determined by the setting mode for the time range and timer mode in function setting mode.

### Present value and ON duty ratio (output mode=Z)

The present value is displayed in the main display and the ON duty ratio is displayed in the sub-display. "A" and "Range" light at the same time. Set the ON duty ratio used in ON/OFF duty adjustable flicker mode (Z) as percentage. If a cycle time is set, cycle control can be performed in ON/OFF duty adjustable flicker mode simply by changing the ON duty ratio.

$$\text{ON time} = \text{cycle time} \times \text{ON duty ratio}(\%) / 100$$

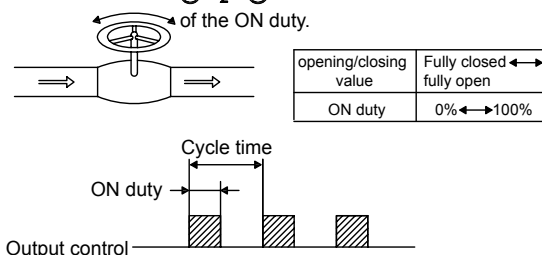
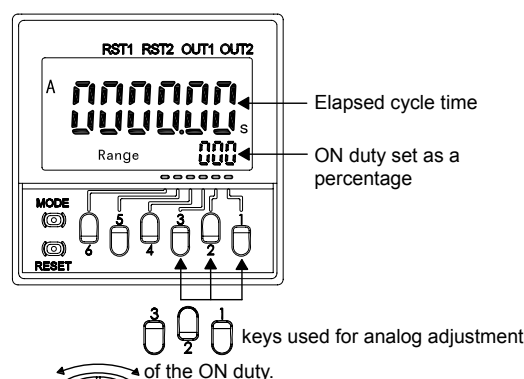
Example:

If the cycle time is 30s, the ON duty ratio is 31%, the ON time is given by the following:

$$30(\text{s}) \times 31(\%) / 100 = 9.3(\text{s})$$

### Present value and Cycle Time (output mode=Z)

The present value is displayed in the main display and the cycle time is displayed in the sub-display. ("B" and "Range" light at the same time.) Set the cycle time used in ON/OFF duty adjustable flicker mode (Z).



## ■ Explanation of functions

### **Time range (timr)**

Set the range to be timed in the range 000.000s to 999999h.

### **Timer Mode (timm)**

Set either the elapsed time (UP) or remaining time (DOWN) mode.

### **Output Mode (outm)**

Set the output mode. The possible settings are A、A-1、A-2、A-3、b、b-1、d、E、F and Z.

For details on output mode operation, refer to “timing charts”.

### **Output time (otim)**

When using one-shot output, set the output time (0000.01~ 9999.99s).

One-shot output can be used only if the selected output mode is set to A、A-1、A-2、A-3、b or b-1.

If the output time is set to 0000.00s, “hold” is displayed and the output is held.

### **Input signal width (iflt)**

Set the minimum signal input width (20ms or 1ms) for signal, reset, and gate inputs.

### **NPN / PNP Input Mode (imod)**

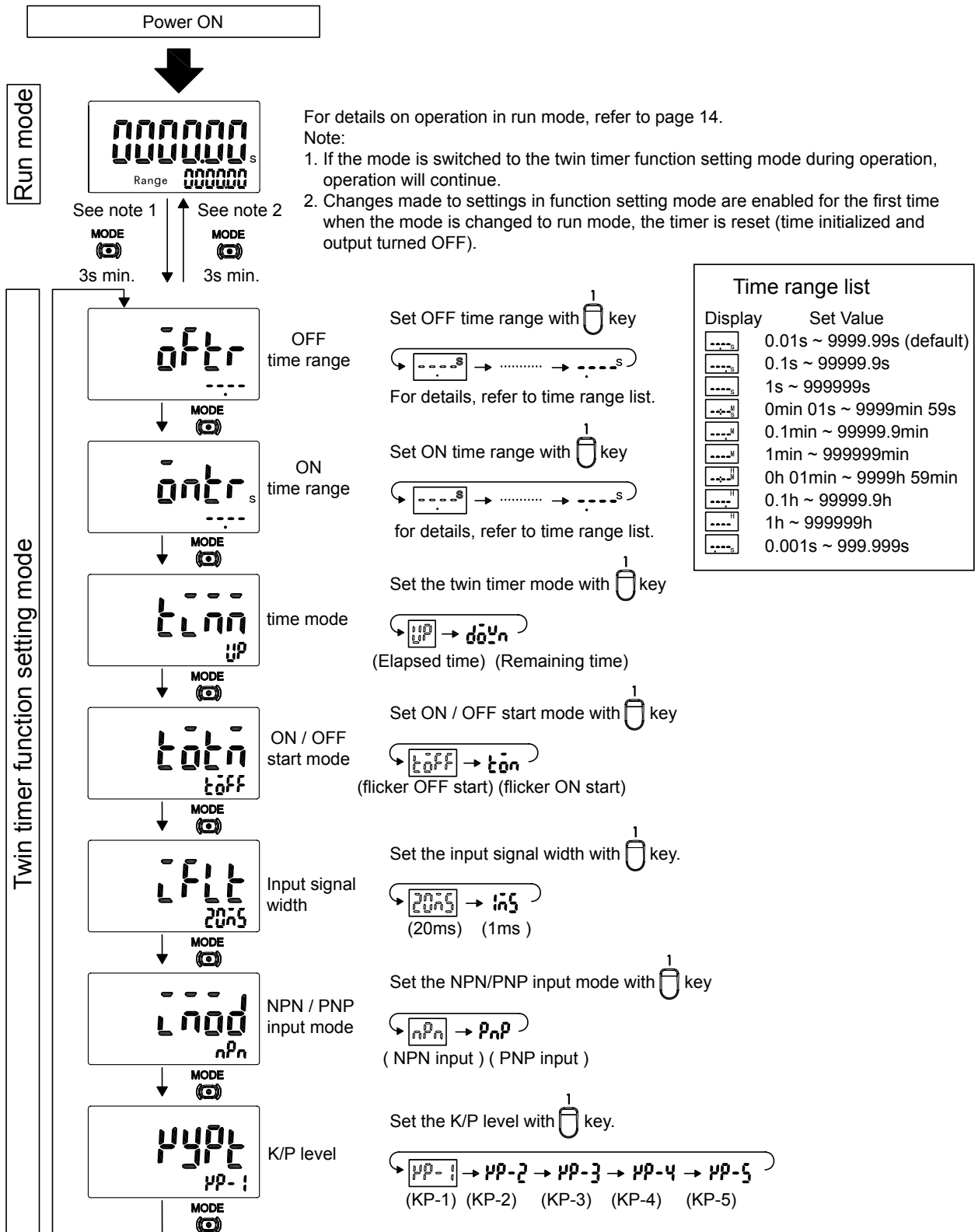
Select NPN input (no-voltage input) or PNP (voltage input) as the input format. The same setting is used for all external inputs. For details on input connection, refer to “input connections” on page 25.

### **Key Protection Level (kypt)**

When the key protection switch is ON, it is possible to prevent setting error by prohibiting the use of certain operation keys by specifying K/P level (KP-1 to KP-5). For details, please refer to “Key Protection Setting Mode” on page 9.

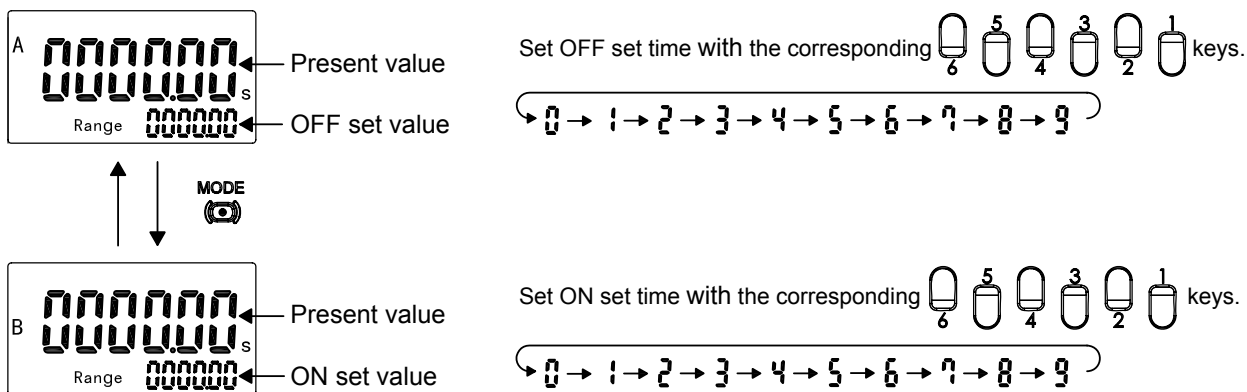
# Twin Timer Function

## ■ Twin Timer Function Setting



## ■ Operation in Run Mode

### Operation in Run Mode



### Present value and OFF Set Time

The present value is displayed in the main display and the OFF Set Time is displayed in the sub-display. "A" and "Range" light at the same time.

### Present value and ON Set Time

The present value is displayed in the main display and the ON Set Time is displayed in the sub-display. "B" and "Range" light at the same time.

## ■ Explanation of functions

### OFF Time range (timr)

Set the range to be timed in the range 000.000s to 999999h.

### ON Time range (timr)

Set the range to be timed in the range 000.000s to 999999h.

### Timer Mode (timm)

Set either the elapsed time (UP) or remaining time (DOWN) mode.

### ON/OFF Start Mode (totm)

Set either the flicker OFF start or flicker ON start. For details on start mode, refer to "timing charts".

### Input signal width (iflt)

Set the minimum signal input width (20ms or 1ms) for signal, reset, and gate inputs.

### NPN / PNP Input Mode (imod)

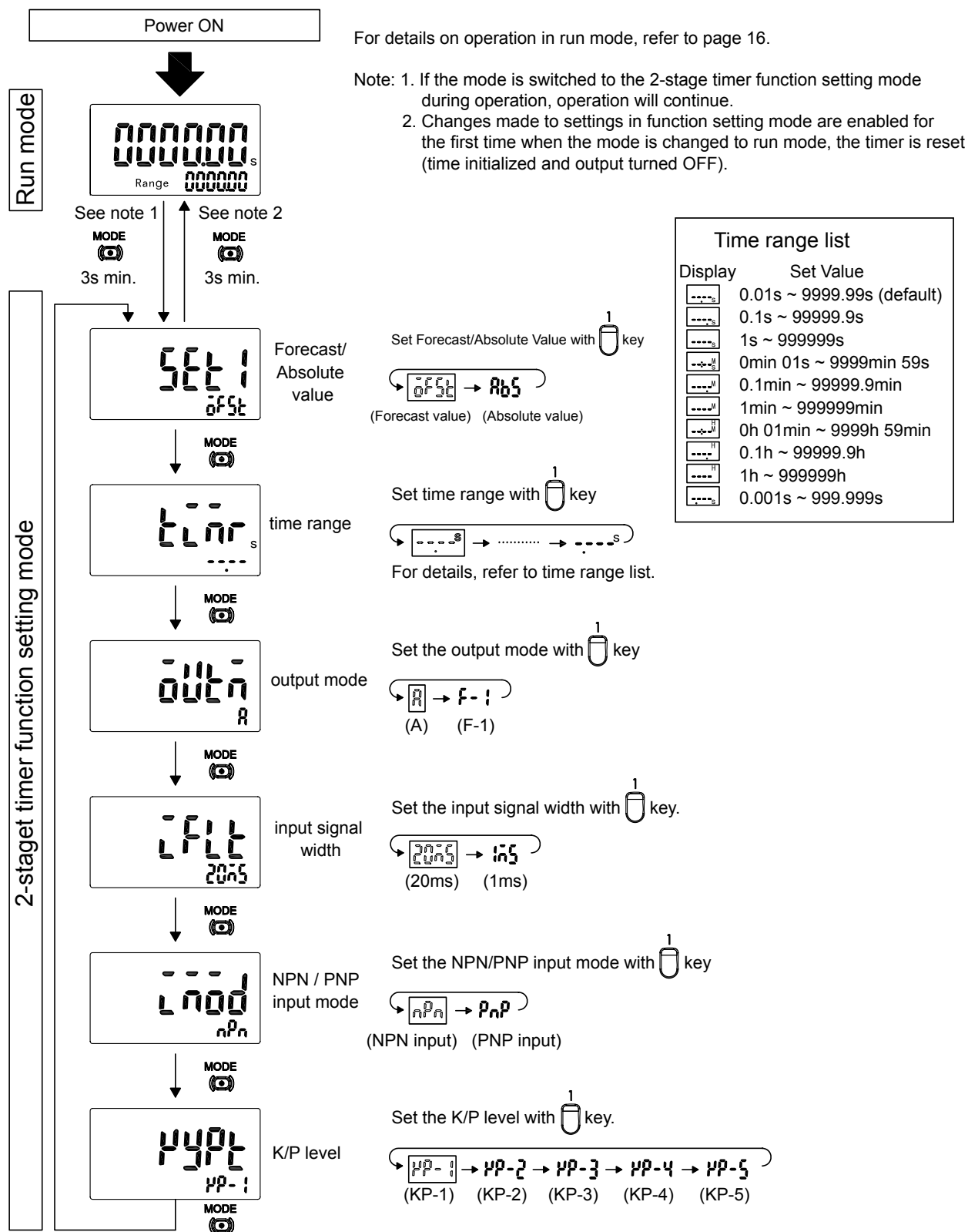
Select NPN input (no-voltage input) or PNP (voltage input) as the input format. The same setting is used for all external inputs. For details on input connection, refer to "input connections" on page 25.

### Key Protection Level (kypt)

When the key protection switch is ON, it is possible to prevent setting error by prohibiting the use of certain operation keys by specifying K/P level (KP-1 to KP-5). For details, refer to "Key Protection Setting Mode" on page 9.

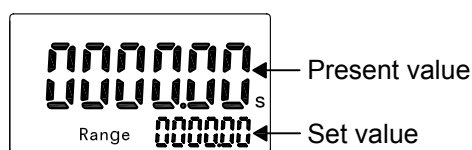
## 2-Stage Timer Function

## ■ 2-stage Function Setting

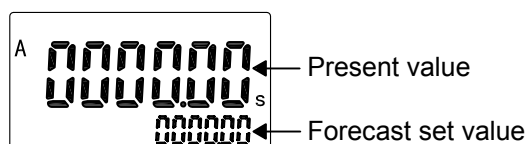
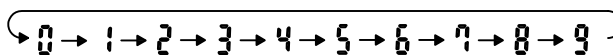
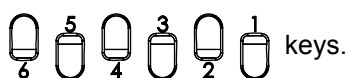


## ■ Operation in Run Mode

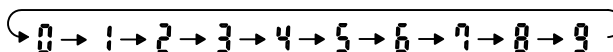
### When the forecast value is selected



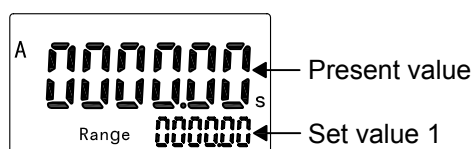
Set "set value" with the corresponding



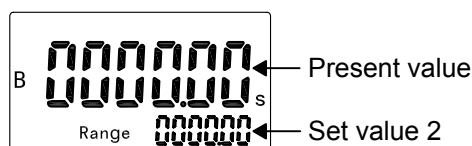
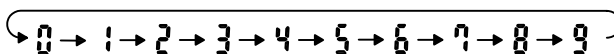
Set "forecast set value" with the corresponding



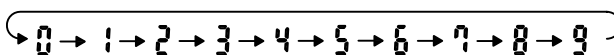
### When the absolute value is selected



Set "set value 1" with the corresponding



Set "set value 2" with the corresponding



## ■ Explanation of functions

### Forecast / Absolute Value (set1)

For details, refer to the following figure.

### Time Range (timr)

Set the range to be timed in the range 000.000s to 999999h.

### Output Mode (outm)

Set the output mode. The possible setting are A and F-1

For details on output mode operation, refer to "timing charts".

### Input signal width (iflt)

Set the minimum signal input width (20ms or 1ms) for signal, reset, and gate inputs.

### NPN / PNP Input Mode (imod)

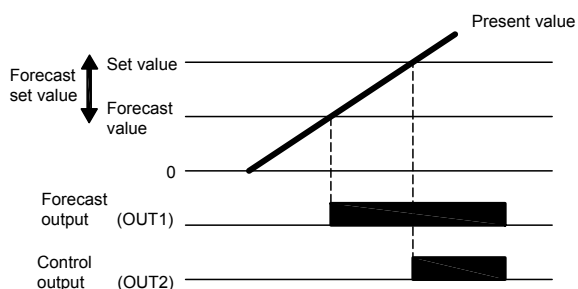
Select NPN input (no-voltage input) or PNP (voltage input) as the input format. The same setting is used for all external inputs. For details on input connection, refer to "input connections" on page 25.

### Key Protection Level (kyp)

When the key protection switch is ON, it is possible to prevent setting error by prohibiting the use of certain operation keys by specifying K/P level (KP-1 to KP-5). For details, refer to "Key Protection Setting Mode" on page 8.

### Forecast Value Setting

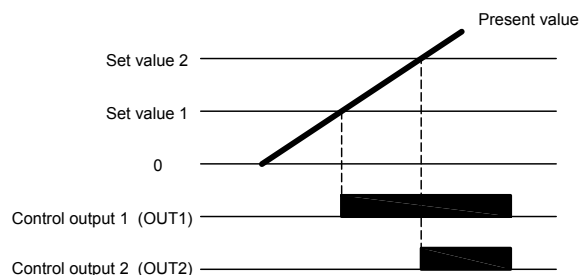
Example: F-1 Mode



1. OUT1 (forecast output) turns ON when the present value reaches the forecast value.  
forecast value = set value - forecast set value  
The forecast set value is used to set the deviation for the set value.
2. OUT2 (control output) turns ON when the present value reaches the set value.
3. If the forecast set value  $\geq$  set value, OUT1 (forecast output) turns ON as soon as timing starts.

### Absolute Value Setting

Example: F-1 Mode

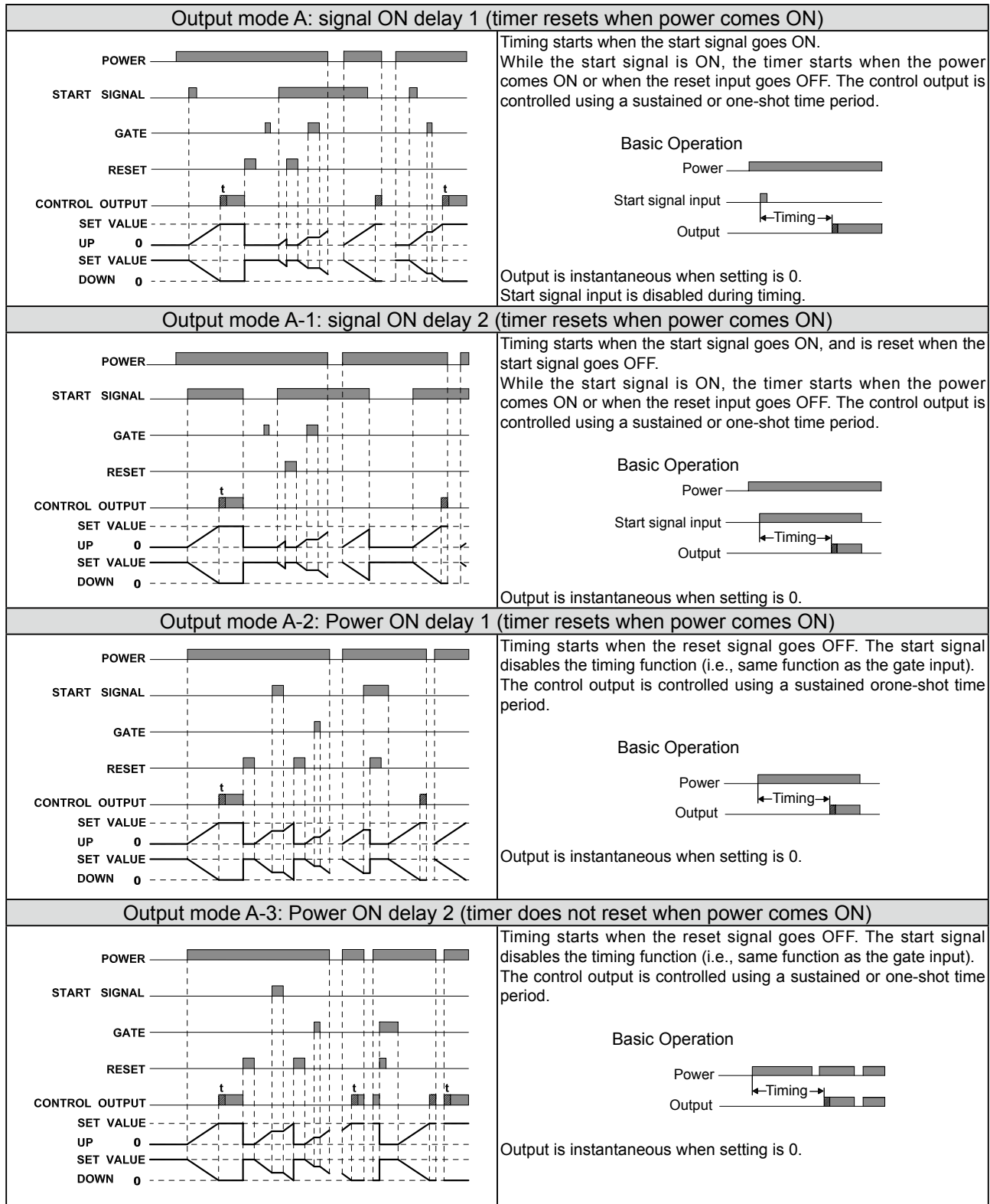
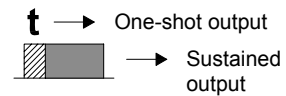


1. OUT1 (control output 1) turns ON when the present value reaches the set value 1.
2. OUT2 (control output 2) turns ON when the present value reaches the set value 2.

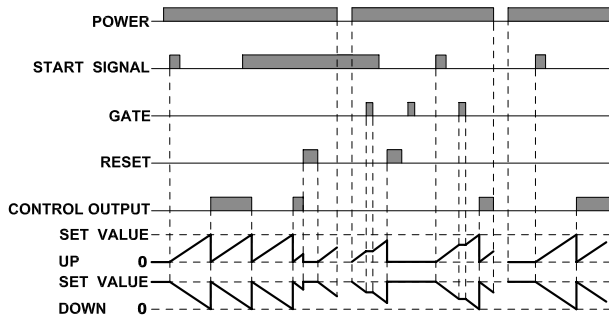
# Sequence Charts

## ■ Timer Operation

Either one-shot output or sustained output can be selected



### Output mode b: Repeat cycle 1 (timer resets when power comes ON)

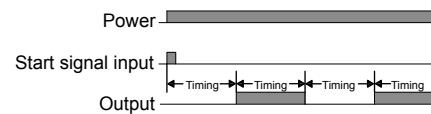


Timing starts when the start signal goes ON.

The status of the control output is reversed when time is up (OFF at start).

While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

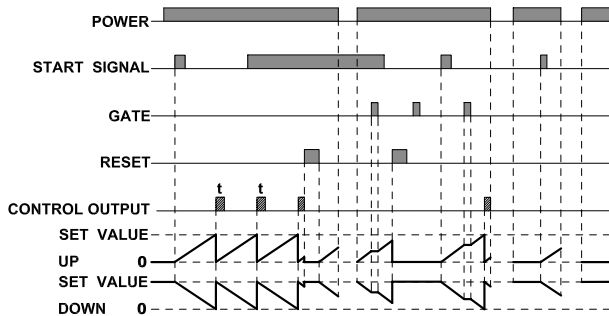
#### Basic Operation



Normal output operation will not be possible if the set time is too short.

Set the value to at least 100ms (contact output type).

Start signal input is disabled during timing.

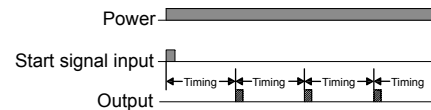


Timing starts when the start signal goes ON.

The status of the control output is turned ON when time is up.

While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

#### Basic Operation

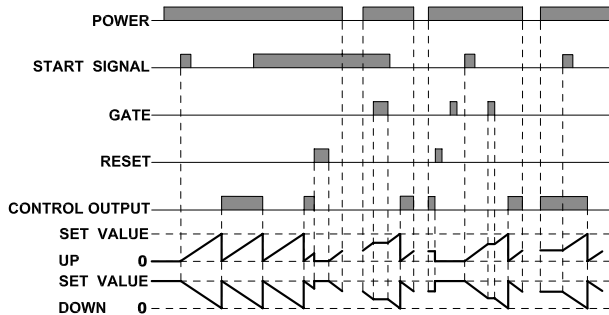


Normal output operation will not be possible if the set time is too short.

Set the value to at least 100ms (contact output type).

Start signal input is disabled during timing.

### Output mode b-1: Repeat cycle 2 (timer does not reset when power comes ON)

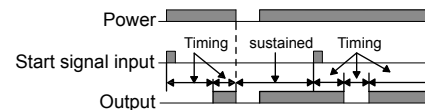


Timing starts when the start signal goes ON.

The status of the control output is reversed when time is up (OFF at start).

While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

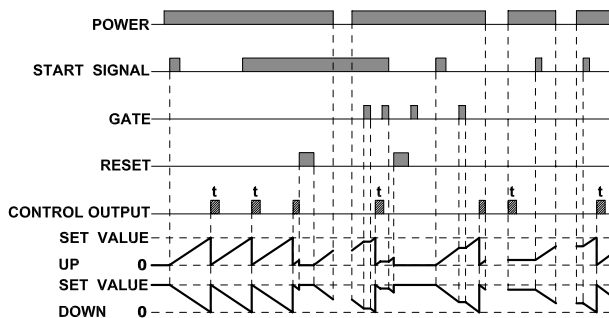
#### Basic Operation



Normal output operation will not be possible if the set time is too short.

Set the value to at least 100ms (contact output type).

Start signal input is disabled during timing.

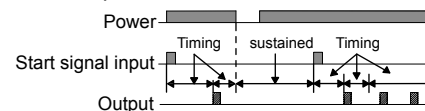


Timing starts when the start signal goes ON.

The status of the control output is reversed when time is up (OFF at start).

While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

#### Basic Operation

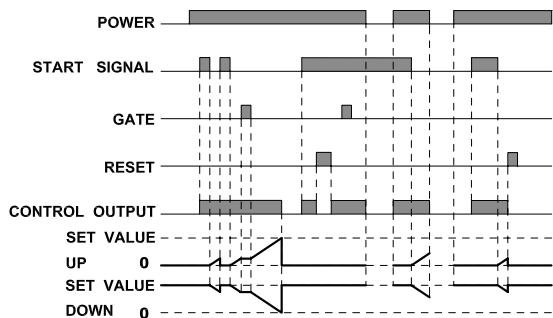


Normal output operation will not be possible if the set time is too short.

Set the value to at least 100ms (contact output type).

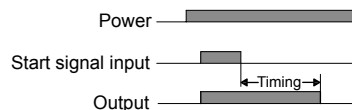
Start signal input is disabled during timing.

### Output mode d: Signal OFF delay (Timer resets when power comes ON.)



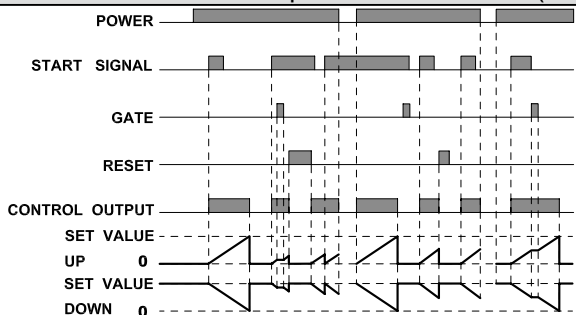
The control output is ON when the start signal is ON (except when the power is OFF or the reset is ON.)  
The timer is reset when the time is up.

#### Basic Operation



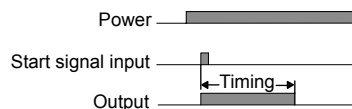
Output functions only during start signal input when setting is 0.  
Start signal input is disabled during timing.

### Output mode E: Interval (timer resets when power comes ON)



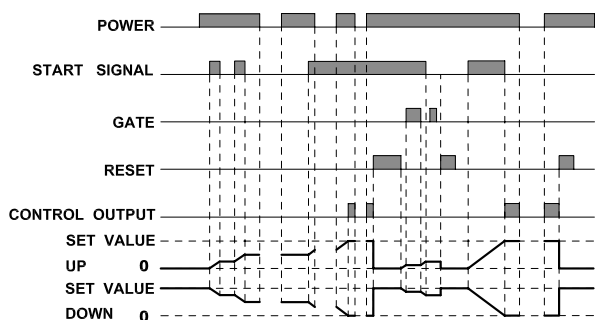
Timing starts when the start signal comes ON. The control output is reset when time is up. While the start signal is ON, the timer starts when power comes ON or when the reset input goes OFF.

#### Basic Operation



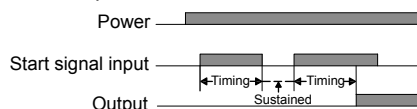
Instantaneous output is disabled when setting is 0.

### Output mode F: Cumulative (timer does not reset when power comes ON.)



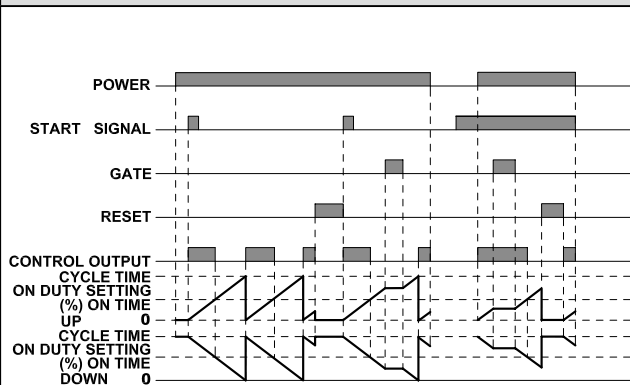
Timing is enabled by start signal (timing is stopped when the start signal is OFF or when the power is OFF).  
A sustained control output is used.

#### Basic Operation



Output is instantaneous when setting is 0.

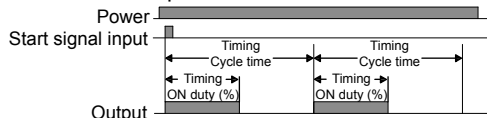
### Z mode : ON/OFF - duty adjustable flicker



Timing starts when the reset signal goes ON.  
The status of the control output is reversed when time is up (ON at start).

While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

#### Basic Operation



Normal output operation will not be possible if the set time is too short.

Set the value to at least 100ms (contact output type).

Start signal input is disabled during timing.

### Z mode:

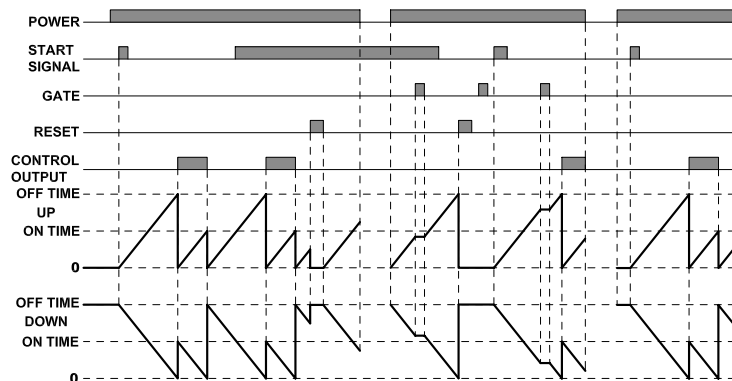
Output quantity can be adjusted by changing the cycle time set in the adjustment level to 1 and by changing the ON duty (%) set value.

Set value shows the ON duty(%) and can be set to a value between 0 and 100 (%). When the cycle time is 0, the output will always be OFF.

When the cycle time is not 0 and when ON duty has been set to 0(%), the output will always be OFF. When ON duty has been set to 100 (%), the output will always be ON.

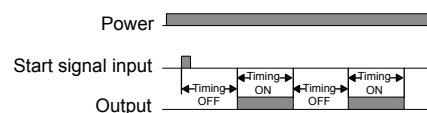
## ■ Twin Timer Operation

### Output Mode toff: flicker OFF start



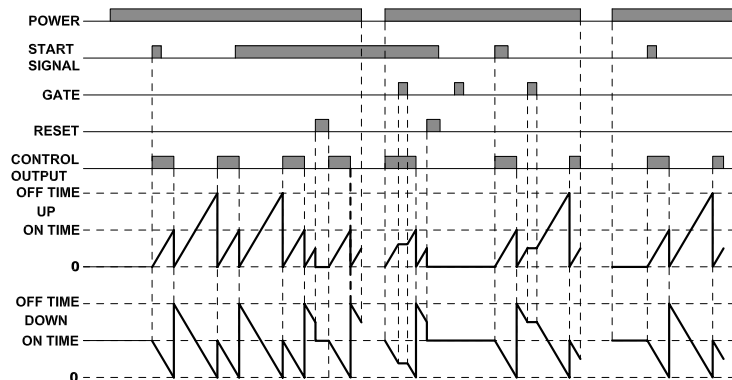
Timing starts when the start signal goes ON.  
The status of the control output is reversed when time is up (OFF at start).  
While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

#### Basic Operation



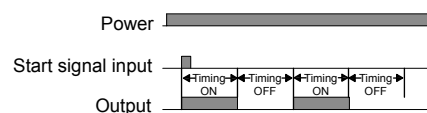
Normal output operation will not be possible if the ON/OFF time is too short.  
Set the value to at least 100ms (contact output type).  
Start signal input is disabled during timing.

### Output Mode ton: flicker ON start



Timing starts when the start signal goes ON.  
The status of the control output is reversed when time is up (ON at start).  
While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

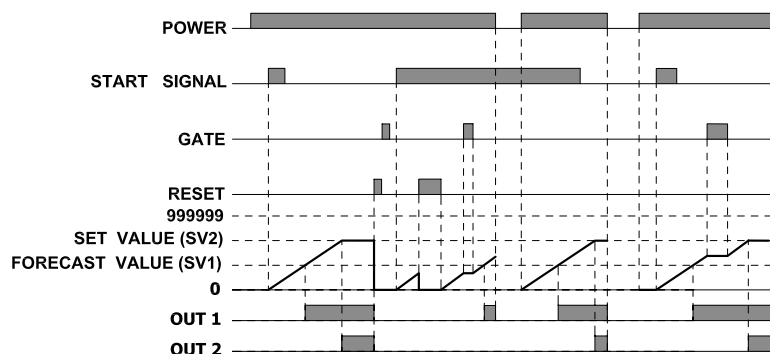
#### Basic Operation



Normal output operation will not be possible if the ON/OFF time is too short.  
Set the value to at least 100ms (contact output type).  
Start signal input is disabled during timing.

## ■ 2-Stage Timer Operation

### A Mode: Signal ON delay (Timer resets when power comes ON.)

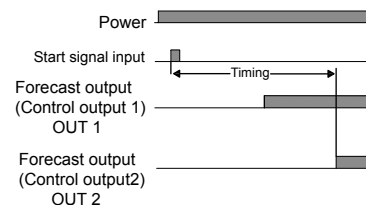


Timing starts when the start signal turns ON. While the start signal is ON, the timer starts when the power turns ON or when the reset input turns OFF.

A sustained control output is used.

Timing stops when the time is up.

#### Basic Operation

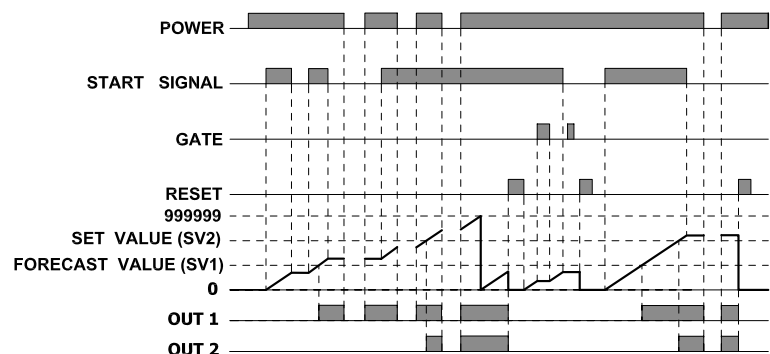


The names in parentheses are used for the absolute value setting.

Output is instantaneous when the set value is 0.

Start signal input is disabled during timing.

### F-1 Mode: Cumulative (Timer does not reset when power comes ON.)

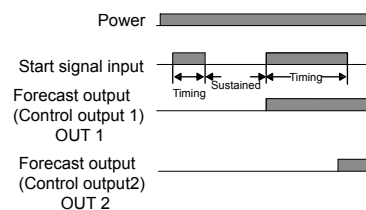


Timing is enabled by start signal (timing is stopped when the start signal is OFF or when the power is OFF).

A sustained control output is used.

Timing continues even after the time is up.

#### Basic Operation



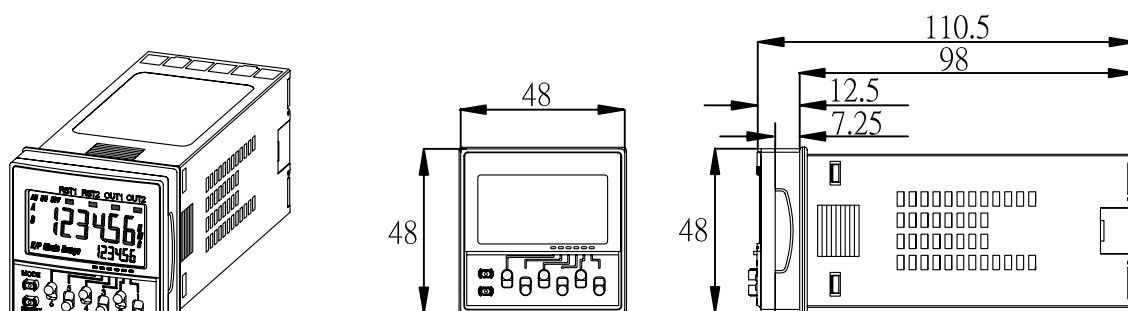
The names in parentheses are used for the absolute value setting.

Output is instantaneous when the set value is 0.

## Dimensions

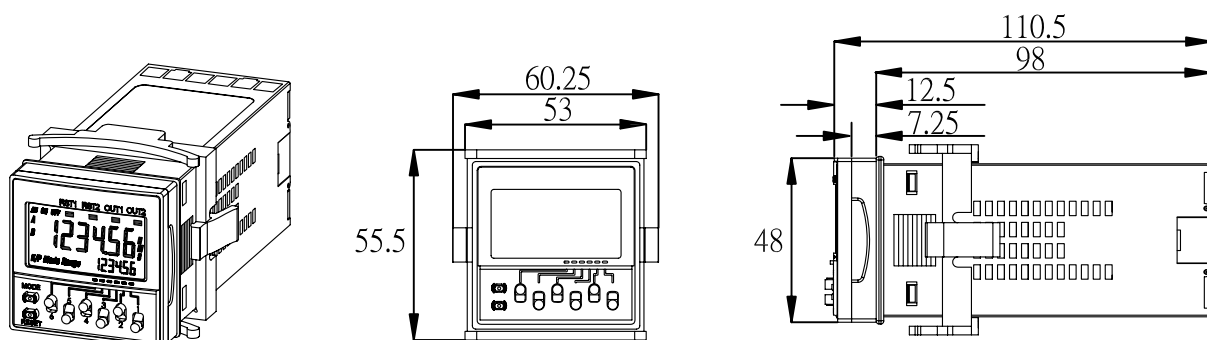
Note: all units are in millimeters unless otherwise indicated.

### Dimensions without Flush Mounting Adapter

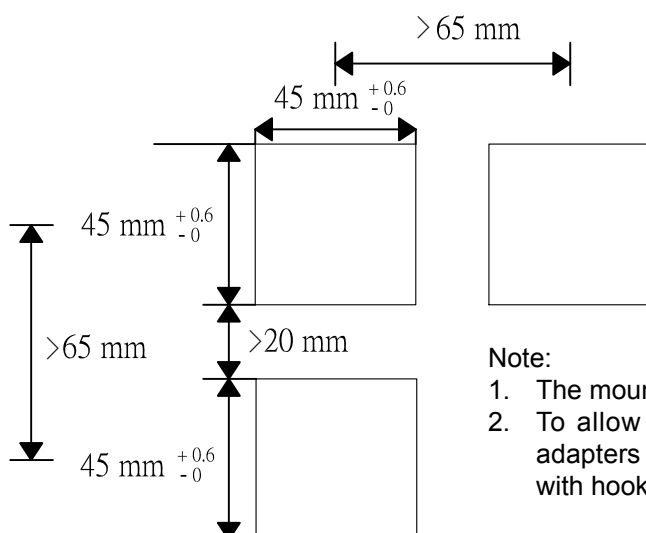


Note: M3 terminal screw (effective length: 8mm)

### Dimensions with Flush Mounting Adapter



### Panel Cutouts



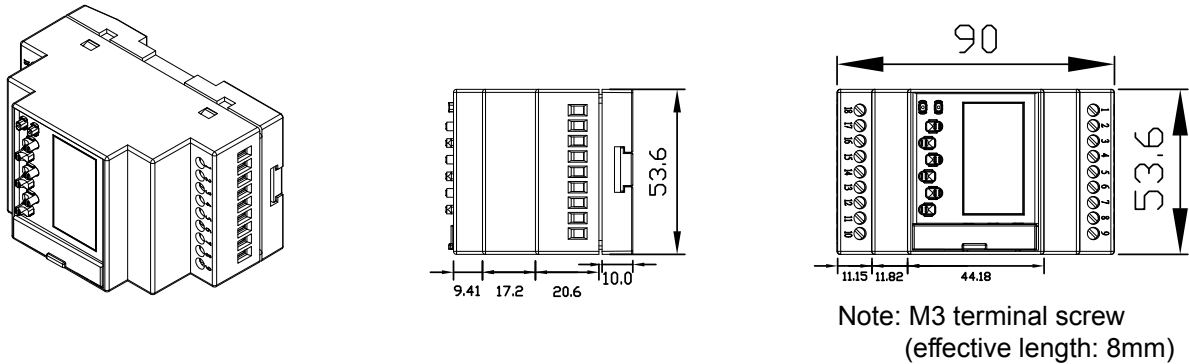
Note:

1. The mounting panel thickness should be 1.5 mm.
2. To allow easier operability, it is recommended that adapters are mounted so that the gap between sides with hooks is at least 20mm.

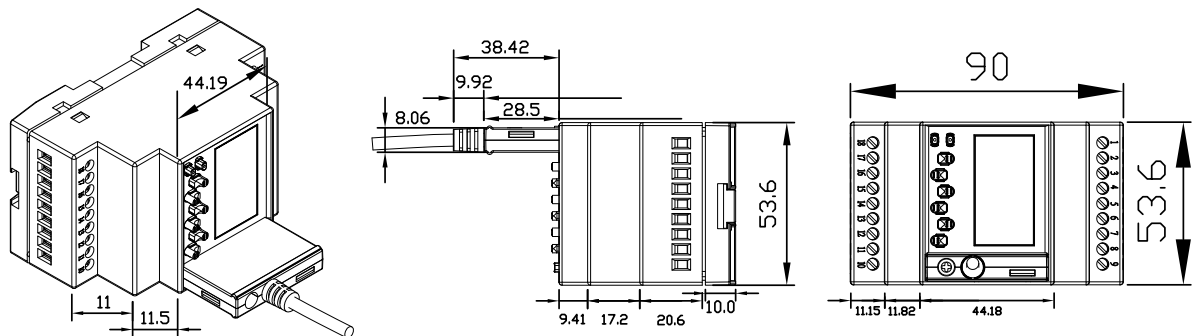
## Dimensions

Note: all units are in millimeters unless otherwise indicated.

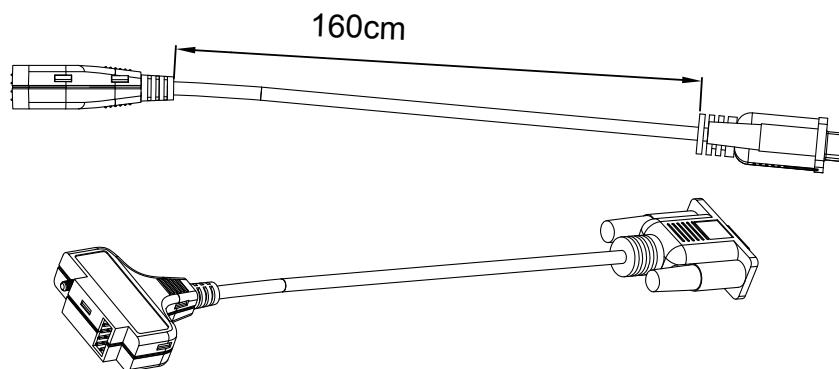
### Dimensions without DIN Track Mounting Adapter



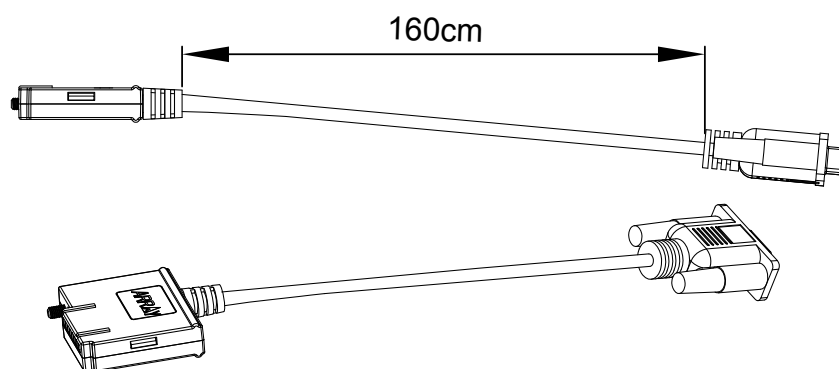
### Dimensions without DIN Track Mounting Adapter (with communication)



## Installation & Accessories



Cable: CAB - 090A□□□(order separately)



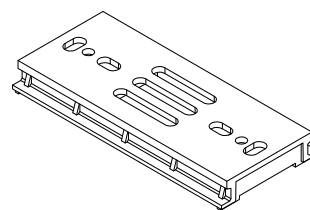
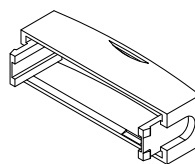
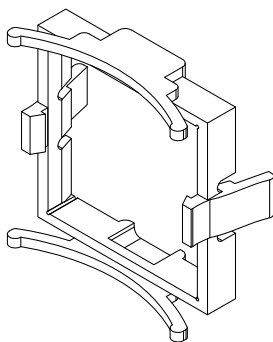
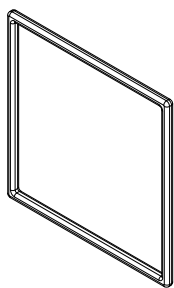
Cable: CAB - 090B□□□(order separately)

Waterproof Packing  
PR-43

Flush Mounting Adapter  
BK-6

End Plate CAB-44

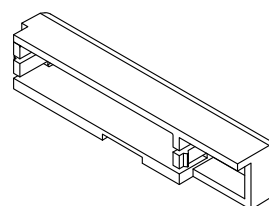
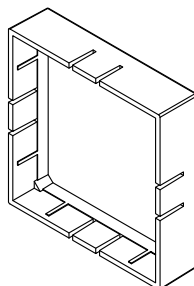
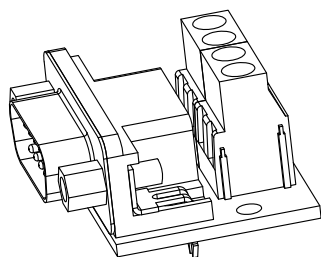
Mounting Track  
0F-A  
(order separately)



ADP-090401 apdater changing 4 into 9 PIN  
(special between 232, 485 and 422,  
order separately)

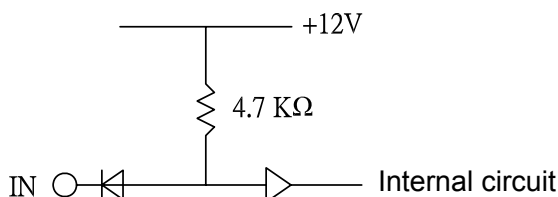
Panel Protective Cover  
SVF-A  
(order separately)

Communication Protective Cover  
TTL-11  
(order separately)



# Input Connections

## Signal, Reset, and Gate Input

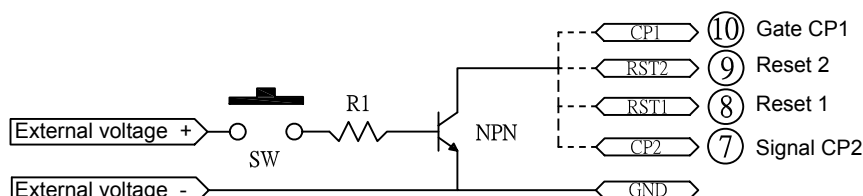


## No-voltage Input Signal Levels

No-contact input	Short-circuit level Transistor ON Residual voltage: 3V max. Impedance when ON: 1KΩ min. (the leakage current is 5 to 20 mA when the impedance is 0 Ω )
	Open level Transistor OFF Impedance when OFF: 100KΩ min.
Contact input	Use contact which can adequately switch 5 mA at 10V. The DC voltage must be 30VDC.

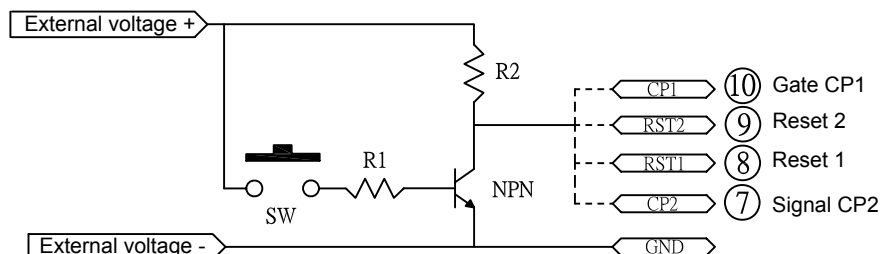
## No-voltage Inputs (NPN Input)

### Open Collector (connection to NPN open collector output sensor)



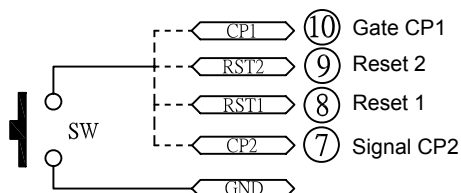
When SW is pressed, the transistor is ON that shows the input has response.

### Voltage Inputs (connection to a voltage output sensor)

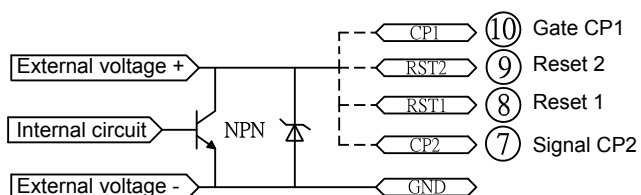


When SW is pressed, the transistor is ON that shows the input has response.

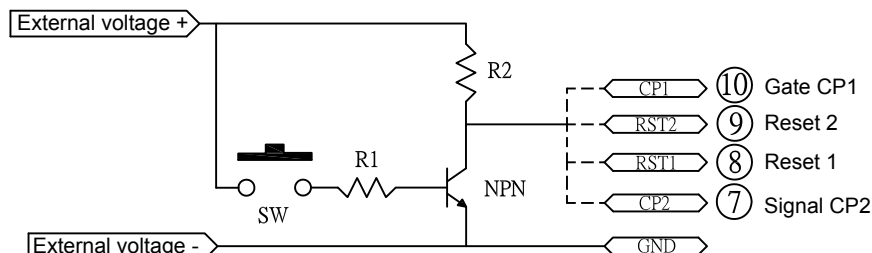
### Contact Input



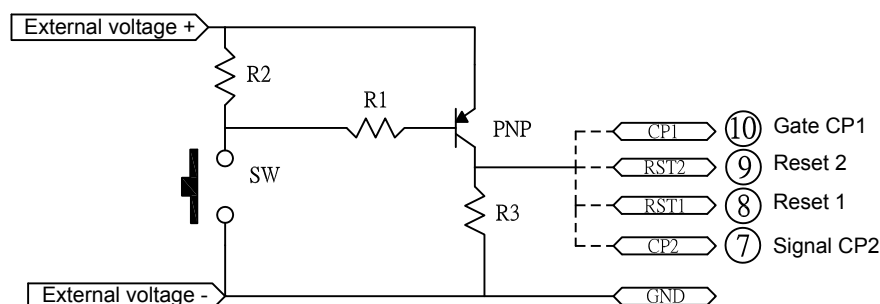
SW is pressed, that shows input the input has response.

**Two-wire Sensor**

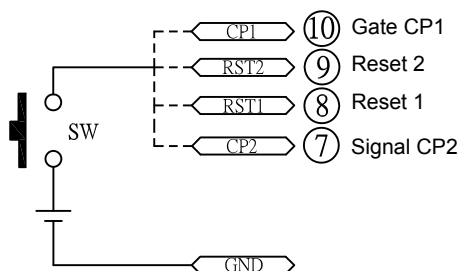
Leakage current: 1.5 mA max.  
 Switching capacity: 5 mA min.  
 Residual voltage: 3 VDC max.  
 Operating voltage: 10 VDC

**Voltage inputs (PNP inputs)****No-contact Input (NPN Transistor) (Connection to NPN open collector output sensor)**

When SW is pressed, the transistor is ON that shows the input has no response.

**No-contact Inputs (PNP Transistor) (connection to a voltage output sensor)**

When SW is pressed, the transistor is ON that shows the input has response.

**Contact Input**

SW is pressed, that shows the input has response.

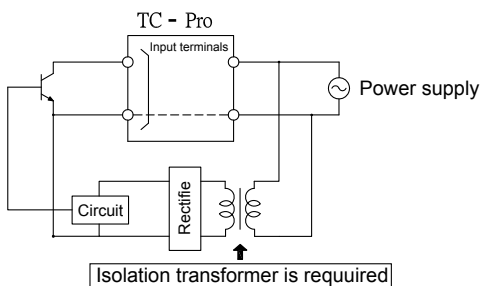
## Safety Precautions

### ⚠ Caution

- ✓ Do not use the product where corrosive or volatile gases are present, or there may occasionally be a risk of explosion.
- ✓ Usable life of output relay is determined by switch condition. According the actual usage, use product within its rated load and electrical life expectancy. If using product beyond its life expectancy, its contacts may become fused or there may be a risk of fire.
- ✓ Do not disassemble, repair, or modify the product. Doing so may result in electric shock, fire, or malfunction.
- ✓ Do not allow metal objects or conductive wires to enter the product, which may result in electric shock, fire, or malfunction.

### Power Supplies

For the power supply of an input device, use an isolating transformer with the primary and the secondary winding not grounded.



Make sure that the voltage applied is within the specified range, otherwise the internal elements of Timer may be damaged.

Do not touch the input terminals while power is supplied, and so touching the input terminals with power supplied may result in electric shock.

When turning the power ON and OFF, input signal reception is possible, unstable, or impossible.

Turn the power ON and OFF using a relay with a rated capacity

of 10A minimum to prevent contact deterioration due to inrush

current caused by turning the power ON and OFF.

Be sure that the power voltage can be immediately reached to the supply voltage value by relays or switches, otherwise it can not be reset or timing error.

### Power Failure Backup

All data is stored in the EEPROM when there is a power failure. The EEPROM can be overwritten more than 100,000 times.

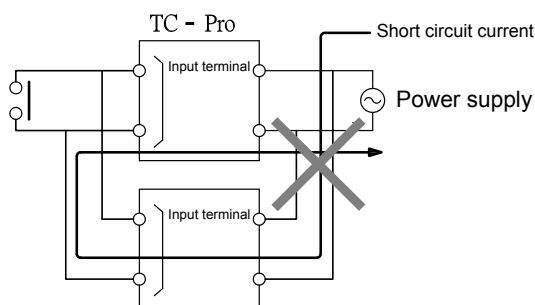
Operating mode	Overwriting timing
A - 3 , F mode	When power is turned OFF
Other mode	When settings are changed

### Input and Output

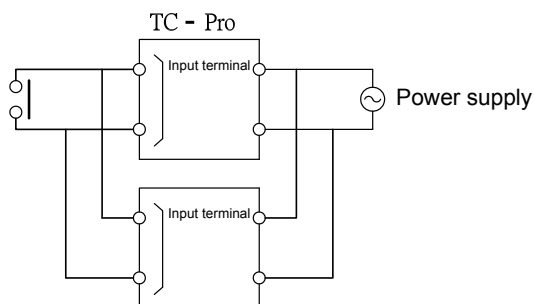
When connecting relay and transformer as an external signal input device, it is necessary to pay attention to the following points to prevent the short circuit because of the hidden current flowing to the power supply. If a relay or transistor connected to two or more timers, those input terminals must be connected correctly, otherwise it can cause short circuit.

### Incorrect

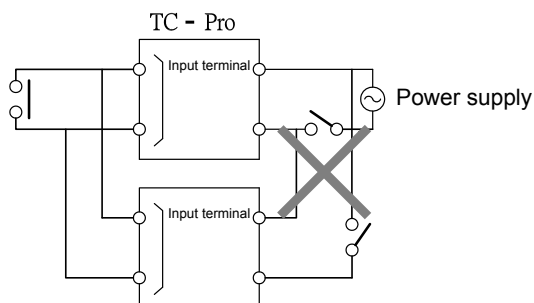
The contact or transistor as an external input signal



### Correct



Don't connect the unattached power switch as below, and without considering whether the timer is different or not.



### Response time when resetting

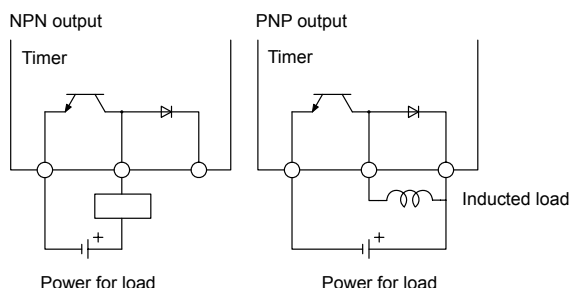
The following table shows the delay from when the reset signal is input until the output is turned OFF.

Min. reset signal width	Output delay time
1ms	0.8~1.2ms
20ms	15~25ms

### Transistor Output

The transistor output of TC-Pro is insulated from the internal circuitry by a photocoupler, so the transistor output can be used as both NPN and PNP output. The diode connected to the collector of the output transistor is used to absorb inverted voltage that is generated when an inductive load is connected to TC-Pro.

The transistor output of TC-Pro is insulated from the internal circuitry by a photocoupler, so the transistor output can be used as both NPN and PNP output. The diode connected to the collector of the output transistor is used to absorb inverted voltage that is generated when an inductive load is connected to TC-Pro.



### Changing the set values

When changing the set value during a timing operation, the output will turn ON if the set value is changed as follows because of the use of a constant read-in system:

Elapsed time(up) mode: present value  $\geq$  set value

Remaining time(DOWN) mode: elapsing time  $\geq$  set value (the present value is set to 0)

Note: when in the remaining time mode, the amount the set value is changed is added to or subtracted from the present value.

### Connection

Make sure that wiring is correct.

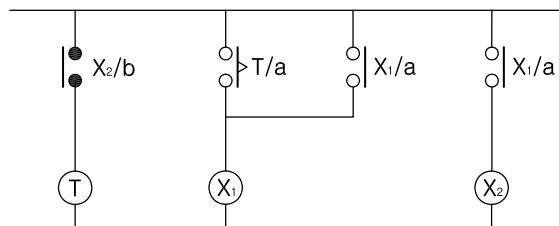
### Mounting

Tighten two mounting screws on the adapter. Tighten them alternately, a little at a time, so as to keep them at an equal tightness.

TC-Pro panel surface is water-resistant. In order to prevent the internal circuit from water penetration through the space between the TC-Pro and operating panel, attach a waterproof packing between TC-Pro and installation panel and secure the waterproof packing with the BK-62 flush-mounting adapter.

### Operation environment

- ✓ Use the product within the rating specified for submerging in water and exposure to oil.
- ✓ Do not use in location affected by excessive vibration or shock
- ✓ Do not use the product in locations subject to dust, corrosive gases, or direct sunlight.
- ✓ Separate the input signal devices, input signal cables, and the product from the source of noise or high-tension cables producing noise.
- ✓ Separate the product from the source of static electricity when using the product in an environment where a large amount of static electricity is produced (e.g. forming compounds, powders, or fluid materials being transported by pipe).
- ✓ Organic solvents (such as paint thinner), as well as very acidic or basic solutions might damage the outer casing of the TC-Pro.
- ✓ Use the product within the rating specified for temperature and humidity.
- ✓ Do not use the product in locations where condensation may occur due to high humidity or where temperature changes are severe.
- ✓ Store at the specified temperature. If TC-Pro has been stored at a temperature of less than  $-10^{\circ}\text{C}$ , allow TC-Pro to stand at room temperature for at least 3 hours before use.



Note: ⊗ auxiliary relay (e.g. MY relay)

### Insulation

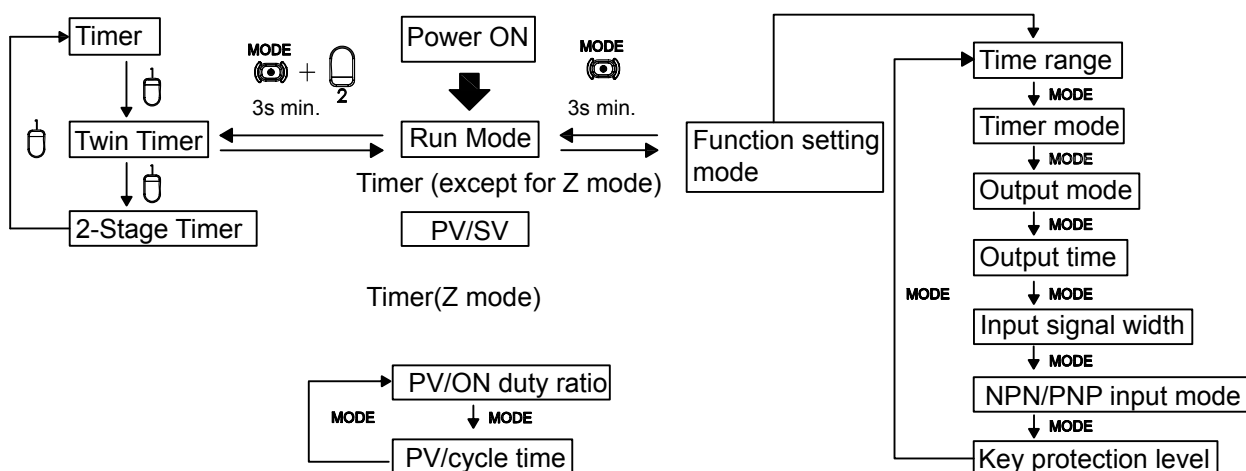
There is basic insulation between power supply and output terminals.

Input and output terminals are connected to devices without exposed charged parts.

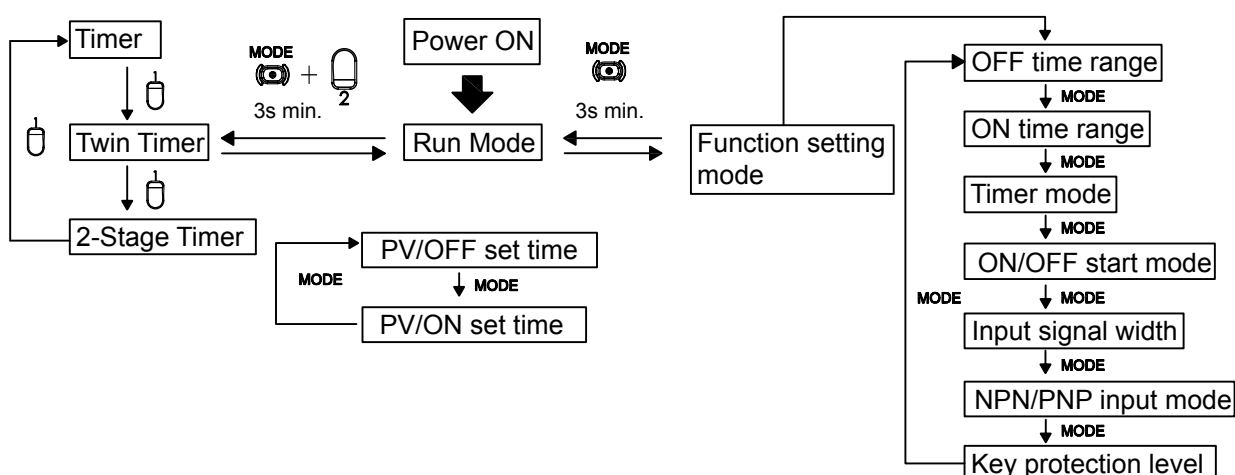
Input and output terminals are connected to devices with basic insulation that is suitable for the maximum operating voltage.

## Additional Information (Using the operation keys)

### ■ Timer Operation

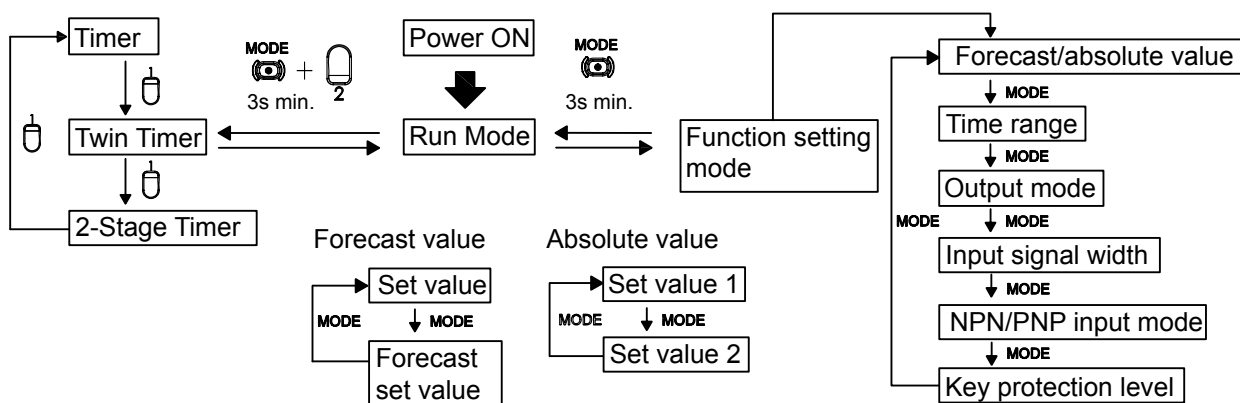


### ■ Twin Timer Operation



Note: For details on the above flowcharts, refer to page 10(timer function), or page 14(twin timer function).

### ■ 2-Stage Timer Operation



Note: For details on the above flowcharts, refer to page 18.(2-stage timer operation)

## List of Settings

### ■ Timer/Twin Timer/2-Stage Timer Selection Mode

Fill in your set values in the set value column of the following tables and utilize the tables for quick reference.

Parameter name	parameter	Setting range	Default value	Unit	Set value
Timer/Twin Timer/2-Stage Timer Selection	func	tim/twin/pst	timt	---	

### ■ Settings for Timer Operation

#### Run mode when output mode is not Z

Parameter name	parameter	Setting range	Default value	Unit	Set value
Set value	---	0000.00~9999.99 (Time range: -.s)	0000.00	s	
	---	00000.0~99999.9 (Time range: -.s)	00000.0	s	
	---	000000~999999 (Time range: --s)	000000	s	
	---	0000:00~9999:59 (Time range: -min:-s)	0000:00	min:s	
	---	00000.0~99999.9 (Time range: -.min)	00000.0	min	
	---	000000~999999 (Time range: --min)	000000	min	
	---	0000:00~9999:59 (Time range: -h:-min)	0000:00	h:min	
	---	00000.0~99999.9 (Time range: -.h)	00000.0	h	
	---	000000~999999 (Time range: --h)	000000	h	
Present value	---	000.000~999.999 (Time range: -.s)	000.000	s	
Present value	---	Same as set value	Same as left	Same as left	

#### Run mode when output mode is Z

Parameter name	parameter	Setting range	Default value	Unit	Set value
Cycle time	---	0000.00~9999.99 (Time range: -.s)	0000.00	s	
	---	00000.0~99999.9 (Time range: ---.s)	00000.0	s	
	---	000000~999999 (Time range: ----s)	000000	s	
	---	0000:00~9999:59 (Time range: --min:--s)	0000:00	min:s	
	---	00000.0~99999.9 (Time range: ---.min)	00000.0	min	
	---	000000~999999 (Time range: ----min)	000000	min	
	---	0000:00~9999:59 (Time range: --h:--min)	0000:00	h:min	
	---	00000.0~99999.9 (Time range: ---.h)	00000.0	h	
	---	000000~999999 (Time range: ----h)	000000	h	
Present value	---	000.000~999.999 (Time range: -.---s)	000.000	s	
Present value	---	Same as cycle time above	Same as left	Same as left	
ON duty ratio	---	0~100	0	%	
Present value	---	Same as cycle time above	Same as left	Same as left	

**Function Setting Mode**

Parameter name	parameter	Setting range	Default value	Unit	Set value
Time range	timr	--.s/---.s/----s/--min:--s/---.min/ ----min/--h:--min/---.h/---h/-..s	--.s	---	
Timer mode	timn	up/down	up	---	
Output mode	outn	a/a-1/a-2/a-3/b/b-1/d/e/f/z	a	---	
Output time	otim	hold/0000.01~9999.99	hold	s	
Input signal width	iflt	20ms/1ms	20ms	---	
NPN/PNP input mode	imod	nnp/npn	nnp	---	
Key protect level	kypt	kp-1/kp-2/kp-3/kp-4/kp-5	kp-1	---	

**■ Settings for Twin Timer Operation****Run mode**

Parameter name	parameter	Setting range	Default value	Unit	Set value
OFF set time	---	0000.00~9999.99 (Time range: --.s)	0000.00	s	
	---	00000.0~99999.9 (Time range: --.s)	00000.0	s	
	---	000000~999999 (Time range: --s)	000000	s	
	---	0000:00~9999:59 (Time range: -min-s)	0000:00	min:s	
	---	00000.0~99999.9 (Time range: --min)	00000.0	min	
	---	000000~999999 (Time range: --min)	000000	min	
	---	0000:00~9999:59 (Time range: -h-min)	0000:00	h:min	
	---	00000.0~99999.9 (Time range: --h)	00000.0	h	
	---	000000~999999 (Time range: --h)	000000	h	
	---	000.000~999.999 (Time range: --.s)	000.000	s	
Present value	---	Same as OFF time above	Same as left	Same as left	
ON duty ratio	---	Same as OFF time above	Same as left	Same as left	
Present value	---	Same as OFF time above	Same as left	Same as left	

**Function setting mode**

Parameter name	parameter	Setting range	Default value	Unit	Set value
OFF time range	oftr	--.s/---.s/----s/--min:--s/---.min/ ----min/--h--min/---.h/---h/-..s	--.s	---	
ON time range	ontr	--.s/---.s/----s/--min:--s/---.min/ ----min/--h--min/---.h/---h/-..s	--.s	---	
Timer mode	timn	up/down	up	---	
ON/OFF start mode	totn	toff/ton	toff	---	
Input signal width	iflt	20ms/1ms	20ms	---	
NPN/PNP input mode	imod	nnp/npn	nnp	---	
Key protection level	kypt	kp-1/kp-2/kp-3/kp-4/kp-5	kp-1	---	

## ■ Settings for 2-Stage Timer Operation

### Run mode

Parameter name	parameter	Setting range	Default value	Unit	Set value
Present value setting	Set value	---	0000.00~9999.99 (Time range: --s)	0000.00	s
		---	00000.0~99999.9 (Time range: --s)	00000.0	s
		---	000000~999999 (Time range: --s)	000000	s
		---	0000:00~9999:59 (Time range: -min-s)	0000:00	min:s
		---	00000.0~99999.9 (Time range: --min)	00000.0	min
		---	000000~999999 (Time range: --min)	000000	min
		---	0000:00~9999:59 (Time range: -h-min)	0000:00	h:min
		---	00000.0~99999.9 (Time range: --h)	00000.0	h
		---	000000~999999 (Time range: --h)	000000	h
		---	000.000~999.999 (Time range: --s)	000.000	s
	Present value	---	Same as the present value of the set value above	Same as left	Same as left
	Present setting value	---	Same as the present value of the set value above	Same as left	Same as left
	Present value	---	Same as the present value of the set value above	Same as left	Same as left
absolute value setting	Set value 1		Same as the present value of the set value above	Same as left	Same as left
	Present value		Same as the present value of the set value above	Same as left	Same as left
	Set value 2		Same as the present value of the set value above	Same as left	Same as left
	Present value		Same as the present value of the set value above	Same as left	Same as left

### Function setting mode

Parameter name	parameter	Setting range	Default value	Unit	Set value
forecast/absolute value	setl	ofst/abs	ofst	---	
Time range	timr	--s/---s/---s/--min--s/---min/ ---min/--h--min/---h/---h/---s	--s	---	
Output mode	outm	a/f-1	a	---	
Input signal width	iflt	20ms/1ms	20ms	---	
NPN/PNP input mode	imod	npn/pnp	npn	---	
Key protection level	kypt	kp-1/kp-2/kp-3/kp-4/kp-5	kp-1	---	

# List of Models :

