Multifunction LCD Digital Timer

TC-Pro480×××

■ 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

Contents

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 settingfor all inputs)
Power reset	Minimum power-opening time: 0.5 s (except for A-3, b-1 and F mode)
Reset system	Power reset (execpt for A-3, b-1and 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

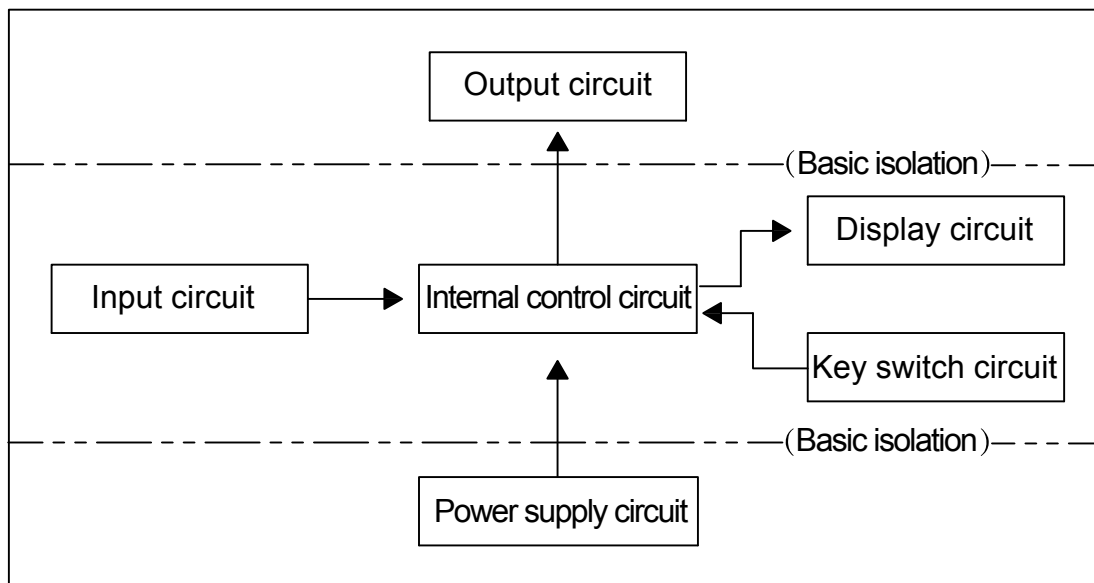| Item	TC-Pro480□□□-□
Life expectancy	Mechanical: 10,000,000 operations min. Electrical: 100,000 operations min. (5 A at 250 VAC, resistance load)
EMC	(EMI) EN61326 Emission Enclosure: EN55011 Emission AC mains: EN55011 (EMS) EN61326 Immunity ESD: EN61000-4-2 Immunity RF-interference: EN61000-4-3 Immunity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

Nomenclature
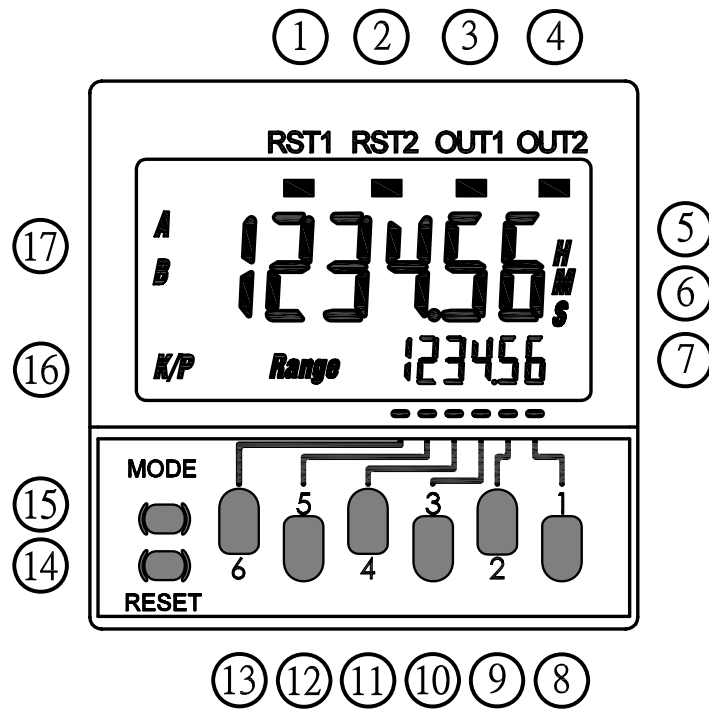
① ② Reset Indicator
③ ④ Control Output Indicator
⑤ Present Value (character height: 9 mm)
⑥ Time Unit Display (If the time range is 0 min, 0.0 min, 0 h, 0.0 h, 0h0 min, this display flashes to indicate timing operation)
⑦ Set Value (character height: 4 mm)
⑧ The First Setting Key
⑨ The Second Setting Key

⑩ The Third Setting Key
⑪ The Fourth Setting Key
⑫ The Fifth Setting Key
⑬ The Sixth Setting Key
⑭ Reset Key (resets present value and output)
⑮ Mode Key (changes modes and setting items)
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)

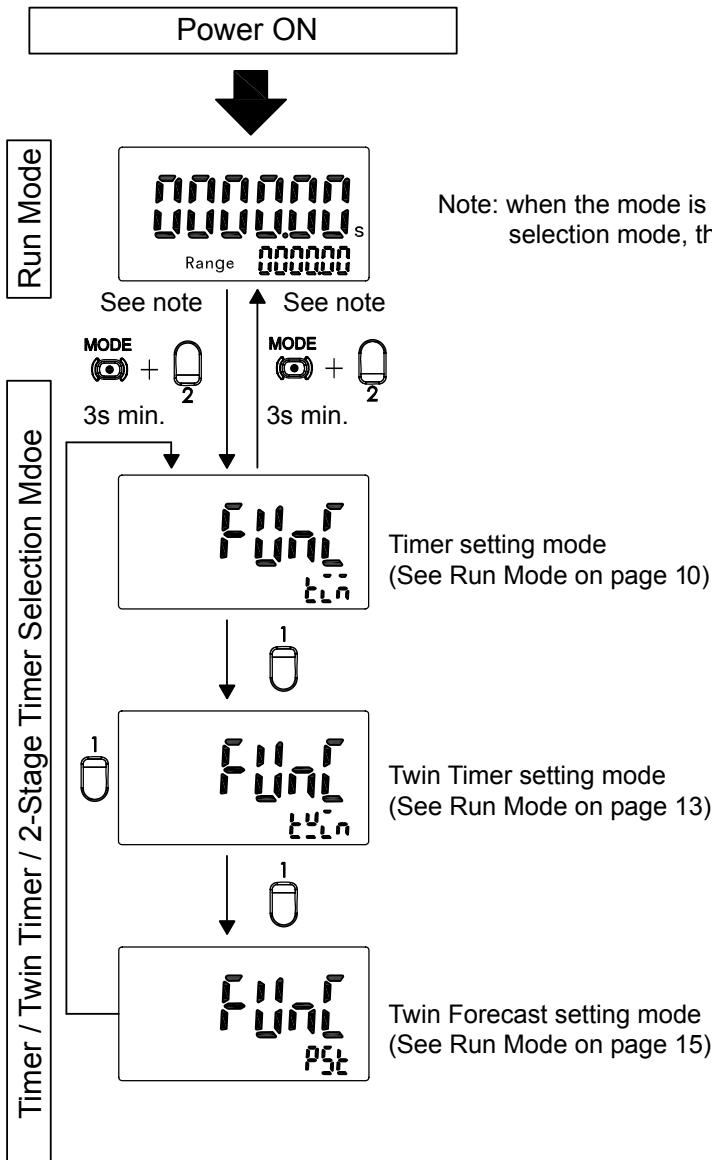|		
Input	Start signal	Stops timing in A-2 and A-3 (power ON delay) modes Starts timing in other modes
	Reset	Reset present value (In elapsed time mode, the present value returns to 0; in remaining time mode, the present value returns to the set value) Count inputs are not accepted and control output 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

Power ON

Run Mode

Note: when the mode is changed to timer/twin timer/2-stage timer selection mode, the present value is reset and output turns OFF.

See note   See note

MODE + 2   **MODE** + 2
3s min.   3s min.

Timer / Twin Timer / 2-Stage Timer Selection Mdoe

FunC
tin

Timer setting mode
(See Run Mode on page 10)

1

FunC
tYin

Twin Timer setting mode
(See Run Mode on page 13)

1

FunC
PSt

Twin Forecast setting mode
(See Run Mode on page 15)

■ Communication Format Function Selection Mode

Power ON

Run mode

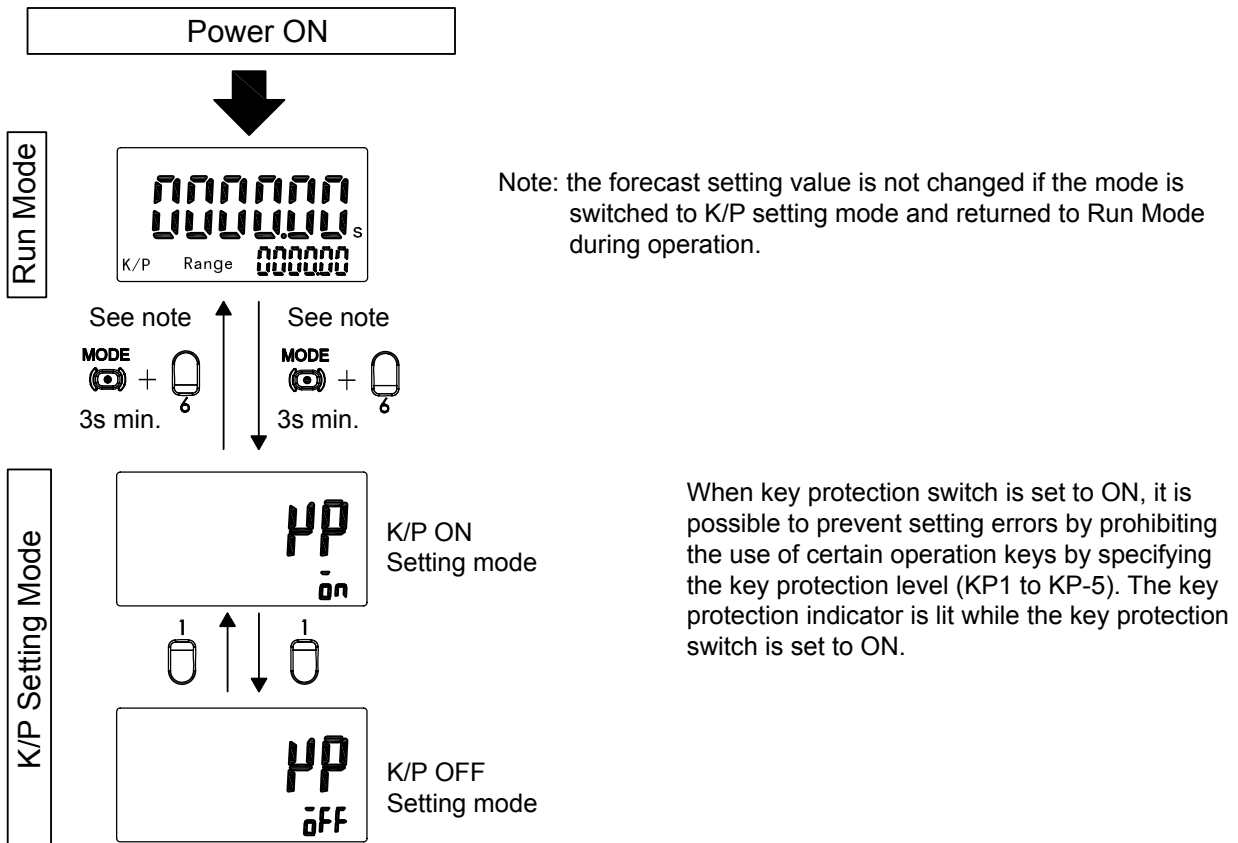Note: Timer will reset when changing into the communication format setting mode during operation

See note   See note

MODE + key 3s min   MODE + key 3s min

Communication Format Function Selection Mode

bAUd / **96** — Transmission Speed

Set the transmision speed with key

96 → .... → 48

Transmission speed:1200,2400,4800,9600,14400,19200,28800,38400,57600bps

MODE

PArC / **nonE** — Parity Check

Set the parity check with key

nonE → odd → EvEn
(NONE) (ODD) (EVEN)

MODE

dAtA / **8bit** — Date bit

Set the date bit with key

8bit → 7bit
(8 bit) (7 bit)

MODE

StoP / **1bit** — Stop bit

Set the stop bit with key

1bit → 2bit
(1 bit) (2 bit)

MODE

Addr / **01** — Station address

Set the Station address (HEX) with key

01 → .... → FF
(01) (FF)

MODE

CoSH / **on** — Communication on/off

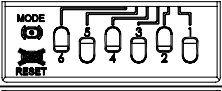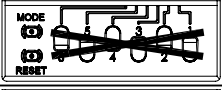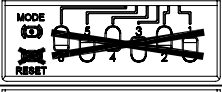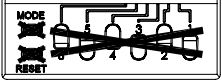Set communication on/off with key

on → oFF
(ON) (OFF)

MODE

Note: The communication format function is not performed for the model without the communication function.
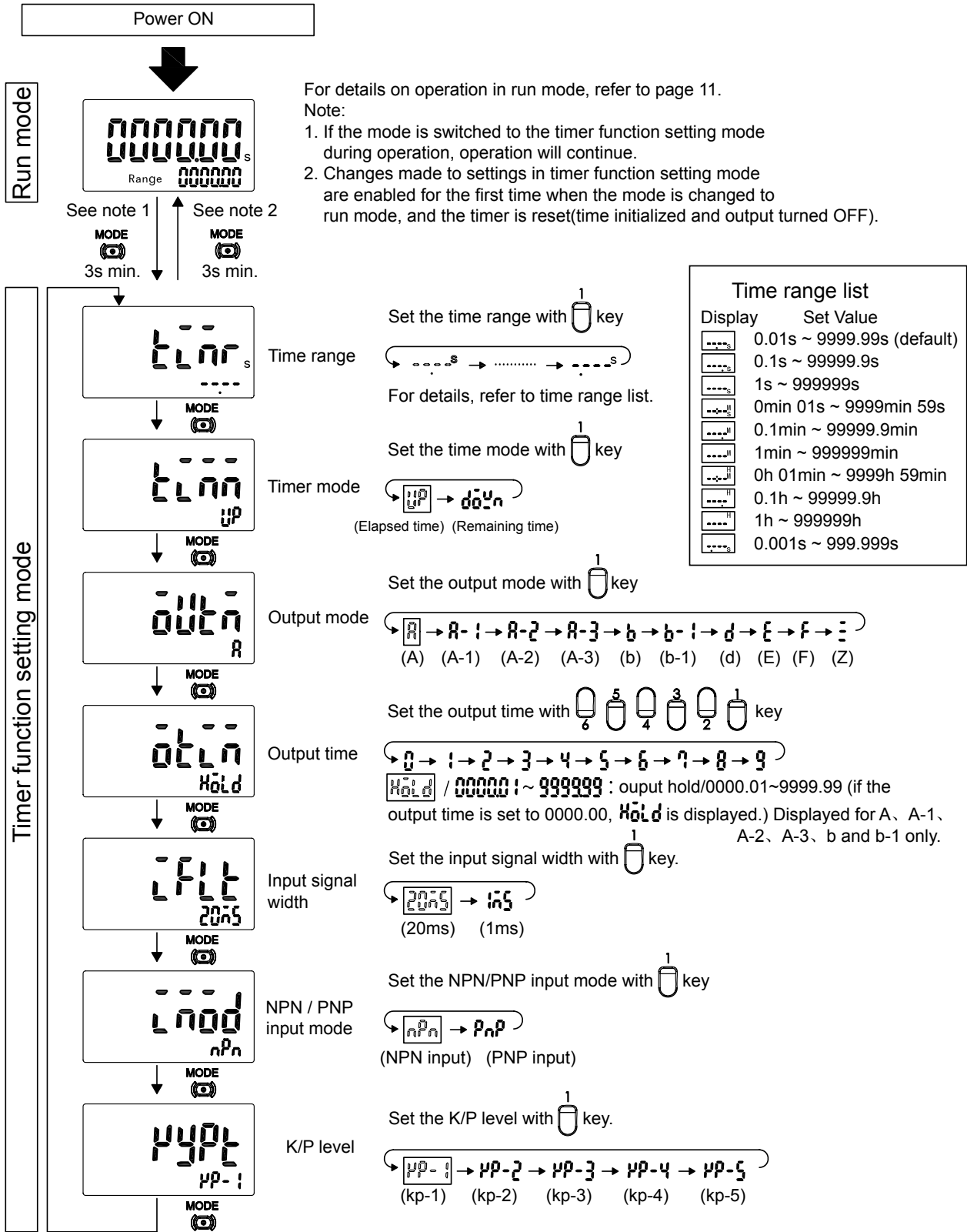
■ Key Protection Setting Mode

Power ON

Run Mode

Note: the forecast setting value is not changed if the mode is switched to K/P setting mode and returned to Run Mode during operation.

See note   See note

MODE + 6   MODE + 6
3s min.   3s min.

K/P Setting Mode

K/P ON
Setting mode

K/P OFF
Setting mode

When key protection switch is set to ON, it is possible to prevent setting errors by prohibiting the use of certain operation keys by specifying the key protection level (KP1 to KP-5). The key protection indicator is lit while the key protection switch is set to ON.

Level	Meaning	Changing mode (see note)	Switching display during operation	Reset key	Up/down key
KP- 1 (default setting)		No	Yes	Yes	Yes
KP- 2		No	Yes	Yes	Yes
KP- 3		No	Yes	Yes	No
KP- 4		No	Yes	No	No
KP- 5		No	No	No	No

Note: Changing mode to Timer/Twin Timer/2-Stage Timer selection mode (MODE + 2 3 min.), Communication Format Function Mode(MODE + 4 3min.),and Basic Function setting (MODE 3s min.)
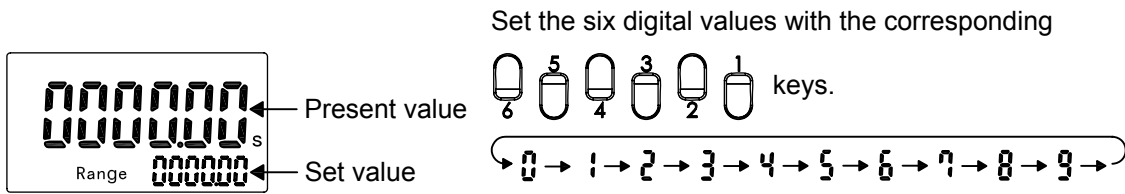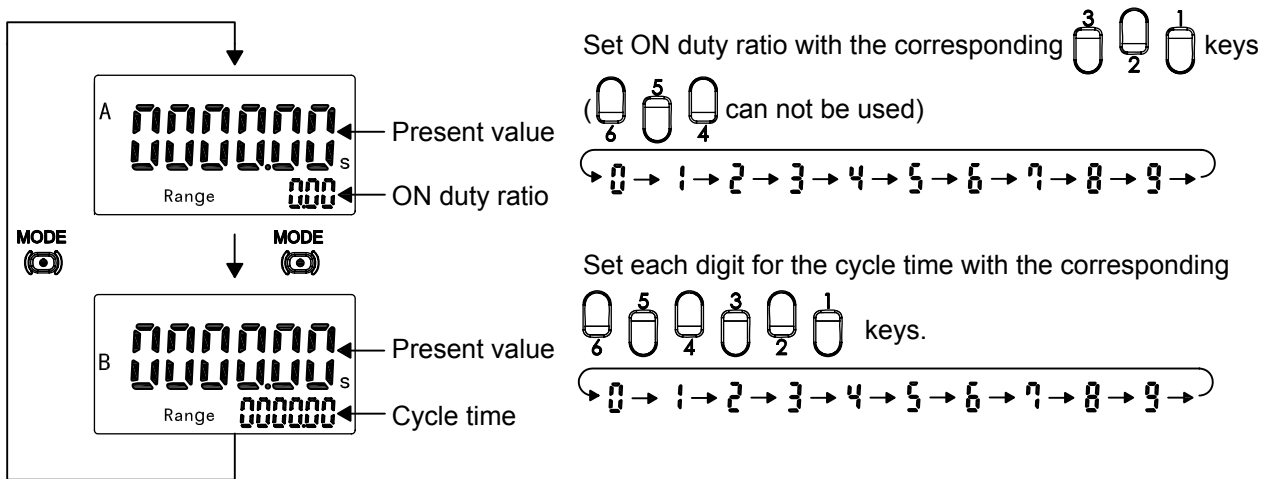
Timer Function

■ Setting for Timer Function

Power ON

Run mode

For details on operation in run mode, refer to page 11.
Note:
1. If the mode is switched to the timer function setting mode during operation, operation will continue.
2. Changes made to settings in timer function setting mode are enabled for the first time when the mode is changed to run mode, and the timer is reset(time initialized and output turned OFF).

See note 1   See note 2
MODE   MODE
3s min.   3s min.

Timer function setting mode

Time range

Set the time range with 1 key

For details, refer to time range list.

Time range list	
Display	Set Value
----s	0.01s ~ 9999.99s (default)
----s	0.1s ~ 99999.9s
----s	1s ~ 999999s
----ʲ	0min 01s ~ 9999min 59s
----ᴹ	0.1min ~ 99999.9min
----ᴹ	1min ~ 999999min
----ᴴ	0h 01min ~ 9999h 59min
----ᴴ	0.1h ~ 99999.9h
----ᴴ	1h ~ 999999h
----s	0.001s ~ 999.999s

Timer mode

Set the time mode with 1 key

UP → doun
(Elapsed time) (Remaining time)

Output mode

Set the output mode with 1 key

A → A-1 → A-2 → A-3 → b → b-1 → d → E → F → Z
(A) (A-1) (A-2) (A-3) (b) (b-1) (d) (E) (F) (Z)

Output time

Set the output time with 6 5 4 3 2 1 key

0 → 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9

Hold / 000001 ~ 999999 : ouput hold/0000.01~9999.99 (if the output time is set to 0000.00, Hold is displayed.) Displayed for A、A-1、A-2、A-3、b and b-1 only.

Input signal width

Set the input signal width with 1 key.

20mS → 1nS
(20ms) (1ms)

NPN / PNP input mode

Set the NPN/PNP input mode with 1 key

nPn → PnP
(NPN input) (PNP input)

K/P level

Set the K/P level with 1 key.

KP-1 → KP-2 → KP-3 → KP-4 → KP-5
(kp-1) (kp-2) (kp-3) (kp-4) (kp-5)

■ Operation in Run Mode

When the output mode is not Z.

Present value
Set value
Range

Set the six digital values with the corresponding keys.

$0 \to 1 \to 2 \to 3 \to 4 \to 5 \to 6 \to 7 \to 8 \to 9 \to$

When the output mode is Z.

A — Present value
Range — ON duty ratio
MODE MODE
B — Present value
Range — Cycle time

Set ON duty ratio with the corresponding keys (can not be used)

$0 \to 1 \to 2 \to 3 \to 4 \to 5 \to 6 \to 7 \to 8 \to 9 \to$

Set each digit for the cycle time with the corresponding keys.

$0 \to 1 \to 2 \to 3 \to 4 \to 5 \to 6 \to 7 \to 8 \to 9 \to$

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.

ON time = cycle time×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(s) ×31(%)/100=9.3(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).

opening/closing value	Fully closed ←→ fully open
ON duty	0%←→100%
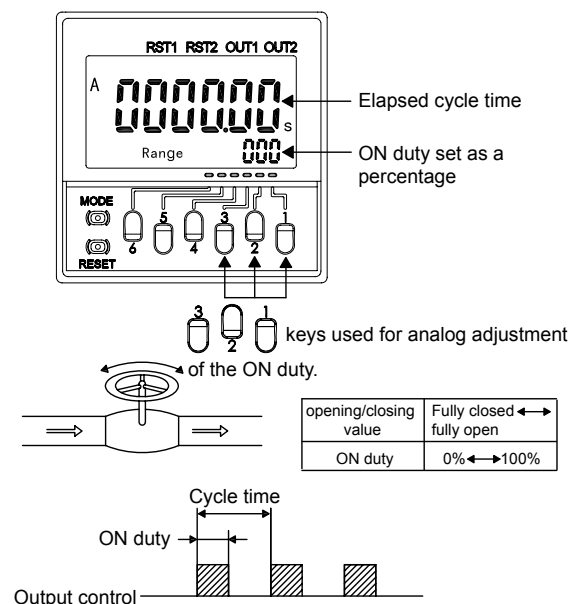
■ Explanation of functions

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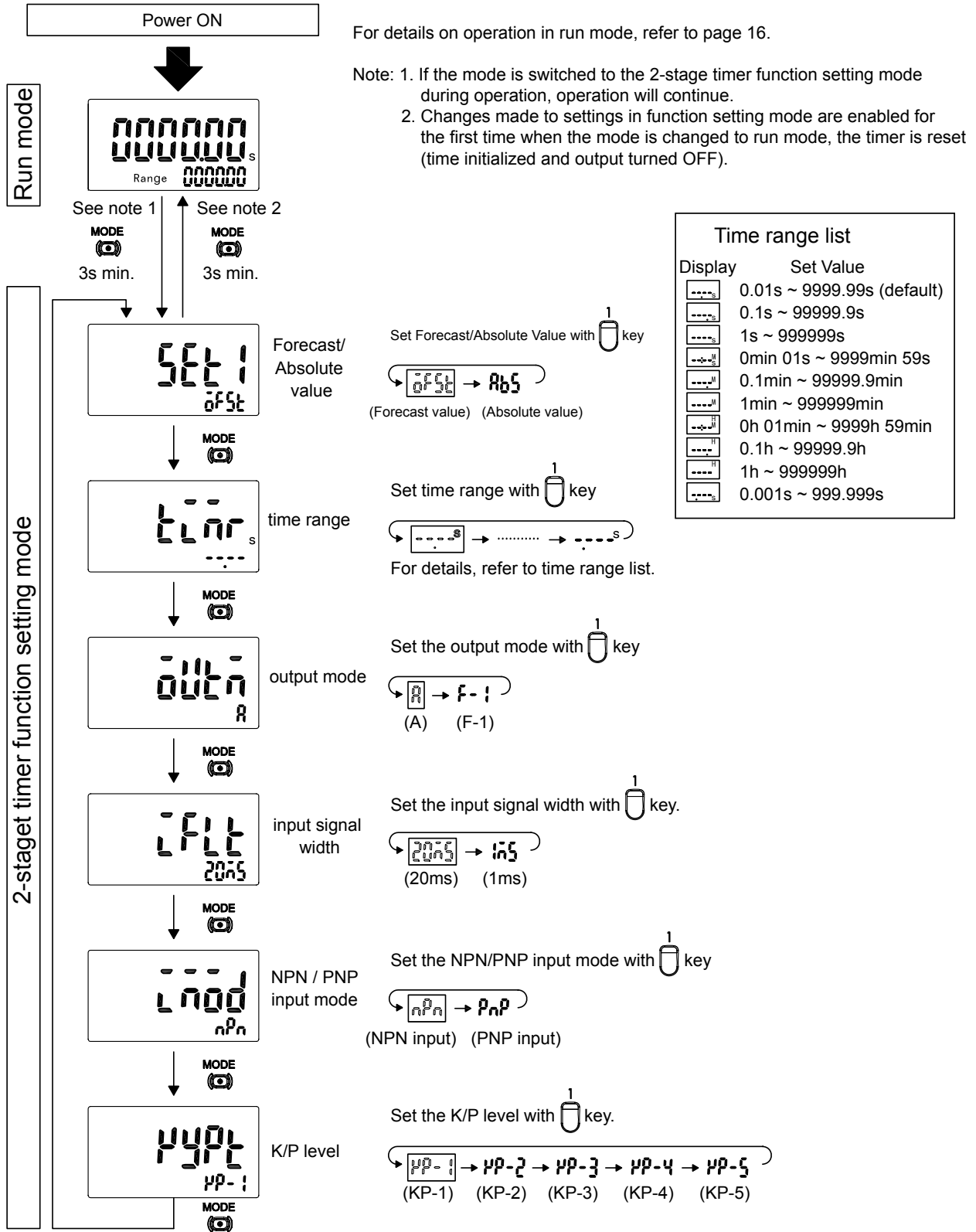
NPN / PNP Input Mode (imod)
Select NPN input (no-voltage input) or PNP (voltage input) as the input format. The same setting is used for all external inputs. For details on input connection, refer to "input connections" on page 25.

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.
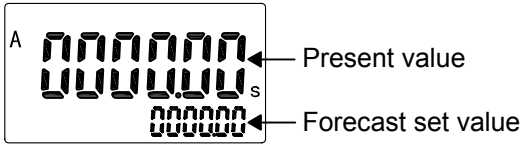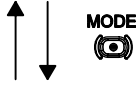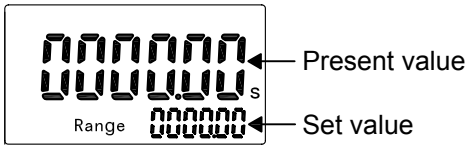
Twin Timer Function

■ Twin Timer Function Setting

Power ON

Run mode

For details on operation in run mode, refer to page 14.
Note:
1. If the mode is switched to the twin timer function setting mode during operation, operation will continue.
2. Changes made to settings in function setting mode are enabled for the first time when the mode is changed to run mode, the timer is reset (time initialized and output turned OFF).

See note 1 / See note 2
MODE 3s min. / MODE 3s min.

Time range list

Display	Set Value
----s	0.01s ~ 9999.99s (default)
----s	0.1s ~ 99999.9s
----s	1s ~ 999999s
----ᴹ	0min 01s ~ 9999min 59s
----ᴹ	0.1min ~ 99999.9min
----ᴹ	1min ~ 999999min
----ᴴ	0h 01min ~ 9999h 59min
----ᴴ	0.1h ~ 99999.9h
----ᴴ	1h ~ 999999h
----s	0.001s ~ 999.999s

Twin timer function setting mode

OFF time range

Set OFF time range with 1 key

----s → ·········· → ----s

For details, refer to time range list.

ON time range

Set ON time range with 1 key

----s → ·········· → ----s

for details, refer to time range list.

time mode

Set the twin timer mode with 1 key

UP → doun
(Elapsed time) (Remaining time)

ON / OFF start mode

Set ON / OFF start mode with 1 key

toFF → ton
(flicker OFF start) (flicker ON start)

Input signal width

Set the input signal width with 1 key.

20mS → 1mS
(20ms) (1ms)

NPN / PNP input mode

Set the NPN/PNP input mode with 1 key

nPn → PnP
(NPN input) (PNP input)

K/P level

Set the K/P level with 1 key.

KP-1 → KP-2 → KP-3 → KP-4 → KP-5
(KP-1) (KP-2) (KP-3) (KP-4) (KP-5)

■ Operation in Run Mode

Operation in Run Mode

Set OFF set time with the corresponding keys.

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

Set ON set time with the corresponding keys.

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$
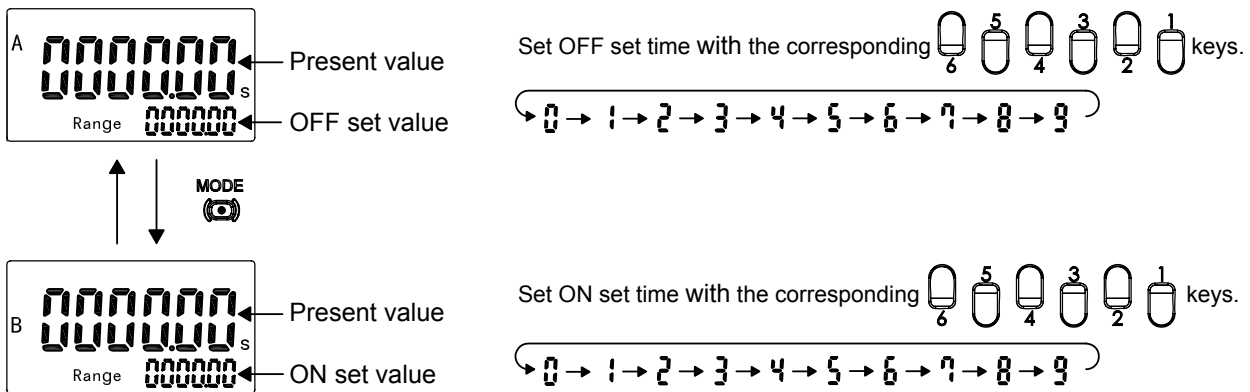
Present value and OFF Set Time

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 OFF 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

Power ON

For details on operation in run mode, refer to page 16.

Note: 1. If the mode is switched to the 2-stage timer function setting mode during operation, operation will continue.
2. Changes made to settings in function setting mode are enabled for the first time when the mode is changed to run mode, the timer is reset (time initialized and output turned OFF).

Run mode

Range

See note 1   See note 2

MODE
3s min.

MODE
3s min.

2-staget timer function setting mode

SEt1 / oFSt — Forecast/Absolute value

Set Forecast/Absolute Value with [1] key

oFSt → AbS

(Forecast value)   (Absolute value)

MODE

tinr — time range

Set time range with [1] key

⌐ ----s → ·········· → ----s

For details, refer to time range list.

MODE

outn / A — output mode

Set the output mode with [1] key

A → F-1

(A)   (F-1)

MODE

iFLt / 20nS — input signal width

Set the input signal width with [1] key.

20nS → 1nS

(20ms)   (1ms)

MODE

inod / nPn — NPN / PNP input mode

Set the NPN/PNP input mode with [1] key

nPn → PnP

(NPN input)   (PNP input)

MODE

KYPt / KP-1 — K/P level

Set the K/P level with [1] key.

KP-1 → KP-2 → KP-3 → KP-4 → KP-5

(KP-1)   (KP-2)   (KP-3)   (KP-4)   (KP-5)

MODE

Time range list

Display	Set Value
----s	0.01s ~ 9999.99s (default)
----s	0.1s ~ 99999.9s
----s	1s ~ 999999s
----M	0min 01s ~ 9999min 59s
----M	0.1min ~ 99999.9min
----M	1min ~ 999999min
----H	0h 01min ~ 9999h 59min
----H	0.1h ~ 99999.9h
----H	1h ~ 999999h
----s	0.001s ~ 999.999s

■ Operation in Run Mode

When the forecast value is selected

— Present value
— Set value

Set "set value" with the corresponding

keys.

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

MODE

— Present value
— Forecast set value
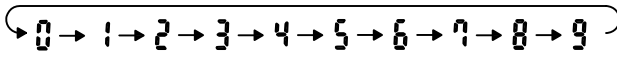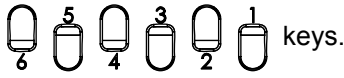
Set "forecast set value" with the corresponding

keys.

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$
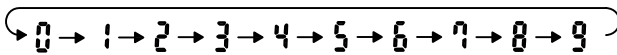
When the absolute value is selected

— Present value
— Set value 1
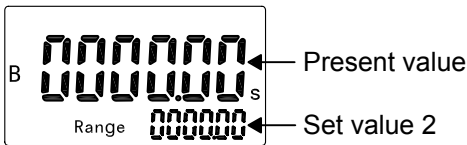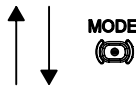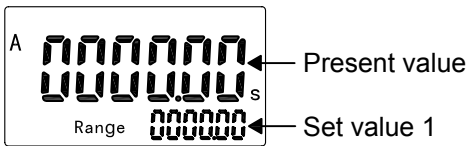
Set "set value 1" with the corresponding

keys.

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

MODE

— Present value
— Set value 2
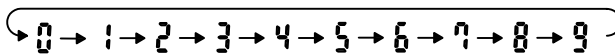
Set "set value 2" with the corresponding

keys.

$0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$
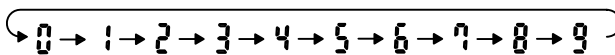
■ Explanation of functions

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 (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 toKP-5). For details, refer to "Key Protection Setting Mode" on page 8.

Forecast Value Setting

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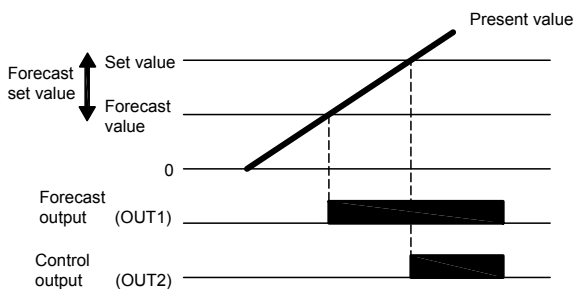
1. OUT1 (forecast output) turns ON when the present value reaches the forecast value.
   forecast value = set value-forecast set value
   The forecast set value is used to set the deviation for the set value.
2. OUT2 (control output) turns ON when the present value reaches the set value.
3. If the forecast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

Absolute Value Setting

Example: F-1 Mode
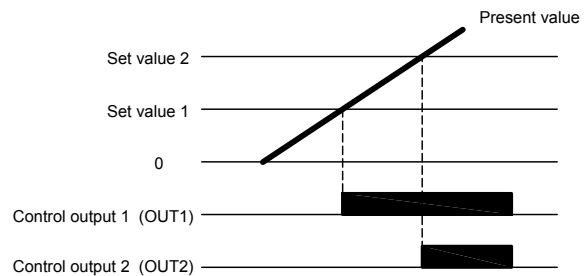
1. OUT1 (control output 1) turns ON when the present value reaches the set value 1.
2. OUT2 (control output 2) turns ON when the present value reaches the set value 2.

Sequence Charts

■ Timer Operation

Either one-shot output or sustained output can be selected

t ⟶ One-shot output

⟶ Sustained output
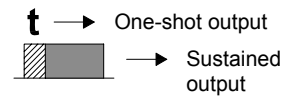
Output mode A: signal ON delay 1 (timer resets when power comes ON)	
POWER START SIGNAL GATE RESET CONTROL OUTPUT SET VALUE UP 0 SET VALUE DOWN 0	Timing starts when the start signal goes ON. While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF. The control output is controlled using a sustained or one-shot time period. Basic Operation Power Start signal input ←Timing→ Output Output is instantaneous when setting is 0. Start signal input is disabled during timing.

Output mode A-1: signal ON delay 2 (timer resets when power comes ON)	
POWER START SIGNAL GATE RESET CONTROL OUTPUT SET VALUE UP 0 SET VALUE DOWN 0	Timing starts when the start signal goes ON, and is reset when the start signal goes OFF. While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF. The control output is controlled using a sustained or one-shot time period. Basic Operation Power Start signal input ←Timing→ Output Output is instantaneous when setting is 0.

Output mode A-2: Power ON delay 1 (timer resets when power comes ON)	
POWER START SIGNAL GATE RESET CONTROL OUTPUT SET VALUE UP 0 SET VALUE DOWN 0	Timing starts when the reset signal goes OFF. The start signal disables the timing function (i.e., same function as the gate input). The control output is controlled using a sustained orone-shot time period. Basic Operation Power ←Timing→ Output Output is instantaneous when setting is 0.

Output mode A-3: Power ON delay 2 (timer does not reset when power comes ON)	
POWER START SIGNAL GATE RESET CONTROL OUTPUT SET VALUE UP 0 SET VALUE DOWN 0	Timing starts when the reset signal goes OFF. The start signal disables the timing function (i.e., same function as the gate input). The control output is controlled using a sustained or one-shot time period. Basic Operation Power ←Timing→ Output Output is instantaneous when setting is 0.

Output mode b: Repeat cycle 1 (timer resets when power comes ON)
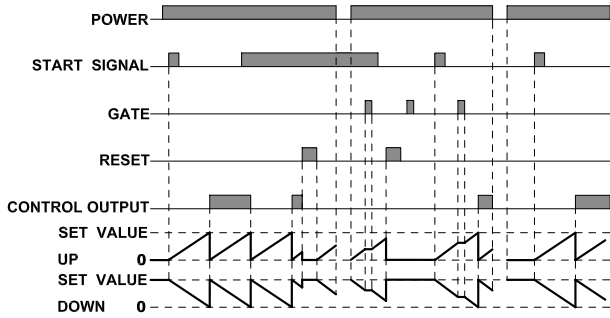
Timing starts when the start signal goes ON.
The status of the control output is reversed when time is up (OFF at start).
While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.
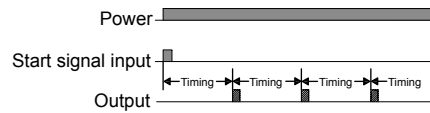
Basic Operation
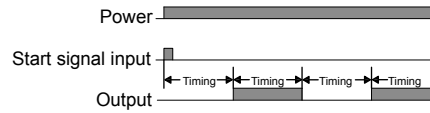
Normal output operation will not be possible if the set time is too short.
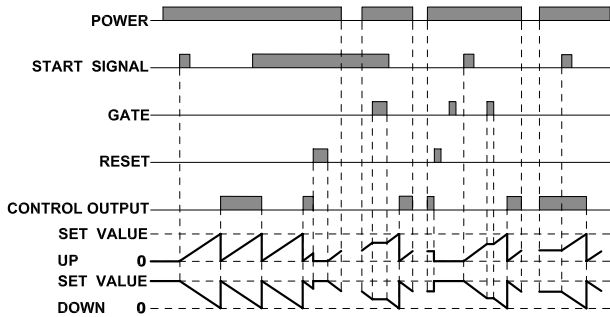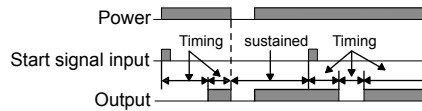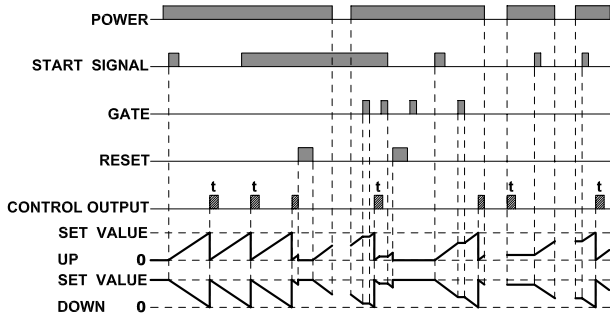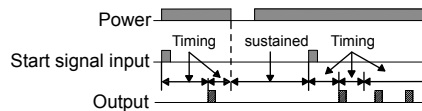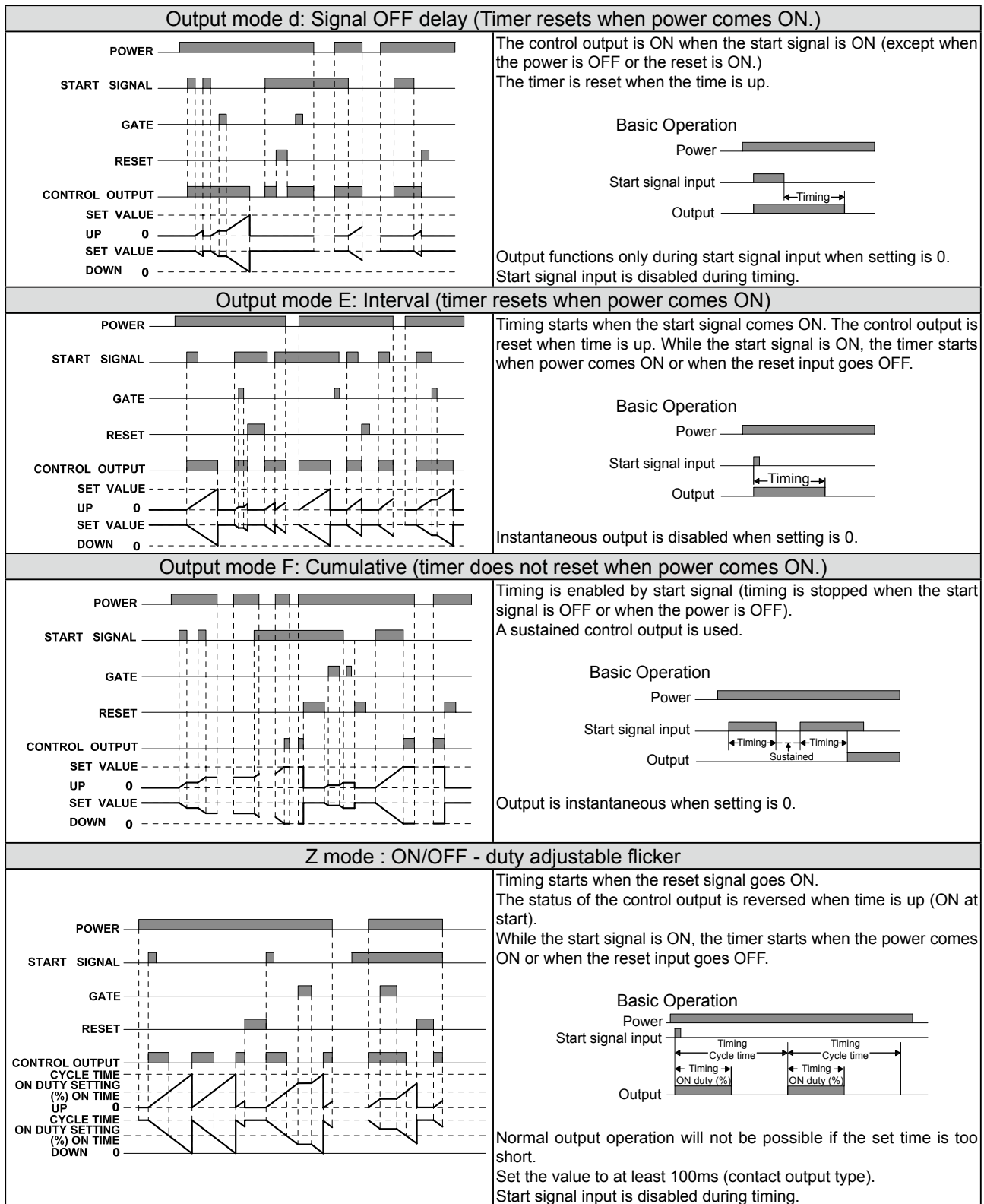Set the value to at least 100ms (contact output type).
Start signal input is disabled during timing.
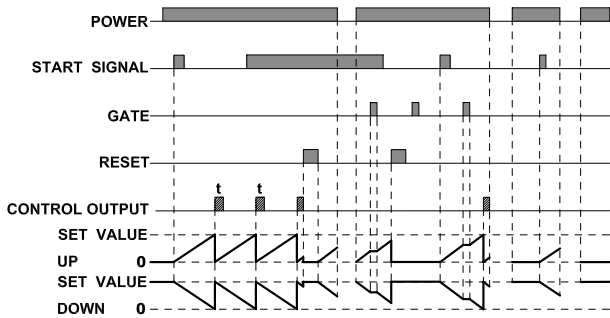
Timing starts when the start signal goes ON.
The status of the control output is turned ON when time is up.
While the start signal is ON, the timer starts when the power comes ON or when the reset input goes OFF.

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).
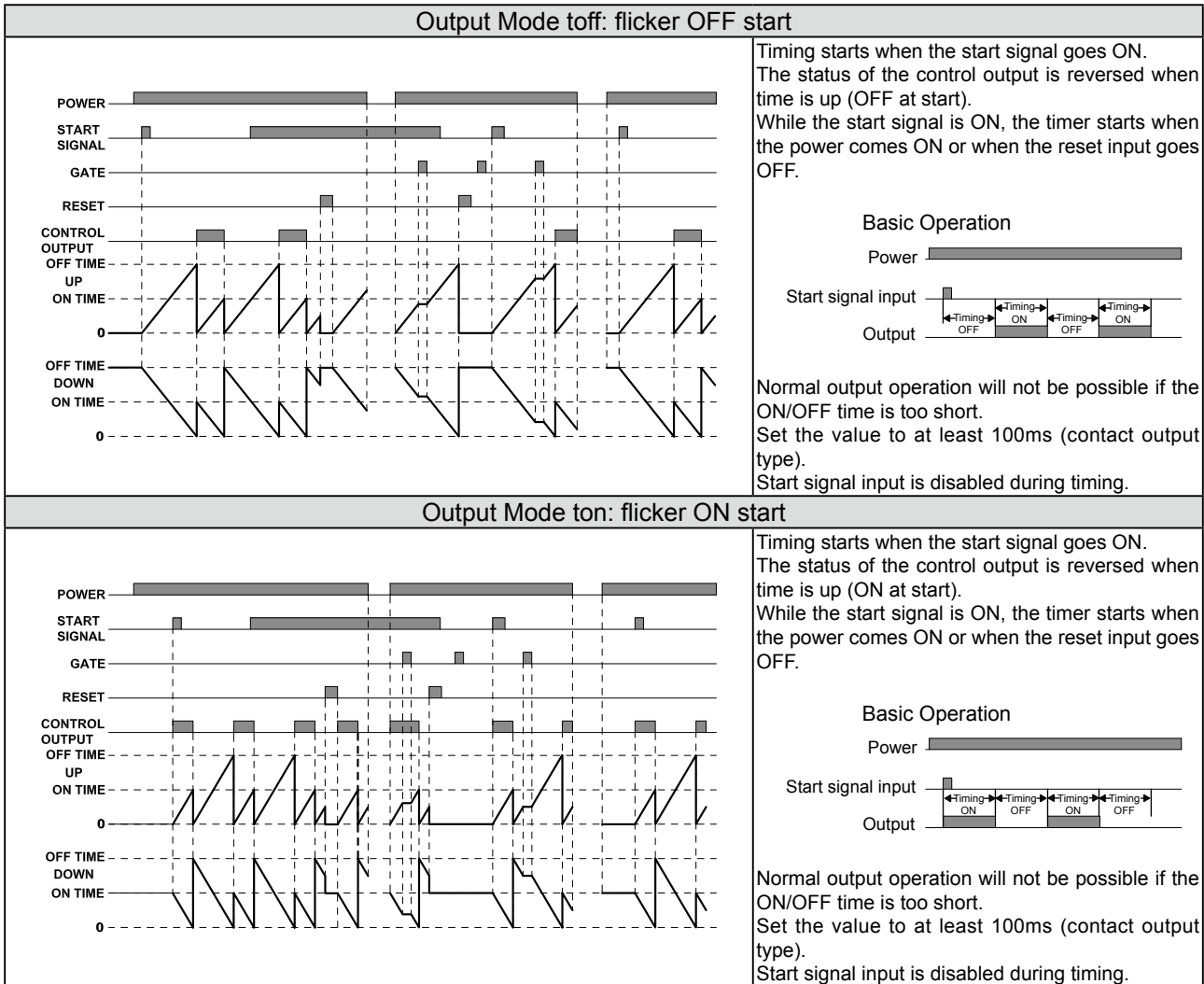Start signal input is disabled during timing.

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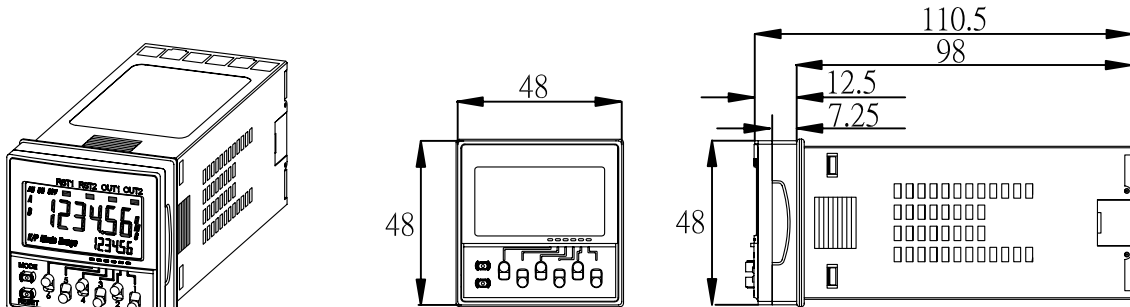
Note: M3 terminal screw (effective length: 8mm)

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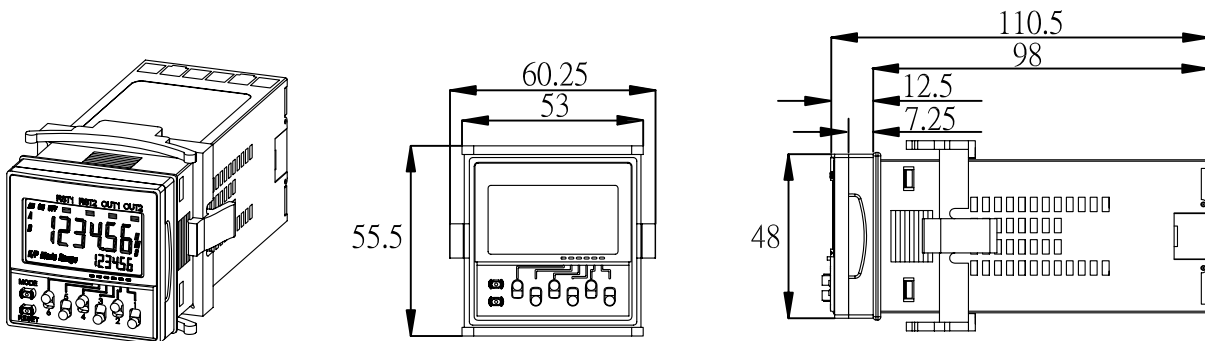
Panel Cutouts
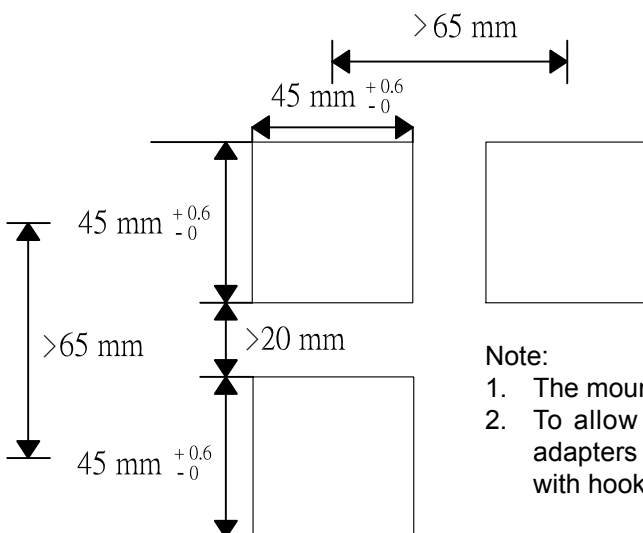
Note:
1. The mounting panel thickness should be 1.5 mm.
2. To allow easier operability, it is recommended that adapters are mounted so that the gap between sides with hooks is at least 20mm.

Dimensions

Note: all units are in millimeters unless otherwise indicated.

Dimensions without DIN Track Mounting Adapter

Note: M3 terminal screw
(effective length: 8mm)
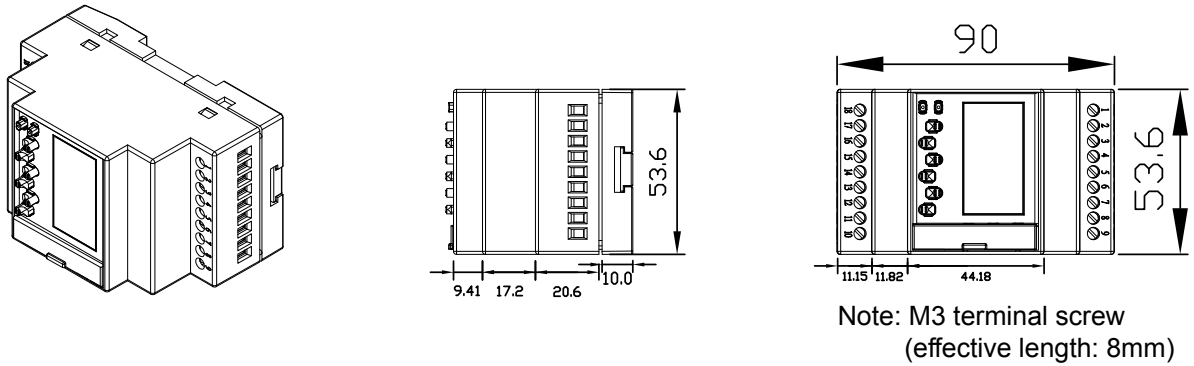
Dimensions without DIN Track Mounting Adapter (with communication)
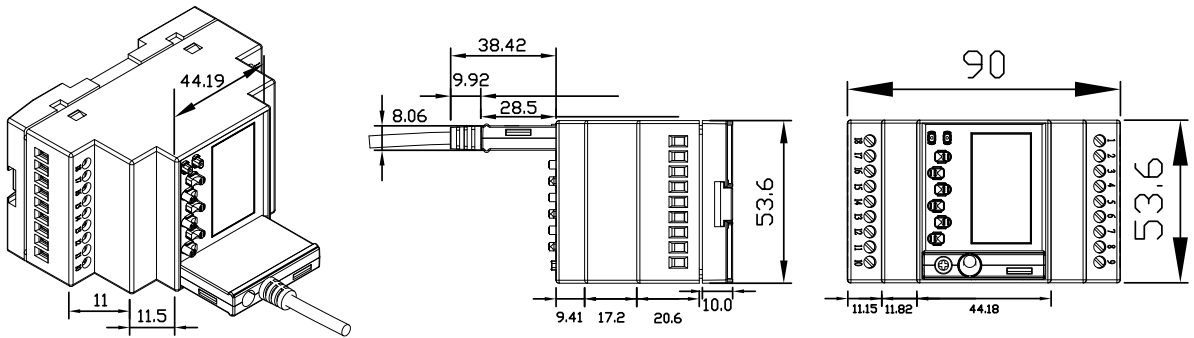
Installation & Accessories

160cm
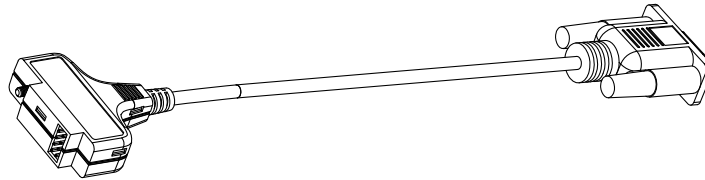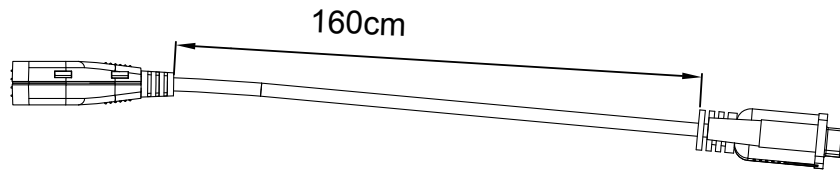
Cable: CAB - 090A□□□(order separately)

160cm
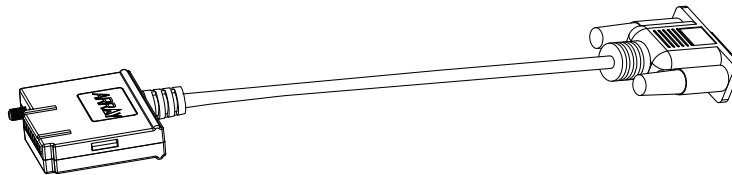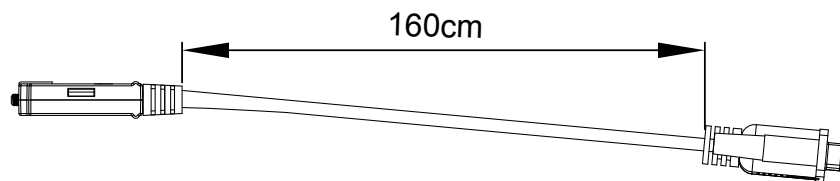
Cable: CAB - 090B□□□(order separately)

| Waterproof Packing PR-43 | Flush Mounting Adapter BK-6 | End Plate CABC-44 | Mounting Track 0F-A (order separately) |
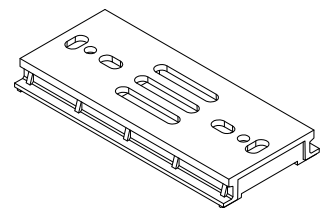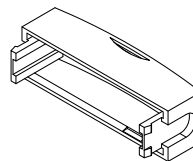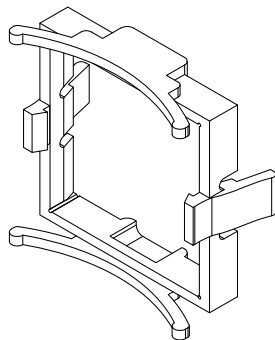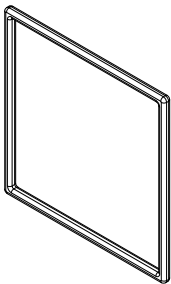
ADP-090401 apdater changing 4 into 9 PIN
(special between 232, 485 and 422,
order separately)

Panel Protective Cover
SVF-A
(order separately)

Communication Protective Cover
TTL-11
(order separately)
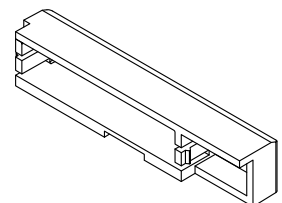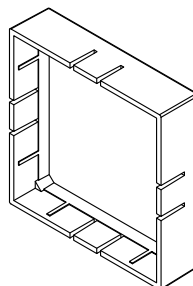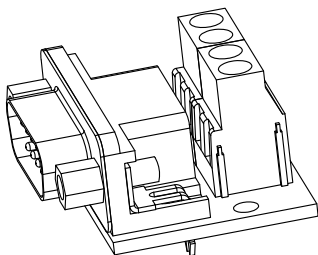
Input Connections

Signal, Reset, and Gate Input
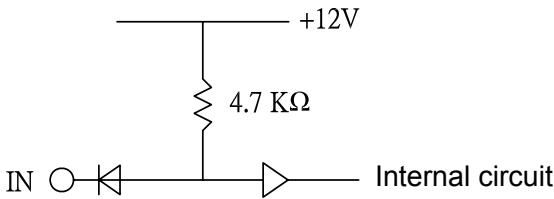
No-voltage Input Signal Levels

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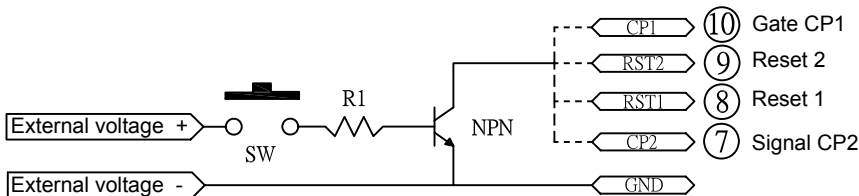
When SW is pressed, the transistor is ON that shows the input has response.

Voltage Inputs (connection to a voltage output sensor)
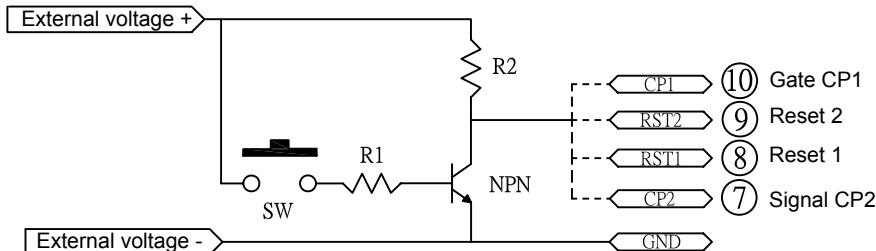
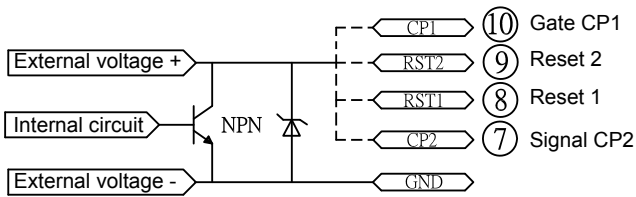When SW is pressed, the transistor is ON that shows the input has response.
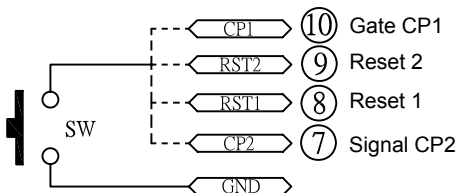
Contact Input

SW is pressed, that shows input the input has response.
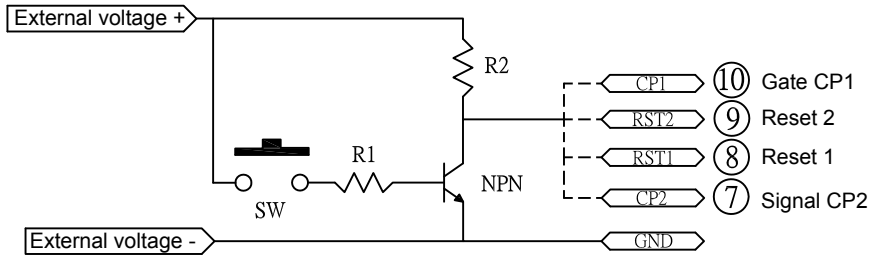
Two-wire Sensor

External voltage +

Internal circuit — NPN

External voltage -

CP1 ⑩ Gate CP1
RST2 ⑨ Reset 2
RST1 ⑧ Reset 1
CP2 ⑦ Signal CP2
GND

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

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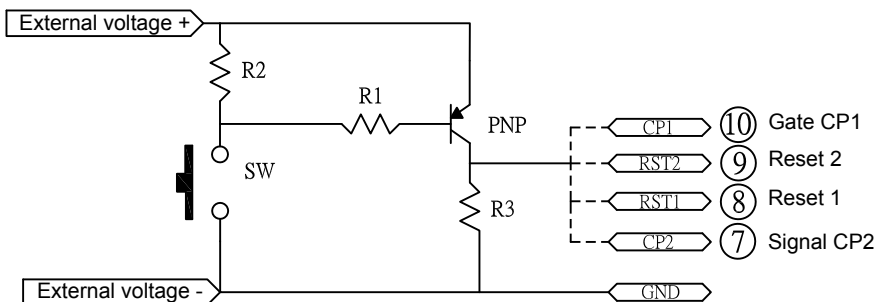
No-contact Input (NPN Transistor) (Connection to NPN open collector output sensor)

External voltage +

R2
R1
SW
NPN

External voltage -

CP1 ⑩ Gate CP1
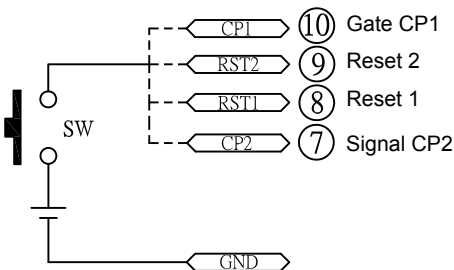RST2 ⑨ Reset 2
RST1 ⑧ Reset 1
CP2 ⑦ Signal CP2
GND

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)

External voltage +

R2
R1
SW
PNP
R3

External voltage -

CP1 ⑩ Gate CP1
RST2 ⑨ Reset 2
RST1 ⑧ Reset 1
CP2 ⑦ Signal CP2
GND

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

Contact Input

SW

CP1 ⑩ Gate CP1
RST2 ⑨ Reset 2
RST1 ⑧ Reset 1
CP2 ⑦ Signal CP2

GND

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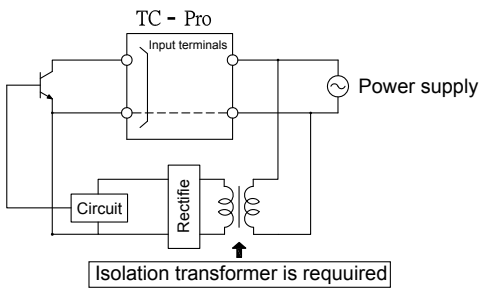
Make sure that the voltage applied is within the specified range, otherwise the internal elements of Timer may be damaged.

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.
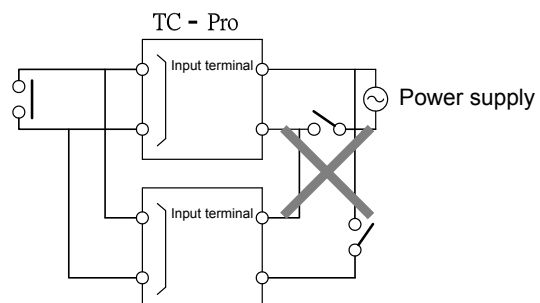
Incorrect

The contact or transistor as an external input signal
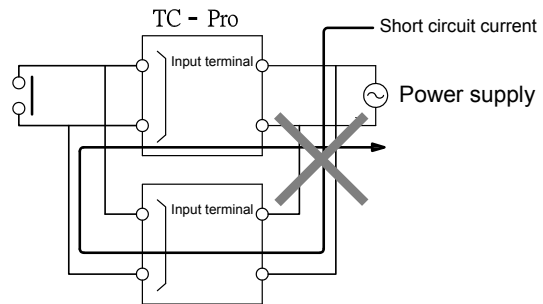
Correct
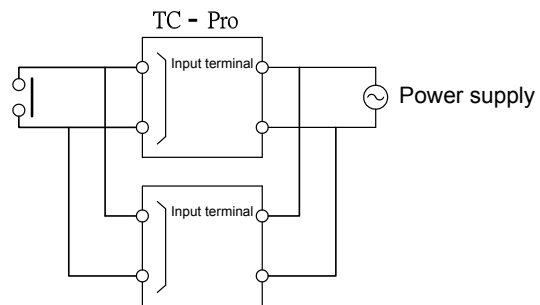
Don't connect the unattached power switch as below, and without considering whether the timer is different or not.

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.

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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.
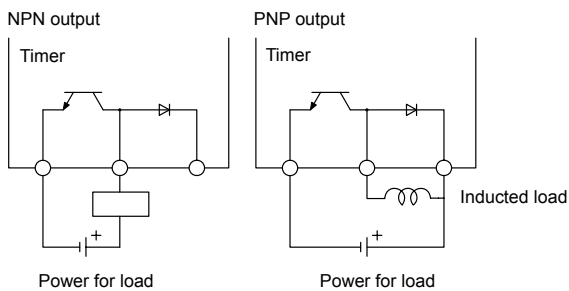
Changing the set values

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≥set value

Remaining time(DOWN) mode: elapsing time≥ 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.
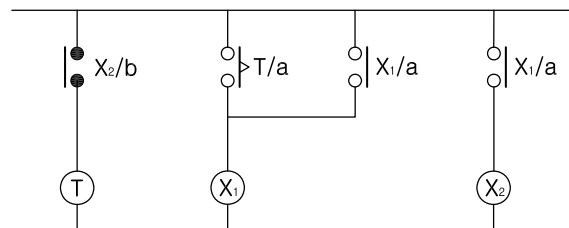
Connection

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℃, allow TC-Pro to stand at room temperature for at least 3 hours before use.

Note: $\otimes$ 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
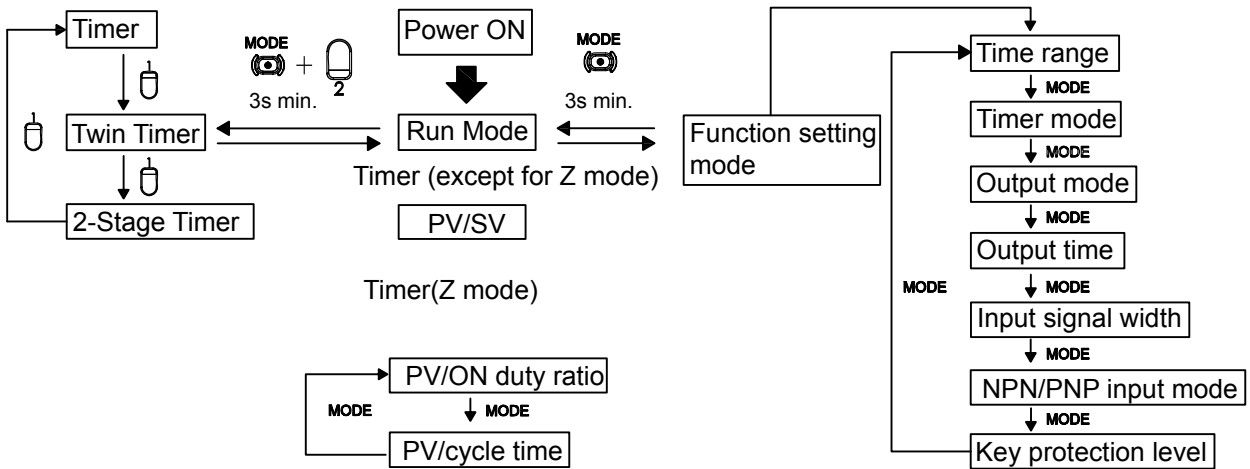
■ Twin Timer Operation
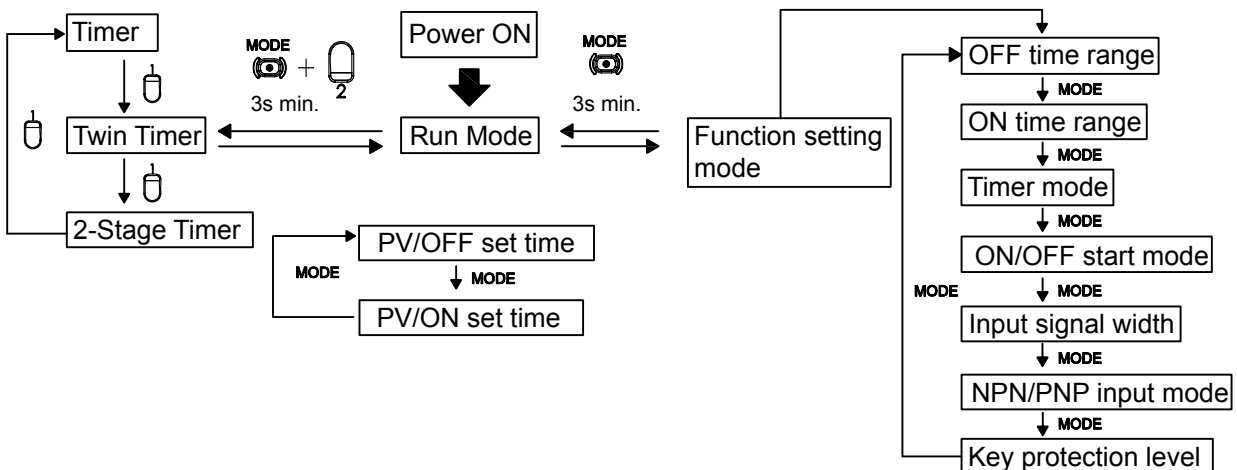
Note: For details on the above flowcharts, refer to page 10(timer function), or page 14(twin timer function).

■ 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.

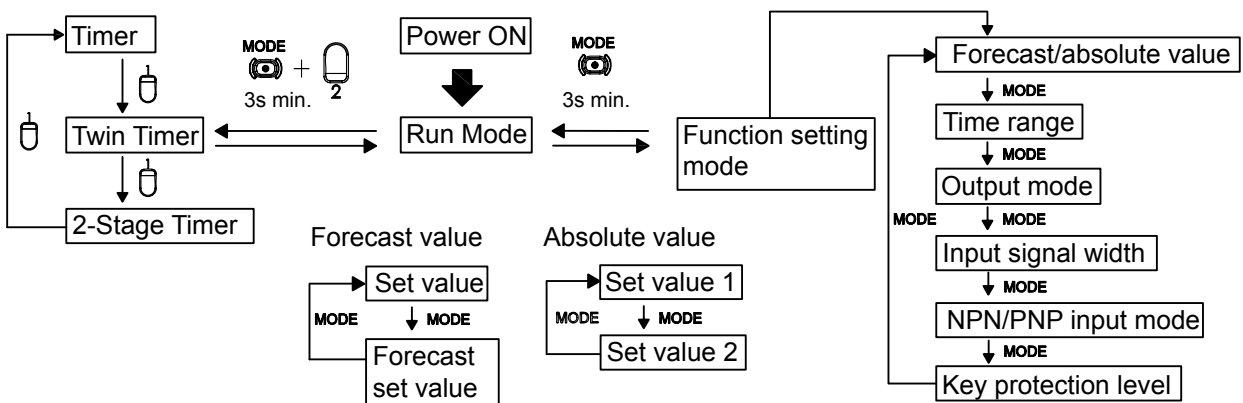| Parameter name	parameter	Setting range	Default value	Unit	Set value
Timer/Twin Timer/2-Stage Timer Selection	func	tim/twin/pst	timt	---	

■ 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	
	---	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	
	---	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	timm	up/down	up	---	
Output mode	outm	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	npn/pnp	npn	---	
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	timm	up/down	up	---	
ON/OFF start mode	totm	toff/ton	toff	---	
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	---	

■ 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 :

TC-Pro480CRA

TC-Pro480CRD

TC-Pro480CTA

TC-Pro480CTD

TC-Pro480SRA

TC-Pro480SRD

TC-Pro480STA

TC-Pro480STD

TC-Pro480CRA-D

TC-Pro480CRD-D

TC-Pro480CTA-D

TC-Pro480CTD-D

TC-Pro480SRA-D

TC-Pro480SRD-D

TC-Pro480STA-D

TC-Pro480STD-D