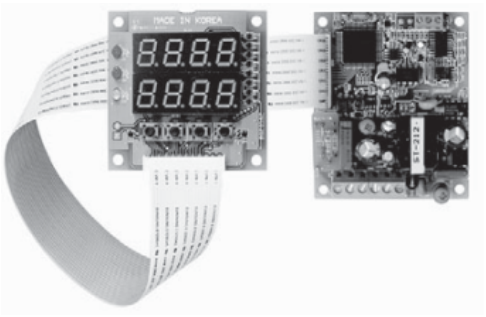
Dual PID control board type

▣ Features

- High quality and economical product
- Convenient organization of panel to use
- Dual PID control
- Time reservation

⚠ **Please read "Caution for your safety" in operation manual before using.**



▣ Ordering information

TB 4 2 – 1 4 R

Item	TB	Temperature Controller Board
Digit	4	9999(4digit)
Display	2	2 Display
Sub output	1	EVENT1 output type
Power supply	4	100-240VAC 50/60Hz
Control output	R	Relay output
	S	SSR drive output
	C	Current output(DC4-20mA)
	N	PV Transmission output(DC4-20mA)

※PV transmission output type does not have EVENT1 output.

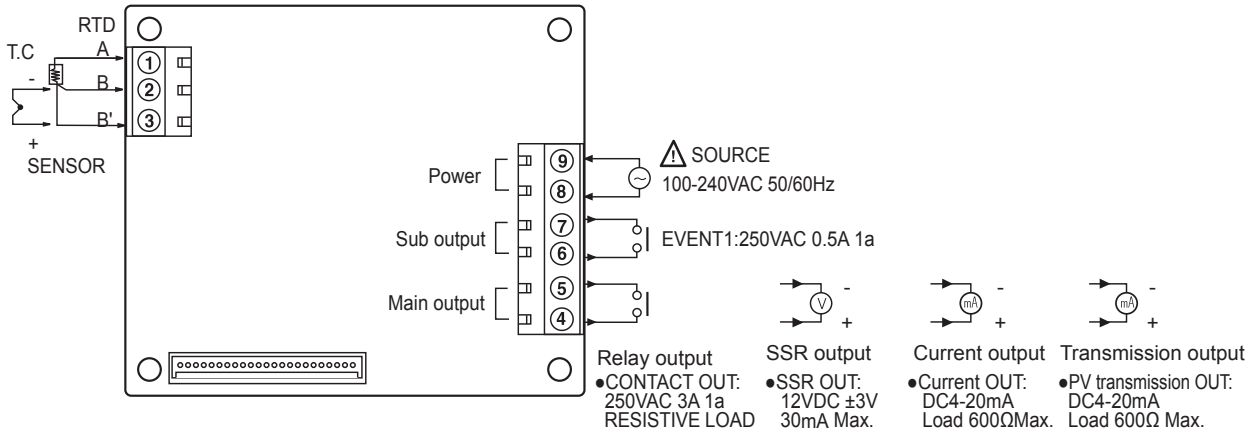
▣ Specifications

Model		TB42-14R	TB42-14S	TB42-14C	TB42-14N
Power supply		100-240VAC 50/60Hz ±10%			
Power consumption		Approx. max. 5VA			
Display method		7 Segment LED display [Processing value(PV) : Green, Setting value(SV): Red]			
Character size		W8×H10mm			
Input	Thermocouple	K(CA), J(IC) [Tolerance outer resistance is max. 100Ω]			
	RTD	DPt100Ω [Allowable line resistance is max. 5Ω per a wire]			
Control output	Relay	250VAC 3A 1a	—	—	—
	SSR drive	—	12VDC ±3V 30mA Max.	—	—
	Current	—	—	DC4-20mA Load 600Ω Max.	—
	Transmission	—	—	—	DC4-20mA, load Max. 600Ω for PV
Sub output		•Event1 output : Relay output(250VAC 0.5A 1a) •Event2 output : OK monitoring display by LED			
Control method		ON/OFF control(Hysteresis is adjustable), P, PI, PD, PIDF, PIDS			
Setting type		Front push buttons			
Display accuracy		F.S ± 0.3% or 3℃(Higher one)			
Hysteresis		Adjustable 1 to 100℃(0.1 to 100.0℃) at ON / OFF control			
Proportional band(P)		0.0 to 100.0%			
Integral time(I)		0 to 3600sec.			
Derivative time(D)		0 to 3600sec.			
Control cycle(T)		1 to 120sec.			
Sampling period		0.5sec.			
Dielectric strength		2000VAC 50/60Hz for 1 minute(Between input and power terminal)			
Vibration		0.75mm amplitude at frequency of 10 to 55Hz(for 1 min.) in each of X, Y, Z directions for 2 hours			
Relay life cycle	Main output	Mechanical : Min. 10,000,000, Electrical : Min. 100,000(250VAC 3A resistive load)			
	Sub output	Mechanical : Min. 20,000,000, Electrical : Min. 200,000(250VAC 0.5A resistive load)			
Insulation resistance		Min. 100MΩ(at 500VDC megger)			
Noise strength		±2kV the square wave noise(pulse width : 1μs) by the noise simulator			
Memory protection		10 years(When using non-volatile semiconductor memory type)			
Environ -ment	Ambient temperature	-10 to 50℃, storage: -20 to 60℃			
	Ambient humidity	35 to 85%RH, storage: 35 to 85%RH			
Approval		c UL us			
Unit weight		Approx. 113.5g			

※Environment resistance is rated at no freezing or condensation.

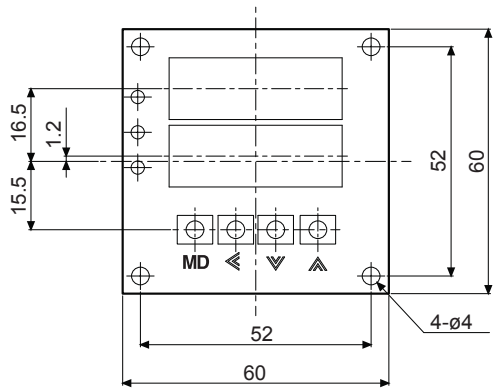
▣ Connections

※Resistance Temperature Detector(RTD) : DPt 100Ω(3-wire type)　※Thermocouple : K, J, R

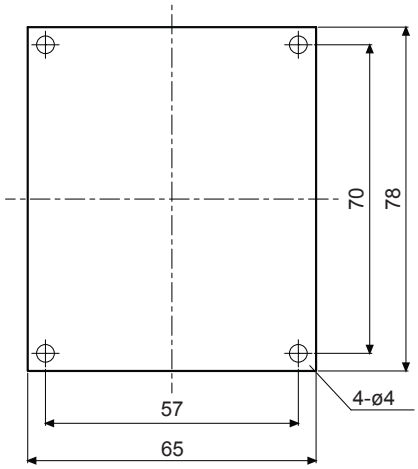


▣ Dimensions

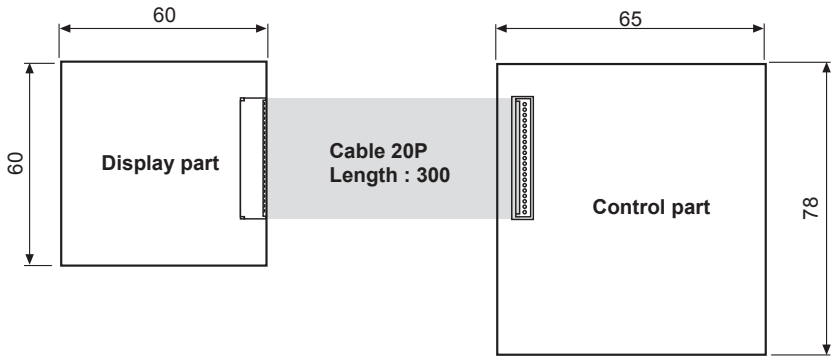
●Display part



●Control part



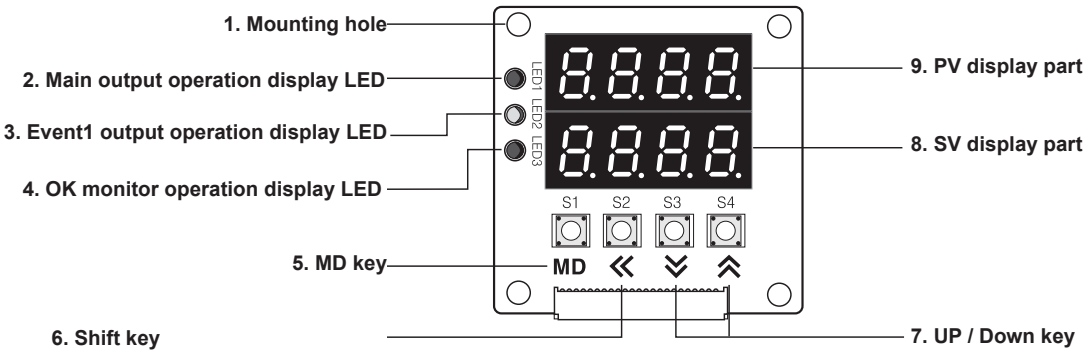
●Layout



※ Cable length is 300mm.
※ The size of board is based on user's application. (customizable)

(unit : mm)

▣ Front panel identification



1. Mounting hole(Ø4.0mm)

2. Main output operation display LED(LED 1)
It indicates the operation status of control output and displayed on "LED 1".
But when it is current output or retransmission output "LED 1" does not operate. (LED indication is OFF)

3. Event 1 output operation display LED(LED 2)
It indicates the operating status of alarm output and displayed on "LED 2".

4. O.K monitor operation display LED(LED 3)
It indicates the operating status of alarm output and displayed on "LED 3".
After setting alarm output in EVENT 2, if execute autotuning, O.K monitor operation will be displayed after AT function.
(it flashes during AT function, and turns OFF after completing AT function)

5. Mode key(S1)
It is used to enter into every parameter group or move to other parameters. It is "S1" on this PCB.

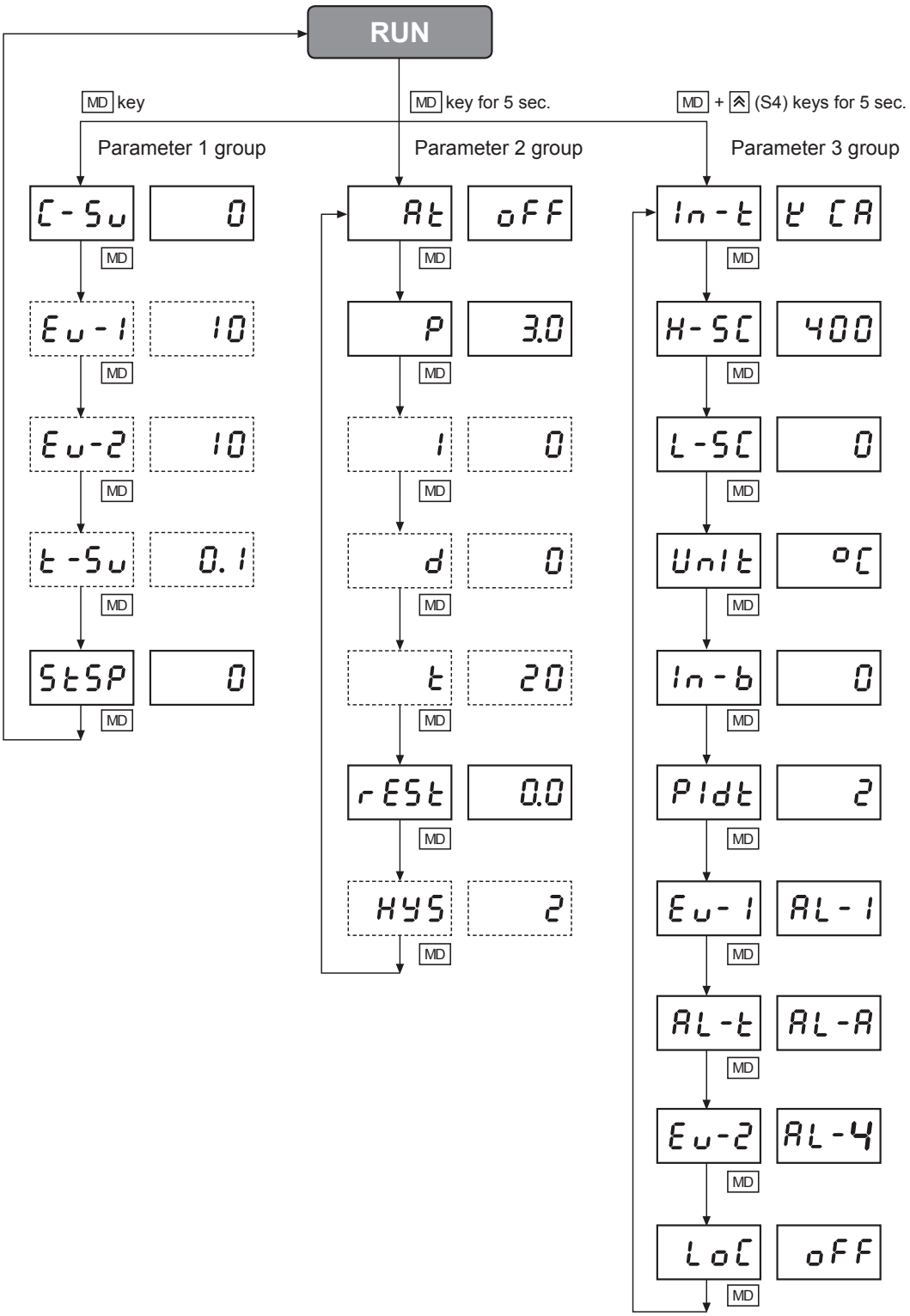
6. Shift key(S2)
It is used when change the setting value or move to digit at the parameter. It is "S2" on this PCB.

7. Up / Down key(S3/S4)
It is used when change the setting value or select setting function.
Up key is "S4" and Down key is "S3" on this PCB.

8. SV display part
The setting temperature is displayed in red LED.
But when timer function is used, the setting time will be displayed at "t-Su".
If time function is OFF, it will return to the setting temperature.

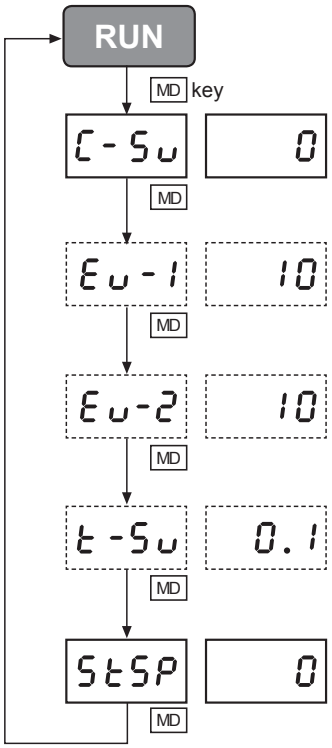
9. PV display part
It displays measured temperature in green LED.

▣ Parameter groups



※It will return to RUN mode, if pressing the MD key for 5 sec. in parameter 2 or 3 group.
※It will return to RUN mode, if no key touched for 90 sec. during every parameter is progressing.

▣ Parameter 1 group



Set SV(setting value).
Temperature range of SV is within input range of each sensor.

Set temperature of Alarm operation which has been set in Eu-1 of Parameter 3 group.
Temperature range of Eu-1 is within input range of each sensor.
※If setting Alarm operation as "AL-0" in Eu-1 of Parameter 3 group, this parameter is not displayed.

Set temperature of Alarm operation which has been set in EV-2 of Parameter 3 group.
Temperature range of EV-2 is within input range of each sensor.
※If setting Alarm operation as"AL-0" in Eu-2 of Parameter 3 group, this parameter is not displayed.

When it is used as timer function, this parameter is for setting the time of using.
The range of setting time is 0.1 to 999.9 the unit is Hour.
※If selecting as "0" in "StSP", this parameter is not displayed.

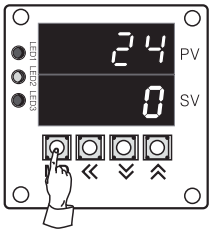
Select timer function.
0 : No Timer function
1 : Cut off output after stop the time
2 : Output operation after stop the time. (reservation function)

※To set SV, press the [≪] key and SV of the SV display part flashes. Press the [≪], [≫] keys and change SV and press the [MD] key to save the value and SV of the SV display part flashes.
※The value in every parameter is factory default.
※Entering parameter is not available in transmission output type.
※Some parameter is able to set decimal point by temperataure sensor type.

●Example of SV value setting

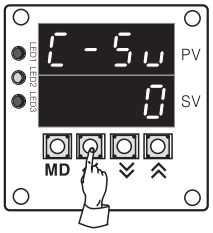
Example of setting 100℃

1.



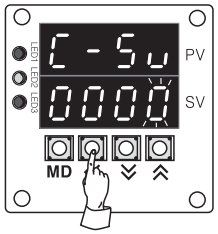
When PV and SV are displayed, press the [MD] key(S1).

2.



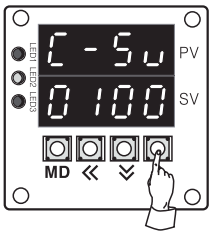
"C-Su"is displayed in the PV display part, "0" is displayed in the SV display part. Press the [≪] key(S2).

3.



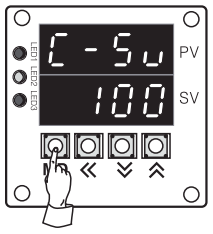
10^0 digit flashes in the SV display part. Move the digit by pressing [≪] key(S2) twice.

4.



Press the [≫] key(S4) and set "1" at 10^2 digit and press the [MD] key.

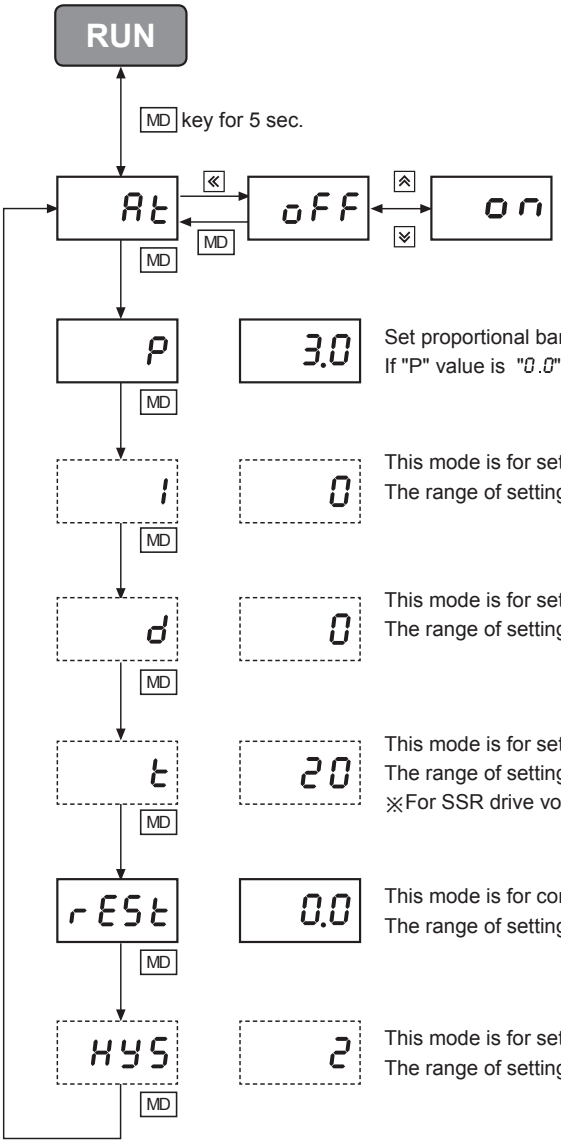
5.



Now SV value is set, then move to Eu-1 by pressing the [MD] key once.

※S1, S2, S3, S4 are on on this PCB Board.

▣ Parameter 2 group



※To set SV, press the « key and SV of the SV display part flashes. Press the ^, v keys and change SV and press the MD key to save the value and SV of the SV display part flashes.

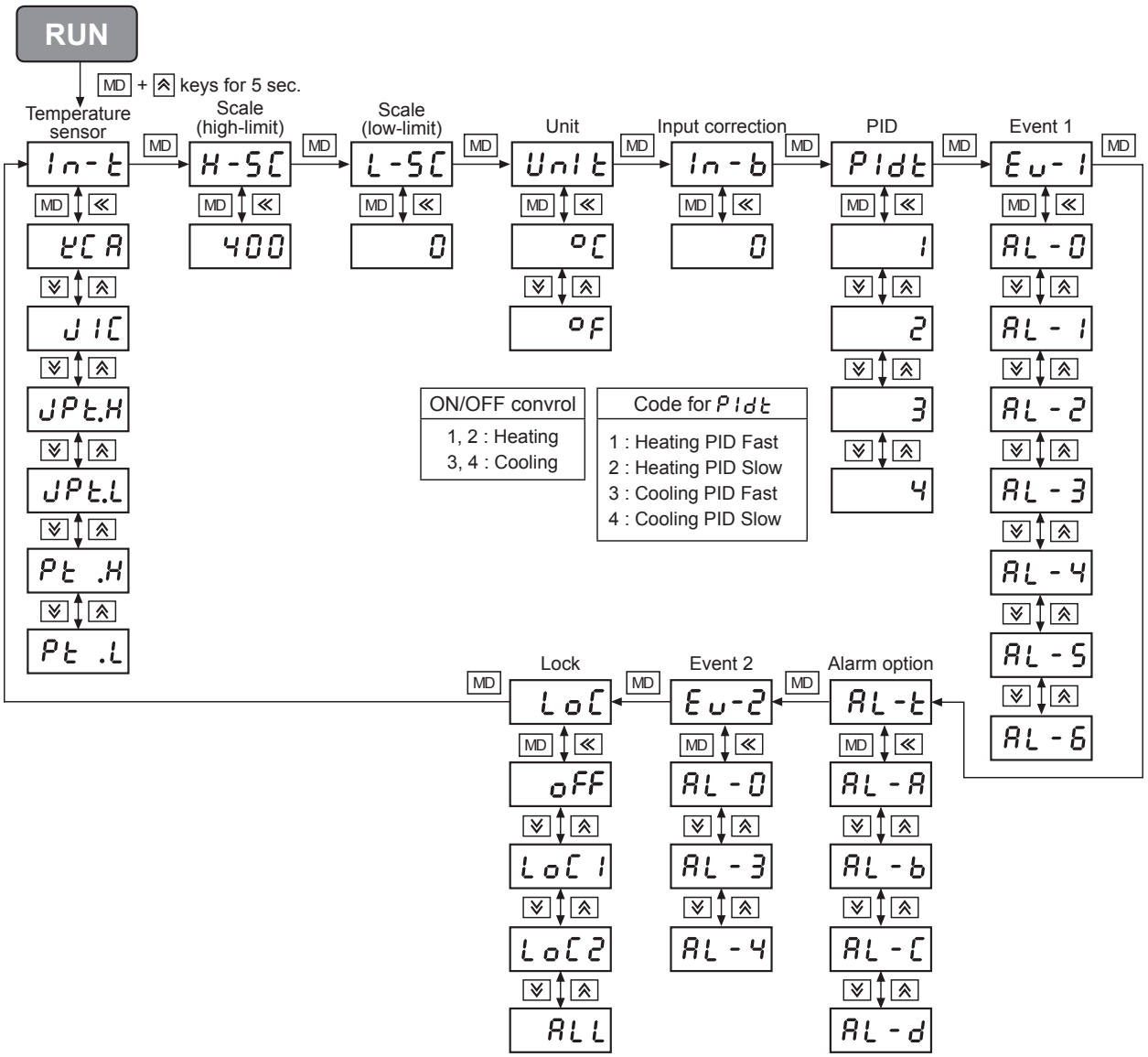
※For ON/OFF control, only P and HYS parameters are displayed.

※The value in every parameter is factory default.

※Press the MD key for 5 sec. in any parameters and it returns to RUN mode.
If there is no additional key operations for 90 sec. in any parameters, it reutrns to RUN mode.

※Transmission output model cannot enter to parameter 2 group.

▣ Parameter 3 group



In-t	YCA	Select one input sensor among 6 types.
H-SC	400	Set high-limit of temperature(20mA output value for transmission output). Set range is within input range of each sensor.
L-SC	0	Set low-limit of temperature(4mA output value for transmission output). Set range is within input range of each sensor.
Unit	°C	Set the unit of temperature between ℃ or ℉.
In-b	0	Set the correction value for error from input sensor. Set range is -50 to 50℃(for decimal point type, -50.0 to50.0℃).
PIdt	1	Select PID control type among 4 kinds.
Eu-1	AL-1	Select Alarm output function of EVENT1 among 7 kinds.
AL-t	AL-A	Select Alarm output option function among 4 kinds.
Eu-2	AL-4	Select Alarm output function of EVENT2 among 3 kinds.
LoC	oFF	Set whether it is locked or not of setting value among 4 kinds.

※To set SV, press the ≪ key and SV of the SV display part flashes. Press the ⋀, ⋁ keys and change SV and press the MD key to save the value and SV of the SV display part flashes.

※If there is no additional key operations for 90 sec. in any parameters, it reutrns to RUN mode.

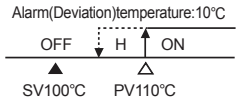
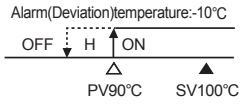
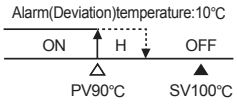
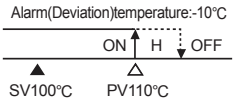
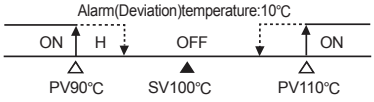
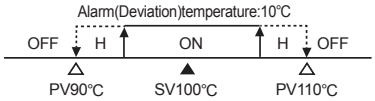
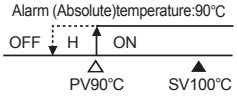
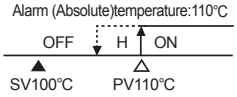
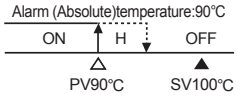
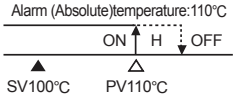
※Press the MD + ⋀ key for 5 sec. in any parameters and it returns to RUN mode.

※The value in every parameter is factory default.

▣ Input type and range

Input type		Display	Input range(℃)	Input range(℉)
Thermocouple	K(CA)	K CA	-100 to 1300℃	-148 to 2372℉
	K(CA) L	J 1 C	0 to 800℃	32 to 1472℉
RTD	JPtH	JPt.H	0 to 500℃	32 to 932℉
	JPtL	JPt.L	-199.9 to 199.9℃	-199.9 to 392.0℉
	DPtH	Pt .H	0 to 500℃	32 to 932℉
	DPtL	Pt .L	-199.9 to 199.9℃	-199.9 to 392.0℉

▣ Alarm mode

Mode	Name	Alarm operation		Description
AL-0	—	—		No alarm output
AL-1	Deviation high-imit alarm			If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL-2	Deviation low-limit alarm			If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL-3	Deviation high/low-limit alarm			If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AL-4	Deviation high/low-limit reverse alarm			If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AL-5	Absolute value high-limit alarm			If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON.
AL-6	Absolute value low-limit alarm			If PV is equal to or lower than the absolute value of alarm temperature, the output will be ON.

※"b" is interval between ON and OFF the setting range is 1 to 100℃(0.1 to 100.0℃) and can be set at "AHYS" made in parameter 1 group.

▣ Alarm option

Option	Name	Description
Aā-A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
Aā-b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.(Alarm output HOLD)
Aā-C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
Aā-d	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.

▣ Functions

◎ Event

This function can execute as main control output and sub function.

● Event 1 output

EVENT1 output is relay contact and contact capacity is 250VAC 0.5A 1a.

Event 1 output is alarm output and there are 7 modes including deviation and absolute alarm.

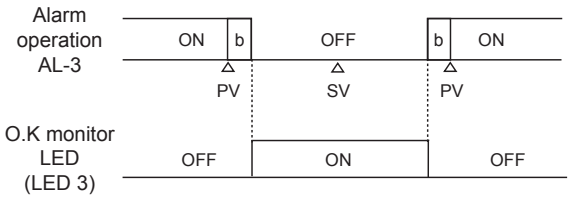
The operation of EVENT1 output is displayed on LED2 at front.

● Event 2 output

There is no terminals for EVENT2 output but front LED 3 lamp displays the input range as O.K monitor.

Event 2 output operates as O.K monitor by setting Event 2(Eu-2) as AL-3 or AL-4 in Parameter 3 group and set the deviation temperature at Eu-2 in Parameter 1 group.

< Example of O.K monitor >



◎ Auto tuning function

PID Autotuning function is automatically to measure thermal characteristics and response of the control object and then execute its value under high response & stability after calculating the time constant of PID required to control optimum temperature. When AT function is started, LED3 will flash and when LED3 is OFF this operation will stop.

(Note)For ON/OFF control, AT function does not operate.

◎ Dual PID function

One is that PV is reached at SV with fast response speed, but a little of overshoot occurs, the other is that PV is reached at SV with slow response speed, but overshoot will be minimized.

PIDF(PID Fast)

: This mode is applied at the machines or systems which requite stop fast response speed, and allowable a little overshoot which requite.

PIDS(PID Slow)

: This mode is applied at the machine which overshoot must not occur, because the fire can be and allowable low response time.

◎ Error

If error occurs while the controller is operating, it will be displayed as follow.

1. "LLLL" flashes,
   when measured input temperature is lower than input range of the sensor.
2. "HHHH" flashes,
   when measured input temperature is higher than input range of the sensor.
3. "oPEn" flashes
   when the input sensor is not connected or its wire is cut.

◎ Transmission output(PV)

This function is to transmit the current value(PV) to external equipment such as PC or recorder etc. the output is 4-20mADC and cannot be used with control output at the same time. It will output 20mA, when PV reaches to the temperature in H-SC and output 4mA, when PV reaches to the temperature in L-SC.

Min. resolutions are 16,000 divisions available. (TB42-14N)

◎ Manual reset (rESt)

Proportional control has an offset because rising time is not the same as falling time, even if the unit operates normally. This function is to correct offset.

◎ Lock

Setting value cannot be changed by unauthorized person. There are 4 types of lock mode in this unit.

1. oFF : Unlocks for all parameters
2. LoC 1: Locks parameter 2, 3 groups
3. LoC2: Locks parameter groups except C-SV parameter
4. "ALL" : Locks all parameters

◎ Timer (StSP)

●There is no output terminal in this function, it controls main output by setting of Timer function.

●Timer operation

①When "StSP" parameter is set as "0"

: No timer function. "t-Su" parameter is not displayed.

②When "StSP" parameter is set as "1"

: This unit controls temperature for the set time of "t-Su".

Ex)When "t-Su" is set as 5.0, this unit controls temperautre for 5 hours and completes to control.

③When "StSP" parameter is set as "2"

: This unit controls temperature after the set time of "t-Su".

Ex)When "t-Su" is set as 5.0, this unit controls temperature after 5 hours.

●To stop timer fnction, enter "StSP" parameter and set "0".

●During timer function, the set time at "t-Su" is displayed on the SV display part in RUN mode. If not using the timer function, it displays SV(Su).

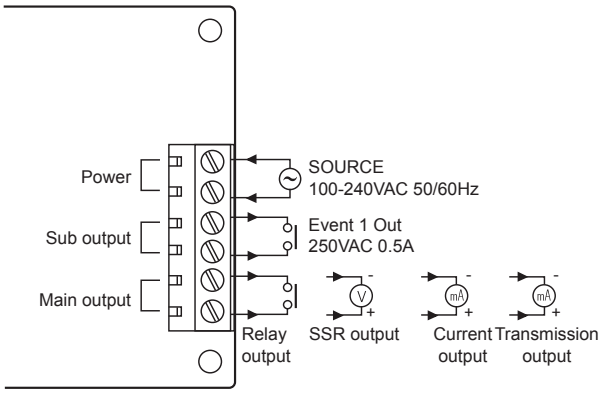
▣ Proper usage

◎ Front part

Front part is able to customized for user's application.
The length of connector cable connected the front part and control part is basically 300mm and also 100mm.

◎ Output

This unit has main output terminals and sub output terminals.
Main output terminals is for relay, SSR, current, transmissionoutput and sub output terminals are fixed for Event 1 output.
Be sure that output terminals are as below.



※Relay output: 1a contact output.
Contact capacity is 250VAC 3A.
※SSR drive voltage output
: It outputs Max. 12VDC ±3V 30mA volutage to drive SSR.
For using SSR drive voltage to other applications, use this within the rated current.
※Current output : It outputs DC4-20mA within the hysteresis.
※Transmission output: It outputs DC4-20mA wihtin the set range at "H-SC" and "L-SC" parameters.
Resoultions: 16,000 divisions

◎ When changing the sensor type

Be sure that when changing the sensor type during operation, the set SV is cleared.

◎ Caution for when mounting on Panel

This unit does not have an additional external case but has only a PCB. When mounting this unit on panel, maintain insulation between iron plates. If dust, oil, or water is enter to inside of panel, inner may be short.
Be sure that interval between terminals is narrow to wire cables. The cable (20P) connected control PCB and front PCB is sensitive signal line. Be careful when wiring this cable not to enter noise or affect to high voltage line.

◎ Caution for using

1. Use separated line from high voltage line or power line in order to avoid inductive noise.
2. Install power switch or circuit-breaker in order to cut power supply off.
3. The switch or circuit-breaker should be installed near by users.
4. Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
5. Be sure to use compensating wire when extends wire from controller to thermocouple, otherwise the temperature deviation will occur at the part where wires are connected to each other.
6. In case of using RTD sensor, 3-wire type must be used. If you need to extend the line, 3-wire must be used with the same thickness as the line.
   It might cause the deviation of temperature if the resistance of line is different.
7. In case of making power line and input signal line close, line filter for noise protection should be installed at power line and input signal line should be shielded.
8. Keep away from the high frequency instruments.
   (High frequency welding machine & sewing machine, big capacitive SCR controller)
9. Installation environment

① It shall be used indoor.
② Altitude max. 2000m
③ Pollution degree 2
④ Installation category II