Programmable Outlet Thermostat

ITC-310T-B

User Manual

Version 1.0

INKBIRD

Inkbird Tech. Co., Ltd.

Disclaimer

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Contents

1. Safety Precautions

- Ensure the product using within the specification.
- Do not touch the terminals at least while power is being supplied. Doing so may occasionally result in injury due to electric shock.
- Do not allow pieces of metal, wire clippings, or fine metallic shaving or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.
- Do not use the product where subject to flammable or explosive gas. Otherwise, injury from explosion may occasionally occur.
- Never disassemble, modify or repair the product or touch any of the internal parts. Electric Shock, fire, or malfunction may occasionally occur.
- If the output relays are used over their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy.

2. Overview

ITC-310T-B is a dual-relay outlet thermostat with programmable timer function, which can be set to automatically control 12 periods timer stages with different temperatures.
This ITC-310T-B can be mainly used to control temperature during fermentation process of beer and wine brewing, also widely used in home brewing, aquarium, pet breeding, hatching, barbecue, boiler temperature control, geothermal temperature control, heating pump constant temperature cycle, strain culture fermentation, seed sprouting, electric heating, electric oven, over-temperature protection and automatic temperature control system of all kinds of electrical equipment, etc.

This plug-n-play product with dual relay, can be connected with refrigeration and heating equipment easily to realize ideal temperature control. It's equipped with dual LED display, and offers display options of Centigrade and Fahrenheit, enabling more humanized temperature control. With large output power 1,200W (110V) /2,200W (220V), it's suitable for most applications.

ITC-310T-B is designed with compressor delay protection for refrigeration, high and low temperature alarm, and sensor fault alarm, which makes the temperature controller more safe and reliable. Functions such as temperature calibration, separately set differential for refrigeration and heating, enable more accurate temperature control.

Main Features

- Programmable, 12 temperatures in 12 periods of time;
- Constantly control 12 stages of temperatures by setting it once;
- Wide timer setting range: 1~999(min/hr), 1~90(days);
- Can be set single or cycle control mode;
- Plug and play design, easy to use;
- Dual relays, heating and cooling outputs;
- F / C temperature display;
- Easy to set, PV and SV dual display screen;;
- User calibration;
- Delay protection for refrigeration control;
- Can be set high and low temperature alarms;
- Alarm when over-temperature and sensor error.

3. Specification

Temperature Control Range	-50.0~120 ℃ /-58.0~248 ℉
Temperature Resolution	0.1 ℃(-50.0~99.9℃) / 0.1℉(-50.0~99.9℉) 1 ℃(100~120℃)/ 1℉(100~248℉)
Measuring Accuracy	±1℃ (-50.0 ~ 70℃) / ±2℉ (-58 ~ 158℉)
Temperature Control Mode	On/Off Control, Heating and Cooling
Timing Range	1~999（min/hr），1~90 （day）
Timing Accuracy	24hour±1.7s
Periods of Time	Max: 12 periods
Cycle Setting	1-999 times cycle, or 00 infinite cycle
Input Voltage	100 ~240VAC, 50Hz/60Hz
Control Output	Current: Max.10A
	Voltage: 100~240V AC
	Power: Max.1200W(120V)/2200W(220V)
Alarm	High and Low Temperature Alarm
Sensor Type	NTC Sensor(including)
Sensor Length	2m / 6.56ft
Relay Output	Cooling(10A,100-240VAC)
	Heating(10A,100-240VAC)
Relay Life	Mechanical；Electrical；
Input Power Cable Length	1.5m (5ft)
Dimension	140x68x33 mm(body)
Operating Ambient Temperature	-30~ 75 ℃ / -22~ 167℉
Storage Condition	Temperature: -20~ 60℃ / -4~ 140℉
	Humidity: 20~85% (No freeze or moisture condensation)
Warranty	1 Year

4. Keys Instruction

① SET Button: Press and hold SET button for 3 seconds to enter setting menu, then press and hold SET button for more than 3 seconds to quit and save the settings during the setting process.

② UP Button: Under running mode, when TR=1 or 2, press this button can view the specific stage of the operating; Under setting mode, press this DOWN button can decrease the setting value.

③ DOWN Button: Under running mode, when TR=1 or 2, press this button can view the left working time; Under setting mode, press this UP button can increase the setting value.

④ Heating Indicator Light: Light on, heating start working.

⑤ Cooling Indicator Light: Light on, cooling start working; light flickering, being in the status of compressor delay.

⑥ Centigrade/Fahrenheit Reading: Select Celsius or Fahrenheit temperature reading.

⑦ PV (Process Value): Under normal mode, display current temperature; Under setting mode, display menu code.

⑧ SV (Setting Value): Under normal mode, display set temperature value; Under setting mode, display setting values.

⑨ Heating Device Socket: For heating output.

⑩ Cooling Device Socket: For cooling output.

5. Key Operation Instruction

5.1 When controller works normally, if TR=0, there will be no reaction by shortly pressing" ▲ " or " ▼ " button; If TR=1 or 2, short press " ▲ " button once then release, will display the left current working time; short press " ▼ " button once then release, will display the specific stage of current working and then return to normal temperature displaying mode after 3 seconds.

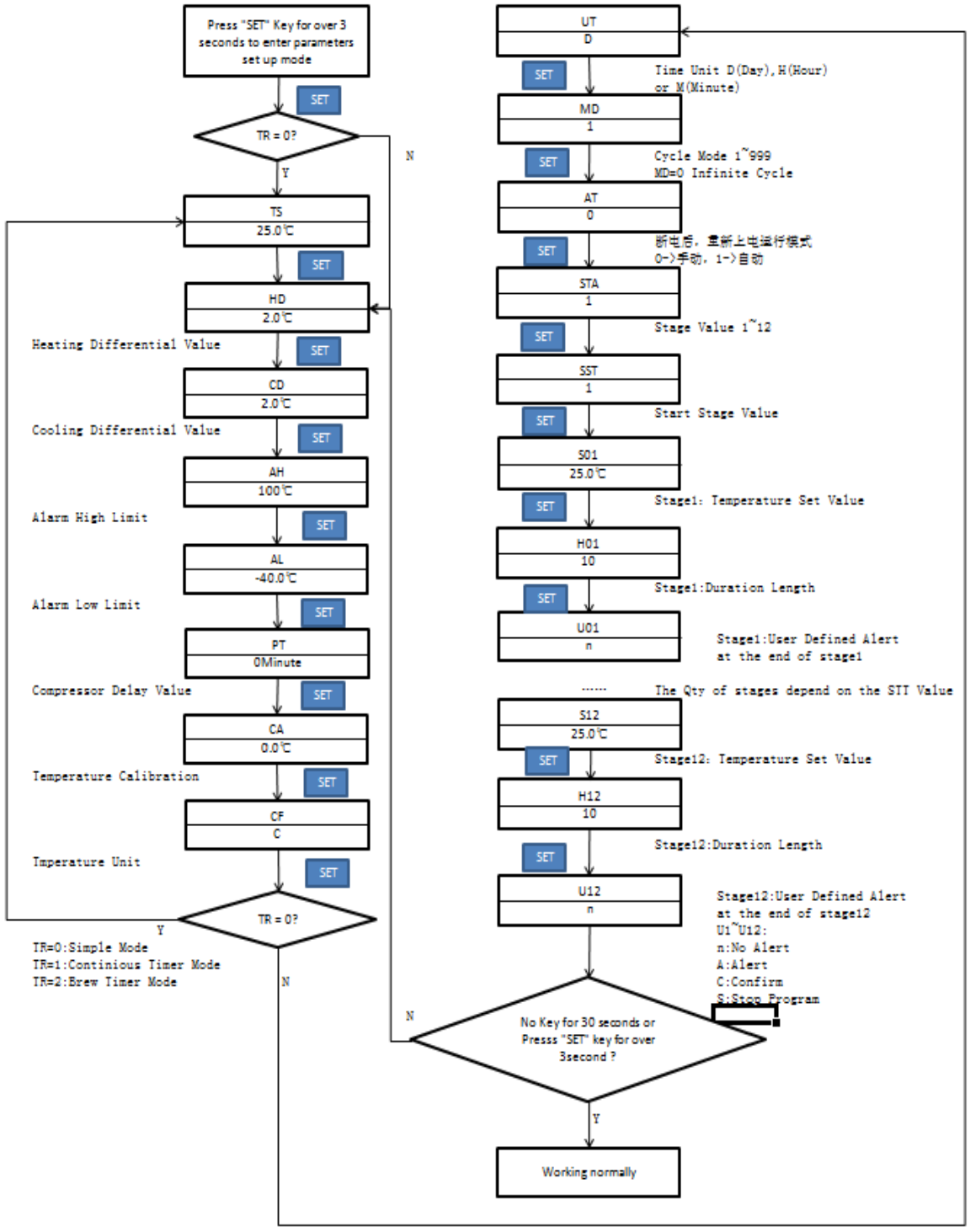
5.2 How to Set Parameters

When controller works normally, press and hold "SET" key for more than 3 seconds to enter into the modify parameter mode, " SET" indicator light will on, PV window displaying the first code "TS" in menu, if TR=1 or 2, there will be second mode "HD" displaying and the related setting value displaying in SV window.

Press "SET" button to save the set value and go to next setting, then press " ▲ " or " ▼ " button can change the current value. After setting, keep pressing "SET" button for 3 seconds at any status will save the changed value and then return to the normal temperature displaying.

During setting, if there is no operation for 10 seconds, system will automatically quit the menu and return to the normal temperature displaying mode with automatically save the modified settings.

5.3 Setup Flow Chart



6. Menu Instruction

6.1 Temperature Control Setting

6.1.1 When setting temperature in Centigrade.

Symbol	Code	Function	Setting Range	Default Setting	Remarks
	TS	Temperature Set Value	-50.0～120℃	25.0℃	
	HD	Heating Differential Value	0.3～15.0℃	2.0℃	in heating
	CD	Cooling Differential Value	0.3～15.0℃	2.0℃	in cooling
	AH	Alarm High Limit	-50.0～120℃	100℃	
	AL	Alarm Low Limit	-50.0～120℃	-40.0℃	
	PT	Compressor Delay	0～10 minutes	0 minute	
	CA	Calibration	-15.0～15.0℃	0.0℃	
	CF	Centigrade/ Fahrenheit		C	
	TR	Timer Setting	0、1or2	0	0->off; 1 or 2->on

6.1.2 When setting temperature in Fahrenheit.

Symbol	Code	Function	Setting Range	Default Setting	Remarks
	TS	Temperature Set Value	-50.0～248℉	77.0℉	Min unit: 1℉
	HD	Heating Differential Value	1.0～30.0℉	3.0℉	Min unit: 1℉
	CD	Cooling Differential Value	1.0～30.0℉	3.0℉	Min unit: 1℉
	AH	Alarm High Limit	-50.0～248℉	212℉	Min unit: 1℉
	AL	Alarm Low Limit	-50.0～248℉	-40.0℉	Min unit: 1℉
	PT	Compressor Delay	0～10 minutes	0 minute	
	CA	Calibration	-15.0～15.0℉	0.0℉	
	CF	Centigrade/ Fahrenheit		F	
	TR	Timer Setting	0、1 or 2	0	0-> off； 1 or 2-> on

6.1.3 When TR=1 or TR=2.

Symbol	Code	Function	Setting Range	Default Setting	Remarks
	UT	Time Unit Setting	D, H, M	D	D: Day H：Hour M: Minute
	MD	Cycle Setting Mode	0-999	1	00, Infinite Cycle
	AT	Auto Mode	0 or 1	0	0: Manual 1:Auto
	STT	Stage Setting Value	1~12	1	Find the below chart.
	SST	Start Stage Setting Value	1~12	1	The stage start to work.

6.1.4 When setting STA=12, menu codes as below chart.

Symbol	Code	Function	Default Setting	Remarks
	S01	Stage 1 Temperature Set Value	25.0℃ or 77.0℉	Same setting range as TS.
	H01	Control Duration	10	
	U01	Finished Alarm of Stage 1	n	Note 6.2.6
	S02	Stage 2 Temperature Set Value	25.0℃ or 77.0℉	
	H02	Control Duration	10	
	U02	Finished Alarm of Stage 2	n	Note 6.2.6
	S03	Stage 3 Temperature Set Value	25.0℃ or 77.0℉	
	H03	Control Duration	10	
	U03	Finished Alarm of Stage 3	n	Note 6.2.6
	S04	Stage 4 Temperature Set Value	25.0℃ or 77.0℉	
	H04	Control Duration	10	
	U04	Finished Alarm of Stage 4	n	Note 6.2.6
	S05	Stage 5 Temperature Set Value	25.0℃ or 77.0℉	
	H05	Control Duration	10	
	U05	Finished Alarm of Stage 5	n	Note 6.2.6
	S06	Stage 6 Temperature Set Value	25.0℃ or 77.0℉	
	H06	Control Duration	10	
	U06	Finished Alarm of Stage 6	n	Note 6.2.6
	S07	Stage 7 Temperature Set Value	25.0℃ or 77.0℉	

	H07	Control Duration	10	
	U07	Finished Alarm of Stage 7	n	Note 6.2.6
	S08	Stage 8 Temperature Set Value	25.0℃ or 77.0℉	
	H08	Control Duration	10	
	U08	Finished Alarm of Stage 8	n	Note 6.2.6
	S09	Stage 9 Temperature Set Value	25.0℃ or 77.0℉	
	H09	Control Duration	10	
	U09	Finished Alarm of Stage 9	n	Note 6.2.6
	S10	Stage 10 Temperature Set Value	25.0℃ or 77.0℉	
	H10	Control Duration	10	
	U10	Finished Alarm of Stage 10	n	Note 6.2.6
	S11	Stage 11 Temperature Set Value	25.0℃ or 77.0℉	
	H11	Control Duration	10	
	U11	Finished Alarm of Stage 11	n	Note 6.2.6
	S12	Stage 12 Temperature Set Value	25.0℃ or 77.0℉	
	H12	Control Duration	10	
	U12	Finished Alarm of Stage 12	n	Note 6.2.6

6.2.1 Temperature setting Range (TS, HD, CD)

When controller works normally, PV screen displays current measuring temperature, automatically switch working modes of cooling and heating.

When TR=0

Under normal temperature control mode, when measured temperature **PV ≥ TS** (**Temperature Set Value**) **+ CD** (**Cooling Differential Value**), entering into cooling mode with cooling indicator lamp on and cooling relay start working; when the **Cooling Indicator Light flickering**, cooling device is being in the status of compressor delay protection; when measured temperature **PV ≤ TS** (**Temperature Set Value**), cooling indicator light off, cooling relay stop working.

When measured temperature **PV ≤TS (Temperature Set Value)-HD (Heating Differential Value)**, entering into heating mode with heating indicator light on and heating relay start working; when measured temperature **PV ≥ TS** (**Temperature Set Value**), heating indicator light off, heating relay stop working.

For example, Set TS=25.0℃, CD=2.0℃, HD=3.0℃: if measured temperature ≥27.0℃(TS+CD), cooling will turn on; if measured temperature ≤25.0℃, cooling will turn off.

If measured temperature ≤22.0℃(TS-HD), heating will turn on; if measured temperature ≥25.0℃, heating will turn off.

NOTE:

When TR=0, under plug in or exit setting mode, no need to compare the current measured temperature with the heating or cooling differential values but only compare directly with the TS value.

For example, when plug in or exit setting mode, Set TS=25.0℃, CD=2.0℃, HD=3.0℃: if measured temperature＞TS(25.0℃), cooling will turn on; if measured temperature ≤25.0℃, cooling will turn off and then return to normal temperature control mode.

If measured temperature ＜TS(22.0℃), heating will turn on; if measured temperature ≥25.0℃, heating will turn off and then return to normal temperature control mode.

When TR=1 (Continuous Timer mode)

With this setting, the TS(temperature set value) will be invalid and the controller will work based on the setting values of S01~S12, H01~H12 and U01~U12.

For example, when periods of time within the range of the control duration of H01, if measured temperature PV≥(Temperature Set Value)TS1+(Cooling Differential Value) CD, then cooling on with cooling indicator light on and cooling relay start working.

About the condition that the interval time between two refrigeration operations shorten than PT(compressor delay time), please note 6.2.3.

When TR=2 (Target Timer mode)

With this setting, the TS(temperature set value) will be out of action and the controller will work based on the setting values of S01~S12, H01~H12 and U01~U12.
For example, when periods of time within the range of the control duration of H01, if measured temperature PV≥Temperature Set Value)TS1+(Cooling Differential Value) CD, then cooling on with cooling indicator light on and cooling relay start working.
NOTE: The control duration of each stage start timing only when the current temperature reach or drop to the setting temperature in current stage.
About the condition that the interval time between two refrigeration operations shorten than PT(compressor delay time), please note 6.2.3.
About how to set the timer and control temperature, please note 6.2.6.

About the difference between TR=1 and TR=2, please refer to the chart below with 3 stages of the temperature:

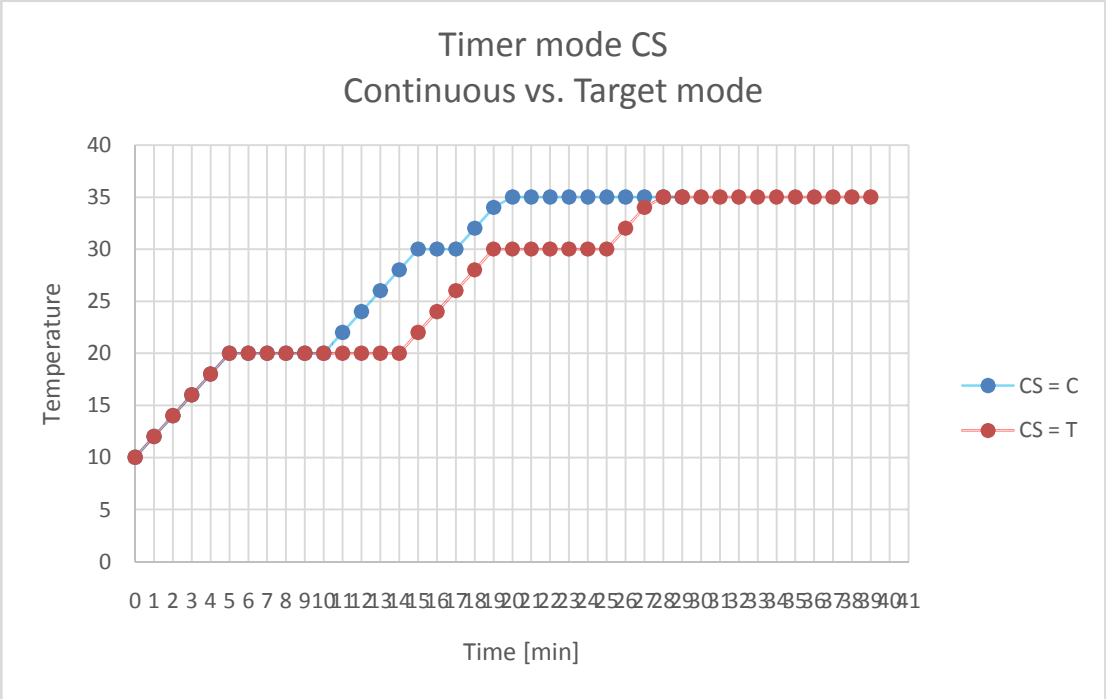
Stage X(N=1~12)	STX(X=1~12)(℃)	HTX(X=1~12)(Minutes)	UAX(X=1~12)
Stage1	20.0	10	n
Stage2	30.0	7	n
Stage3	35.0	12	n

The difference of the action time as the chart below:

	TR = 1 Continuous Timer mode		TR = 2 Target Timer mode	
Time [minutes]	Temp [°C]	Stage	Temp [°C]	Stage
0	10	1	10	
1	12	1	12	
2	14	1	14	
3	16	1	16	
4	18	1	18	
5	20	1	20	1
6	20	1	20	1
7	20	1	20	1
8	20	1	20	1
9	20	1	20	1
10	20	1	20	1
11	22	2	20	1
12	24	2	20	1
13	26	2	20	1
14	28	2	20	1

15	30	2	22	
16	30	2	24	
17	30	2	26	
18	32	3	28	
19	34	3	30	2
20	35	3	30	2
21	35	3	30	2
22	35	3	30	2
23	35	3	30	2
24	35	3	30	2
25	35	3	30	2
26	35	3	32	
27	35	3	34	
28	35	3	35	3
29	35	3	35	3
30			35	3
31			35	3
32			35	3
33			35	3
34			35	3
35			35	3
36			35	3
37			35	3
38			35	3
39			35	3

Above chart is the difference between the continuous timer mode and target timer mode, can be shown as below graph:



The graph show when TR=1, the continuous timer mode as blue line: the current stage control time of H01~H03 is counted continuously and total time of 0~10, 11~17 and 18~29 is 29 minutes; when TR=2, the target timer as red line: the current stage control time od H01~H03 will only start to count down when the current measured temperature has been reached the set temperature of current stage and total time of 5~14, 19~25 and 32~35 is 39 minutes.

6.2.2 Alarm High/Low Limit Setting (AH, AL)

When measured temperature **PV ≥ AH**, alarm with "BI-BI-BIII" sound until the temperature < AH or press any button, then will close the buzzer.

When measured temperature **PV ≤ AL**, alarm with "BI-BI-BIII" sound until the temperature > AL or press any button, then will close the buzzer.

When the buzzer alarming, output of heating or cooling will keep working follow the settings.

6.2.3 Compressor Delay (PT)

Under cooling mode, first time to power on, when measured temperature PV ≥ TS (Temperature Set Value) + CD (Cooling Differential Value), device won't start cooling immediately, but waiting for a delay time (PT).

When the interval time between two refrigeration operations is longer than the delay time, device will start cooling immediately. When the interval time between two refrigeration operations is shorter than the delay time, device will start working until there is no delay time left.

Delay time will be calculated right after the moment when device stop working.

6.2.4 Temperature Calibration (CA)

When there is temperature off between measured temperature and actual temperature, user can set CA for calibration to get the measured temperature value same as the actual temperature value.

The calibrated temperature = the measured temperature value + calibration value (positive value, 0 or negative value)

6.2.5 Display in Fahrenheit or Centigrade unit (CF)

Users can select the temperature reading in Fahrenheit or Centigrade temperature value, the default setting is in Centigrade. If need to change the temperature reading in Fahrenheit, then set CF to F.

Attentions: when CF value changed, all the setting will be recovered to factory default setting.

6.2.6 Timer-Temperature Set Values(TR, UT, STT, SST, S01~S12, H01~H12, U01~U12)

TR: a value to set timer, set to 0, timer off and set to 1, timer on. When TR=0, timer function will be off, there will not display the other set values follow TR and no need to set them; when TR=1 or TR=2, timer function will be activated, user can set the time and the control temperature values as required, with these settings, TS will be invalid and the the controller will work based on the set temperature of the timer stages.

UT: a value to set the time unit, can be set to day, hour or minutes as required.

STT: a value to set stages of controlled temperature, can be set to max 12 stages: 12 temperature set values and each temperature set value respectively corresponded to a continuous periods of time; when need to control different temperature in different time, SST can be set to max 12 stages with 12 temperatures as required.

SST: a value to set start stage to control temperature, can be set to the required stage to start the temperature control.

S01~S12: values to set the desired controlled temperature, when TR=1, the values of S01~S012 will replace the TS value as the temperature control values.

H01~H12: values to set continuous timer, if UT (time unit) set to hour and set H01 to 12, then the controller will control the set temperature of S01 for 12 hours.

U01~U12: values to set the alarm, set to n=NO Alert; A=Alert; C=Confirm and S=Stop Program.

UX=n: if set to n in current stage, when completed the continuous timer, the controlling will go to the next stage without alarming.

UX=A: if set to A in current stage , when completed the continuous timer, there will be alarming with PV screen displaying the current stage value UX(X=01~12) and SV screen displaying the A in 1Hz flickering. Buzzer will be alarm shortly in every 2 seconds and then go to next stage control.

UX=C: if set to C in current stage, when completed the continuous timer, there ill be alarming with PV screen displaying the current stage value UX(X=01~12) and SV screen displaying the A in 1Hz flickering. Buzzer will be alarm shortly in every 2 seconds but still controlling the temperature of current stage, only by pressing any button will go to the next stage control.

UX=S: if set to S in current stage,when completed the continuous timer, there ill be alarming with PV screen displaying the current stage value UX(UX=01~12) and SV screen displaying the A in 1Hz flickering. Buzzer will be alarm shortly in every 2 seconds with all output control turned off, only by pressing any button will go to next stage control.

6.2.7 Cycle and Auto Mode (MD, AT)

MD: value to set the operation time of timer and temperature set values, 00: infinite cycle; **1~999**: specific time of operation. The default value is 1, means the controller will stop running after a one time operation with the set values.

AT: value to set the operation mode when re-plug after power off. AT=0: Manual mode, the controller will stop working when re-plug after power off; user need to reset the setting values by entering the menu, the controller will restart working after re-plugged.

AT=1: Auto mode. When there is a power failure or outage,the timer will continue to work ; when re-plug in, the controller will automatically count the time during power off and re-plug based on the operation time and status of H01~H12 and U01~U12, then run to the co rresponding stage.

For example, set S01(Stage 1)=25.0C℃, H01=4H, S02(Stage 2) =30.0℃， H02=6H, U02 =0 or A; if there is a 3 hours power failure when the controller has worked on Stage1 for 2 hours, in this case, the controller will default the 2+3=5 hours to the operated time; when re-

plug in, if U01=n or A, the controller will work on Stage 2, if U01=C or S, the controller will stop working on Stage 1 with alarming.

7. Error Description

Sensor fault alarm: when temperature sensor being in short circuit or open loop, the controller will initiate the mode of sensor fault, and cancel all the operations. Buzzer alarming with displaying ER code. Press any keys can stop the alarm, and return to the normal working mode after remove the sensor fault.

8. Technical Assistance and Warranty

8.1 Technical Assistance

If you have any problems installing or using this thermostat, please carefully and thoroughly review the instruction manual. If you require assistance, please write us to cs@ink-bird.com. We will reply your emails in 24 hours from Monday through Saturday.
You can also visit our web site www.ink-bird.com to find the answers of the common technical questions.

8.2 Warranty

INKBIRD TECH. C.L. warrants this thermostat for one years from the date of purchase when operated under normal condition by the original purchaser (not transferable), against defects caused by INKBIRD's workmanship or materials. This warranty is limited to the repair or replacement, at INKBIRD's discretion, of all or part of the thermostat. The original receipt is required for warranty purposes.
INKBIRD is not responsible for injury property damage or other consequential damages or damages of third parties arising directly from an actual or alleged in mater of workmanship of the product.
There are no representations, warranties, or conditions, express or implied, statutory or otherwise, other than herein contained in the sale of goods act or any other statue.

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