



# **TEMPERATURE CONTROLLER**

# **OPERATION MANUAL**

**M.R.C.LTD.**

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Before using please check whether range , input and output match your requirement.

## 1. Front panel instruction

### 1.1 DISPLAY

PV : Process value , 4 digit display (red color)

SV : Setting value , 4 digit display (green color)

### 1.2 LED

OUT1 : Output 1 , green color

OUT2 : Output 2 , green color

AT : Auto Tuning , yellow color

PRO : Program , yellow color

AL1 : Alarm 1 , red color

AL2 : Alarm 2 , red color

MAN : Manual , yellow color

### 1.3 KEY

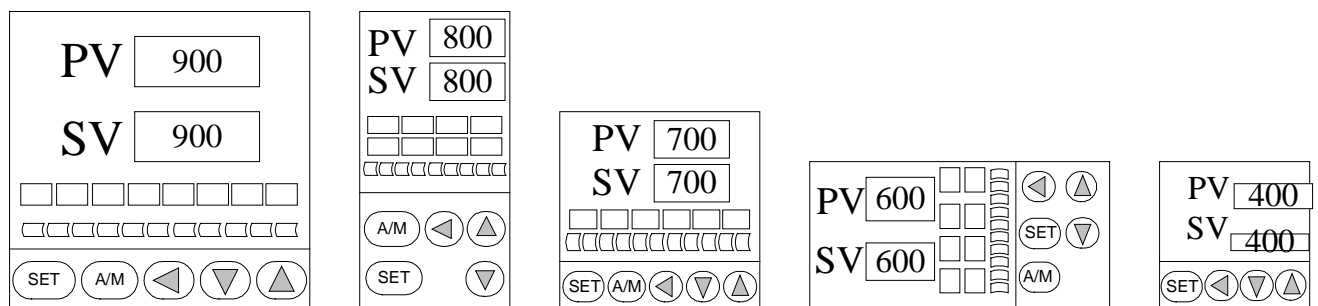
SET : MODE & SET key

◀ : SHIFT key

▼ : DOWN key

▲ : UP key

A/M : Auto/Manual key



## 2 Auto tuning

- 2.2 Once AT set YES , auto tuning is to be performed.
- 2.3 After auto tuning finished , PID parameter is to be set automatically.
- 2.4 ATVL=auto tuning offset , and it will be deduced from SV (it can prevent over shoot during auto tuning)  
SV-ATVL=Auto-tuning value , ATVL=auto tuning offset  
Ex.SV=200°C , ATVL=5 , Auto tuning point is at 195°C  
\* ATVL means Auto-tuning point in program type
- 2.5 Auto tuning failure  
Passible 1 : ATVL is too big. (If not sure , set ATVL=0)  
Passible 2 : System time is too long.(Set PID parameter individually)

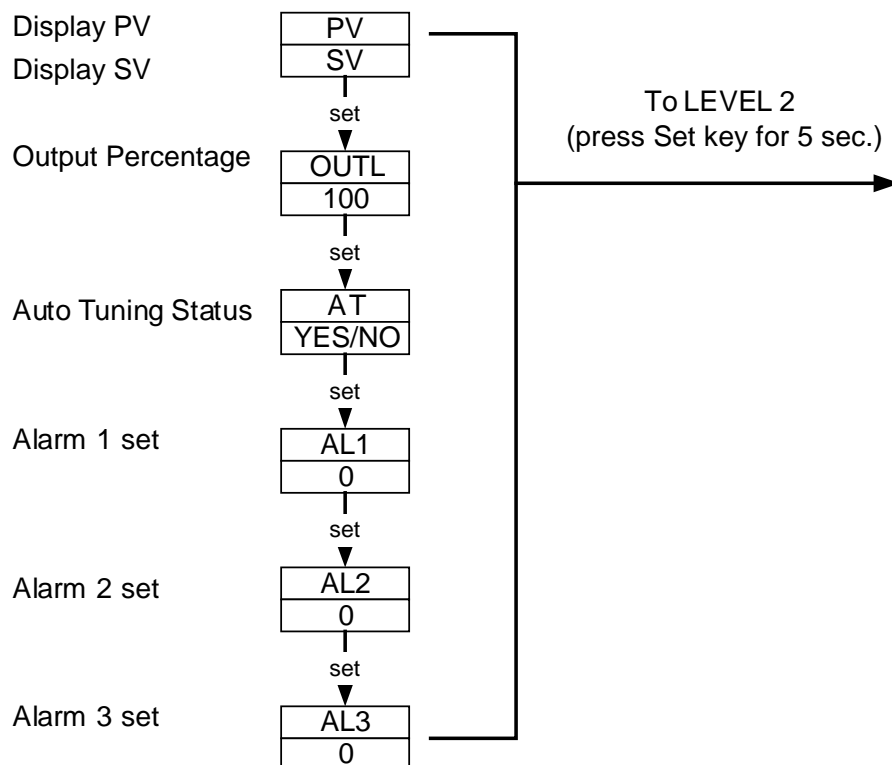
## 3. Error information

DISPLAY	DESCRIPTION
<b>IN1E</b>	Open circuit of main control sensor.
<b>* ADCF</b>	A/D converter failed.
<b>* CJCE</b>	Cold junction compensation failed.
<b>IN2E</b>	Open circuit of sub control sensor.
<b>UUU1</b>	PV exceeds USPL.
<b>NNN1</b>	PV under LSPL.
<b>UUU2</b>	Input signal of sub control exceeds the upper limit.
<b>NNN2</b>	Input signal of sub control under the lower limit.
<b>* RAMF</b>	RAM failed.
<b>INTF</b>	Interface failed.
<b>AUTF</b>	Auto tuning failed.

**NOTE :** If the “\*” marked error comes up , the Controller needs repair.  
Please send it to the nearest sales office or retail dealer.

## 4. Operating flow

### 4.1 LEVEL 1 (User Level)



- 4.1.1 Press the **SHIFT KEY** (◀) to change the parameters. If the **SHIFT KEY** is pressed, the first digit begins blinking. Press the **UP KEY** (▲) or **DOWN KEY** (▼) to increase or decrease the value of the digit, then press the **SHIFT KEY** (◀) again to go to the next digit. As all the digit are written, press **SET KEY** to enter the value.
- 4.1.2 **SET KEY** also has the function of changing MODEs, if the **SET KEY** is pressed, the display shows the next MODE.
- 4.1.3 Press **SET KEY** for 5 sec. the display goes to LEVEL 2, and do the same thing to return LEVEL 1.
- 4.1.4 If any key were not pressed for 1 minute, the display would go to LEVEL 1.
- 4.1.5 Press **A/M KEY** the display to go to LEVEL 1, no matter where it is.
- 4.1.6 If **OUTL** set "0", it means the controller has no output,

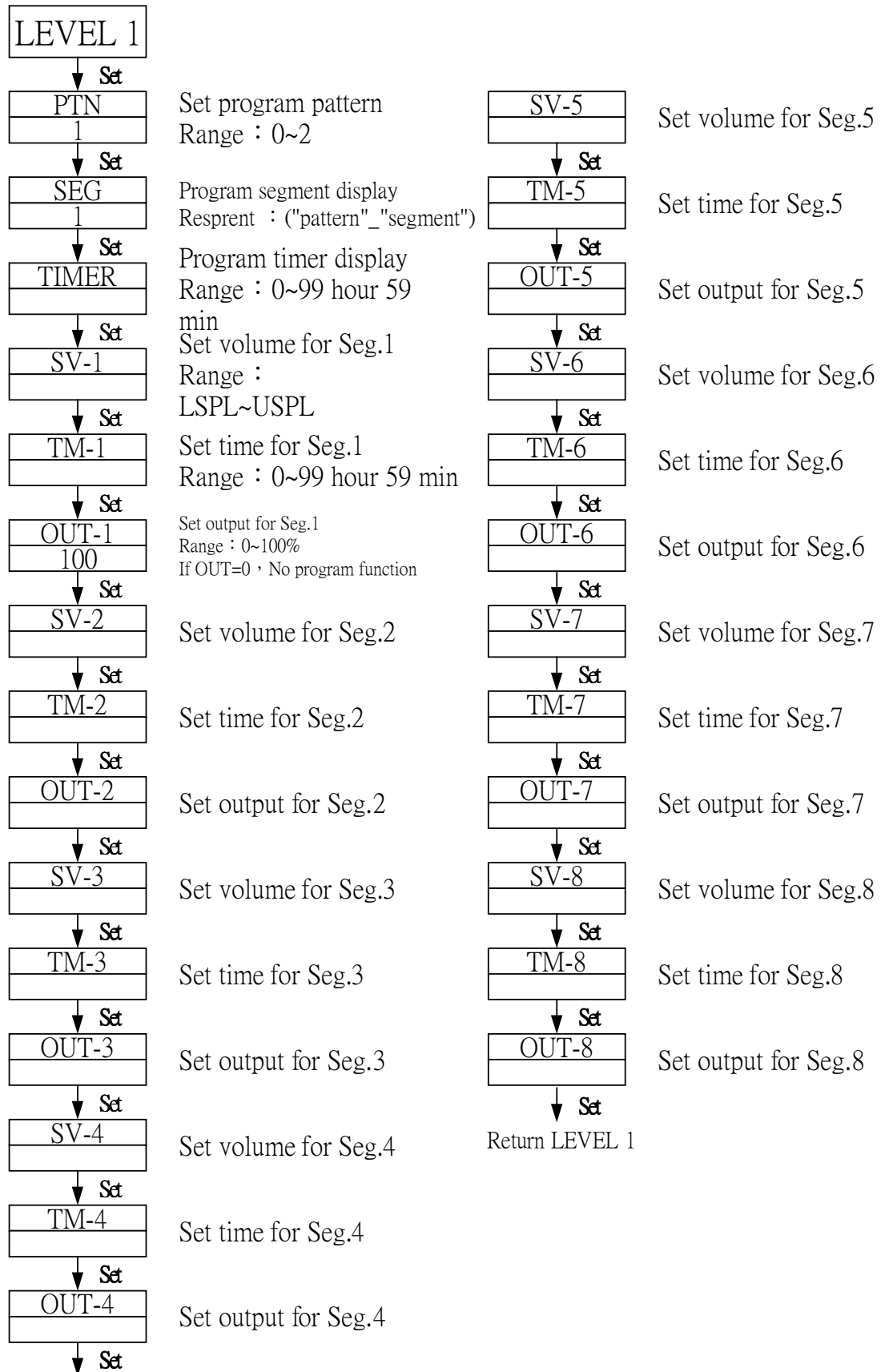
## 4.2 LEVEL 2 (PID Level)

press SET key for 5 seconds to enter Level 2

P1	Main Control	Range : 0-200%
3	Proportional Band	ON/OFF at P=0
↓		
Set		
I1	Main Control	Range : 0~3600 Sec
240	Integral Time	Integral OFF at I=0
↓		
Set		
D1	Main Control	Range : 0~900 Sec
60	Derivative Time	Derivative OFF at D=0
↓		
Set		
db 1	Main Control	Dead time compensation
0	Dead-band Time	Range : 0~1000 Sec
↓		
Set		
ATVL	Main Control	Range : 0~USPL
0	Auto tuning off-set	
↓		
Set		
CYT1	Main Control	Output (SSR=1 , 4 ~ 20mA=0 , Relay=over 10)
10	Proportional Cycle	Range : 0~150 Sec
↓		
Set		
HYS1	Main Control	For ON/OFF control only
1	Hysteresis	Range : 0~1000
↓		
Set		
P2	Sub Control	Sames as P1
3	Proportional Band	
↓		
Set		
I2	Sub Control	Sames as I1
240	Integral Time	
↓		
Set		
D2	Sub Control	Sames as D1
240	Derivative Time	
↓		
Set		
CYT2	Sub Control	Sames as CYT1
10	Proportional Cycle	
↓		
Set		
HYS2	Sub Control	Sames as HYS1
1	Hysteresis	
↓		
Set		
GAP1	Main Control	For 2 output use only , set the volume turning.
0	Gap (Output 1)	"OFF" early to SV
↓		
Set		
GAP2	Sub Control	For 2 output use only , set the volume turning.
0	Gap (Output 2)	"ON" early to SV
↓		
Set		
LCK	Function Lock	
0000		
↓		
Set		
Return P1		

LCK=0000 , To enter any Level ( not include SET Level) and change their parameters  
 LCK=1111 , To enter any Level (include SET Level) and change their parameters  
 LCK=0100 , To enter Level 1 & 2 and to change their parameters.  
 LCK=0110 , To enter Level 1 & 2 and to change Level 1 parameters only.  
 LCK=0001 , To enter Level 1 only and to change SV only.  
 LCK=0101 , it can't change any parameter except LCK.

## 4.5 PROGRAM LEVEL (to be ordered)



4.5.1 This program has 2 patterns , each pattern contains 8 segments. The segment can be arranged a period of Ramp status or Soak status.

#### 4.5.2 Terminologies

**pattern** : A program consists of some steps.

**Step** : A Ramp status + a Soak status.

**Ramp status** : The status with changing SV.

**Ramp status** : The status with fixed SV.

#### 4.5.3 Operating

##### 1. "KEY" function(no changing parameter)

△ (START) : To start program procedure , **PRO** in panel flicker.

▽ (WAIT) : To suspend program procedure , **PRO** in panel will stop flicker but light.

△ + **SET**(JUMP) : To to jump segment.

▽ + **SET** (RESET) : To reset program procedure , **PRO** in panel will be "off".

##### 2. Alarm Function :

If **ALD1** to be set "07"(\* refer to the selection , p.14~15) ,

**AL1** to be set "2"(AL1=2 , it means alarm in segment 2 end) ,

**ALT1** to be set "00.10"(alarm time 10 sec.).

\* In this case , when program proceeds to segment 2 end , **ALM1** relay will be on 10 sec.

##### 3. END function :

If **ALD** to be set "17"(refer to the selection , p.14~15) , This program will be end in segment 8 or 16.

\* In this case , **PV** and **END** will flicker in display window and the alarm relay acts.

This controller doesn't have END order if program procedure are less than 8 segments. In this case , please set segment's out = 0. then this program will be end in last set segment. Otherwise , it will proceed 8 or 16 segments.

##### 4. Linking Function :

**PTN**=1 proceed pattern 1 , contains 8 segments.

**PTN**=2 proceed pattern 2 , contains 8 segments.

**PTN**=0 linking proceed pattern 1 and 2 totally 16 segments.(set **PTN1** and **PTN2** at first , then set **PTN**=0)

##### 5. Other function(\* refer to LEVEL 4)

**SET** 8.1=1 program repeat.

**SET** 8.2=0 No power fail function.

<i><b>TYPE</b></i>	<i><b>CODE</b></i>	<i><b>RANGE</b></i>
<b>K</b>	<b>K1</b>	0.0 ~ 200.0°C / 0.0 ~392.0°F
	<b>K2</b>	0.0 ~ 400.0°C / 0.0 ~752.0°F
	<b>K3</b>	0 ~ 600°C / 0 ~1112°F
	<b>K4</b>	0 ~ 800°C / 0 ~1472°F
	<b>K5</b>	0 ~ 1000°C / 0 ~1832°F
	<b>K6</b>	0 ~ 1200°C / 0 ~2192°F
<b>J</b>	<b>J1</b>	0.0 ~ 200.0°C / 0.0 ~392.0°F
	<b>J2</b>	0.0 ~ 400.0°C / 0.0 ~752.0°F
	<b>J3</b>	0 ~ 600°C / 0 ~1112°F
	<b>J4</b>	0 ~ 800°C / 0 ~1472°F
	<b>J5</b>	0 ~ 1000°C / 0 ~1832°F
	<b>J6</b>	0 ~ 1200°C / 0 ~2192°F
<b>R</b>	<b>R1</b>	0 ~ 1600°C / 0 ~2912°F
	<b>R2</b>	0 ~ 1796°C / 0 ~3216°F
<b>S</b>	<b>S1</b>	0 ~ 1600°C / 0 ~2912°F
	<b>S2</b>	0 ~ 1796°C / 0 ~3216°F
<b>B</b>	<b>B1</b>	0 ~ 1820°C / 0 ~3308°F
<b>E</b>	<b>E1</b>	0 ~ 800°C / 0 ~1472°F
	<b>E2</b>	0 ~ 1000°C / 0 ~1832°F
<b>N</b>	<b>N1</b>	0 ~ 1200°C / 0 ~2192°F
	<b>N2</b>	0 ~ 1300°C / 0 ~2372°F
<b>T</b>	<b>T1</b>	-199.9 ~ 400.0°C / -199.9 ~752.0°F
	<b>T2</b>	-199.9 ~ 200.0°C / -199.9 ~392.0°F
	<b>T3</b>	0.0 ~ 350.0°C / 0.0 ~662.0°F
<b>W</b>	<b>W1</b>	0 ~ 2000°C / 0 ~3632°F
	<b>W1</b>	0 ~ 2320°C / 0 ~2372°F
<b>PL II</b>	<b>PL 1</b>	0 ~ 1300°C / 0 ~2372°F
	<b>PL 2</b>	0 ~ 1390°C / 0 ~2534°F
<b>U</b>	<b>U1</b>	-199.9 ~ 600.0°C / -199.9 ~999.9°F
	<b>U2</b>	-199.9 ~ 200.0°C / -199.9 ~392.0°F
	<b>U3</b>	0.0 ~ 400.0°C / 0.0 ~752.0°F



<b>TYPE</b>	<b>CODE</b>	<b>RANGE</b>
<b>L</b>	<b>L1</b>	0 ~ 400°C / 0 ~ 752°F
	<b>L2</b>	0 ~ 800°C / 0 ~ 1472°F
<b>JIS PT100</b>	<b>JP 1</b>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<b>JP 2</b>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<b>JP 3</b>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<b>JP 4</b>	0 ~ 200°C / 0 ~ 392°F
	<b>JP 5</b>	0 ~ 400°C / 0 ~ 752°F
	<b>JP 6</b>	0 ~ 600°C / 0 ~ 1112°F
<b>DIN PT100</b>	<b>DP 1</b>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<b>DP 2</b>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<b>DP 3</b>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<b>DP 4</b>	0 ~ 200°C / 0 ~ 392°F
	<b>DP 5</b>	0 ~ 400°C / 0 ~ 752°F
	<b>DP 6</b>	0 ~ 600°C / 0 ~ 1112°F
<b>JIS PT50</b>	<b>JP.1</b>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<b>JP.2</b>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<b>JP.3</b>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<b>JP.4</b>	0 ~ 200°C / 0 ~ 392°F
	<b>JP.5</b>	0 ~ 400°C / 0 ~ 752°F
	<b>JP.6</b>	0 ~ 600°C / 0 ~ 1112°F
<b>AN1</b>	<b>AN1</b>	-10 ~ 10mV / -1999~9999
<b>AN2</b>	<b>AN2</b>	0 ~ 10mV / -1999~9999
<b>AN3</b>	<b>AN3</b>	0 ~ 20mV / -1999~9999
<b>AN4</b>	<b>AN4</b>	0 ~ 50mV / -1999~9999
<b>AN5</b>	<b>AN5</b>	10 ~ 50mV / 1999~9999

\* The initial set in factory is "K2" without any certain requirement

## 6. ALARM

### 6.1 Alarm function selection

<b><i>CODE</i></b>	<b><i>DESCRIPTION</i></b>	<b><i>INHIBIT</i></b>
<b>00 / 10</b>	None	
<b>01</b>	Deviation high limit alarm	<b>YES</b>
<b>11</b>	Deviation high limit alarm	<b>NO</b>
<b>02</b>	Deviation low limit alarm	<b>YES</b>
<b>12</b>	Deviation low limit alarm	<b>NO</b>
<b>03</b>	Deviation high / low limit alarm	<b>YES</b>
<b>13</b>	Deviation high / low limit alarm	<b>NO</b>
<b>04 / 14</b>	Deviation high / low limit range alarm	<b>NO</b>
<b>05</b>	Absolute value high limit alarm	<b>YES</b>
<b>15</b>	Absolute value high limit alarm	<b>NO</b>
<b>06</b>	Absolute value low limit alarm	<b>YES</b>
<b>16</b>	Absolute value low limit alarm	<b>NO</b>
<b>07</b>	Segment end alarm (use for program only)	-
<b>17</b>	Program end alarm (use for program only)	-
<b>08</b>	System error alarm-on	-
<b>18</b>	System error alarm-off	-
<b>09</b>	Heater break alarm-on (single phase)	-
<b>19</b>	On delay timer alarm	-

**Note :** the word “**INHIBIT**” means that alarm does not work at the first time.

## 6.2 Alarm action description

▲ : SV

△ : Alarm set value  
(inhibit means alarm doesn't work at the first time)

00 10	<b>Non</b>
01	<b>Deviation high alarm inhibit</b> 
11	<b>Deviation high alarm no inhibit</b> 
02	<b>Deviation low alarm inhibit</b> 
12	<b>Deviation low alarm no inhibit</b> 
03	<b>High low alarm inhibit</b> 
13	<b>High low alarm no inhibit</b> 
04 14	<b>Band alarm</b> 
05	<b>Absolute high alarm inhibit</b> 

15	<b>Absolute high alarm no inhibit</b> 
06	<b>Absolute low alarm inhibit</b> 
16	<b>Absolute low alarm no inhibit</b> 
07	<b>Segment end alarm (use for program only)</b> (1) ALD1~3 , set 07 (2) AL1~3=alarm segment No.set (3) ALT1~3 if set 0=flicker alarm ALT1~3 if set 99.59=continued alarm ALT1~3 if set others=ON delay time
17	<b>Program end alarm (use for program only)</b> 
08	<b>System error alarm - ON</b> 
18	<b>System error alarm - OFF</b> 
09	
19	<b>On delay timer</b> When PV=alarm SV , it keeps a certain period(set time)before alarm action. Range:00H.00M~99H.59M