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DIGITAL TEMPERATURE CONTROLLER

MiSUMi
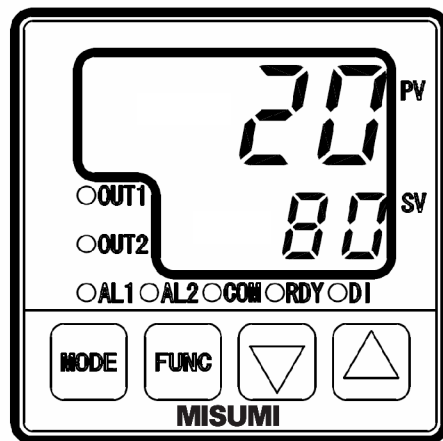
Thank you for purchasing Digital Temperature Controller. Please go through this Instruction Manual carefully and use the unit in proper manner.

NOTICE/WARNING BEFORE OPERATION USE

The following symbol ⚠ is provided to prevent incident or damage. Kindly refer to the details of the WARNING/CAUTION when using for the first time.

⚠	WARNING	Due to mishandling, serious dangers may occur to the operator such as death, electrocution and a skin burn.
⚠	CAUTION	Due to mishandling, it may cause some damage to the unit or the operator getting slight injury.

⚠ WARNING
Make sure the correct wiring connection before turning on electricity. Miss-Wiring may cause malfunction of the unit and fire. Never modify the unit to prevent damage or incident such as malfunction and fire etc.

⚠ CAUTION
For prevention of its malfunction, do not push the front key with sharp points. Spare terminal must not be used for other purposes.

Please put this user's manual aside for your reference, when operating the unit.
Copy or reprint of this manual, wholly or partially, is not allowed.
The contents of this manual may change without notice in future.

OPERATING ENVIRONMENT

Never use in the following environments. It may cause fire and break the wire.
1   Around explosive gases, inflammable gases or corrosive gases
2   In either sunshine or ambient temperature (above 50) remarkably increases
3   In very low ambient temperature (below 0), such as outdoors in cold areas
4   In very high humidity (85%RH or higher)
5   Around splashing of water or chemicals
6   Under severe vibration or shocks
7   Around dust, iron powder, black smoke
8   Around external noise, induction trouble, vibration, large shocks, and others such that can have damaging effects to the electric circuit.
9   Under violent temperature change

SPECIFICATIONS

Type	MTCTR Relay contact MTCTS SSR drive voltage
Power Supply Voltage	100 to 240V AC, 50/60Hz
Power Consumption	Below 10 VA
Memory Element	EEPROM
Input of Sensor	Thermocouple,R.T.D./0-5V,1-5V,4-20mA (Changeable by front key)
Control Output	Relay contact, SSR drive voltage, Current
Control Method	Two kinds of PID,ON/OFF
Operation Environment	0 to 50 ,20 to 90%RH(Avoid making dew)
Storage Environment	-25 to 70 ,5 to 95%RH(Avoid making dew)
Weight	Less than 180g
Location of the Unit Setting	Keep away from the followings. Gas of corrosion, dust and oily smoke. The electric noise of generator The influence of electromagnetic field. Mechanical vibration and shock. The direct sunlight.
Installation condition	Installation category

Set-up program is stored operation, as non-volatile memory, is equipped with the controllers.

Either thermocouple or R.T.D.(Pt 100/JPt100) is selectable input type, but Current/Voltage input needs to be selected individually. For suitable application, please select most appropriate input type and adjust input setup.

（Thermocouple at the time of shipment (K)）

PID or ON/OFF control is selective for the optimal perform and each detail of features is specified in the table below.

PID constants are automatically calculated and written in, when control begins or SV is altered on self-tuning.

	PID Control	ON/OFF Control
Merit	Better control result is achieved as opposed to that of ON/OFF control.	Life span of relay is generally longer, as it is ON when SV and it is OFF when temperature is over SV (For heating control).
Demerit	Life span of relay is shorter, as output exists frequently with relay contact.	Control value is worse in comparison with that of PID control.

PARTS INDICATION

PV	Process value, character for setting mode display.
SV	Setting value, input value for setting mode display.
OUT1	Lights ON when output 1 turn ON
OUT2	Lights ON when output 2 turn ON
AL1	Lights ON when Event output 1 turn ON
AL2	Lights ON when Event output 2 turn ON
COM	Flash ON and OFF when communicating. Lights ON when communication is selected as an option.

RDY	Lights ON under Ready
DI	Lights ON when DI turn ON
MODE KEY	For change of display
FUNC KEY	For action of function setting
KEY	Up down key for change of setting value. Holding the up down keys are the value at a rapid rate.
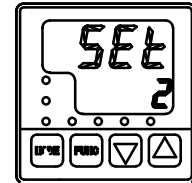
part is not used.

INSTALLTION AND WIRING

1)Outer Dimensions

Front   Packing   Case (black)   Attachment

2)Panel Cutout

60 or more

(48× No. of units 3)

A 45mm   tolerance +0.6 -0

3)Wiring

EV2 (For alarm)

Relay output 250V AC   2.4A(Load resistance)

EV1 (For alarm)

Relay output
250V AC, 2.4A
(Load resistance)

OUT1

Relay output
250V AC, 3A
(Load resistance)

SSR drive voltage
12VDC output

Sensor Input

b
B
A

RTD   TC

POWER ON

100V to 240V AC 50/60Hz 10VA
(NO polarity)
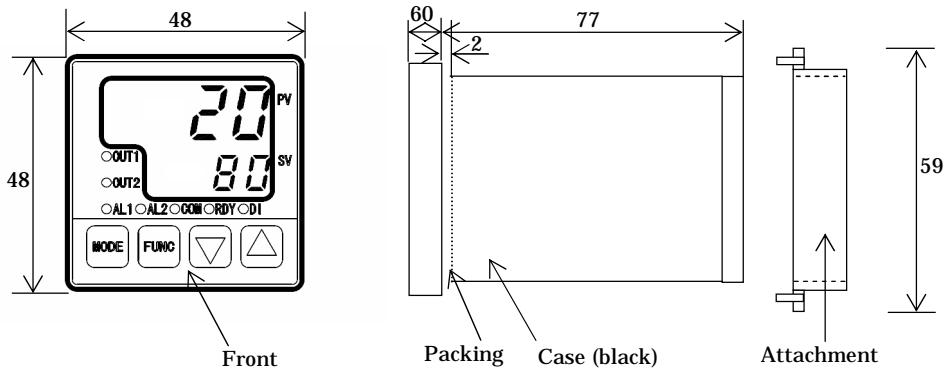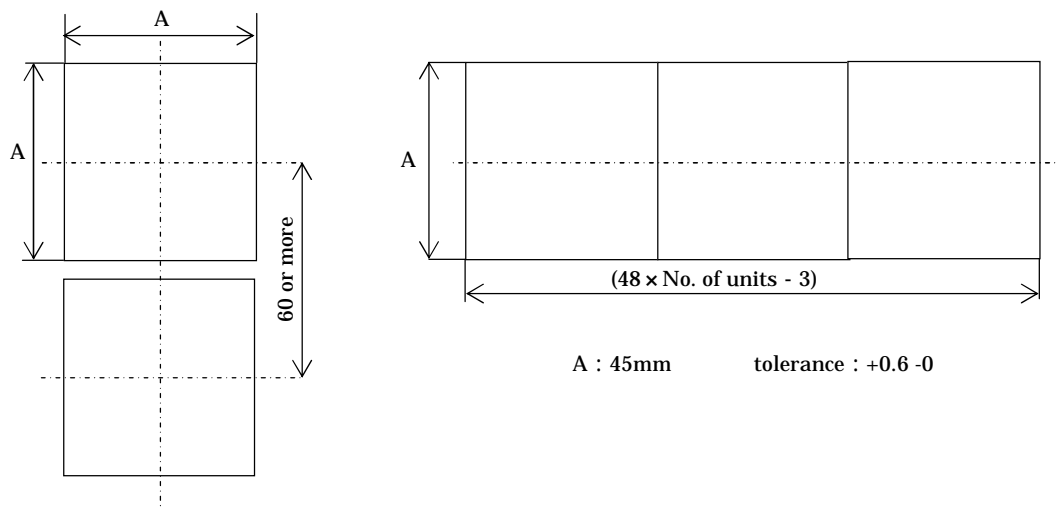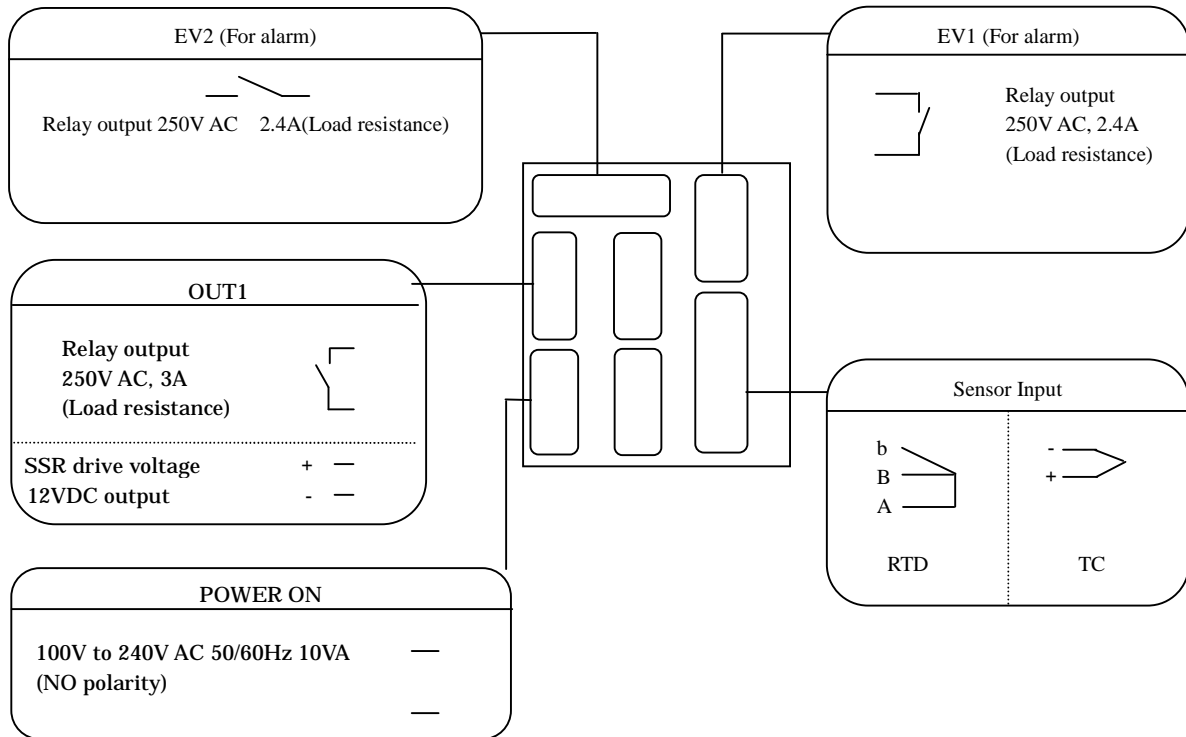
⚠️ | **CAUTION**

For prevention of electric shock, please connect wiring only after turning power off and don't touch the terminal part when powered on.

PRECAUTIONS ON WIRE CONNECTION

1) When connecting wires, be sure to turn off the power supply in advance, or electric shock may result.
2) This unit will not perform control operation for approx. 4 seconds after turning on the power. Note this point when using the unit as an interlock circuit, because no output is issued during this period.
3) Use the crimping terminal for wire connection that fits M3.5 thread.
   (Tighten the wire directly at the center portion)
4) Use wire with line resistance 5   or lower (per line) for connection between the temperature measuring resistor and the temperature controller, and use the specified compensation copper wire or strand itself for connection between the thermocouple and temperature controller.
5) When using the unit in the vicinity of a noise source, use shielded wire. Do not lay input and output lines together in the same duct or conduit tube.
6) Separate the input and output signal lines 50 cm or more from the power supply line and load line.

SET-UP PARAMETERS BEFORE USAGE

Follow the instructions below to set-up parameters

*If advanced set-up is required, refer to "Operation Flow and Setting" screen.

		Parameter No
1	Refer to [Table1.Input Sensor Selection/Setting Range] and set to the input settings of the sensor you are using (Refer to Default settings)	SET1 2. Input type setting

2	Set Yes/No of decimal requirements. (Refer to Default settings)	SET1 6. Position of decimal point

3	Refer to "Caution before Flow" and set the control alternatives available for Output 1. Recommended settings Main Unit: SSR output PID Control Main Unit: Relay contact output ON-OFF control(Refer to Default settings)	SET2 13. Selection of control type setting

4	Set according to Heating control (0:Reverse) or -Cooling Control(1:Normal) (Refer to Default settings)	SET2 14. Change of normal or reverse

5	If alarm output is required, set Upper and Lower limit setting values. Refer to "Alarm Operating Range" table shown on P5. The Alarm Operating Range compares the measured value and present value to turn the event on or off. It is effective for monitoring abnormalities or starting/stopping of other systems.	SET3 38. SET4 48. Function setting for EV 1 Function setting for EV 2 (Refer to Ex.5.)

6	Set	Operate mode display Primary displays

7	Set (Auto Tuning) *When using PID control
	Default values are pre-set for PID. Default values can be used, but in order to stabilize controls, please perform AT.
	AT Calculations depend on the kind of control.
	    Select 1, and press FUNC key to start AT.
	    Press the FUNC key once more during operation to stop. (Refer to Default settings)
		SET2 16 Setting for PID tuning type

8	Other
	    Check each movement. (Stable temperature/Alarm)
	    Setting of mis-operation(SV limiter/ Keylock)	

Table1 To select input sensors and setting range.			(unit:)
Symbol	Low limit High limit	0.0Setting	
00: K Thermocouple	-200 1372	-199.9 990.0	
01: J	-200 850	-199.9 850.0	
02: R	0 1700		
03: T	-200 400	-199.9 390.0	
04: N	-200 1300	-199.9 990.0	
05: S	0 1700		
06: B	0 1800		
10: Rt100	-199 500	-199.9 500.0	
11: JPt100	-199 500	-199.9 500.0	

Setting of shipment	
SET1 2. Input type setting	00 K Thermocouple
SET1 6. Position of decimal point	0 Not required
SET2 14. Change of normal or reverse	0 Reverse
SET3 38. SET4 48. Function setting for EV 1 Function setting for EV 2	 00 None 00 None
SET2 16 Setting for PID tuning type	 1 Auto-tuning output 1

ALARM OPERATING RANGE

Deviation high and low limit	AL1L AL1H	Absolute value high and low limit	AL1H / AL1L / 0
Deviation high limit	AL1H	Absolute value high limit	AL1H / 0
Deviation low limit	AL1L	Absolute value low limit	AL1L / 0
Deviation high and low limit range	AL1L AL1H	Absolute value high and low limit range	AL1H / AL1L / 0

Position of Setting value   AL1L:Lower limit setting value   AL1H:Upper limit setting value

Event ON area

* The above alarm settings (AL1L, AL1H) apply for when positive values are set.

How to release BLIND Function

1. Power ON
Automatically

```
_  I  n  P
   0 0
```
taking 4 sec

2. Initial Display
Automatically

```
Process value
Setting value
```

3. Operation Mode
Press MODE Key (10sec)

```
S  E  t
```
→
```
_  C  k  F
      o C
```

4. Immediately after the "Blink", press FUNC Key, and quickly press MODE Key.

```
_  S  u  1
      o n
```
←
```
_  C  k  F
      o C
```
(Blink once)

5. Press   MODE Key (3 sec)

```
S  E  t  1     **1
      o n
```

6. Press   UP Key ( )for 1   7

```
S  E  t  7     **2
      o F F
```

7. Press FUNC Key
8. Power OFF

```
S  E  t  7     **3
      o n
```

9. Power ON

```
_  I  n  P
   0 0
```
taking 4 sec

10. Initial Display
Automatically

```
Process value
Setting value
```

**1 Please select an appropriate character (eg. Timer Setting etc) being of BLIND Function effect for the demanding release.

11. TIMER Setting Mode
(OPERATION Mode)

```
S  E  t
      1
```

12. Press UP Key ( )
for 1   7

```
S  E  t
      7
```

**2 Character selected for TIMER Setting.

**3 BLIND Function for "SELECTION DISPLAY (Timer Setting Mode)" is released.

13. Go on TIMER Setting
Press MODE Key consecutively

Power ON

Shows for 4 seconds
(Warming up)

Operate mode display

A. Primary displays

| Process value | PV | Set the temperature |
| Setting value | SV | required |

MODE key

B. Priority displays. Refer to Ex.1.

SET0: Priority displays by setting and shows max.9 displays by setting.

MODE key, return to A

FUNC key

FUNK key operates on the selected setting mode 7. Refer to Ex.2.

Press MODE key more than 2 seconds

Setting mode

Ex.1. Priority displays & its setting

This function is to shift the most essential screens on setting mode into operation mode as a priority. Please select priority displays through priority display setting.

eg   Basic display → Output 1 manipulated value

→ Setting high limit for event Output 1

Screen is shifted when pressing mode key each time.

Ex.3. To select PID

Feature of type A and B

| Type A | Ordinary PID |
| Type B | Over shoot protection PID |

If control is unstable under self-tuning, please change to type A or B and also to ON/OFF-control.

Ex.2. FUNC key work

This function is to enable FUNC key to use as a specific key, for the following actions selected in FUNC key setting belonged to setting mode.
1. Digit shift
    Setting digit shift is enabled when setting value is changed.
2. RUN/READY
Control stop (READY) and control performance (RUN) are alternately switched every FUNC key is pressed. (READY lamp is ON during control stop)
3. Auto-Tuning (AT)
AT starts instantly after pressing FUNC key. (Start/Reset operation is available, each time FUNC key is pressed)
4. Timer
Available for start/reset.

Ex.4. ARW

Anti-reset wind-up take effect for overshooting by over-integral of PID control action.

    ARW controls integral action (PV accords with SV).
    If integral value goes down, it takes effects.
    If integral value is set "0", it stops integral action.

SET1 Initial Setting

1.Initial Setting display

PV	Initial setting mode
1 SV	Calling display

↓ MODE key

2.Input type setting

InP PV	Select input type
00 SV	Refer to Table 1.

↓ MODE key

3.PV correction gain

PuG PV	When measurement value comes an error,set the correction value(Multiplication)
1.00 SV	

↓ MODE key

4.Zero point setting for PV correction

PuS PV	When measurement value comes an error,set the correction value(Addition)
1.00 SV	

↓ MODE key

5.Filter input

PdF PV	CR filter effect is operational on software when making first-order lag operation to process value(PV)
1 SV	

↓ MODE key

6.Position of decimal point

dP PV	
0 SV	

Thermocouple/R.T.D(Pt100,JPt100)

SV	0	Not required
SV	0.0	Required

↓ MODE key

7.FUNK key setting(Refer to Ex.2)

FU PV	Selectable below functions
0 SV	

SV	0	None
SV	1	Change of digit
SV	2	RUN/READY
SV	3	Auto-Tuning
SV	4	Timer

↓ MODE key

8.Key lock setting

LoC PV	Key lock setting for protection of error operation. Selectable below functions
0 SV	

SV	0	None
SV	1	All lock (Not available)
SV	2	Operation mode lock only
SV	3	Except operation mode

↓ MODE key (return to 1)

↓ MODE key

16.Setting for PID tuning type

tun PV	Tunes suitably setting value
1 SV	

SV	1	Auto-tuning output 1
SV	2	Self-tuning output 1
SV	3	Auto-tuning output 2
SV	4	Self-tuning output 2
SV	5	Auto-tuning output 1.2

Auto-tuning : Select above 1 3 or 5 and press FUNC key once. Call off autotuning : press FUNC key once on operating.

↓ MODE key

17.AT coefficient setting

AtG PV	Coefficient is multiplied by proportional band value computed at auto-tuning.
1.0 SV	

↓ MODE key

18.AT sensitivity setting

AtC PV	Sensitivity is set up during ON/OFF control at auto-tuning,particulary when PV is fairly unstable.
2.0 SV	

↓ MODE key

19.Proportional band setting for output 1

P1 PV	Adjusts proportional band for output 1(%per SLL SLH)
3.0 SV	

↓ MODE key

20.Integral time setting

I PV	Adjusts integral time
0 SV	0 3600(second)

↓ MODE key

21.Deviative time setting

d PV	Adjusts deviative time
0 SV	0 3600(second)

↓ MODE key

22.Proportional cycle setting for output 1

t1 PV	Adjusts proportional cycle time 1 120(second)
20 SV	

↓ MODE key

23.ARW setting (see Ex.4)

Arw PV	Adjusts ARW by %0.0 100.0 (-10.0 110.0%)
100.0 SV	

↓ MODE key (go to 24)

SET2 Control Setting

key

9.Initial Setting display

PV	Control setting mode
2 SV	Calling display

↓ MODE key

10.High limit setting in SV limiter

SLH PV	Display of high limit setting of setting value. (Within setting range of Table 1)
1200 SV	

↓ MODE key

11.Low limit setting in SV limiter

SLL PV	Display of low limit setting of setting value. (Within setting range of Table 1)
0 SV	

↓ MODE key

12.Key lock setting

Md PV	Usable for control mode setting
run SV	

SV	run	Control performance
SV	rdy	Non-control performance (Manipulated value low limiter output)
SV		Manual control

↓ MODE key

13.Selection of control type setting

Cnt PV	Selectable and switchable below control modes.
113 SV	

SV 0.1.3

PID (Refer to Ex.3)	Control output 1	Control output 2
0 Type A	1 PID	0 None
1 Type B	2 ON/OFF	1 PID
		2 ON/OFF
		3 Event output

↓ MODE key

14.Change of normal or reverse

dlr PV	Switchable below control output actions.
0 SV	

SV	rdy	0 Reverse (Heating)
		1 Normal (Cooling)

↓ MODE key

15.Manipulated value for output 1 (%)

Mu1 PV	Shows process manipulated value for output 1, and setting the value on manual control. Display range : 0.0 100.0% (-10.0 110.0%) Setting range : Manipulated value low/hige limiter
SV	

24.High limit setting of manipulated value for output 1

MH1 PV	For setting of manipulated high limit value.(output 1) (%)
100.0 SV	

↓ MODE key

25.Low limit setting of manipulated value for output 1

ML1 PV	For setting of manipulated low limit value.(output 1) (%)
SV	

↓ MODE key

31.Manual reset setting

Pbb PV	For Shifting proportional band.
SV	

↓ MODE key (return to 9)

When select ON/OFF Control

33.Contorol sensitivity setting for output 1

C1 PV	Adjusts control snsitivity of ON/OFF control for output 1.
SV	

↓ MODE key

34.OFF position setting for output 1

CP1 PV	For setting OFF position of control output 1.
0 SV	

↓ MODE key (return to 9)

SET3 Event Output 1

key

37.Event output 1 Setting

PV	EV 1 setting mode Calling display
3 SV	

↓ MODE key

38.Function setting for EV 1

E1F PV	Select below functions.
00 SV	

PV Event functions

0	None
1	Deviation high and low limit
2	Deviation high limit
3	Deviation low limit
4	Deviation high and low limit range
5	Absolute value high and low limit
6	Absolute value high limit
7	Absolute value low limit
8	Absolute value high and low limit range

Additional Event functions

0	None
1	EV output hold
2	Stand-by sequence
3	EV output hold & stand-by sequence

↓ MODE key

39.High limit setting for EV 1

E1H PV	Set high limit value.
00 SV	

↓ MODE key

40.Low limit setting for EV 1

E1L PV	Set low limit value.
0 SV	

↓ MODE key

41.Control sensitivity setting for EV 1

E1C PV	Set sensitivity when required ( ).
0 SV	

↓ MODE key

42.Delay timer setting for EV 1

E1t PV	Set delay timer when required (sec).
0 SV	

↓ MODE key

43.Abnormal for EV 1

E1b PV	For outbreak of sensor and heater abnormal
00 SV	

Type

0	None
1	PV abnormal (sensor break)
2	Heater abnormal
3	PV + Heater abnormal

Action

0	None
1	Hold (Power reset)

↓ MODE key

44.Polarity setting for EV 1

E1P PV	Normal open/close is selectable while event output is ON.
0 SV	

SV	0	Normal open
SV	1	Normal close

↓ MODE key (return to 37)

SET4 Event Output 2

key → 47.Event output 2 Setting

	PV	EV 2 setting mode Calling display
4	SV	

↓ MODE key

48.Function setting for EV 2

E2F	PV	Select below functions.
00	SV	

PV Event functions
0 None
1 Deviation high and low limit
2 Deviation high limit
3 Deviation low limit
4 Deviation high and low limit range
5 Absolute value high and low limit
6 Absolute value high limit
7 Absolute value low limit
8 Absolute value high and low limit range

Additional Event functions
0 None
1 EV output hold
2 Stand-by sequence
3 EV output hold & stand-by sequence

↓ MODE key

49.High limit setting for EV 2

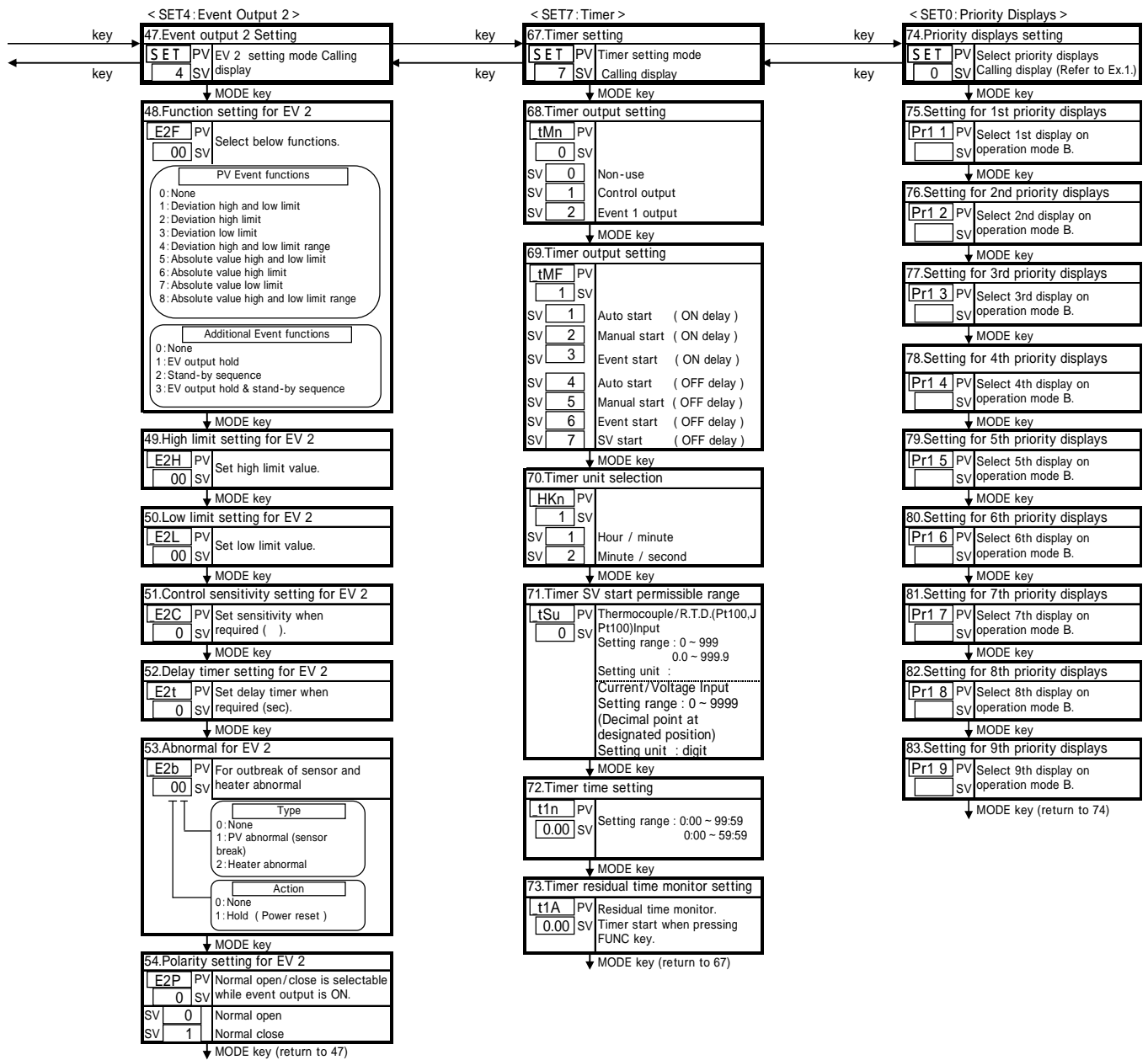| E2H	PV	Set high limit value.
00	SV	

↓ MODE key

50.Low limit setting for EV 2

E2L	PV	Set low limit value.
00	SV	

↓ MODE key

51.Control sensitivity setting for EV 2

E2C	PV	Set sensitivity when required ( ).
0	SV	

↓ MODE key

52.Delay timer setting for EV 2

E2t	PV	Set delay timer when required (sec).
0	SV	

↓ MODE key

53.Abnormal for EV 2

E2b	PV	For outbreak of sensor and heater abnormal
00	SV	

Type
0 None
1 PV abnormal (sensor break)
2 Heater abnormal

Action
0 None
1 Hold (Power reset)

↓ MODE key

54.Polarity setting for EV 2

E2P	PV	Normal open/close is selectable while event output is ON.
0	SV	

SV	0	Normal open
SV	1	Normal close

↓ MODE key (return to 47)

SET7 Timer

key → 67.Timer setting

	PV	Timer setting mode Calling display
7	SV	

↓ MODE key

68.Timer output setting

tMn	PV	
0	SV	

SV	0	Non-use
SV	1	Control output
SV	2	Event 1 output

↓ MODE key

69.Timer output setting

tMF	PV	
1	SV	

SV	1	Auto start (ON delay)
SV	2	Manual start (ON delay)
SV	3	Event start (ON delay)
SV	4	Auto start (OFF delay)
SV	5	Manual start (OFF delay)
SV	6	Event start (OFF delay)
SV	7	SV start (OFF delay)

↓ MODE key

70.Timer unit selection

HKn	PV	
1	SV	

SV	1	Hour / minute
SV	2	Minute / second

↓ MODE key

71.Timer SV start permissible range

tSu	PV	Thermocouple/R.T.D.(Pt100,JPt100)Input
0	SV	Setting range : 0 999

Setting range : 0 999
0.0 999.9
Setting unit :
Current/Voltage Input
Setting range : 0 9999
(Decimal point at designated position)
Setting unit : digit

↓ MODE key

72.Timer time setting

t1n	PV	Setting range : 0.00 99.59
0.00	SV	0.00 59.59

↓ MODE key

73.Timer residual time monitor setting

t1A	PV	Residual time monitor. Timer start when pressing FUNC key.
0.00	SV	

↓ MODE key (return to 67)

SET0 Priority Displays

key → 74.Priority displays setting

	PV	Select priority displays Calling display (Refer to Ex.1.)
0	SV	

↓ MODE key

75.Setting for 1st priority displays

Pr1 1	PV	Select 1st display on operation mode B.
	SV	

↓ MODE key

76.Setting for 2nd priority displays

Pr1 2	PV	Select 2nd display on operation mode B.
	SV	

↓ MODE key

77.Setting for 3rd priority displays

Pr1 3	PV	Select 3rd display on operation mode B.
	SV	

↓ MODE key

78.Setting for 4th priority displays

Pr1 4	PV	Select 4th display on operation mode B.
	SV	

↓ MODE key

79.Setting for 5th priority displays

Pr1 5	PV	Select 5th display on operation mode B.
	SV	

↓ MODE key

80.Setting for 6th priority displays

Pr1 6	PV	Select 6th display on operation mode B.
	SV	

↓ MODE key

81.Setting for 7th priority displays

Pr1 7	PV	Select 7th display on operation mode B.
	SV	

↓ MODE key

82.Setting for 8th priority displays

Pr1 8	PV	Select 8th display on operation mode B.
	SV	

↓ MODE key

83.Setting for 9th priority displays

Pr1 9	PV	Select 9th display on operation mode B.
	SV	

↓ MODE key (return to 74)

(Display)	(Description)	(Trouble Shooting)
	Shown whenever input value exceeds the high limit of display range. Also display when the wire thermocouple, ABb-terminal of R.T.D is snapped off.	Check the snapping of thermocouple and R.T.D. input.
	Shown whenever input value exceeds the low limit of display range.	Check short circuit of input lines between A-B and A-b R.T.D.
E r r 0	Display of memory error.	In case this indication shows after the re-input of power, replace unit if it persists.
E r r 1	Display of A/D converter error or incorrect sensor connection with selectable input.	Ditto
E r r 2	Display of auto-tuning error.	Check sensor connection or change to other tuning.
L o C	Display when parameter is changed in key-lock condition.	Discontinue to change parameter.
A t	Alternately this SV/PV display are shown.	Normality
S u 2	Display when setting value is changed on SV2 control.	Discontinue to change setting value (during control of SV2)
d I	Display when changing setting value of shift on DI.	Discontinue to change setting value of the self on digital input
F U n K	Display when making setting value change in control display while function key is on RUN/READY.	Discontinue to change setting value
t I M E	Display when altering setting value in control display while being on timer.	Discontinue to change setting value of the self on digital input

MEMO

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