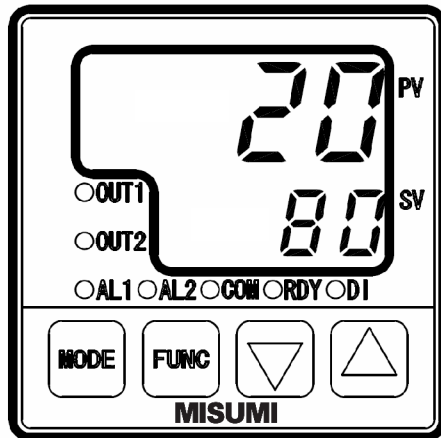


MTCTR/MTCTS


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	
<p>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.</p>		

	CAUTION	
<p>For prevention of its malfunction, do not push the front key with sharp points. Spare terminal must not be used for other purposes.</p> <ul style="list-style-type: none"> • 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	<p>Keep away from the followings.</p> <ul style="list-style-type: none"> • Gas of corrosion, dust and oily smoke. • The influence of electromagnetic field. • The direct sunlight. • The electric noise of generator • Mechanical vibration and shock.
Installation condition	Installation category

CAUTION BEFORE CONTROL

- 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.

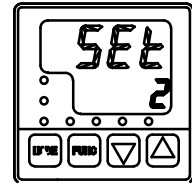
PID constants are automatically calculated and written in, when control begins or SV is altered on self-tuning.

	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.

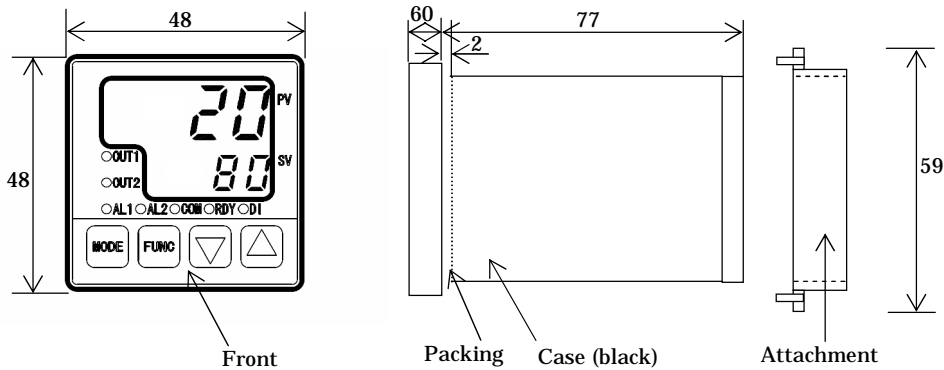
RDY	Lights ON under Ready
DI	Lights ON when DI turn ON
MODE KEY	For change of display
FUNC KEY	For action of function setting
KEY	Up down key for change of setting value. Holding the up down keys are the value at a rapid rate.



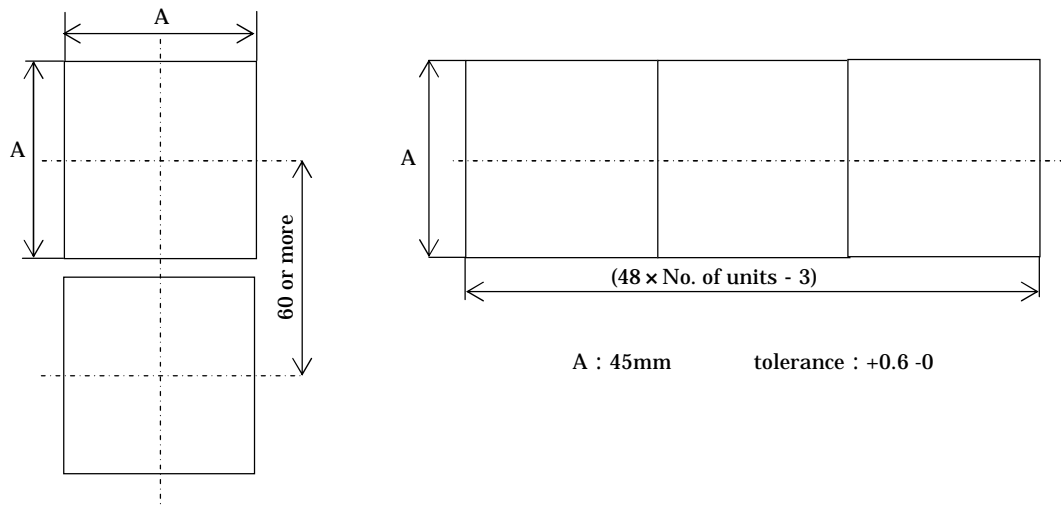
part is not used.

INSTALLTION AND WIRING

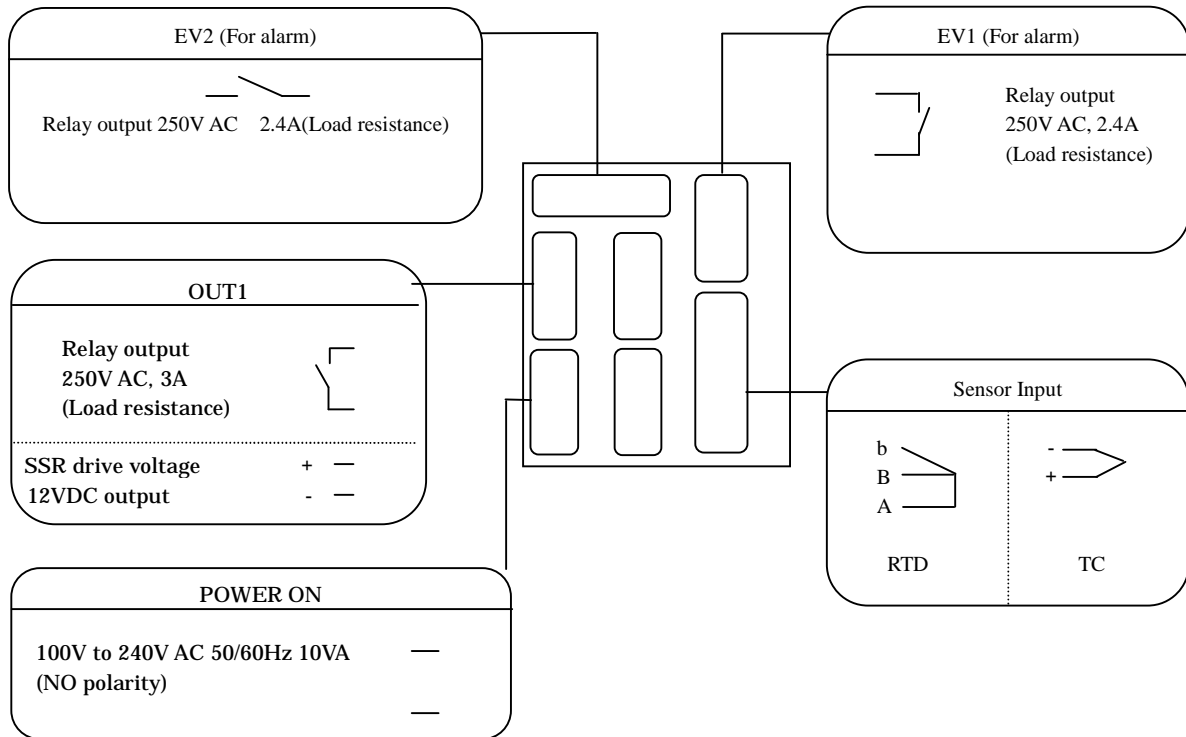
1)Outer Dimensions



2)Panel Cutout



3)Wiring



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 Ω 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 S V	Operate mode display Primary displays
7	Set A T (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)	

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		Absolute value high and low limit	
Deviation high limit		Absolute value high limit	
Deviation low limit		Absolute value low limit	
Deviation high and low limit range		Absolute value high and low limit range	

: 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

1

→

_ 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
5. Press MODE Key (3 sec)

S E t 1

o n

**1 (Blink once)
6. Press UP Key () for 1 7

S E t 7

o F F

**2
7. Press FUNC Key

S E t 7

o n

**3
8. Power OFF
9. Power ON

_ I n P

0 0

taking 4 sec
10. Initial Display
Automatically

Process value

Setting value
11. TIMER Setting Mode
(OPERATION Mode)

S E t

1
12. Press UP Key ()
for 1 7

S E t

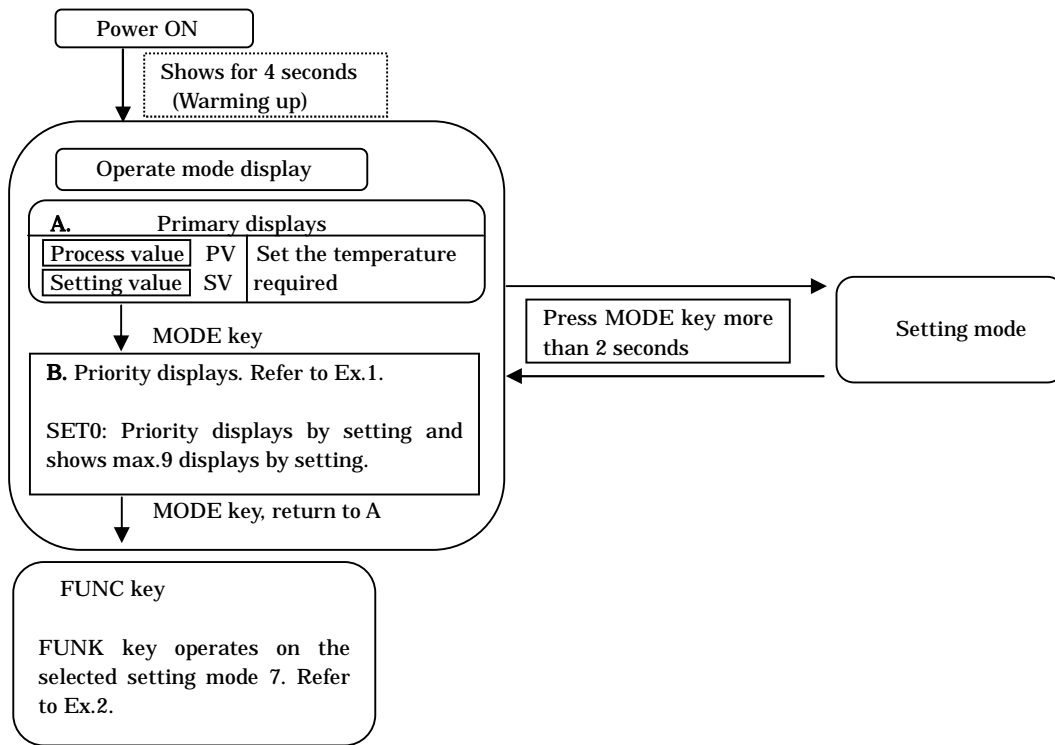
7
13. Go on TIMER Setting
Press MODE Key consecutively

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

**2 Character selected for TIMER Setting.

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

OPERATION FLOW AND SETTING MENU



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.

Setting mode (The numerical value of display is an initial value.)

< SET1: Initial Setting >

1. Initial Setting display
 SET 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, particularly 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 ~ 3600(second)
 0 SV
 MODE key

21. Deviative time setting
 d PV Adjusts deviative time
 0 ~ 3600(second)
 0 SV
 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 (-100.0 ~ 110.0%)
 100.0 SV
 MODE key (go to 24.)

< SET2: Control Setting >

9. Initial Setting display
 SET 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 Control performance
 rdy SV Non-control performance (Manipulated value low limiter output)
 Manual control
 MODE key

13. Selection of control type setting
 Cnt PV Selectable and switchable below control modes.
 113 SV
 SV 013
 PID (Refer to Ex.3)
 Control output 1
 1: PID
 2: ON/OFF
 Control output 2
 0: None
 1: PID
 2: ON/OFF
 3: Event output
 MODE key

14. Change of normal or reverse
 dir 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/high limiter
 MODE key

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. Control sensitivity setting for output 1
 C1 PV Adjusts control sensitivity 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 >

37. Event output 1 Setting
 SET 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

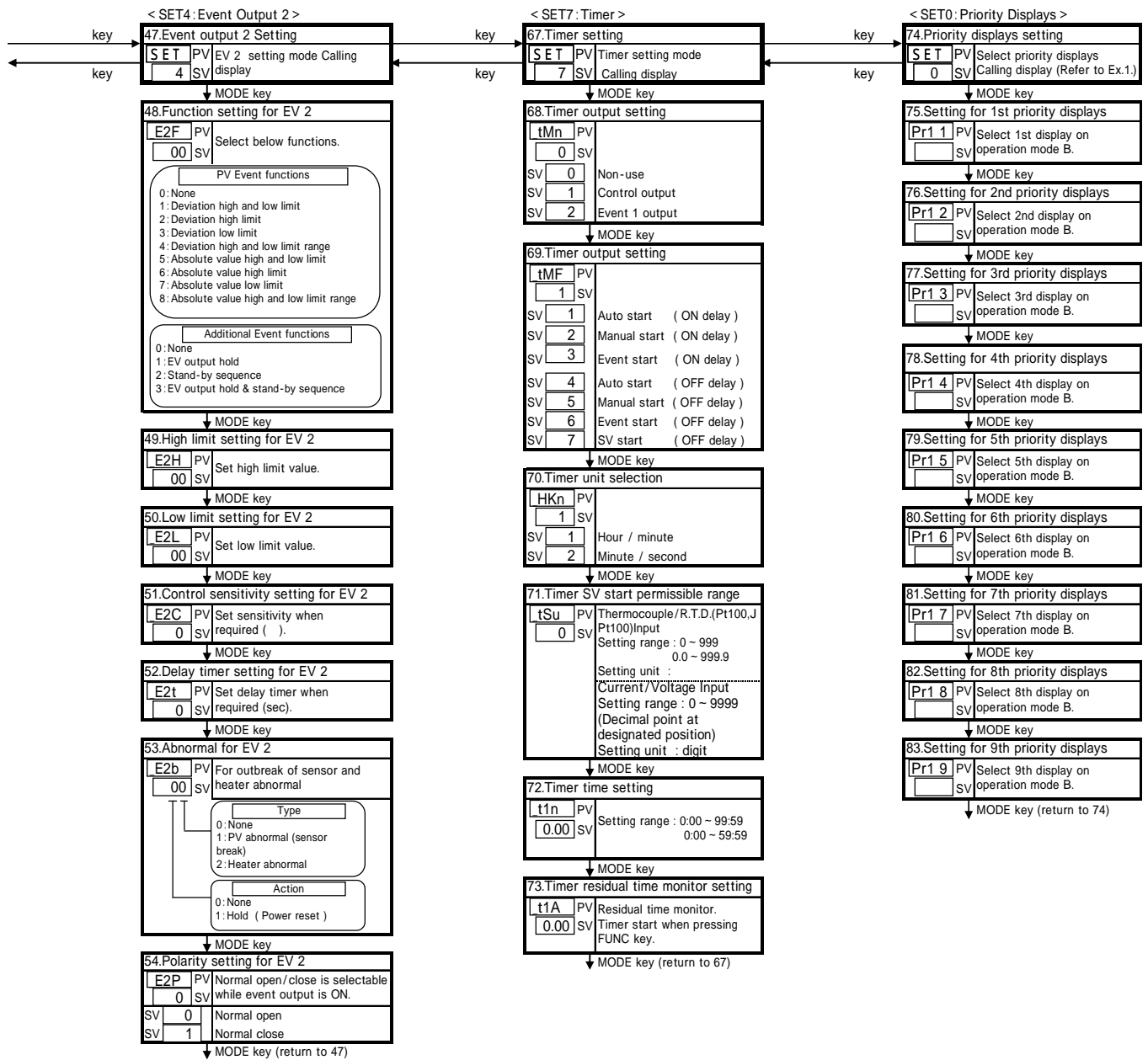
40. Low limit setting for EV 1
 E1L PV Set low limit value.
 0 SV
 MODE key

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

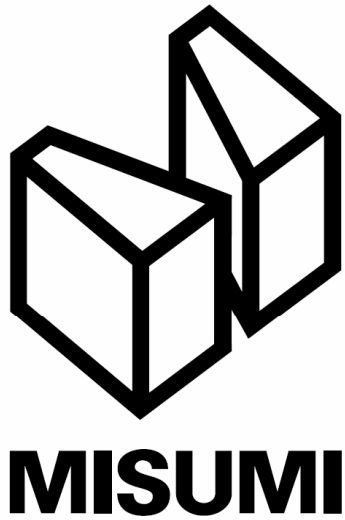
43. Abnormal for EV 1
 E1b PV For outbreak of sensor and heater abnormal
 00 SV
 Type
 0: None
 1: PV abnormal (sensor break)
 2: Heater abnormal
 3: PV + Heater abnormal
 Action
 0: None
 1: Hold (Power reset)
 MODE key

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)



(Display)	(Description)	(Trouble Shooting)
<div style="border: 1px solid black; padding: 2px; display: inline-block;">- - - -</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	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.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">- - - - -</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	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.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">E r r 0</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display of memory error.	In case this indication shows after the re-input of power, replace unit if it persists.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">E r r 1</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display of A/D converter error or incorrect sensor connection with selectable input.	Ditto
<div style="border: 1px solid black; padding: 2px; display: inline-block;">E r r 2</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display of auto-tuning error.	Check sensor connection or change to other tuning.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">L o C</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display when parameter is changed in key-lock condition.	Discontinue to change parameter.
<div style="border: 1px solid black; padding: 2px; display: inline-block;">A t</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Alternately this SV/PV display are shown.	Normality
<div style="border: 1px solid black; padding: 2px; display: inline-block;">S u 2</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display when setting value is changed on SV2 control.	Discontinue to change setting value (during control of SV2)
<div style="border: 1px solid black; padding: 2px; display: inline-block;">d I</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display when changing setting value of shift on DI.	Discontinue to change setting value of the self on digital input
<div style="border: 1px solid black; padding: 2px; display: inline-block;">F U n K</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	Display when making setting value change in control display while function key is on RUN/READY.	Discontinue to change setting value
<div style="border: 1px solid black; padding: 2px; display: inline-block;">t I M E</div> <div style="border: 1px solid black; width: 100px; height: 15px; margin-top: 2px;"></div>	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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