

DZ2000 SERIES

STEP TYPE

DIGITAL INDICATING CONTROLLER

INSTRUCTIONS

Please keep this instruction manual ready to the final user's hand.

Thank you for your purchase of CHINO's step type digital indicating controller DZ2000 series. You are requested to read this instruction manual carefully before using the instrument and operate the instrument correctly.

SUMMARY OF PRODUCT

This instrument offers two independent set value switching functions (SV1, SV2), handy program mode, and event output functions (EV1, EV2) as the standard equipment in addition to the excellent basic performance of the DZ1000 series, such as the input full-multi range, control output multi function, AT (auto tuning), fuzzy function, communication function, operation ease, etc.

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CHINO

1 CAUTIONS ON SAFETY

FOR SAFE USE OF THE PRODUCT

In order to use this instrument correctly and safely, be sure to observe caution as follows.

1. Installation place and terminal cover

① Panel mounting type

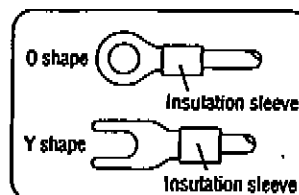
This instrument must be installed on the panel for operation. In order to avoid electric shock, provide means to prevent operators from touching any power supply section or the input/output terminals.

② Mobile type

Provide a cover to the terminals section in order to avoid electrical shock.

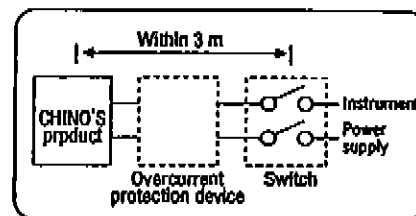
2. Terminal processes for connections

Crimp style terminals with insulation sleeve should be employed for the connections. O-shaped terminals should be used for the power supply and the protective grounding terminals.



3. Installation of a power supply circuit breaker

For the power supply, provide a switch which is suitable to the rated power supply for this instrument or an overcurrent protection device within a distance of 3 m from the unit and also within easy reach.



4. Provide separate safety measures for the output functions

When the instrument is to be used in a system which has output functions including controls, alarm, etc., apply separate safety measures against phenomena which would be caused by malfunction due to mis-operation, or failure of the instruments or sensors.

5. Symbol marks used for this instrument



This symbol is used on parts where there is an electric shock hazard. Be very careful against electric shock when wiring, maintaining or servicing these parts.



This symbol is used on parts which require protection by a ground terminal. Instruments with this symbol must to be grounded for power supply facilities before starting operation.

Warnings

Confirm power supply voltage rates and grounding.	Before supplying power to the instrument, be sure to check that its rated voltage matches the supply voltage and that the power and protective grounding wiring has been connected correctly and securely.
Do not put your hands into the case.	Unless essential operational repairs are required, do not put your hands inside the rack or case. Electric shock or injury may occur.
Do not use in a gaseous atmosphere.	Do not operate or install the instrument in a place where there is a combustible or explosive gas or vapor.
Maintenance and modification.	When maintenance and modification become necessary, consult your nearest CHINO branch office, agent or your dealer. <Note> Only a service person designated by CHINO can perform maintenance and modification by replacing parts.

2 NAMES AND FUNCTIONS OF COMPONENT PARTS

Display item guide display

Indicates the display items on No. 2 indicator in the run mode.

- PARA1 : Lights when an SV1 parameter is displayed.
- PARA2 : Lights when an SV2 parameter is displayed.
- SV : Lights when a control set value (SV) is displayed.
- OUT : Lights when a control output value is displayed.
- EV1 : Lights when an event 1 set value is displayed.
- EV2 : Lights when an event 2 set value is displayed.
- P : Lights when a proportional band (P) set value is displayed.
- I : Lights when an integral time (I) set value is displayed.
- D : Lights when a derivative time (D) set value is displayed.

Status display

- SV1 : Lights when execution SV1 is selected.
- SV2 : Lights when execution SV2 is selected.
- RAMP : Lights during SV ramp operation.
- EV1 : Lights when an event 1 occurs.
- EV2 : Lights when an event 2 occurs.
- AT : Lights during auto tuning.

Auto /Manual display

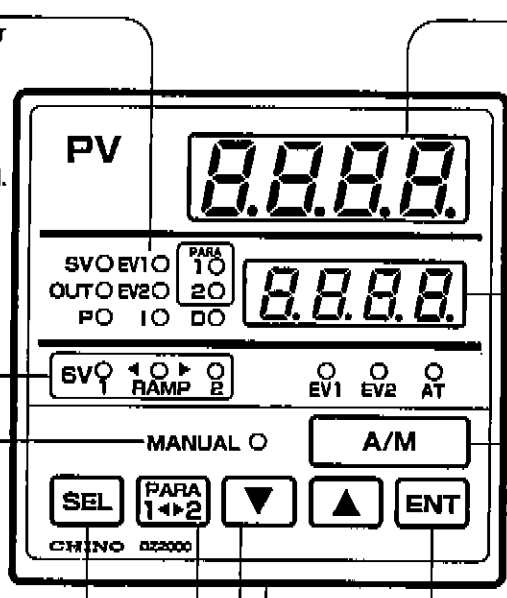
MANUAL : Lights in manual output mode.

Select (SEL) key

Switches parameters in run mode or selects either setting mode or run mode.

Parameter (PARA) key

Switches parameter 1, 2 display.



No. 1 Indicator

Run mode : Indicates process variables (PV)
Setting mode : Indicates set values.

No.2 Indicator

Run mode : Indicates control set value (SV), control output value, event set value, and PID values.
Setting mode : Indicates mode No. or setting items.

Auto/Manual (A/M) key

Switches the auto mode or manual mode of outputs.

Entry (ENT) key

Sets desired constants or desired functions to be selected.

Internal unit lock

The internal unit can be drawn out by inserting the attached internal unit puller.

Up (▲) key, Down (▼) key

These keys are used for changing set values or selecting setting mode No.

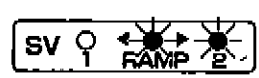
Definite examples of execution SV status display



When execution SV1 is selected;



When execution SV2 is selected;



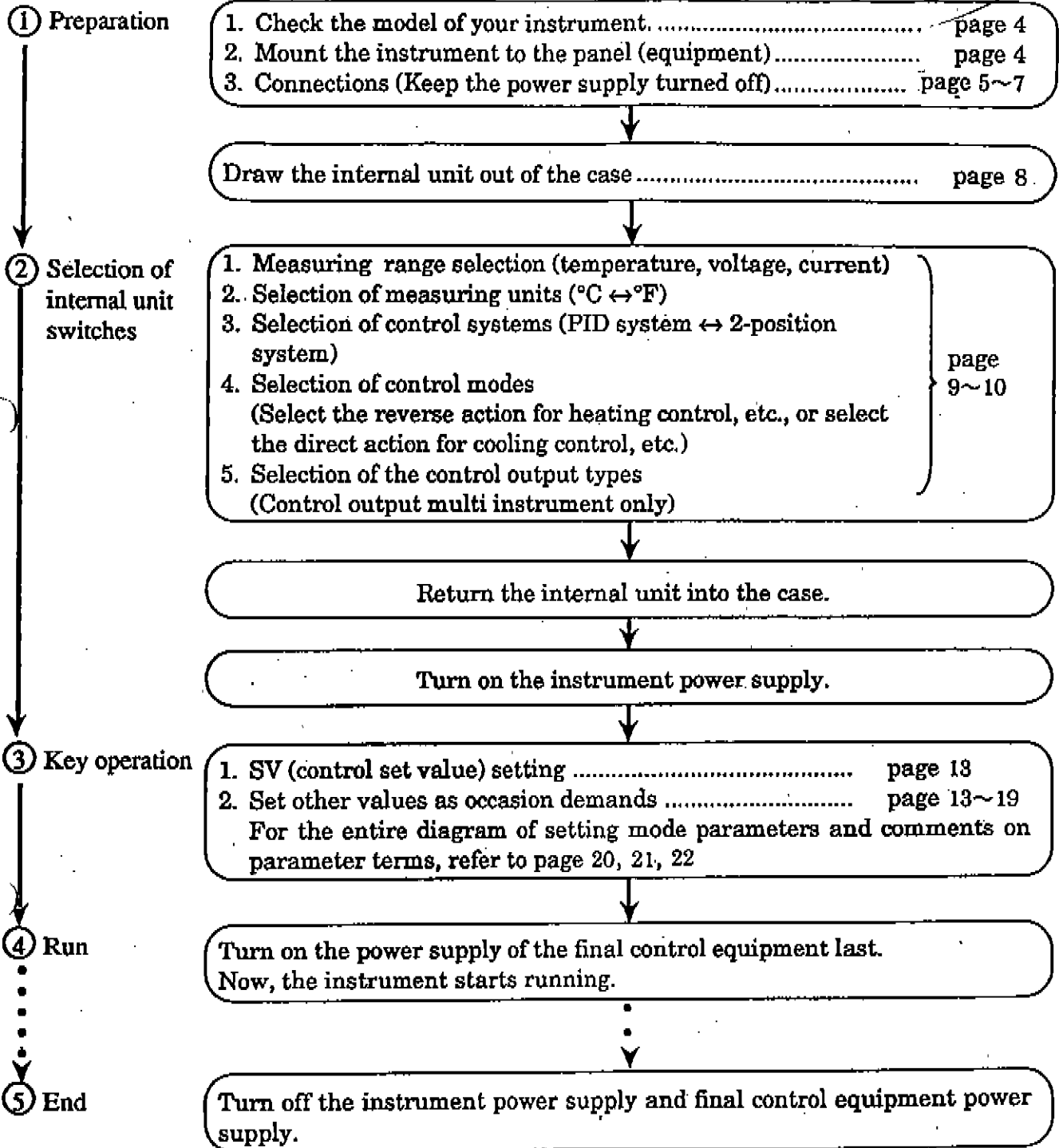
During execution SV1 → SV2 ramp operation;



During execution SV2 → SV1 ramp operation;

3 OPERATION PROCEDURE

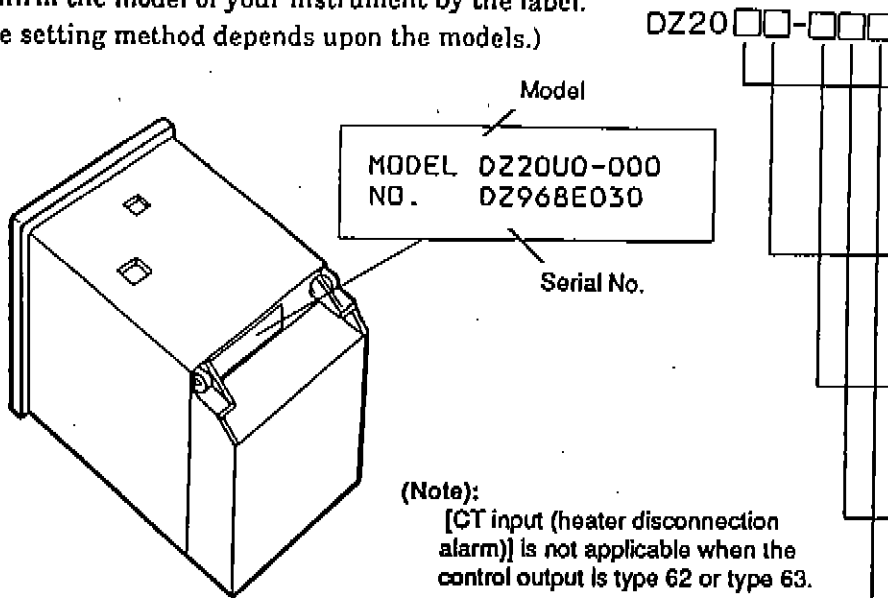
The operation procedure for this instrument is shown below. Initial set values are preset at the delivery time from the factory. Refer to ~~page 16-18~~ para. **10** *20~22 page*



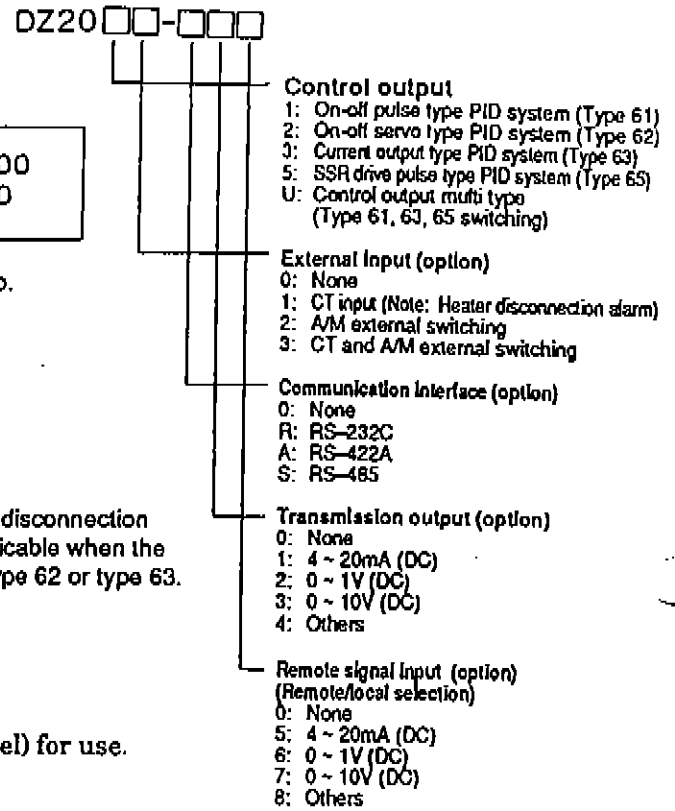
4 PREPARATION

4.1 Confirmation of the Model of Your Instrument

Confirm the model of your instrument by the label.
(The setting method depends upon the models.)



(Note):
[CT input (heater disconnection alarm)] is not applicable when the control output is type 62 or type 63.



4.2 Mounting to Panel (equipment)

This instrument is mounted to a panel (instrument panel) for use.

1. Mounting position



Caution

Ambient temperature and humidity range

- Temperature range : -10 ~ +50°C
- Humidity range : Lower than 90%RH

Mount the instrument in an environment where the ambient temperature and humidity are stable within the above ranges.

Ambient environment

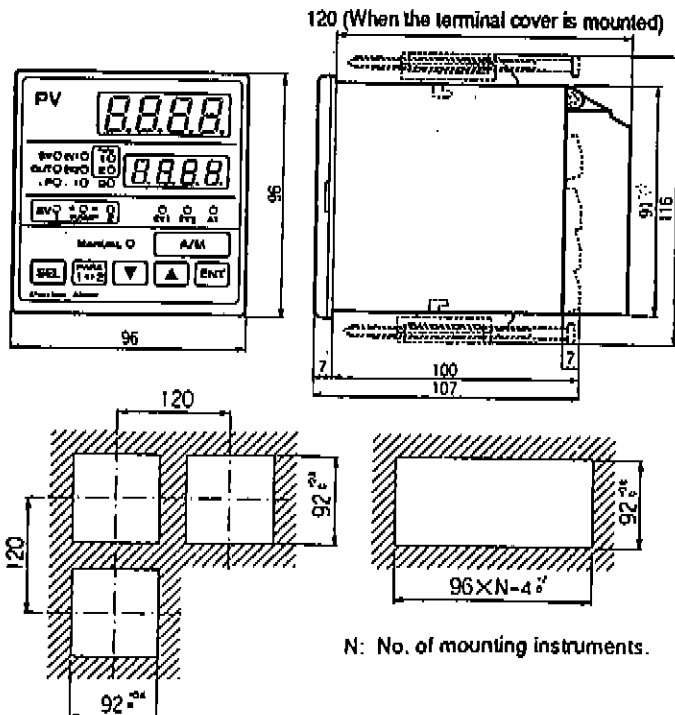
Don't mount the instrument in the following environments.

1. A dusty place
2. A corrosive gas atmosphere
3. A place subjected to vibrations and shocks

Mounting place, etc.

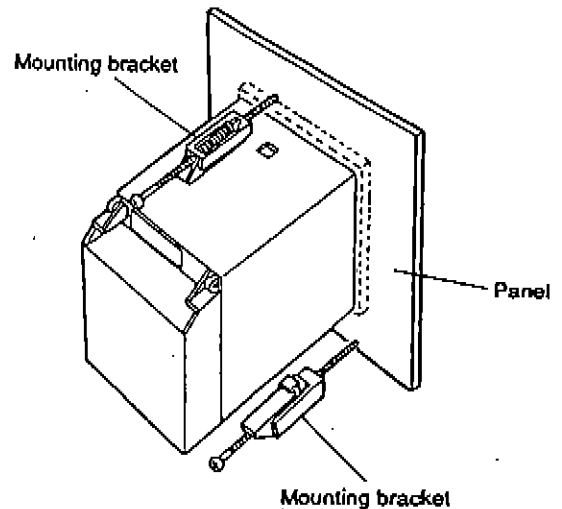
1. Don't mount the instrument at a place where the instrument is exposed to the direct sunlight because of the characteristics of display device (LED), otherwise the visibility deteriorates.
2. Don't mount the instrument at a place subjected to powerful noises.

2. External dimensions and panel cutout



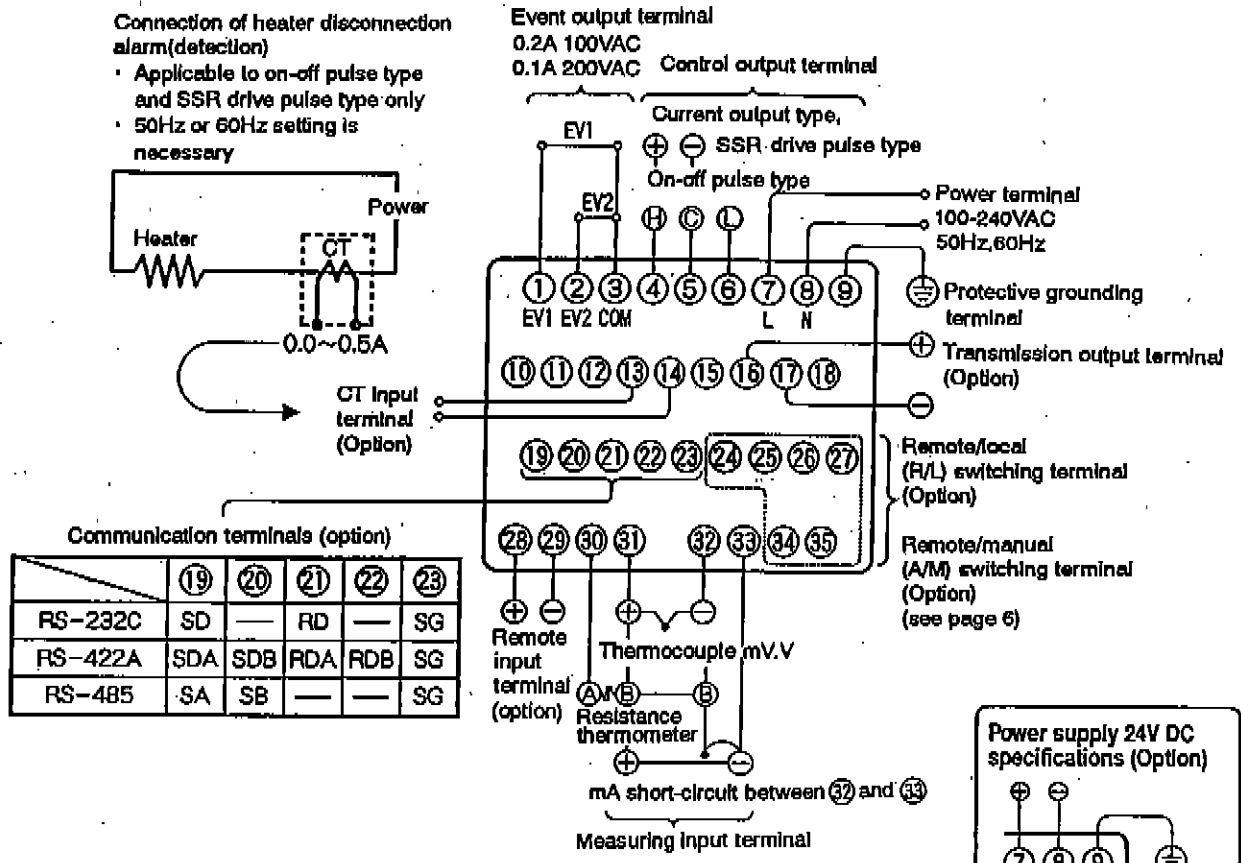
3. Mounting method to panel

Fasten the instrument to the panel by two attached mounting brackets until these brackets turn idly.



5 CONNECTIONS

5.1 On-off pulse type, current output type, and SSR drive pulse type

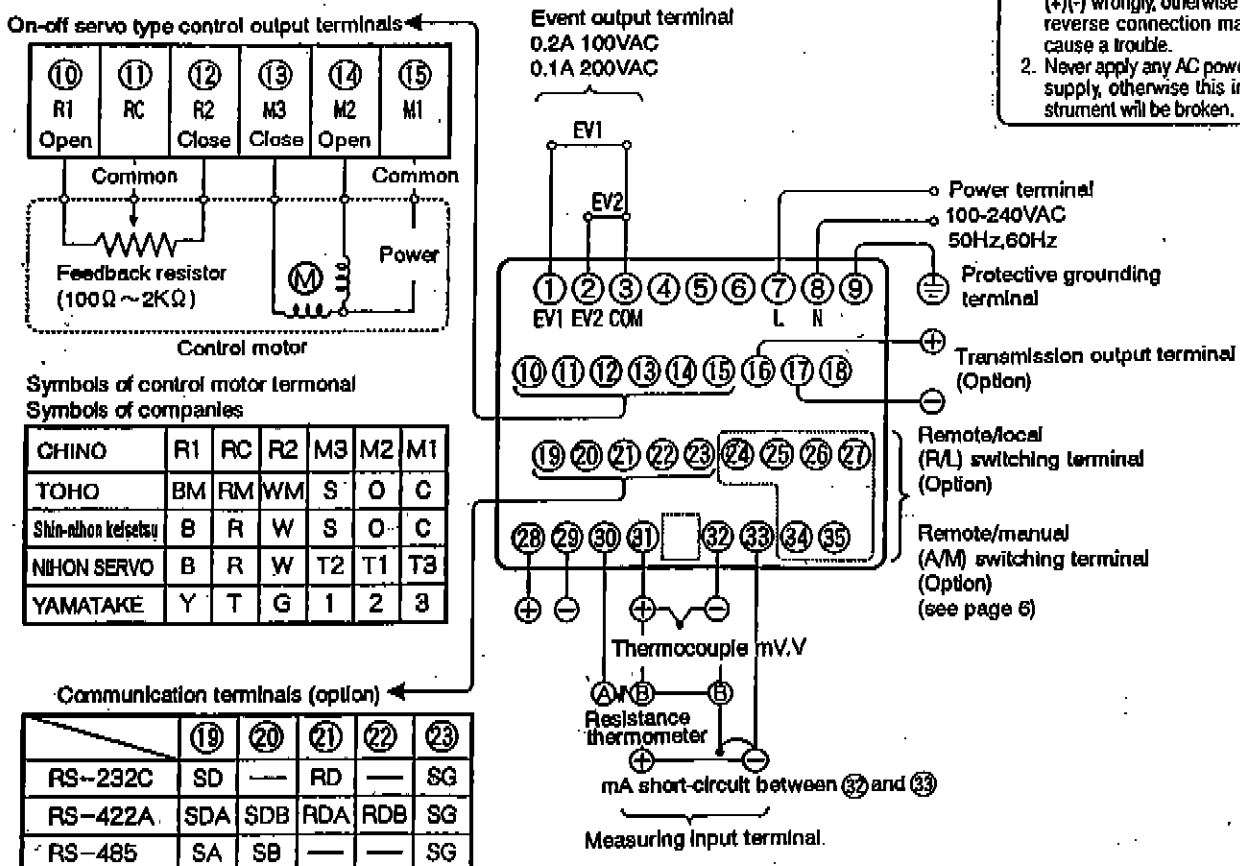


Power supply 24V DC specifications (Option)




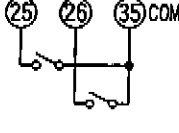
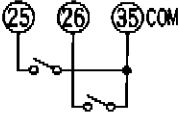
⚠ Cautions

1. Don't connect the polarities (+)(-) wrongly, otherwise a reverse connection may cause a trouble.
2. Never apply any AC power supply, otherwise this instrument will be broken.

5.2 On-off servo type



5.3 Connections of Options

	Terminal No. and connections	Short	Open	Remarks												
Remote/Local (R/L) selection		Remote control	Local control	This is used for receiving an SV from the other instrument in the communication remote or analog remote mode. (Local control is done by the SV of this instrument proper.)												
Auto/Manual (A/M) external selection (option)		Manual run	Auto run	Auto or manual selection of control outputs												
Preset manual external selection (option)		Run with preset values	Auto run	Switches to the preset control output value (OUT) by an external signal.												
SV1/SV2 external selection (option)		<table border="1" data-bbox="586 586 1015 807"> <tr> <td>External switching terminals</td> <td>SV1,2 switching terminals</td> <td>Execution SV</td> </tr> <tr> <td>Short (external)</td> <td>Short: SV2</td> <td>SV2</td> </tr> <tr> <td></td> <td>Open: SV1</td> <td>SV1</td> </tr> <tr> <td>Open</td> <td>Invalid</td> <td>Key selection</td> </tr> </table>	External switching terminals	SV1,2 switching terminals	Execution SV	Short (external)	Short: SV2	SV2		Open: SV1	SV1	Open	Invalid	Key selection		Switches execution SV1/SV2 by an external signal.
External switching terminals	SV1,2 switching terminals	Execution SV														
Short (external)	Short: SV2	SV2														
	Open: SV1	SV1														
Open	Invalid	Key selection														
Program start/reset external selection (option) Valid in program mode only		<table border="1" data-bbox="586 829 1015 1050"> <tr> <td>External switching terminals</td> <td>Start/reset switching terminals</td> <td>Program run</td> </tr> <tr> <td>Short (external)</td> <td>Short: Start</td> <td>Start</td> </tr> <tr> <td></td> <td>Open: Reset</td> <td>Reset</td> </tr> <tr> <td>Open</td> <td>Invalid</td> <td>Key selection</td> </tr> </table>	External switching terminals	Start/reset switching terminals	Program run	Short (external)	Short: Start	Start		Open: Reset	Reset	Open	Invalid	Key selection		Set the program pattern in mode 6 to a mode other than OFF by key operation in advance. ([OFF] constant value control) <ul style="list-style-type: none"> These terminals are common to SV1/SV2 external switching and they cannot be used at the same time. Select the start condition during program run.
External switching terminals	Start/reset switching terminals	Program run														
Short (external)	Short: Start	Start														
	Open: Reset	Reset														
Open	Invalid	Key selection														



Cautions on connections

1. Be careful with strong electric circuits and noises

Don't mount this instrument at the following places, although this instrument provides various noise suppression measures.

- Strong electric circuit or powerful noise generation source
Separate the instrument more than 50cm from a strong electric circuit, if input signals are parallel with the strong electric circuit.
This instrument is designed to be resistible against noises on condition that the protective grounding terminal is connected correctly.
Connect the protective grounding terminal correctly, otherwise the noise preventive characteristic deteriorates.

2. Be careful with fluctuations of power voltage.

This instrument uses a free power supply (85V AC ~ 264V AC).

Don't connect this instrument to the following power supplies.

- A power supply whose voltage fluctuates abruptly
- A power supply whose waveforms are distorted noticeably

3. Don't apply any excessive voltage to input terminals.

Don't apply a voltage exceeding $\pm 8V$ or power voltage to the input terminals, otherwise the instrument will be broken.

4. Be careful with fastening of terminals.

- Solder lead wires correctly, and fasten the screws securely to terminals. Connect the grounding wire securely. (Use crimp style terminals each having an insulation sleeve.)
Don't connect any jumper wire.
- Neither power switch nor fuse is mounted as a built-in device. Mount these devices externally.

5. Relay contact protective device

No contact protective device is built in for relay outputs (on-off pulse type, on-off servo type) of this instrument.

Mount a contact protective device externally according to the load capacity.

If the contact protective device is not mounted externally, malfunction of relay contacts occurs within a short time due to deposition or other failures to shorten the relay life noticeably.

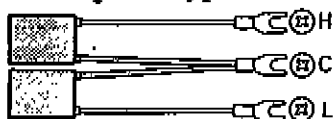
Since the relay of this instrument is small, mount a buffer relay outside the instrument.

External mounting contact protective device (option)

- For light load (Article code CX-CR1)
 $0.01\mu F + 120\Omega$
- For heavy load (Article code CX-CR2)
 $0.5\mu F + 47\Omega$

Names of mounting terminals

On-off pulse type



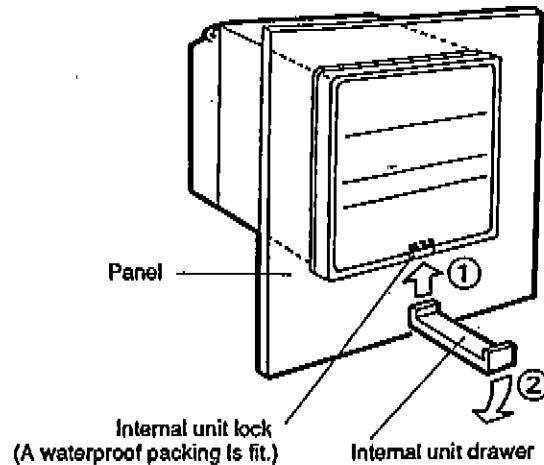
On-off servo type



6 SELECTION OF INTERNAL UNIT SWITCHES

6.1 How to Draw Out the Internal Unit

Since the front panel of this instrument conforms to IEC529 [IP65], it is difficult more or less to draw out the internal unit.



1. When the internal unit is mounted to the panel; (See the above figure.)

- ① A water-proof packing is fit to the internal unit lock. Remove this packing, and insert the L part of the attached internal unit drawer to the internal lock.
- ② By pressing the internal unit drawer under this condition, the instrument front panel is protruded by 2 ~ 3mm to be ready for removing the internal unit.
- ③ After setting the internal unit switches, return the internal unit into the case by slowly pushing it in parallel after aligning the guide rail inside the case to meet the PCB of the internal unit. Fit the water-proof packing securely.

2. When the internal unit is not mounted to the panel;

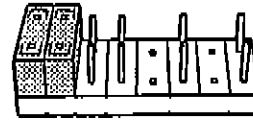
- ① A water-proof packing is fit to the internal unit lock. Remove this packing, and insert the L part of the attached internal unit drawer to the internal lock, while pressing the case by the left hand and holding the attached internal unit drawer by the right hand.
- ② By oscillating the internal unit drawer rightward or leftward under this condition, the instrument front panel is protruded by 2 ~ 3mm to be ready for removing the internal unit.
- ③ After setting the internal unit switches, return the internal unit into the case by slowly pushing it in parallel after aligning the guide rail inside the case to meet the PCB of the internal unit. Fit the water-proof packing securely.

6.2 Mounting Position of Internal Switches

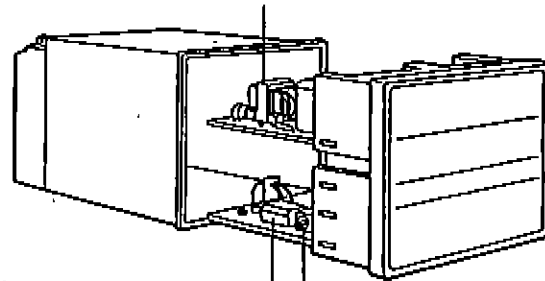
The internal unit is provided with selector switch 1 (SW1), selector switches 2 (SW2), and a short-circuit switch which is added to the control output multi type instrument only. Select these three switches if necessary.

Caution

Be careful since the set values of all parameters are reset to the initial set values, if selector switch 1 (measuring range selection) and switch No.1 (auxiliary switching of measuring range) and No.2 (switching of measuring unit) of selector switches 2 are switched after setting all parameters by key operation.

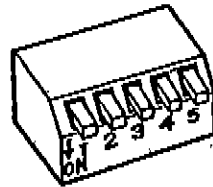


Short-circuit switch (mounted on the control output multi type instrument only)



Selector switch 2 (SW.2)

Selector switch 1 (SW.1)



These switches other than No.5 switch are turned off (set to the upper notches) at the delivery time from the factory..



6.3 Switching of Control Functions, etc. (Selector switches 2 (SW.2))

Switch No.	Switching contents		Switch on-off selection
1	Auxillary switching of measuring ranges (See the switching of measuring ranges)		ON or OFF
2	Switching of measuring ranges	°C	OFF
		°F	ON
3	Switching of control systems	PID system	OFF
		2-position system	ON
4	Switching of control modes	Reverse action (heating)	OFF
		Direct action (cooling)	ON
* 5	Switching of the types of control output (Combined with short-circuit switch)	Current output type (type 63)	OFF
		Pulse type (Type 61, 65)	ON

* Applies to the control output multi type instrument only.

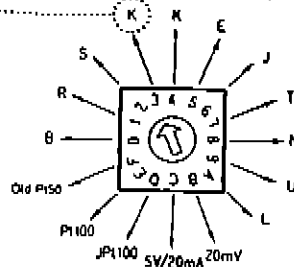
Don't operate this switch for other instruments, otherwise the instruments don't function normally.

6.4 Switching of Measuring Ranges

This switch is preset to arrow 3 (K: $-200^{\circ}\text{C} - 1370^{\circ}\text{C}$) at the delivery time from the factory.

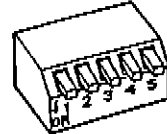
Use a small (-) screwdriver for turning this switch.

Selector switch 1 (SW. 1)



Selector switches 2 (SW2)

These switches other than switch No.5 are turned off (preset to the upper notch) at the delivery time from the factory.



Input type		Input range		SW.1	SW.2 No.1
Thermocouple	B	0 ~ 1820 °C	32 ~ 3300 °F	0	OFF
	R	0 ~ 1760 °C	32 ~ 3200 °F	1	
	S	0 ~ 1760 °C	32 ~ 3200 °F	2	
	K	-200 ~ 1370 °C	-300 ~ 2450 °F	3	
	K	-200 ~ 500 °C	-300 ~ 900 °F	4	
	E	-200 ~ 700 °C	-300 ~ 1250 °F	5	
	J	-200 ~ 900 °C	-300 ~ 1650 °F	6	
	T	-200 ~ 400 °C	-300 ~ 700 °F	7	
	N	0 ~ 1300 °C	32 ~ 2350 °F	8	
	U	-200 ~ 400 °C	-300 ~ 700 °F	9	
L	-200 ~ 900 °C	-300 ~ 1650 °F	A		
Voltage	mV	-20 mV ~ 20 mV (Initial value 0.0 ~ 20.0)		B	OFF
	V	-5 V ~ 5 V (Initial value 1.00 ~ 5.00)		C	
Current	mA	0 mA ~ 20 mA (Initial value 4.0 ~ 20.0)		D	ON
Resistance thermometer	JPt100	-200 ~ 649 °C	-300 ~ 1200 °F	D	OFF
	JPt100	-200 ~ 200 °C	-300 ~ 300 °F		ON
	Pt100	-200 ~ 660 °C	-300 ~ 1200 °F	E	OFF
	Pt100	-200 ~ 200 °C	-300 ~ 300 °F		ON
	Old Pt50	-200 ~ 649 °C	-300 ~ 1200 °F		F

6.5 Switching of Control Output Types (Applies to the control output multi type instrument only)

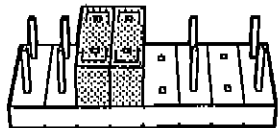
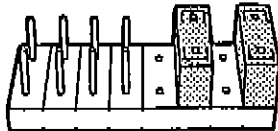
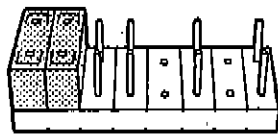
In case of the control output multi type instrument, the following control outputs are selectable by selecting two switches of selector switches 2. (Type 63 is selected at the delivery time from the factory)

Control output type	Nomination
On-off pulse type PID system (Relay contact output)	Type 61
Current output type PID system	Type 63
SSR drive pulse type PID system	Type 65

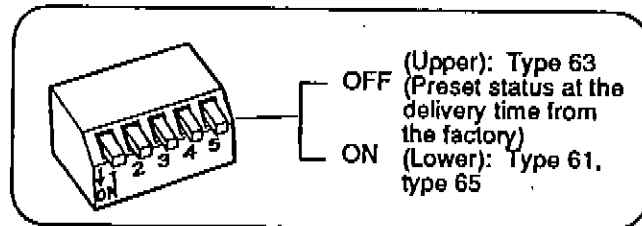
1. Switching of short-circuit switch

Draw out two sockets upward and relocate them to a desired control output position. (Select No.5 of selector switch 2)

- Switching position of type 63 (Preset status at the delivery time from the factory)
- Switching position of type 61
- Switching position of type 65



- Selection of No.5 of selector switches 2
Set No.5 switch to OFF (upper) or ON (lower). (Select the short circuit switch, too)



! Cautions

- Select two switches without fail. The instrument does not function if one switch only is selected.
- This selection cannot be done if this instrument is specified to type 61, 62, 63, or 65. (Applicable to the control output multi type instrument only. See the type check on page 4.)
- The control output multi type instrument cannot be selected to on-off servo type (type 62).

7 SWITCHING METHOD OF RUN DISPLAY SCREEN

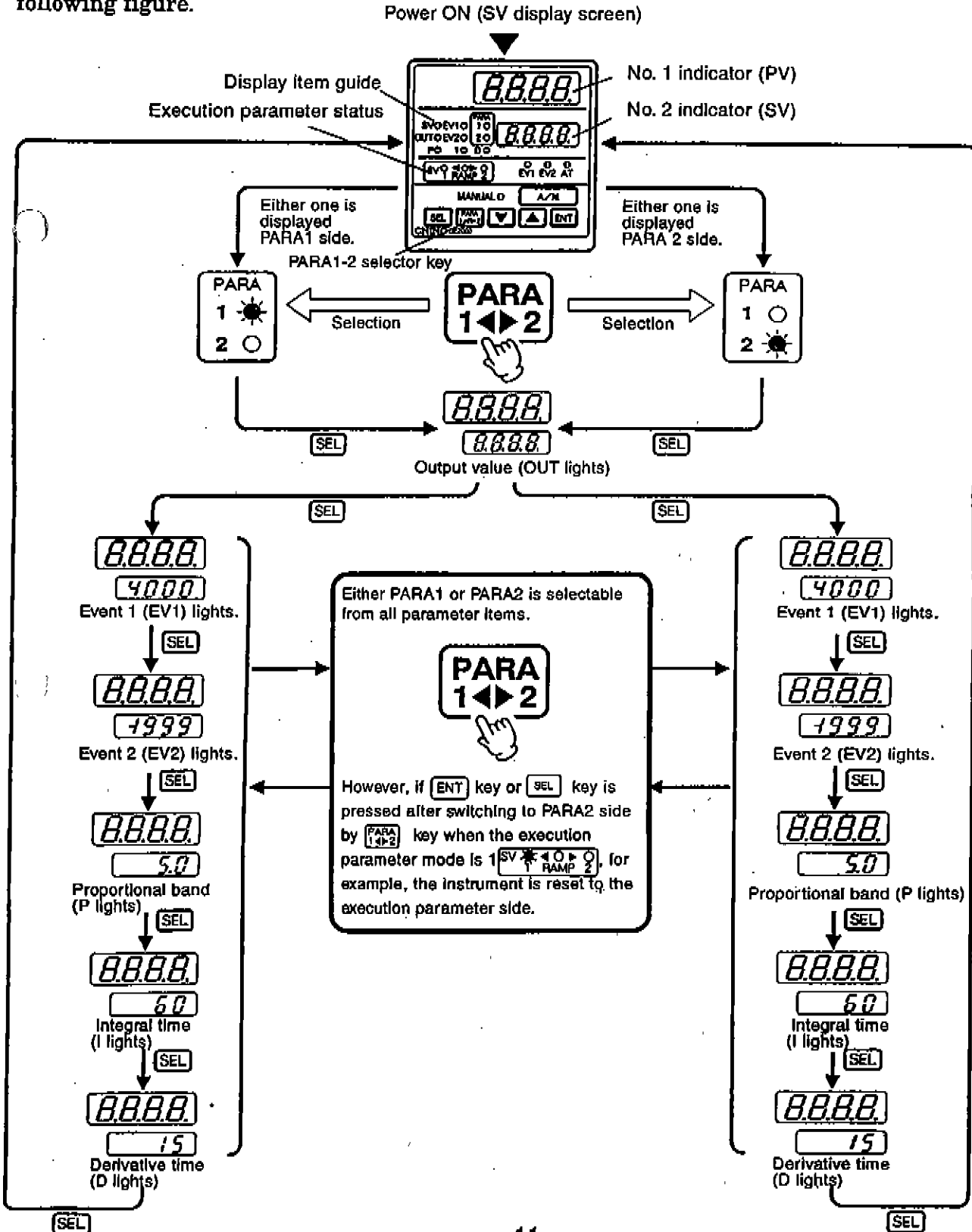
7.1 Switching Method of Run Display Screen

By turning on the power supply, PV (process variable) is indicated on No. 1 indicator, while SV (control set value) is displayed on No.2 indicator, and [SV] and selected PARA [1] or [2] of the display item guide light. This screen is called SV display screen.

Run display screen [1] ↔ [2] can be selected by key, and set values can be changed. (This does not mean any execution SV selection.) Either [1] or [2] of the execution parameter status indicator lights and also, the present selected execution SV side is displayed.

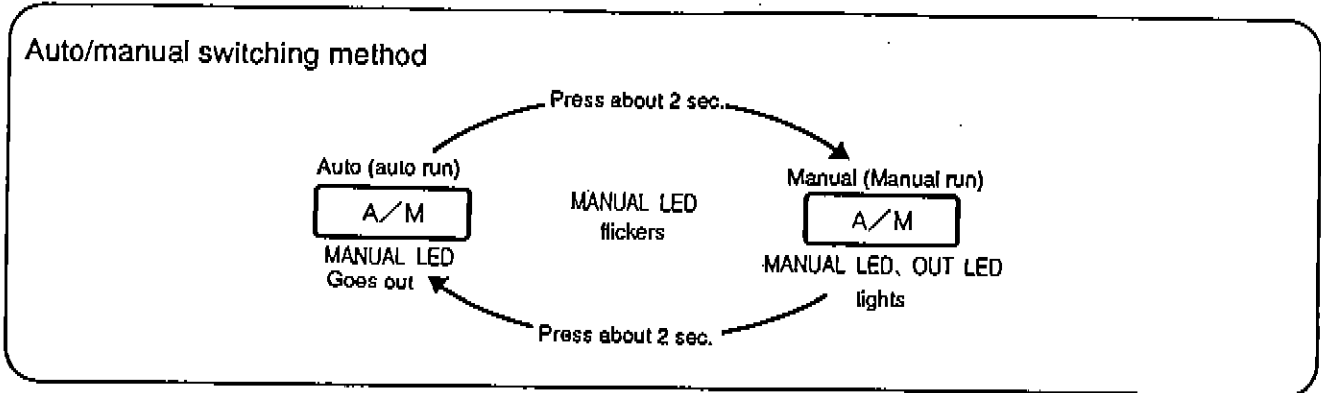
The execution SV is selected in setting mode 2 ③ (See page 15).

In addition to this SV display, the run display screen is developed by key as shown in the following figure.



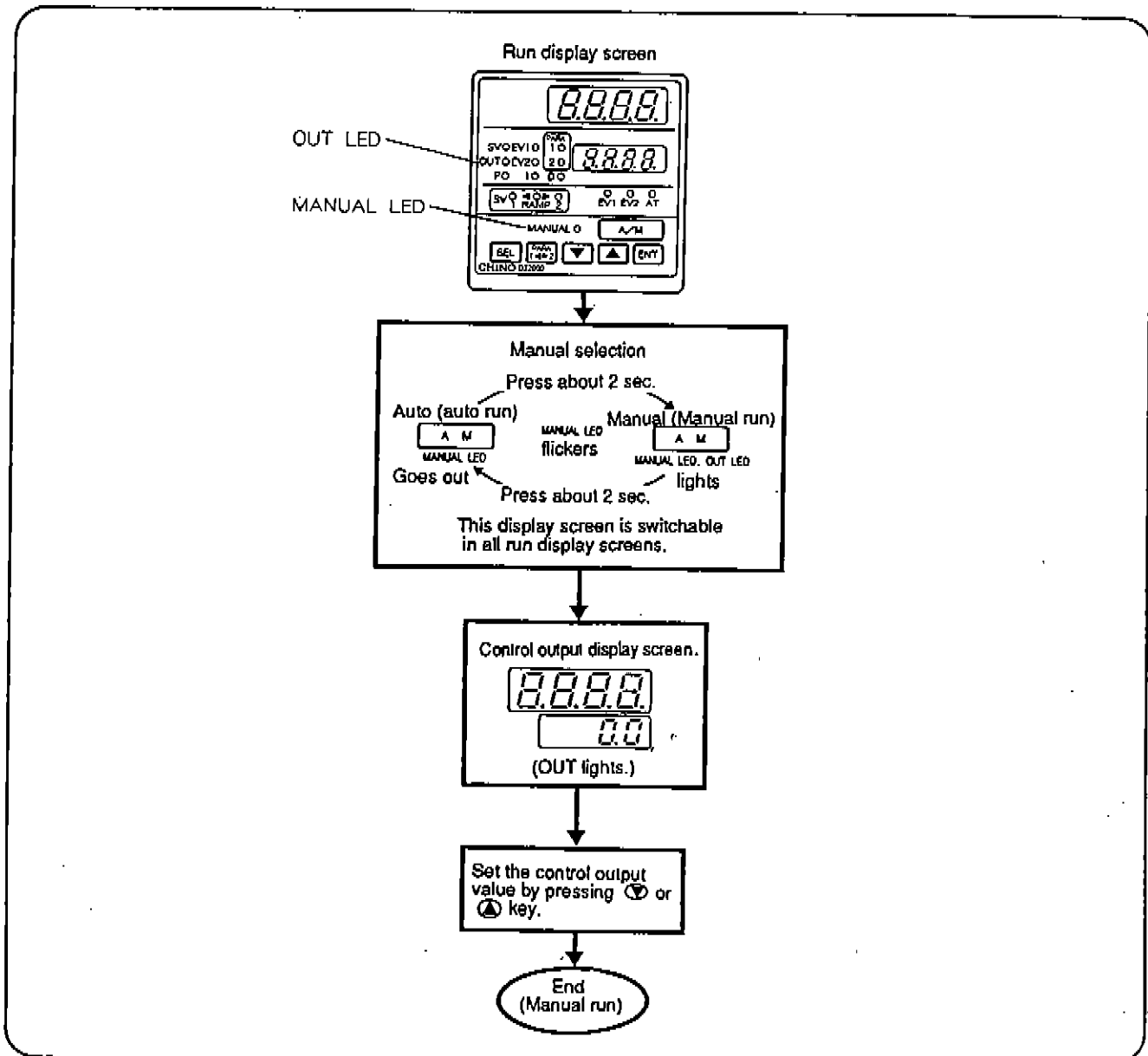
7.2 Switching Method of Auto/Manual (A/M)

The instrument is normally used in the auto mode (auto run) when this mode is switched to manual by pressing (A/M) key, the MANUAL LED lights, and the control output can be operated manually. This auto/manual modes can be switched in all run display screens other than the setting mode screen.






Other parameters can be set during manual run.

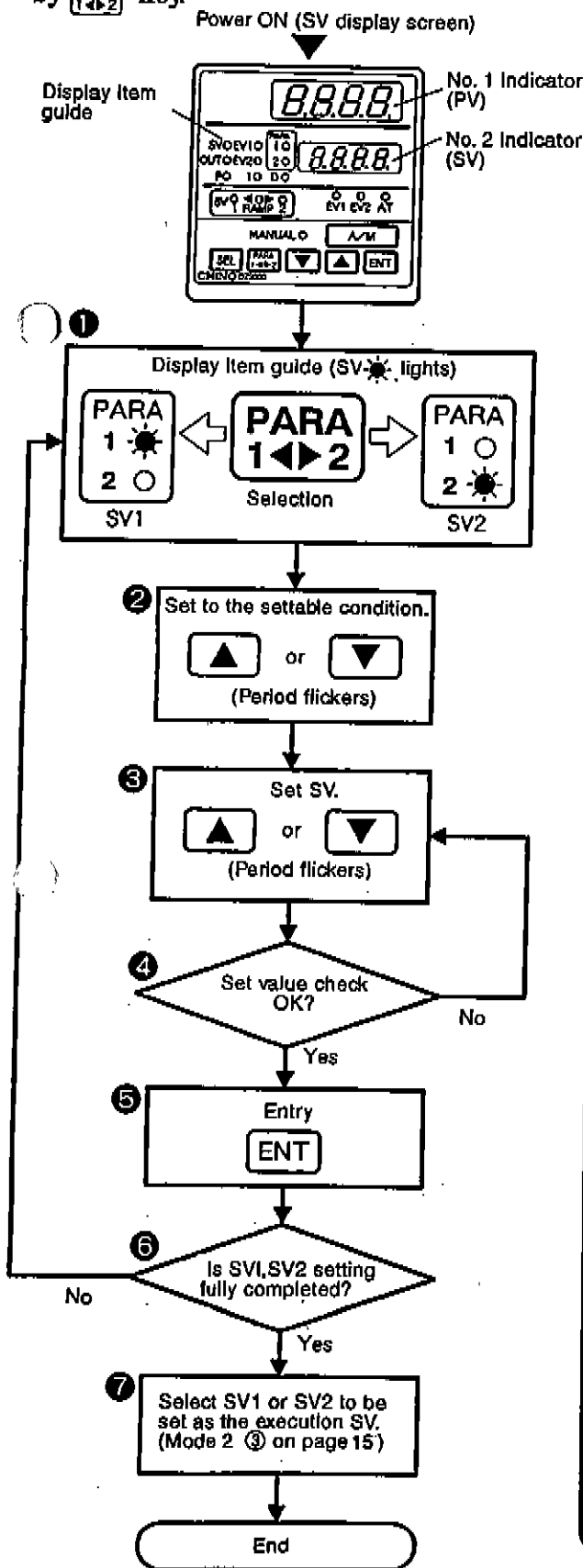
7.3 Setting Method of Control Output Value In Manual Mode





8 KEY OPERATION




8.1 Setting Method of SV (Control Set Values 1, 2)



This instrument can set [SV1, SV2] (Control set values 1, 2) and can execute control by selecting either one as the execution SV in mode 2 ③ (see page 15). (It is not necessary for simple program control (see page 15) to select the execution SV). By turning on the power supply, the SV display screen appears first, and No. 1 indicator indicates [PV] (process variable) and No. 2 indicator indicates [SV] (control set value). Either [SV1] or [SV2] is displayed, and this SV can be confirmed by the [SV *] and the lighting of [1] or [2] lamp of  in the display item guide. The lighting lamp indicates SV which can be set (changed). [SV1]  [SV2] display is switched by  key.




① By turning on the power supply, the SV display screen appears.

Lamp SV * lights in the display item guide and [1] or [2] of  light. The lighting lamp indicates SV which can be set (changed). SV1 and SV2 are selectable from each other by  key.

② By pressing  or  key, the SV setting screen appears, and the period starts flickering. Press  key for resetting the flickering (setting condition).


③ Set a desired SV by  or  key. The period continues flickering.

④ Check if the set value is correct.

⑤ The set value is entered by pressing  key. (Period goes out.)




⑥ Check if [SV1, SV2] setting (change) has been completed. If SV1 or SV2 is not set (changed), return to ① to set it.

⑦ Select the execution SV (in case of constant value control only).

Select SV1 or SV2 to be set as the execution SV by switching (SV1)  (SV2) in mode 2 ③ (See page 13).

* No setting is necessary in case of simple program control.

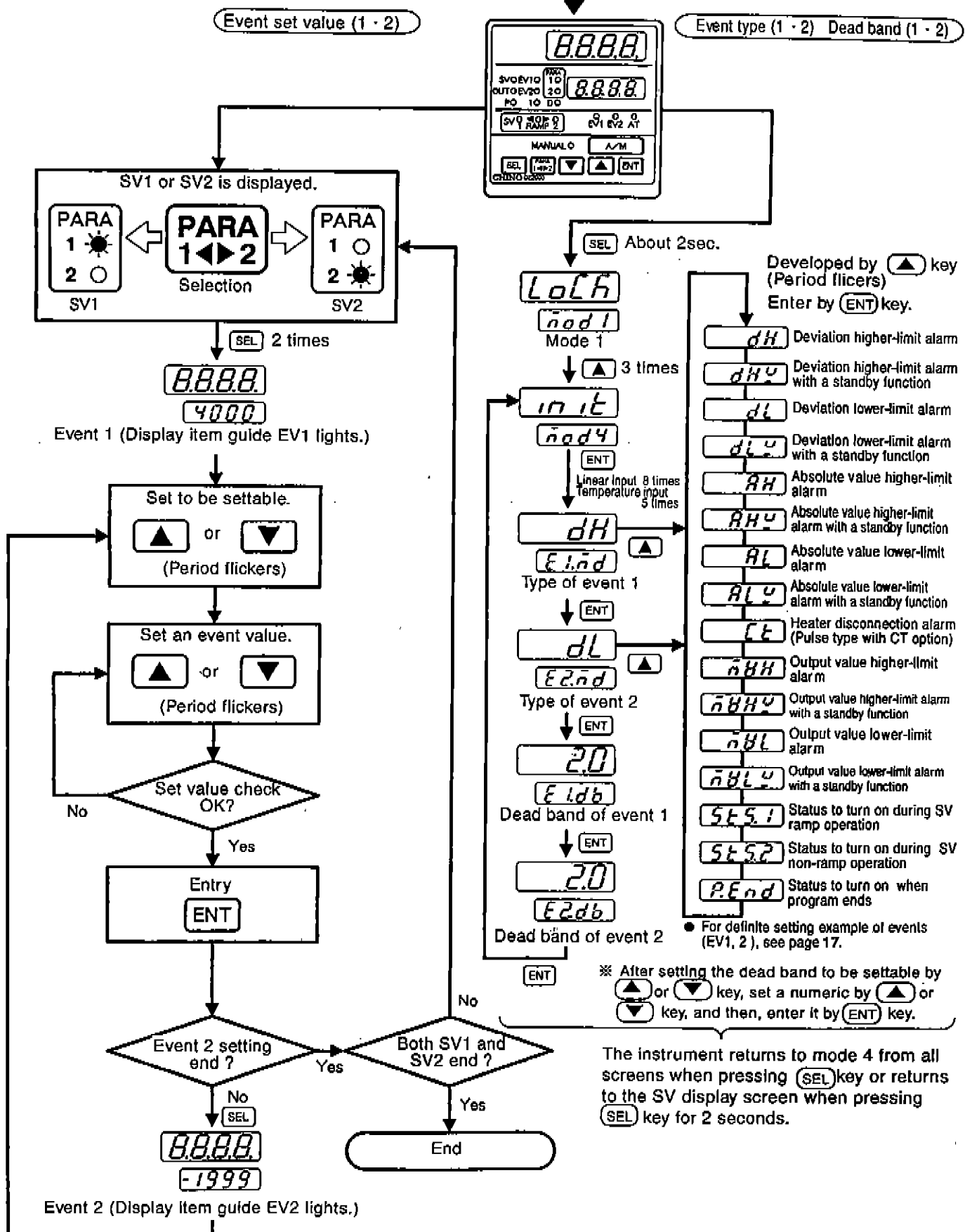
How to use common all parameters setting

1. Period flickering indicates settable (changeable) condition.
For setting, check if the period is flickering.
2.  (UP) key
Increases the numeric while this key is being pressed.
(This key is also used for selecting an item.)
3.  (DOWN) key
Decreases the numeric while this key is being pressed.
(This key is also used for selecting an item.)
4. Entry method
Press  key without fail, otherwise the value returns to the value before setting without being entered. (Manual control output setting is not required.)
5. The screen returns to the SV value display screen, if no key operation is done for longer than one minute.

8.2 Setting of Event (EV) 1 and 2 (Set Values, Types, Dead Band)

This instrument is provided with two sets of event output terminals [Event 1 (EV1)] and [Event 2 (EV2)] as the standard equipment, and it can set the event types (1, 2) and dead band (1, 2) to the output terminals. Event set values (1, 2) can be set to execution SV1 or execution SV2, respectively. (Setting of mode 3 (30) (see page 15) is necessary when CT : heater disconnection alarm of the event type has been selected.)

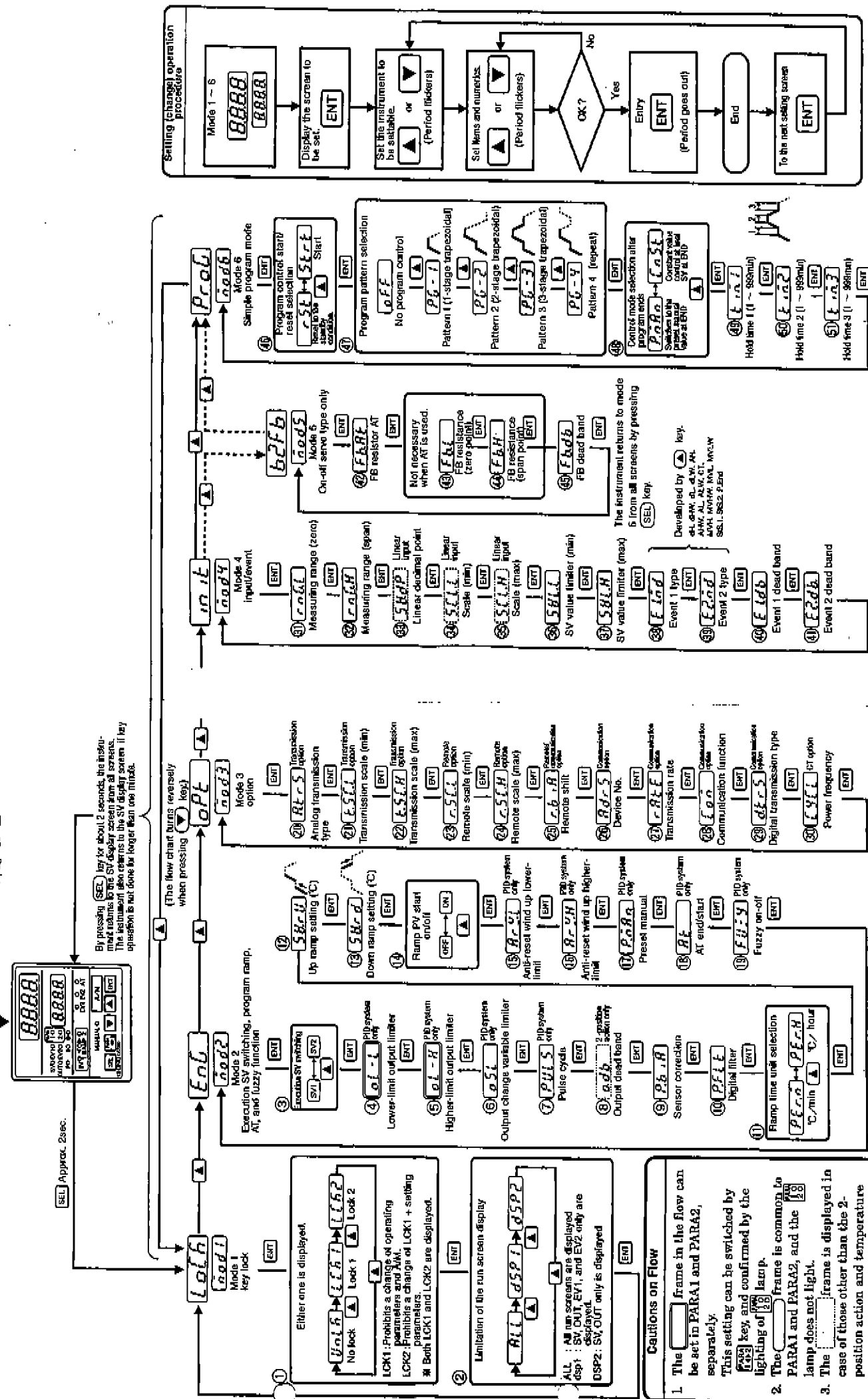
Power ON (SV display screen)



9 SETTING MODE PARAMETERS

Parameter Flow Chart

Power ON (SV display screen)
 * For meanings of each parameter, refer to page 20~22



The instrument returns to mode 2 from all screens by pressing (SEL) key.

The instrument returns to mode 3 from all screens by pressing (SEL) key.

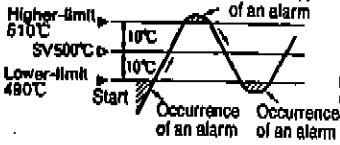
The instrument returns to mode 4 from all screens by pressing (SEL) key.

The instrument returns to mode 5 from all screens by pressing (SEL) key.

The instrument returns to mode 6 from all screens by pressing (SEL) key.

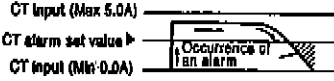
An event (EV) setting example

A setting example of absolute value alarm at both higher-limit and lower-limit



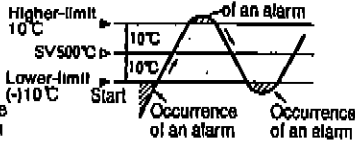
[Caution] If a standby function is provided, an alarm does not occur at the start time or when execution SV1 has been switched to SV2.

A setting example of heater disconnection alarm



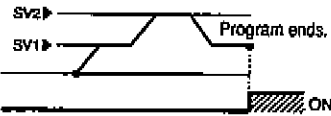
- CT alarm is the same alarm operation as the absolute value lower-limit alarm and is set automatically when CT is selected.

Setting example of deviation alarm at both higher-limit and lower-limit



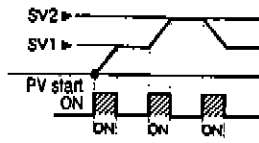
[Caution] If a standby function is provided, an alarm does not occur at the start time or when execution SV1 has been switched to SV2.

Program END status signal



- An ON signal occurs when the program ends.

Status signal at ramp PV start [ON].

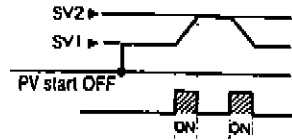


- An ON signal occurs during ramp operation. (Sts.1)



- An ON signal occurs during non-ramp operation. (StS.2)

Status signal at ramp PV start [OFF].



- An ON signal occurs during ramp operation. (Sts.1)

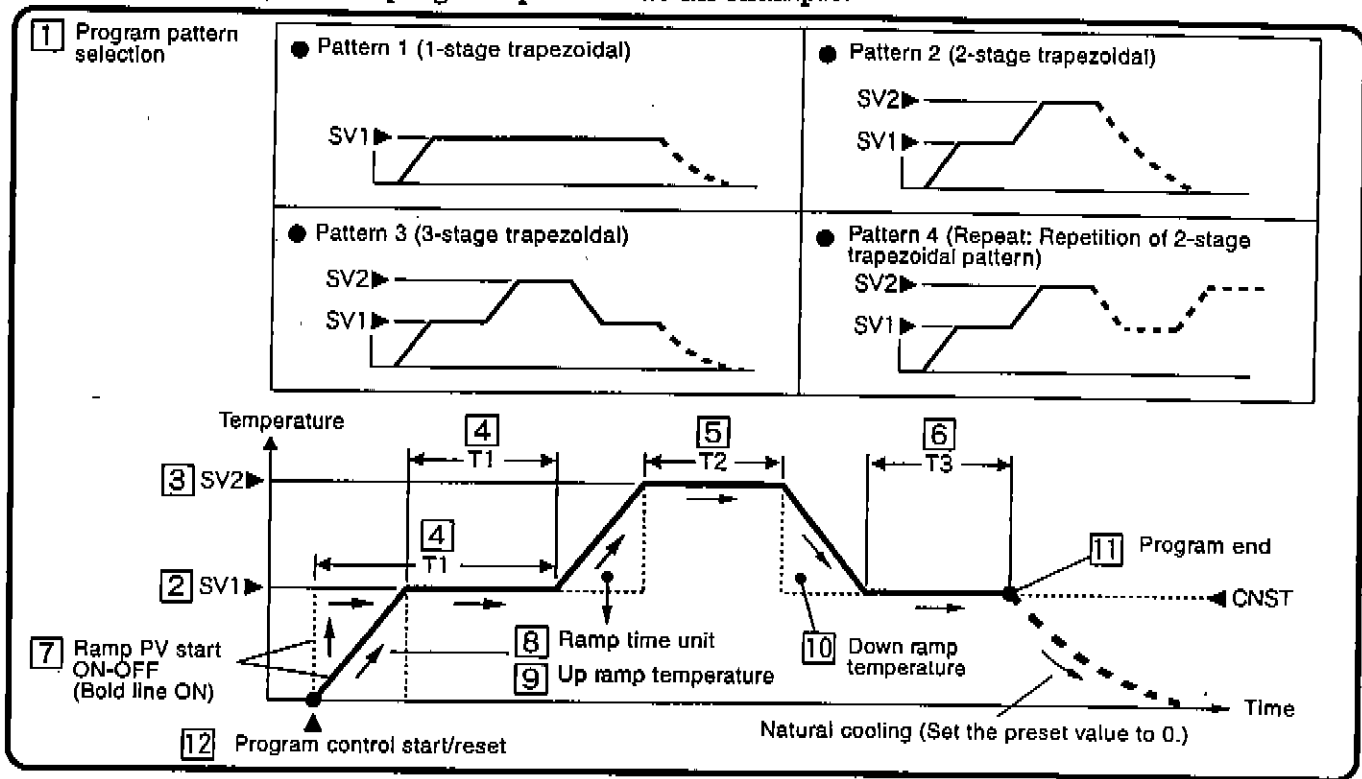


- An ON signal occurs during non-ramp operation. (StS.2)

[Caution] Neither event set value (1, 2) setting nor dead band (1, 2) setting is required for the status signal.

9.1 Setting Method Simple Program

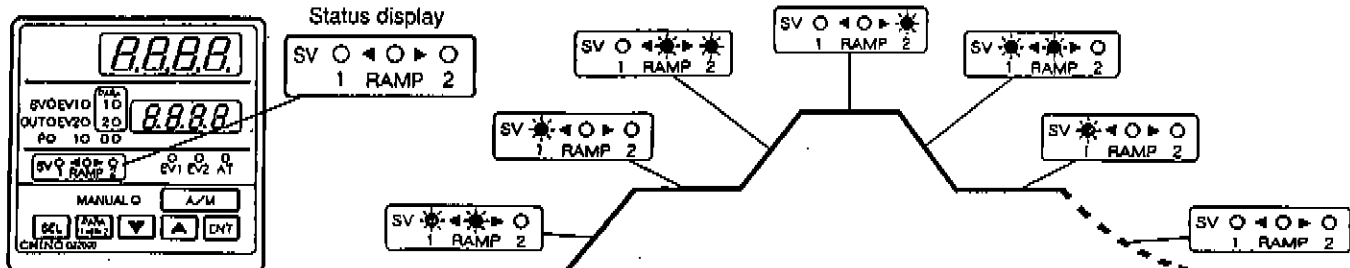
This instrument offers the simple program mode (mode 6) being developed by applying the set value switching function as the standard equipment. Its setting method is described, referring to the 3-stage trapezoidal program pattern as an example.



Set the simple program according to the setting procedure 1 ~ 12.

1 Program pattern selection	By selecting pattern 1 ~ 4 in mode 6 (47), the simple program mode is set automatically. Select [OFF] for returning to the constant value control. (Initial value [OFF]) [Caution] All output values become 0 when the program mode is selected.
2 3 SV1,SV2 setting	See 8.1 on page 13.
4 T1 (SV1 hold time) setting	Set it in mode 6 (49) (1 ~ 999min Initial value 60min)
5 T2 (SV2 hold time) setting	Set it in mode 6 (50) (1 ~ 999min Initial value 60min)
6 T3 (SV1 hold time) setting	Set it in mode 6 (51) (1 ~ 999min Initial value 60min)
7 Ramp PV start ON/OFF setting	Set it in mode 2 (14). ON: PV start OFF: Control is started with SV1.
8 Ramp time unit (minute, hour) setting	Set xxxx°C/min, xxxx°C/hour in mode 2 (11). (Common to each ramp)
9 Up ramp temperature setting	Set xxxx°C in mode 2 (12). (Common to each ramp)
10 Down ramp temperature setting	Set xxxx°C in mode 2 (13).
11 Program end setting	Select the control mode after the end of program pattern in mode 6 (48). (1) P.MAN: Switches to the preset value in mode 2 (17). Program is finished with natural cooling if the preset value is set to 0. (2) CnSt: Constant value control condition at SV when the program ends. (SV1 in this case)
12 Program control start/reset setting	Set this item in mode 6 (46). Strt: Simple program control is started rSt: Standby status Now, setting ends.

Program progressive SV selection status display



9.2 Combined Adjustment with Final Controlling Equipment (Applicable to on-off servo type Instrument only)

This instrument uses free feedback resistors ($100\Omega \sim 2k\Omega$). However, since the residual components of the feedback resistance of final controlling equipment (control motor, motor-operated valves, etc.) differ individually, combined adjustment is necessary by combining this instrument with the final controlling equipment at a ratio of 1 to 1. Set the following parameters before setting.

① Mode 5 FB dead band setting:

Fb-db = 4% (Make sure that the initial value is set to 4%.)

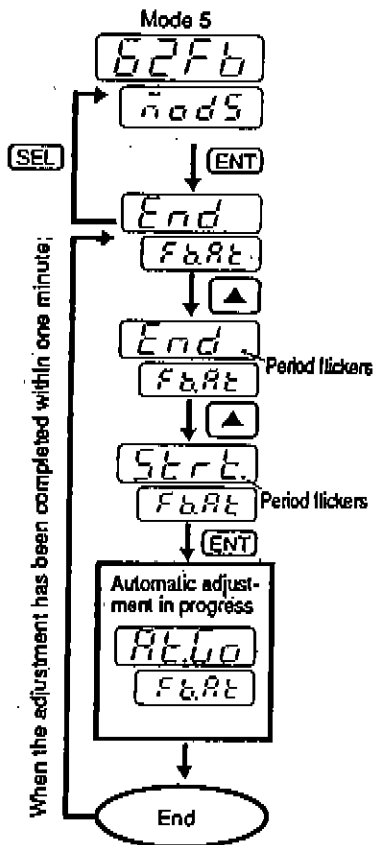
If this dead band is narrower than specified, hunting is apt to occur to unfavorably affect lives of the final controlling equipment and relays of this instrument. Set the dead band to a large value as much as possible within the controllable range.

② Mode 2 Output limiter (lower-limit, higher-limit) setting

OL-L (lower-limit) = 0.0% (Make sure that the initial value is set to 0.0%)

OL-H (higher-limit) = 100.0% (Make sure that the initial value is set to 100%)

• Adjustment (AT)



⚠ Caution

If this adjustment is not finished within one minute, the display returns to the run screen. (However, the adjustment is continued automatically.)

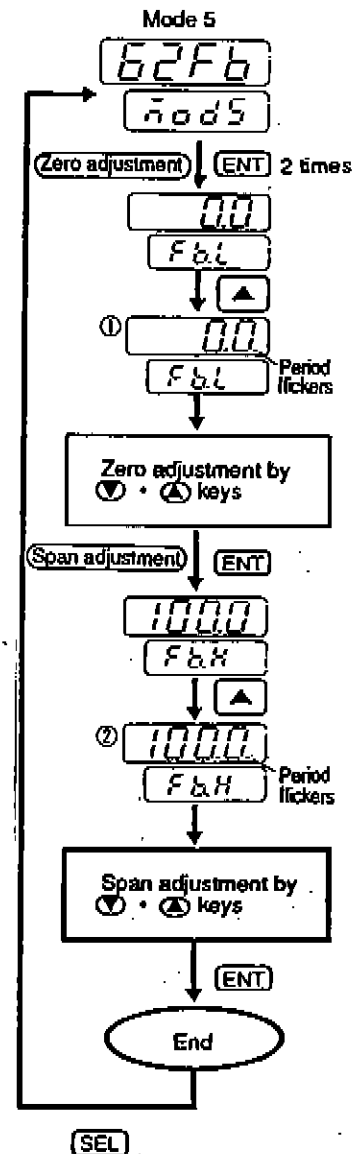
For checking whether the adjustment has been completed or not, select mode 5 again, and press (ENT) key.

The following display appears, respectively.

When adjustment has been completed; When adjustment is in progress;

End	AtGo
F&Rt	F&Rt

• Adjustment (Manual)



10 INITIAL SET VALUES AND COMMENTS ON THE TERMS

7 segments LED



10.1 Characters of Display

The indicators of this instrument use 7 segments. Alphabetic characters are represented as shown in the following table.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	b	c	d	e	f	G	H	,	J	k	L	n	n	o	P	/	r	S	t	U	u	v	X	y	z

10.2 Comments on the Terms of Parameters on Run Display Screen

Parameter names	Initial values	Setting ranges	Remarks
1. SV1 (Control set value 1) 2. SV2 (Control set value 2)	0 or 0.0	Within the measuring range	Select by PARA key, and confirm it by the PARA lamp. (See page11) Select the execution SV in setting mode 2 ③.
3. Control output value (OUT)		-5.0 ~ 105.0%	Control output is variable in manual mode. (Display only in 2-position control mode.) (See page 12.)
4. Event 1 (EV1) 5. Event 2 (EV2)	4000 (dH) -1999 (dL)	-1999 ~ 9999	Set the event type (setting mode 4 ③ ③) For the setting method, see page 11 and 14.
6. Proportional band (P) 7. Integral time (I) 8. Derivative time (D)	5% 60sec. 15sec.	0.1 ~ 999.9% 0 ~ 9999sec. 0 ~ 9999sec.	Used for setting the PID constant in manual mode. No setting is necessary when AT (setting mode 2 ③) is used. (or used for fine adjustment) (See page11.)
9. Valve opening input value	<ul style="list-style-type: none"> ● Display contents FL25 : Numeric display 0 ~ 99% 100%.....SP display Fo : Open side relay is attracted. FL : Closed side relay is attracted. Fo : Neither open side nor closed side relay is attracted. (within the dead band) 		Display during on-off servo output
10. CT input value	CE30	: 0.0 ~ 5.0A	Displayed when pulse output is selected with CT option

10.3 Comments on the Terms of Setting Mode Parameters

(①~ ⑨) in the table are equal to the numbers on the flow chart on pages 15 and 16.)

Parameter names	Display	Application limits	Contents
① Keylock (mode 1)	KEY	None	UNLK: Resettable (Initial value) LCK1 : Prohibits a change of operation parameters and AM LCK2 : Prohibits a change of LCK1 + setting parameters
② Run screen display limit (Mode 1)	d,SP	None	ALL : All running screens are displayed. (Initial value) dSP1 : Displays SV · OUT · EV1 · EV2 only dSP2 : Displays SV · OUT only.
③ Execution SV switching (Mode 2)	SHno	Constant value control only	Sets which is selected out of SV1 and SV2 for running (Initial value : SV1)
④ Lower-limit output limiter ⑤ Higher-limit output limiter (Mode 2)	oL-L oL-H	PID control only	Limits the higher-limit and lower-limit of the control output so that the output does not become higher than or lower than a set value. oL-L : Lower-limit -5.0 ~ 100.0% (Initial value : 0.0%) oL-H : Higher-limit 0.0 ~ 105.0% (Initial value : 100.0%) * Settable to SV1 and SV2.
⑥ Output variable limiter (Mode 2)	oSL	PID control only	Suppresses the variable per control output (0.2sec) to a desired value so as to prevent an abrupt change of output. Setting range : 0.1 ~ 100.0% (Initial value : 100.0%)
⑦ Pulse cycle (Mode 2)	PULS	PID control only (Pulse output time)	Sets the on-off signal cycle. Set the time to be short for fine control. However, short setting may affect the live of final controlling equipment. Setting range : 1 ~ 120sec (Initial value : 30sec)
⑧ Output dead band (Mode 2)	adb	2-position control time	This parameter is used to prevent chattering of output relays. Sets the dead band (%) to the setting span (Large dead band results in a large cycling width.) Setting range : 0.1 ~ 9.9% (Initial value : 0.5%)
⑨ Sensor correction (Mode 2)	Pb.A	None	Shifts the entire indicating value in parallel. Setting range : -199.9 ~ +999.9% (Initial value : 0.0)

Parameter names	Display	Application limits	Contents
⑩ Digital filter (Mode 2)	P.FLT	None	Used when the measuring input changes abruptly. Stable indication can be got by setting a delay to the indicating value. If the set value is large, the indication delay increases, correspondingly. Setting range : 0.0 ~ 99.9sec (Initial value : 0.1sec)
⑪ Ramp time unit (Mode 2)	r.Uni	None	Time unit to be set to ramp PER.M : °C/min (Initial value) PER.H : °C/hour
⑫ Up ramp setting (Mode 2)	SR-U	None	Temperature to be set to up ramp Setting : xxxx°C/min, xxxx°C/hour (Initial value : 0°C/min * 0=No ramp action is done.)
⑬ Down ramp setting (Mode 2)	SR-d	None	Temperature to be set to down ramp Setting : xxxx°C/min, xxxx°C/hour (Initial value : 0°C/min * 0=No ramp action is done.)
⑭ Ramp PV start ON/OFF (Mode 2)	PRSt	None	Selects whether ramp is started by PV (ON) or not (OFF). PV start requires the setting in ⑪ and ⑫. (Initial value : OFF)
⑮ ⑯ Anti-reset windup (Mode 2)	ArWL ArWH	PID control only	This overshoot suppression function is used to set the integral action range. ArW.L : Sets to the lower-limit side 0.0 ~ 100.0% (Initial value : +100.0%) Ar.W.H : Sets to the higher-limit side. -100.0 ~ 0.0% (Initial value : -100.0%)
⑰ Preset manual (Mode 2)	PnAn	PID control only	Outputs a preset output value when the present manual mode is selected. Setting range : -5.0 ~ +105.0% (Initial value : 0.0%)
⑱ AT (PID auto tuning) (Mode 2)	At	PID control only	Calculates optimum PID constants automatically and sets them. END: No AT start START: AT start
⑲ Fuzzy (Mode 2)	FUZY	PID control only	Overshoot can be suppressed by fuzzy operation. However the effect may be reverse if this function is used at quick response processes. Be careful since the switching to this function during stable control may cause interference. ON : Fuzzy function is used. OFF : Fuzzy function is not used. (Initial value)
⑳ Analog transmission type (Mode 3)	At-rS	Transmission option only	Carries out analog transmission of data of transmission types. (Initial value : PV) Transmission type : PV (Process variables) SV (Set values) MV (Control output) RSV (SV received by remote) MFB (On-off servo output valve opening)
㉑ ㉒ Transmission scale (Mode 3)	t.SCL t.SCH	Transmission option only	Sets in analog transmission. t.SCL: Sets the minimum value of transmission scale (-1999 ~ +9999) t.SCH: Sets the maximum value of transmission scale (-1999 ~ +9999) Scale range
㉓ ㉔ Remote scale (Mode 3)	r.SCL r.SCH	Remote option only	Sets in analog remote mode. r.SCL: Sets the minimum value of remote scale (-1999 ~ +9999) r.SCH: Sets the maximum value of remote scale (-1999 ~ +9999) Scale range
㉕ Remote shift (Mode 3)	r.b.r	Remote and communication options only	Shift setting to data received by remote/communication. (Settable every unit) Setting range : -199.9 ~ +999.9 (Initial value : 0.0)
㉖ ㉗ ㉘ Device No, transmission rate, communication type (Mode 3)	PdrS rAtE Com	Communication option only	AdrS : Sets device No. (Setting range : 01 ~ 99 initial value 01) rAtE : Sets the transmission rate Setting range : 1200, 2400, 4800, 9600bps (Initial value 4800) Com : Sets the communication type (Com : Personal computer communication rEM : Transmission data receive trS : Transmission data send)
㉙ Digital transmission type (Mode 3)	dt-rS	Communication option only	Transmits digital-transmit data of transmission type to the slave unit (Initial value : PV) Transmission type : PV (Process variables), SV (Set values) MV (Control output), RSV (SV received by remote), MFB(On-off servo output valve opening)
㉚ Power frequency	CYCL	CT option only	Sets the CT input power frequency. Setting : 50Hz/60Hz (Initial value : 50Hz)
㉛ ㉜ Measuring range (Mode 4)	mGL mGH	None	Sets the measuring range to an actual working range mG.L: Zero (minimum scale) mG.H: Span (maximum scale) Setting range : Temperature input ; Within the measuring range mV input : -20.0 ~ +20.0 (Initial value 0.0 ~ 20.0) V input : -5.00 ~ +5.00 (Initial value 1.00 ~ 5.00) mA input : 0.00 ~ 20.00 (Initial value 4.00 ~ 20.00)

Parameter names	Display	Application limits	Contents
③③ Linear decimal point (Mode 4)	SHdP	Linear input only	Sets the decimal point position of linear scale. Setting range : 0, 1, 2, 3 (Initial value : 1)
③④ ③⑤ Linear scale (Mode 4)	SCLL SCLH	Linear input only	Graduates the range setting input to the actual indicating value. SCLL : MIN value -1999 ~ +9999 (Initial value : 0.0) SCLH : MAX value -1999 ~ +9999 (Initial value : 100.0)
③⑥ ③⑦ SV limiter (Mode 4)	SVLL SVLH	None	Sets the limitation of the higher-limit and lower-limit of the SV setting range (for preventing a danger). Set to L < H without fail. SVL.L : Lower limit Temperature input (within the range set value) Linear input (within a scale set value -1999 ~ +9999) SVL.H : Higher-limit Temperature input (within the range set value) Linear input (within a scale set value -1999 ~ +9999)
③⑧ ③⑨ Event mode (Mode 4)	E1nd E2nd	None	Sets the event types ; event 1 (EV1) and event 2 (EV2). Symbols develop. dH (deviation higher-limit alarm) → dHW (dH with a standby function) → dL (deviation lower-limit alarm) → dLW (dL with a standby function) → AH (absolute value higher-limit alarm) → AHW (AH with a standby function) → AL (absolute value lower-limit alarm) → ALW (AL with a standby function) → CT (heater disconnection alarm) → MVH (control output higher-limit alarm) → MVHW (MVH with a standby function) → MVL (control output lower-limit alarm) → MVLW (MVL with a standby function) → STS.1 (status to turn on during ramp operation of SV) → STS.2 (status to turn on during constant value operation of SV) → P.End (status to turn on when program ends.) Initial value : E1(dH) E2(dL)
④⑩ ④① Event dead band (Mode 4)	E1db E2db	None	Sets the event output dead band to prevent chattering of the event output. Setting range : E1 : 0.0 ~ 999.9 (Initial value 2.0) } Set by absolute value. : E2 : 0.0 ~ 999.9 (Initial value 2.0)
④② Final controlling equipment adjustment (AT) (Mode 5)	FbAt	On-off servo type only	Adjusts the feedback resistance of the final controlling equipment automatically. Fb.At → Strt → At.GO → Adjustment → End (For details, see page 19.)
④③ ④④ Final controlling equipment adjustment (Manual) (Mode 5)	FbL FbH	On-off servo type only	Adjusts the feedback resistance of the final controlling equipment manually. This setting is not necessary if ④② is set. (For details, see page 19.)
④⑤ Feedback resistance dead band (Mode 5)	Fb.db	On-off servo type only	Sets the dead band of feedback resistance of final controlling equipment. Setting range : 1.0 ~ 20.0% (Initial value : 4.0%)
④⑥ Program control start/reset (Mode 6)	PGSt	Program control only	Sets whether the program control is started or reset to be standing by. rSt : Resets to the standby condition (initial value) Strt : Program control start
④⑦ Program pattern selection (Mode 6)	PGnd	None	Selects either constant value control or program control. Program control is selected when PG1 ~ PG4 are selected. oPF : Constant value control (Initial value) PG-1: Program pattern 1 (1-stage trapezoidal control) PG-2: Program pattern 2 (2-stage trapezoidal control) PG-3: Program pattern 3 (3-stage trapezoidal control) PG-4: Program pattern 4 (Repetition of 2-stage trapezoidal control) } Program control
④⑧ Control mode after program control ends (Mode 6)	P.End	Program control only	Selects the control mode after the end of program control. P.MAn: Switches to the preset manual value when program ends. CnSt : Constant value control is done by final SV when program control ends.
④⑨ ⑤⑩ ⑤① Program pattern constant value control hold time (Mode 6)	t.i.n.1 t.i.n.2 t.i.n.3	Program control only	Sets the constant value control hold time of program patterns to T1, T2, or T3. tiM.1 : 1 ~ 999min. tiM.2 : 1 ~ 999min. tiM.3 : 1 ~ 999min. } Absolute value setting (Initial value : 60min)

11 ERROR DISPLAY AND CONTROL OUTPUT

Display contents	Causes	Controller action		
		Alarm output	Control output	Auto tuning
BBBB	<ul style="list-style-type: none"> Input value is higher than the scale range of controller Disconnection (thermocouple, resistance thermometer, mV input) 	Higher-limit alarm output	0%	Stop
BBBB	<ul style="list-style-type: none"> Input value is lower than the scale range of controller 	Lower-limit alarm output	0%	
Er02 Measuring value and alternate display	<ul style="list-style-type: none"> A/D, C/J data error 		Control is continued (without C/J)	
Er03 Measuring value and alternate display	<ul style="list-style-type: none"> A/D, EOC error 		0%	
Er04 Measuring value and alternate display	<ul style="list-style-type: none"> Calibration data error 		Control is continued (Non-adjusted condition)	
Er05 Measuring value and alternate display	<ul style="list-style-type: none"> RAM backup error 		Control is continued	

Turn on the power supply once, and turn it on again in case of Er02 and Er03.

Check the setting in case of Er05. If the condition remains unchanged or if Er04 occurs, please contact your nearest CHINO's sales agent.

12 TROUBLE SHOOTING

Symptoms	Check contents and remedial measures
None of keys is acceptable	Are keys not locked? Check the lock condition in mode 1. (See page 15 and 16)
Manual run is impossible.	Is MANUAL LED (red) lighting? (See page 11)
Process variable (PV) fluctuates	<ul style="list-style-type: none"> Check the connections again (See page 5.) Check for ingress of noises.
No alarm occurs.	<ul style="list-style-type: none"> Is the alarm standby set to provided? (See page 14) Is the alarm type set according to your desired specifications?
Er02 is displayed.	It is possible that temperature compensation unit was broken when assembling the internal unit into the case. Repair is necessary, if so.

● Exchange parts

The electrical life of control relays (on-off pulse type, on-off servo type) employed in this instrument is more than 100,000 times.

Replace them periodically before they reach their lives.

If a trouble occurred, please contact your nearest CHINO's sales agent.

Controller name	Types of control relays, maker names	Q'ty	Electrical life
On-off pulse type	AGP2013 (Manufactured by Matsushita Denko Co.)	1	More than 100,000 times
On-off servo type	AW3013 (Manufactured by Matsushita Denko Co.)	2	More than 100,000 times

13 MAJOR SPECIFICATIONS

■ General specifications

Input signals

- : Thermocouple B, R, S, N, K, E, J, T, U, L
- DC voltage $\pm 20\text{mV}$, $\pm 5\text{V}$
- DC current $0 \sim 20\text{mA}$
- Resistance thermometer ... Pt100, JPt100, old Pt50

Temperature measuring unit

- : $^{\circ}\text{C}$ or $^{\circ}\text{F}$ (Internal switch selection)

Sampling cycle : Approx. 0.2sec.

Burnout

- : Higher-limit burnout is provided to thermocouple input, resistance thermometer input, and mV input as the standard equipment. Output 0% and higher-limit alarm ON during burnout.

Rated power voltage

- : 100V \sim 240V AC, 50Hz/60Hz free
- * 50Hz-60Hz setting is provided in case of option CT input (Option 24V DC)

Allowable power voltage

- : 10% of the rated power voltage

Working temperature range : $-10 \sim +50^{\circ}\text{C}$

Working humidity range

- : 20~ 90% RH (No dew condensation is allowable.)

Measure against power interruption

- : The set contents are held for longer than 10 years by a lithium battery.

Allowable signal source resistance

- : Thermocouple, DC voltage
..... Lower than 100Ω
- Resistance thermometer
..... Lower than 5Ω per line (provided that the wiring resistance of 3 wires shall be equal.)

Input resistance

- : Thermocouple, DC voltage Higher than $5\text{M}\Omega$
- DC current Approx. 35Ω

Measuring current (resistance thermometer input)

- : $2\text{mA} \pm 20\%$

Power consumption : Max. 15VA

Case and terminal cover : ABS resin

Front panel : IEC529 IP65

Weight : Approx. 600g

■ Control specifications

Control switching cycle : Approx. 0.2sec

Measuring system

- : Current output type PID system
- On-off pulse type PID system
- SSR drive pulse type PID system
- Current output type/on-off pulse type/SSR drive pulse type PID multiple On-off servo type PID system (2-position output is selectable by DIP switches.)

Control set value

- : 2 groups switching
- Within the measuring value range ($-1999 \sim +9999$)
- Execution SV 1/2 switching by screen setting (standard)
- Execution SV 1/2 switching by an external signal (option)

Set value ramp function

- : Set value ramp unit
 $^{\circ}\text{C}/\text{min}$ or $^{\circ}\text{C}/\text{hour}$ (Common to up and down)

Set value up ramp
: $0 \sim 9999$ (0=No operation)

Set value down ramp
: $0 \sim 9999$ (0=No operation)

PV start function

- : At SV change (front panel, external), at power ON, at MAN \rightarrow AUTO [front panel, external (external MAN, preset MAN)] ON/OFF selectable

Control setting accuracy rating

- : Relative error from indicating value is ± 1 digit.

Output specifications :

● Current output type PID system controller

Output signal : $4 \sim 20\text{mA}$ DC

Load resistance : Lower than 600Ω

● On-off pulse type PID system controller

Output signal : On-off pulse conductive signal

Contact capacity

: Resistive load ; 100V AC, 2A, 200V AC, 1A, 24V DC, 1A

Inductive load ; 100V AC, 1A, 200V AC, 0.5A, 24V DC, 0.5A

Minimum load; 10mA, 5VDC or over

Electrical life of relays : 100,000 times or over

On-off pulse cycle

- : About 1sec \sim about 120sec variable (1-sec step)

Contact protective element

- : Not built in. (An option contact protective element is to be externally mounted as occasion demands.)

● SSR drive pulse type PID system controller

Output signal

- : DC voltage pulse signal
- ON ; $12\text{V DC} \pm 20\%$ (max. 20mA)
- OFF ; 0.8V DC or lower

Pulse cycle

- : About 1sec \sim 120sec variable (1-sec step)

● On-off servo type PID system controller

Output signal : On-off servo conductive signal

Contact capacity

: Resistive load ; 100V AC, 2A, 200V AC, 1A, 24V DC, 1A

Inductive load ; 100V AC, 1A, 200V AC, 0.5A, 24V DC, 0.5A

Minimum load; 10mA, 5V DC or over

Electrical life of relays : 100,000 times or over

Contact protective element

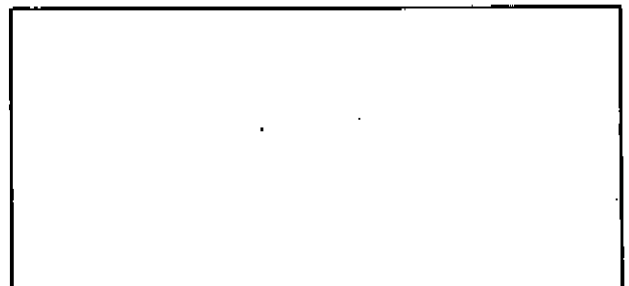
- : Not built in. (An option contact protective element is to be externally mounted as occasion demands.)

CHINO

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