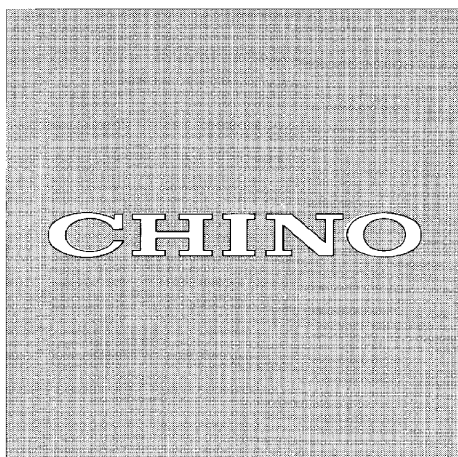
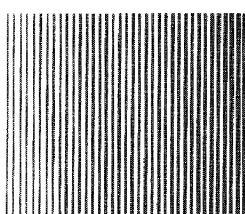




DB500 SERIES
COMPACT DIGITAL
INDICATING CONTROLLER



INSTRUCTIONS

CHINO



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

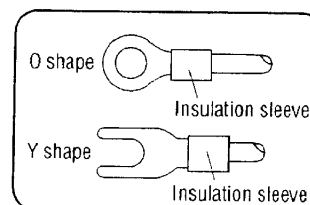
This instrument must be installed on the panel for operation. In order to avoid electric shock, provide means to prevent operators from touching any power supply section or the input/output terminals.

② Mobile type

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

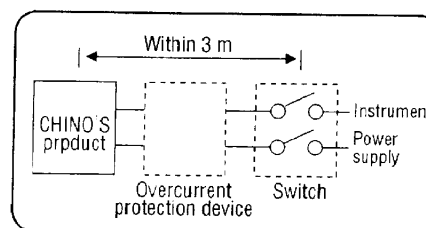
2. Terminal processes for connections

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 misoperation, 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 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.

Names and Functions of Component Parts

- Process variables (PV) display (in operation mode)
- Operation parameters display (in setting mode 1)
- Engineering parameters display (in setting mode 2)

Status display (operating conditions display)

- SET** Lights green during parameter setting.
- OUT** Flickers green when a control output turns ON and OFF.
- AT** Lights green during auto tuning.
- AL1** Lights red when an alarm 1 occurs.
- AL2** Lights red when an alarm 2 occurs.

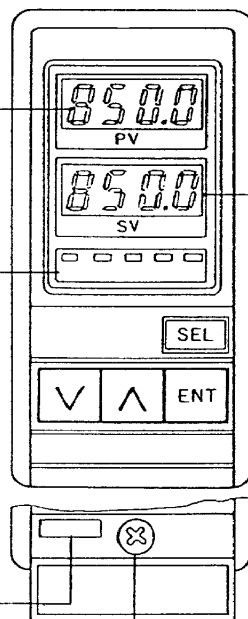
Lock switch

Sets all locks when setting this switch rightward.

Internal unit lock screw

By loosening this screw until it turns idly, the front is protruded about 1cm to be ready for drawing out the internal unit.

This is used for selecting measuring ranges or power frequency.



- Set point variables (SV values) display (in operation mode)
- Parameter setting contents display (in setting mode 1, 2)

Setting operation keys

- SEL** (Select keys) Calls parameters.
- ▲ ▼** Changes setting.
- Numeric up/down
 - Parameter selection item change-over
- ENT** (Entry key) Registers setting contents.
- Calls setting mode 2 when pressing this key together with **SEL** key.

Model

Confirm the model by the label mounted on the case

DB5□□0-□□0

- Control output
- 1: On-off pulse type PID
 - 3: Current output type PID
 - 5: SSR drive pulse type PID
- Fuzzy function
- 0: Not provided.
 - F: Provided.
- Communication/transmission output signal *Option
- 0: None
 - A: Communication I/F RS422A
 - 1: Transmitting signal 4 ~ 20mA DC

CONTENTS

1. Names and Functions of Component Parts.....	1	8. PID and Alarm Temperature Setting.....	6
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Initial Values and Setting Ranges of Major Parameters

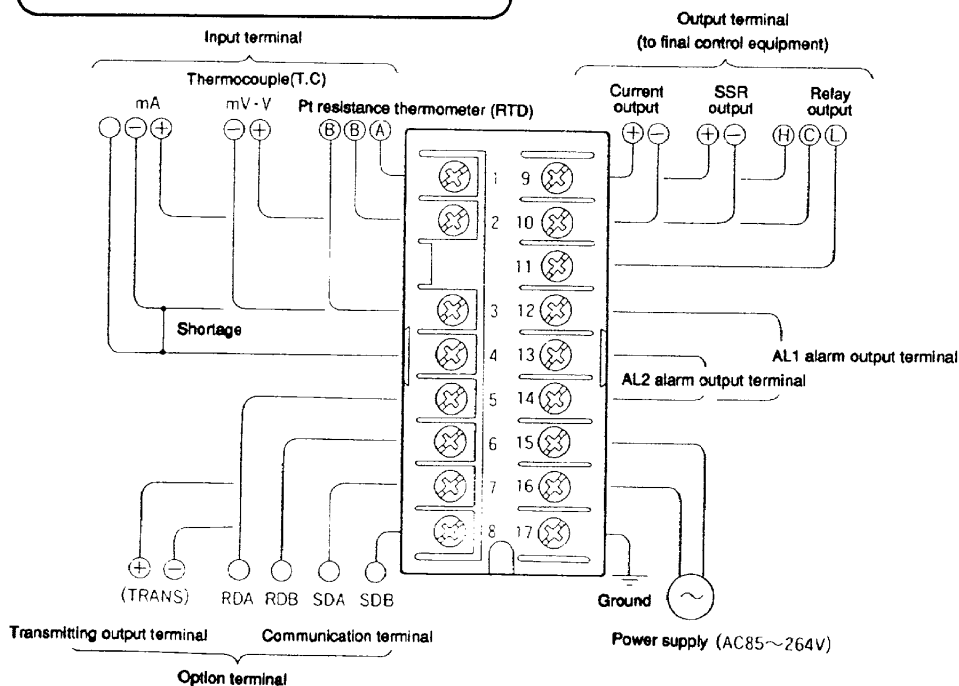
Major parameters are initialized at the delivery time from the factory. Check these parameters again and reset desired items and SV values before starting operation.

Parameter name	Initial value	Setting range	Setting mode and page
1. Desired control value (SV value)	0 or 0.0	Optional (measuring range)	Operation mode (page 5)
2. PID constants	P: 5(%), I: 60(sec), D: 30(sec)	P : 0.1 ~ 999.9(%), I: 0 ~ 9999(sec) D : 0 ~ 9999(sec)	Setting mode 1 (Page 6)
3. Alarm 1, 2	AL1: 4000(high-limit deviation), AL2: -1999(low-limit deviation)	Both AL1 and 2 -1999 ~ 9999 * ¹	Setting mode 2 (Page 7)
4. Output limiter	OL-L: 0.0%(low-limit) OL-H: 100.0%(high-limit)	OL-L: -5.0 ~ 100.0(%) OL-H: 0.0 ~ 105.0(%)	
5. Output change quantity limiter	OSL: 100.0(%)	0.1 ~ 100.0(%)	
6. Pulse cycle	PULS: 30(sec)	1 ~ 100(sec)	
7. Output dead band	O.db : 0.5(%)	0.1 ~ 9.9(%)	
8. Digital filter	P.FLT: 0.1(sec)	0.0 ~ 99.9(sec)	
9. Fuzzy function	FUZY: OFF	ON/OFF	
10. Linear range (L.H)	mG(mV) : L = 0.00 H = 10.00 mG(V) : L = 1.00 H = 5.00 mG(mA) : L = 4.0 H = 20.0	mV(both L and H) : -10.00 ~ 10.00 V (both L and H) : -5.00 ~ 5.00 mA(both L and H) : -20.0 ~ 20.0	
11. Linear decimal point	SV.DP:1	0, 1, 2, 3 selection	
12. Linear scale (L-H)	SCL.L: 0.0 SCL.H: 100.0	Both L and H -1999 ~ 9999 * ¹	
13. Sensor correction	P.BIA: 0 or 0.0	-199.9 ~ 999.9 * ²	Setting mode 2 (Page 7) (See separate communication volume)
14. Alarm type (1, 2)	A1.Md: dH(high-limit deviation) A2.Md: (low-limit deviation)	Both A1 and A2 dH.WH.dL.WL.AH.AL selection	
15. Alarm dead band(1,2)	A1.db: 2.0 A2.db: 2.0	Both A1 and A2 0.0 ~ 999.9 * ³	
16. Transmission	trnS (transmission type): PV t.SC.L(H) (transmitting scale) : Scale range	trnS(transmission type) : PV/SV selection t.SC (both L and H) : -1999 ~ 9999* ¹	
17. Communication	rAtE(transmitting speed) : 1200 AdrS(device No.) : 01 CoM(communication function selection) : CoM r.biA(digital remote shift) : 0.0	rAtE(transmitting speed) : 1200/2400/4800/9600 AdrS(device No.) : 01 ~ 99 CoM(Communication function selection) : CoM/REM/trns selection r.biA(digital remote shift): -199.9~999.9* ³	

[Decimal point position]

- *¹ The decimal point position changes according to the input types in case of a temperature input or according to the setting of the linear decimal point in case of a linear input (mV, V, mA).
- *² The decimal point position increases 1 digit from No. of decimal digits of a PV value. (It becomes xxx.x when the PV value is xxxx.)
- *³ The decimal point position increase 1 digit from No. of decimal digits of an SV value. (It becomes xx.xx when the SV value is xxx.x.)

Terminal Board and Connections

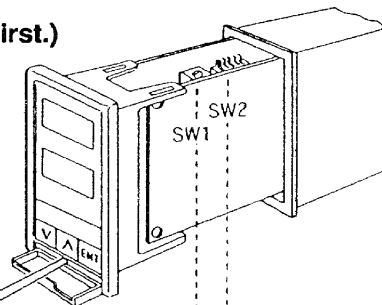
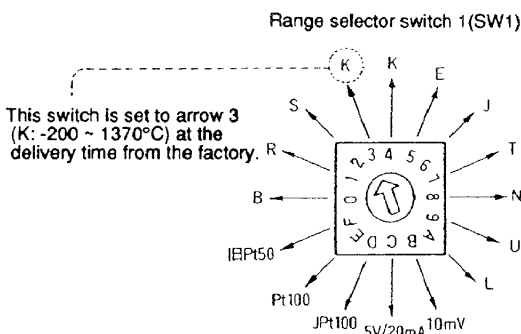


Cautions

- Don't use this instrument near a strong power circuit or a place subjected to strong inductive interferences. Separate the power line, input cable, and output cable from each other.
- M3.5 terminals are used. Use an M4 chip of less than 8mm in width.
- Neither power switch nor fuse is mounted to this instrument. It is recommended to mount these parts in circuits near the instrument.

Switching Methods of Measuring Ranges, etc.

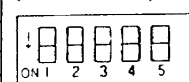
(Set switches 1 and 2 first.)



• Selector switch 2 (SW2) functions

DIP SW No.	Selection contents	ON-OFF conditions of switches
①	Auxiliary selection of measuring ranges (See measuring ranges.)	ON or OFF
②	Power frequency	50Hz OFF 60Hz ON
③	Measuring unit	°C OFF °F ON
④	Control system	PID OFF 2-position ON
⑤	Control mode	Reverse action OFF Direct action ON

SW2 (DIP switches)

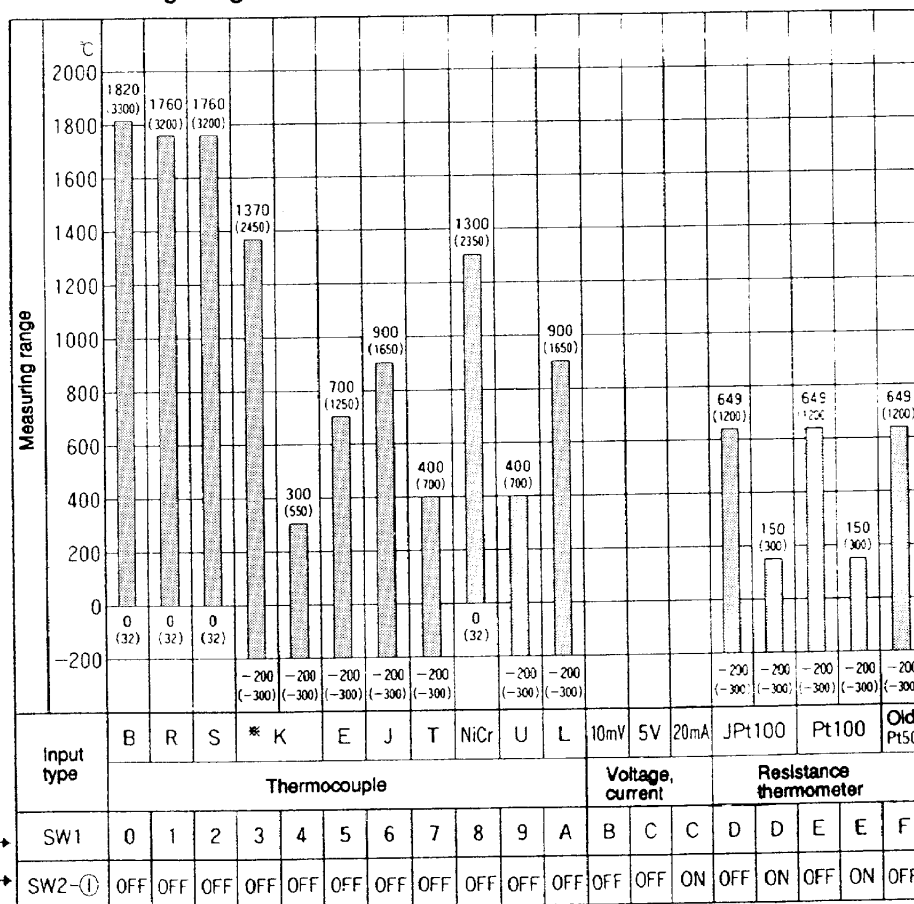


All DIP switches are set to off at the delivery time from the factory

Reverse action : Heating
Direct action : Cooling

• Measuring ranges

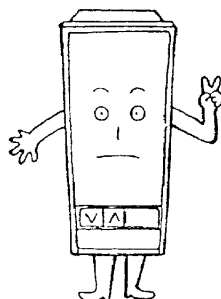
() shows °F scale.



* The range selector switch is set to [K thermocouple -200 ~ 1370°C] at the delivery time from the factory.

Turned OFF at the delivery time from the factory.

Two switches are accessible after drawing out the internal unit. Select them by using a small (-) screwdriver without fail.

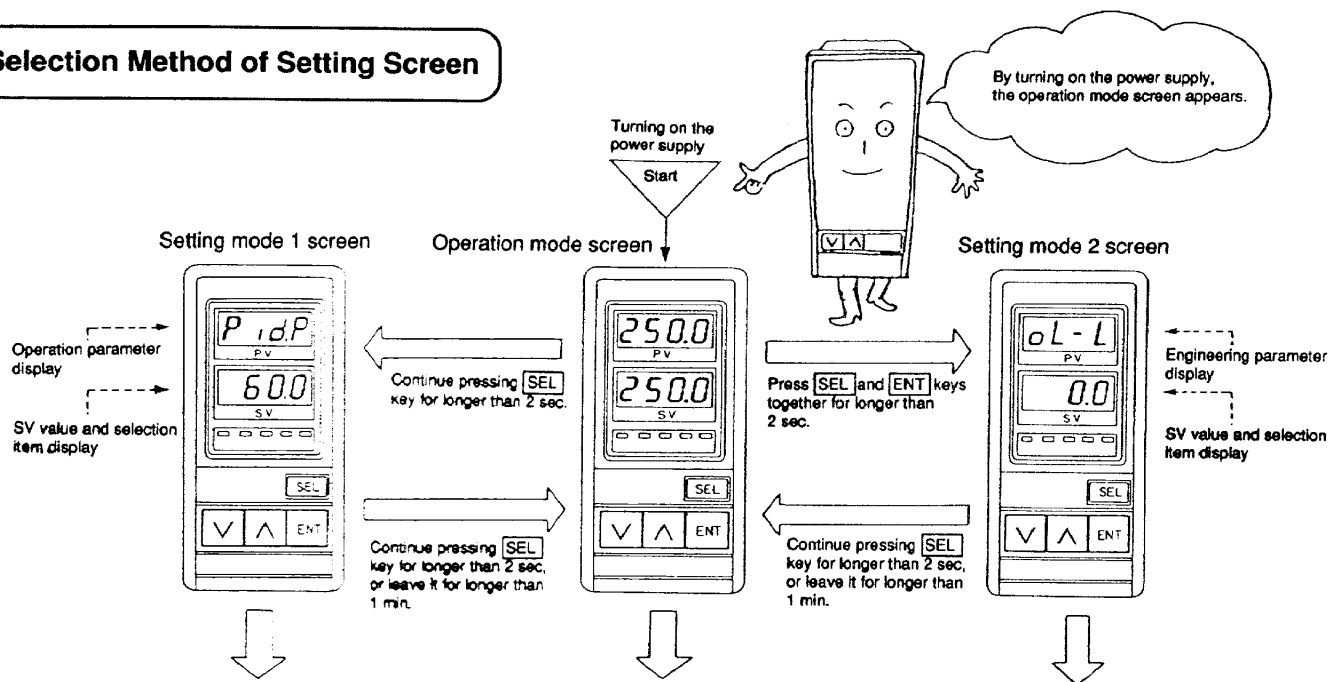


Caution

If the measuring range (SW1) and measuring unit (SW2 - ③) are changed after setting all parameters, all parameters are initialized and reset to initial values.

Accordingly, set the measuring range and measuring unit first without fail.

Selection Method of Setting Screen



Operation parameter setting

PID values, PID auto tuning (AT), and alarm 1, 2 temperature setting can be done. Parameter items differ according to the control systems.

1. Operation parameter items are displayed on the PV screen each time **[SEL]** key is pressed.
2. By pressing **[Δ]** or **[▽]** key, the setting mode is selected, and either decimal point or period starts flickering.
3. Set desired values by **[Δ]****[▽]** keys, set END and start of AT, and then, register them by **[ENT]** key. (As a result, flickering stops)

SV value setting

When this operation mode screen is started, PV indicates a PV value, while SV indicates a desired control value.

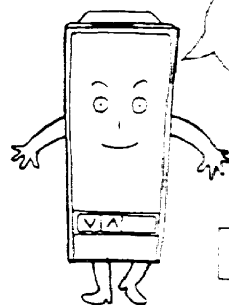
1. By pressing **[Δ]** or **[▽]** key, the setting mode is selected, and either decimal point or period starts flickering.
 Either decimal point or period flickers.
2. Set a desired SV value by **[Δ]****[▽]** keys.
3. Register it by **[ENT]** key. (Flickering stops, and the operation mode screen appears.)

Setting of engineering (Eng) parameters

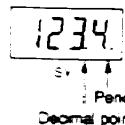
An engineering 1, 2 setting screen appears.

Parameter items differ according to the input types (temperature, voltage, current), control systems, and the addition of options.

1. Eng. 1 parameter item is displayed first, and it is switched each time **[SEL]** key is pressed.
2. Press **[ENT]** key after Eng. 2 display has appeared. An Eng. 2 parameter item is displayed each time **[SEL]** key is pressed.
3. By pressing **[Δ]** or **[▽]** key, the setting mode is selected, and either decimal point or period starts flickering.
4. Set a desired numeric or a selection item by **[Δ]****[▽]** keys.
5. Register them by **[ENT]** key. (Flickering stops.)

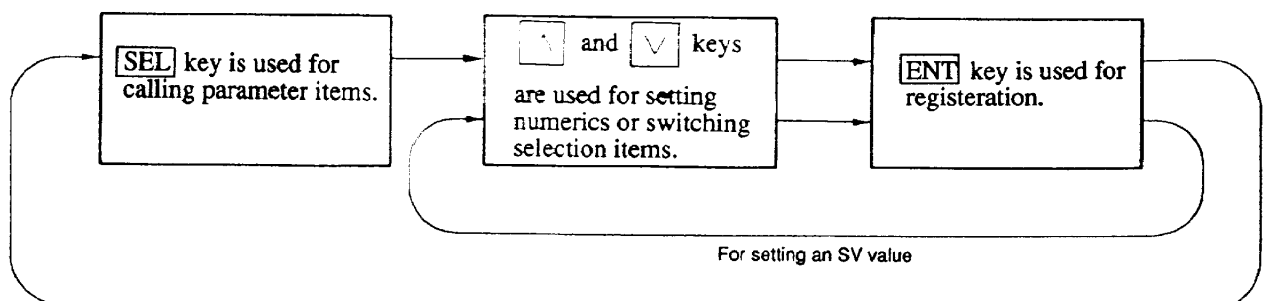


• Decimal point or period flickering position



Either decimal point or period flickers according to the range input types. (Decimal point appears when the MAX value of the range input type is lower than 900°C.)

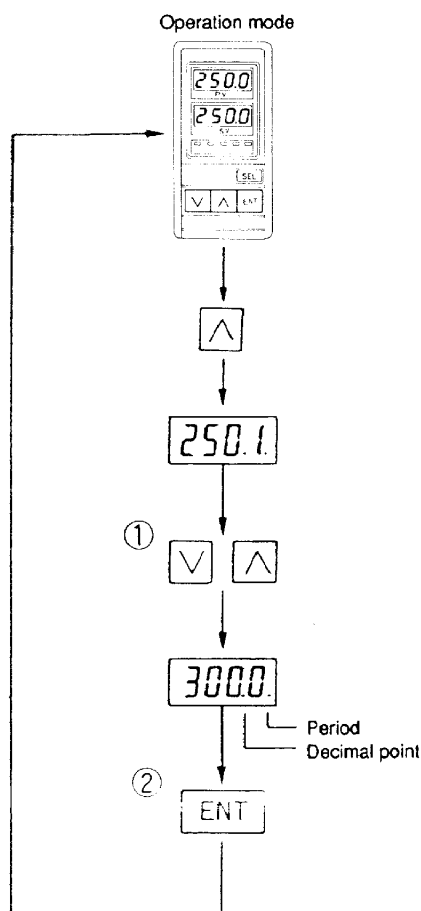
Basic Operation for Parameter Setting



For setting operation parameters and engineering parameters

Setting Method of a Desired Control Value (an SV Value)

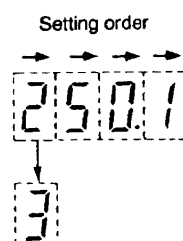
(Set a desired control value.)



- ① Set a desired SV value by pressing ∇ or Δ key.
Either decimal point or period starts flickering on the SV screen.

An example of changing the setting from 250.0(°C) to 300.0(°C)

Be sure to set an SV value in the descending order sequentially, starting with the most significant digit.



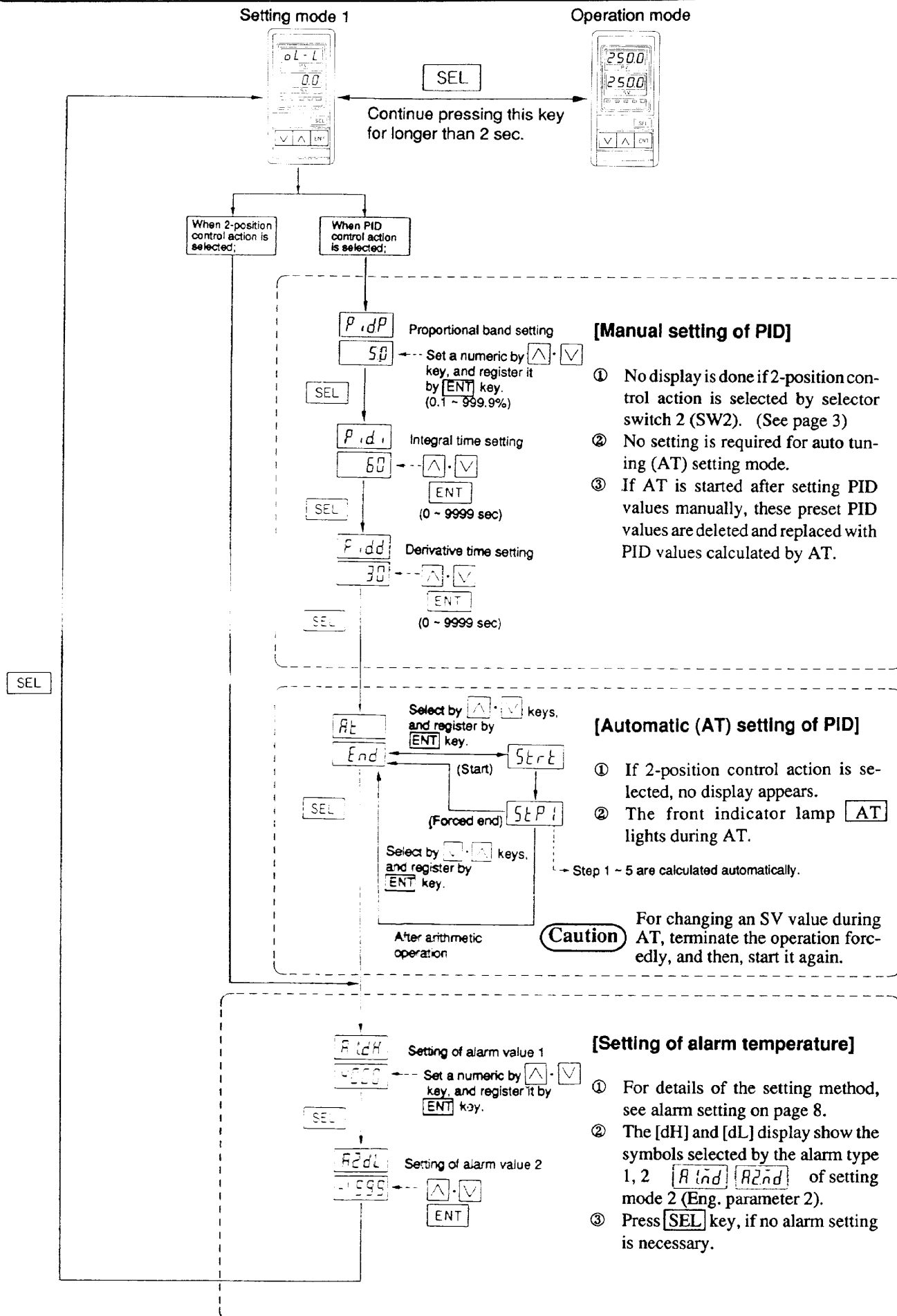
Continue pressing Δ key until 3 appears, and release it. If the desired numeric has passed, return it by ∇ key. When its display has approached a desired value, release the key once, and then, press the key intermittently to advance the numeric one by one to obtain the desired value. If the key is released for longer than one second, this operation is started with the least significant digit. Set the next digits in the same way to set 300.0 finally.

- ② Register the value by pressing ENT key.
Now, the decimal point or period stops flickering, and the mode is reset to the operation mode.

• Up-down keys (Δ · ∇) functions.

1. Up key (Δ) : Each time this key is pressed once, one is added to the present numeric. If this key is continued pressing, the addition is done fast to advance to 1→10→100→1000 digits, and stopped at the MAX value being set in the range. If this key is released for longer than one second halfway, the operation is started with the unit digit (least significant digit).
2. Down key (∇) : Each time this key is pressed once, one is subtracted from the present numeric. If this key is continued pressing, the subtraction is done fast to advance to 1→10→100→1000 digits, and stopped at the MIN value being set in the range. If this key is released for longer than one second halfway, the operation is started with the unit digit (least significant digit).

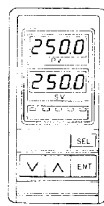
Setting Mode 1 (Operation Parameters = PID. AT. Alarm Values Setting)



Setting Mode 2 (Setting of Eng. 1, 2 Parameters)

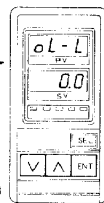
Operation mode

Setting mode 2



Press both keys together for 2 sec.

Press **SEL** key for longer than 2 sec or leave it for longer than 1 min. (This operation can also be done halfway from an intermediate parameter.)

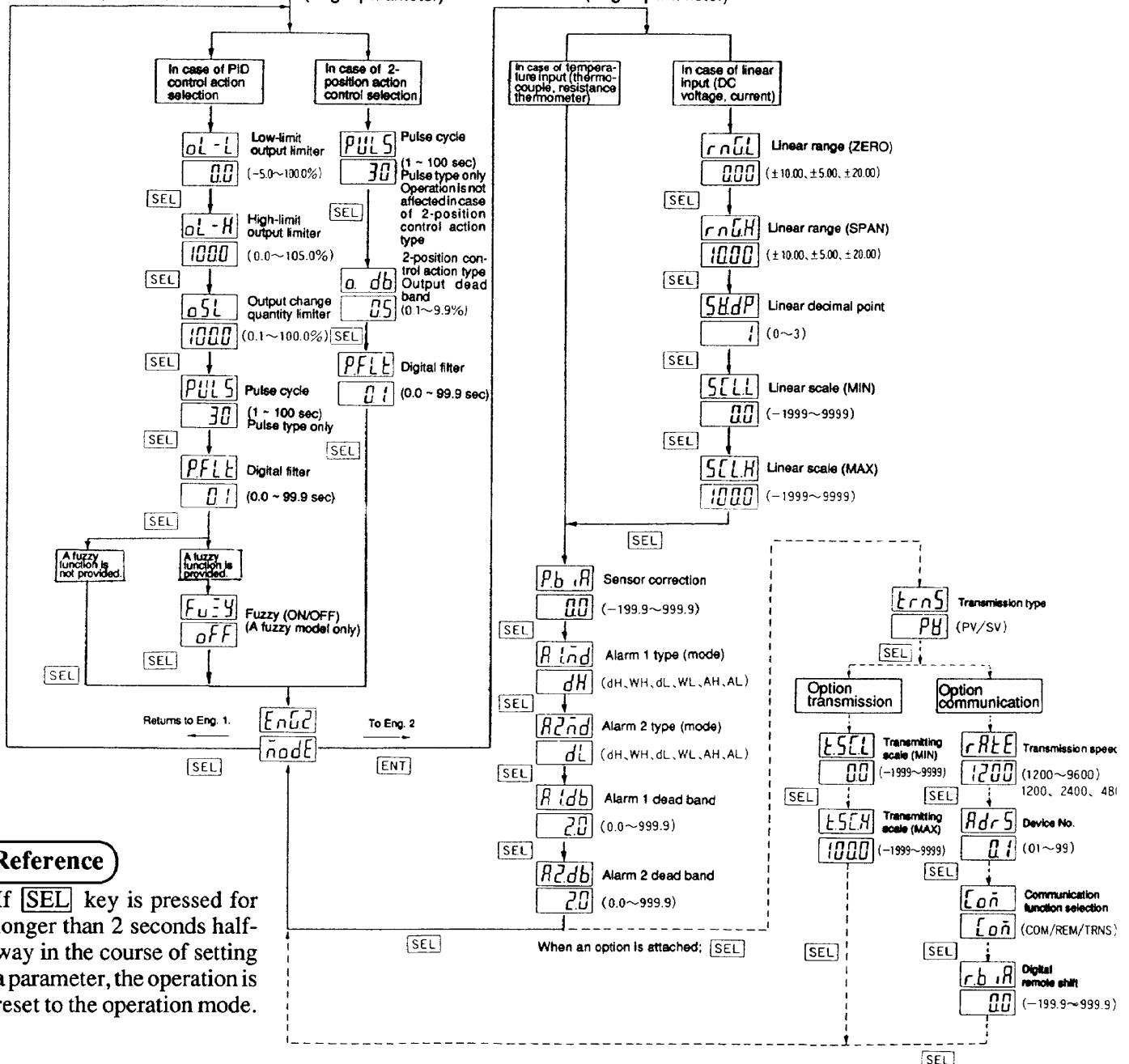


(Eng.1 parameter)

(Eng. 2 parameter)

In case of fuzzy model

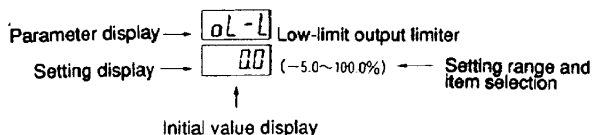
The fuzzy function is initialized to be turned OFF. For using this fuzzy function, turn it ON, referring to ⑧ on page 9.



Reference

If **SEL** key is pressed for longer than 2 seconds halfway in the course of setting a parameter, the operation is reset to the operation mode.

Reference



1. For meanings of parameters, see the comments on terms on page 9.
2. For setting, set a numeric or select an item by **SEL** key, and register it by **ENT** key.
3. The decimal point position of numerics changes according to the setting of linear decimal point and temperature range type.

Alarm Setting Method

(Set the alarm type, alarm dead band, and alarm temperature.)

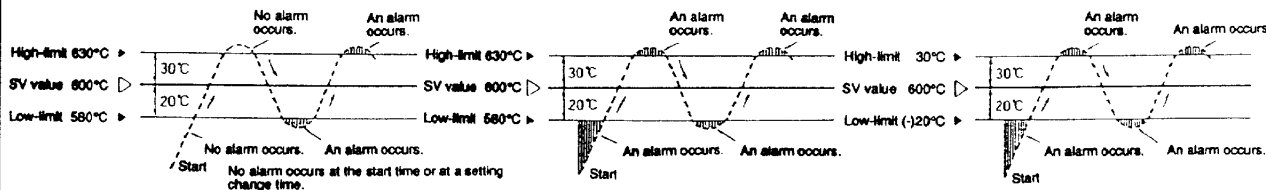
Setting example

This instrument is provided with two alarm output terminals (alarm 1 = A1, alarm 2 = A2) as standard equipment.

The high-limit and low-limit setting shows an example of a standby absolute alarms.

The high-limit and low-limit setting shows an example of absolute value alarms.

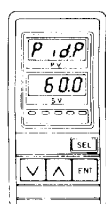
The high-limit and low-limit setting shows an example of deviation alarms.



Setting mode 1

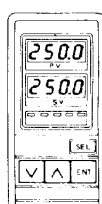
Operation mode

Setting mode 2



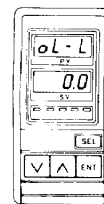
SEL

Press this key for longer than 2 sec.



SEL
ENT

Press these keys together for longer than 2 sec.



Setting sequence

Select Eng. 2 parameter.

③ Set an alarm temperature.

SEL

R1RH

An alarm type is displayed.

630

Set it by Δ · ∇ keys and register it by ENT key.

SEL

R2YL

Set it by Δ · ∇ keys, and register it by ENT key.

-20

Setting Example)

A1 : Absolute high-limit alarm of 630°C
A2 : Standby deviation low-limit alarm of -20°C

Caution

Deviation alarm values

Set a deviation alarm to (±) xx (°C) with reference to an SV value. Accordingly, the deviation low-limit alarm value is always set to (-) xx (°C). (No plus (+) sign is displayed.)

① Set an alarm type.

Select it by Δ key, and register it by ENT key.

SEL

R1nd

RH

SEL

R2nd

YL

SEL

UL

RL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

② Set the alarm dead band.

SEL

R1db

20

SEL

R2db

20

SEL

AL

AL

AL

AL

AL

AL

AL

AL

AL

AL

Setting example)
Initial value of 2.0 is set to both A1 and A2. (An initial value is normally set.)

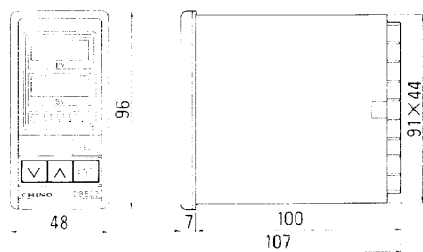
Press [SEL] key for longer than 2 seconds.

Comments on the Terms of Major Parameters

Various parameters are prepared for DB500. Perform optimum control by fully utilizing these parameters.

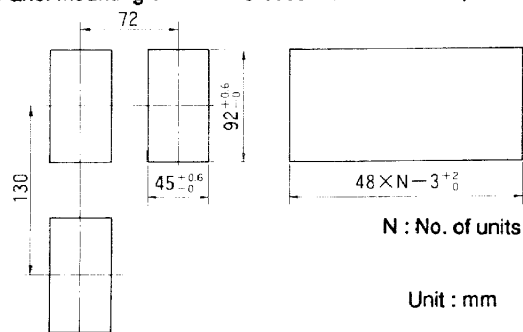
Parameter name (): Setting unit	Display	Applicable model	Contents	Setting mode and page
① PID auto tuning	 (t = r)	PID type only	This parameter sets optimum PID constants automatically. When AT is started, the ON/OFF control action is repeated 5 times (Step 1 ~ 5), and END is displayed after the end.	1 (Page 6)
② Alarm value 1 Alarm value 2	 (d = L)	All models	These parameters are used to set a desired alarm temperature. Alarms can be set at the high-limit, low-limit, high-high-limit and low-low-limit. Symbols dH and dL represent the alarm symbols selected by the alarm type in ⑬. A deviation alarm is set to $\pm xx(^{\circ}\text{C})$ to an SV value, and an absolute value alarm is directly set to a desired value.	1 (Page 6 and 8)
③ Low-limit output limiter, high-limit output limiter (%)	 (L = H)	PID type only	These parameters are used to limit the control output to be less than or more than an SV value for the purpose of suppressing the input value temperature rise or fall.	2 (Eng.1) (Page 7)
④ Output change quantity limiter (%)	 (S = L)	PID type only	This parameter suppresses a change quantity of the control output every output (0.2 sec) to a desired value for the purpose of preventing an abrupt change of output.	2 (Eng.1) (Page 7)
⑤ Pulse cycle (sec)	 (S = L)	DB510, 550 (Pulse output type) only	This parameter is used to set the ON/OFF signal cycle. This time is set to be short when fine control is desired. However, it affects the life of the final control equipment.	2 (Eng.1) (Page 7)
⑥ Output dead band (%)	 (b = L)	2-position control action type only	This parameter is provided to prevent chattering of an output relay. It is set to a dead band (%) of an output to the full scale. As this parameter is set larger, the cycling interval increases, correspondingly.	2 (Eng.1) (Page 7)
⑦ Digital filter (sec)	 (L = T)	All models	This parameter stabilizes a measuring input by keeping a delay in indicating values when a measuring input changes abruptly. However, when the SV value increases, the delay also increases, correspondingly.	2 (Eng.1) (Page 7)
⑧ Fuzzy	 (F = Z)	DB500-F00 only	When this function is turned ON, an overshoot is suppressed by fuzzy operation. However, this may cause a counter result, if the response of controlled systems is high. (This switching causes disturbances when the control condition is stable.)	2 (Eng.1) (Page 7)
⑨ Linear range	 (r = r)	Voltage and current inputs only	This parameter is used to set an input range of $\pm 10\text{mV}$, $\pm 5\text{V}$, or $\pm 20\text{mA}$ to an actual input range. Example) $\pm 10\text{mV} \rightarrow 0 \sim 10\text{mV}$ (L) 0.0 $\pm 5\text{V} \rightarrow 1 \sim 5\text{V}$ (L) 0.0 $\pm 20\text{mA} \rightarrow 4 \sim 20\text{mA}$ (L) 0.0 etc.	2 (Eng.2) (Page 7)
⑩ Linear decimal point	 (g = V)	Voltage and current inputs only	The decimal point position of the scale in ⑨ can be set to 0, 1, 2 or 3. Example) If 0 ~ 100% is set in [1], 0.0 ~ 100.0(%) results.	2 (Eng.2) (Page 7)
⑪ Linear scale	 (L = H)	Voltage and current inputs only	This parameter is used to set the linear range (MIN ~ MAX) being set in ⑨ to an actual indicating value (MIN ~ MAX). Example) $0 \sim 10\text{mV} \rightarrow 0 \sim 1200$ (L) 0.0 $1 \sim 5\text{V} \rightarrow 0 \sim 100$ (L) 0.0 $4 \sim 20\text{mA} \rightarrow 0.0 \sim 50.0$ (L) 0.0 etc.	2 (Eng.2) (Page 7)
⑫ Sensor correction	 (b = R)	All models	This parameter shifts the entire indicating value in parallel.	2 (Eng.2) (Page 7)
⑬ Alarm type 1 Alarm type 2	 (d = M)	All models	These parameters are used to set an alarm type. The following alarm types are prepared in alarm mode 1 and 2, and their symbols are selected. Alarms are displayed in the order of the following alarms. dH : Deviation high-limit $\rightarrow W(^{\circ})H$: Standby deviation high-limit $\rightarrow$ dL : Deviation low-limit $\rightarrow W(^{\circ})L$: Standby deviation low-limit $\rightarrow$ AH : Absolute value high-limit $\rightarrow AL$: Absolute value low-limit The selected symbol is also displayed in ②. Reference) Standby deviation alarm : An alarm output is turned OFF to prevent a wrong alarm even at an alarm point when changing an SV value or an alarm value or when initializing the instrument at the time of turning on the power supply.	2 (Eng.2) (Page 7 and 8)
⑭ Alarm 1, dead band Alarm 2, dead band	 (b = L)	All models	These parameters are used to set a dead band for an alarm output value and its reset value so as to prevent chattering of the alarm output. (They are set by an absolute value.)	
⑮ Communication (option)	 (t = E)	DB500-0A0 only	: Sets the transmission speed selectively out of 1200, 2400, 4800, and 9600. : Set this parameter to the address of a connected unit. Device numbers can be set over a range from 01 to 99. : Sets the communication type. CoM ($\sim$) : Host communication rEM ($\sim$) : Digital remote communication trnS ($\sim$) : Digital transmission : Sets the remote shift during the use in the digital remote mode.	2 (Eng.2) (Page 7) (Attachment communication reference)
⑯ Transmission (option)	 (S = L)	DB500-0A10 only	: Selects either PV or SV as the transmission type. : Sets the MIN value of the transmitting scale. (Sets an indicating value when the analog output value is 4mA.) : Sets the MAX value of the transmitting scale. (Sets an indicating value when the analog output value is 20mA.)	

External Dimensions and Panel Cutout



Panel mounting size

Closed instrumentation panel size



Trouble Display and Output

Display contents	Causes	Controller action		
		Alarm output	Control output	Auto tuning
 Lights	- An input value is higher than the scale range of controller. - Disconnection (when a thermocouple, resistance thermometer, or mV signal is input.)	High-limit alarm output	0%	Stop
 Lights	An input value is lower than the scale range of controller.	Low-limit alarm output	0%	Stop
 * Alternate display with a PV value	A/D zero cancel data error	—	0%	Stop
 * Alternate display with a PV value	A/D, CJ data error	—	Control is continued (without CJ)	Stop
 * Alternate display with a PV value	A/D, EOC error	—	0%	Stop
 * Alternate display with a PV value	A calibration data error	—	Control is continued (Not adjusted)	Stop

* 1-sec changeover : If Er□□ occurred, turn off the power supply once, and then, turn it on again. If the condition still remains unchanged, please contact your nearest CHINO's sales agent.

Major Specifications

General specifications

Measuring accuracy	$\pm 0.2\% \pm 1$ digit of input span Thermocouple input does not include any reference junction compensation accuracy.
Reference junction compensation accuracy	$\pm 0.8^\circ\text{C}$
Sampling cycle	About 0.2 sec
Burnout	Provided for thermocouple inputs, resistance thermometer inputs and mV inputs. Output is 0%, and the high-limit alarm is output when this burnout function turns on.
Display system	4 digits x 2 rows by 7 segment LEDs Status display by individual LEDs. (5 LEDs)
Automatic reset	The instrument is reset to the operation mode automatically, if it is not operated for longer than 1 minute in the setting mode.
Power supply	85 ~ 264V AC free, 50/60Hz (internal switch selection)
Input resistance	Thermocouple, mV and V input ... Higher than $1\text{M}\Omega$, mA input... About 150Ω
Measuring current	Resistance thermometer input ... About 2mA
Power consumption	About 7VA
Case	ABS resin

Troubleshooting

Symptoms	Check contents
None of keys is acceptable.	Check if the lock switch is set to the right notch. (See page 1.)
PV value fluctuates.	- Check the connections - Check them for the introduction of noises.
Decimal point or period automatically flickers.	The decimal point position changes according to the range input types (see pages 2 and 4) and linear decimal point (see ⑩ on page 9). Flickering can be stopped by pressing [ENT] key.

Alarm specifications

No. of alarm points	2 points
Output mode	Relay make contact, common
Contact capacity	
	; Resistive load 100V AC · 1A 200V AC · 0.5A
	; Inductive load 100V AC · 0.5A 200V AC · 0.2A

Control specifications

Output model	
• Current output type	Output signal 4 ~ 20mA DC Load resistance Lower than 500Ω
• On-off pulse type	Output signal 3-point (H.C.L) output through relay contacts
Contact capacity	
	; Resistive load 100V AC · 2A 200V AC · 1A
	; Inductive load 100V AC · 1A 200V AC · 0.5A
• SSR drive pulse type	
	Output signal DC voltage pulse signal ON ; 12V DC $\pm 20\%$ OFF ; Lower than 0.5V DC
Load capacity	Lower than 20mA