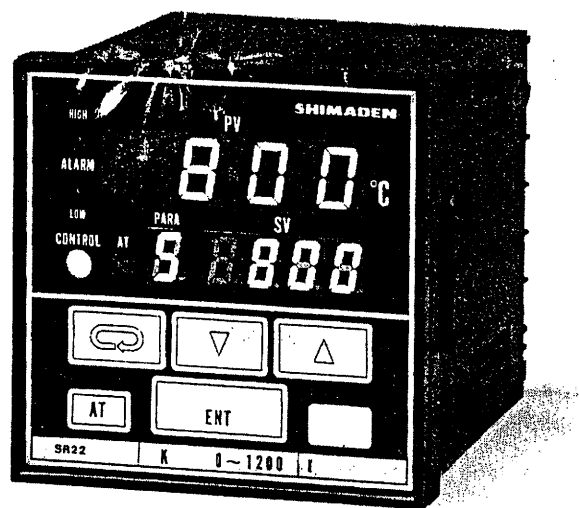


SERIES SR22
MICROPROCESSOR-BASED AUTO-TUNING PID CONTROLLERS

OPERATING INSTRUCTIONS



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Display	
Process Value (PV) Display:	Digital LED (10.1 mm high)
Display Tolerance:	$\pm 0.3\%$ + 1 digit at $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$
Display Resolution:	Upon scaling (0.01, 0.1, 1)
Set Value (SV) Display:	Digital LED (8.0 mm high)
Parameter Display:	SV, PB, IT, DT, High/Low alarm set values, High/Low alarm set limiter, SA (On/Off mode), PB cycle, Alarm sensitivity, Control output, Setting lock, PV bias
Monitor Display:	Auto-tuning, High/Low alarm, Control output
Setting	
Setting Method:	Front membrane keypad
Setting Selection:	Same as parameter display
Setting Resolution:	Upon scaling (0.01, 0.1, 1)
Set Key Selection:	Parameter check, UP, DOWN, AT, ENT, Mode key (6 Modes)
Inputs	
Thermocouples	
(User-selectable):	JIS/ANSI/DIN T, J, E, K, N, R, S, B, WRe5-26, U & L (DIN43710)
External Resistance:	100 Ω max.
Input Impedance:	500k Ω
Burnout Circuit:	Standard feature (Up-scale)
Cold Junction Temperature Compensation Range :	5 ~ 45 $^{\circ}\text{C}$
R.T.D.	Pt100 Ω JIS/ANSI/DIN
Amperage:	1mA
Lead Wire Tolerable Range:	5 Ω max/wire
DC Voltage/Input Impedance:	0 ~ 10 mV, 10 ~ 50 mV, 0 ~ 20 mV, 0 ~ 50 mV, - 10 ~ 10 mV / 500k Ω - Programmable range
DC Current/Receiving Impedance:	4 ~ 20mA, 0 ~ 20mA/250 Ω - Programmable range
Control Output	
Control Mode:	Auto-tuning PID with anti-reset windup
Proportional Band (PB):	0 ~ 200.0% (On/Off mode at 0 setting, contact & SSR only)
Integral Time (IT):	1 ~ 3600 seconds
Derivative Time (DT):	0 ~ 1200 seconds (PI mode at 0 setting)
Proportional Cycle:	1 ~ 120 seconds (Contact & SSR output)
On/Off Sensitivity:	0.1 ~ 5%FS (Contact & SSR output)
Control Output Characteristics:	RA/DA internally selectable (factory set RA)
Control Outputs:	Contact = 240V AC 2.5A/resistive load, 1A/inductive load Voltage = 0 ~ 10V DC load current/2mA max. Current = 4 ~ 20mA DC load resistance/600 Ω max. SSR Voltage = 15V DC 20mA max.
Sampling Cycle:	0.25 second
Isolation:	Between input and internal circuit Between internal circuit and output
Alarm	
Alarm Mode:	Individually setting/output, High/Low alarm selectable, deviation/absolute value selectable
Alarm Setting:	Digital setting by keypad
Alarm Setting Ranges	
Deviation:	High alarm = SV 0 ~ + 1999 Low alarm = SV 0 ~ - 1999
Absolute Value:	Within measuring range for both high & low alarms, High alarm > Low alarm
Alarm Mode & Sensitivity:	On/Off, 0.1 ~ 5%FS
Inhibit/Non-inhibit:	Internally selectable (factory set non-inhibit)
Alarm Output/Rating:	Contact/240V AC, 2.5A/resistive load
Data Memory:	By nonvolatile static RAM
Operating Ambient Temperature Range :	- 10 ~ 50 $^{\circ}\text{C}$
Operating Ambient Humidity Range :	90%RH max. (non-condensing)
Power Supply:	100 ~ 240V AC $\pm 10\%$, 50/60Hz. (universal power supply)
Power Consumption:	Approx. 5VA
Insulation Resistance:	500V DC 20M Ω between input terminal and power supply terminal 500V DC 20M Ω between power supply terminal and ground terminal One minute at 500V AC between input terminal and power supply terminal One minute at 1000V AC between power supply terminal and earth terminal
Dielectric Strength:	72(H) x 72(W) x 103(D) mm (panel depth 90 mm)
External Dimensions:	Approx. 310 g
Weight:	

2 ORDERING INFORMATION

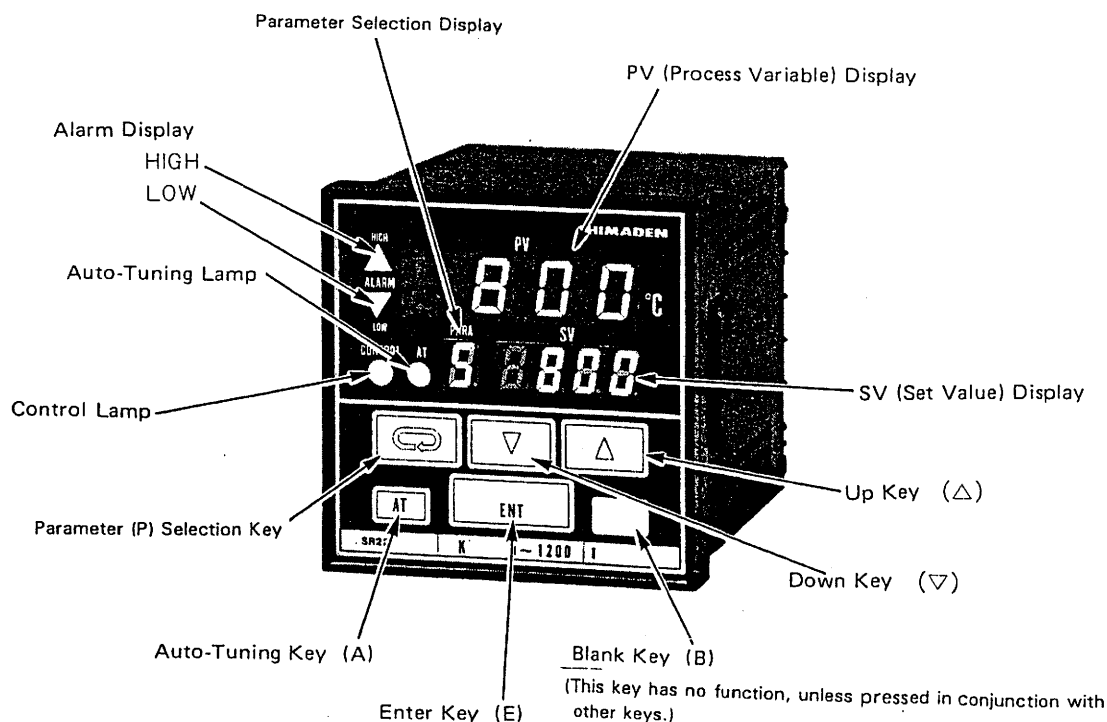
ITEMS	CODE	SPECIFICATIONS
SERIES	SR22-	MPU-Based PID Auto-Tuning Controller, DIN 72 x 72 mm, $\pm 0.3\%$ FS Accuracy
INPUT	1	Thermocouples, User-Selectable Inputs, Programmable Ranges
	2	R.T.D. (Pt100), User-Selectable Ranges
	3	DC Voltage, User-Selectable 0 ~ 10, 10 ~ 50, - 10 ~ 10, 0 ~ 20, 0 ~ 50 mV Linear, User-Programmable Ranges
	4	DC Current, 4 ~ 20, 0 ~ 20mA Linear, User-Programmable Ranges
	6	DC Voltage, User-selectable 0 ~ 1, 1 ~ 5, - 1 ~ 1, 0 ~ 2, 0 ~ 5 V DC Linear, User- Programmable Ranges
	9	Others (Please consult before ordering.)
CONTROL OUTPUT	Y	Contact: PC Cycle 1 ~ 120 seconds, Capacity = 240V AC/Resistive Load 1A/Inductive Load
	I	Current: 4 ~ 20mA DC, Load Resistance 600 Ω max.
	P	SSR Voltage: PC Cycle 1 ~ 120 seconds, Output Rating 15V DC/20mA max.
	V	Voltage: 0 ~ 10V DC, Load Current 2mA max.
	X	Others (Please consult before ordering.)
ALARM	00	None
	09	Individually Setting/Output, High/Low, Deviation/Absolute Value (Selectable), Inhibit/ Non-Inhibit (Selectable), SA: 0.1 ~ 5% FS (Selectable)
REMARKS	0	Without
	9	With (Please consult before ordering.)

Since the Series SR22- has been designed for user-selectable inputs, user-selectable ranges and user-programmable scaling, the unit will be shipped with one factory-set standard ranges.

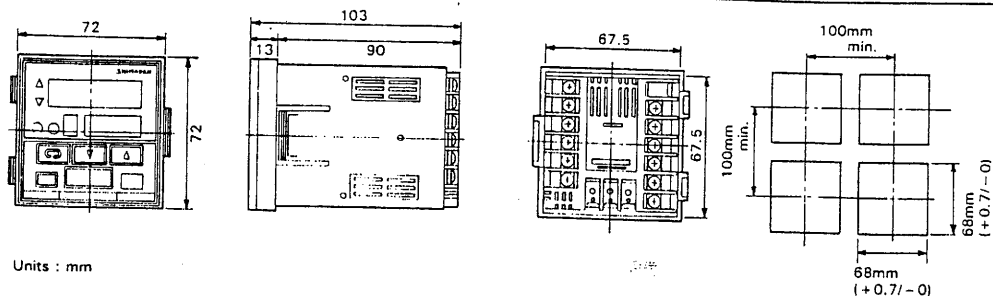
Standard Range (Factory-Set when shipping)

Input	Standard/Rating	Ranges
1 Thermocouple	JIS (K)	0 ~ 800°C
2 R.T.D.	JIS Pt100	0 ~ 200.0°C
3 DC Voltage	0 ~ 10mV	0 ~ 100.0%
4 DC Current	4 ~ 20mA	0 ~ 100.0%
6 DC Voltage	1 ~ 5V	0 ~ 100.0%

3 NAME & FUNCTION



4 EXTERNAL DIMENSIONS & PANEL CUTOUT

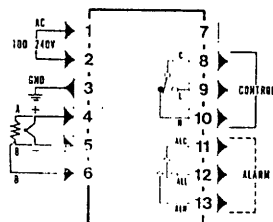


5 INSTALLATION

- Prepare a panel cutout of 68(H) x 68(W)mm in the panel. Insert the unit in the panel until it clicks into place.
- Installation area should be:
 1. Free from corrosive gases.
 2. Within $-10 \sim 50^{\circ}\text{C}$ ambient temperature and 90%RH max. humidity.
 3. Away from direct sunlight, impact and radiant heat from electric ovens.

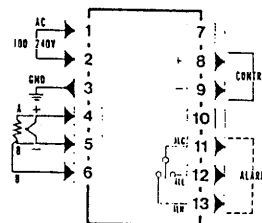
6 TERMINAL ARRANGMENT & WIRING

Contact Output (Y)



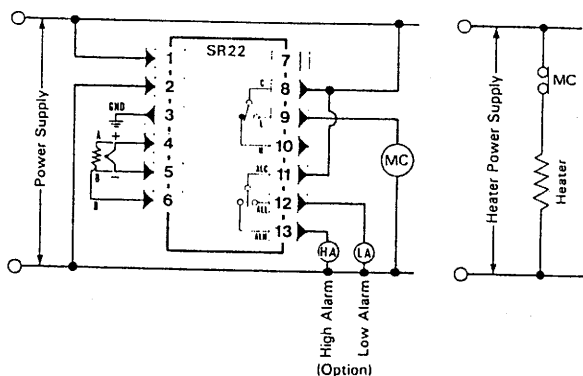
Current Output (I) Voltage Output (V)

SSR Voltage (P)

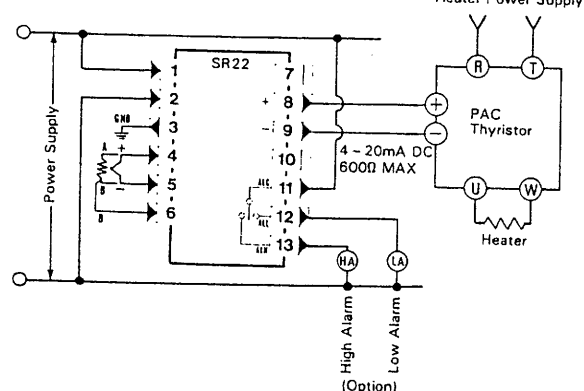


The input circuit operates on a weak current signal. Please wire it separately from the motor circuit and operation circuit. If it becomes necessary to wire them together, please use shield wire and one point grounding.

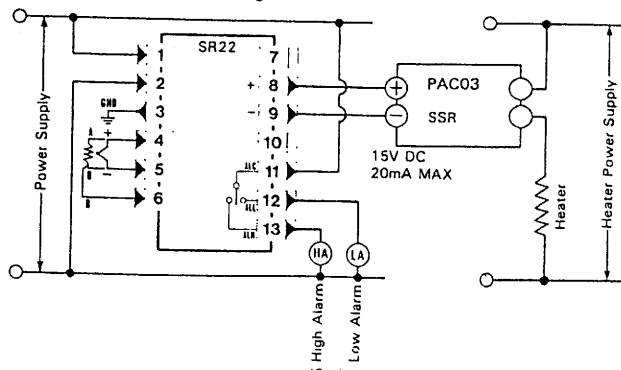
Contact Output (Y)



Current Output (I)



SSR Voltage (P)

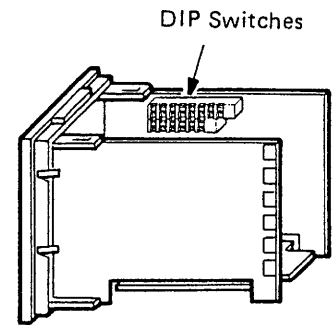
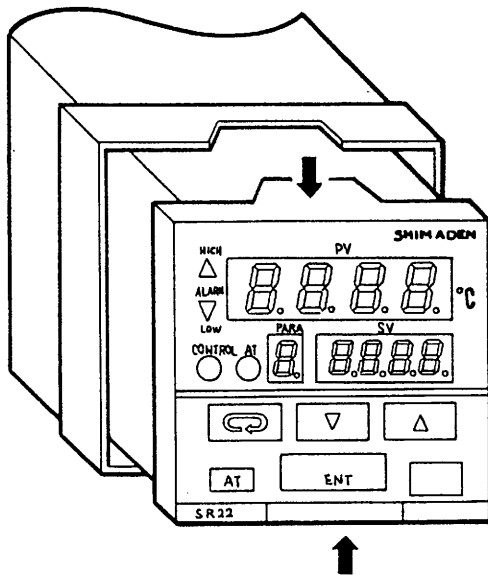


Note:
For contact output models, please be sure to install the varistor included with the unit to the output terminals (C-L or C-H) for surge suppression.

7 SETTING & SELECTION (By inner DIP Switches)

The case and inner unit of this instrument are connected with a connector. You can draw out the inner unit while pushing the lock spring located under the front panel. When encasing the inner unit, push it in slowly.

* Before drawing out the inner unit, turn off the power supply to the instrument.



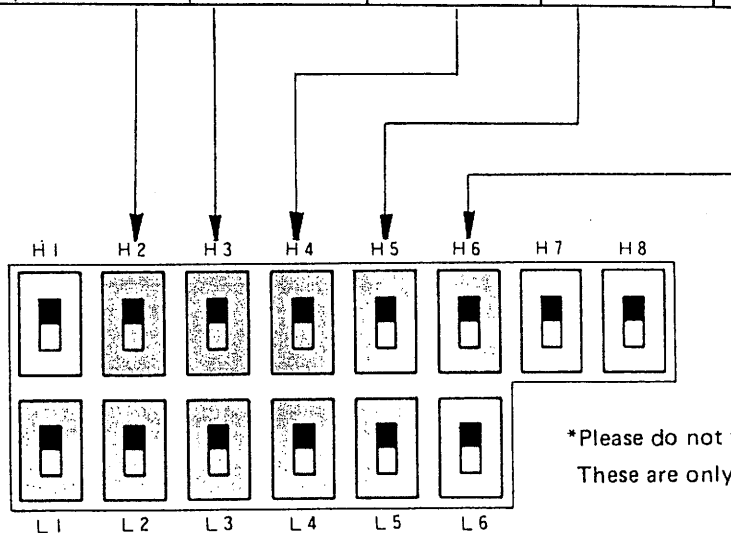
(Draw out while pushing the lock spring located under the front panel.)

* Be sure to turn off the power supply before drawing out.

DIP Switches Arrangement

	Output Characteristic	Standard	Legend	Alarm	Alarm
Upper (OFF)	RA	JIS	°C	Non-inhibit	Deviation Value
Lower (ON)	DA	DIN	°F	Inhibit	Absolute Value

Factory set : Upper



Lower Upper
(ON) (OFF)



* Please do not touch DIP switches H1, H7, H8 and L6. These are only for adjustment.

* L1 ~ L5 are the measuring range select switches for the thermocouple and Pt 100 inputs and the input range select switches for voltage input.

* Set these switches by referring to the table for measuring ranges selection.

* The DIP switches are very small and tight to prevent misoperation. Set these switches with a miniature slotted screwdriver.

7-2 How to select measuring range for thermocouple input and RTD (Pt 100) input type and how to select input range for voltage input

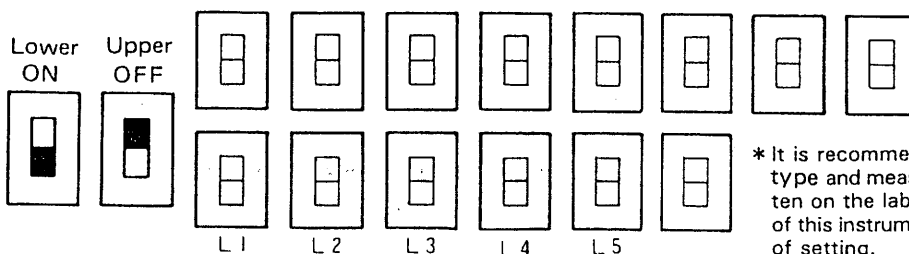
Draw out the inner unit in accordance with the above-mentioned procedure. Select the intended measuring range and set it with DIP switches L1 ~ L5.

Asterisked (*) values are the settings without the designation of a measuring range before the instrument leaves our factory.

DIP Switches Setting

Note: When measuring range/input range is changed, all the data are initialized. Therefore, the data must be re-entered.

Input		DIP Switches L1, L2, L3, L4, L5,	°C	°F
Thermocouple	T		-200 ~ 200	-300 ~ 400
	J		0 ~ 400.0	0 ~ 750
	E		-100 ~ 600	-150 ~ 1100
	K		0 ~ 400.0	0 ~ 750
	K		* 0 ~ 800	0 ~ 1450
	K		0 ~ 1200	0 ~ 2200
	N		0 ~ 1200	0 ~ 2200
	R		0 ~ 1600	0 ~ 2900
	S		0 ~ 1600	0 ~ 2900
	B		0 ~ 1800	0 ~ 3300
	WRo5-26		0 ~ 2300	0 ~ 4200
	U		-200 ~ 200	-300 ~ 400
	L		0 ~ 400	0 ~ 750
R.T.D. (Pt100)			-200 ~ 600	-300 ~ 1100
			-100.0 ~ 200.0	-150 ~ 390
			-100.0 ~ 300.0	-150 ~ 570
			0 ~ 50.0	0 ~ 120.0
			0 ~ 100.0	0 ~ 200.0
			* 0 ~ 200.0	0 ~ 400.0
			0 ~ 500	0 ~ 950
DC Voltage/ Current	-10 ~ 10mV *(-1 ~ 1V)		* 0 ~ 100.0%	0 ~ 100.0%
	0 ~ 10mV *(0 ~ 1V)			
	10 ~ 50mV *(1 ~ 5V)			
	0 ~ 20mV *(0 ~ 2V)			
	0 ~ 50mV *(0 ~ 5V)			
	*4 ~ 20mV			
	0 ~ 20mV			



* It is recommended that the input type and measuring range be written on the label on the rear panel of this instrument after completion of setting.

INPUT
MEASURING RANGE

7-3 How to choose between JIS/DIN STANDARDS for RTD input type

(Set position at the time of shipment: JIS)

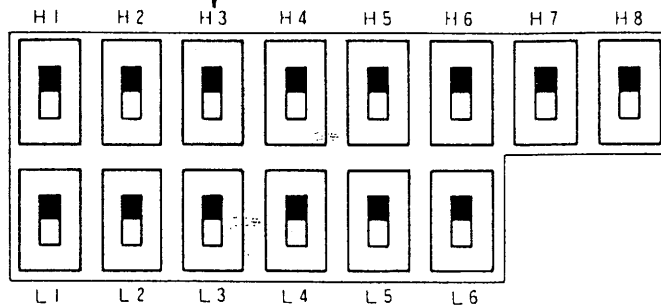
When using the instrument in the JIS mode, it is not necessary to choose between JIS and DIN.

When changing to the JIS mode after using in the DIN mode, set the DIP switch H3 OFF position (upside) as illustrated.

When using in the DIN mode, set the DIP switch H3 to ON lower position.

	Standard
Upper (OFF)	JIS
Lower (ON)	DIN

Factory set : Upper



7-4 How to choose between Centigrade (°C) and Fahrenheit (°F)

(Set position at the time of shipment: °C)

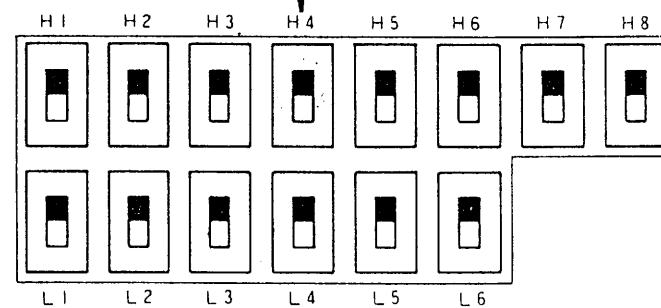
When using the instrument in Centigrade, it is not necessary to choose between °C and °F.

When changing to °C after using in Fahrenheit, set the DIP switch H4 to OFF position (upside) as illustrated.

When using the instrument in Fahrenheit, set the DIP switch H4 to ON position (lower side).

	Legend
Upper (OFF)	°C
Lower (ON)	°F

Factory set : Upper



7-5 How to choose between output characteristics RA/DA

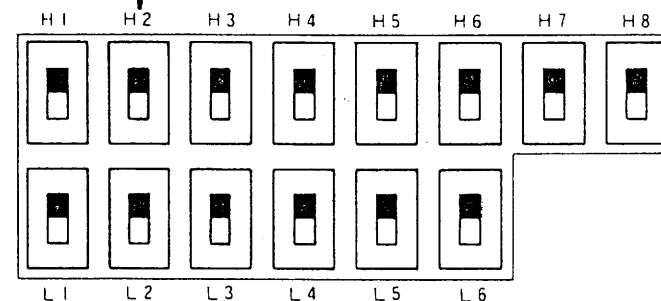
(Set position at the time of shipment: RA)

RA (Reverse Action): When using the instrument on the heating characteristic mode, set the DIP switch H2 to OFF position (upside) as illustrated.

DA (Direct Action): When using the instrument on the cooling characteristic mode, set the DIP switch H2 to ON position (lower side).

	RA or DA
Upper (OFF)	RA
Lower (ON)	DA

Factory set : Upper



7-6 How to choose between absolute value/deviation value and between inhibit/non-inhibit for alarm type (option)

(Set position at the time of shipment: Deviation value & non-inhibit)

Choose between absolute value and deviation value with the DIP switch H6 as illustrated.

Absolute value: ON position (lower side)

Deviation value: OFF position (upper side)

Note: When absolute value/deviation value is changed, the alarm setting returns to the initial value. Therefore, the alarm values must be re-entered.

Choose between inhibit/non-inhibit with the DIP switch H5 as illustrated.

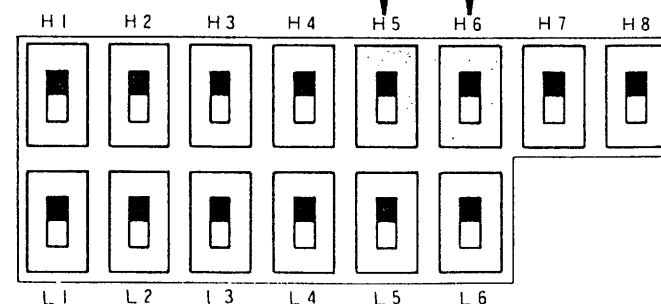
Inhibit: ON (lower side)

Non-inhibit: OFF (upper side)

*For the instrument without alarm, the alarm setting/alarm operating indicator lamp functions normally but no alarm signal output.

	Alarm	Alarm
Upper (OFF)	Non-inhibit	Deviation Value
Lower (ON)	Inhibit	Absolute Value

Factory set : Upper



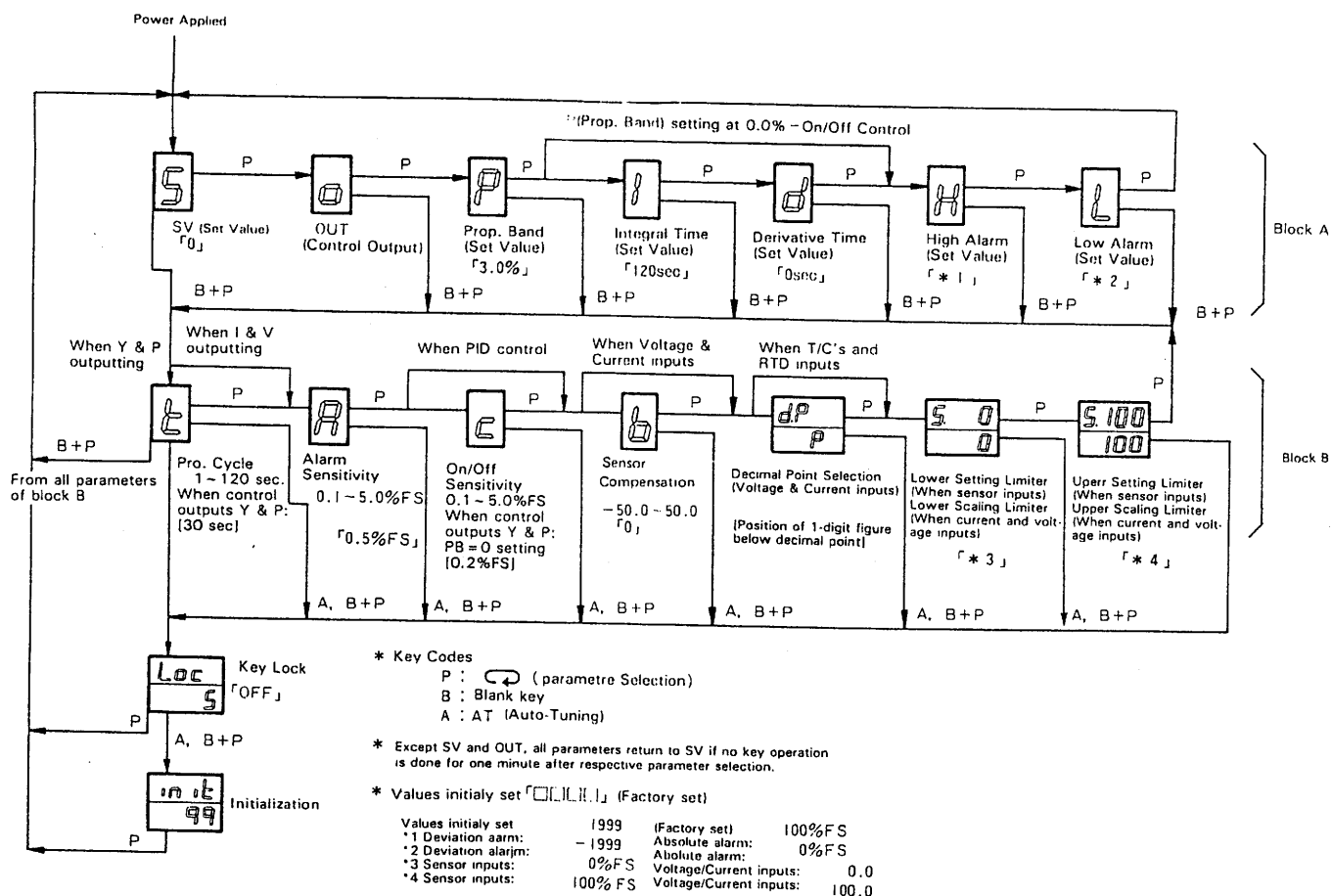
8 SETTING & SELECTION (By front key pad)

Set the parameters by referring to the Parameter Block Diagram shown below.

- The intended parameter may be called by means of pressing the P (Parameter Selection), the B (Blank), or A (Auto-Tuning) Keys. The required numerical values may be set by means of the UP/DOWN Key. During parameter setting, the decimal point in the lower right corner of the bottom display will flicker. Once the required value has been chosen, press the ENT Key to set the value, at which time the decimal point will stop flickering.
- To select a parameter in either Block A or Block B illustrated below in the the Parameter Block Diagram, press the P Key. Each time P is pressed, the displayed parameter will move to the right, one block on the Parameter Block Diagram. For example, if the Set Value is displayed, depression of the P Key will cause the Control Output to be displayed.
- To move back and forth between Block A and Block B, press the B and P Keys simultaneously.
- To proceed from Block B to the Key Lock Setting Parameter, first depress the A Key which will cause the AT lamp to light.
- Next depress the B and P Keys simultaneously to enter the Key Lock Setting Mode.
- To proceed from the Key Lock Setting Parameter to the Initialization Mode, again press A, followed by pressing the B and P Keys simultaneously.
- To return to Block A from either the Key Lock Setting Parameter or Initialization Mode, Press P.
- It is not possible to change parameter settings in the Key lock state or during Auto-tuning. However, the alarm setting can be set during Auto-Tuning provided the Key is unlocked.

Note: The membrane key must be pressed by 'finger'.
Please do not press it by using something similar hardness or sharpness tool such as screwdriver to prevent 'lock up'.

8-1 parameter Block Diagram



* To return to the parameter in the previous block, press A followed by pressing P. This will, for example, allow you to move from the Derivative Time block to the Integral Time block directly, without having to scroll through the other parameters.

- 8-2 Setting the SV (set value) (Initial value: 0)**
 For thermocouple and R.T.D. (Pt 100) inputs: Within the upper and lower limiters within the measuring range
 For voltage and current inputs : Within the scaling
- 8-3 OUT (control output) monitor alone**
- 8-4 Setting the P (proportional band)**
 Setting range: 0 ~ 200.0 % (initial set value: 3.0%)
 *When setting at 0.0%, 2-position control is available (Contact, SSR drive voltage output). In this case, when pressing "P." without selecting "I.D.", the upper limit alarm setting parameter is given.
- 8-5 Setting the I (integral time)**
 Setting range: 1 ~ 3600 sec (initial set value: 120 sec)
- 8-6 Setting the D (derivative time)**
 Setting range: 1 ~ 1200 sec (initial set value: 0 sec)
 Setting at 0 results in PI operation.
- 8-7 Setting the HA (upper limit alarm)/LA (lower limit alarm) (Option)**
 Choose between Absolute and Deviation Value Alarms with the internal DIP switch.
 Setting range HA Absolute value alarm: Within measuring range (LA < HA) Note: if setting over HA or
 Deviation value alarm: 0 ~ +1999 LA of the measuring
 (Decimal point position is the same as PV.) range, the operating
 LA Absolute value alarm: Within measuring range (LA < HA) range becomes the
 Deviation value alarm: 0 ~ -1999 upper limit plus 1%
 (Decimal point position is the same as PV.) FS and the lower
 limit minus 1% FS.
 Setting range: 0.1 ~ 5.0% FS (initial set value: 0.5% FS)
 Common to upper and lower limits
 Note: For the instrument without alarm, setting and operation display function but alarm output does not function.
- 8-8 Setting the proportional cycle**
 This parameter is displayed for contact and SSR drive voltage output types alone.
 However, when making the 2-position control with the proportional band set at "0", the parameter is not displayed.
 Setting range: 1 ~ 120 sec (initial set value: 30 sec)
- 8-9 Setting the alarm sensitivity (Option)**
 Setting range: 0.1 ~ 5.0% FS (initial set value: 0.5% FS)
 Common to upper and lower limits
 Note: For the instrument without alarm, setting and operation display function but alarm output does not function.
- 8-10 Setting the control sensitivity when making the 2-position control**
 This parameter is displayed when setting the proportional band at "0" for 2-position control in the case of contact and SSR drive voltage output types.
 Setting range: 0.1 ~ 5.0 FS % (initial set value: 0.2% FS)
- 8-11 Sensor compensation**
 This parameter is only displayed for thermocouple and R.T.D. (Pt 100) input types.
 Compensation Range : -50.0 ~ 50.0°C/°F (initial set value : 0.0)
- 8-12-1 Setting the decimal point position for voltage/current input**
 This parameter is not displayed for thermocouple and R.T.D. (Pt 100) input types.
 Setting range: Up to 3-digit figure below decimal point (initial set value: 1-digit figure below decimal point)
 Set the decimal point position according to P position.
- | Display | Decimal point position |
|---------|------------------------|
| - - - P | 1234 |
| - - P - | 123.4 |
| - P - - | 12.34 |
| P - - - | 1.234 |
- 8-12-2 Setting the measuring range for voltage/current input**
 Setting range: Within span of 100 ~ 5000 counts within -1999 ~ 7999 counts
 Initial set value Lower limit: 0.0
 Upper limit: 100.0
- 8-13 Setting the HA and LA setting limiter for thermocouple and R.T.D. (Pt 100) inputs.**
 Setting range Lower limit: More than lower limit value within measuring range (initial set value: 0% FS)
 Upper limit: Less than upper limit value within measuring range (initial set value: 100% FS)
 Setting condition: 0% FS ≤ Lower limit set value < Upper limit set value ≤ 100% FS
- 8-14 Key lock and unlock**
 With the key lock state (ON), change of setting, execution and stop of AT cannot be done.
 Set to the key lock parameter and press ENT key, and **oN** is displayed bringing in the key lock state.
 To unlock this state, set at "5" and press ENT key, and **oFF** is displayed bringing in the key unlock state.
- 8-15 Initialization of data**
 This parameter is used to initialize (factory set) all the settings and internal data set by the user.
 Set at the initialization parameter and set "99" and press ENT key.
 SV (set value) is displayed after several seconds and all the setting and data are initialized.

9 AUTO-TUNING

To execute auto tuning, press the AT key to light up the AT-LED and press the ENT key to flicker the AT-LED, bringing in the auto tuning mode.

When the auto tuning is finished, the AT-LED goes out.

After about 10 seconds with the AT key pressed and the AT-LED on, the AT-LED goes out automatically.

To cancel the auto tuning function before it completes its determination press the AT key followed by the ENT key. Depression of the AT key will cause the AT-LED to flicker rapidly until the ENT is pressed, at which time the AT-LED will turn off.

Note

1. If power fails during auto tuning, the auto tuning is automatically released.
2. If 0% or 100% output continues for more than 4 hours and 30 minutes after auto tuning is started, the auto tuning is automatically released.

10 ERROR DISPLAY

When the PV (Process Variable) exceeds the measuring range, the following display are shown on the front.

PV < -10%FS	LL--
110%FS < PV	HH--

When the temperature sensor is abnormal, the following displays are shown respectively on the front.

Thermocouple Burnout	HH--	* 1
----------------------	------	-----

Pt 100 Burnout of 1	HH--	* 1	
Pt 100 Burnout of 2	LL--	* 2	
Pt 100, Burnout of 3, 1-2, 1-3, 2-3, 1-2-3	LL--	* 2	

□ Control output when the sensor is abnormal

*1 In case of RA characteristics: 0%

In case of DA characteristics: 100%

*2 0% independently of characteristics

Both upper limit alarm/lower limit alarm are output. (Option)

Output discontinues while auto tuning is executed.

Temperature and Humidity Control Specialists

SHIMADEN CO., LTD.

Head Office: 2-30-10, Kitamachi, Nerima-ku, Tokyo 179 Japan
Phone: (03) 3931-9111 Fax: (03) 3937-1240 Telex: 02722778 SDCLJ