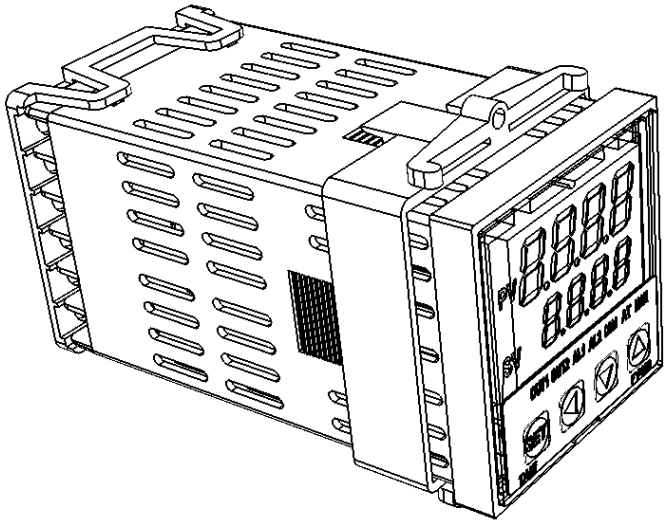
Digital Temperature Controller

Model: FE400

Operation Manual Ver 2.5



TAIE

台灣儀控股份有限公司

TAIWAN INSTRUMENT & CONTROL CO., LTD

Contents

Thanks for purchase FE series Digital Temperature Controller.
Before using controller, please make sure the spec and type is correspond your demand.
Please check the Voltage` Frequency and input/output range.
Please follow the operation manual and pass the user to keep it.
FE series controller is the newest generation using the latest technology and SMT equipment plus our plentiful exploitation experience to publish it.

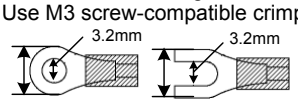
1. Notice

Warning

1. Danger! Electric Shock!
2. DON'T touch AC power wiring terminals when controller has been activated!
3. Make sure the power off until all of the wirings are completed!

Warning

1. Please confirm the AC power wiring to controller is correct, otherwise it will be caused an aggravated damage on controller.
2. Make sure to use the rated power supply (AC85~265V or DC24V), otherwise it will be caused severely damage on controller.
3. Please confirm wirings are connected with correct terminals (Input, Output, Alarm).
4. Use M3 screw-compatible crimp-on terminals with an insulation sleeve, as shown below



Torque : 0.4 N.m (4kgf.cm)

5. Avoid installing controller in following spaces:
   I. A place where the ambient temperature may reach beyond the range from -10 to 50℃
   II. A place where the ambient humidity may reach beyond the range from 20 to 90% RH.
   III. A place where the controller likely to come into contact with water, oil, chemicals, steam and vapor.
   IV. A place where the controller is subject to interface with static electricity, magnetism and noise.
6. For thermocouple (TC) input, use shield compensating lead wire.
7. For RTD input, use shield wires which have low resistance and no resistance difference between 3 wires.

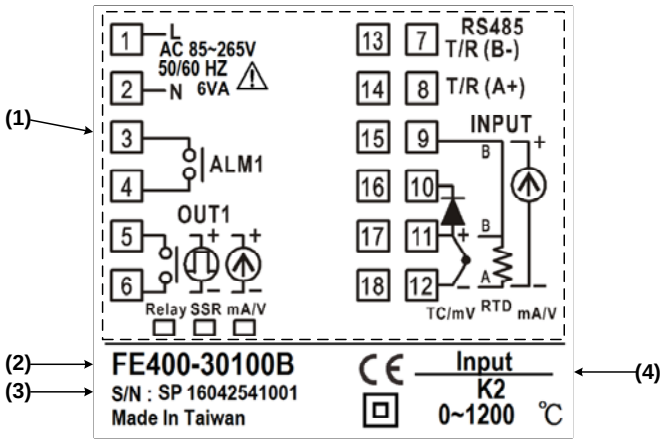
2. Order & Label information

2.1 Order information

	Output 1	Output 2	Alarm	TRS	DI	COMM	Input type	Power
FE400 —	1	0	1	0	0	0	— 0 1 —	A
	0 None	0 None	0 None	0 None	0 None	0 None	See input Range type code	A AC 85~265V
	1 Relay	1 Relay	1 1 Set	1 4~20mA	E 2 Points	B RS-485		D DC 24V
	2 Voltage Pulse (SSR Drive)	2 Voltage Pulse (SSR Drive)	2 2 Sets	2 0~20mA				
	3 4~20mA	3 4~20mA		A 0~5V				
	4 0~20mA	4 0~20mA		B 0~10V				
	A 0~5V	A 0~5V		C 1~5V				
	B 0~10V	B 0~10V		D 2~10V				
	C 1~5V	C 1~5V						
	D 2~10V	D 2~10V						

※ : ■ Block means optional functions with additional charge.

2.2 Label Explanation



NO.	Explanation	Indication Example
(1)	Terminal arrangement	Terminal arrangement for the FE400
(2)	Model Number	FE400-30100B
(3)	Series Number	16042541001
(4)	Input type	Multi-range (Multi-range input)

3. Specifications

Power supply voltage		85 ~ 265 VAC,DC 24V (Optional)
Frequency		50/60 Hz
Power consumption		Approx 6VA
Memory		Non-volatile memory EEPROM
Sensor input ※ Please refer to input range table		Accuracy : 0.2% FS
		Sample time 50ms
		TC : K、J、R、S、B、E、N、T、W、PLⅡ、L
		RTD : PT100
		Linear : 0~20mA、4~20mA 0~1V、0~5V、0~10V、0~2V、1~5V、2~10V 0~25mV、0~50mV、10~50mV、0~70mV
Control output	Relay	SPST-NO, 250 VAC, 8A (resistive load), electrical life: 100,000 operations
	SSR driver	ON: 24 V OFF: 0V max. load current: 20 mA, with short-circuit protection circuit
	Linear	4~20mA,0~20mA, 0~5V,0~10V, 1~5V,2~10V
Control method		ON-OFF or P,PI,PID control
Alarm output		SPST-NO, 250VAC, 5A (resistive load), electrical life: 100,000 operations
Transmission		PV1,SV1,PV2,OP1
Digit input		2 points
Commun-ication	Interface	RS-485 Maximum unit : 32 pcs Maximum distance : 1200m
	Protocol	Modbus RTU , TAIE
	Parity	None , odd , even
	Data bit	8bit
	Stop bit	1 or 2 bit
	Baud rate	2400,4800,9600,19200,38400,57600,115200 bps
	Delay time	0~250 ms
Special features		3 SV choose(SV1,SV2,SV3), Power-on soft start, Timer function (1 minute to 99 hours,59 minutes)
Operating temperature humidity		-10 ~ 50°C (with no icing or condensation) 20% ~ 90% RH
Storage temperature		-25 ~ 65°C (with no icing or condensation)
Dimension		W 26 x H 75 x D 90 mm
Weight (approx)		Approx 120g

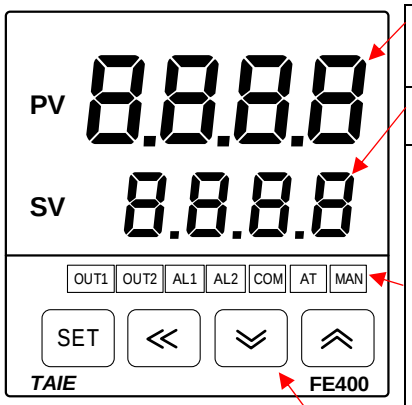
4. Input range table

Model	Input type		Code	Range	
				°C	°F
TC	K	K1	01	-50.0~400.0	-50.0~750.0
		K2	02	0~1200	0~2190
	J	J1	03	-50.0~400.0	-50.0~750.0
		J2	04	0~1200	0~2190
	R	R	05	0~1760	0~3200
	S	S	06	0~1760	0~3200
	B	B	07	0~1820	0~3300
	E	E	08	0~900	0~1650
	N	N	09	0~1300	0~2370
	T	T1	10	-199.9~400.0	-199.9~750.0
		T2	11	-199~400	-199~750
	W	W	12	0~2320	0~4200
	PLⅡ	PLⅡ	13	0~1200	0~2190
	L	L	14	0~800	0~1470
RTD	PT100	DP1	15	-199.9~600.0	-199.9~999.9
		DP2	16	-199~600	-199~1110
		DP3	17	0~600	0~1110
Linear	AN1	0~25mV	18	-1.999~9.999 -19.99~99.99 -199.9~999.9 -1999~9999	
	AN2	0~50mV	19		
		0~20mA	20		
		4~20mA	21		
		0~1V	22		
		0~5V	23		
		0~10V	24		
		0~2V	25		
		1~5V	26		
		2~10V	27		
		other	28		
	AN3	0~70mV	29		

5. Packing list

1. Temperature Controller …..1pcs
2. Fix bracket……...1pcs
3. Terminal protect cover……1pcs
4. Manual……..1pcs

6. Parts description

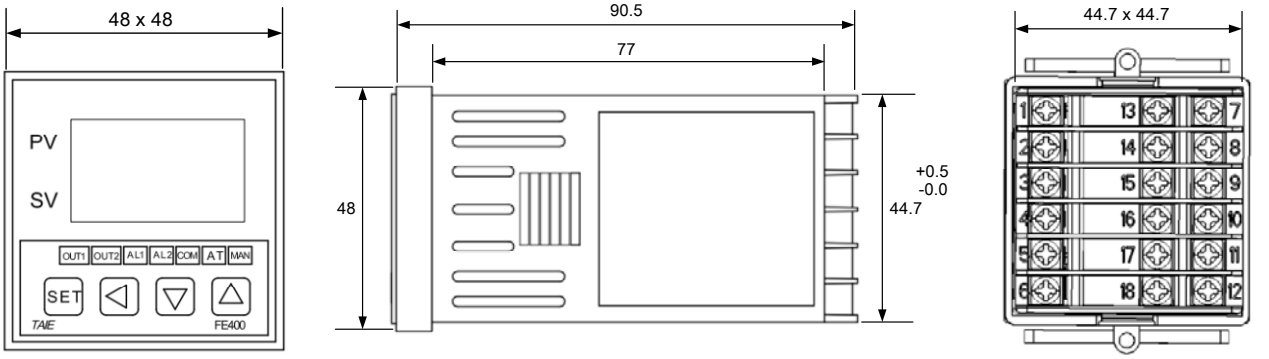


1	PV		Indicates PV (measured value) and character information such as parameter codes and error codes(Red)
2	SV		Indicates SV (target set value) and parameter values(Green)
3	LED	OUT1	Lamp lit when OUT1 is activated (Orange)
		OUT2	Lamp lit when OUT2 is activated (Orange)
		AL1	Lamp lit when Alarm 1 is activated (Red)
		AL2	Lamp lit when Alarm 2 is activated (Red)
		COM	Lamp lit when controller response data (Orange)
		AT	Lamp lit when Auto tuning is activated (Orange)
		MAN	Lamp lit when controller in manual mode or get error condition (Orange)
4	Keypad	SET SET	Used for parameter calling up and set value registration
		≪ SHIFT	Shift digits when settings are changed
		≫ DOWN	Decrease numerals
		≪ UP	Increase numerals

7. Installation

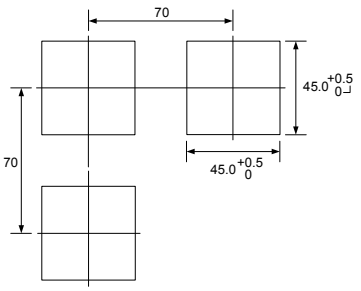
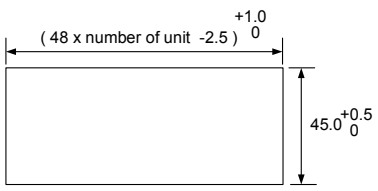
7.1 Dimensions

(Unit : mm)



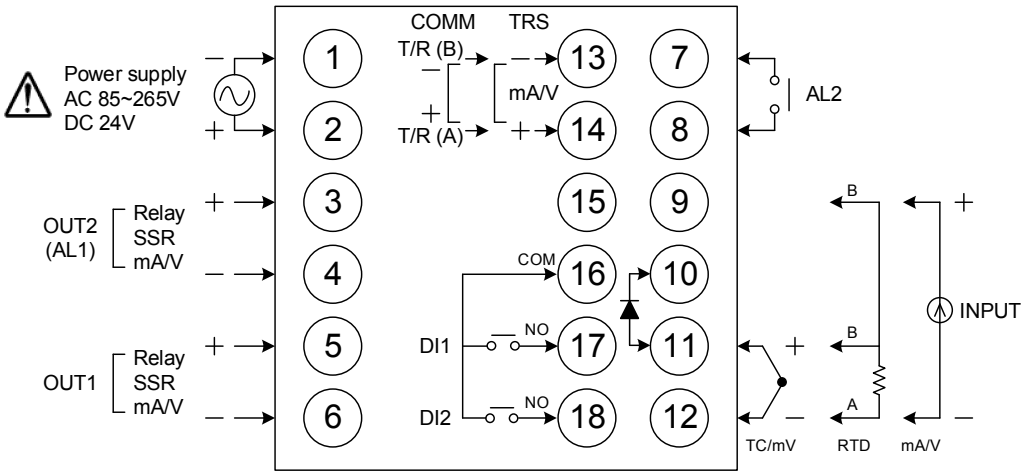
7.2 Panel cutout

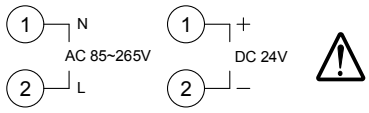
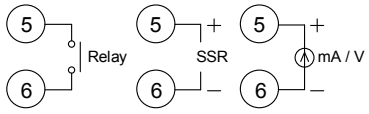
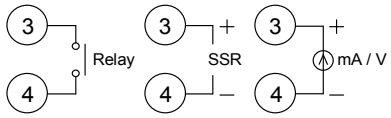
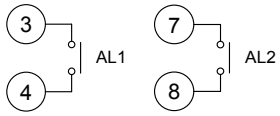
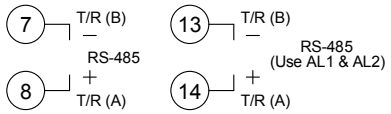
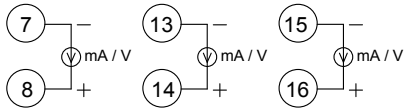
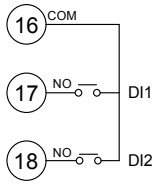
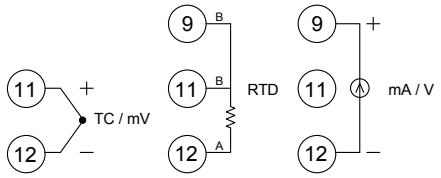
(Unit : mm)

Individual mounting	Group mounting
	

8. Terminal arrangement

> **Notice**
>
> Make sure the power off until all of the wirings are completed!
> Turn the power supply to the instrument off before wiring or checking.
> Working on or touching the terminal with the power switched on may result in severe injury or death due to electric shock.

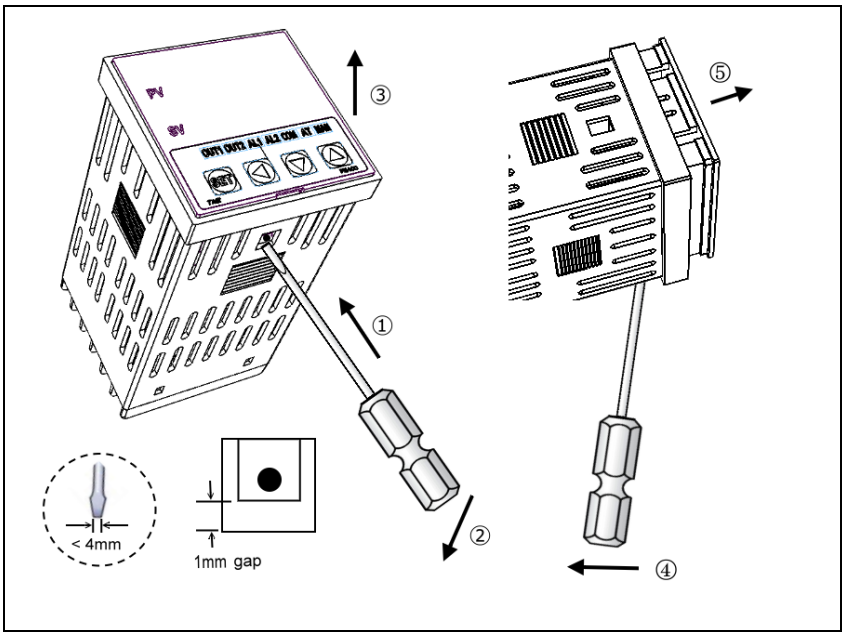


Power	
Output-1	
Output-2	
Alarm-1 Alarm-2	
Communication	
Transmission	
Digit Input	
Input	

9. Mounting procedures

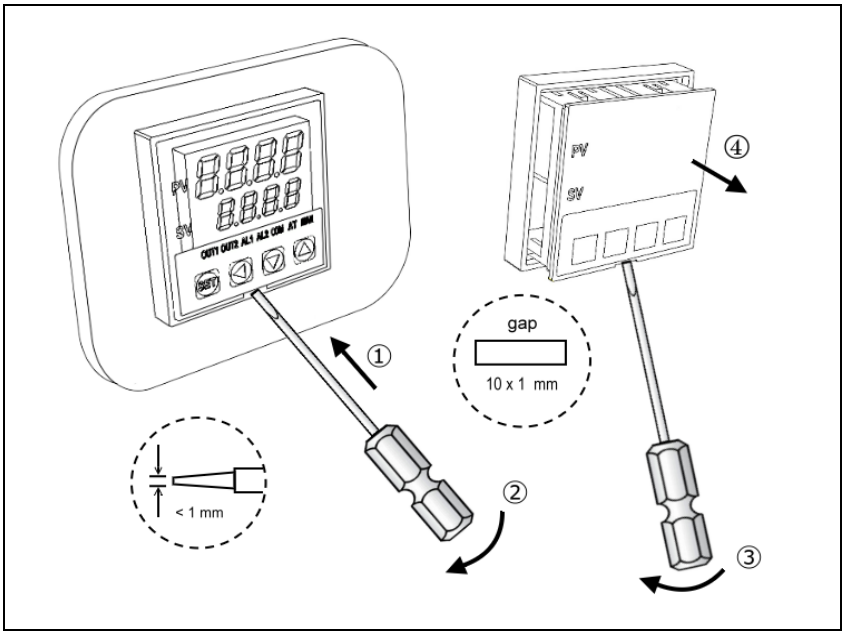
9.1 Before wiring

1. Turn controller to upside down, control panel forward face the label side, will see the little point in the square hole.
2. Use”-“type screwdriver (head width <4mm) and vertically insert the square hole into the top of the shell about 1 mm gap.
3. Please be noted: take the screwdriver into the slit (do not withstand and pressed down the plastic Exposed hook, it will cause the plastic exposed hook broken)
4. Push forward the screwdriver with leverage theory to extrusion the controller from the opposition direction.
5. After pulling out the body, you can exchange output module or add the additional option or repairing.



9.2 After wiring

1. It can only be pulled out from the front direction main body if the controller is already installed on the machine.
2. Use a small - type screwdriver (front thickness <1mm) and let screwdriver front to insert the controller panel below the small rectangular hole about 1 mm gap.
3. Use the screwdriver head to insert 2 ~ 3mm and withstand the controller to go to the opposite direction to squeeze and pick up the controller body.
4. If the body is exposed little it cannot be a complete extrusion. Take the screwdriver to insert the front two square holes of the exposed transparent cover of the body.
5. Use a small "-" type screwdriver to insert the square hole and then forward and pick the hole and pull out the controller body via the opposite direction of extrusion.
6. After pulling out the body, you can exchange output module or add the additional option, or repairing.



10. Basic function setting

10.1 Input type setting

1.	PV 25 SV 0	Operation panel display.	2.	PV INP1 SV K2	Hold SET key + ≪ key 3 seconds, then the controller will enter LEVEL_3 upper display show “INP1” lower display show current input type.
3.	PV INP1 SV K2	When ≪ key is pressed, the lower display flashes.	4.	PV INP1 SV dP2	Press ≪ key and ≫ key to set the desire input type.
5.	PV INP1 SV dP2	Press SET key to store new value of INP1.	Modify input type needs to interchange of jumper location, and it needs to recalibration for linear input type change. Please refer to ch18 Input type modification.		

※： INP1 setting value refer the “Input range table”

10.2 SV value setting

1.	PV 25 SV 0	Operation panel display.	2.	PV 25 SV 0000	When ≪ key is pressed, the lower display flashes.
3.	PV 25 SV 0150	Press ≪ key to choose digit and pressing ≫ key and ≪ key to set the desire value.	4.	PV 25 SV 150	Press SET key to store new value of SV.

10.3 RUN/STOP mode selection

1.	PV 25 SV 150	Operation panel display.	2.	PV r-S SV StoP	Press SET key to get parameter setup display, “r-s” shown on the upper display.
3.	PV r-S SV StoP	When ≪ key is pressed, the lower display flashes.	4.	PV r-S SV run	Press ≫ key or ≪ key to select run/stop mode.
5.	PV r-S SV run	Press SET key to store new value of R-S.	When controller selection STOP mode, close all OUTPUT and ALARM function.		

10.4 Auto tuning execution

1.	PV 25 SV 150	Operation panel display.	2.	PV AT SV no	Press SET key to get parameter setup display, “AT” shown on the upper display.
3.	PV AT SV no	When ≪ key is pressed, the lower display flashes.	4.	PV AT SV YES	Press ≫ key or ≪ key to select auto tuning execution or not.
5.	PV AT SV YES	Press SET key to store new value of AT.	When auto tuning AT LED lamp lit and start to output, through a few circles to get new PID value with the precise control, if finished the AT LED will be lamp off.		

10.5 PID value setting

1.	PV 25 SV 0	Operation panel display.	2.	PV P1 SV 3.0	Hold SET key 3 seconds, then the controller will enter LEVEL_2 upper display show “P1” lower display show current P1 value.
3.	PV 25 SV 003.0	When ≪ key is pressed, the lower display flashes.	4.	PV 25 SV 050.0	Press ≫ key and ≫ key to set the desire P1 value.
5.	PV P1 SV 50.0	Press SET key to store new value of P1.	Similarly, use the same ways to set integral value(I1) and derivative value(D1).		

※： Press SHIFT key the upper display will show PV value,
this function can let user easy to monitor PV and this parameter relationship.

10.6 ON/OFF control setting

1.	PV 25 SV 150	Operation panel display.	2.	PV P1 SV 3.0	Hold SET key 3 seconds, then the controller will enter LEVEL_2 upper display show “P1” lower display show current P1 value.
3.	PV 25 SV 003.0	When ≪ key is pressed, the lower display flashes, upper display will show current PV value.	4.	PV 25 SV on.oF	Press ≫ key until P1 = on.oF (0.0)
5.	PV P1 SV on.oF	Press SET key to store new value.	6.	PV HY01 SV 1	Press SET key to get parameter setup display, “HYO1” shown on the upper display.
7.	PV HY01 SV 1	When ≪ key is pressed, the lower display flashes.	8.	PV HY01 SV 10	Press ≫ key and ≫ key to set the desire HYO1 value.
9.	PV HY01 SV 10	Press SET key to store new value.	Heat mode formula: PV ≧(SV + HYO1) → OUT1 OFF PV ≦(SV – HYO1) → OUT1 ON Cool mode formula: PV ≧(SV + HYO1) → OUT1 ON PV ≦(SV – HYO1) → OUT1 OFF		

10.7 Alarm mode setting

1.	PV 25 SV 0	Operation panel display.	2.	PV INP1 SV E2	Hold SET key + ≪ key 3 seconds, then the controller will enter LEVEL_3 upper display show “INP1” lower display show current input type.
3.	PV AL01 SV 11	Press SET key to get parameter setup display, “ALD1” shown on the upper display.	4.	PV AL01 SV 11	When ≪ SHIFT key is pressed, the lower display flashes.
5.	PV AL01 SV 12	Press ≫ key and ≫ key to set the desire ALD1 value.	6.	PV AL01 SV 12	Press SET key to store new value of ALD1. ※ Please refer to ch16.1 Alarm mode.

10.8 Alarm value setting

1.	PV 25 SV 0	Operation panel display.	2.	PV AL 1H SV 0	Press SET key to get parameter setup display, “AL1H” shown on the upper display.
3.	PV AL 1H SV 0000	When ≪ key is pressed, the lower display flashes.	4.	PV AL 1H SV 0020	Press ≫ key and ≫ key to set the desire AL1H value.
5.	PV AL 1H SV 20	Press SET key to store new value of AL1H.			

10.9 Manual mode selection

1.	PV 25 SV 150	Operation panel display.	2.	PV A-M SV Auto	Press SET key to get parameter setup display, “A-M” shown on the upper display.
3.	PV A-M SV Auto	When ≪ key is pressed, the lower display flashes.	4.	PV A-M SV MAn	Press ≫ key or ≫ key to select Auto/Man mode.
5.	PV A-M SV MAn	Press SET key to store new value of A-M.	6.	PV MOP SV 0.0	Press SET key to get parameter setup display, “MOP” shown on the upper display.
7.	PV MOP SV 000.0	When ≪ key is pressed, the lower display flashes.	8.	PV MOP SV 100.0	Press ≪ key to choose digit and pressing ≫ key and ≫ key to set the desire value.
9.	PV MOP SV 100.0	Press SET key to store new value of MOP.	In manual mode MOP=100.0 output=100.0% continuous		

※ : SET8.2=1 (Show A-M & MOP parameter)

11. Flow chart of parameters setting

11.1 Levels operation mode

1. LEVEL 1 enter to the LEVEL 2
   Press and hold SET key for 3 seconds then enter to LEVEL 2

2. LEVEL 1 enter to the LEVEL 3
   Press and hold SET key + press SHIFT key for 3 seconds then enter to LEVEL 3

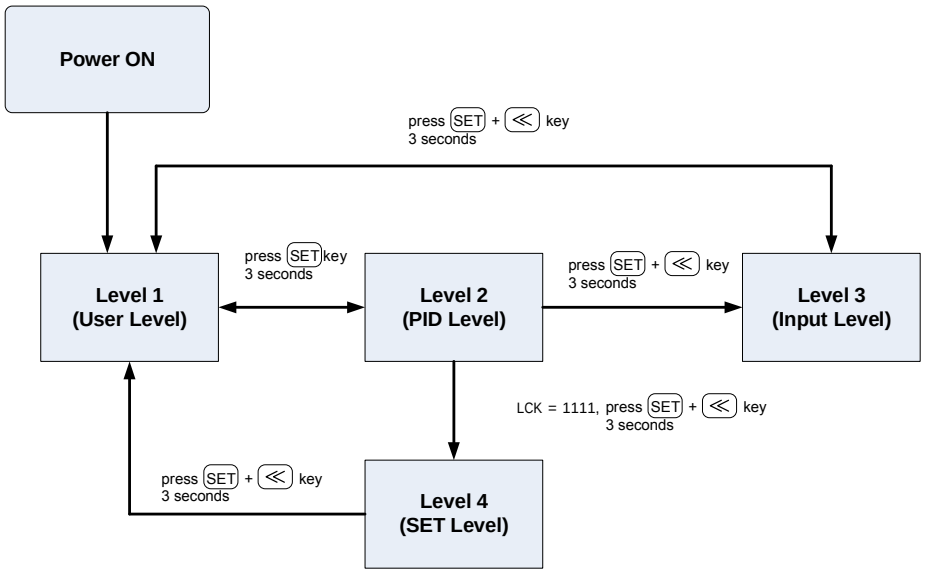
3. LEVEL 1 enter to the LEVEL 4
   Press and hold SET key for 3 seconds then enter to LEVEL 2 in LEVEL 2
   press SET key to find parameter “LCK” , modify LCK value from current value to 1111
   then Press and hold SET key + press SHIFT key for 3 seconds enter to LEVEL 4

4. LEVEL 2 return to the LEVEL 1
   Press and hold SET key for 3 seconds then return to LEVEL 1

5. LEVEL 3 return to the LEVEL 1
   Press and hold SET key + press SHIFT key for 3 seconds then return to LEVEL 1

6. LEVEL 4 return to the LEVEL 1
   Press and hold SET key + press SHIFT key for 3 seconds then return to LEVEL 1

11.2 Levels operation diagram



※： This instrument returns to the PV/SV display mode if no key operation is performed for more than one minute.

11.3 Data lock (LCK) function

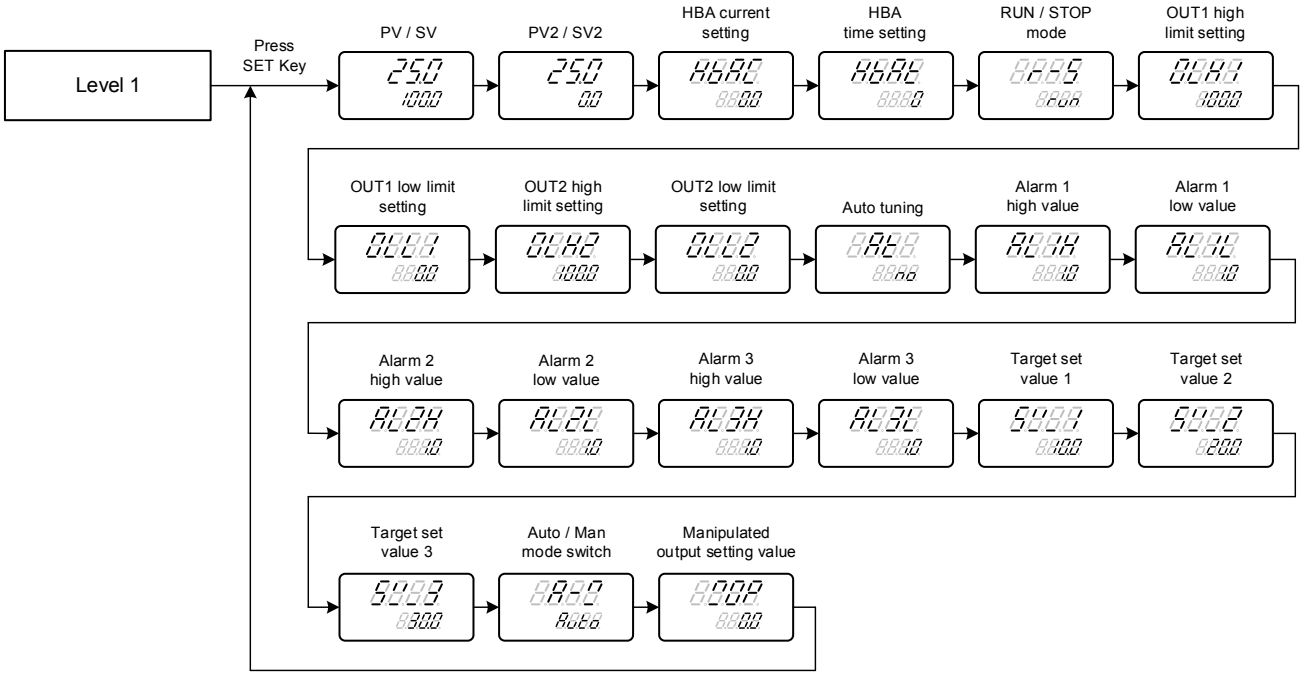
Lock and protect set data of parameters. this function avoid the important parameters to being changed by operator during operation.
If parameter cannot be changed check the LCK setting value first.

LCK-function table

LCK	LEVEL				Remark
	Level_1	Level_2	Level_3	Level_4	
0000	◎	◎	◎	X	modify LEVEL_1_2_3 parameter available (initial)
1111	◎	◎	X	◎	modify LEVEL_1_2_4 parameter available
0110	◎	◎	X	X	modify LEVEL_1 parameter available
0001	◎	◎	X	X	only approval modify parameter SV，LCK
0011	◎	◎	X	X	only approval modify parameter SV，LCK，R-S
0101	◎	◎	X	X	only approval modify parameter LCK

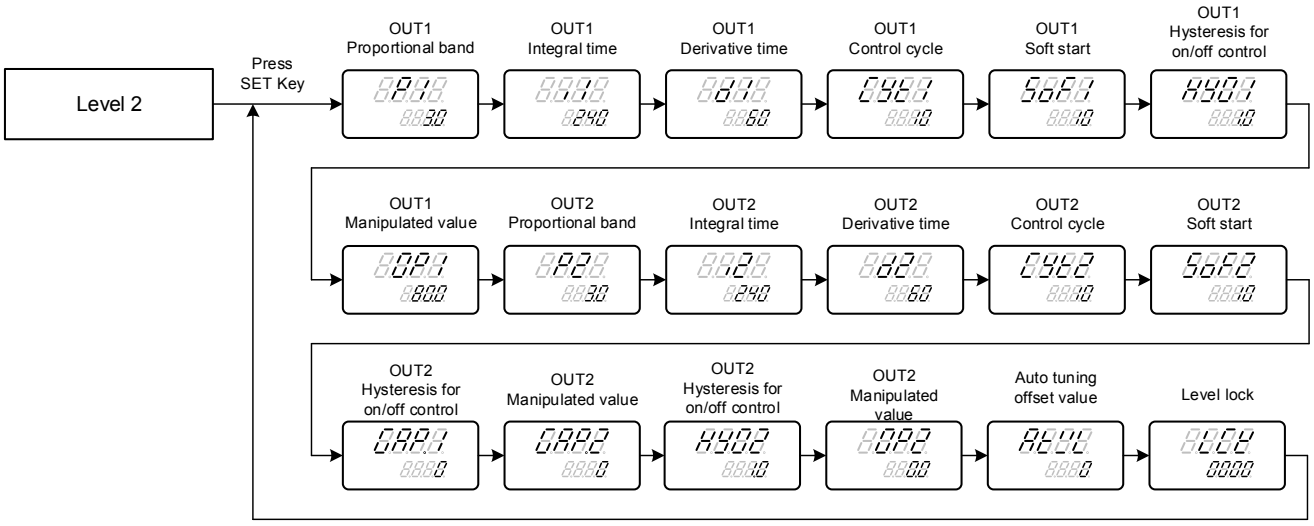
◎： approval X： inhibit

11.4 Level 1 (User Level) all parameters display



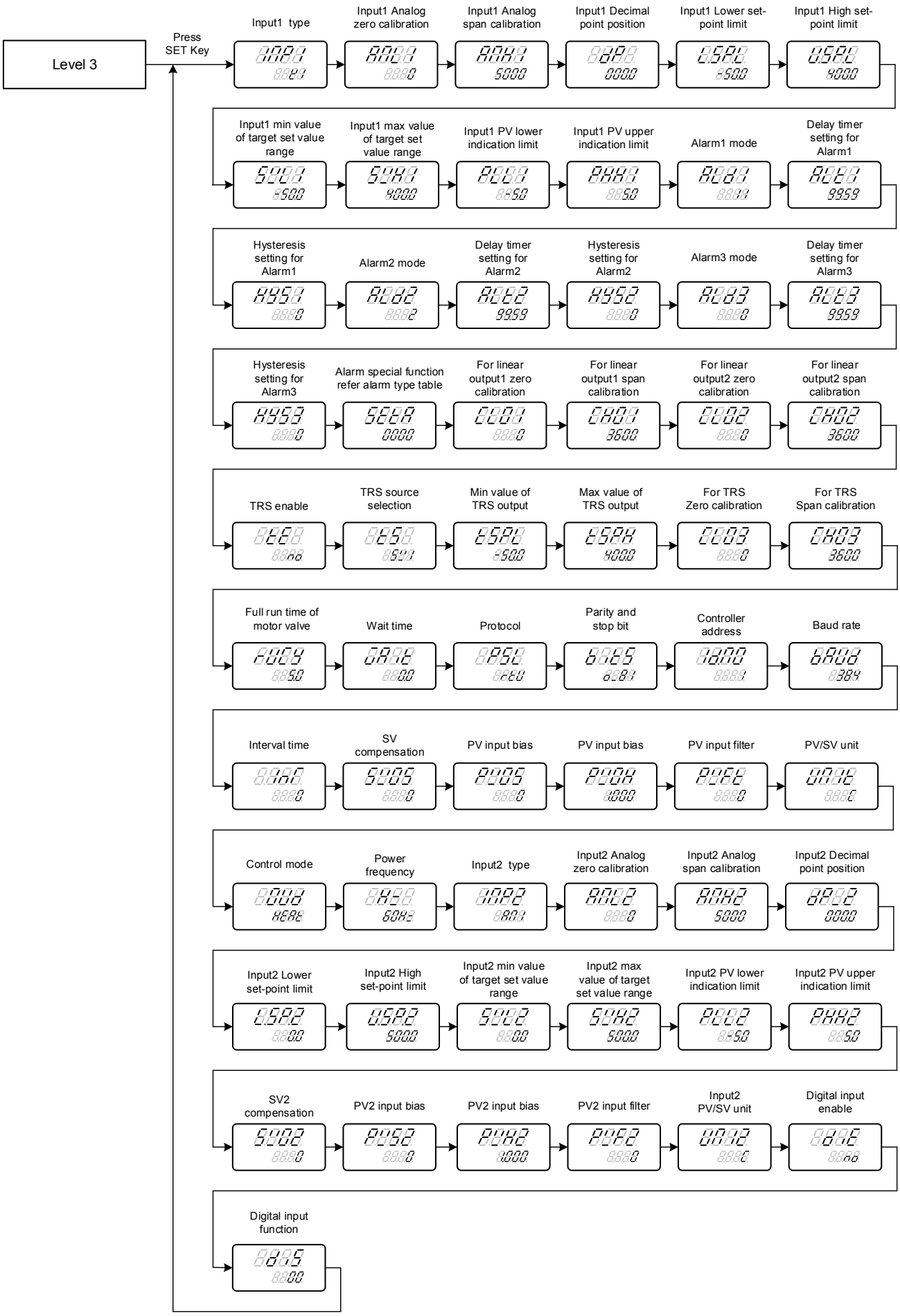
※： This instrument returns to the PV/SV display mode if no key operation is performed for more than one minute.

11.5 Level 2 (PID Level) all parameters display



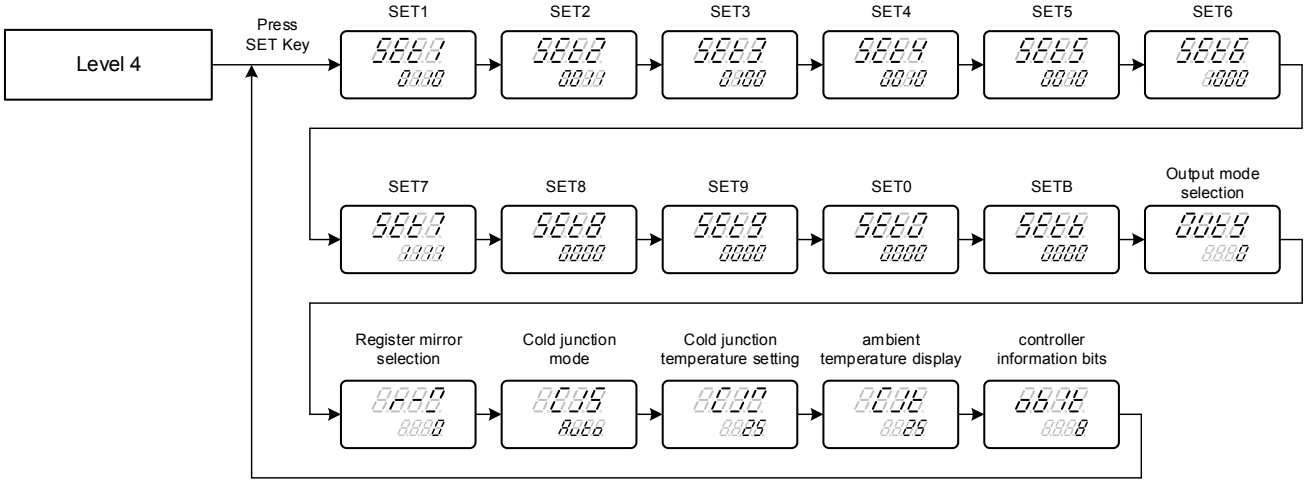
※： This instrument returns to the PV/SV display mode if no key operation is performed for more than one minute.

11.6 Level 3 (Input Level) all parameters display



※： This instrument returns to the PV/SV display mode if no key operation is performed for more than one minute.

11.7 Level 4 (Setting Level) all parameters display



※： This instrument returns to the PV/SV display mode if no key operation is performed for more than one minute.

12. Troubleshooting

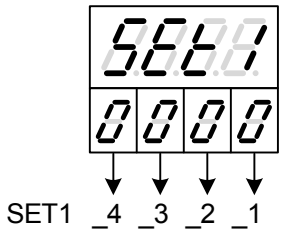
If the controller displays one of the following, carry out the appropriate remedy for the particular error.

LED	Error	Solution
INIE	INIE: Input1 Error	Check whether input loop is opened or wiring incorrect.
UUU1	UUU1: PV is above USPL	Check whether the input value is correct or not.
NNN1	NNN1: PV is below LSPL	Check whether the input value is correct or not.

If any of the indication in the table below appear, the controller need to be repaired do not try to repair the controller by yourself, order a new one or contact us to repair.

LED	Error	Solution
ADCF	ADCF: A/D convert failed	Send back repair.
CJCE	CJCE: Cold junction compensation failed	Send back repair.
RAMF	RAMF: EEPROM failed	Send back repair.

13. Parameters hide / display table on Level 4



SET1	SET1_1	0	hide	HBAC HBAT
		1	display	HBAC HBAT
	SET1_2	0	hide	R-S
		1	display	R-S
	SET1_3	0	hide	OLH1 OLL1
		1	display	OLH1 OLL1
	SET1_4	0	hide	OLH2 OLL2
		1	display	OLH2 OLL2

SET2	SET2_1	0	hide	AT
		1	display	AT
	SET2_2	0	hide	AL1H AL1L
		1	display	AL1H AL1L
	SET2_3	0	hide	AL2H AL2L
		1	display	AL2H AL2L
	SET2_4	0	hide	AL3H AL3L
		1	display	AL3H AL3L

SET3	SET3_1	0	hide	SV_1 SV_2 SV_3
		1	display	SV_1 SV_2 SV_3
	SET3_2	0	hide	ANL1 ANH1 DP
		1	display	ANL1 ANH1 DP
	SET3_3	0	hide	LSPL USPL
		1	display	LSPL USPL
	SET3_4	0	hide	SVL1 SVH1
		1	display	SVL1 SVH1

SET4	SET4_1	0	hide	PLL1 PHH1
		1	display	PLL1 PHH1
	SET4_2	0	hide	ALD1 ALT1 HYS1
		1	display	ALD1 ALT1 HYS1
	SET4_3	0	hide	ALD2 ALT2 HYS2
		1	display	ALD2 ALT2 HYS2
	SET4_4	0	hide	ALD3 ALT3 HYS3
		1	display	ALD3 ALT3 HYS3

SET5	SET5_1	0	hide	SETA
		1	display	SETA
	SET5_2	0	hide	CLO1 CHO1
		1	display	CLO1 CHO1
	SET5_3	0	hide	CLO2 CHO2
		1	display	CLO2 CHO2
	SET5_4	0	hide	TE TS TSPL TSPH CLO3 CHO3
		1	display	TE TS TSPL TSPH CLO3 CHO3

SET6	SET6_1	0	hide	RUCY WAIT
		1	display	RUCY WAIT
	SET6_2	0	hide	PSL IDNO BITS BAUD INT
		1	display	PSL IDNO BITS BAUD INT
	SET6_3	0	hide	SVOS
		1	display	SVOS
	SET6_4	0	hide	PVOS PVOH
		1	display	PVOS PVOH

SET7	SET7_1	0	hide	PVFT
		1	display	PVFT
	SET7_2	0	hide	UNIT
		1	display	UNIT
	SET7_3	0	hide	OUD
		1	display	OUD
	SET7_4	0	hide	HZ
		1	display	HZ

SET8	SET8_1	0	hide	DIE DIS
		1	display	DIE DIS
	SET8_2	0	hide	A-M MOP
		1	display	A-M MOP
	SET8_3	0	hide	reserve ,do not care
		1	display	reserve ,do not care
	SET8_4	0	hide	reserve ,do not care
		1	display	reserve ,do not care

SET9	SET9_1	0	Channel 2 input disable
		1	Channel 2 input enable
	SET9_2	0	Channel 1 analog input reverse display disable
		1	Channel 1 analog input reverse display enable
	SET9_3	0	Channel 2 analog input reverse display disable
		1	Channel 2 analog input reverse display enable
	SET9_4	0	register mirror disable
		1	register mirror enable

SET0	SET0_1	0	power – on soft start disable
		1	power – on soft start enable
	SET0_2	0	hot runner disable
		1	hot runner enable
	SET0_3	0	Remote SV disable
		1	Remote SV enable
	SET0_4	0	reserve ,do not care
		1	reserve ,do not care

14. List of parameters

14.1 COMM GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
PSL		Protocol selection 0: TAIE 1: Modbus RTU	1	0	Modbus RTU	Level 3
BITS		Parity and stop bit 0: O_81 1: O_82 2: E_81 3: E_82 4: N_81 5: N_82	5	0	O_81	Level 3
IDNO		Controller address	255	0	1	Level 3
BAUD		Baudrate 0: 2400 1: 4800 2: 9600 3: 19200 4: 38400 5: 57600 6: 115200	6	0	38400	Level 3
INT		Interval time (ms) Use for data response delay	250	0	0	Level 3
R-M		Register mirror selection	10	0	0	Level 4

14.2 DI GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
DIE		Digital input enable 0: NO (disable) 1: YES (enable)	1	0	NO	Level 3
DIS		Digital input function Please refer to ch15.1.	9999	0000	0000	Level 3

14.3 ALARM GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
AL1H		Alarm value upper limit 1	9999	-1999	10	Level 1
AL1L		Alarm value lower limit 1	9999	-1999	10	Level 1
AL2H		Alarm value upper limit 2	9999	-1999	10	Level 1
AL2L		Alarm value lower limit 2	9999	-1999	10	Level 1
AL3H		Alarm value upper limit 3	9999	-1999	10	Level 1
AL3L		Alarm value lower limit 3	9999	-1999	10	Level 1
ALD1		Alarm1 mode selection	25	0	11	Level 3
ALD2		Alarm2 mode selection	25	0	2	Level 3
ALD3		Alarm3 mode selection	25	0	0	Level 3
ALT1		00.00: Flicker 99.59: Continued ON 00.01~99.58: delay time	99.59	00.00	99.59	Level 3
ALT2			99.59	00.00	99.59	Level 3
ALT3			99.59	00.00	99.59	Level 3
HYS1		Hysteresis setting for alarm1	1000	0	0	Level 3
HYS2		Hysteresis setting for alarm2	1000	0	0	Level 3
HYS3		Hysteresis setting for alarm3	1000	0	0	Level 3
SETA		Alarm special function Please refer to ch16.2 .	1111	0000	0000	Level 3

14.4 PID GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MAX		
※ P1		OUT1 Proportional band 0：  ON/OFF control 0.1~200.0：PID control	200.0	0.0	3.0	Level 2
※ I1		OUT1 Integral time	3600	0	240	Level 2
※ D1		OUT1 Derivative time	2400	0	60	Level 2
CYT1		OUT1 Control cycle 0：  Linear signal 1：  SSR drive 2~150：Relay	150	0	10	Level 2
GAP.1		Control gap 1 (for output 1)	1000	0	0	Level 2
※ P2		OUT2 Proportional band 0：  ON/OFF control 0.1~200.0：PID control	200.0	0.0	3.0	Level 2
※ I2		OUT2 Integral time	3600	0	240	Level 2
※ D2		OUT2 Derivative time	2400	0	60	Level 2
CYT2		OUT2 Control cycle 0：  Linear signal 1：  SSR drive 2~150：Relay	150	0	10	Level 2
GAP.2		Control gap 2 (for output 2)	1000	0	0	Level 2
HYO1		Hysteresis for OUT1 on/off control	1000	0	1	Level 2
HYO2		Hysteresis for OUT2 on/off control	1000	0	1	Level 2

※ : Press SHIFT key the upper display will show PV value, this function can let user easy to monitor PV with this parameter effect.

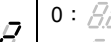
14.5 SV GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
SV		Local set value for input1	SVH1	SVL1	0	Level 1
SV2		Local set value for input2	SVH2	SVL2	0	Level 1
SV-1		Target set value 1	SVH1	SVL1	0	Level 1
SV-2		Target set value 2	SVH1	SVL1	0	Level 1
SV-3		Target set value 3	SVH1	SVL1	0	Level 1
SVL1		Minimum value of target set value range for input1	USPL	LSPL	LSPL	Level 3
SVH1		Maximum value of target set value range for input1	USPL	LSPL	USPL	Level 3
SVL2		Minimum value of target set value range for input2	USP2	LSP2	LSP2	Level 3
SVH2		Maximum value of target set value range for input2	USP2	LSP2	USP2	Level 3
SVOS		SV compensation	5000	-1000	0	Level 3
SVO2		SV2 compensation	5000	-1000	0	Level 3

14.6 AT GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
AT		Auto-tuning 0:  1: 	1	0	NO	Level 1
ATVL		Auto tuning offset value	USPL	0	0	Level 2

14.7 SYSTEM GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
LCK		Function lock Please refer to “LCK-function table”	1111	0000	0000	Level 2
UNIT		Temperature unit 0 :  ℃ 1 :  ℉ 2 :  Linear signal	2	0	C	Level 3
HZ		Power frequency 0 :  50HZ 1 :  60HZ	1	0	60HZ	Level 3
UNI2		Temperature unit 0 :  ℃ 1 :  ℉ 2 :  Linear signal	2	0	C	Level 3
OBIT		Communication bits configuration Bit_0 : OUT1 Bit_1 : OUT2 Bit_2 : AT Bit_3 : AL1 Bit_4 : AL2 Bit_5 : AL3 Bit_6 : COM Bit_7 : MAN Bit_8 : INIE Bit_9 : ADCF Bit_10 : CJCE Bit_11 : IN2E Bit_12 : UUU1 Bit_13 : NNN1 Bit_14 : UUU2 Bit_15 : NNN2	---	---	---	Level 4
CJS		Cold junction mode selection 0 :  Automatic compensation 1 :  Manual compensation	1	0	Auto	Level 4
CJM		Cold junction temperature setting	50	0	25	Level 4
CJT		Ambience temperature display	---	---	---	Level 4

14.8 CONTROL GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
R-S		Run/stop mode 0: STOP Output stop 1: RUN Output enable	1	0	RUN	Level 1
OLH1		High limit setting of manipulated value for output1	100.0	0.0	100.0	Level 1
OLL1		low limit setting of manipulated value for output1	100.0	0.0	0.0	Level 1
OLH2		High limit setting of manipulated value for output2	100.0	0.0	100.0	Level 1
OLL2		low limit setting of manipulated value for output2	100.0	0.0	0.0	Level 1
A-M		Auto/Man mode switch 0: AUTO Automatic 1: MAN Manual	1	0	Auto	Level 1
MOP		Manipulated output setting value	100.0	0.0	0.0	Level 1
SOF1		Power-ON soft start function for output1	5000	5	10	Level 2
OP1		Manipulated value for output1	100.0	0.0	---	Level 2
SOF2		Power-ON soft start function for output2	5000	5	10	Level 2
OP2		Manipulated value for output2	100.0	0.0	---	Level 2
※ CLO1		output1 zero calibration only for linear signal	9999	0	0	Level 3
※ CHO1		output1 span calibration only for linear signal	9999	0	3600	Level 3
※ CLO2		Output2 zero calibration only for linear signal	9999	0	0	Level 3
※ CHO2		Output2 span calibration only for linear signal	9999	0	3600	Level 3
OUD		Control mode 0：HEAT Heating mode 1：COOL Cooling mode	1	0	HEAT	Level 3

※ : Each controller calibration values are different, before the modify please record the current value.

14.9 INPUT GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
PV	---	Process value for input1	USPL	LSPL	---	Level 1
PV2	---	Process value for input2	USP2	LSP2	---	Level 1
INP1	INP1	Input1 type selection Please refer to ch4 Input range table	19	1	1	Level 3
※ ANL1	AnL1	Analog input zero calibration for input1 Please refer to ch18.4 Input calibration flowchart	9999	-1999	0	Level 3
※ ANH1	AnH1	Analog input span calibration for input1 Please refer to ch18.4 Input calibration flowchart	9999	-1999	5000	Level 3
DP	dP1	Decimal point position for input1 0: 0000 1: 000.0 2: 00.00 3: 0.000	3	0	1	Level 3
LSPL	L.SPL	Minimum value of measured input1 scale	9999	-1999	---	Level 3
USPL	U.SPL	Maximum value of measured input1 scale	9999	-1999	---	Level 3
PLL1	PLL1	PV lower indication limit for input1 PV<(LSPL+PLL1)=>show under range error message	9999	-1999	-5.0	Level 3
PHH1	PHH1	PV upper indication limit for input1 PV>(USPL+PHH1)=>show over range error message	9999	-1999	5.0	Level 3
※ PVOS	PVOS	PV input1 bias(for zero) PV=(PVxPVOH)+PVOS	5000	-1000	0	Level 3
※ PVOH	PVOH	PV input1 bias(for span) PV=(PVxPVOH)+PVOS	9.999	0.000	1.000	Level 3
PVFT	PVFt	Is used to eliminate noise against the measure input1 0：noFt: no filter 0.1~10.0 : digital filter	10.0	0.0	0.0	Level 3
INP2	INP2	Input2 type selection Please refer to ch4 Input range table	19	1	1	Level 3
※ ANL2	AnL2	remote input zero calibration for input2	9999	-1999	0	Level 3
※ ANH2	AnH2	remote input span calibration for input2	9999	-1999	5000	Level 3
DP_2	dP2	Decimal point position for input2 0: 0000 1: 000.0 2: 00.00 3: 0.000	3	0	1	Level 3
LSP2	L.SP2	Minimum value of measured input2 scale	9999	-1999	---	Level 3
USP2	U.SP2	Maximum value of measured input2 scale	9999	-1999	---	Level 3
PLL2	PLL2	PV2 lower indication limit for input2 PV2<(LSP2-PLL2)=>show under range error message	9999	-1999	-5.0	Level 3
PHH2	PHH2	PV2 upper indication limit for input2 PV2>(USP2+PHH2)=>show over range error message	9999	-1999	5.0	Level 3
※ PVS2	PVS2	PV input2 bias(for zero) PV2=(PV2xPVH2)+PVS2	5000	-1000	0	Level 3
※ PVH2	PVH2	PV input2 bias(for span) PV2=(PV2xPVH2)+PVS2	9.999	0.000	1.000	Level 3

※ : Press SHIFT key the upper display will show PV/PV2 value, this function can let user easy to monitor PV with this parameter effect.

14.9 INPUT GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
PVF2	PVF2	Is used to eliminate noise against the measure input2 0 : nonF : no filter 0.1~10.0 : digital filter	10.0	0.0	0.0	Level 3

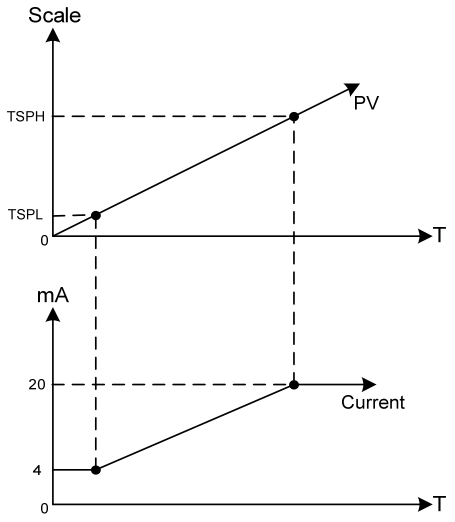
※ : Press SHIFT key the upper display will show PV/PV2 value, this function can let user easy to monitor PV with this parameter effect.

14.10 TRANSMISSION GROUP

Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
TE	tEE	Transmission function enable 0: no (disable) 1: YES (enable)	1	0	0	Level 3
TS	tES	Transmission output signal choose 0: SV1 1: PV1 2: PV2 3: OP1	3	0	0	Level 3
TSPL	tSPL	Minimum value of retransmission output	USPL	LSPL	LSPL	Level 3
TSPH	tSPH	Maximum value of retransmission output	USPL	LSPL	USPL	Level 3
※ CLO3	CL03	For transmission zero calibration	9999	-1999	0	Level 3
※ CHO3	CH03	For transmission span calibration	9999	-1999	3600	Level 3

※ : Refer to the transmission example.

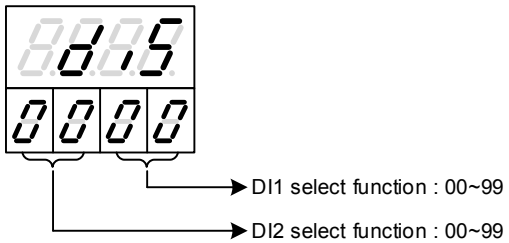
FE series controller transmission function allows digital value PV1/PV2/SV1/OP1 parameters with analog signaled to an external device according to predetermined range. (TSPL ~ TSPH)



14.11 HBA GROUP

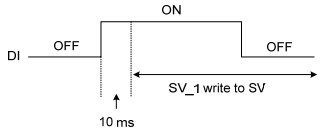
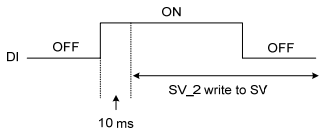
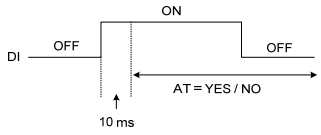
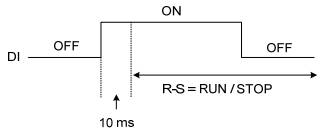
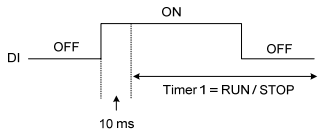
Parameter	LED	Content	Range		Initial	Level
			MAX	MIN		
HBAC	HBAC	HBA current setting unit : ampere(A)	100.0	0.0	0.0	Level 1
HBAT	HBAt	HBA disconnection set time unit : second(S)	100	0	5	Level 1

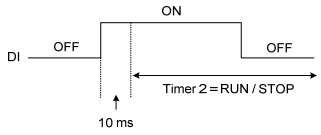
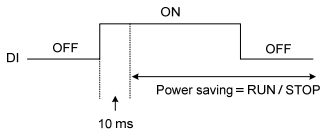
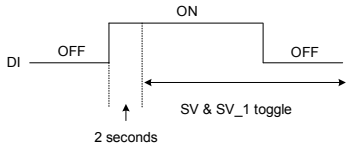
15. Digital input function



15.1 DIS mode table

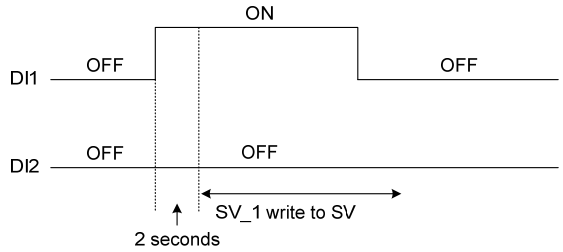
DIS parameter is digital input mode selection, low byte of the first group DI1 mode setting, its range 00~99
high byte of the second group DI2 mode setting, its range 00~99

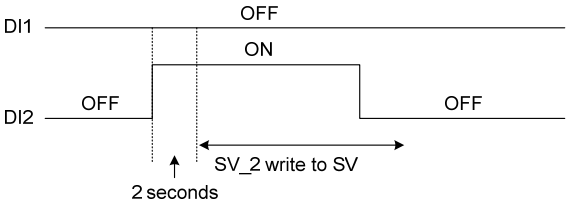
Mode	DI1 (XX00~XX99)	DI2 (00XX~99XX)
00	Disable Digital Input function	
01	SV_1 write to SV 	
02	SV_2 write to SV 	
03	AT = YES / NO 	
04	R-S = RUN / STOP 	
05	Timer 1 = RUN / STOP  ※ set ALD1 = 7 (timer mode)	

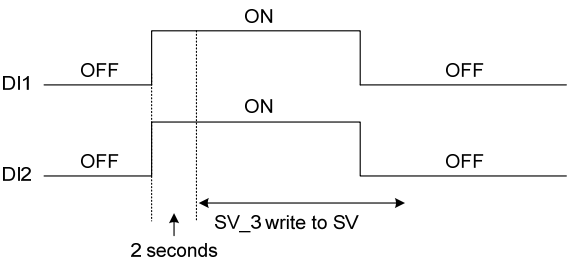
Mode	DI1 (XX00~XX99)	DI2 (00XX~99XX)
06	Timer 2 = RUN / STOP  ※ set ALD2 = 7 (timer mode)	
07	Power saving = RUN / STOP 	
08	Choose SV_1~SV_3 to write to SV , Please refer to DI for SV table	
09	SV & SV_1 toggle 	

※ : Dry contact output rated open >500 KΩ or more, close <10Ω, sample time >10 ms.

15.2 DI for 3SV

DIS	SV_1 write to SV	
	DI1=ON	DI2=OFF
8888		

DIS	SV_2 write to SV	
	DI1=OFF	DI2=ON
8888		

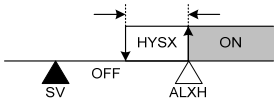
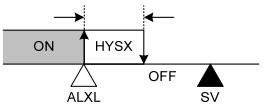
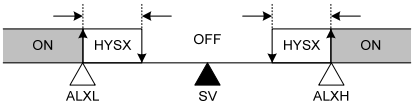
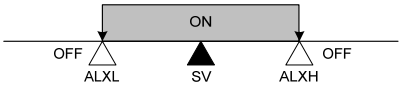
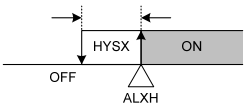
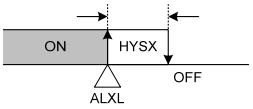
DIS	SV_3 write to SV	
	DI1=ON	DI2=ON
8888		

※ : Dry contact output rated open >500 KΩ, close <10Ω, sample time >2 sec.

16. Alarm action explanation

16.1 Alarm mode

▲ : SV △ : Alarm set value， ***X*** : 1 or 2

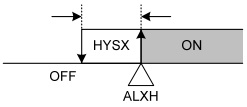
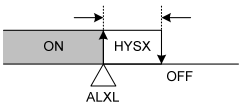
ALD***X***	Alarm type	Description	
00	No alarm	Not drive any alarm relays and the corresponding LED lamp.	
01	Deviation high With hold action		
11	Deviation high	Formula	PV ＞ (SV + AL***X***H) → Alarm ON PV ≦ (SV + AL***X***H – HYS***X***) → Alarm OFF
02	Deviation low With hold action		
12	Deviation low	Formula	PV ＜ (SV + AL***X***L) → Alarm ON PV ≧ (SV + AL***X***L + HYS***X***) → Alarm OFF
03	Deviation high/low With hold action		
13	Deviation high/low	Formula	PV ＜ (SV – AL***X***L) → Alarm ON PV ≧ (SV – AL***X***L + HYS***X***) → Alarm OFF PV ＞ (SV + AL***X***H) → Alarm ON PV ≦ (SV + AL***X***H – HYS***X***) → Alarm OFF
04	Band With hold action		
14	Band	Formula	PV ≧ (SV – AL***X***L) → Alarm ON PV ＜ (SV – AL***X***L) → Alarm OFF PV ≦ (SV + AL***X***H) → Alarm ON PV ＞ (SV + AL***X***H) → Alarm OFF
05	PV high With hold action		
15	PV high	Formula	PV ＞ AL***X***H → Alarm ON PV ≦ (AL***X***H – HYS***X***) → Alarm OFF
06	PV low With hold action		
16	PV low	Formula	PV ＜ AL***X***L → Alarm ON PV ≧ (AL***X***L + HYS***X***) → Alarm OFF

※： With hold action

When hold action is ON, the alarm action is suppressed at start-up until measured value has entered the non-alarm range.

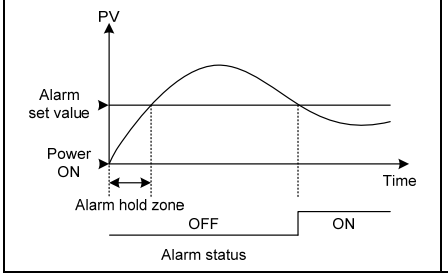
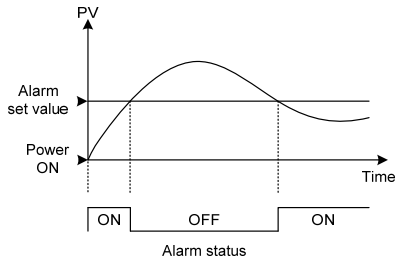
16.1 Alarm mode

▲ : SV　　△ : Alarm set value，***X*** : 1 or 2

ALD***X***	Alarm mode	Description
07	Timer	(1) set AL***X***H = 1000 timer start counting , when timer count to ALT***X*** setting value alarm action ON (2) set AL***X***H = 0 stop and reset timer ALT***X***="hour"." minute"
08	Error	when PV show error message alarm ON when PV show normal temperature alarm OFF
09	SV high	 Formula: SV ＞ AL***X***H → Alarm ON SV ≦ (AL***X***H – HYS***X***) → Alarm OFF
10	SV low	 Formula: SV ＜ AL***X***L → Alarm ON SV ≧ (AL***X***L + HYS***X***) → Alarm OFF

※ : With hold action
When hold action is ON, the alarm action is suppressed at start-up until measured value has entered the non-alarm range.

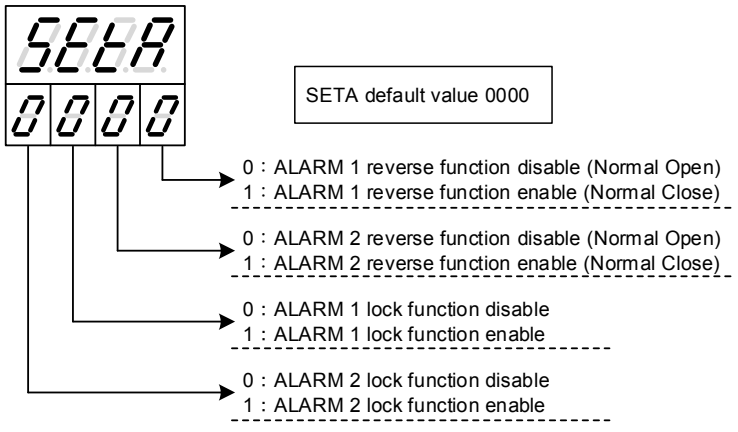
Ex: Process low alarm

with alarm hold action (ALD1=06)	without alarm hold action (ALD1=16)
	

16.2 Alarm special function

1. Alarm Reverse Function
After power-on if no alarm events generate the alarm relay will contact in close condition if alarm events generate the alarm relay will contact in open condition.

2. Alarm Lock Function
When alarm events generate the alarm relay contact and led indicator continuous will on even PV/SV return to normal band led still not release until power reset the contact.

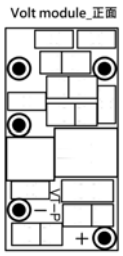
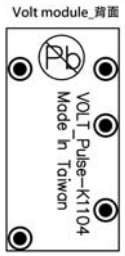


17. Control module modification

17.1 RELAY Control

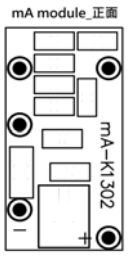
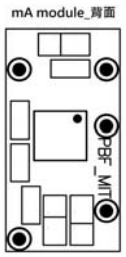
Top view	Side view	Software Setting
		Set the parameter “CYT1=10”

17.2 SSR Control

Top view	Bottom view	Software Setting
		Set the parameter “CYT1=SSr(1)”

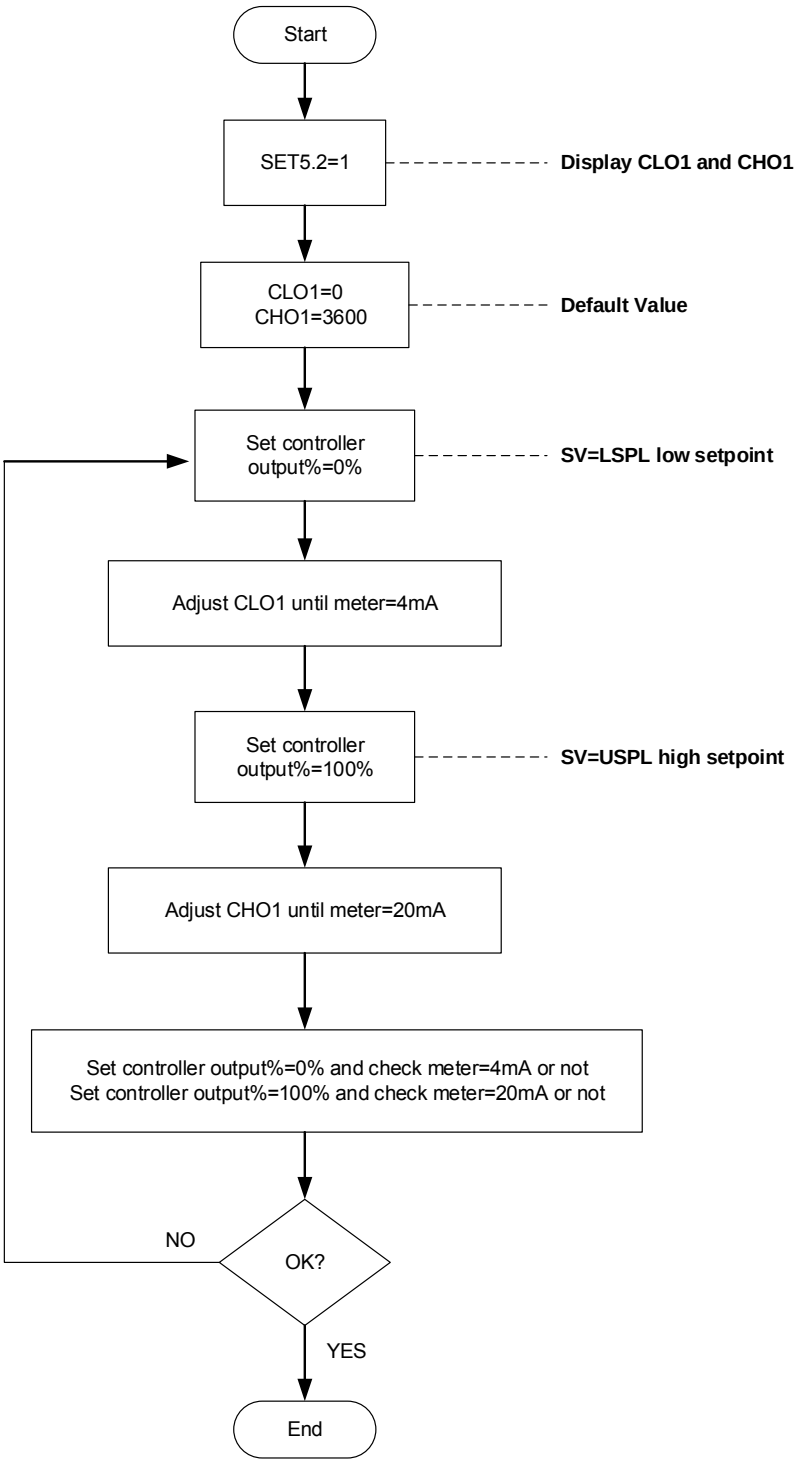
17.3 Linear Control

※： When modify linear module need to calibrate output signal, please refer to ch17.4 Output calibration flowchart.

Top view	Bottom view	Software Setting
		Set the parameter “CYT1=LinE(0)”

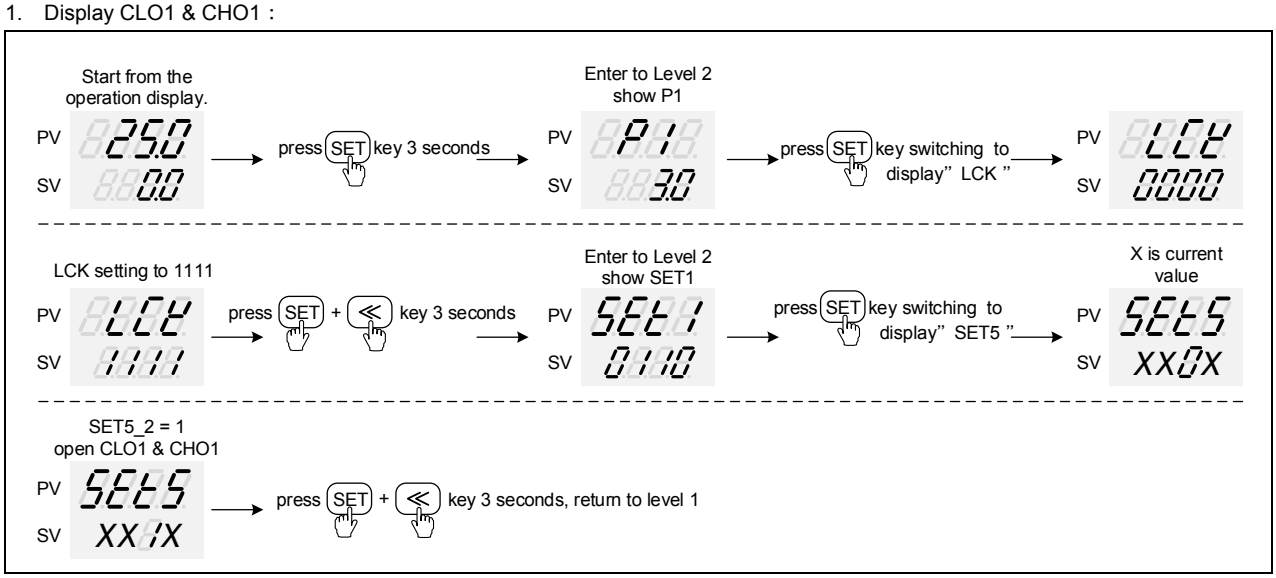
17.4 Output calibration flowchart

Output Signal (4mA~20mA) calibration flowchart



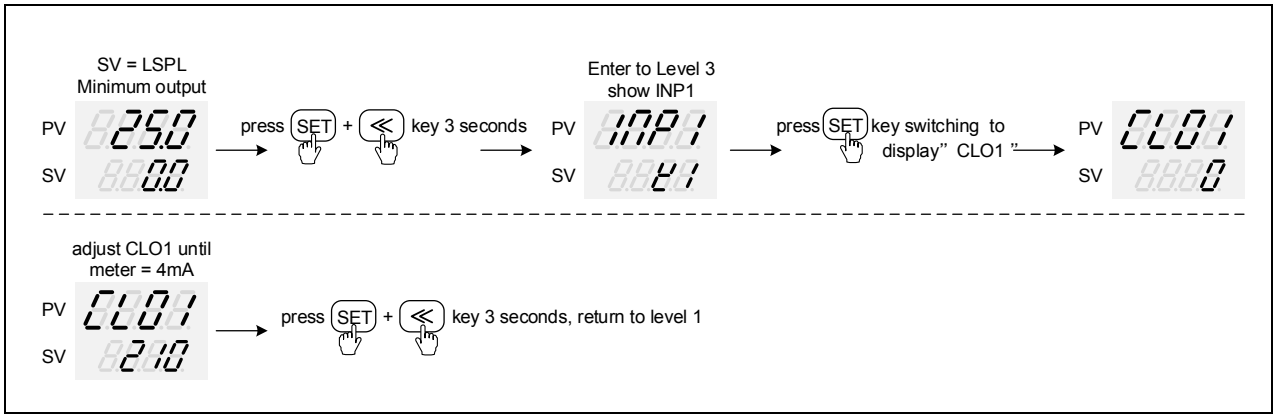
17.5 Output calibration steps

1. Display CLO1 & CHO1：



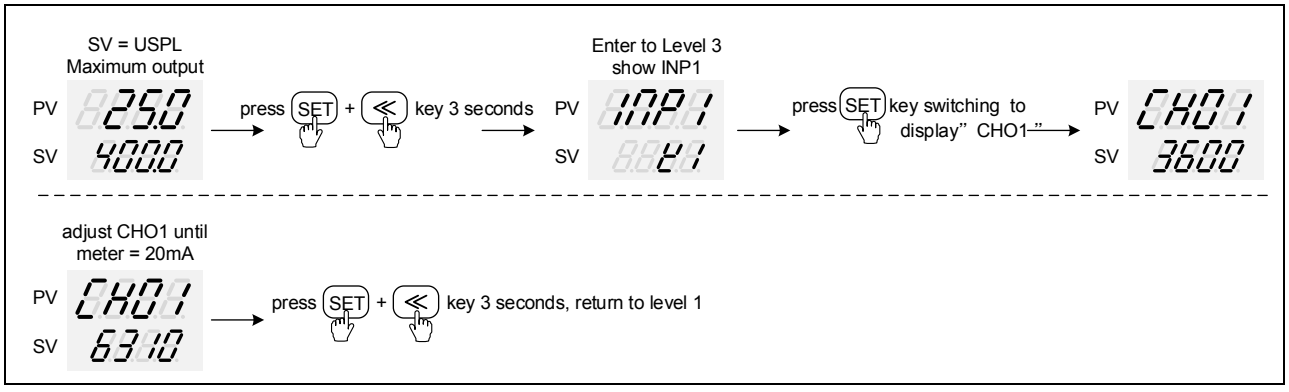
※ : X is current value

2. Adjust CLO1 value：



※ : Each controller CLO1 value is different.

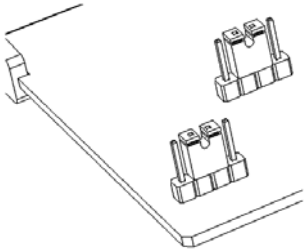
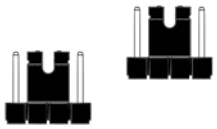
3. Adjust CHO1 value：



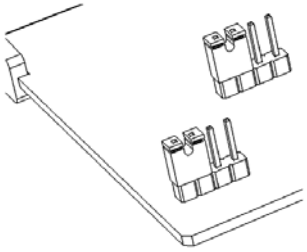
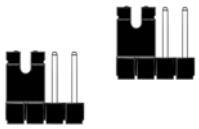
※ : Each controller CHO1 value is different.

18. Input type modification

18.1 Modify to Thermocouple

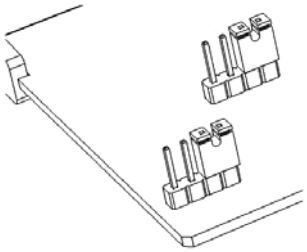
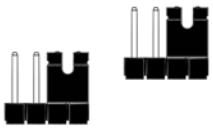
Jumper Address Middle location		Software Setting
		Set the parameter “INP1=K1~L”

18.2 Modify to RTD

Jumper Address Left location		Software Setting
		Set the parameter “INP1=DP1~DP3”

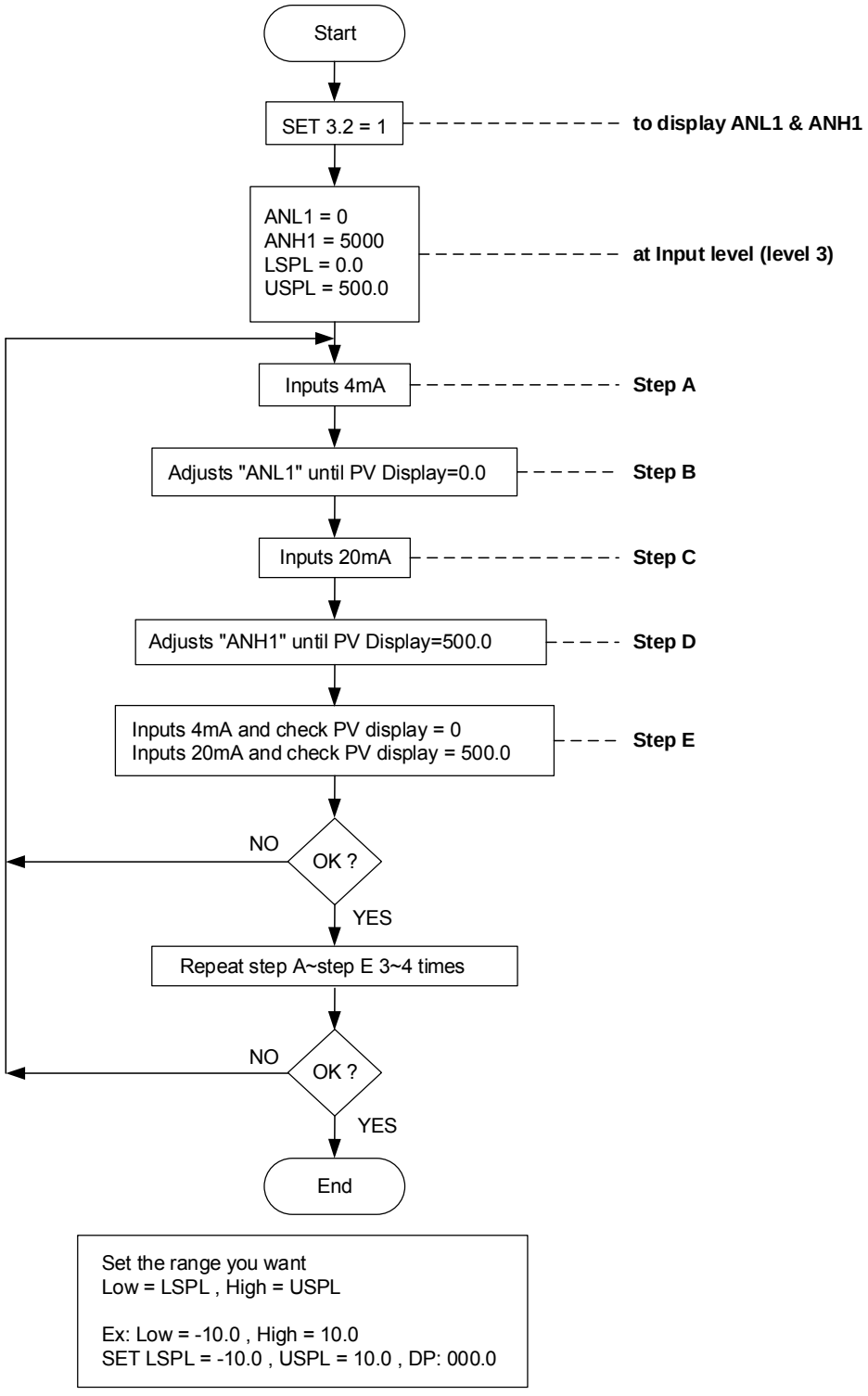
18.3 Modify to Linear (4~20mA)

※ : 1. When modify input type to linear signal need to calibrate input signal, please refer to ch18.4 Input calibration flowchart
2. If want modify to other linear signal, please send it to the retail dealer.

Jumper Address Right location		Software Setting
		Set the parameter “INP1=AN2”

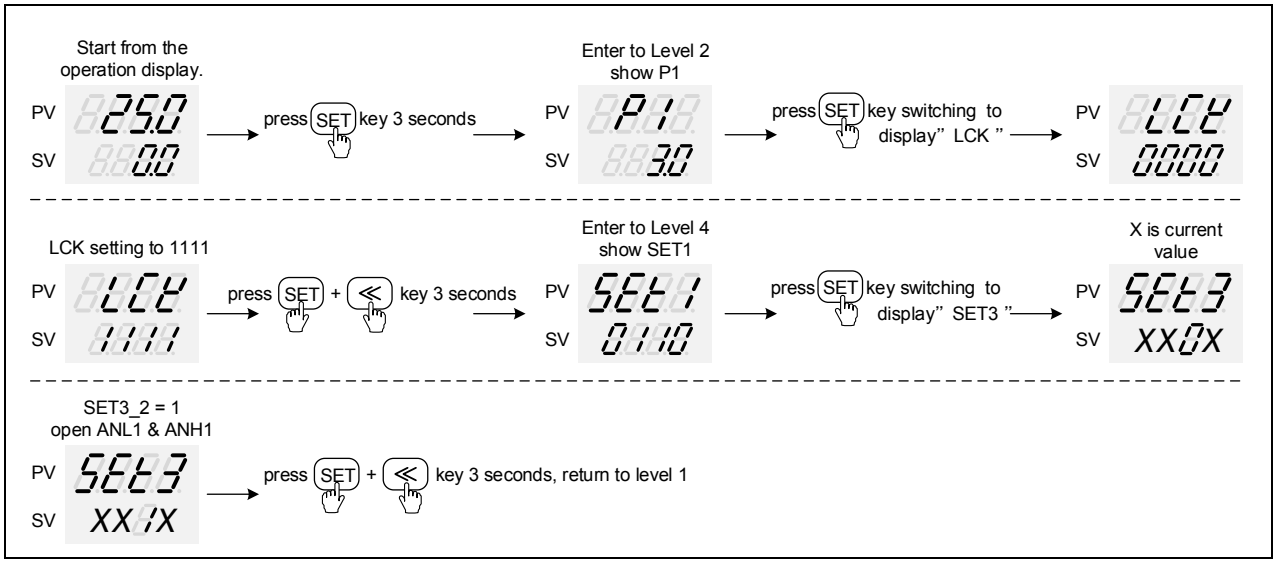
18.4 Input calibration flowchart

Input Signal (4mA~20mA) calibration flowchart



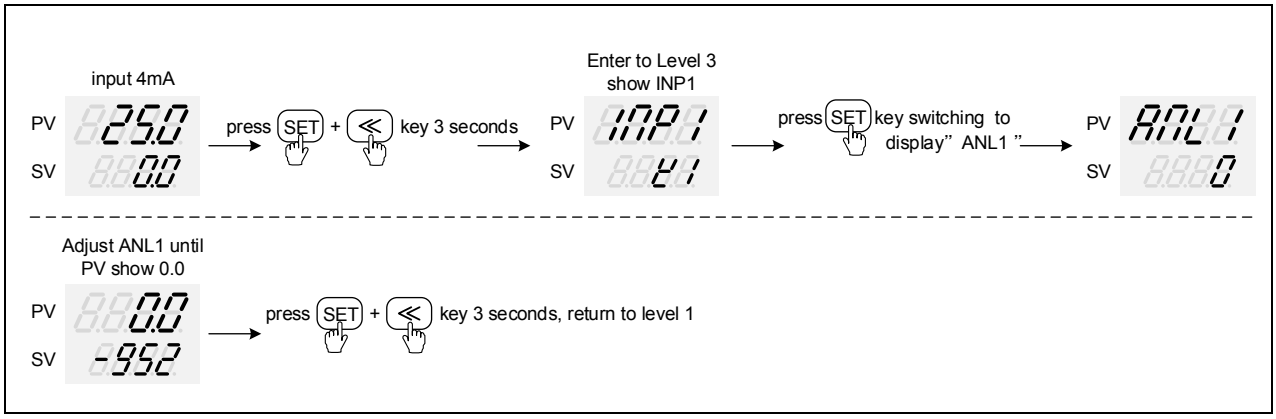
18.5 Input calibration steps

1. Display ANL1 & ANH1：



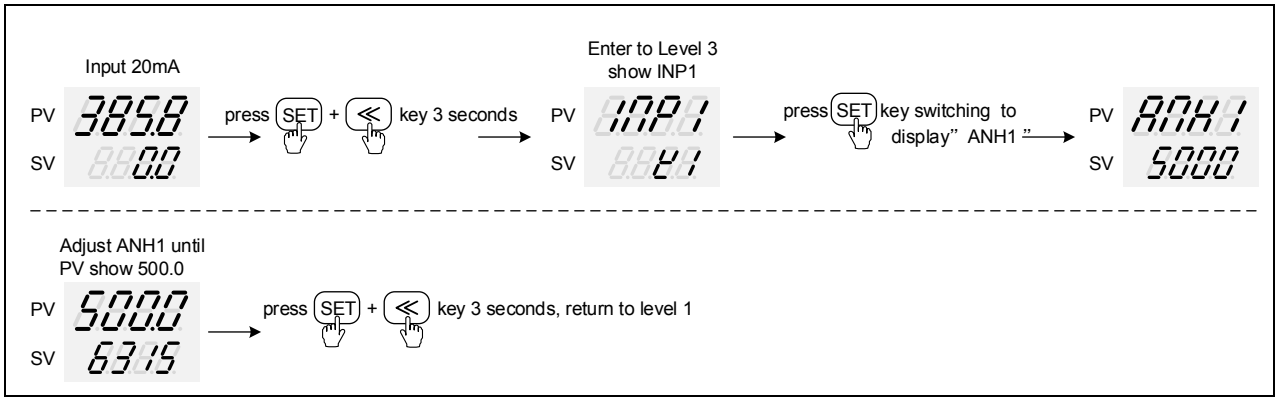
※ : X is current value

2. Adjust ANL1 value：



※ : Each controller ANL1 value is different.

3. Adjust ANH1 value：



※ : Each controller ANH1 value is different.

19. Communication register address table

Parameter	Register Address		R / W
	Hex	Dec	
SV	0x00	0	R / W
PV	0x01	1	R
SV2	0x02	2	R / W
PV2	0x03	3	R
HBAC	0x04	4	R / W
HBAT	0x05	5	R / W
R-S	0x06	6	R / W
OLH1	0x07	7	R / W
OLL1	0x08	8	R / W
OLH2	0x09	9	R / W
OLL2	0x0A	10	R / W
AT	0x0B	11	R / W
AL1H	0x0C	12	R / W
AL1L	0x0D	13	R / W
AL2H	0x0E	14	R / W
AL2L	0x0F	15	R / W
AL3H	0x10	16	R / W
AL3L	0x11	17	R / W
SV_1	0x12	18	R / W
SV_2	0x13	19	R / W
SV_3	0x14	20	R / W
A-M	0x15	21	R / W
MOP	0x16	22	R / W
P1	0x35	53	R / W
I1	0x36	54	R / W
D1	0x37	55	R / W
CYT1	0x38	56	R / W
SOF1	0x39	57	R / W
HYO1	0x3A	58	R / W
OP1	0x3B	59	R
P2	0x3C	60	R / W
I2	0x3D	61	R / W
D2	0x3E	62	R / W
CYT2	0x3F	63	R / W
SOF2	0x40	64	R / W
GAP.1	0x41	65	R / W
GAP.2	0x42	66	R / W
HYO2	0x43	67	R / W
OP2	0x44	68	R
ATVL	0x45	69	R / W
LCK	0x4B	75	R / W
INP1	0x4C	76	R / W
ANL1	0x4D	77	R / W
ANH1	0x4E	78	R / W
DP	0x4F	79	R / W
LSPL	0x50	80	R / W
USPL	0x51	81	R / W
SVL1	0x52	82	R / W
SVH1	0x53	83	R / W
PLL1	0x54	84	R / W
PHH1	0x55	85	R / W
ALD1	0x56	86	R / W
ALT1	0x57	87	R / W
HYS1	0x58	88	R / W
ALD2	0x59	89	R / W
ALT2	0x5A	90	R / W
HYS2	0x5B	91	R / W
ALD3	0x5C	92	R / W
ALT3	0x5D	93	R / W
HYS3	0x5E	94	R / W
SETA	0x5F	95	R / W
CLO1	0x60	96	R / W
CHO1	0x61	97	R / W
CLO2	0x62	98	R / W
CHO2	0x63	99	R / W
TE	0x64	100	R / W
TS	0x65	101	R / W
TSPL	0x66	102	R / W
TSPH	0x67	103	R / W

Parameter	Register Address		R / W
	Hex	Dec	
CLO3	0x68	104	R / W
CHO3	0x69	105	R / W
RUCY	0x6A	106	R / W
WAIT	0x6B	107	R / W
PSL	0x6C	108	R / W
BITS	0x6D	109	R / W
IDNO	0x6E	110	R / W
BAUD	0x6F	111	R / W
INT	0x70	112	R / W
SVOS	0x71	113	R / W
PVOS	0x72	114	R / W
PVOH	0x73	115	R / W
PVFT	0x74	116	R / W
UNIT	0x75	117	R / W
OUD	0x76	118	R / W
HZ	0x77	119	R / W
INP2	0x78	120	R / W
ANL2	0x79	121	R / W
ANH2	0x7A	122	R / W
DP_2	0x7B	123	R / W
LSP2	0x7C	124	R / W
USP2	0x7D	125	R / W
SVL2	0x7E	126	R / W
SVH2	0x7F	127	R / W
PLL2	0x80	128	R / W
PHH2	0x81	129	R / W
SVO2	0x82	130	R / W
PVS2	0x83	131	R / W
PVH2	0x84	132	R / W
PVF2	0x85	133	R / W
UNI2	0x86	134	R / W
DIE	0x8C	140	R / W
DIS	0x8D	141	R / W
SET1	0x8E	142	R / W
SET2	0x8F	143	R / W
SET3	0x90	144	R / W
SET4	0x91	145	R / W
SET5	0x92	146	R / W
SET6	0x93	147	R / W
SET7	0x94	148	R / W
SET8	0x95	149	R / W
SET9	0x96	150	R / W
SET0	0x97	151	R / W
OUTY	0x9D	157	R / W
R-M	0x9E	158	R / W
CJS	0x9F	159	R / W
CJM	0xA0	160	R / W
CJT	0xA1	161	R
OBIT	0xA2	162	R
D_01	0xA5	165	R / W
D_02	0xA6	166	R / W
D_03	0xA7	167	R / W
D_04	0xA8	168	R / W
D_05	0xA9	169	R / W
D_06	0xAA	170	R / W
D_07	0xAB	171	R / W
D_08	0xAC	172	R / W
D_09	0xAD	173	R / W
D_10	0xAE	174	R / W
D_11	0xAF	175	R / W
D_12	0xB0	176	R / W
D_13	0xB1	177	R / W
D_14	0xB2	178	R / W
D_15	0xB3	179	R / W
D_16	0xB4	180	R / W