
WT Series Digital PID Controller

WT404

WT409

WT707

WT904

WT909

Operation Manual

JUNE,2006

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1. Notice before start-up

WT series controller has got the CE approvals as below :

LDV : D/N EN61010-1

EMC : EN 55 022 1994/A1: 1995/A2: 1997,
EN 61 000-3-2: 1995/ -3-3: 1995,
EN 61 000-4-2: 1995/ -4-3: 1996/ -4-5: 1995/ -4-6
1996/ -4-8: 1993/ -4-11: 1996/ EN 50 204: 1995

Please confirm the specification of controller is to totally with your requirement before using it, also read this manual in detail.



Danger

Attention! Electric Shock!

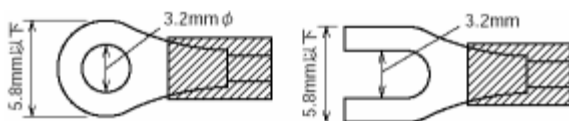
After electrifying, do not touch the terminal to prevent attacking!!

Please ensure the power has closed while you perform power wiring.



Warning

1. Please make sure the position of the rear terminal for AC power is correct, or the controller would be damage after electrifying.
(WT404 for Pin1, 6 ; WT904/707/409/909 for Pin1,2)
2. Please ensure the votage is the same with the spec (AC85~265 or DC 24V), or the controller would be damage after electrifying.
3. Please ensure the wiring has connected to the right usage(Input, Output, Alarm) terminal.
4. Please choose the suited terminal fitted for M3 screw, express as below:



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

5. Do not set your controller under the surrounding with high interfere, caustic gas, and high temperature high humid.(normal working envirnment : 0~50 , 50~85%RH).
6. In order to avoid been interfered by noise, power wiring should leave from motivity power line and load power line.
7. While useng down-lead for thermocouple, please chose the suited thermocouple compensating lead wires.
8. Wille using down-lead for RTD, pleae chose samll , and use the same material between three line.

1. Specifications

● Standard spec.

Model	WT404	WT904	WT 707	WT409	WT909
Dimension	48X48mm	96X48mm	72X72mm	48X96mm	96X96mm
Supply voltage	AC 85~265V , DC 15~50V (Option)				
Frequency	50 / 60 HZ				
Power consumption	approx 3VA	approx 4VA	approx 3VA	approx 4VA	approx 4VA
Input	Accuracy	0.2 % FS \pm 1digit			
	Sample time	250ms			
	TC	K , J , R , S , B , E , N , T , W5Re/W26Re , PLII , U , L			
	RTD	PT100,JPT100,JPT50			
	mA dc	4~20mA ,0~20mA			
	mV / V dc	0~1V,0~5V,0~10V,1~5V,2~10V -10~10mV,0~10mV,0~20mV,0~50mV,10~50mV			
	Decimal point position	0000 , 000.0 , 00.00 , 0.000 Available for linear input (mA / mV / V)			
Output 1	Relay	SPST type	SPDT type	SPST type	SPDT type
		3A , 220V , electrical life:100,000 times or more (under rated load)			
	Voltage pulse	For SSR drive. ON : 24V , OFF : 0V , max load current : 20mA			
	mA dc	4~20mA, 0~20mA. Maximum load resistance:560 Ω			
	Voltage dc	0~5V , 0~10V , 1~5V , 2~10V . Max load current:20mA			
Alarm 1	3A , 220V , electrical life:100,000 times or more (under rated load)				
Control algorithm	PID , PI , PD , P , ON / OFF(P=0) , FUZZY .				
PID range	P: 0.0 ~ 200.0 % , I: 0~3600s , D: 0~900s				
Isolation	Output terminals(control output , alarm , transmission) and input terminals are isolated separately				
Isolated resistance	10M Ω or more between input and case (ground) at DC 500 V 10M Ω or more between output and case (ground) at DC 500 V				
Dielectric strength	1000V AC for 1 minute between input terminal and case (ground) 1500V AC for 1 minute between output terminal and case (ground)				
Operating temperature	0~50 $^{\circ}$ C				
Humidity range	20~90%RH				
Weight	150g	225g	225g	225g	300g
Display Height	PV:7mm SV:7mm	PV:7mm SV:7mm	PV:14mm SV:10mm	PV:7mm SV:7mm	PV:14mm SV:10mm

● **Optional Spec.**

Model	WT404	WT904	WT707	WT409	WT909
Output 2	For heating and cooling control use. Relay , SSR , 4~20mA , 0~20mA , 0~5V , 0~10V , 1~5V , 2~10V				
Alarm 2	SPST type	SPDT type	SPST type	SPDT type	SPDT type
	3A , 220V , electrical life:100,000 times or more (under rated load)				
Alarm 3	Not available	Available	Available	Available	Available
		SPST type	SPST type	SPST type	SPST type
	3A , 220V , electrical life:100,000 times or more (under rated load)				
Heater Break Alarm (HBA)	Display range of heater current : 0.0~99.9A , Accuracy : 1%FS				
	Included CT : SC-80-T				
	Alarm relay : AL1				
Transmission	Available for PV or SV transmission				
	4~20mA , 0~20mA , 0~1V , 0~5V , 0~10V , 1~5V , 2~10V				
Remote SV	4~20mA , 0~20mA , 0~1V , 0~5V , 0~10V , 1~5V , 2~10V				
Communication	Protocol : MODBUS RTU , MODBUS ASCII , TAIE				
	RS232 , RS485 , TTL				
	Baud rate: 2400 , 4800 , 9600 , 19200 , 38400 bps. Data bits : 8 , Stop bit : 1 or 2bit , Odd or Even parity.				
Water/Dust proof	IP65				

● **Special control output (OUT1)**

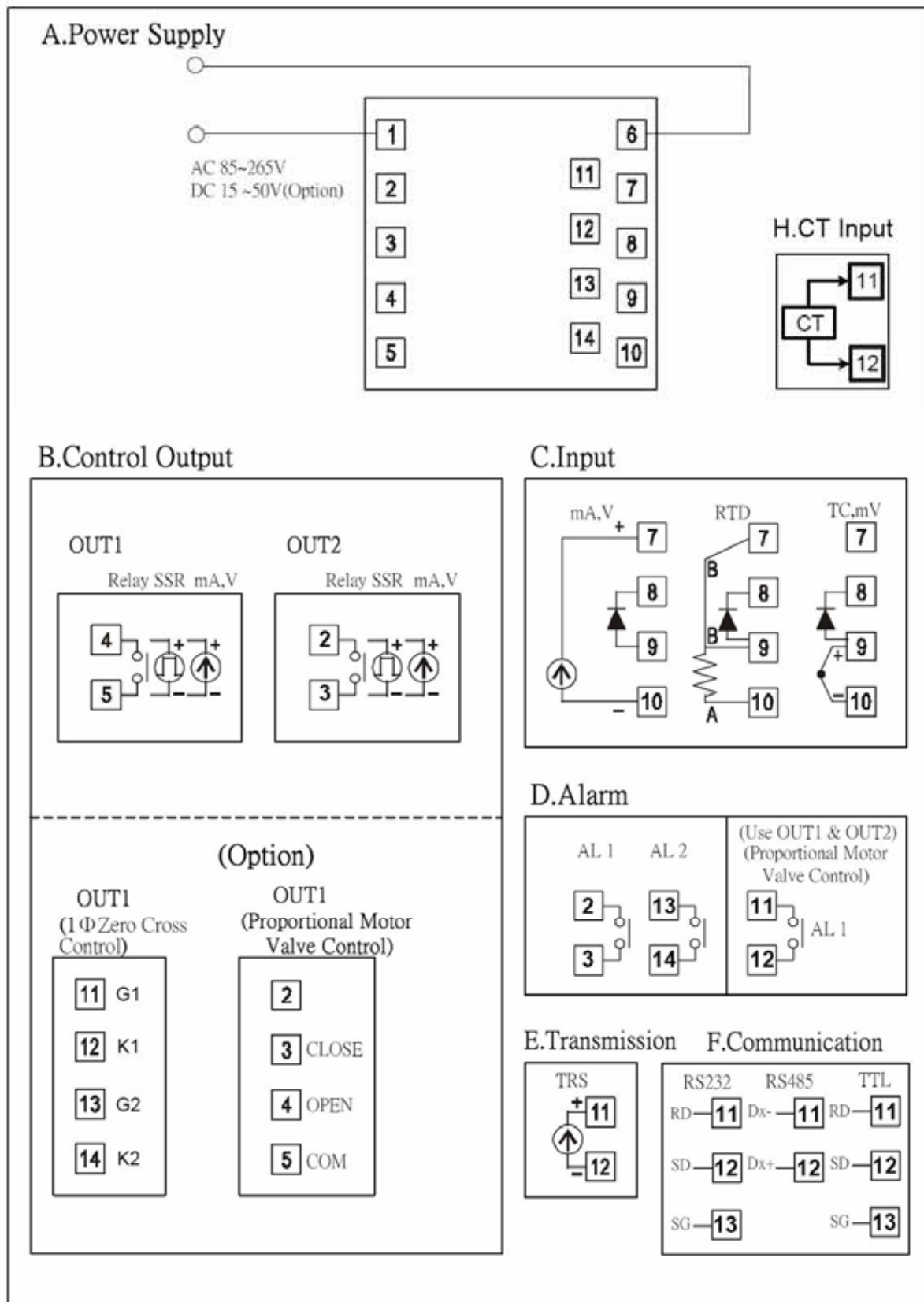
Model	WT404	WT904	WT707	WT409	WT909
1φ zero crossing control(1φSSR)	Available	Not available	Available	Not available	Available
3φ zero crossing control(3φSSR)	Not available				Available
Motor valve control	Available				
1φ phase angle control(1φSCR)	Not available	Available			
3φ phase angle control(3φSCR)	Not available				Available

● **Programmable RAMP/SOAK**

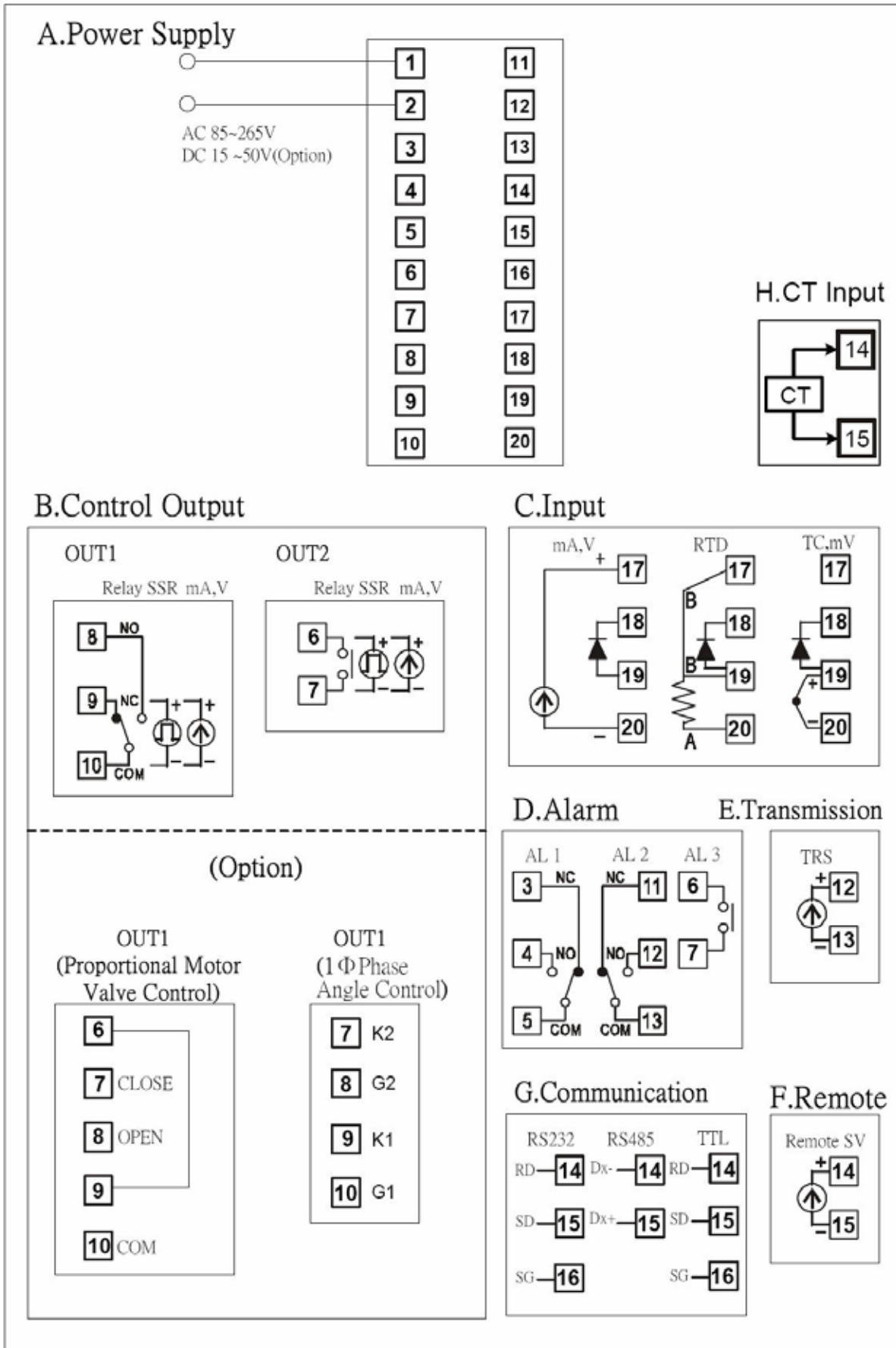
Model	WT404	WT904	WT707	WT409	WT909
Programmable RAMP/SOAK	2 patterns with 8 segments each. The 2 patterns can be linked together as 16 segments use.				

3. Terminal arrangement

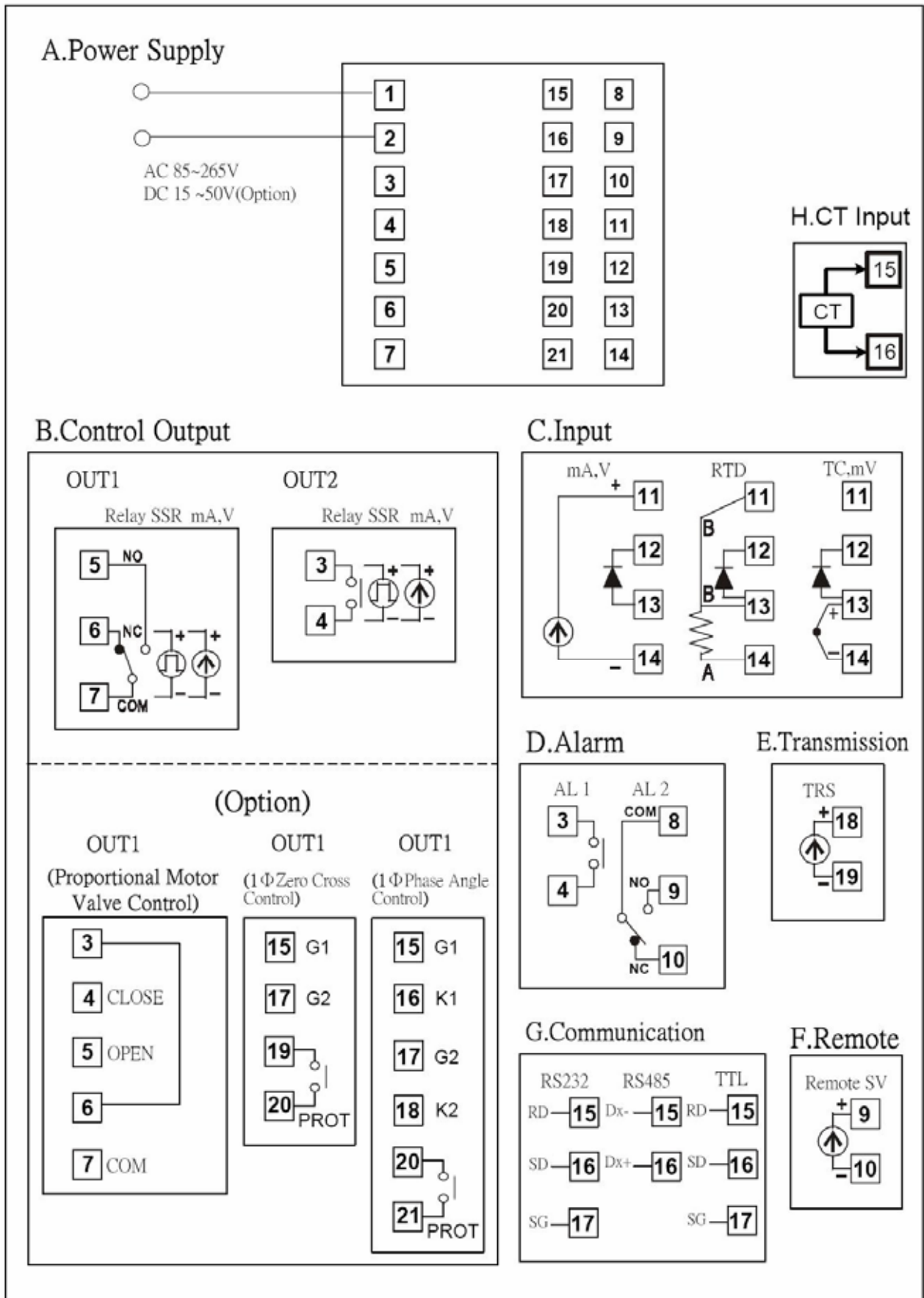
3.1 WT404 Terminals (48mm x 48mm , DIN 1/16)



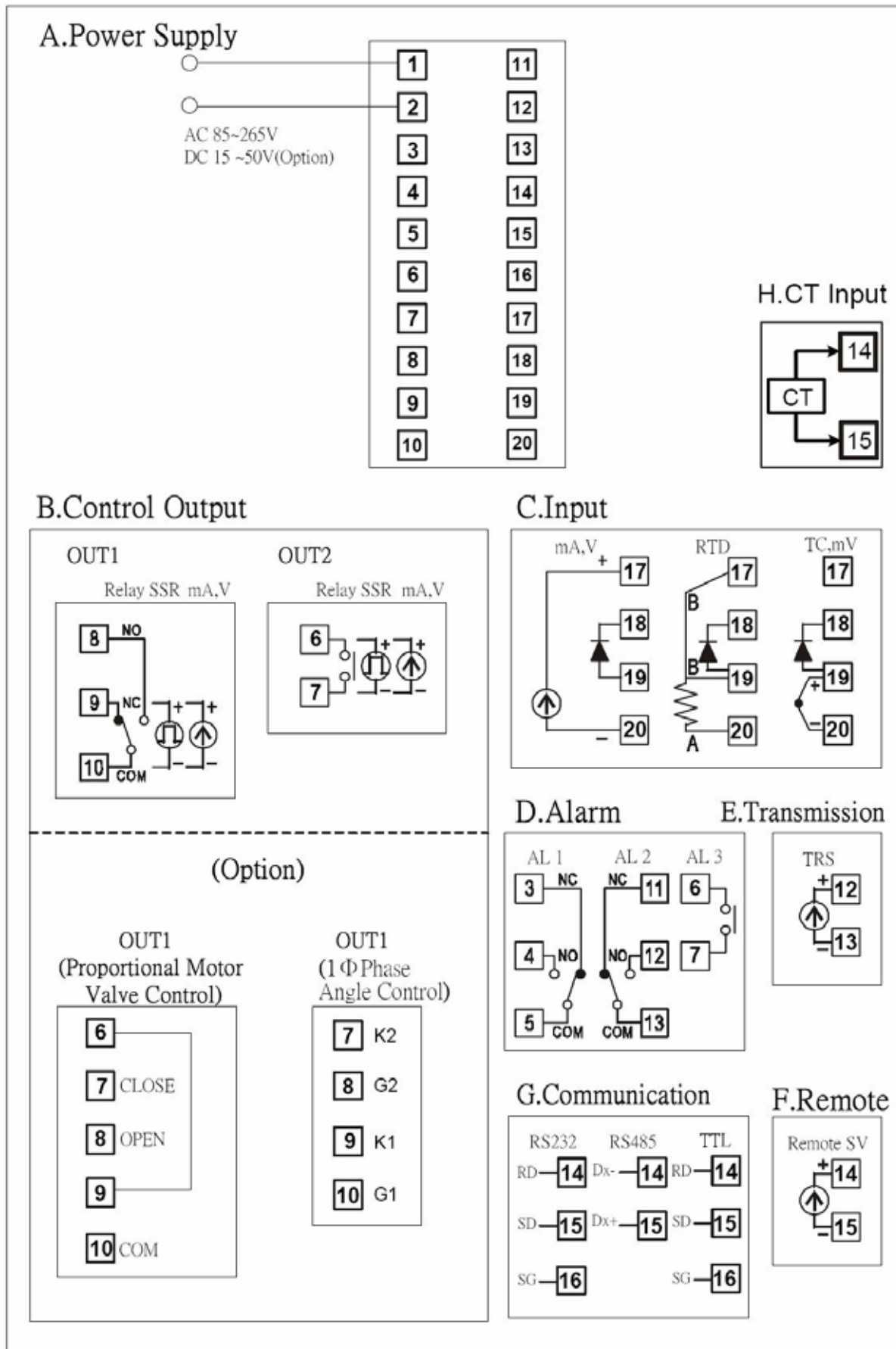
3.2 WT904 Terminals (96mm x 48mm , DIN 1/8)



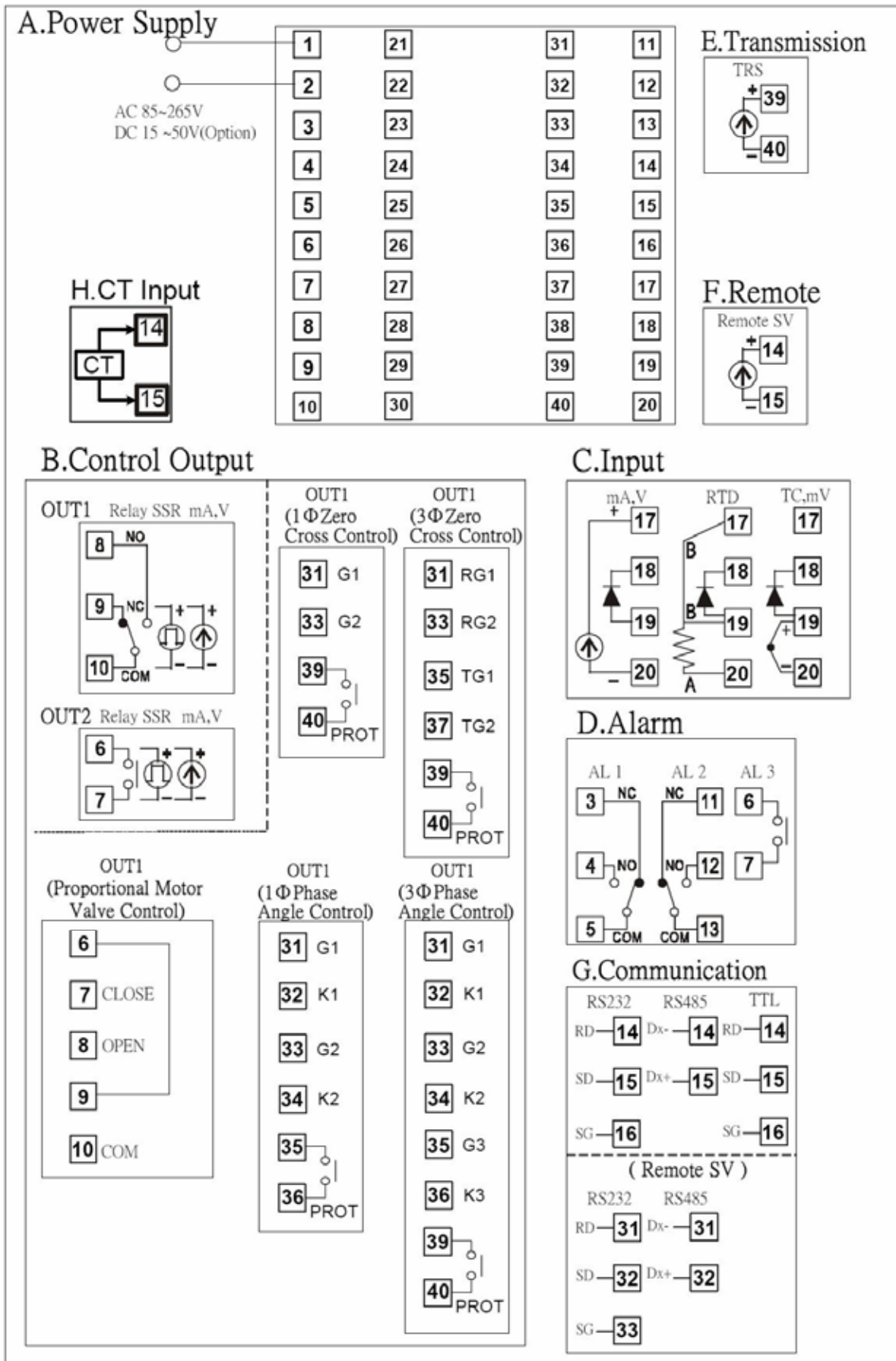
3.3 WT707 Terminals (72mm x 72mm)



3.4 WT409 Terminals (48mm x 96mm , DIN 1/8)

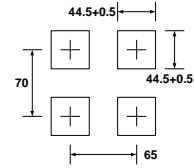
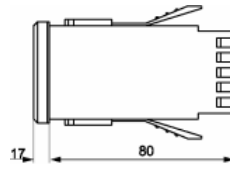
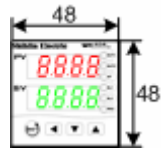


3.5 WT909 Terminals (96mm x 96mm , DIN 1/4)

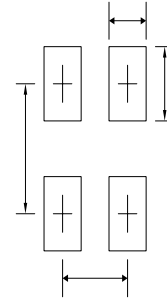
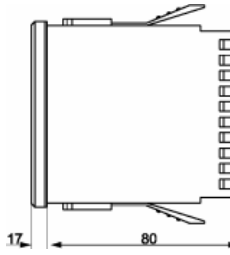
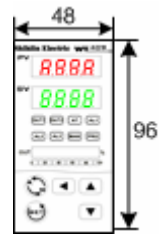


4. External dimension and panel cutout (Unit : mm)

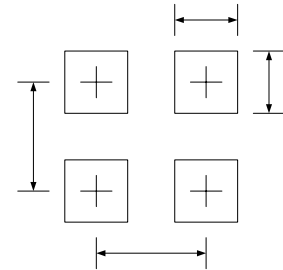
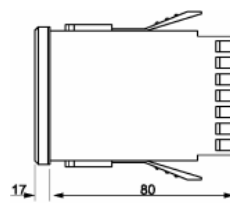
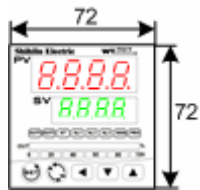
WT404



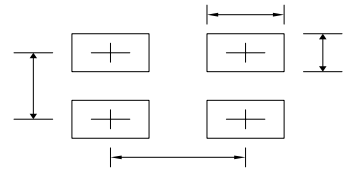
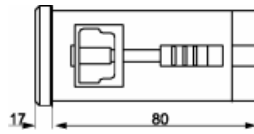
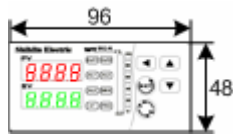
WT409



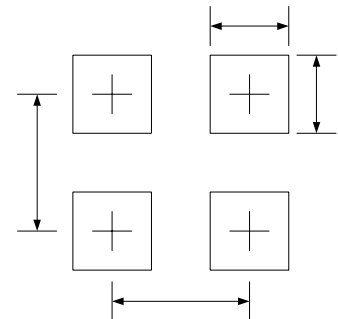
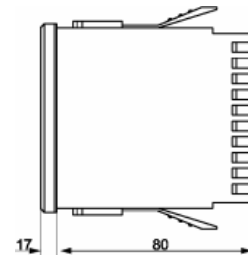
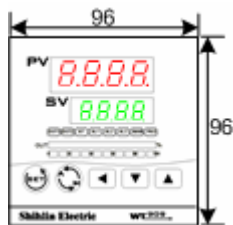
WT707



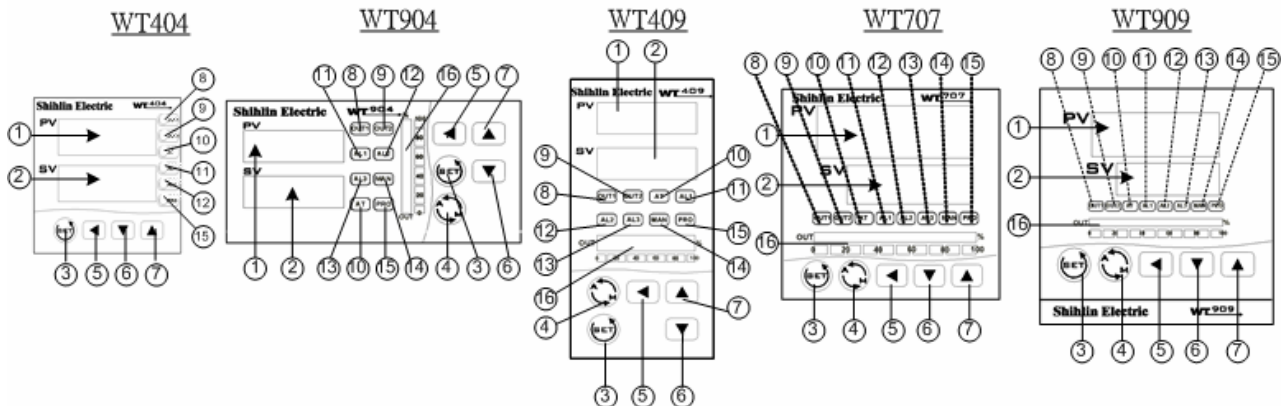
WT904








WT909



5. Parts description

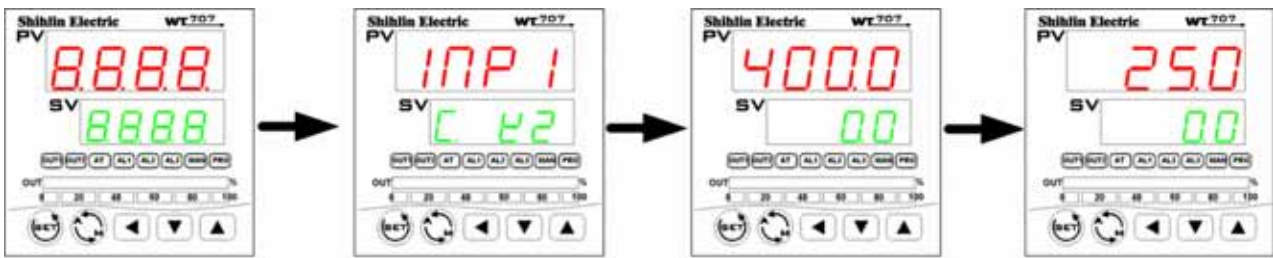


SYMBOL	NAME	FUNCTION
PV	1 Measured value (PV) display	Display PV or various parameter symbols (Red).
SV	2 Set Value (SV)display	Displays SV or various parameter set values(Green).
	3 Set key	Used for parameter calling up and set value registration.
	4 Auto/Manual key	Switches between Auto(PID) output mode and Manual output mode.
	5 Shift key	Shift digits when settings are changed.
	6 Down key <i>*Program hold</i>	Decrease numbers(-1000,-100,-10,-1) <i>*Program hold(programmable controller).</i>
	7 Up key <i>*Program run</i>	Decrease numbers(+1000,+100,+10,+1) <i>*Program hold(programmable controller).</i>
OUT1	8 OUT1 lamp	Lights when OUT1 is activated (Green).
OUT2	9 OUT2 lamp	Lights when OUT2 is activated (Green).
AT	10 Auto tuning lamp	Lights when Auto tuning is activated (Orange).
AL1	11 Alarm1 lamp	Lights when Alarm 1 is activated (Red).
AL2	12 Alarm2 lamp	Lights when Alarm 2 is activated (Red).
AL3	13 Alarm3 lamp	Lights when Alarm 3 is activated (Red).
MAN	14 Manual output lamp	Lights when manual output is activated(Orange).
PRO	15 <i>*Program running lamp</i>	<i>*Flashes when program is running(Programmable controller).</i>
OUT%	16 Out% bar-graph display	Output% is displayed on 10-dot LED.

6. Operations

6.1 Power On

Controller will display as below



Light up all LED lamp
and 7 section display

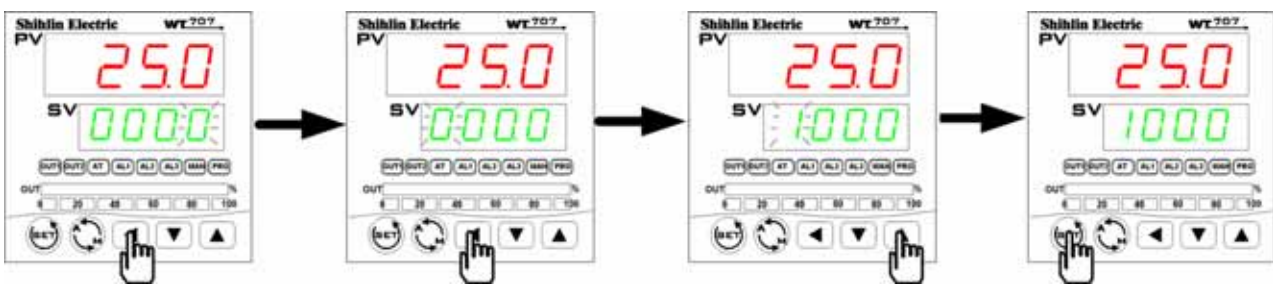
Display unit "C" and input
type "K2"

Display value (0.0~400.0)

Start to use

6.2 Change the Set Value (SV)

Example : Set value =100, Operation step express as below :



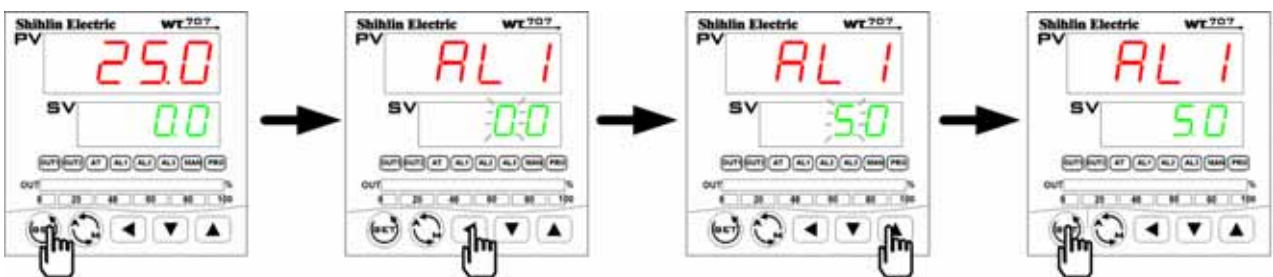
Press SHIFT key
First digit start is glisten

Press SHIFT key
Shift to digit fourth

Press UP key
Increase the value

Press SET key
Set value=100

6.3 Change the Alarm Value



Press SET key
Change to alarm1

Press SHIFT key
Shift to the second digit

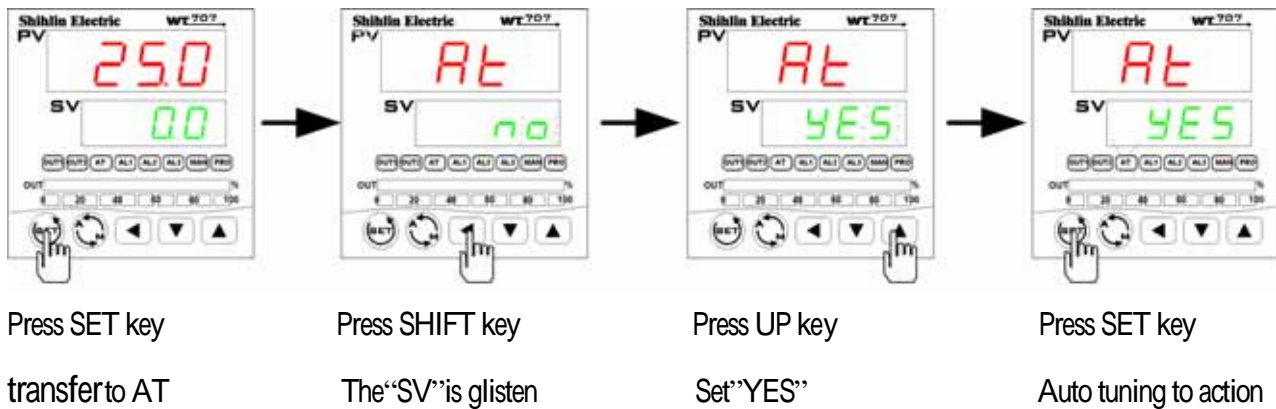
Press UP key
Increase the value

Press SET key
Set alarm value

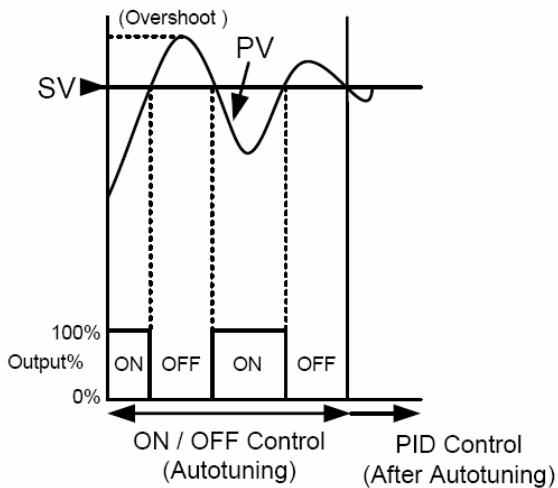
- Notes :
1. Set alarm value to " 5 " (When " PV " is higher then five, alarm1 action)
 2. This control with 16 mode, please refer to page 30 " Alarm mode table " .
 3. When change alarm mode, please press " SET key " and " SHIFT key " to Level 3, set ALD1 parameter.

6.4 Autotuning (AT)

Use AT function to automatically



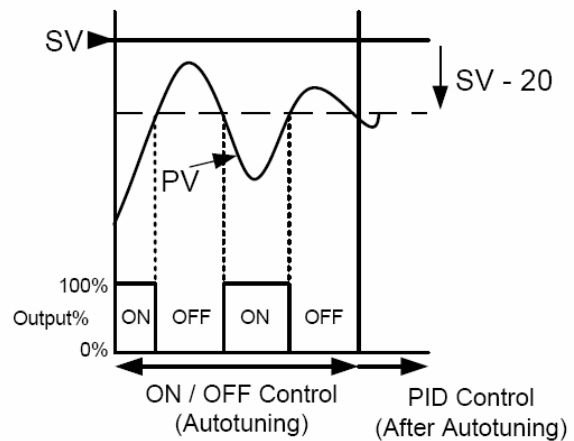
Autotuning ATVL=0



Autotuning ATVL=20

*Set ATVL to prevent overshoot occurred during autotuning process.

To set ATVL ,press **SET** key 5 seconds to enter Level 2 (PID Level) and then change the value.



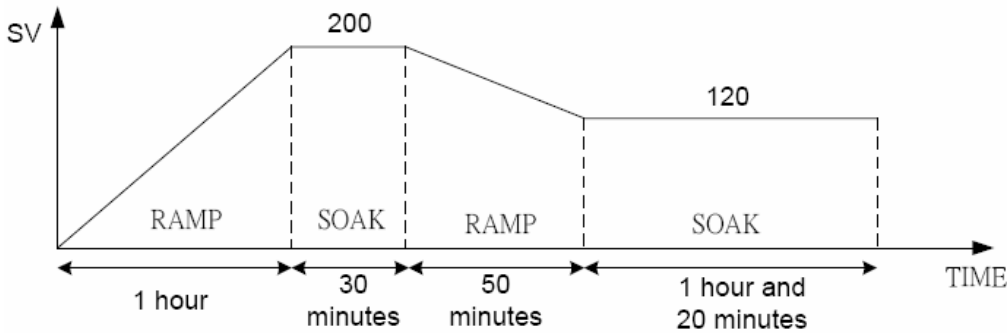
Autotuning failure

- Possible cause 1 : ATVL is too big. (If not sure , set ATVL=0)
- Possible cause 2 : Calculation time is too long. (Set PID parameter manually)

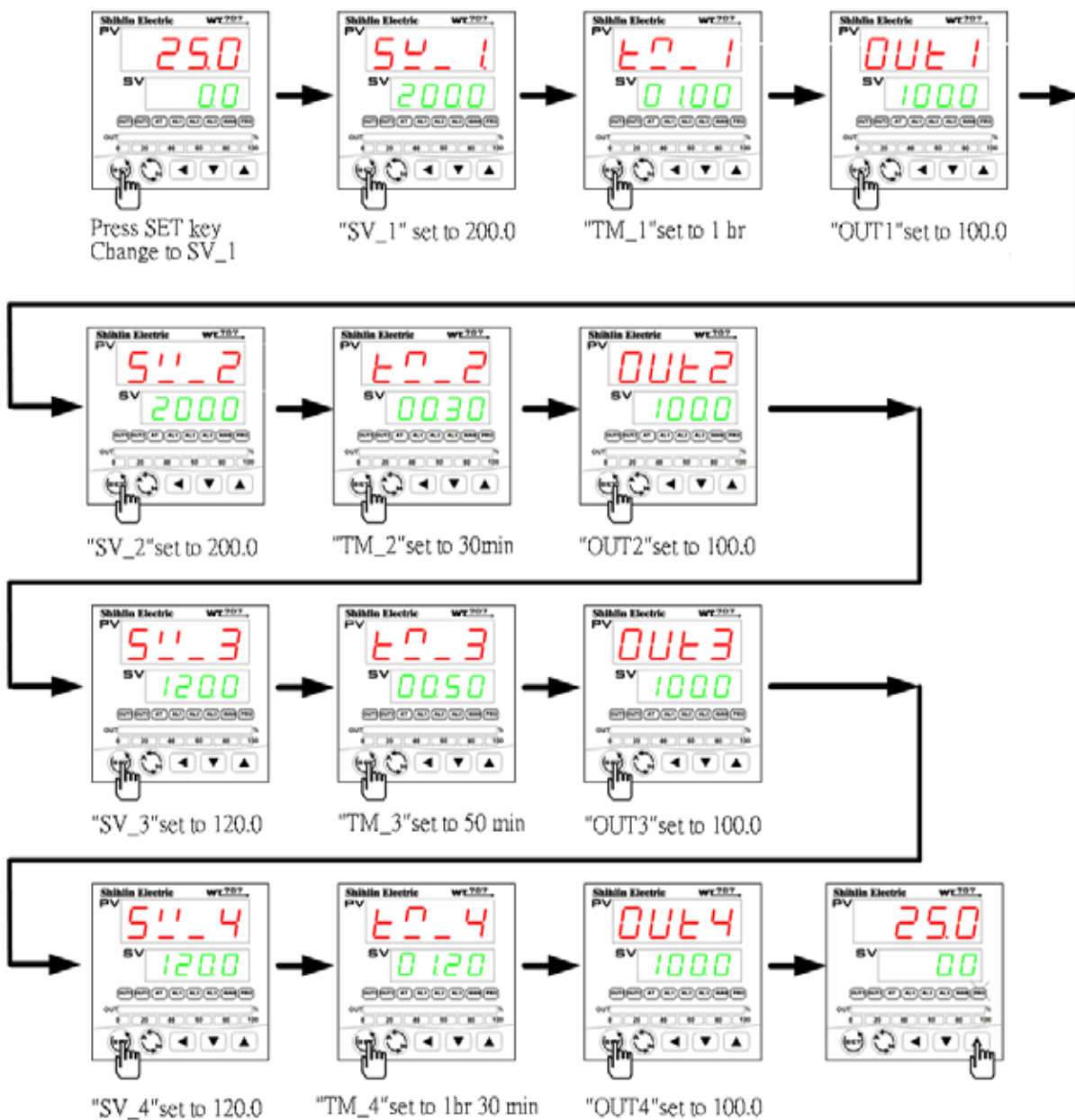
6.5 Programmable RAMP / SOCK

For detail of programmable instruction ,please refer with page 25.

Assume the temperature profile is as below (use total 4 segments)

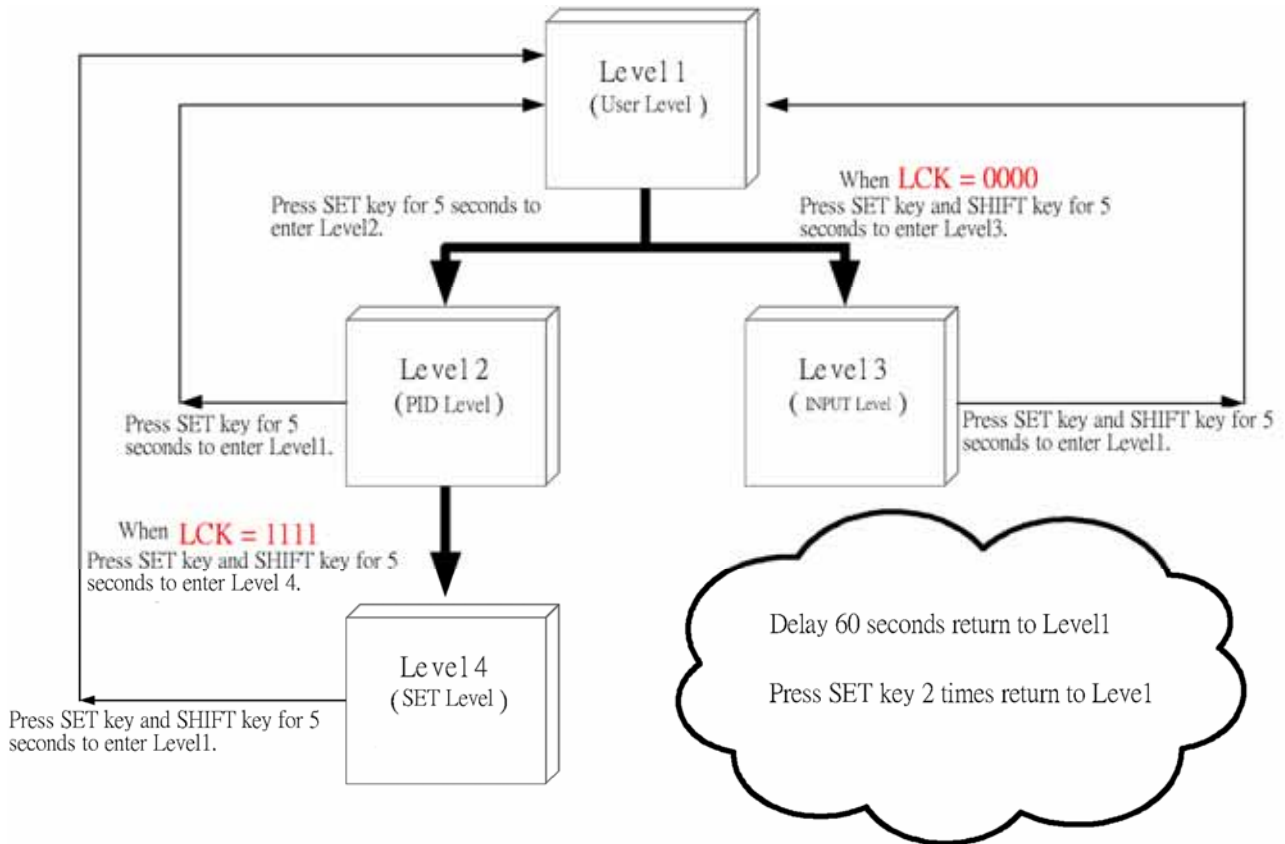


Please operate controller as following steps :



7. Operation levels

7.1 Levels diagram



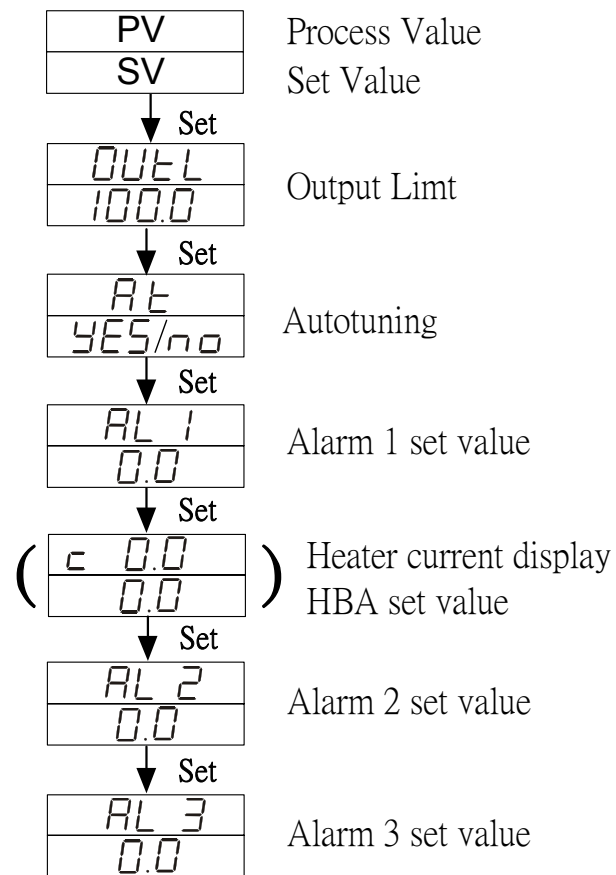
7.2 Lock function

- To use lock function, please set parameter "LCK" in level 2.

LCK	Levels entering available				Parameters which can be changed
	Level 1 (User)	Level 2 (PID)	Level 3 (Input)	Level 4 (SET)	
0000	○	○	○	-----	All parameters (Factory set value)
1111	○	○	-----	○	All parameters
0100	○	○	-----	-----	All parameters except level 3
0110	○	○	-----	-----	Parameters in level 1
0001	○	○	-----	-----	"SV" and "LCK"
0101	○	○	-----	-----	Only "LCK"

8. Parameters

8.1 Level 1 (User Level)



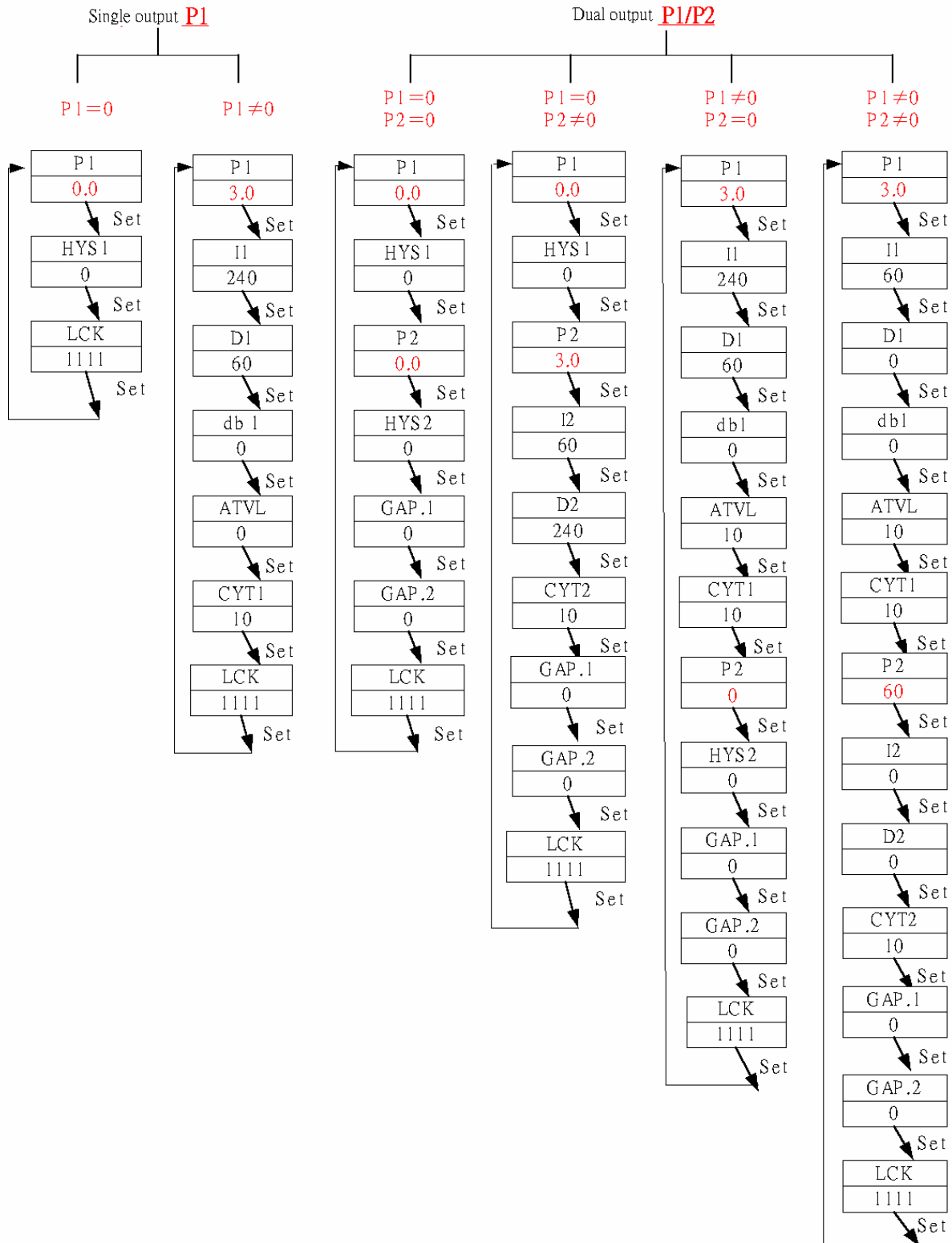
8.2 LEVEL 2 (PID Level)

To enter level2, press SET key 5 seconds in Level1.

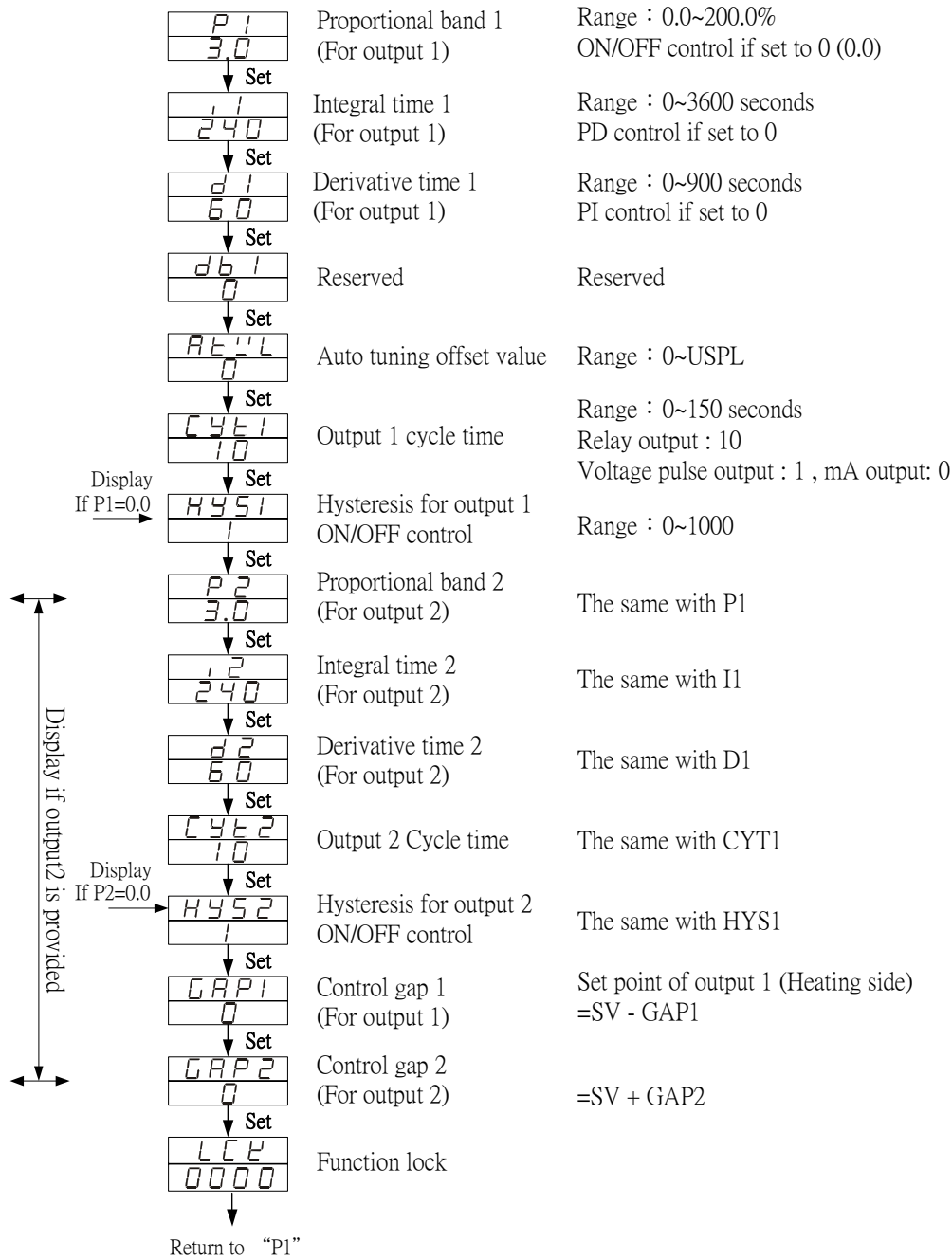
8.2.1 Level 2 parameters display / hiding condition

1. LCK = 1111
2. Press SET key and SHIFT key for 5 seconds to enter Level4.
3. **OUT = 0** Single output **P1**

1. LCK = 1111
2. Press SET key and SHIFT key for 5 seconds to enter Level4.
3. **OUT = 1** Dual output **P1/P2**



8.2.2 Description of parameters

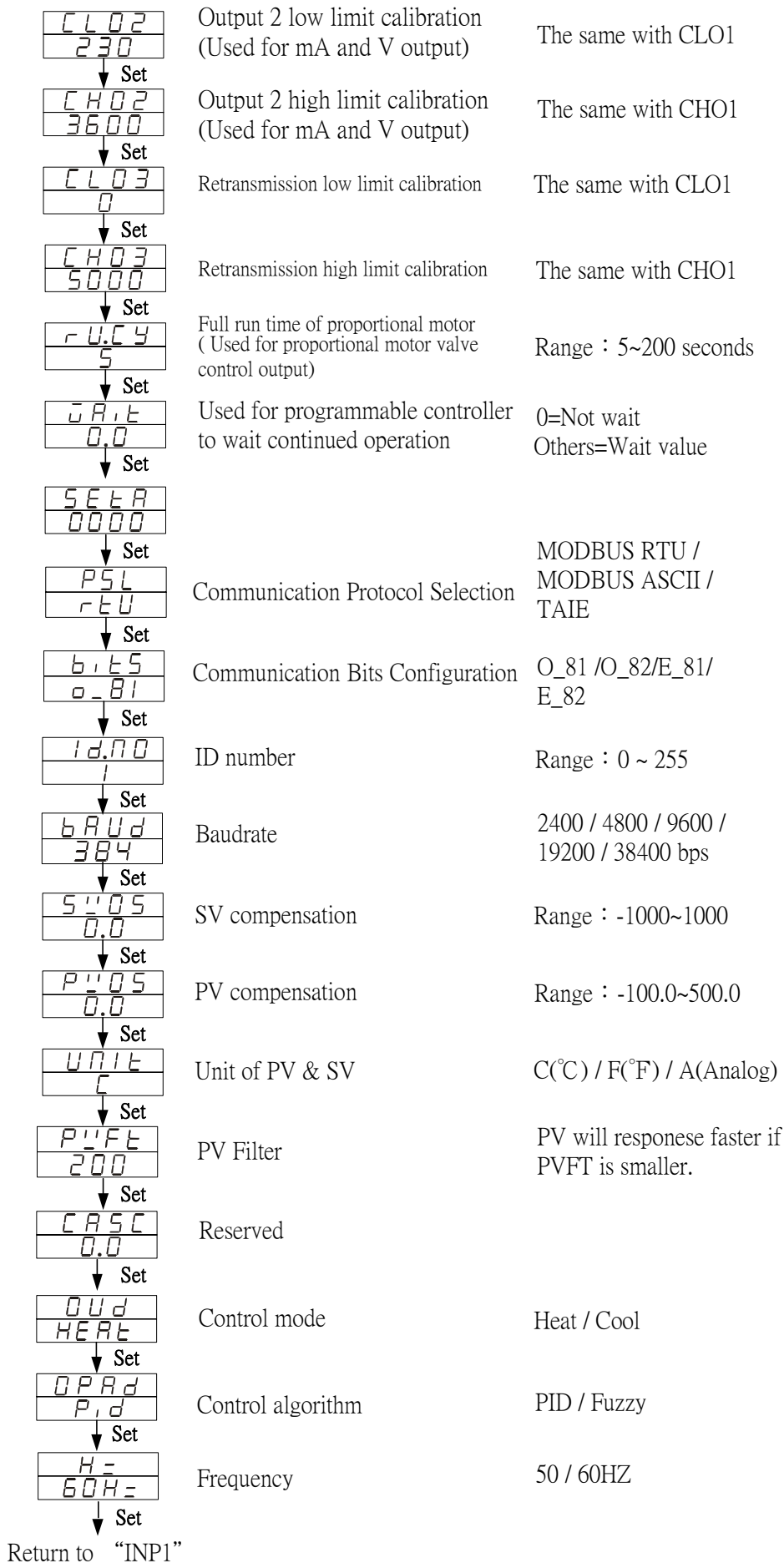


LCK	Levels entering available				Parameters which can be changed
	Level 1 (User)	Level 2 (PID)	Level 3 (Input)	Level 4 (SET)	
0000	⊙	⊙	⊙	-----	All parameters (default value)
1111	⊙	⊙	-----	⊙	All parameters
0100	⊙	⊙	-----	-----	All parameters except level 3
0110	⊙	⊙	-----	-----	Parameters in level 1
0001	⊙	⊙	-----	-----	"SV" and "LCK"
0101	⊙	⊙	-----	-----	Only "LCK"

8.3 LEVEL 3 (Input Level)

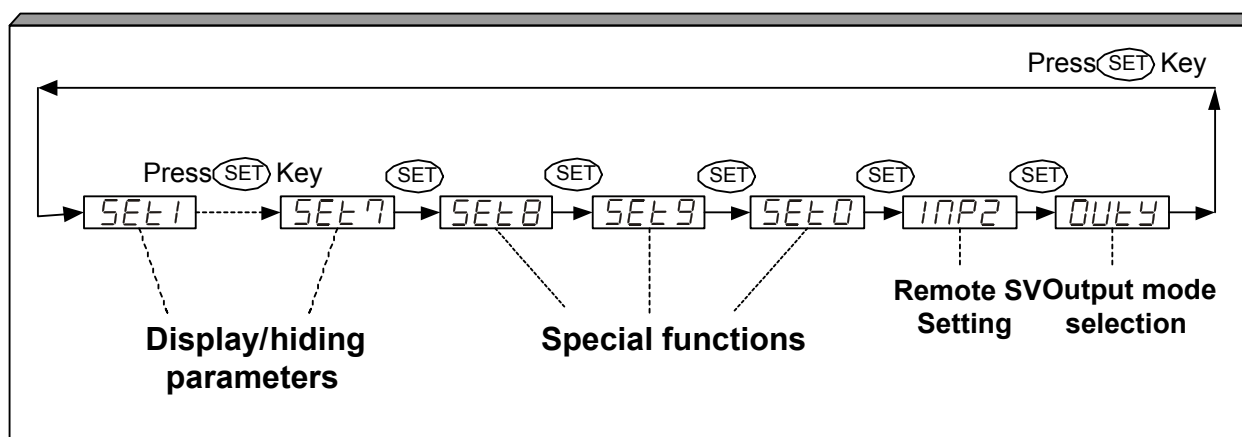
To enter level 3 , set LCK to "0000" and then press SET key + Shift() key 5 seconds.

<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">INP1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">22</div>	Input type selection	
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ANL1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0</div>	Analog input low limit calibration (Used for mA and V input)	Range : -1999 ~ 9999
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ANH1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">5000</div>	Analog input high limit calibration (Used for mA and V input)	Range : 0 ~ 9999
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">dP</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0000</div>	Decimal point position (Available for mA and V input)	0000 , 000.0 , 00.00 , 0.000
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">L.S.P.L</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0.0</div>	Lower Set-Point Limit	Scaling Low Limit
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">U.S.P.L</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">400.0</div>	Upper Set-Point Limit	Scaling High Limit
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ANL2</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0</div>	Remote input low limit calibration	Range : -1999 ~ 9999
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ANH2</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">5000</div>	Remote input high limit calibration	Range : 0 ~ 9999
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ALd1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">11</div>	Alarm mode of AL1	Range:00~19 Refer to "Alarm mode type"
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ALt1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">99.59</div>	Alarm time of AL1	Range : 0~99 Min 59 Secs 0=Flicker Alarm , 99:59=Continued Others=On delay time (If ALD=07 , ALT means alarm on time)
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ALd2</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0</div>	Alarm mode of AL2	The same with ALD1
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ALt2</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">99.59</div>	Alarm time of AL2	The same with ALT1
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ALd3</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0</div>	Alarm mode of AL3	The same with ALD1
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">ALt3</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">99.59</div>	Alarm time of AL3	The same with ALT1
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">HYSR</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0.0</div>	Hysteresis of all Alarm	Range : 0~1000
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">CLD1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">230</div>	Output 1 low limit calibration (Used for mA and V output)	Range : 0 ~ 9999
↓ Set		
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">CHD1</div> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">3600</div>	Output 1 high limit calibration (Used for mA and V output)	Range : 0 ~ 9999
↓ Set		

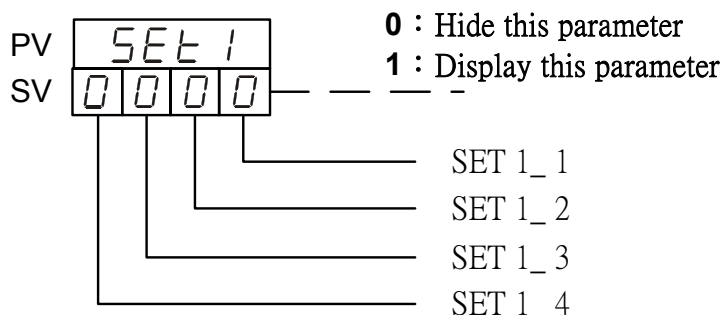


8.4 Level 4 (SET level)

To enter level 4, set LCK to "1111" and then press SET key + Shift(◀) key 5 seconds.



8.4.1 How to hide parameters (Use SET1~SET7)



*For the description of Level 1 parameters, please refer with page 17.

*For the description of Level 3 parameters, please refer with page 20.

SET	Display / hiding	Level	SET	Display / hiding	Level
1_1	OUTL	Level 1	5_1	CLD2,CHD2	Level 3
1_2	AL	Level 1	5_2	CLD3,CHD3	Level 3
1_3	AL1	Level 1	5_3	r.u.cY,DAI,t,SEtA	Level 3
1_4	AL2	Level 1	5_4	PSL,b,tS,Id.NO,bArd	Level 3
2_1	AL3	Level 1	6_1	SUDS	Level 3
2_2	ANL1,ANH1,dP	Level 3	6_2	PUDS	Level 3
2_3	L.SPL,U.SPL	Level 3	6_3	UNIT	Level 3
2_4	ANL2,ANH2	Level 3	6_4	P'Ft	Level 3
3_1	ALd1	Level 3	7_1	CASC	Level 3
3_2	ALt1	Level 3	7_2	DUd	Level 3
3_3	ALd2	Level 3	7_3	OPAd	Level 3
3_4	ALt2	Level 3	7_4	H =	Level 3
4_1	ALd3	Level 3			
4_2	ALt3	Level 3			
4_3	HYSR	Level 3			
4_4	CLD1,CHD1	Level 3			

8.4.2 Special functions (Use SET8 / SET9 / SET0)

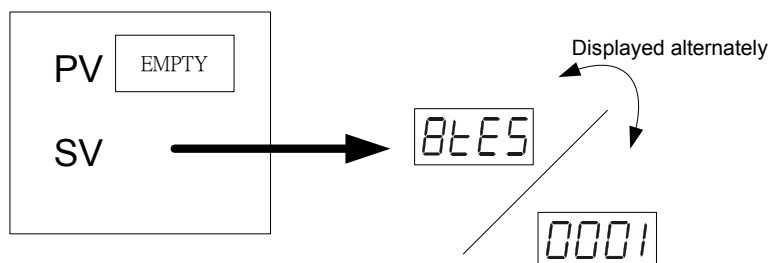
SET 8		Remark
8_1	0 : Program not repeat	Only available for programmable controller
	1 : Program repeat	
8_2	0 : No power failure option	
	1 : With power failure option	
8_3	0 : Program starts from 0	
	1 : Program starts from PV	
8_4	0 : Reserved (Don't change it)	


SET 9		Remark
9_1	0 : Reserved (Don't change it)	
9_2	0 : Timer Unit = "Hour : Minute"	Only available for programmable controller
	1 : Timer Unit = "Minute : Second"	
9_3	0 : Disable transmission	Used for transmission output
	1 : SV Transmission	
9_4	0 : Disable transmission	
	1 : PV Transmission	

SET 0		Remark
0_1	0 : TTL Communication (Slave)	Used for TTL communication
	1 : TTL Communication (Master)	
0_2	0 : Hide parameter "RATE"	AL3 will be replaced by "RATE"
	1 : Display parameter "RATE"	
0_3	0 : Disable Remote SV function	Used for Remote SV function
	1 : Enable Remote SV function	
0_4	0 : use output relay "b" contact when motor valve closed	Used for 3 wire proportional motor valve control
	1 : use output relay "a" contact when motor valve closed	

Please don't operate **SET 8_4**, otherwise the controller's process will be in confusion.

If SET8.4 is set to "1", the controller will enter into "Single Display" mode, the PV LED will not display any values. The SV LED will display both the parameter value and the setting value alternately as shown in the diagram below.



To rectify the problem please press the SHIFT KEY () and change the setting value to "0000".

8.4.3 Remote SV type selection

INP2=0 None

INP2=1 10~50mV / 4~20mA / 1~5V / 2~10V

INP2=2 0~50mV / 0~20mA / 0~5V / 0~10V

INP2=4 CT input

※Remote SV function is not available for programmable controller

8.4.4 Output mode selection (Use OUTY)

OUTY=0 Single output (OUT1)

OUTY=1 Dual output (OUT1 / OUT2)

OUTY=2 Reserved

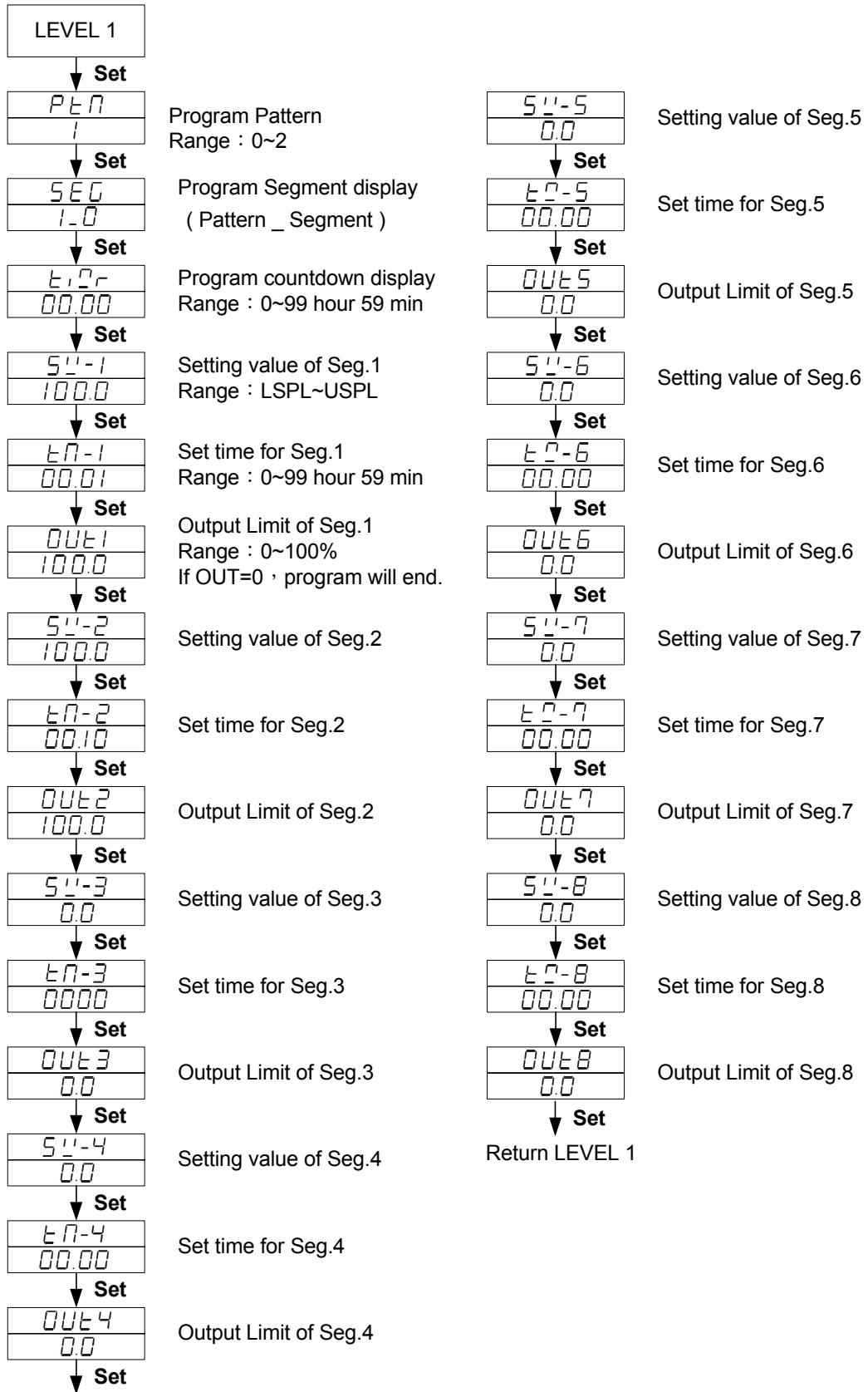
OUTY=3 3 wire proportional motor valve control

OUTY=4 1 ψ Phase angle control (1 ψ SCR)

OUTY=5 3 ψ Phase angle control (3 ψ SCR)

8.5 Program Level (Only displayed in programmable controller)

8.5.1 Description of parameters



8.5.2 Description of operation

1. There are 2 patterns can be used , each pattern contains 8 segments.

2. Terminologies


Pattern : A program consists of some steps.


Ramp status : The status with changing SV.


Soak status : The status with fixed SV.


3. Operating

I. "KEY" function (no changing parameter)

 (RUN) : Start program procedure , **PRO** LED in panel start flicking.

 (HOLD) : Suspend program procedure , **PRO** LED in panel will stop flicker but still light on.

 + **SET**(JUMP) : Jump to previous segment.

 + **SET** (RESET) : Reset program procedure , **PRO** LED in panel will off.

II. Alarm Function :

ALD1 = "07"(Segment end alarm) ,

AL1 ="2"(It means when segment 2 end,AL1 will act) ,

ALT1 ="00:10"(Relay on time is 10 seconds).

* In this case , when program proceeds to segment 2 end , the relay of AL1 will be on 10 seconds.

III. END function :

The Controller doesn't have END order, so if program procedure is less than 8 segments, please set the last segment's OUT to "0". Program will end in this segment. Otherwise , it will proceed 8 or 16 segments.

IV. Linking Function :

PTN=1 proceed pattern 1 , contains 8 segments.

PTN=2 proceed pattern 2 , contains 8 segments.

PTN=0 linking proceed pattern 1 and 2 totally 16 segments.

(Please set PTN1 and PTN2 at first , and then set PTN to 0)

V. Other function(* refer to LEVEL 4)

SET 8_1=1 Program repeats.

SET 8_2=0 No power failure function.

SET 8_2=1 Enable power failure function.

(When power shut down and on again , the controller will start from the segment which is near PV)

SET 8_3=0 Program starts from 0.

SET 8_3=1 Program starts from PV.

SET 9_2=0 Timer Unit = "Hour : Minute"

SET 9_2=1 Timer Unit = "Minute : Second"

9. Input type table (INP1 selection)

TYPE	CODE	RANGE
K	<i>K1</i>	0.0 ~ 200.0°C / 0.0 ~ 392.0°F
	<i>K2</i>	0.0 ~ 400.0°C / 0.0 ~ 752.0°F
	<i>K3</i>	0 ~ 600°C / 0 ~ 1112°F
	<i>K4</i>	0 ~ 800°C / 0 ~ 1472°F
	<i>K5</i>	0 ~ 1000°C / 0 ~ 1832°F
	<i>K6</i>	0 ~ 1200°C / 0 ~ 2192°F
J	<i>J1</i>	0.0 ~ 200.0°C / 0.0 ~ 392.0°F
	<i>J2</i>	0.0 ~ 400.0°C / 0.0 ~ 752.0°F
	<i>J3</i>	0 ~ 600°C / 0 ~ 1112°F
	<i>J4</i>	0 ~ 800°C / 0 ~ 1472°F
	<i>J5</i>	0 ~ 1000°C / 0 ~ 1832°F
	<i>J6</i>	0 ~ 1200°C / 0 ~ 2192°F
R	<i>r1</i>	0 ~ 1600°C / 0 ~ 2912°F
	<i>r2</i>	0 ~ 1769°C / 0 ~ 3216°F
S	<i>S1</i>	0 ~ 1600°C / 0 ~ 2912°F
	<i>S2</i>	0 ~ 1769°C / 0 ~ 3216°F
B	<i>b1</i>	0 ~ 1820°C / 0 ~ 3308°F
E	<i>E1</i>	0 ~ 800°C / 0 ~ 1472°F
	<i>E2</i>	0 ~ 900°C / 0 ~ 1652°F
N	<i>n1</i>	0 ~ 1200°C / 0 ~ 2192°F
	<i>n2</i>	0 ~ 1300°C / 0 ~ 2372°F
T	<i>t1</i>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<i>t2</i>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<i>t3</i>	0.0 ~ 350.0°C / 0.0 ~ 662.0°F
W5Re/W26Re	<i>w1</i>	0 ~ 2000°C / 0 ~ 3632°F
	<i>w2</i>	0 ~ 2320°C / 0 ~ 4208°F
PL II	<i>PL1</i>	0 ~ 1300°C / 0 ~ 2372°F
	<i>PL2</i>	0 ~ 1390°C / 0 ~ 2534°F
U	<i>U1</i>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<i>U2</i>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<i>U3</i>	0.0 ~ 400.0°C / 0.0 ~ 752.0°F
L	<i>L1</i>	0 ~ 400°C / 0 ~ 752°F
	<i>L2</i>	0 ~ 800°C / 0 ~ 1472°F

TYPE	CODE	RANGE
JIS PT100	<i>JP1</i>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<i>JP2</i>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<i>JP3</i>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<i>JP4</i>	0 ~ 200°C / 0 ~ 392°F
	<i>JP5</i>	0 ~ 400°C / 0 ~ 752°F
	<i>JP6</i>	0 ~ 600°C / 0 ~ 1112°F
DIN PT100	<i>dP1</i>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<i>dP2</i>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<i>dP3</i>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<i>dP4</i>	0 ~ 200°C / 0 ~ 392°F
	<i>dP5</i>	0 ~ 400°C / 0 ~ 752°F
	<i>dP6</i>	0 ~ 600°C / 0 ~ 1112°F
JIS PT50	<i>dP.1</i>	-199.9 ~ 600.0°C / -199.9 ~ 999.9°F
	<i>dP.2</i>	-199.9 ~ 400.0°C / -199.9 ~ 752.0°F
	<i>dP.3</i>	-199.9 ~ 200.0°C / -199.9 ~ 392.0°F
	<i>dP.4</i>	0 ~ 200°C / 0 ~ 392°F
	<i>dP.5</i>	0 ~ 400°C / 0 ~ 752°F
	<i>dP.6</i>	0 ~ 600°C / 0 ~ 1112°F
AN1	<i>AN1</i>	-10 ~ 10mV / -1999~9999
AN2	<i>AN2</i>	0 ~ 10mV / -1999~9999
AN3	<i>AN3</i>	0 ~ 20mV / -1999~9999
AN4	<i>AN4</i>	0 ~ 50mV / -1999~9999
AN5	<i>AN5</i>	10 ~ 50mV / -1999~9999

* The initial setting in factory is "K2".

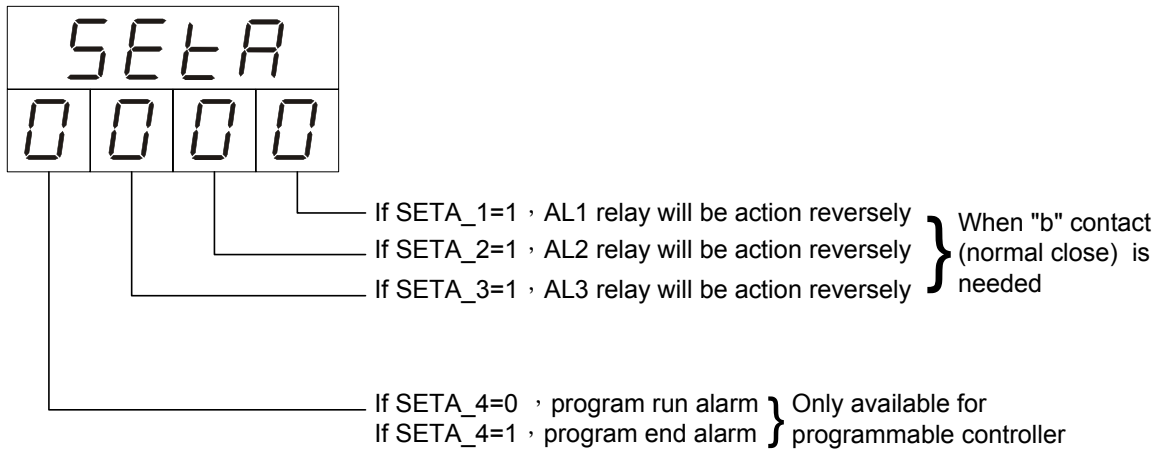
10. Alarm

10.1 Alarm time (ALT1/ALT2/ALT3)

ALT1=0 Flicker alarm
ALT1=99.59 Continued alarm
ALT1=00.01 ~ 99.58 Alarm on delay time

10.2 SETA

*SETA is in Level 3 (Input level)



10.3 Alarm mode (ALD1 / ALD2 / ALD3)

(▲ :SV △ :Alarm set value)

01	Deviation high alarm with hold action* 	06	Process low alarm with hold action*
11	Deviation high alarm 	16	Process low alarm
02	Deviation low alarm with hold action* 	07	Segment End alarm (Only for Programmable controller) (1) ALD1~3 , set 07 (2) ALD1~3=Alarm Segment (3) ALT1~3 defines as follows: 0 =flicker alarm 99.59 =continued alarm others =alarm ON time
12	Deviation low alarm 	17	Program Run alarm (Only for Programmable controller)
03	Deviation high/low alarm with hold action* 	08	System failed alarm* (ON)
13	Deviation high/low alarm 	18	System failed alarm* (OFF)
04 14	Band alarm 	09	Heater Break Alarm (HBA) Please refer with HBA function description in page 31.
05	Process high alarm with hold action* 	00 10	No alarm
15	Process high alarm 		

***Hold action:**

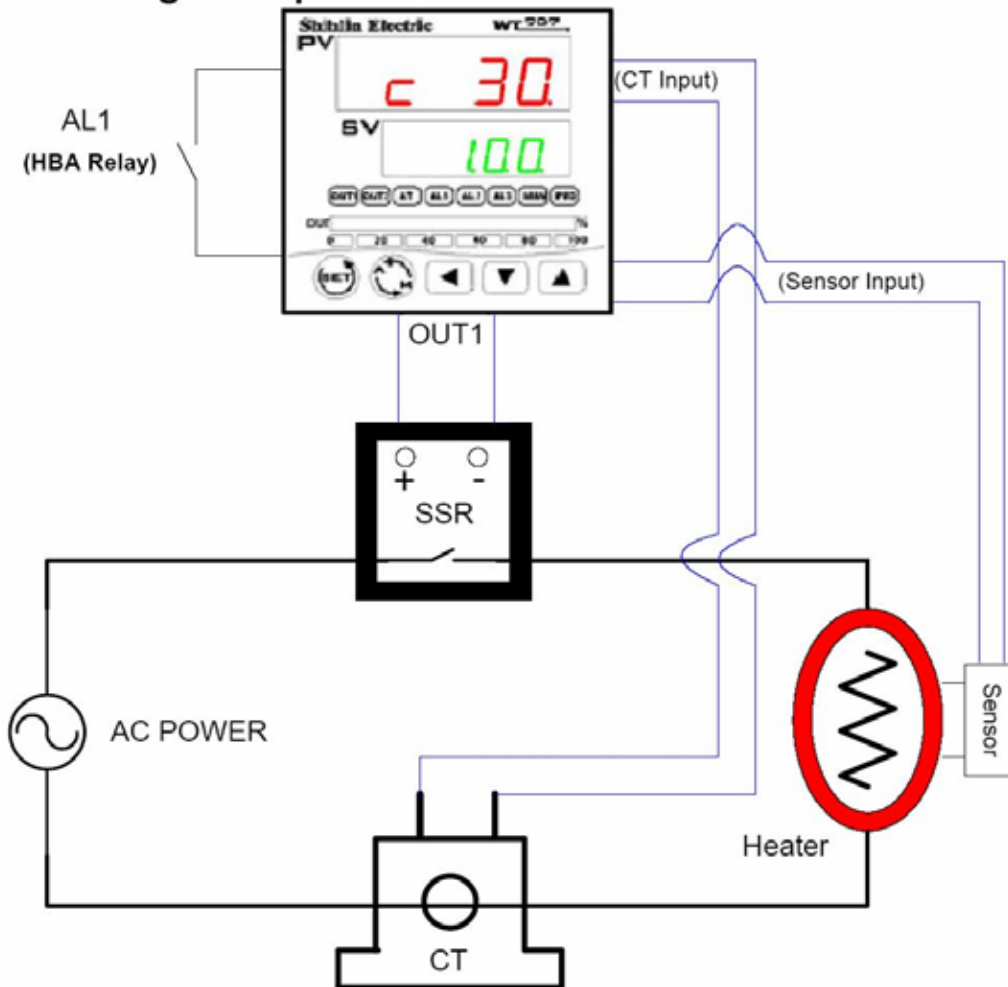
When Hold action is ON ,the alarm action is suppressed at start-up until the measured value(PV) enters the non-alarm range.

***System failed:**

It means that the controller display error message with one of following :
 "UUU1" or "NNN1" or "CJCE"

11. Heater Break Alarm (HBA)

11.1 HBA Wiring Example

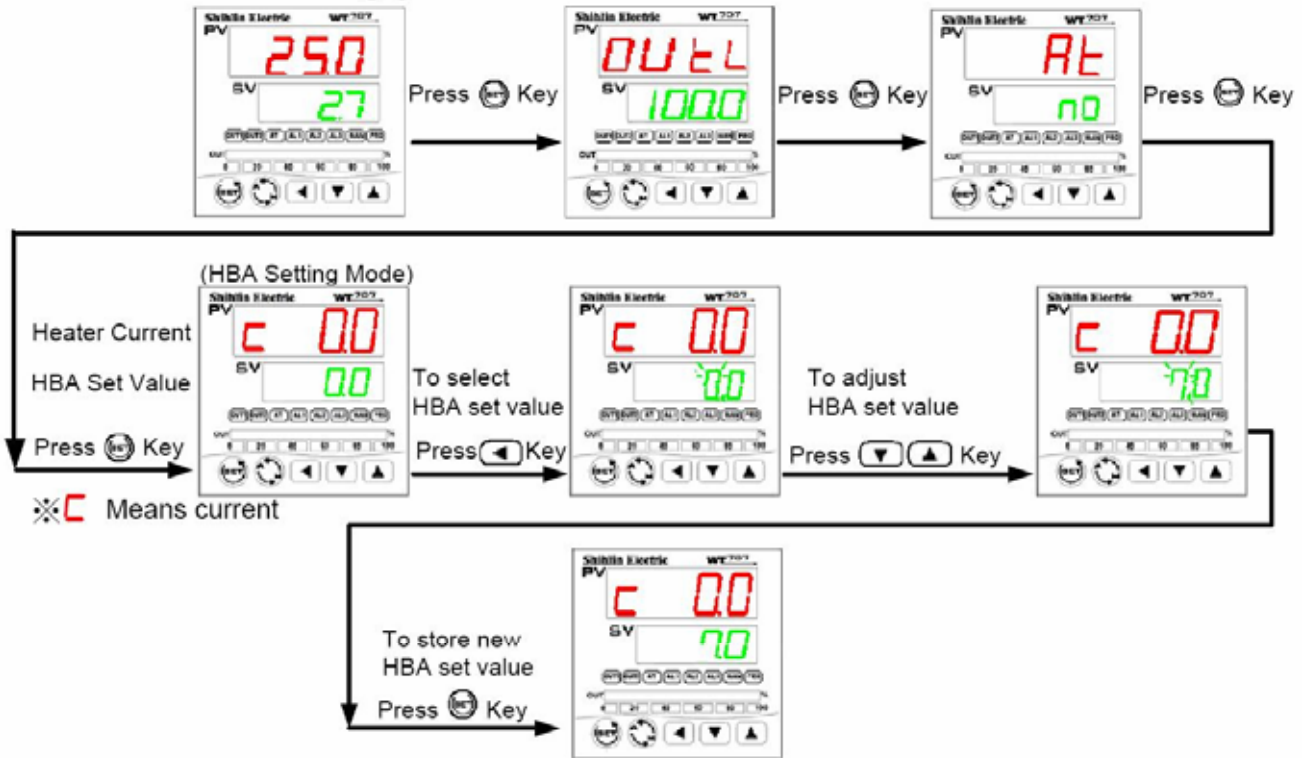


11.2 HBA Function Description

HBA function detects the AC current flowing through the heater by a Current Transformer (CT), and compares the CT input value and HBA set value. When OUT1 is ON and CT input value is less than HBA set value during 5 seconds, AL1 is activated. Otherwise, AL1 is not activated.

The AC current flowing through heater can also be monitored in HBA setting mode.

11.3 HBA setting procedure



11.4 Parameters for HBA function

Name	Value	Operation Level
AL1	HBA Set Value	Level 1
ALD1	9	Level 3
SET0	0100	Level 4
INP2	4	Level 4

How to enter 3 : Set parameter "LCK" to 0000 in Level 2, and then press "SET" key + "Shift" key 5 Seconds to enter operation Level 3.

How to enter 4 : Set parameter "LCK" to 1111 in Level 2, and then press "SET" key + "Shift" key 5 Seconds to enter operation Level 4.

11.5 Activated conditions of HBA

Condition
1. OUT1 is ON
2. Heater current is less the HBA set value
3. Condition1 and 2 continued more than 5 seconds

AL1 will be activated, if condition 1&2&3 are all “true”.

11.6 Remarks

- Available output(OUT1) type for HBA
 - I. Relay
 - II. Voltage pulse (SSR drive)

- Since HBA function uses AL1 as alarm relay, please set temperature alarms in AL2 or AL3.

12. Error codes

DISPLAY	DESCRIPTION
<i>in1E</i>	Open circuit of main control sensor.(INP1)
* <i>AdCF</i>	A/D convert failed.
* <i>CJCE</i>	Cold junction compensation failed.
<i>in2E</i>	Open circuit of sub control sensor.(Remote SV)
<i>uuu1</i>	PV exceeds USPL.
<i>nnn1</i>	PV under LSPL.
<i>uuu2</i>	Input signal of sub control exceeds the upper limit. (Remote SV)
<i>nnn2</i>	Input signal of sub control under the lower limit. (Remote SV)
* <i>FRDF</i>	RAM failed.
<i>intF</i>	Interface failed.
<i>AutF</i>	Auto tuning failed.

NOTE : If the “*” marked error comes up , the controller needs to be repaired.
Please send it to the nearest sales office or retail dealer.

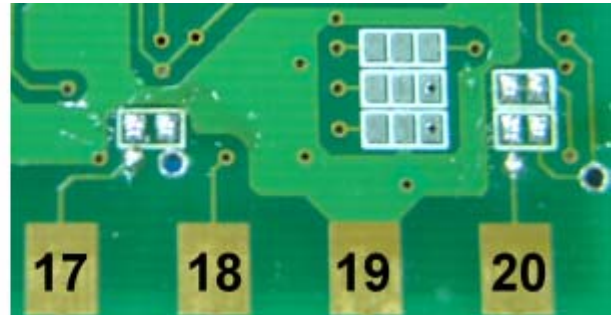
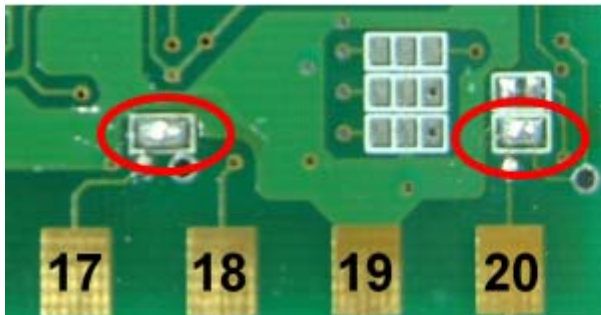
13. Modify input type (“TC” \rightleftharpoons “RTD”)

If the controller needs to modify input type from **TC** or **mV** to **RTD**, please make PAD short on the back side of PC board as following diagram and change input selection(INP1).
On the contrary, modify from **RTD** to **TC** or **mV**, make PAD open.

96x96,48x96,96x48(mm)

RTD : Short pads

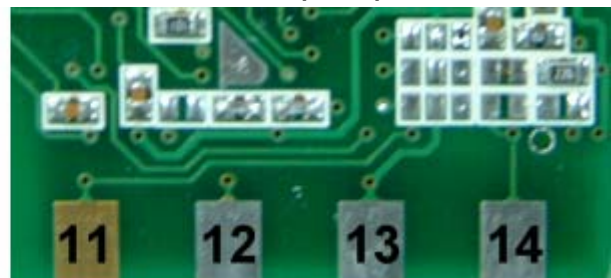
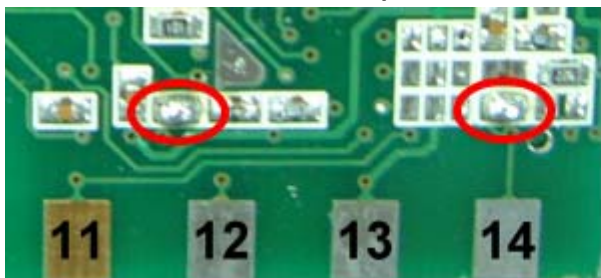
TC or mV : Open pads



72x72(mm)

RTD : Short pads

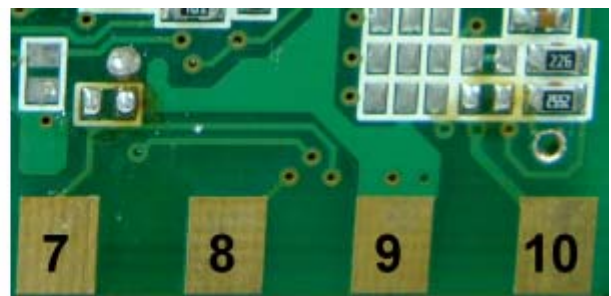
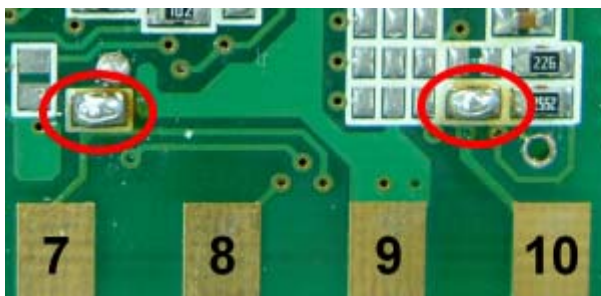
TC or mV : Open pads



48x48(mm)

RTD : Short pads

TC or mV : Open pads



14. Modify input type : Linear Input (mA ,V)

14.1 Hardware :

	96×96 , 48×96 , 96×48	72×72	48×48
INPUT (+)	PIN 17	PIN 11	PIN 7
INPUT (-)	PIN 20	PIN 14	PIN 10

0~20mA (INP1=AN4) : (R3 use 100Ω , R5 use 2.4Ω , S3 & S5 SHORT)

4~20mA (INP1=AN5) : (R3 use 100Ω , R5 use 2.4Ω , S3 & S5 SHORT)

0 ~ 1V (INP1=AN4) : (R1 use 2KΩ , R4 use 100Ω , S1 & S4 SHORT)

0 ~ 5V (INP1=AN4) : (R2 use 10KΩ , R4 use 100Ω , S2 & S4 SHORT)

1 ~ 5V (INP1=AN5) : (R2 use 10KΩ , R4 use 100Ω , S2 & S4 SHORT)

0 ~ 10V (INP1=AN4) : (R3 use 22KΩ , R4 use 100Ω , S3 & S4 SHORT)

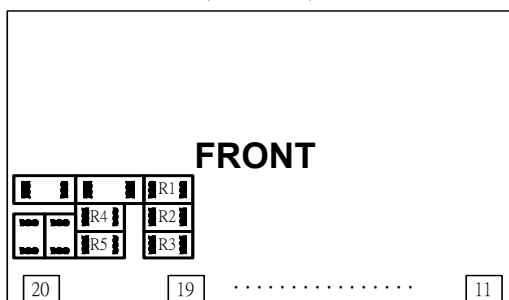
2 ~ 10V (INP1=AN5) : (R3 use 22KΩ , R4 use 100Ω , S3 & S4 SHORT)

96×96 , 48×96 , 96×48

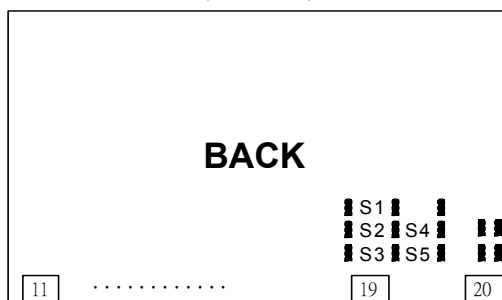
(PC Board)

96×96 , 48×96 , 96×48

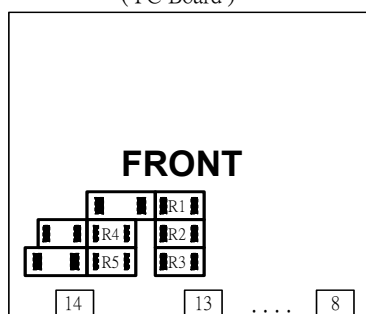
(PC Board)



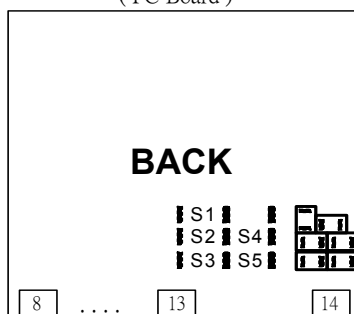
72×72
(PC Board)



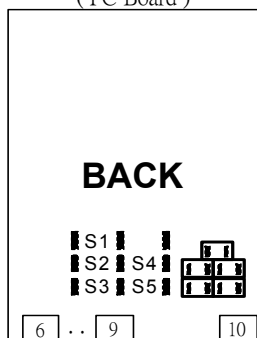
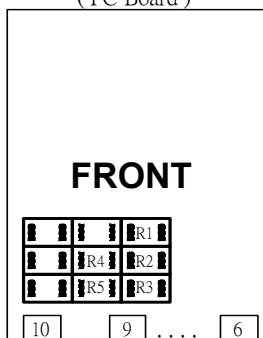
72×72
(PC Board)



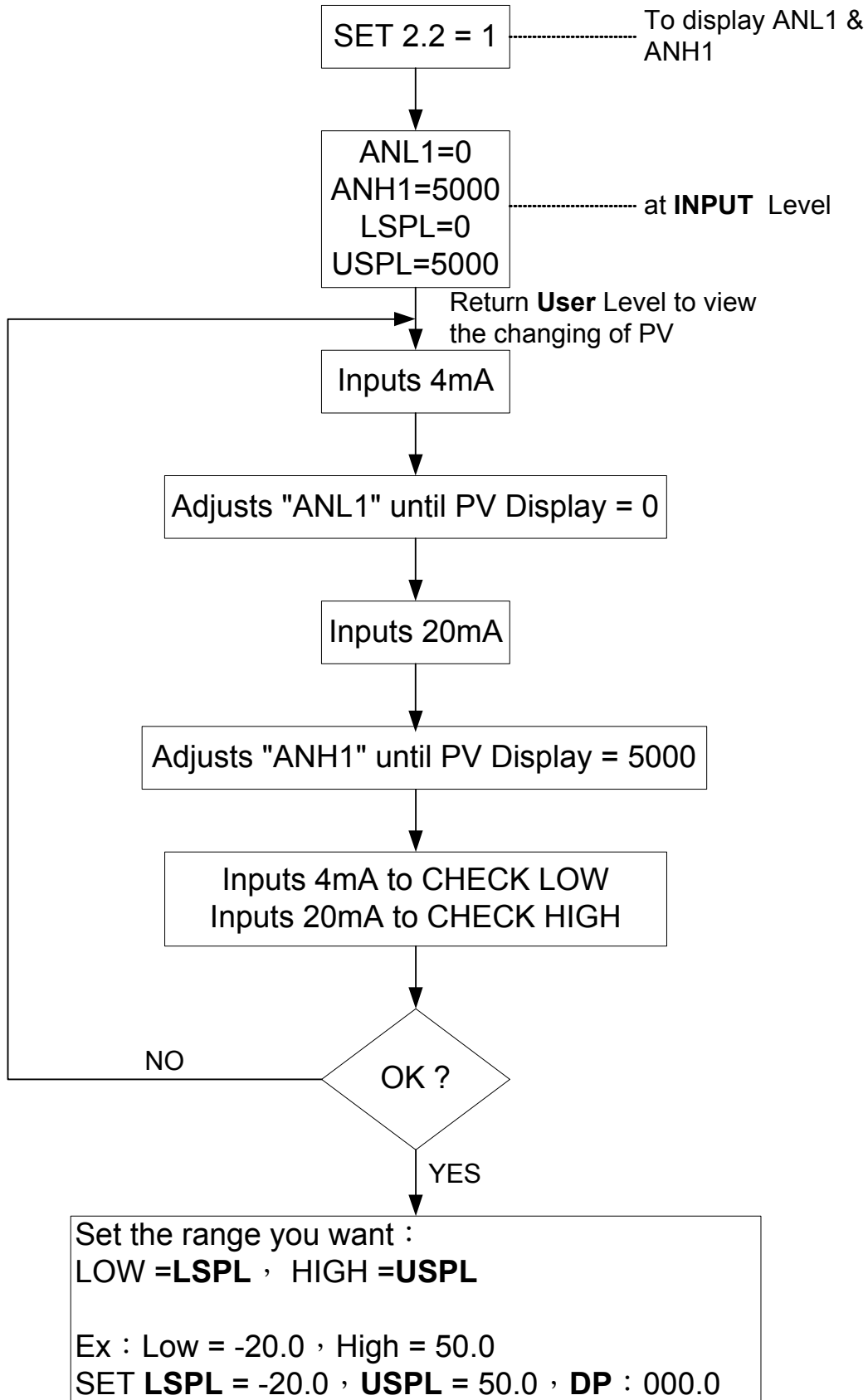
48×48
(PC Board)



48×48
(PC Board)



14.2 Calibration :



15. Modify input type : Linear Input (mA ,V)

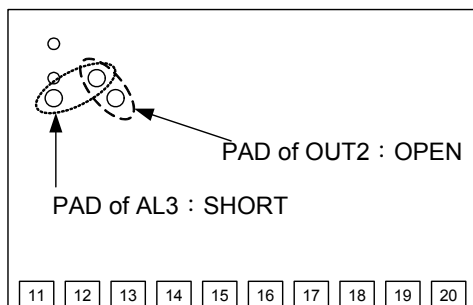
It just needs to change a module at the same position ,
and modify parameter **CYT1** in LEVEL 2 .

→Relay: CYT1=10, Voltage pulse: CYT1=1, 4~20mA:CYT1=0

16. Modify output mode: OUT1/ALARM, OUT1/OUT2

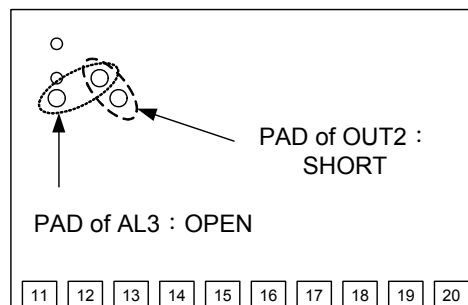
OUT1 / ALARM

96×96 , 48×96 , 96×48
(CPU Board)

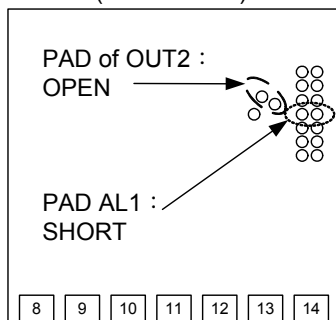


OUT1 /OUT2

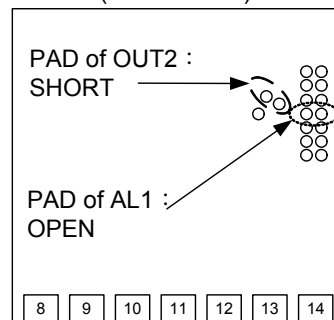
96×96 , 48×96 , 96×48
(CPU Board)



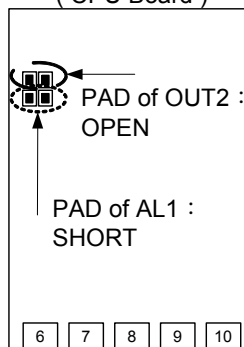
72×72
(CPU Board)



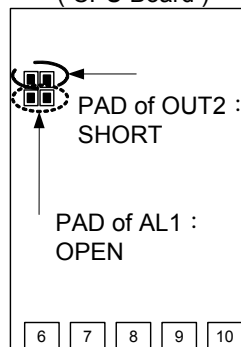
72×72
(CPU Board)



48×48
(CPU Board)



48×48
(CPU Board)



17. Applications

17.1 RAMP & SOAK

● **RAMP :**

- I. SET2.1=1 → To display AL3
- II. SET4.1=1 → To display ALD3
- III. ALD3=9 → Open RAMP option
- IV. Then, AL3 will not display. It was replaced by RAMP.

RAMP
00.00

Range : 00.00 ~ 99.99(°C / min)
 (If RAMP is not used , please set
 ALD3 to 0)

● **SOAK :**

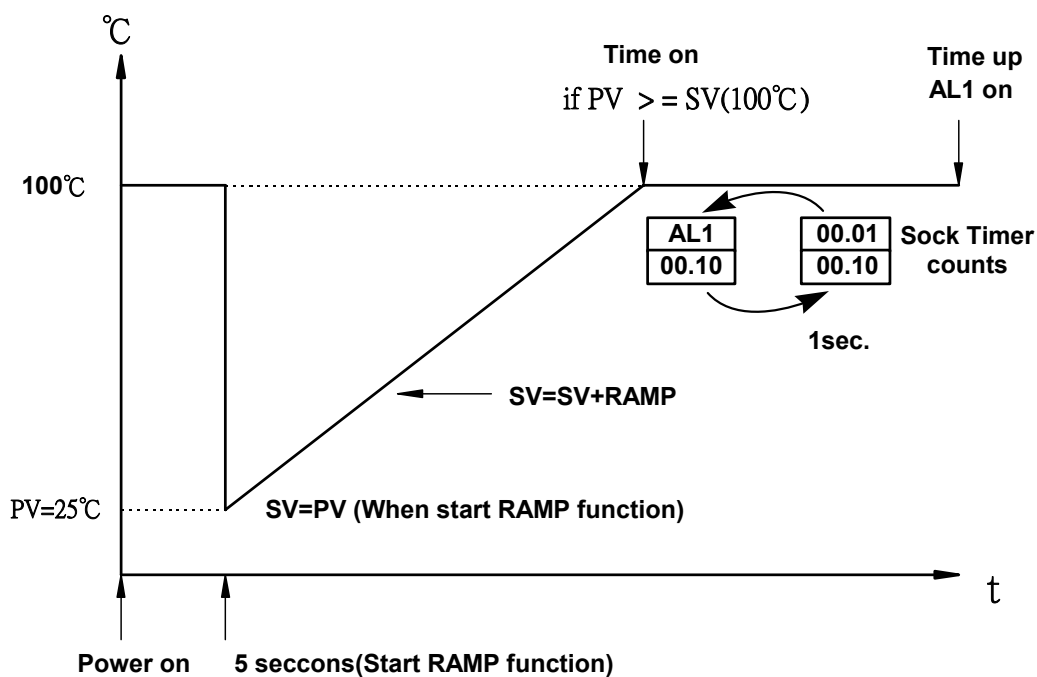
- I. ALD1 / ALD2=19 → To use Sock Timer.
- II. AL1 / AL2 will display as below:

AL1
00.00

Range : 00.00 ~ 99.59(Hour.Minute)

● **Example :**

SV=100°C , RAMP=10.00 (°C/min) , AL1=00.10 min , PV=25°C



17.2 TTL Communication : SV output and RATE function

- **Open RATE function (use for slave controller)**

Display AL3 : SET2.1=1

Display ALD3 : SET4.1=1

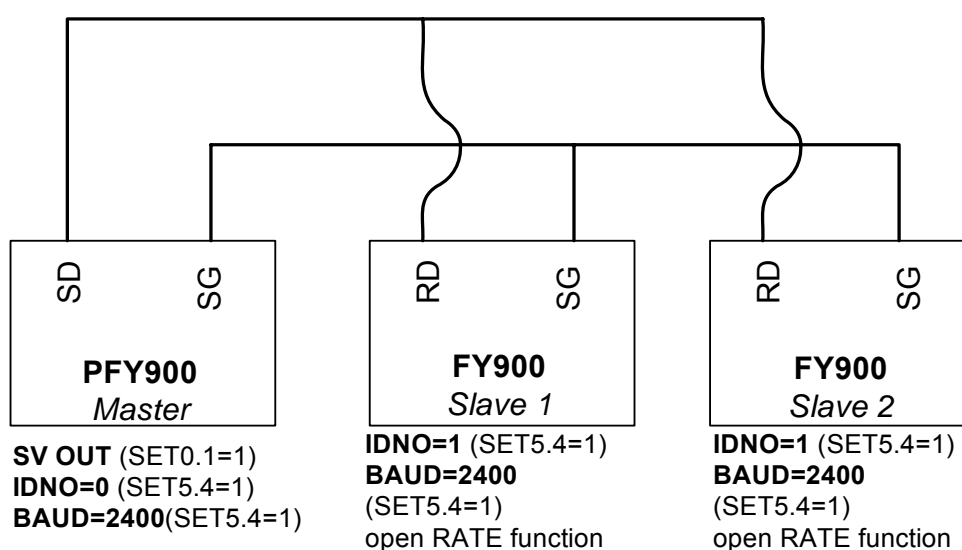
Display RATE(AL3 will be replaced) : SET0.2=1

Set ALD3 to 0. (In Level 3)

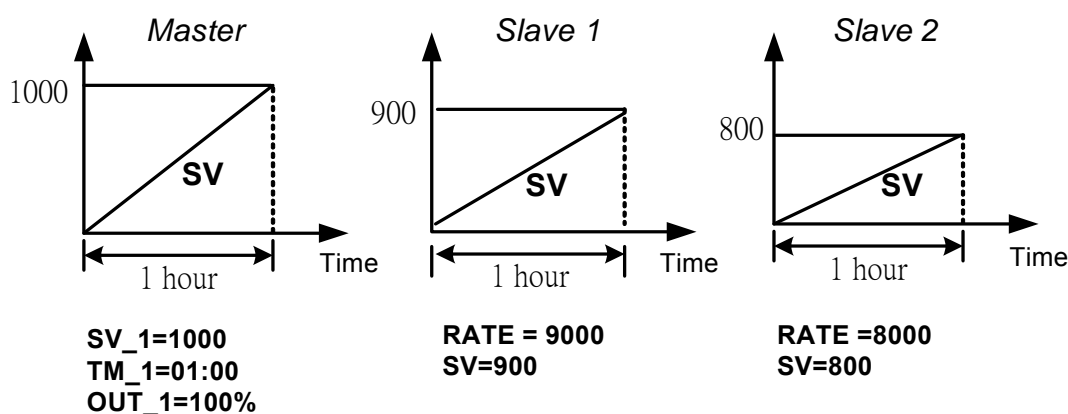
Slave SV = (RATE÷9999)×master SV

- **Example :**

Connection Diagram



Time Chart



(Three controllers reach to the max value at the same time)

17.3 1 Phase angle control (By SCR module)

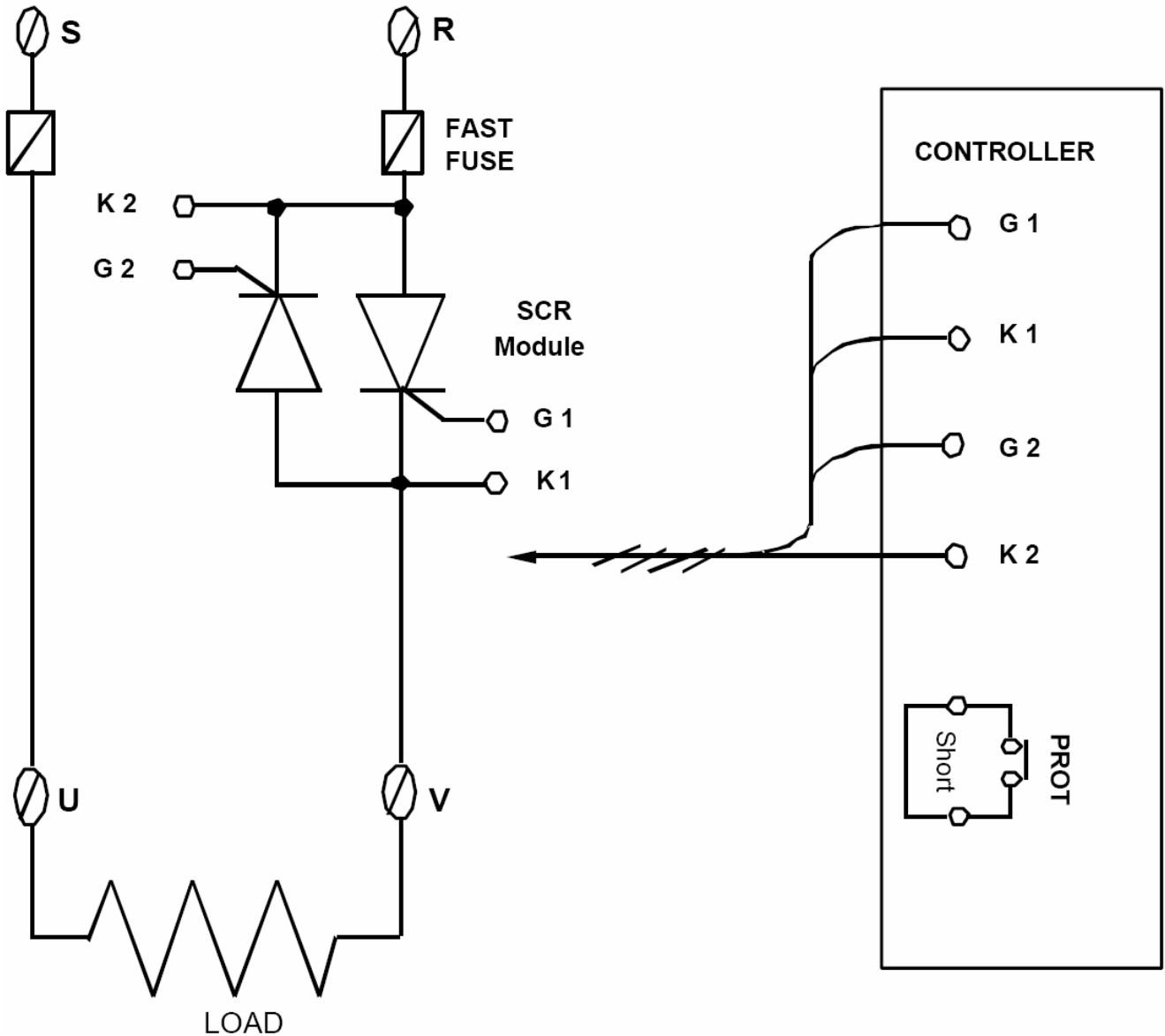
Available Models : WT909, WT707

OUT1 : 1 SCR

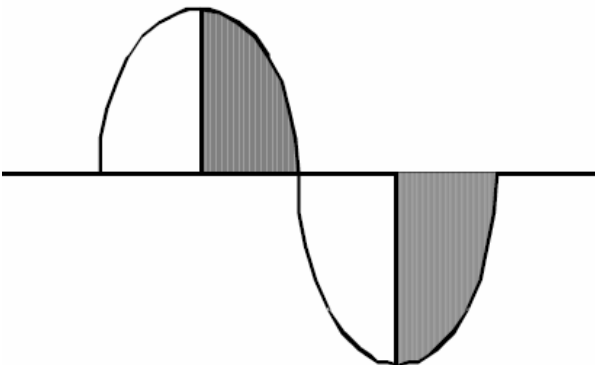
Parameter setting : OUT = 4

CLO1 = 0, CHO1 = 4500 if use for resistance load.

CLO1 = 0, CHO1 = 4500 if use for inductor load.



**Controller source phase must be same as load source phase



17.4 1 Phase angle control (By TRIAC module)

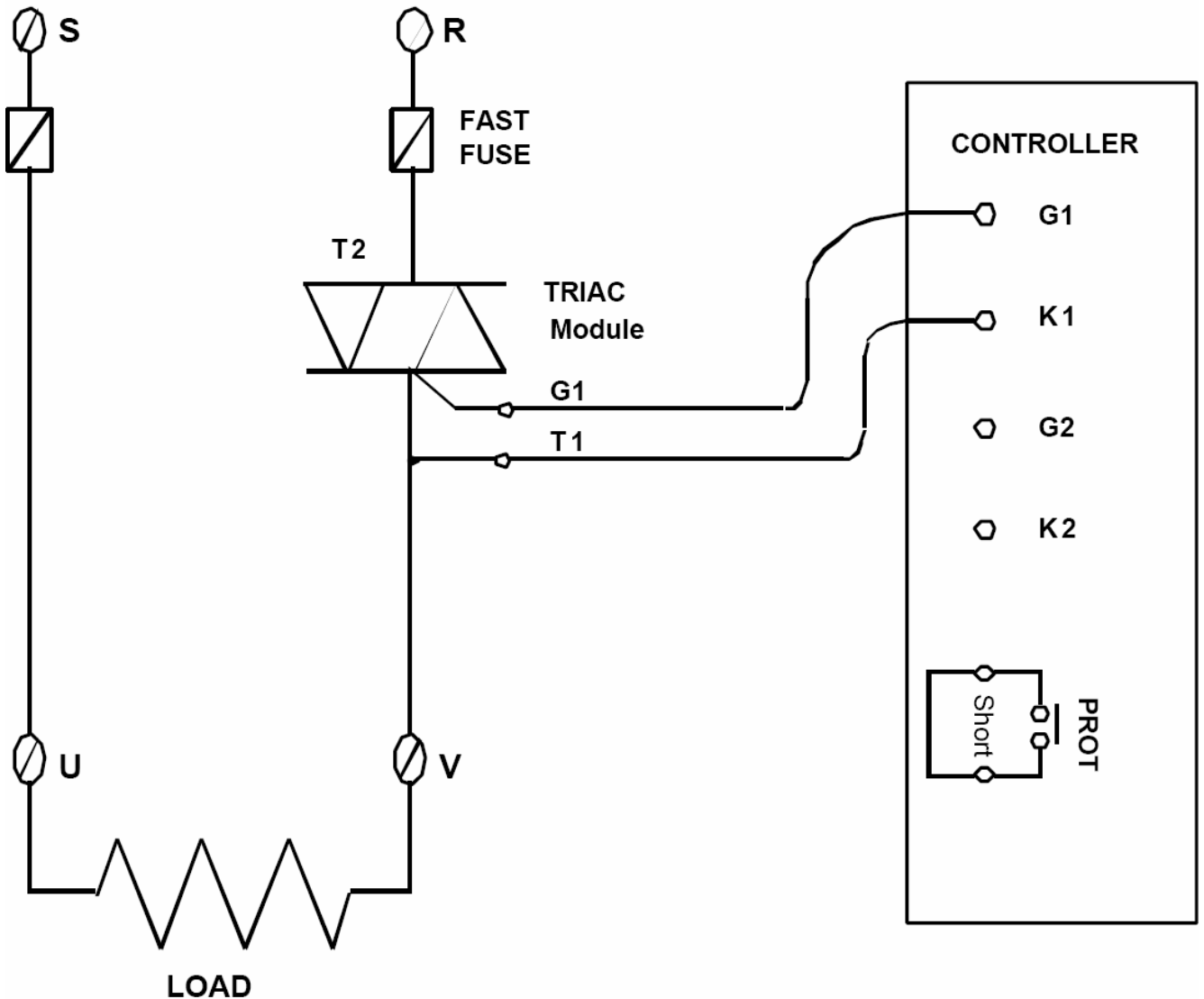
Available Models : WT909, WT707

OUT1 : 1 SCR

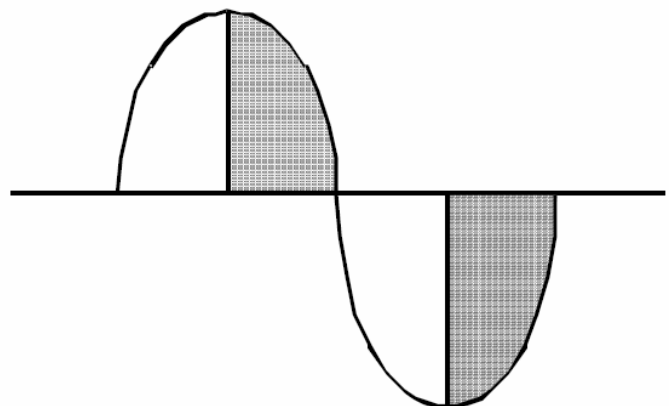
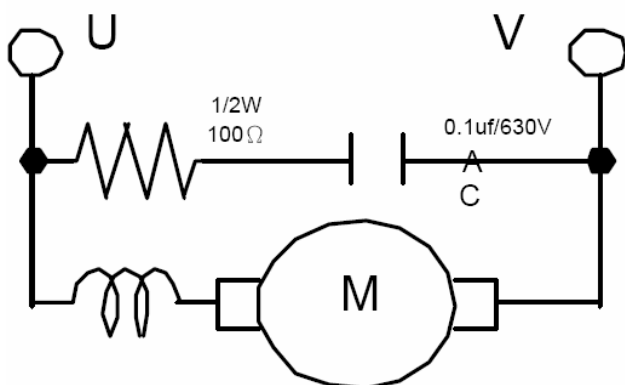
Parameter setting : OUT = 4

CLO1 = 0, CHO1 = 4500 if use for resistance load.

CLO1 = 0, CHO1 = 4500 if use for inductor load.



**Controller source phase must be same as load source phase



17.5 3 Phase angle control (By DIODE/SCR module)

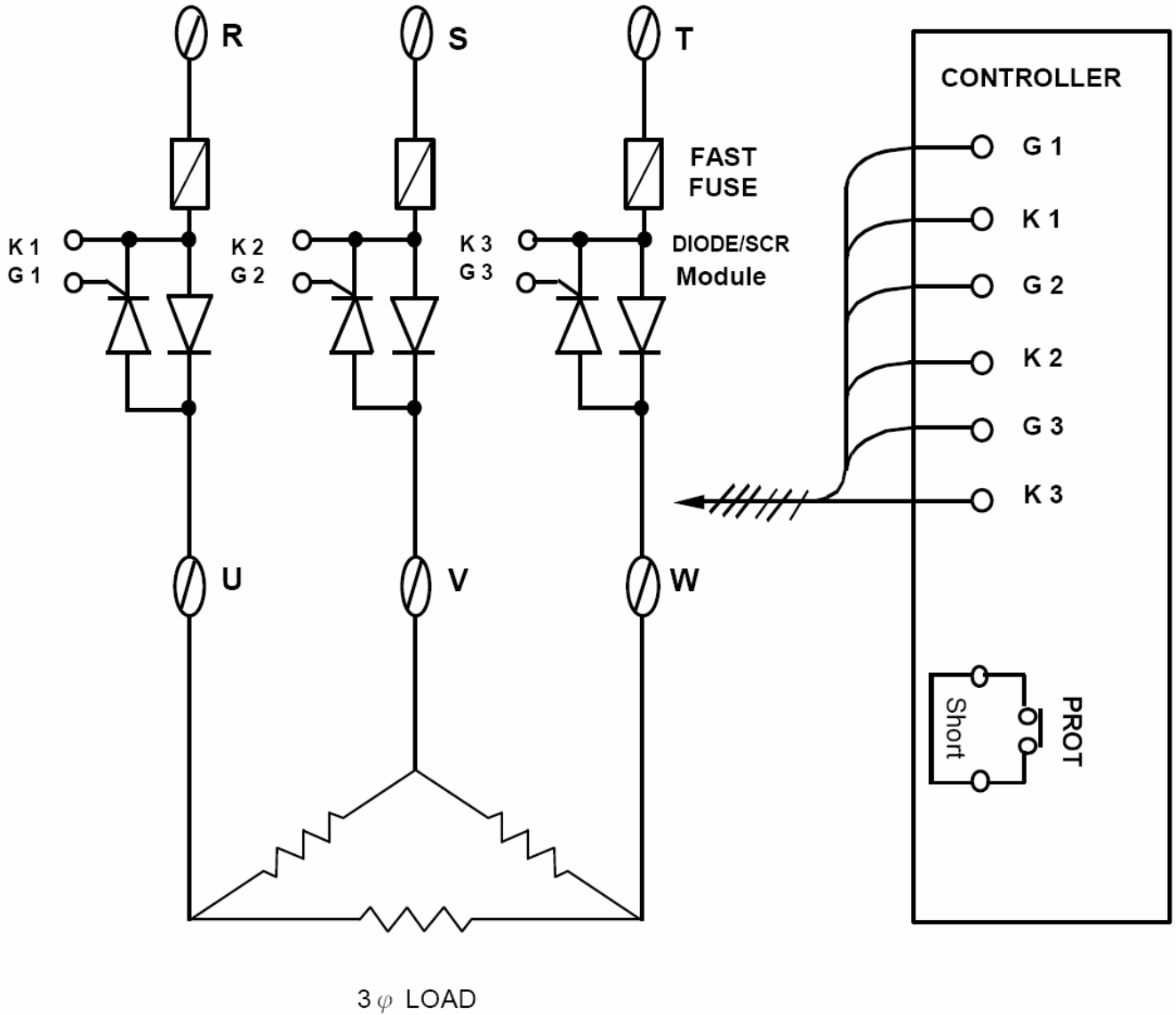
Available Models : WT909

OUT1 : 3 SCR

Parameter setting : OUT = 5

CLO1 = 0, CHO1 = 4500 if use for resistance load.

CLO1 = 0, CHO1 = 4500 if use for inductor load.

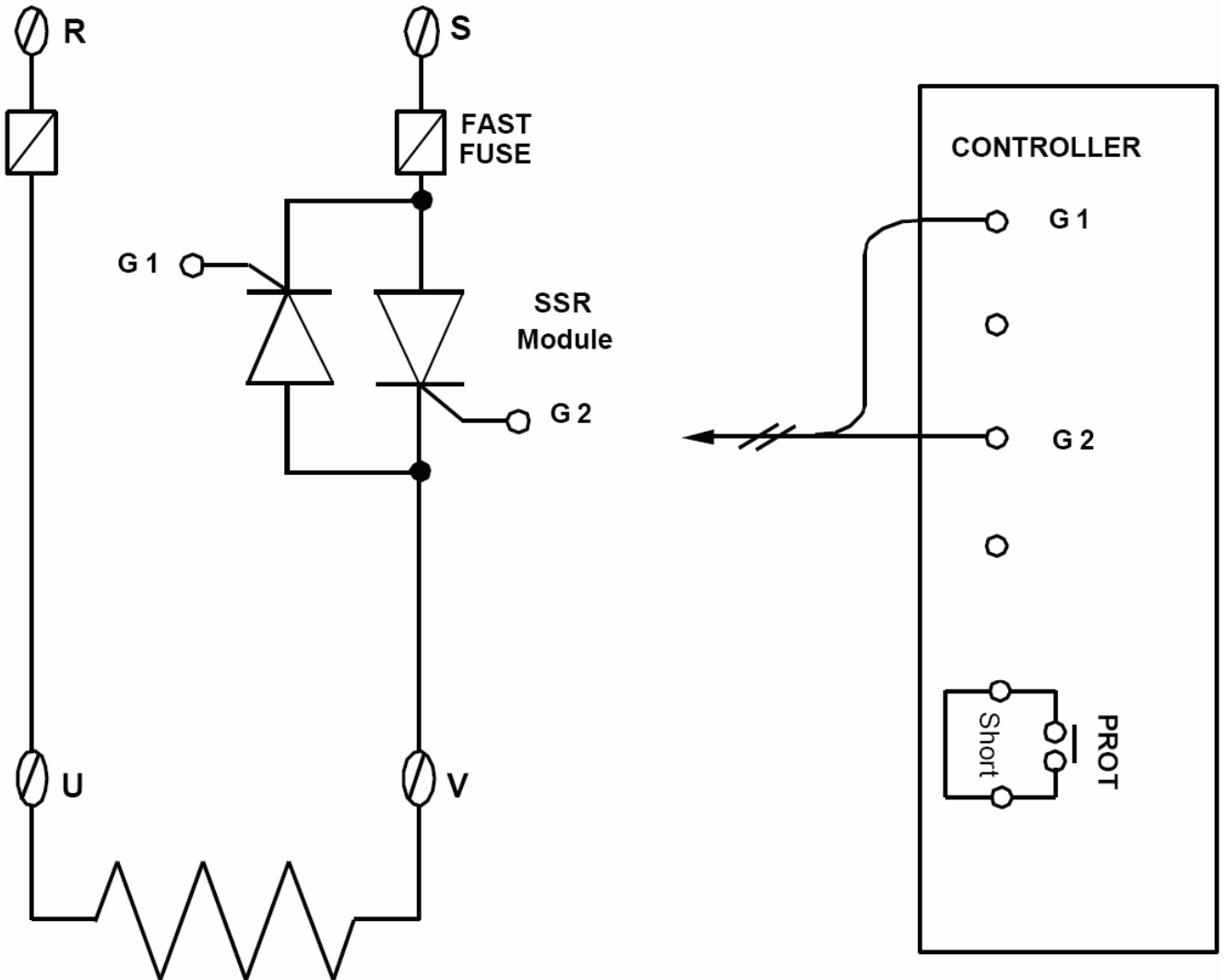


17.6 1 Zero crossing control (By SSR module)

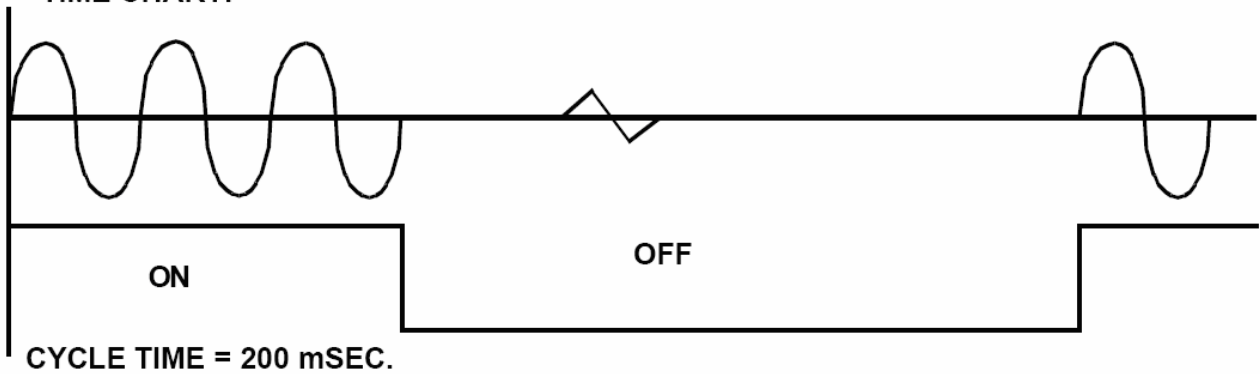
Available Models : WT909, WT707, WT404

OUT1 : 1 SSR

Parameter setting : OUT = 0
CYT1 = 1



TIME CHART:

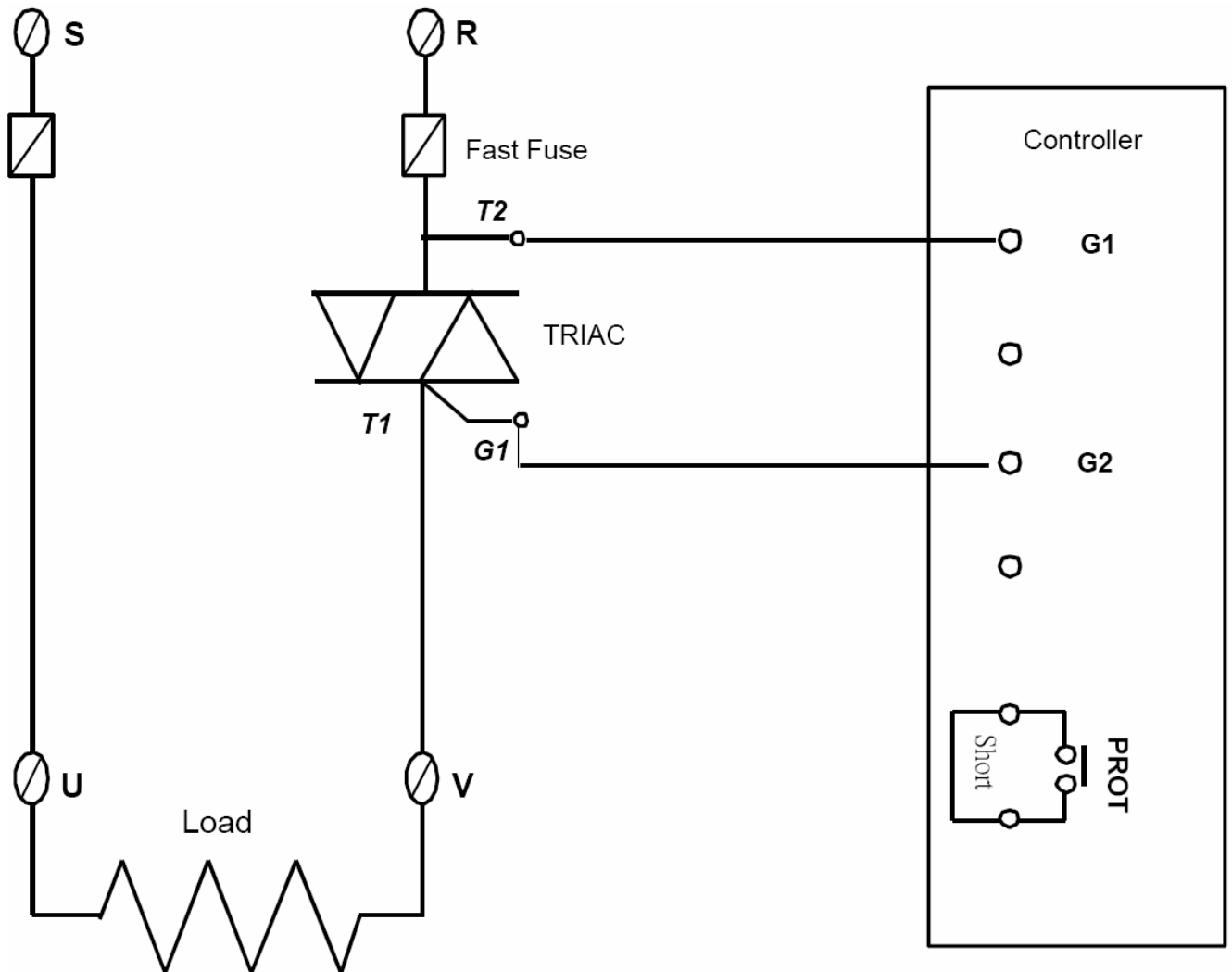


17.7 1 Zero crossing control (By TRIAC module)

Available Models : WT909, WT707, WT404

OUT1 : 1 SSR

Parameter setting : OUT = 0
 CYT1 = 1

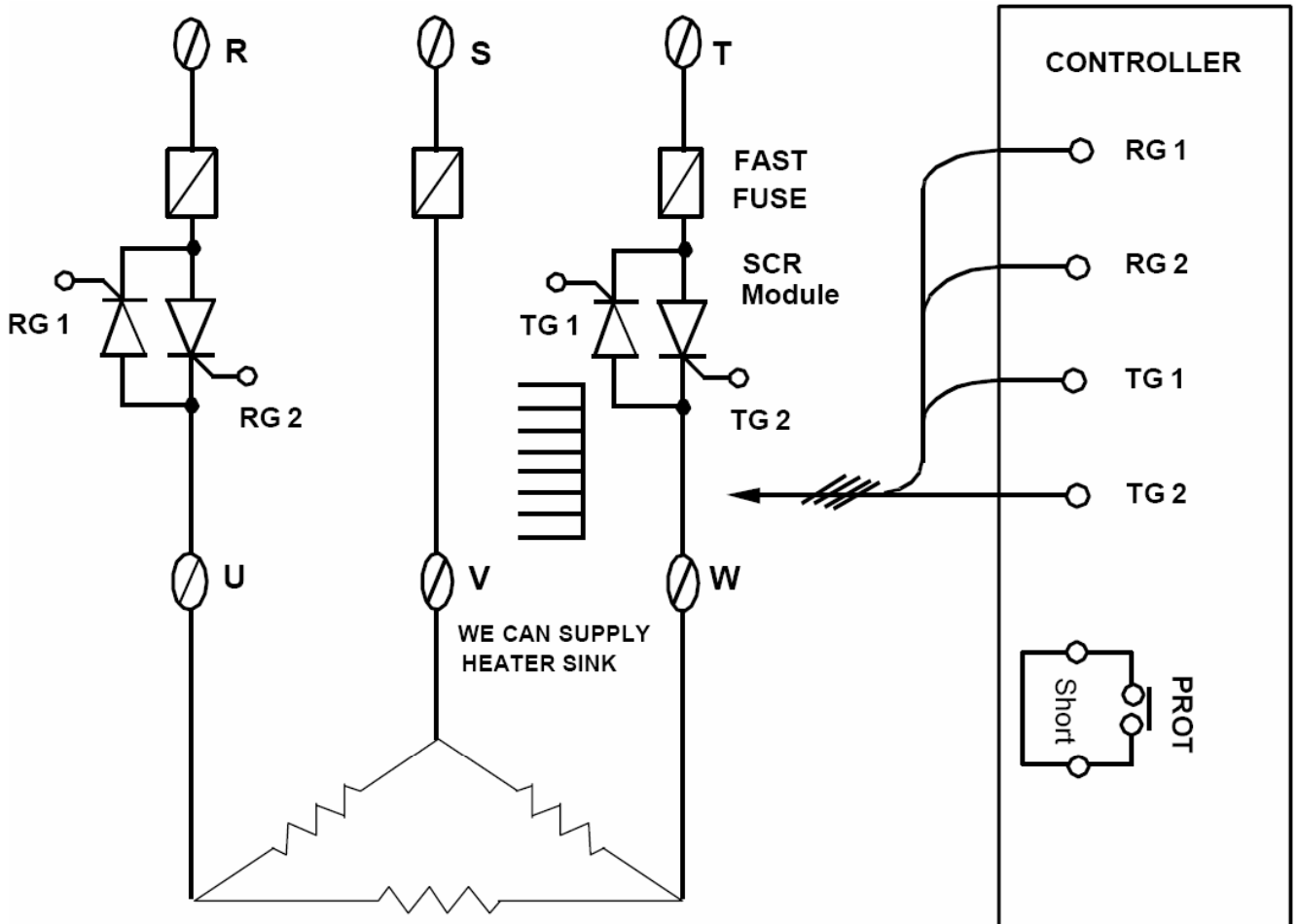


17.8 3 Zero crossing control (By SCR module)

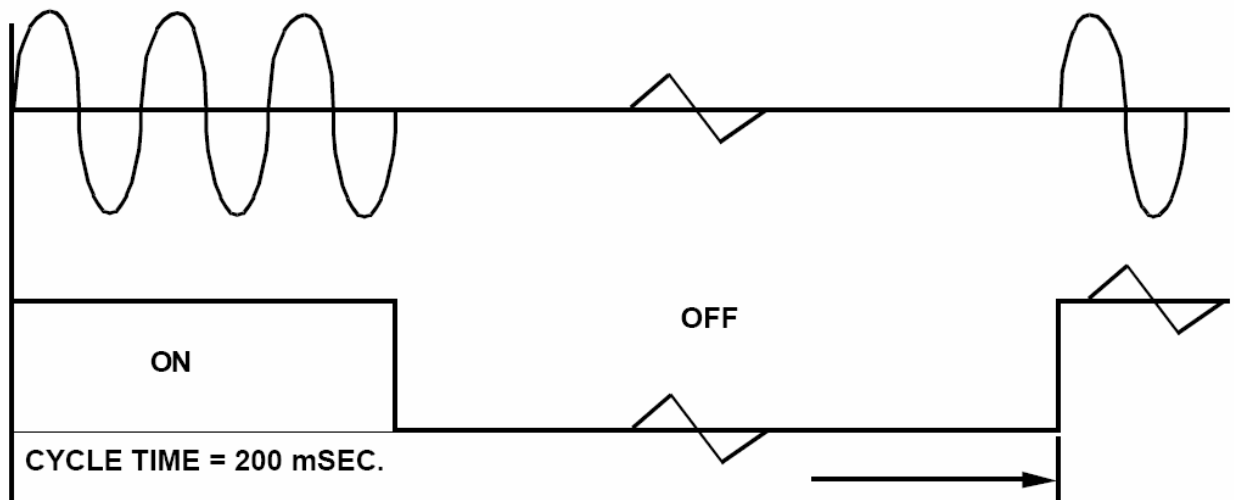
Available Models : WT909

OUT1 : 3 SSR

Parameter setting : OUT = 0
CYT1 = 1



TIME CHART:

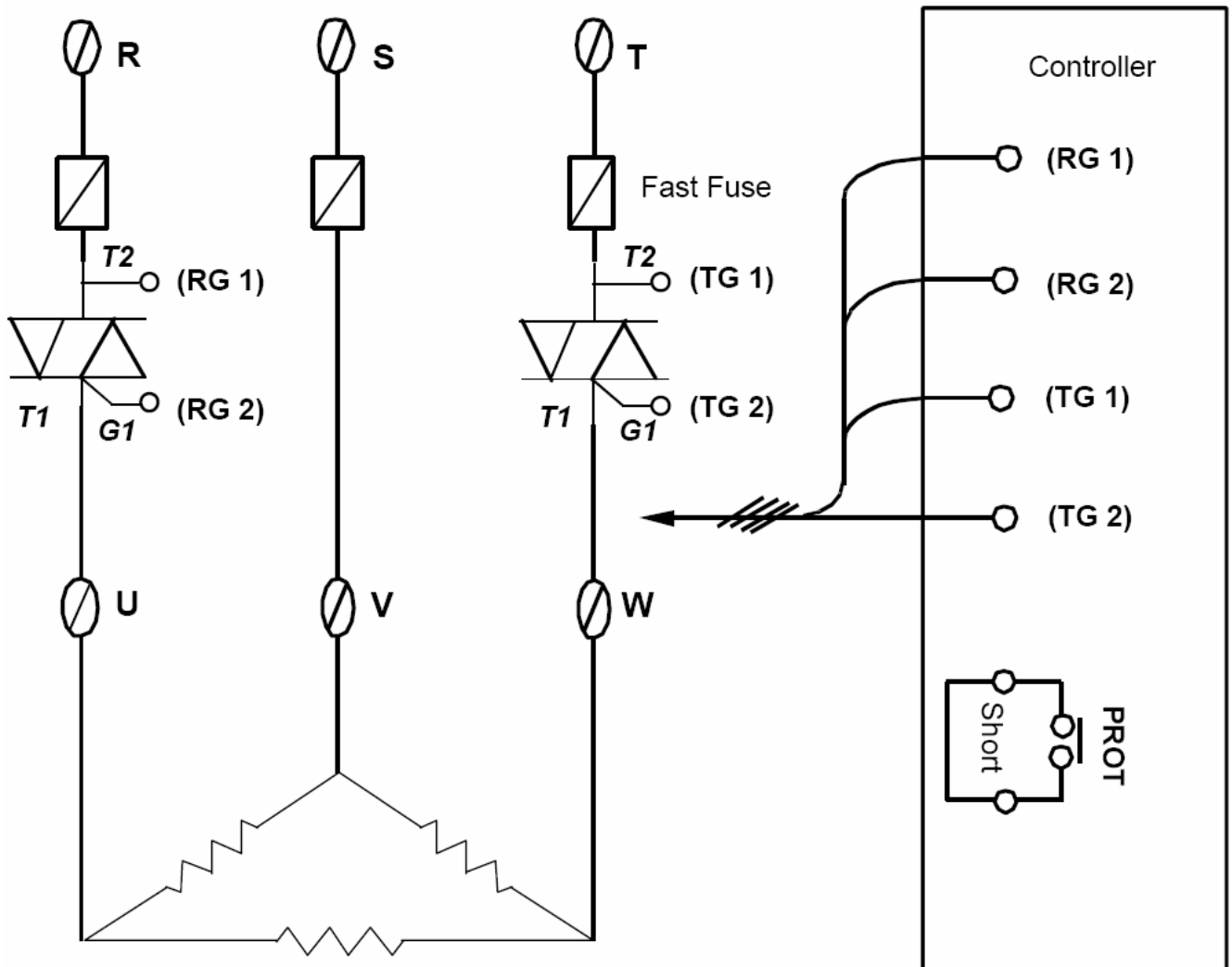


17.9 3 Zero crossing control (By TRIAC module)

Available Models : WT909

OUT1 : 3 SSR

Parameter setting : OUT = 0
 CYT1 = 1



17.10 3 wires proportional motor valve control

Available Models : WT909, WT409, WT707, WT904, WT404

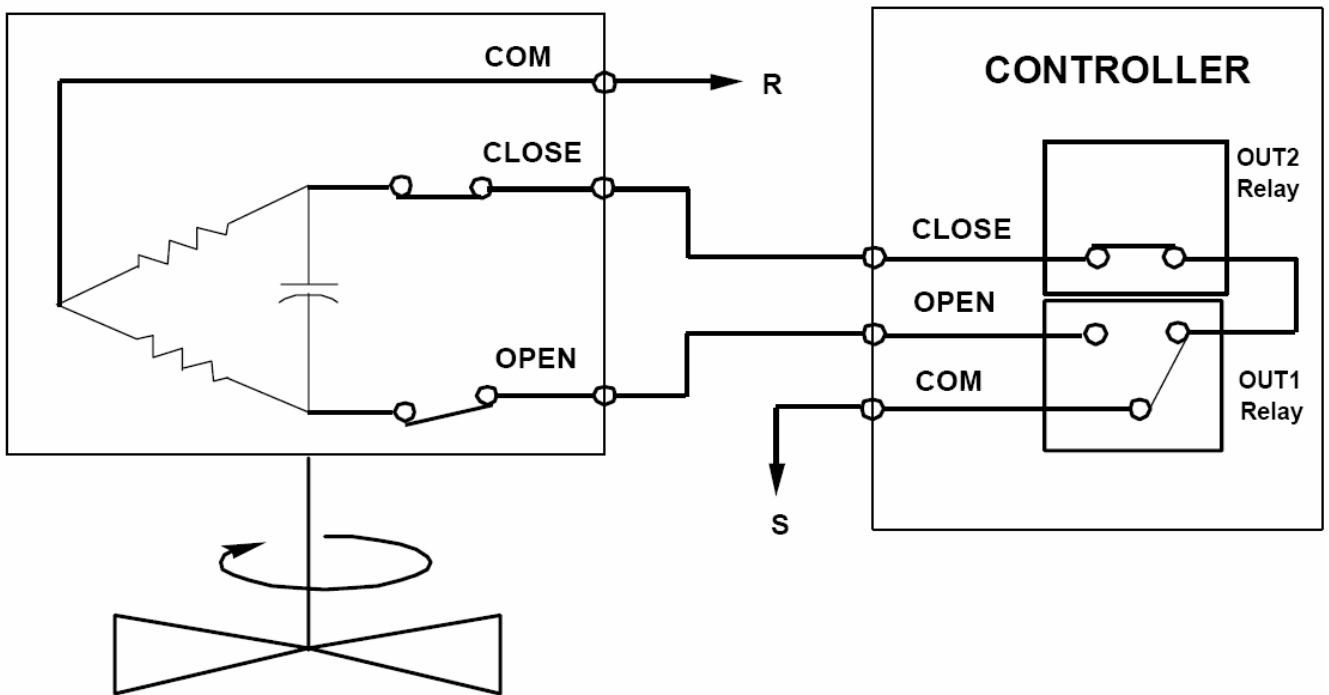
Parameter setting : OUT = 3 ~ 100sec (Manufacturing default setting "5" seconds).

CYT1 = 1

RUCY = 5~200 seconds.

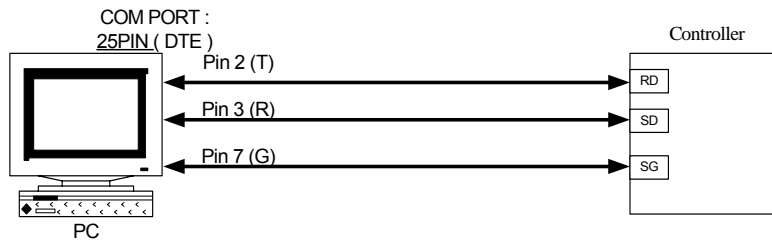
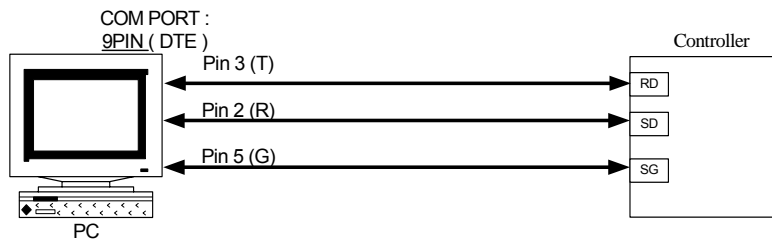
1. CYT1 is the cycle time of Open / Close
2. RUCY is the 0 ~ 100% running time of motor valve

MOTOR VALVE



17.11 Wiring diagram of PC communication

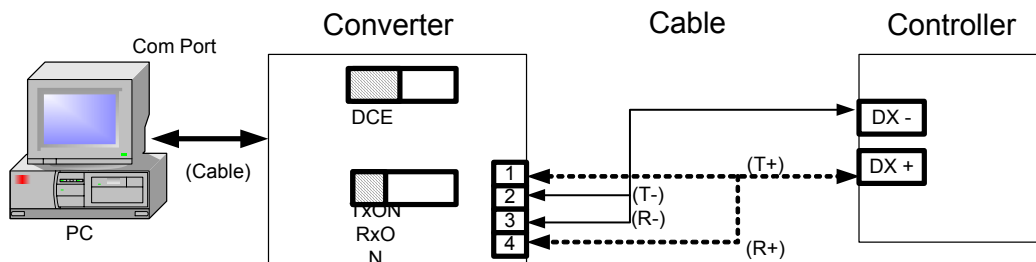
RS232 Connection Diagram



NOTE:

- 1.The length of cable be connected between controller and PC can't exceed 15 meter.
- 2.One Com Port can only be connected to one controller.
If more than one controller is connected to one Com Port , communication will be failed.
- 3.Ensure that the controller's IDNO and BAUD settings are the same with PC software's settings.
- 4.For the software DTE communication format please refer to communication manual.

RS485 Connection Diagram



NOTE:

- 1.The length of cable be connected between Converter and Controller can't exceed 1.2 KM.
Suggestion:choose "Shielded Cable".
- 2.One Com Port can be connected up to a maximum of 30 Controllers.
- 3.Ensure that the Controller's IDNO and BAUD settings are the same with PC software's settings.
- 4.For the software communication format ,please refer to communication manual.

