KCM-XJ8M Multi-Loop Controller Instruction Manual

1. Features:

The temperature controller has 8 channels of analog Signal 4-20mA sensors input and 8 channels of temperature controls.8 kinds of combinations of temperature set value, PID constant, alarm set value, etc.

1.1.Input Sensor Types

Thermocouple (temperature input): K, J, T, E, S

Resistance thermometer (temperature input): Pt100, CU50

Or Current input (analog input): 4 ~ 20 mA DC, 0 ~ 10 mA DC depending on the controller model.

1.2.Control Outputs

a. Relay output: relay contact: 250 V AC, 3 A (Resistive load)

b. SSR output: DC 0/10v voltage output (for driving SSR)

depending on the controller model.

1.3.Adjusting PID Constants

Can be easily set the optimum PID constants by performing AT (auto-tuning) with the limit cycle method.

1.4. Standard Alarms (OPTIONAL)

Relay contact:250 V AC, 3 A (Resistive load).

Can be output an alarm when the deviation, process value, set point, or manipulated value reaches a specified value.

1.5 Sampling Time: 2 sec

1.6.Use this controller within the following allowable range:

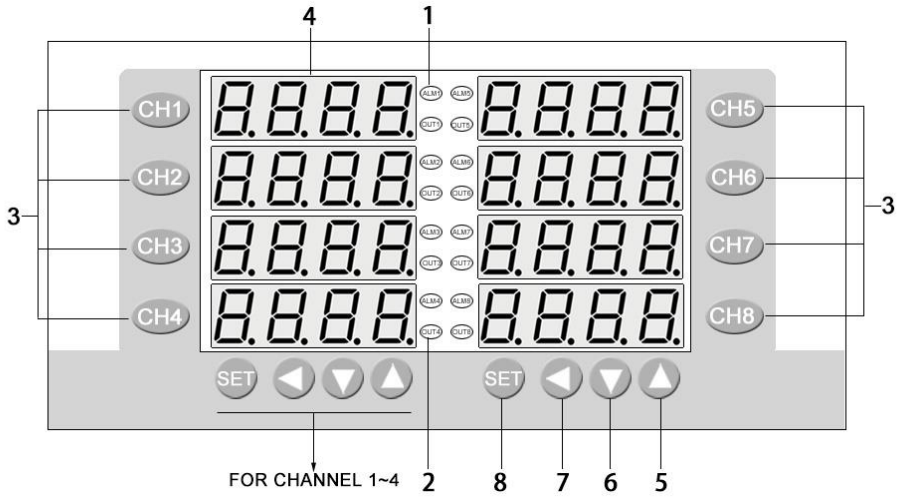
Allowable ambient temperature: −0 to +55 °C

Allowable ambient humidity: 5 to 85 % RH.

2. Dimensions:

h×w×d(Unit: mm) 160×80×85 Panel cutout 152×76

3. Parts Description:



1 ALM: lamp Lights when Event occurs

2 Output lamp: Lights when output is turned on

3 Channel key:

You can press 'CH1~8' for 3 seconds to enter into corresponding channel menu.

4 PV display:

Displays Measured value (PV)

5 Up key:

6 Down key:

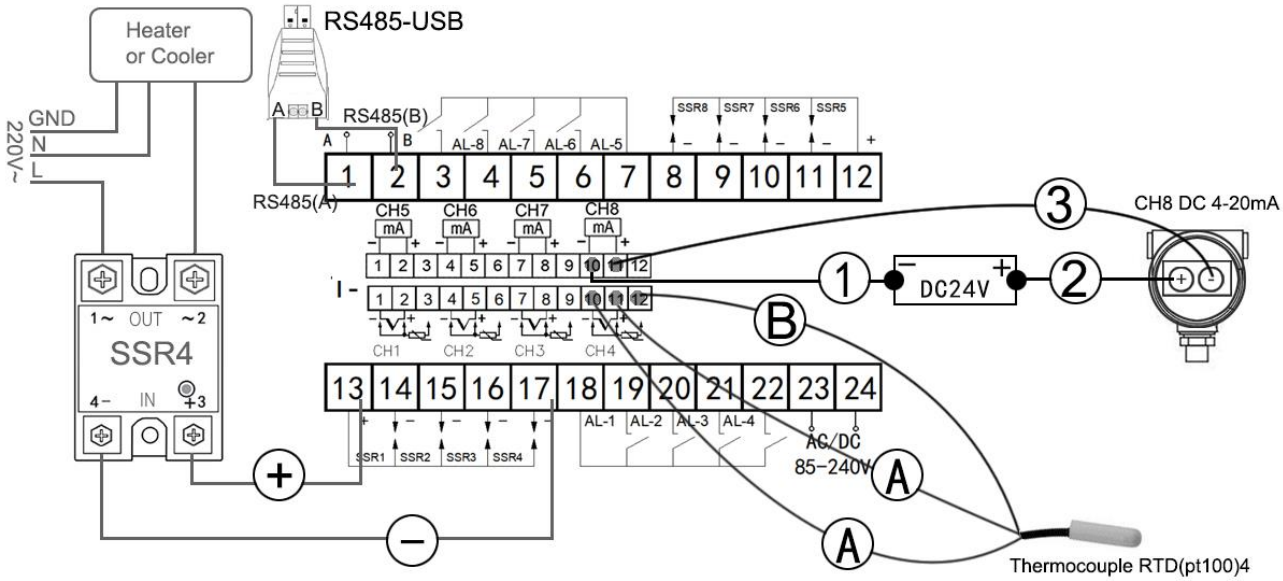
Increase numerals.

7Shift key: Shift digits when settings are changed.

Decrease numerals

8 Set (SET) key: Used for parameter calling up and set value registration.

4. Terminal Arrangement:



This wiring diagram is offered for example purposes only.

Tip: Correct terminal arrangement depending on the actual model.

5. Parameters

Table 5.1

ID	Symbol	Name	Manual	Setting range	Ex-Factory
The public parameters(First level)					
0	LocK	Set data lock	LOCK=18, Set data unlock LOCK≠18, Set data lock.	0～50	18
1	t	PID control cycle.	PID control response time	2～120	10
2	oPb	Communication	0:no output; 1:RS232 or RS485;	0-2	1
3	Add	Address	Communication address can be set from 0 to 255	0-255	1
4	bAud	Baud Rate	1200; 2400; 4800; 9600;	0-4	1
The Parameters of each channels(Second level)					
5	Sn	Input type	Refer to Table 5.2	-	-
6	ALP	Alarm type	0: Alarm function OFF; 1:Process high alarm; 2:Process low alarm; For more information, Refer to 8. Alarm function	0～6	1

7	SP	Setting value	Set the temperature set value (SV) which is the target value for control	Determined by P-SL P-SH	100
8	AL	Alarm set value	For more information, Refer to 8. Alarm function		200
9	SC	PV Bias	The value set in the PV bias is added to the actual input value to correct the input value.	±20.0	0
10	P	Proportional band	Set when PI or PID control is performance. For heating / cooling PID action. When P=0,the meter is ON/OFF control	1～100	0
11	I	Integral time	Eliminates offset occurring in proportional control.	0～3000	500
12	d	Derivative time	Prevents overshoot and/or undershoot caused by integral action effect..	0～2000S	100S
13	AT	Auto tuning	1: AT with learning start 0: AT with learning stop	0～1	0
14	HY	Differential gap	Output and alarm Hysteresis Value Refer to the next subsection: 9. OUT Relay contact On/Off mode 8. Alarm function	0.1～50.0	1.0
15	CoL	Hot/Cold	0:reverse control(heating) 1:positive control(cooling)	0～1	0
16	dP	Decimal point selection	0：No decimal point 1：1 decimal digit	0～3	0
17	PSH	Range high	Input range (high)	P-SL～9999	-
18	PSL	Range low	Input range (low)	-1999～P-SH	-

Table 5.2

MODEL	Input type list		
Temperature sensor	Cu50(Cu50) –50.0～150.0℃		Pt100(Pt2) –199.9～600.0℃
	K(K) -30.0～1300℃	E(E) -30.0～700.0℃	J (J)-30.0～900.0℃
	T(t) -199.9～400.0℃	S(S) -30～1600℃	
Analog input (Optional)	0～50mV(0_50);	10～50mV(A_50)	0～5V/0～10mA(0_5u)
	1～5V/4～20mA(1_5u)		
	DC input is single-option, depending on the actual mode.		

6. Operation

6.1 First level menu setting

Press and hold the SET key for 3 seconds to go to the first level menu, the controller will display the parameter symbols (0～4) on the first LED display, and display the parameter value on the second LED display.

6.2 Second level menu setting.

Press and hold the CH1/ CH2/ CH3 /CH4/CH5/CH6/CH8 key for 3 seconds to go to one of the channel menu level.

The controller will display the parameter symbols (5～18) on the first LED display, and display the parameter value on the second LED display.

6.3 Parameter value setting

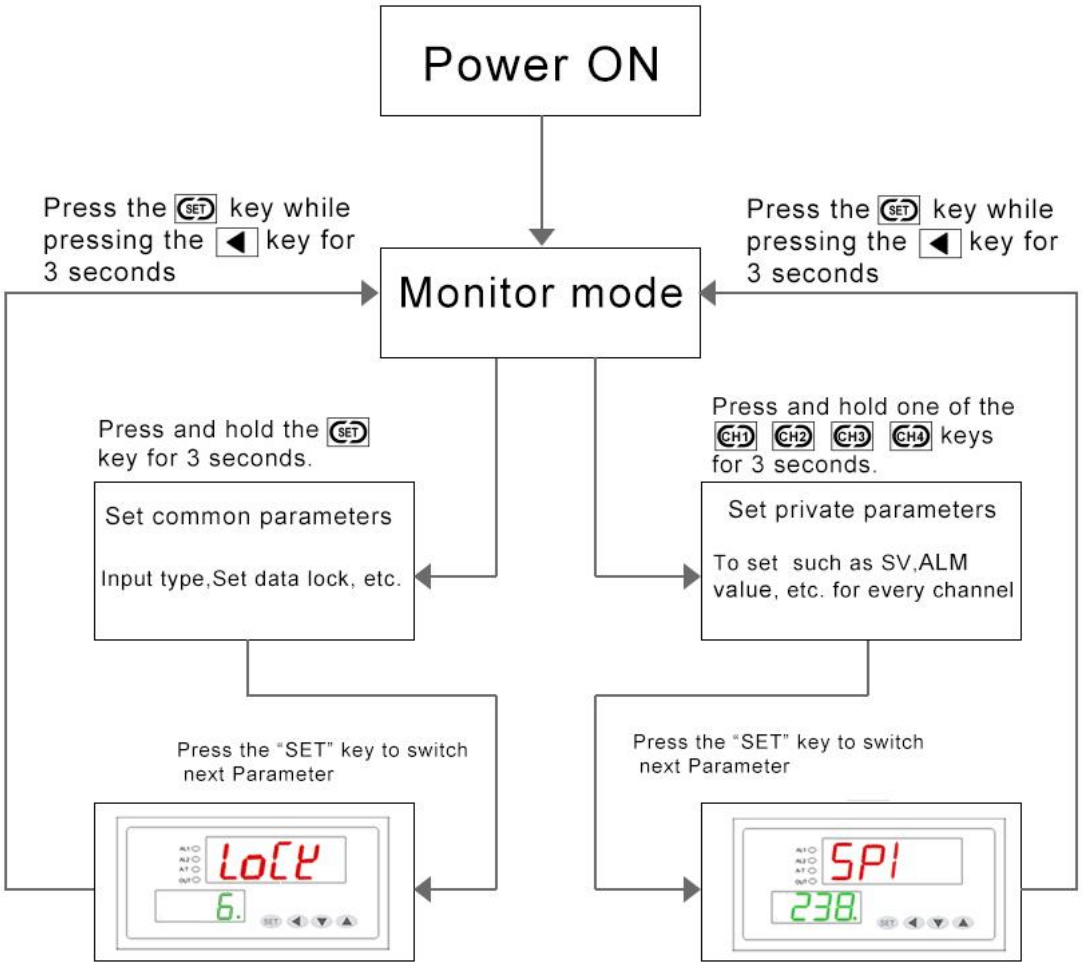
Press ◀ key to go to a different digit.

Parameters value can be changed by pressing the ▼ key or the ▲ key.

Press the SET key. The display changes to the next parameter and the new value will be stored.

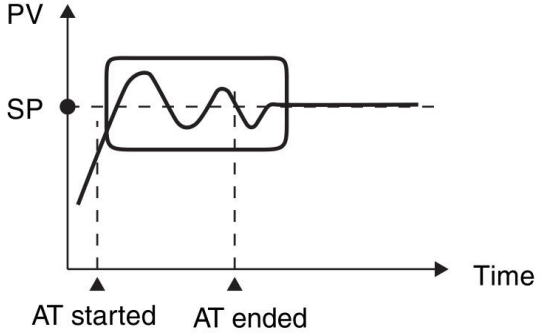
All the Parameters can be modified when LocU=18.

Display returns to the PV monitor if no key operation is performed within 10 seconds , and the set value will be saved.



7.Determining PID Constants(Auto-tuning)

When AT is executed, the optimum PID constants for the set point at that time are set automatically. A method (called the limit cycle method) for forcibly



changing the manipulated variable and finding the characteristics of the control object is employed.

Set parameter HY as 0.5, if the output is relay set the t as 10, then set the AT as 1, in this time the controller enter into **Auto-tuning**. PV window will alternately Display “AT” and PV value, control mode is on-off mode, after 3 times vibrating(3 control period) automatic save P, I, D parameter, the self-adjusting procession finished.

Attentions：

-The parameters of 14: HY ,1: t ,13: AT refer to 5.Parameters

-when **Auto-tuning**, the controller should not change the set value.

-When the power off during **Auto-tuning**, it will restart **Auto-tuning** next time.

-When it need artificially exit during **Auto-tuning**, set the Parameter(AT) to 0 so that can exit，but the setting result will not be valid.

8. Alarm function[OPTIONAL]

Take example for channel 1 alarm		
Alarm function	Alarm status[ON]	Alarm status[OFF]
ALP=1	PV1≥AL1	PV1<AL1 − HY1
ALP=2	PV1≤AL1	PV1>AL1 + HY1
ALP=3	PV1≥ SP1 + AL1	PV1< SP1 + AL1 − HY1
ALP=4	PV1≤ SP1 − AL1	PV1> SP1 − AL1 + HY1

ALP=5	Alarm status[ON]	PV1≤ SP1 − AL1 OR PV1≥ SP1 + AL1
	Alarm status[OFF]	SP1 − AL1 + HY1 < PV1< SP1 + AL1 − HY1
ALP=6	Alarm status[ON]	SP1 − AL1 ≤ PV1≤ SP1 + AL1
	Alarm status[OFF]	PV1< SP1 − AL1 − HY1 OR PV1> SP1 + AL1 + HY1
The parameters of 7: SP1 , 8: AL1 , 14: HY1 , 6: ALP refer to 5.Parameters		

9. OUT Relay contact On/Off mode

Set the parameter of P (Proportional Band)=1, When P=0,the controller is ON/OFF control.

OUT function		OUT status[ON]	OUT status[OFF]
positive control	P =0; CoL =1;	PV ≥ SP + HY	PV ≤ SP − HY
reverse control	P =0; CoL =0	PV ≤ SP − HY	PV ≥ SP + HY
The parameters of 7: SP , 10: P , 14: HY , 15:CoL refer to 5.Parameters			

10. Host communication based on MODBUS-RTU protocol

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.

10.1 Communication Mode:

Data bit length	Stop bits	Parity bit	Communication time interval
8-bit (Binary)	1,2	NONE	300ms

10.2 Message length of each function (Unit: byte):

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	8	8	7	7
06H	Preset single register	8	8	8	8

10.3 Message format

Slave address	The slave address is a number from 1 to 255 manually set at the front key panel of the controller.
Function code	Refer to **2. Message length of each function**
Data	The data to execute the function specified by the function code is sent to the slave and corresponding data returned to the master from the slave.
CRC-16	CRC-16: Cyclic Redundancy Check)

10.4 Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read.

Slave address	Function code 03H	Register address	Quantity The setting must be 1	CRC16
Example: The contents of the holding register 1001H are the read out from slave address 1. Query message: 01 03 10 01 00 01 D1 0A Response message: 01 03 02 **00 FD** 79 C5 Explain：00FD=253,is processed as 25.3				

10.5 Preset single register [06H]

The query message specifies data to be written into the designated holding register. Only R/W holding registers can be specified. The controller EEPROM had a life span of data written to the EEPROM less than 1000,000 times

Slave address	Function code	Register address	Write data	CRC16
Example: Data is written into the holding register 0004H of slave address 1. Query message: 01 06 00 04 FF 38 88 29 Response message: 01 06 00 04 FF 38 88 29 When input set value(SV) is -20.0,-20.0 is processed as -200,-200=0000H-00C8H=FF38H				

10.6 No response

The slave ignores the query message and does not respond when:

• The slave address in the query message does not coincide with any slave address settings.

• The CRC code of the master does not coincide with that of the slave.

• Transmission error such as overrun, framing, parity and etc., is found in the query message.

• Set the Response Timeout >200ms and Delay between polls>200ms.

10.7 Register address list:

8 channels controller is composed of two identical 4 channels controller, so it has two Slave address

Symbol	Decimal point	Real Register	Holding Register
Measured value(PV1~4)	YES	PV1: 1001H~PV4: 1004H	44098~44101
Measured value(PV5~8)	YES	PV5: 1001H~PV8: 1004H	44098~44101
Channel 1~4: the default Modbus device address is 1, Channel 5~8: the default device address is 2.			
The first public parameters *(Refer to 5. Parameters)*			
LocK	NO	0000H	40001
... And so on			
Baud	NO	0004H	40005
The Parameters of channel 1 *(Refer to 5. Parameters)*			
Sn1(sn5)~ PSL1(PSL5)	-	0005H~0012H	40006~40019
The Parameters of channel 2 *(Refer to 5. Parameters)*			
Sn2(sn6)~ PSL2(PSL6)	-	0013H~0020H	40020~40033
The Parameters of channel 3 *(Refer to 5. Parameters)*			
Sn3(sn7)~ PSL3(PSL7)	-	0021H~002EH	40034~40047
The Parameters of channel 4 *(Refer to 5. Parameters)*			
Sn4(sn8)~ PSL4(PSL8)	-	002FH~003CH	40048~40061

Refer to this link for more information on MODBUS-RTU Communication Protocol:

http://www.kcmeter.com/servicesread.asp?id=4

Or scan QR code for more information:

Character Symbols ： This manual indicates 9-segment display characters as shown below.

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
A	b	C	d	E	F	G	H	I	J	K	L	n
N	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**Y**				
n	o	P	q	r	S	t	u	y				

11. Model and Suffix Code

Specifications	Model and Suffix Code							
Model	KC	☐	☐	☐	☐	☐	☐	
SIZE	160×80mm panel cutout :152×76mm	M						
Number of channel	8 channels		XJ8					
Number alarm	No alarm			☐				
	1 Alarm relay out for each channel			1				
Input Type	Thermocouple, RTD, DC voltage or Current Fixed input type per channel				M			
Control output	Relay output					☐		
	Voltage pulse(for driving SSR)					G		
Power supply voltage	100 to 240V AC						☐	
	24V DC						1	
Communications	RS-485(2-wire system: MODBUS-RTU)							RS
	RS-232(3-wire system: MODBUS-RTU)							RX