

SAS923FCT-CO-S-485 Digital Thermostat

Application: 2 pipe cool/ventilation or 2 pipe heat/cool/ventilation
Installation and operation instructions

Product description:

SAS923FCT-CO-S-485 digital thermostat have the function of setting temperature offset ,adjusting temperature by up and down, Power off memory, setting fan coil running mode, pump protection and compressor delay protection. It's normal applied for commercial, industrial, civil building and villas to heating and cooling or control fan or valve in air conditioning terminal.

Dimension	88mm×88mm×12mm
Setting temperature range	5°C~35°C
Accuracy	±0.5°C
Power	100-240VAC 50/60Hz
Fan Relay Amps	8(5)A
Valve relay Amps	3(2)A
Protection class	IP21
Working environment	0-50°C, 5-95%RH

OPERATION:

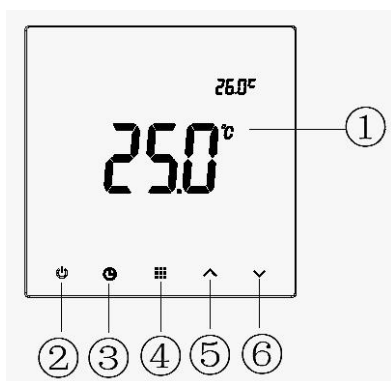


Figure 1

Buttons:

- ① Display area
- ② Power button
- ③ Fan button
- ④ Mode button
- ⑤ up button
- ⑥ Down button

Introduction of Button:

- ② Power button: ON/OFF thermostat
- ③ Fan button: Setting fan mode (HI, MED, LOW and AUTO)
- ④ Mode button: Working mode option (Cool, heat and ventilate)
- ⑤ UP button: Raise temperature
- ⑥ Down button: Lower temperature

The Display:

- a : Indicates heat mode
- b : Indicates cool mode
- c : Indicates ventilation mode
- d : Indicates thermostat is "calling" for cool
- e : Indicate external sensor status
- f : Indicates setting
- g : Indicates compressor delay
- h : Indicates current fan setting
- i : Indicates thermostat is "calling" for heat
- j : Indicates room temperature
- k : Indicates set temperature

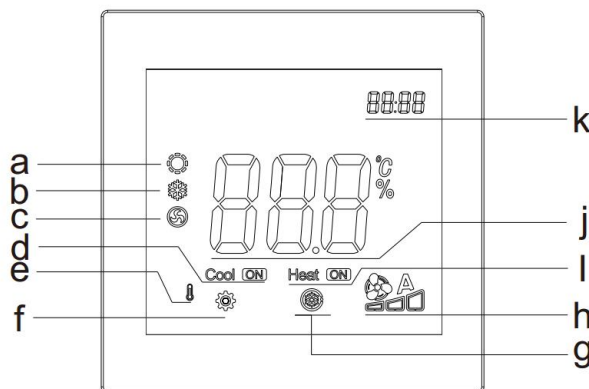


Figure 2

FUNCTION: _____

1. Fan operation

Press  button to choose HI /MED /LOW /AUTO speed, Without AUTO mode in ventilation mode

2. Mode operation

Press  button to select different working mode in power on status

 = CH: Heat mode/cool mode/ventilate mode

 = CO: cool only mode/ventilate mode

CONFIGURATION: _____

The configuration menu allows you to set thermostat operating characteristics to your system or personal requirements. Switch off the thermostat and hold the  button for over 5 seconds entered the configuration menu item setting, and will show the first configuration menu item.

Press  and  button to select. Press  to enter next item. Press  back to previous item

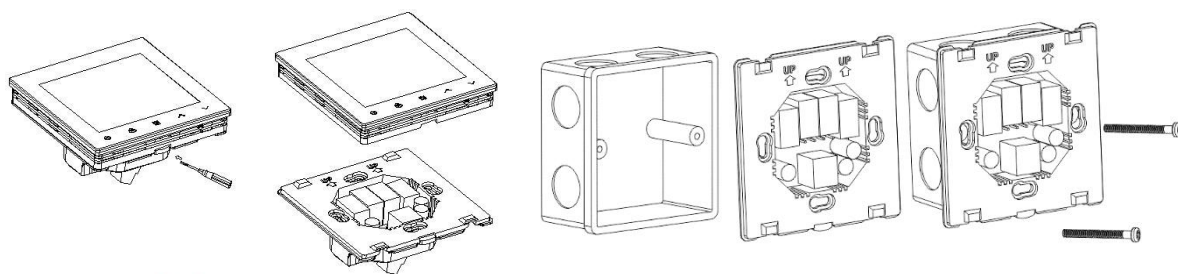
Press  to exit menu and back to power off status.

If no keys are pressed within 30 seconds the thermostat will be switched off. To revert to factory default setting, push  button for over 5 seconds. Display will show "DEF" indicates all the configuration setting has reverted to factory default.

NO	Press button	Displayed (factory default)	Press  and  to select	Description
1	 / 	 (0)	-4.0—+4.0℃	Calibrate Temperature
2	 / 	 (30℃)	20.0℃—35.0℃	Select maximum setting temperature
3	 / 	 (16℃)	5.0℃—18.0℃	Select minimum setting temperature
4	 / 	 (20%)	1-50%	Select display backlight brightness
5	 / 	 (OFF)	ON/OFF	Fan running mode selection OFF: Fan coil would not linkage output with valve ON: Fan coil and valve linkage output, When valve stop, fan will stop too.
6	 / 	 (rE)	rd/ rE	Memorize power on/off option before power loss  :no matter the thermostat is switched on or off before power loss, after the power supply comes to normal again the thermostat will keep power off.  : the thermostat will keep memory when its ON or OFF status before power loss

7		PP (PP)	OO/ PP	Select pump protection OO: cancel function PP: activate function
7		CH (CO)	CO/CH	Model Selection: CO: Cooling only CH: heating and cooling both
9		CP (3)	0/3/5	Compressor off-time cycle setting(Only using when model selection was CO) 0: Cancel compressor delay 3: off-time cycle is 3 minutes 5: off-time cycle is 5 minutes
10		FE (2)	2	Control system selection for fan coil 2:2 pipe SAS923FCT-CO-S-485 is not suitable for 4 pipe system
11		RES (10)	OFF/10/100	External sensor setting OFF: Cancel external sensor 10 :NTC-10K 100:NTC-100K

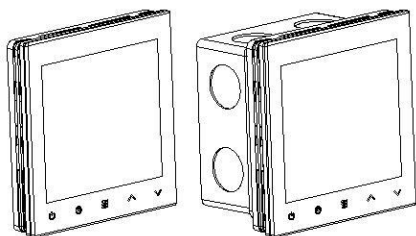
INSTALL THE THERMOSTAT: _____



1. Gently opening the front panel by screw driver at the bottom open mouth.

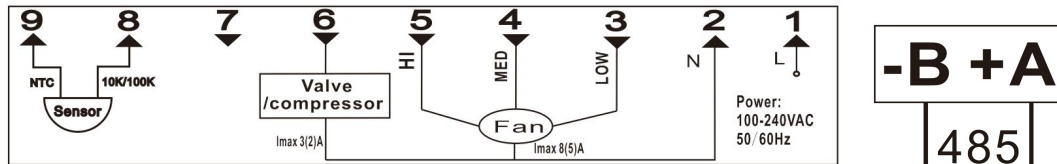
2. To screw for mounting thermostat in the wall.

Gently pulling the control panel straight off the base connector.



3. Fix the cover on the base.

Wiring diagram: _____



IMPORTANT SAFETY INFORMATION

- Always turn off power at the main power source by unscrewing fuse or switching circuit breaker to the off position before installing, removing, cleaning, or servicing this thermostat.
- Read all of the information in this manual before installing this thermostat.
- Only a professional contractor should install this thermostat.
- All wiring must conform to local and national building and electrical codes and ordinances.
- If system is not operating properly, check wiring and replace fuse if necessary.
- Use this thermostat only as described in this manual.

RS-485 MODBUS Universal Interface Protocols

User Manual

1. Instruction of protocol

NO.	Parameter	Protocol provision
1	Operating mode	RS-485, master-slave; thermostat is the slave machine
2	Physical interface	A(+), B(-), GND three-wire system or A(+), B(-) two-wire system
3	Baud rate	(Default), 9600 refer 001Fh register
4	Data format	Data bit: 8, Validation: without Validation, stop bit: 1
5	Transmission mode	RTU format (consult MODBUS standard)
6	Thermostat address	1—247 (option), Default is 23h, refer 0020h register
7	Command code	03h, 06h, 10h (03h—Read register, 06h—Set single register, 10h—Write multiple register)
8	CRC check code	CRC-16 (consult MODBUS standard)
9	CRC verification mode	CRC-16 (consult MODBUS standard)
10	Data frame interval	10ms

2. Modbus communication operation:

Long press  over 5 seconds after power off .It will enter setting interface of Modbus.
Press  button to change to the next item. Press  and  button to change setting. In setting interface of Modbus, long press  over 5 seconds until it show DEF to revert to factory default setting.

With detail, please refer our protocol V1.1

NO.	Press button	Displayed (factory default)	Press“^”、“v”to select	Descriptions
1	 / 	Addr (35)	1~247	RS485 slave address :Show decimalism need to change it into hexadecimal when using
2	 / 	Baud (2)	1/2/3/4/5	RS485 baud rate setting 1: 4800 2: 9600 3: 19200 4: 38400 5: 115200
3	 / 	CHEC (0)	0/1/2	RS485 verification mode 0: None parity 1: Odd parity 2: Even parity
4	 / 	STOP (1)	1/2	RS485 Stop bit settings 1: One stop bit 2: Two stop bit

3. Read register data (03H)

In a remote device, use this function code to read the contents of a contiguous block of registers. The request PDU describes the start register address and the number of registers. It start addressing register from 0. Therefore, the addressing register 1-16 is 0-15. The register data in the response message is divided into two bytes for each register, and the binary content is directly adjusted in each byte.

For each register, the first byte includes the upper bits, and the second byte includes the lower bits.

Request

Thermostat address	One byte	0x23(default)
Function code	One byte	0x03
Start address	Two byte	0x0000 to 0x0020
Number of register	Two byte	1-32(0001h – 0021h)
verification mode	Two byte	High 8 bits of CRC check code

		Low 8 bits of CRC check code
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Response

Thermostat address	One byte	0x23 (default)
Function code	One byte	0x03
Number of byte	One byte	2×N* (Number of register
Register values	N*×2 byte	Storage values of every register
verification mode	Two byte	High 8 bits of CRC check code Low 8 bits of CRC check code

Read the thermostat ON/OFF state

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x23	03	00	01(start address)	00	01	CRC low	CRC high

Response frame (Give by thermostat)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x23	03(command code)	02(Bytes)	ON/OFF state high byte)	ON/OFF state low byte)	CRC low	CRC high

4. Write single register data (06H)

Using this function code to write single register in a remote device. Requested PDU mean the register's address have been written. It start addressing register from 0 .Therefore, addressing register 1 is 0. The normal response is response to the request and returns this normal response after writing the contents of the register.

Request

Thermostat address	One byte	0x23(default)
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Function code	One byte	0x06
Start address	Two byte	0x0001 to 0xFFFF
Write data	Two byte	According description of register to operate
verification mode	Two byte	High 8 bits of CRC check code Low 8 bits of CRC check code

Response

Thermostat address	One byte	0x23 (default)
Function code	One byte	0x06
Two byte	Two byte	0x0001 to 0xFFFF
Write data	Two byte	According description of register to operate

5. Write multiple register data (10H)

Using this function code to write continuous register blocks (1 to 16 register) in a remote device. In requested data field mean request write values .Every register will divide data into two bytes. The normal response return the function code, start address, and the number of registers written.

Request PDU

Thermostat address	One byte	0x23 (default)
Function code	One byte	0x10
Start address	Two byte	0x0000 to 0xFFFF
Number of register	Two byte	0x0001 to 0x0010
Number of bytes	One byte	2×N*
Values of register	N×2 bytes	values
verification mode	Two byte	High 8 bits of CRC check code Low 8 bits of CRC check code

*N=Number of register

Respond PDU

Thermostat address	One byte	0x23 (default)
Function code	One byte	0x10
Start address	Two byte	0x0000 to 0xFFFF
Number of register	Two byte	1 to 16 (0x10)
verification mode	Two byte	High 8 bits of CRC check code Low 8 bits of CRC check code

6. Thermostat device status value register table

If you want to write in the only read register or invalid bit, it can use 0 to set .eg.0001h register write 0100h.it can read register high 8 bits write down 01h.Low 8 bits write down 00h (would not effective).If there are not any description of address of register in register list, write and read need to avoid in attention. Not allow to do any operate. The detail operation refer description of register.

Address	Type	Byte	Description	Read and write mode	Notes
0000h	ID	H	ID high 8 bits	R	Default: 0923h Only write can 0932h,other is not effective and alarm
		L	ID low 8 bits	R	
0001h	Thermostat status	H	Bit0: 0 Power off , 1-power on Bit1-7:reserved, No valid is 0	R/W	Default: 0000h Only write 0100h,0000h, other is not effective and alarm
		L	Bit0-7, reserved ,no valid is 0	R	
0002h	Working mode	H	High 8 bits: reserved , no valid is 0	R	Default: 0000h 0000h,0001h, ,0002h other is not effective and alarm
		L	Bit0-1: 00-heating mode in fan coil 01-cooling in fan coil 10-Ventilation Bit2-7:reserved, no valid is 0	R/W	
0003h	Output mode in fan coil	H	00h:Fixed fan output 01h:Auto fan output	R/W	Default: 0000h Auto fan write 01XXH ,Fixed fan speed: 0001h,0002h,0003h other is not effective and alarm
		L	Bit0-1: 00-close fan output 01-HIGH 10-MED 11-LOW Bit2-7:reserved, no valid is 0	R/W	
0004h	Current setting	H	Integer part: 5-35	R/W	Default: 1A00h (26.0℃) It must
		L	decimal part: 0/5	R/W	

	temperat ure				be within in the range of 0014h,0015h when write down data, otherwise it will alarm. And the vales of L divide 5's remainder must be equal 0,otherwise it will alarm
0005h	Current room temperat ure	H	Integer part: 0-50	R	Default: 1900h(25.0℃) Range: 0-50℃ , Only read couldn't write.0000h is not valid to write, but it can miss alarm, 10H's operation is as same.
		L	decimal part: 0/5	R	
0006h	External sensor's temperat ure 1	H	Integer part: 0-50	R	Default: 1900h(25.0℃) Range: 0-50℃ , Only read couldn't write,0000h is not valid to write ,but it can miss alarm .10H's operation is as same.
		L	decimal part: 0/5	R	
0007h	External sensor's temperat ure 2	H	reserved, no valid is 0	R	Default: 0000h(00.0℃) Only read couldn't write, 0000h is not valid to write, but it can miss alarm .10H's operation is as same.
		L	reserved, no valid is 0	R	
0008h	Key lock function	H	reserved, no valid is 0	R	Default: 0000h Only read couldn't write, 0000h is not valid to write, but it can miss alarm .10H's operation is as same.
		L	reserved, no valid is 0	R	
0009h	Room card status	H	reserved, no valid is 0	R	Default: 0000h Only read couldn't write, 0000h is not valid to write, but it can miss alarm .10H's operation is as same.
		L	reserved, no valid is 0	R	
000Ah	Output	H	reserved, no valid is 0	R	Default: 0000h

	status	L	Bit0:fan coil linkage output,(no use) 0-ON 1-OFF Bit1:Valve output status in fan coil 0-ON 1-OFF Bit2:Heating valve in fan coil(4 pipe (SAS923FCT-C-S-485 have not this output) 0-ON 1-OFF Bit3: High speed output status in fan 0-ON 1-OFF Bit4: MED speed output status in fan 0-ON 1-OFF Bit5: LOW speed output status in fan 0-ON 1-OFF Bit6-7:reserved, no valid is 0	R	Only read couldn't write,0000h is not valid to write ,but it can miss alarm ; 06h/10h's operation is as same
000Bh	Year	H	Century: 00-99	R/W	Default: 1411h=2017 Year It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	Year : 0-99	R/W	
000Ch	Month	H	reserved, no valid is 0	R/W	Default: 0001h=1 Month It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	Setting range from 1 to 12	R/W	
000Dh	Date	H	reserved, no valid is 0	R/W	Default: 0001h=1 date It must according the rules of

		L	Setting range from 1 to 31	R/W	calendar, otherwise it's not valid and alarm. E.g. February only have 28 or 29.
000Eh	Hours	H	reserved, no valid is 0	R/W	Default: 0000h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	setting range from 0 to 23	R/W	
000Fh	Minutes	H	reserved, no valid is 0	R/W	Default: 0000h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	Setting range from 0 to 59	R/W	
001h	Seconds	H	reserved, no valid is 0	R/W	Default: 0000h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	Setting range from 0 to 59	R/W	
0011H	Weeks	H	reserved, no valid is 0	R/W	Default: 0000h=weeks It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	Setting range from 0 to 6 0-Sunday 1-Monday 2-Tuesday 3-Wednesday 4-Thursday 5-Friday 6-Saturday	R/W	

7. Thermostat's configuration setting register table

Address	Type	Bytes	Description	Read and write mode	Notes
0012h	Temperature calibration	H	0x00: L is positive number; 0xFF: L is negative number	R/W	Default: 0000h(0℃) Setting range -40 ~ 40

		L	Setting range : 0~40 (Decimal)	R/W	mean -4.0℃~4.0℃ It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
0013h	Maximum setting temperature	H	Integer part: 20-35	R/W	Default: 1E00(30.0℃) Setting range 20.0~35.0℃ It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	decimal part: 0 or 5	R/W	
0014h	Minimum setting temperature	H	Integer part: 5-18	R/W	Default: 1000 (16.0℃) Setting range 20.0~35.0℃ It must according to the range of operation When writing .Otherwise the operation is not valid and alarm
		L	decimal part: 0	R/W	
0015h	Setting backlight	H	Backlight range when operation : 100,it would not change	R	Default: 6414h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm. Writing range : H = 64,1<=L<=50
		L	Without operation : 1-50	R/W	
0016h	Fan coil	H	Reserved , no valid is 0	R/W	Default: 0000h

	Linkage output	L	0-OFF: Fan coil is not linkage ,the output keep valid in long time 1-ON :Fan coil and valve linkage output, except underfloor heating	R/W	It must according to the range of operation When writing .Otherwise the operation is not valid and alarm, Writing range : 0000h(OFF)or 0001h(ON)
0017h	Memorize power on/off option before power loss	H	Reserved , no valid is 0	R/W	Default: 0000h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm., Writing range : 0000h(OFF) or 0001h(ON)
		L	0-OFF: no matter the thermostat is switched on or off before power loss, after the power supply comes to normal again the thermostat will keep power off. 1-ON :the thermostat will keep memory when its ON or OFF status before power loss	R/W	
0018h	Pump protection	H	Reserved , no valid is 0	R/W	Default: 0000h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm, Writing range : 0000h(OFF)or 0001h(ON)
		L	0-OFF: OFF 1-ON : ON	R/W	
0019h	The difference of temperature in heating mode of fan coil	H	Reserved , no valid is 0	R/W	Default: 0001h It must according to the range of operation When writing .Otherwise the operation is not valid and alarm, Writing range : 0000h
		L	Reserved , no valid is 0	R/W	
001Ah	Working	H	Reserved , no valid is 0	R	Default: 0001h

	system options	L	1-Two pipe: Four kind of working mode Heating and cooling with same valve in fan coil 2-Four pipe :Cooling mode in fan coil (Reserved, no valid .Without this function in SAS923FCT-CO-S-485) Heating and cooling in fan coil aren't use same valve	R	Only read not write.0001h is not valid ,but it can miss alarm ;06h/10h can operate
001Bh	Programmable	H	Reserved , no valid is 0	R	Default: 0000h Only read not write.0000h is not valid ,but it can miss alarm ,06h/10h can operate
		L	0 cancel 7 days programmable 1 open 7 days programmable 2 open 3 days programmable Other values is not valid .It's not accept other values SAS923FCT-CO-S-485 without function of 7 days programmable	R	
001Ch	Working mode	H	Reserved , no valid is 0	R/W	Default: 0001h Only can write 0001h/0002h,Other values will alarm
		L	1: cooling mode 2: heating and cooling both Other values is not valid .It's not accept other values	R/W	
001Dh	Compressor delay	H	Reserved , no valid is 0	R/W	Default: 0000h Only can write 0001h/0002h/0003h Other values will alarm
		L	1 : OFF cancel compressor delay 2 : off-time cycle is 3 minutes 3 : off-time cycle is 5 minutes Other values is not valid .It's not accept other values	R/W	
001Eh	External	H	Reserved , no valid is 0	R/W	Default: 0000h

	sensor	L	0 : OFF cancel external sensor 1 : NTC10K-B3997 2 : NTC100K-B3990 Other values is not valid .It's not accept other values	R/W	Only can write 0000h/0001h/0002h Other values will alarm
001Fh	Communication setting	H	Baud rate set: 4800:1 9600:2 19200:3 38400:4 115200:5 Other is not valid and alarm	R/W	Default: 0281h
		L	Bit7-4:1000 (couldn't change) 8 bits; Bit3-2: 10 Even parity 01 Odd parity 00 None parity 11 Not valid ,it will alarm Bit1-0: 01 stop bits 1 10 stop bits 2 00/11 not valid, It will alarm	R/W	
0020h	Thermostat address	H	Reserved ,no valid is 0	R/W	Default: 0023h
		L	Setting range : 1-247	R/W	