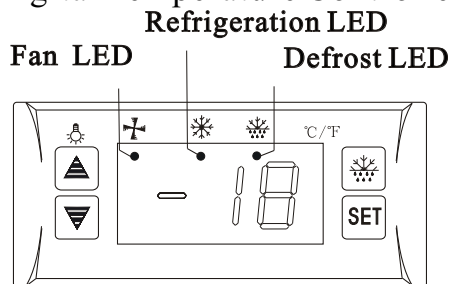


# Model: SF-103ST Digital Temperature Controller



## Features of Function

- Mini-sized and integrated intelligent control and applicable to the compressor of one HP.(Include 1HP)
- Temperature Display/ Temperature Control/ Energy saving control/Manual, automatic defrost/Evap. Fan control/ Light Control /Time to end defrost/ Value Storing/ Self Testing

## Specifications

1. Power supply:220V ~240VAC 50/60Hz
2. Temperature sensor: NTC (B=3380,10k=25°C),
3. Range of temperature displayed :  $-45\sim 99^{\circ}\text{C}$  ( $-45\sim 210^{\circ}\text{F}$ ) Accuracy:  $\pm 1^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{F}$ )
4. Range of set temperature: E1~E2 Factory default :  $00^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ )
5. Dimension:77(Length) $\times$ 35(Width) $\times$ 32(Depth)mm  
Mounting hole dimension:71(Length) $\times$ 29(Width)mm  
Relay box dimension:106(Length) $\times$ 96(Width) $\times$ 46(Depth)mm
6. Temperature of the operating environment: $-10\sim 60^{\circ}\text{C}$  ( $14\sim 140^{\circ}\text{F}$ )  
Relative Humidity:20%~90%(Non-condensing)
7. Relay contact capacity:
  - Compressor: N. O. 30A/250VAC  
(Can connect 1HP compressor, if more it needs to connect an AC contactor)
  - Evap. fan: N. O. 10A/250VAC • Light: N. O. 10A/250VAC

## Front Panel Operation

1. Set temperature (compressor stop temperature) adjustment
  - Press **SET** button, the set temperature is displayed.
  - Press **▲** or **▼** button to modify and store the displayed value. Press **SET** button to exit the adjustment and display the cold-room temperature.
  - If no more button is pressed within 6 seconds, the cold-room temperature will be displayed.  
(Set temperature adjustment range: E1~E2)
2. Manual start/stop defrost: Press **☄** button and hold for 6 seconds to defrost or stop defrost.
3. Clock adjustment: Press **☄** and **SET** for once to enter clock adjustment state, "t" + hour flash display, press **▲** and **▼** to adjust the hour, press **SET** again for once, "t" + minutes flash display, press **▲** and **▼** to adjust minutes. It will exit, if no more button is pressed within 6 seconds.
4. Refrigeration LED: during the delay start, LED flashes. During refrigeration, the LED is on; during temperature constant state, the LED turns off.
5. Defrost LED: during defrosting, the LED is on; during dripping time the LED flashes.
6. Evap. Fan LED: during fan operation, the LED is on. When the fan stops operation, the LED is off.
7. Light control: press **▲** for once can turn on or turn off the light, when power on, it can still memorize.
8. Parameters setup  
Press **SET** button for 6 seconds to enter parameter setting(PA will display and flash);and then press **SET** button, E1, E2~CPA, E1 will display sequentially, press **▲** or **▼** button to display and revise the values; if no more button is pressed within 6 seconds, it will exit and store new values. Note: only when it enters inner parameter manual (PA is displayed) and enter correct password, the parameter values can be adjusted. If the entered password is wrong, then all the parameters just can be checked and can not be changed, the set temperature adjustment is still valid. If the user forget the password, then it need to resume factory defaults.
9. Factory default resumption: press **▲** and **▼** button simultaneously for 6 seconds, "888" will be displayed. At that moment all the parameters and set temperature will resume to factory default, after 6 seconds it will return to normal operation.
10. Only after enter correct password when it enters inner parameter menu (PA is displayed), CPA value can be checked and modified. After enter inner parameter "CPA" press **▲** or **▼** button can display and change password, and then press **☄** button to confirm and store new password. ( When "CPA" value is set to "00" that means cancel password).

## Function details

1. Temperature control(When power on, press **▼** for once to cancel the delay and enter automatic control mode.)
  - After turning on for delay time(E40), the compressor starts operating when cold room temperature  $>$  (set temp.+ Hysteresis E3), and will be off when cold room temperature  $<$  set temp.
  - To protect the compressor, it can not re-start unless the time when the compressor stops every time is longer than the delay time (Parameter E41).

Parameter	Function	Set range	Default	Parameter	Function	Set range	Default
PA	Password	00~50~99	82	t0	Energy saving switch	00=off 01=on	01
E1	Lower set point limit	-45°C~set temp. -49°F	02°C 35.6°F	t1	Energy saving temp. Hysteresis	00~15 °C 00~27 °F	07°C 04°F
E2	Higher set point limit	Set temp. ~45°C 113°F	10°C 50°F	t2	Energy saving power on time: hr	00~23hr	05hr
E3	Temp. Hysteresis	01~10°C 02~18°F	03°C 09°F	t3	Energy saving power on time: min	00~59min	00min
E40	When power on, Comp. start delay time (Effective for the first time after power on)	00~10min	02min	t4	Energy saving stop time: hr	00~23hr	11hr
E41	Reach the temperature, comp. Stop, the comp. Must delay start time	00~10min	05min	t5	Energy saving stop time: min	00~59min	00min
E5	Offset on room temp.	-05~05°C -09~09°F	-1 °C 00°F	t6	Light on time: hr	00~23hr	00hr
E7	Cold-room sensor failure Compressor stop time	01~180min	15min	t7	Light on time: min	00~59min	00min
E8	Cold-room sensor failure compressor operation time	01~180min	45min	t8	Light off time: hr	00~23hr	00hr
F1	Max. Defrost duration	01~60min	10min	t9	Light off time: min	00~59min	00min
F2	Defrost interval time	00~24hr	04hr	LS	Set temp. Adjustment mode	00=set temp. adjustable 01=set temp. Non-adjustable, can be checked only	00
F4	Display during defrost	00=Normal display 01 = Last value before defrost 02=Defrost code "dEF"	01	H1	High temperature alarm for cold-room sensor	45°C ~H2/113°F ~H2	45°C 113°F
F5	Power on fan start mode	00=Parallel with comp.(stop when defrost) 01=Continuous running(stop when defrost) 02=Parallel with comp.(start when defrost) 03= Continuous running (start when defrost) 04=when comp. Stops, on for 3 minutes and off for 1 minute (start when defrost) 05= when comp. Stops, on for 2 minutes and off for 2 minutes (start when defrost)	03	H2	Low temperature alarm for cold-room sensor	H1 ~ -45°C H1 ~ -49°F	-40°C -40°F
F8	After defrost fan start time	00~20min	00min	H5	Power on alarm delay	00~180min	60min
				H6	Continue alarm delay	00~180min	00min
				A1	Room temperature display mode	00=Normal display 01 = locked low temperature display	00
				CF	Temperature unit	°C=Celsius °F=Fahrenheit	°C
				CPA	Change menu password	00-99 (if it is set to 00, that means cancel password)	82

## 2. Temperature display

- When A1=01, the temperature will display in low speed: in the speed of every 30 seconds 1 degree to reach the actual temperature, and do not affect the compressor work normally. When power on, and the actual temperature reach the set temperature for once, only if the cold room temperature is within the range of (set temperature+E3+2°C/4°F), will display the set temperature, otherwise the temperature will display in low speed.

## 3. Defrosting by turning off compressor

- After worked for a defrost interval F2 will enter defrost state automatically. The defrost LED is on, the compressor stops.
- When reached defrost duration F1, will exit defrost and enter automatic refrigeration state.
- When the defrost interval is set to "00", the function of automatic defrost will be cancelled.

## 4. Display during defrost

- When setting parameter F4=0, it will display cold room temperature normally.
- When setting the parameter F4=1, the room temp. is locked during defrost, and the last value before defrost is displayed. When defrost ends, normal display will be resumed after 20 minutes delay of room temp. Display (or cold room temperature < set temperature + hysteresis E3). The defrost LED flashes during the locked delay.
- When setting parameter F4=2, it will display "dEF". When defrost ends, normal display will be resumed after 20 minutes delay of room temp. Display (or cold room temperature < set temperature + hysteresis E3). The defrost LED flashes during the locked delay.

## 5. Fan control:

- During refrigeration, the fan start mode is determined by parameter F5 outside the bracket. During defrosting, the fan start mode is determined by parameter F5 inside the bracket. After defrosting, the fan start pass F8 time.

## 6. Energy saving mode temperature control (Note: When the energy-saving start-up time is the same as the shutdown time, it will not enter the energy-saving mode)

- When the system work to energy saving start time, the operation temperature will set to (original set temperature + t1) values automatically, flash display tE. When operate to energy saving end time, the operation temperature will adjust to the original set temperature automatically, and display normally. When the energy saving mode t0=1, the energy saving mode start, when t0=0, the energy saving mode stop.

## 7. Energy saving mode light control (Note: When the lighting time is the same as the lighting time in energy-saving mode, the lighting is always on, and it can also be turned on or off manually)

- When system work to light on time, the light is on automatically. When work to light off time, the light is off automatically. During energy saving mode can press upward button to control the light switch, when work to the next light on or off time, the light is on or off automatically.

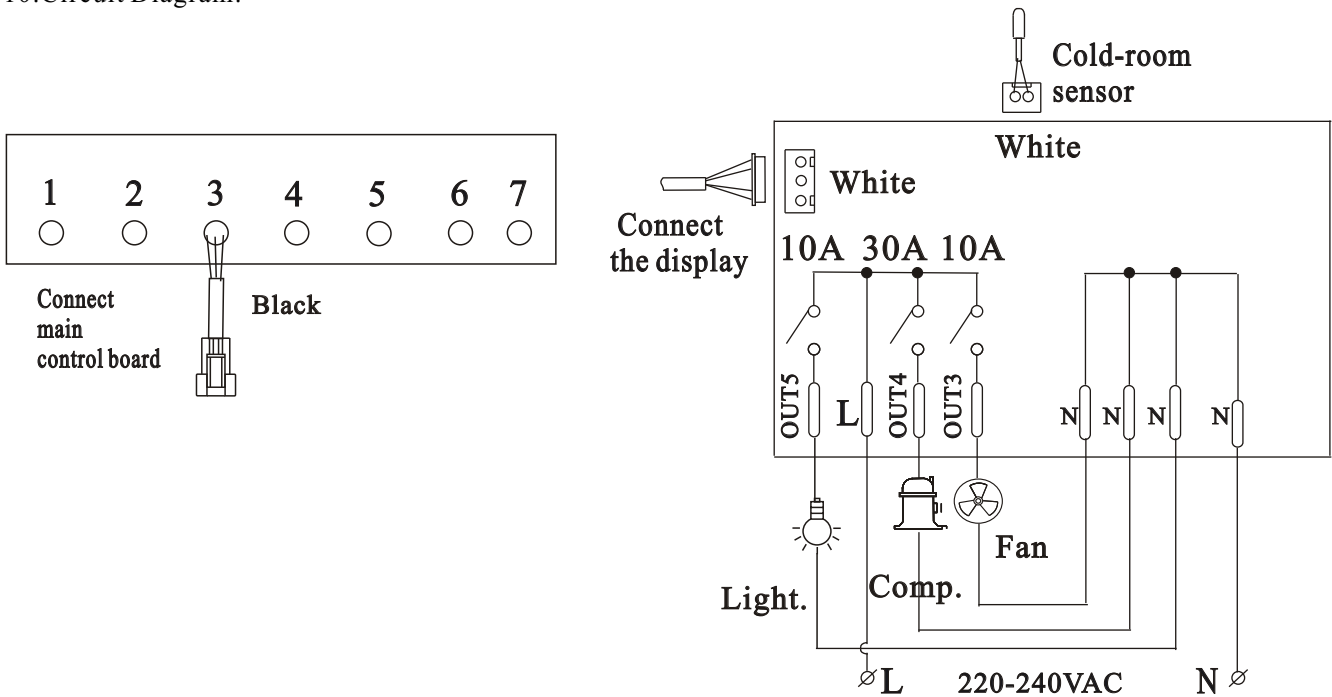
### 8. High/low temperature overrun alarm

After power on delay time exceeds parameter H5, when cold-room temperature is higher than the value of parameter H1, after alarm delay time (parameter H6), the cold-room temperature and Hi will display and flash, it will exit defrost and start the compressor. When cold-room temperature is lower than the value of parameter H2, after alarm delay time (parameter H6), the cold-room temperature and Lo will display and flash, the compressor control output will be disconnected. At the same time the buzzer will sound, the sound can be stopped by pressing random button.

### 9. Abnormal work mode:

Failure code	Description	Operation Mode
1H	Cold-room sensor is short-circuited or exceeds high temperature limit ( $>99^{\circ}\text{C}/210^{\circ}\text{F}$ )	Compressor works according to E8, E7 mode
1L	Cold-room sensor is open-circuited or exceeds low temperature limit ( $<-45^{\circ}\text{C}/-49^{\circ}\text{F}$ )	

### 10. Circuit Diagram:



### Notes for Installation

1. The sensor cable leads must be kept separately from main voltage wires in order to avoid high frequency noise induced. Separate the 12V low-voltage lines from the high-voltage lines of the controller.
2. When install the sensor, it shall be placed with the head upward and the wire downward.
3. In case of long-distance probe installation from the controller, the probe cable may be prolonged up to 100 m max. without any re-calibration
4. The temperature controller can not be installed in the area with water drops.
5. The temperature controller can not be installed in the corrosive and strong electromagnetic pulse interference places.