

## Model: SF-104 Digital Temperature Controller



Dimension: 77(Length) × 35(Width) × 60(Depth) mm  
Mounting hole dimension: 71(Length) × 29(Width) mm

### Features of Function

- Mini-sized and integrated intelligent control and applicable to the compressor of one HP.
- Temperature Display/ Temperature Control/ Manual, automatic defrost by electric heater /Evap. Fan Control/ Value Storing/ Self Testing /Parameter Locking

### Specifications

1. Output of the outside sealed transformer: AC12V (one transformer matched with one temp. controller)
2. Temperature sensor: NTC, Double sensors (for cold room temp. & defrost control), 2m (L)
3. Range of temperature displayed:  $-45 \sim 45^{\circ}\text{C}$  ( $-40 \sim 120^{\circ}\text{F}$ ) Accuracy:  $\pm 1^{\circ}\text{C}$  ( $\pm 2^{\circ}\text{F}$ )
4. Range of set temperature:  $-45 \sim 45^{\circ}\text{C}$  ( $-40 \sim 120^{\circ}\text{F}$ ) Factory default:  $0^{\circ}\text{C}$  ( $\pm 32^{\circ}\text{F}$ )
5. Temperature of the operating environment:  $-10 \sim 60^{\circ}\text{C}$  ( $14 \sim 140^{\circ}\text{F}$ )  
Relative Humidity: 20% ~ 90% (Non-condensing)
6. Output contact capacity:
  - Compressor: N.O. 20A/250VAC (applicable to 1 HP compressor, if more connected to AC contactor)
  - Defrost: N.O. 10A/250VAC (applicable to 1KW load, if more connected to AC contactor)
  - Evap. Fan: N.O. 5A/250VAC


### Front Panel Operation

1. Set temperature
  - 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 10 seconds, the cold room temperature will be displayed.
2. Manual start/stop defrost: Press **☀** button and hold for 6 seconds to defrost or stop defrost.
3. Display the evap. Temperature: Press **△** button and hold for 6 seconds, the evap. Temp. is displayed., after 10 seconds the cold room temp. is resumed to be displayed.
4. Refrigeration LED: During refrigeration, the LED is on; When the cold room temp. is constant, the LED is off; During the delay start, the LED flashes.
5. Defrost LED: during defrosting, the LED is on; When it stops defrosting, the LED is off. During the delay display of defrost, the LED flashes.
6. Parameter setup
  - Press **SET** button and hold for 6 seconds to enter the parameter setup mode while E1 flashes.
  - Press again **SET** button to select sequentially from the parameters: E1, E2, E3, E4, E5, E6, F1, F2 ~ F5, C1.
  - Press **△** or **▽** button, the value of parameter will be displayed and can be modified and stored.
  - If no more button is pressed within 10 seconds, the cold room temperature will be displayed.

Parameter	Function	Set range	Default	Parameter	Function	Set range	Default
E1	Lower setpoint limit	$-45^{\circ}\text{C} \sim \text{Set temp.}$ $-40^{\circ}\text{F}$	$-35^{\circ}\text{C}$ $-31^{\circ}\text{F}$	F1	Max. Defrost duration	1 ~ 60Min	20Min
E2	Higher setpoint limit	Set temp. ~ $45^{\circ}\text{C}$ $120^{\circ}\text{F}$	$20^{\circ}\text{C}$ $68^{\circ}\text{F}$	F2	Defrost interval time	0 ~ 24Hr	6Hr
E3	Temp. Hysteresis	1 ~ $10^{\circ}\text{C}$ 1 ~ $18^{\circ}\text{F}$	$4^{\circ}\text{C}$ $7^{\circ}\text{F}$	F3	Defrost termination temp.	0 ~ $20^{\circ}\text{C}$ $32 \sim 68^{\circ}\text{F}$	$8^{\circ}\text{C}$ $46^{\circ}\text{F}$
E4	Comp.start delay time	0 ~ 10Min	2Min	F4	Display during defrost	0=Normal display 1= Last value before defrost	0
E5	Offset on room temp.	$-5 \sim 5^{\circ}\text{C}$ / $^{\circ}\text{F}$	0	F5	Fan operating function	0=Parallel with comp. 1= Continuous running except defrost	0
E6	Offset on evap. Temp.	$-5 \sim 5^{\circ}\text{C}$ / $^{\circ}\text{F}$	0				
C1	Temperature unit	0= $^{\circ}\text{C}$ 1= $^{\circ}\text{F}$	0				

7. The factory default resumption: press **▽** button for 1 second and then press **△** button simultaneously for 6 seconds, the indicator flashes, all parameters will be resumed as same as factory defaults. After 10 seconds, it returns to the normal operation.

## 8. Lock parameters

In normal operating, press  button and hold for 10 seconds to lock the parameters if "OFF" is displayed (No modification is allowed), or to unlock if "ON" is displayed. Parameter can be displayed only and can not be modified if locked, but the adjustment of the set temp. is active. (the factory default is "ON" )

## Function details

### 1. Temperature controller

- After turning on for one minute, the evap. fan operates, And after the delay time ,the compressor starts operating when cold room temperature  $\geq$  (set temp.+ Hysteresis ), and will be off when cold room temperature  $\leq$  set temp.
- To protect the compressor, it can re-start unless the time when the compressor stops every time is longer than the delay time (Parameter E4).

### 2. Defrost

- It defrosts and heats only if the temp. of the evap. sensor is less than the defrost termination temperature (Parameter F3).
- Operating after a defrost interval time. it will be automatically in the status of defrost. If the temperature of evap. sensor is less than the defrost termination temp. , the defrost LED will turn on, the heater will work, and the compressor and the evaporation fan will stop.
- When the temp. of the evap. sensor is over the temp. of defrost termination; or the defrost duration ends, the compressor will exit the defrost status. The heater will stop. After two minutes it will be in the normal status of refrigeration , after one minute the evaporation fan will run.
- When the duration of defrost is set "00" , the function of automatic defrost will be cancelled.

### 3. Display during defrost

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. The defrost LED flashes during the delay.

### 4. Abnormal work mode:

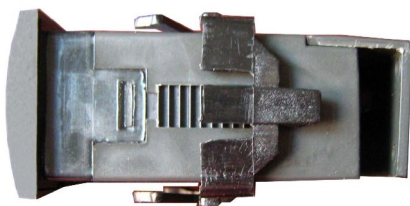
- Room sensor short circuit or overheated (more than 45°C /120°F) "HH" is displayed; Room sensor open circuit or too low temperature (less than -45°C/-40°F) "LL" is displayed. At that time the compressor automatically by the cycle of 45 minutes on and 15 minutes off.
- Evap. sensor fails or over the displayed range, the defrost termination will be just controlled by the defrost duration. (Parameter F1)

## Notes for Installation

1. Sensor leads must be kept separately from main voltage wires in order to avoid high frequency noise induced. Separate the power supply of the loads from the power supply of the controller.
2. When installation the probe shall be placed with the head upward and the wire downward; The evaporator probe must be installed between the fins of the evaporator in the area, where probably the ice is the thickest. Don't place the evaporator probe near the electric heater.
3. The temperature controller can not be installed in the area with water drops.

## Accessories for the temperature controller

1. One attached transformer
2. Two temperature sensors
3. One installation stand
4. One cover panel and 1  $\phi 3 \times 10$ mm screw



## Circuit Diagram

