**Technical Parameters:**

Power consumption < 3W

Accuracy: 0.1 Degree

Temperature range: -50 to 120 °C (-58 to 248 °F)

Sensors: Two temperature sensors with 2m and 4m wire length

Power supply: DC 12V, DC 24V, AC 100-240V (check the model no.)

Output: 2 outputs with 10 or 30 Amp load (check the model no.)

**Features:**

This controller has three differential modes (heating, cooling, and reverse outputs) and one two-zone mode.

2 color display (red and blue) for each zone.

Record maximum and minimum temperature for 2 sensors. Selectable between Celsius and Fahrenheit.

This controller allows you to set high/low alarm limits for 2 zones to protect against overheating or freezing, with buzzer and flasher alerts, and the ability to turn off the outputs.

2 timer output delay for Out1 and Out2.

Temperature calibration for each sensors.

Keep Setting on memory and factory default setting option.

Parameter Setting summary :

To prevent the controller settings from reverting to the factory default settings, please select the differential mode (P1) before adjusting any other settings. Once you have selected the differential mode, please review the wiring section for the selected mode.

The popular factory default for solar temperature controller's differential mode function is F2 with P1=F2.

Ⓐ For setup the Parameters, Press ▲▲ button for 3 second :

Parameters	Default
P0: Select between Fahrenheit or Celsius F/C	C
P1: Differential mode function (F1, F2, F3, F4)	F2
P2: Lower differential value LD (from 0.1 to HD)	5
P3: Higher differential value HD (from LD to 120)	10
P4: High temperature Alarm limit 1	120
P5: Low temperature Alarm limit 1	-55
P6: High temperature Alarm limit 2	120
P7: Low temperature Alarm limit 2	-55
P8: Delay start 1	0
P9: Delay start 2	0
P10: Record maximum temperature T1	
P11: Record minimum temperature T1	
P12: Record maximum temperature T2	
P13: Record minimum temperature T2	

Ⓑ Press ▼▼ button for 3 second → factory default setting

Ⓒ Press ▼▲ button for 3 second → Calibration of sensor 2
Press ▲▼ button for 3 second → Calibration of sensor 1

Parameter setting description:

After setting each parameter mode, wait 3 seconds and controller will exit the parameter setting.

Ⓐ Setup the programs from P0 to P13:

P0: You can change temperature measuring unit to °C or °F

P1: Differential mode function (F1, F2, F3, F4)

F1: Thermostat mode (series output or independent zones):

In this mode each zone can act separately like a thermostat and if you want to use this function for solar system, you need to wire Out1 and Out2 in series.

When you set P1=F1, you need to configure these parameters.

Setup start and stop temperature in thermostat mode :

- Press ▲ button for 3 seconds → Set Start Temp Zone 2
- Press ▲ button for 3 seconds → Set Start Temp Zone 1
- Press ▼ button for 3 seconds → Set Stop Temp Zone 2
- Press ▼ button for 3 seconds → Set Stop Temp Zone 1

You can set the start and stop temperature value of each outputs. The controller automatically recognize the heating or cooling mode,

Heating mode: When the start temp value is less than stop temp.

Cooling mode: When the start temp value is higher than stop temp.

By quick pressing of keys, you can check each sensor, start and stop temperature.

F2: Differential Heating mode:

This is the popular mode for using heat for solar system. In this mode heated water from collector will be pumped to your required area. This mode works according to the values of LD and HD parameters, which are the higher and lower limits of difference between the temperatures of 2 zones. **Out2 is the differential output (check wiring section F2).**

F3: Differential cooling mode:

When you want to use a cooling system like a fan, this mode is the best mode for your application. In this mode cool weather transfers from outside to your needed area according to your setting values of LD and HD. In order to use this mode your device should be wired to Out1.

F4: Differential value (Reverse outputs):

This mode can be used to control a 2-way electric valve (when one way is close the other way is open). For example if you have a system for heating the pool, the 2-way valve can change the water direction from collector to the pool, according to your setting values of LD and HD. This mode works with both Out1 and Out2 (for connecting 2-way valve switch). When Out1 is closed, Out2 is open and reverse.

P2, P3: Lower and Higher differential value (LD, HD)

sensor2 is high temperature sensor (T2) and Sensor1 is low temperature sensor (T1) and (T2-T1) is differential temperature between 2 sensors. "P3=Hd" and "P2=Ld" are called higher and lower differential temperature numbers that we can change these numbers in parameter setting. So by adjusting P3 (higher range of Hd=T2-T1) and P2 (lower range of Ld= T2-T1) parameters you will define the acting range of your pump in your solar system.

Find the "P2" or "P3" in the parameter setting by pressing "▲" or "▼" keys together. Press the "▼" or "▲" key when you find "P2" or "P3" and then by pressing "▼" or "▲" adjust this parameter value.

P1=F2 in Heating mode:

For example when "P3=HD" is set on 10 and "P2=LD" is set on 5, the pump output switch will be ON when T2-T1 is higher than 10 degrees and will be Off when T2-T1 drops to 5 degrees. You can define "P2=Ld" parameter any number 0.1 and less than "Hd" parameter and "P3=Hd" parameter can be any number more than "P2=Ld" parameter and less than 120°C.

P1=F3 in cooling mode:

For example when "P3=HD" is set on 10 and "P2=LD" is set on 5, the fan output (Out1) switch will be Off when T2-T1 is higher than 10 degrees and will be On when T2-T1 drops to 5 degrees. (In this mode T1 sensor is in the place that you want to control)

P4, P5, P6, P7 High and Low temperature Alarm setting T1,T2:

You can set higher and lower alarm limits for T1 and T2. if the temperature passes the higher or lower alarm temperature values, the controller makes a beeping sound and flash on each separate zone. The default setting for zone1 are P4=120, P5=-55 and for zone2 are P6=120, P7=-55.

When T1 and T2 exceed their designated high or low safe temperature limits, the controller's protective function will be activated, automatically turning off all outputs and triggering an alarm sound and flasher to provide crucial protection against potential overheating or freezing. The function is highly beneficial in safeguarding equipment from potential damage caused by temperature extremes, making it an essential feature for maintaining optimal performance and longevity of the equipment.

P8, P9 Delay protection:

When operating in cooling mode, you can use this parameter to protect your cooling system from damage due to frequent startups. The default setting is 0, but you can set a delay time between 0-60 minutes for the cooling system to start.

P10, P11, P12, P13 Record maximum and minimum T1 and T2

The maximum and minimum temperature of sensor 1 and 2 will save on P10 to P13. When you turn off and on the controller, it will be ready to save new minimum or maximum temperature for sensor1 and 2. The numbers help to setup efficient values for differential parameters.

Ⓑ Factory default setting:

All of your parameter settings will remain on your controller memory even you turn off the controller, but you can always set the parameters back to factory default setting with this function.

Ⓒ Temperature Calibration:

You can calibrate both temperature reading with this function. The value can be positive, negative or 0 from -10 to 10.

Error messages and troubleshooting:

- 1) When the controller displays "---" it shows that the sensor is disconnected. The controller will make a beeping sound and the output relay will be closed for safety.
- 2) When the controller displays "LLL" or "HHH" it shows that the measured temperature by sensor is out of controller temperature range

Caution:

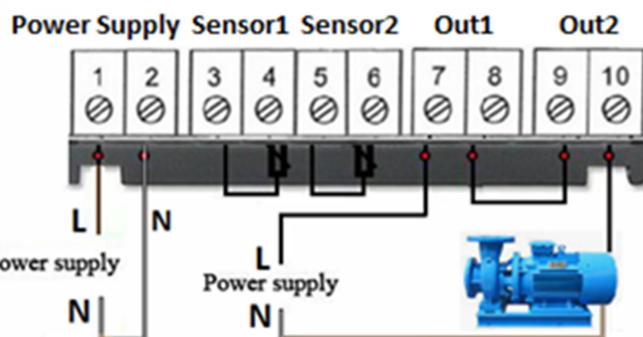
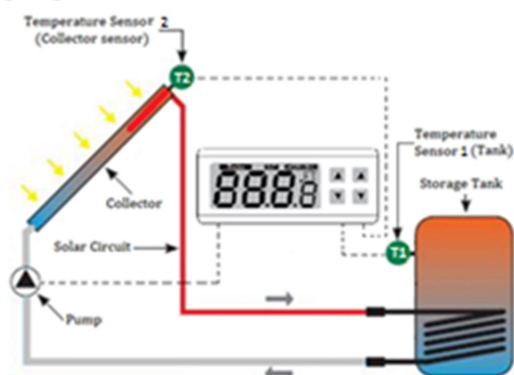
- ◆ The maximum current load of the heating or cooling source must not exceed the output relay contact capacity. It will damage the unit and may cause fire.
- ◆ Check the wiring diagram before wiring the unit. Wrong wiring will damage the controller and may cause fire.
- ◆ Applying extra force on the screws of controller terminals will break the base. Please tighten the screws gently.
- ◆ For your safety, turn the power supply off when you are wiring the controller.

Wiring Diagram for F1, F2, F3 and F4 mode

F1

Wiring Diagram for series output:

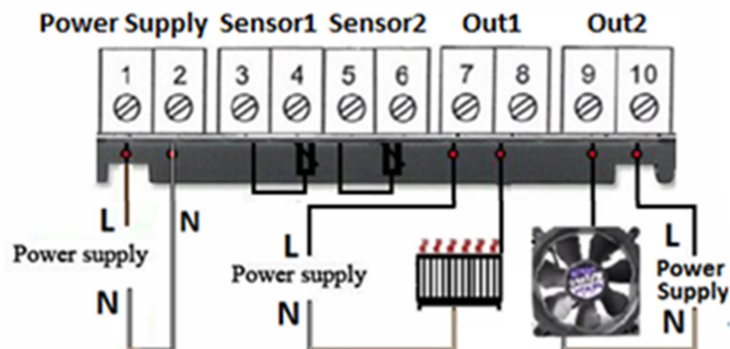
First select P1=F1. And T2 is higher and T1 is lower Temperature. You can wire Out1 and Out2 in series for applications like solar water heater. You need to control the temperature of both water heater storage tank (T1) and solar panel collector (T2) together. For example you can set the controller to turn the solar pump ON when T1 drops to 40°C and T2 reaches to 65°C and turn the pump OFF when T1 reaches to 55°C or T2 drops to 58°C. Please check the following diagrams for more clarification.



Wiring diagram for 2 independent zones:

This wiring use When you select P1=F1.

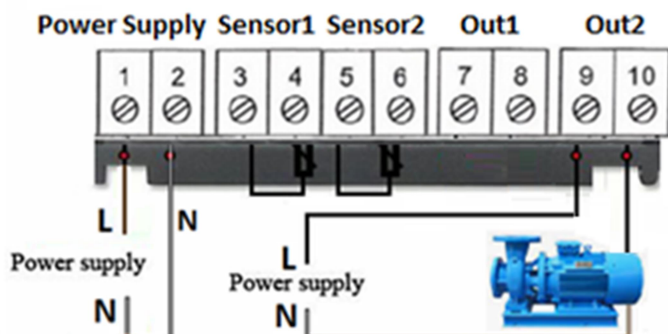
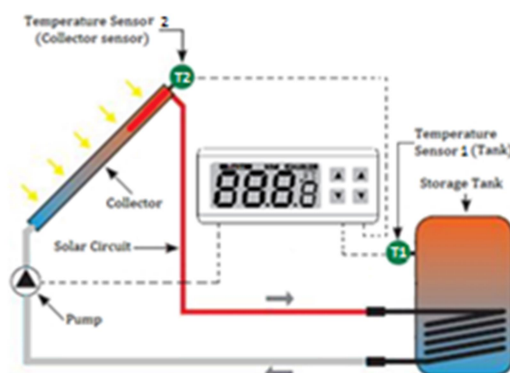
This is another application for controlling heating and cooling of 2 separate zones. This wiring is not suitable for solar system and only use for special applications.



F2

Wiring diagram for differential value (Heating):

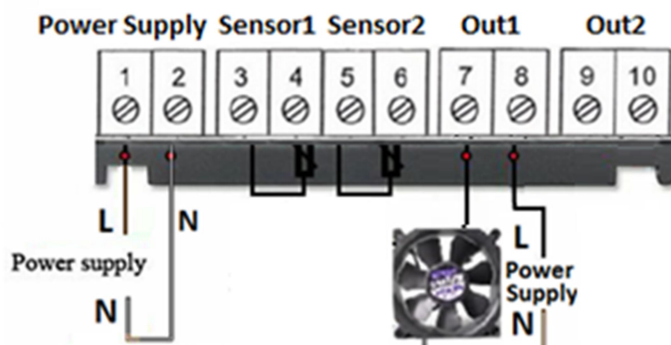
This is the most popular mode for solar system. First select P1=F2 and define P2 and P3 parameters as lower LD and higher HD differential values (T2 - T1). T2 is higher and T1 is lower temperature. Check section P2 and P3 for more information.



F3

Wiring diagram for differential Value (cooling):

Choose P1=F3, set P2 and P3 as lower LD and higher HD differential values (T2-T1). For more information, refer to section P2 and P3. T2 is the higher temperature sensor in the place of controlling area.



F4

Wiring diagram for differential value (reverse outputs):

To use reverse outputs, select P1=F4 and set P2 and P3 as the lower LD and higher HD differential values (T_2-T_1), respectively. For more details, refer to section P2 and P3. With this function, Out1 is Off when Out2 is On and vice versa.

This function can control a 2-way electric valve to manage water flow direction (i.e., one way open while the other is closed). In a pool heating system with 2-way electric valves, the valve can switch water flow between the collector and the pool using the LD and HD settings. Both Out1 and Out2 can operate in this mode, where one is closed while the other is open and vice versa.

