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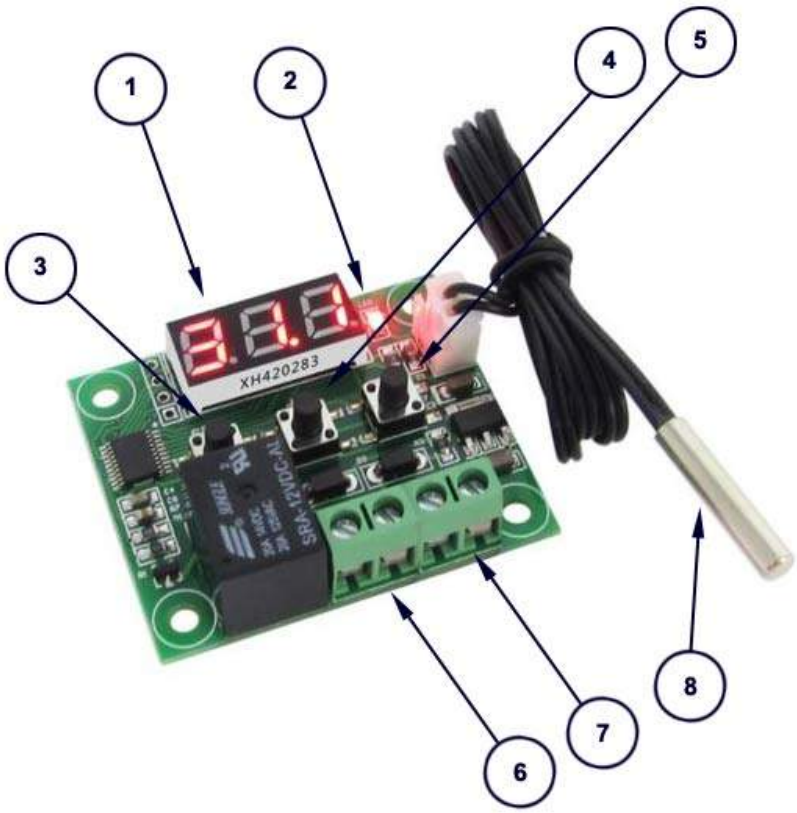
Programmable Digital Thermostat PCB

This temperature controller PCB (Printed Circuit Board) can be used as the heart of a basic temperature control system. It is programmable (settings will be retained when the power is switched off) and can be used for switching either heating or cooling systems on and off (but not both) and has a relay with a single pole, single throw "normally open" set of contacts. The module is supplied as a Printed Circuit Board only; housing and power supply are not included and must be provided by the user.

The unit is not to be used for switching 220V loads without being fitted into a properly insulated housing. Failure to do so may result in electric shock, injury or death.

Product Overview



1. 3 digit LCD display
2. Indicator light (on when relay is activated, i.e. when load is switched on)
3. "Set' button
4. "Plus" button
5. "Minus" button
6. Relay contact terminals
7. +12V / Ground contacts
8. Temperature probe

Specifications

- Temperature range: -30°C ... +110°C
- Display resolution: 0.1°C for temperatures between -9.9°C and +99.9°C;
  1°C for temperatures outside that range
- Accuracy: better than 1%
- Minimum hysteresis: 0.1°C
- Power requirements: 12V DC, 35mA (standby), 65mA (when relay activated)
- Dimensions: 48.5 x 40mm; temperature probe lead ca. 50cm.
- Environmental requirements for PCB: -10 ... +60°C, max. relative humidity 85%
- Maximum load to be switched: 220V, 3A, non-inductive.

  Note: the relay housing shows a rating of 20A maximum at 125V. The relay is suitable for 220V, however the 20A rating is not to be taken literally. While this small relay is theoretically capable of switching 20A loads initially, this will drastically shorten the lifespan of the unit. For sustained operation a maximum load current of 3A is strongly recommended. For switching heavier or inductive loads (which may cause arcing across the relay contacts) a heavier secondary relay should be used.

Basic Operation

When the unit is powered on, the display will show the current temperature as measured by the temperature probe. If the temperature exceeds the allowable range, the display will show "HHH" (for temperatures above the high end of the range) or "LLL" (for temperatures below the low end of the range). If the temperature sensor is not connected, the display will also show "LLL".

Depending on the temperature and the settings, the relay will be activated when the unit is powered on, or not. If the relay is activated, the indicator light (2) will be on.

The unit may be operated in two modes: heating and cooling. The default is cooling mode. In cooling mode, the relay will switch on when the temperature is **above** the set threshold. In heating mode, the relay will be switched on when the temperature is **below** the set threshold.

The relay will be switched on or off depending on two settings: the temperature threshold setting and the hysteresis setting. Hysteresis is the difference between the temperatures at which the relay is switched on and off. Too small a hysteresis setting may cause the relay to rapidly switch on and off repeatedly during small temperature fluctuations, which may in turn cause damage to the relay and the load being switched.

The default hysteresis setting is 2°C. In cooling mode, if the temperature threshold is set to 20°C and the hysteresis is 2°C, the relay will be switched on at 22°C and switched off again at 20°C. In heating mode, the relay will be switched on at 22°C and switched off again at 19.5°C.

Briefly press the Set button. The display will flash, showing the temperature threshold. Briefly press the + or - switches to increase or decrease the temperature threshold by 0.1°C, or press and hold the + or - buttons to adjust the temperature across a larger range.

After about 5 seconds the unit will save the temperature setting and revert to normal operation.

Programming

To enter programming mode, press the Set button for 5 seconds, then release. The display will now show "P0", indicating that Program 0 is about to be changed. Press the + and - buttons to select the desired program to change (or leave it as it is to select Program 0), then briefly press the Set button again to enter the selected program.

The following programmable settings are available:

- P0 - Heating or Cooling mode (factory default: cooling)
- P1 - Hysteresis (factory default: 2°C)
- P2 - Maximum allowable temperature (factory default: 110°C)
- P3 - Minimum allowable temperature (factory default: -30°C)
- P4 - Temperature correction (factory default: 0.0°C)
- P5 - Delay in minutes (factory default: 0)
- P6 - Over temperature alarm (factory default: off)

Press the Set button briefly to leave the selected program and select other programs using the + or - buttons. To leave programming mode and return to normal operation, do not press any buttons for about 10 seconds. The unit will then automatically save all settings and return to normal operation.

P0 - Heating/Cooling mode. This setting selects the heating or cooling mode (i.e. the unit switches either a heating element or a cooling system) as described above.

P1 - Hysteresis. This setting controls the "gap" between the temperatures at which the relay is switched on and off, as described above. The minimum setting is 0.1°C, however this low a setting is not recommended as temperature fluctuations as low as 0.1°C may cause the relay to be rapidly switched on and off repeatedly which can cause damage to both the unit and the load. Note that this setting operates independently from the delay setting in Program 5.

P2 - Maximum allowable temperature setting. This is the upper limit across which the temperature threshold may be set. For example, if P2 is set to 40, the temperature threshold at which the relay is to be switched on or off cannot exceed 40°C. The default setting is 110°C which is the maximum for the unit.

P3 - Minimum allowable temperature setting. As P2, but controlling the minimum allowable temperature setting. The default setting is -30°C which is the minimum for the unit.

P4 - Temperature correction. Should the unit develop an inaccuracy, this setting may be used to correct the temperature measured by the temperature probe in steps of +/- 0.1°C.

P5 - Delay in minutes. This setting specifies a time delay (0-10 minutes) for the relay to be switched on. This is useful when switching cooling systems in which the compressor must be left switched off for a number of minutes before being switched on again.

P6 - Over temperature alarm. When set, this will cause the unit to display "HHH" when the measured temperature exceeds the maximum set here. Use the + or - buttons to set this to "ON" or "OFF", then briefly press Set again to select the temperature limit above which the over temperature indication will show on the display.