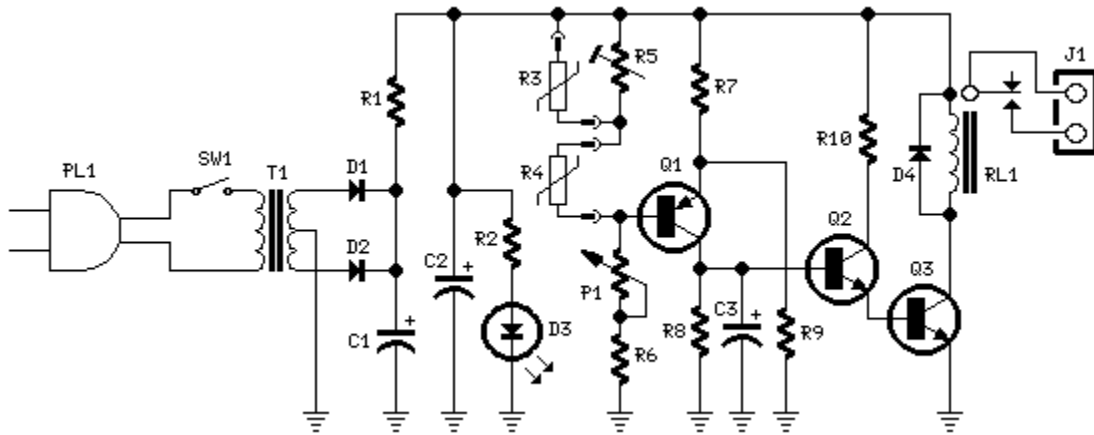


# Heating System Thermostat

**Controlled by indoor and outdoor temperature**  
**Simple, high reliability design**

## Circuit diagram:



## Parts:

P1	_____1K	Linear Potentiometer
R1	_____10R	1/4W Resistor
R2	_____1K	1/4W Resistor
R3	_____3K3	@ 20°C n.t.c. Thermistor (see Notes)
R4	_____2K2	@ 20°C n.t.c. Thermistor (see Notes)
R5	_____10K	1/2W Trimmer Cermet
R6	_____3K3	1/4W Resistor
R7,R9	_____4K7	1/4W Resistors
R8	_____470K	1/4W Resistor
R10	_____10K	1/4W Resistor
C1,C2	_____470µF	25V Electrolytic Capacitors
C3	_____1µF	63V Electrolytic Capacitor
D1,D2,D4	_____1N4002	100V 1A Diodes
D3	_____LED	Red 3 or 5mm.
Q1	_____BC557	45V 100mA PNP Transistor
Q2	_____BC547	45V 100mA NPN Transistor
Q3	_____BC337	45V 800mA NPN Transistor
RL1	_____Relay with SPDT 2A @ 220V switch	Coil Voltage 12V. Coil resistance 200-300 Ohm

J1\_\_\_\_\_Two ways output socket

SW1\_\_\_\_\_SPST Mains Switch

T1\_\_\_\_\_220V Primary, 12 + 12V Secondary 3VA Mains transformer

PL1\_\_\_\_\_Male Mains plug & cable

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## Device purpose:

This circuit is intended to control a heating system or central heating plan, keeping constant indoor temperature in spite of wide range changes in the outdoor one. Two sensors are needed: one placed outdoors, in order to sense the external temperature; the other placed on the water-pipe returning from heating system circuit, short before its input to the boiler. The output from the Relay contact must be connected to the boiler's start-stop control input.

This circuit, though simple, has proven very reliable: in fact it was installed over 20 years ago at my parents' home. I know, it's a bit old: but it's still doing its job very well and without problems of any kind.

## Circuit operation:

When Q1 Base to ground voltage is less than half voltage supply (set by R7 & R9), a voltage is generated across R8 and the driver transistors Q2 & Q3 switch-on the Relay. When Q1 Base to ground voltage is more than half voltage supply, caused when one of the n.t.c. Thermistors lowers its value due to an increase in temperature, no voltage appears across R8 and the Relay is off.

C3 allows a clean switching of the Relay.

P1 acts as main temperature control.

## Notes:

- | R3 is the outdoor sensor, R4 the indoor sensor.
- | If you are unable to find a 3K3 Thermistor for R3 you can use a 4K7 value instead. The different value can be easily compensated by means of Trimmer R5.
- | R5 allows to set the heating system for outdoor temperatures ranging from about +10°C downwards. The higher R5's resistance the hotter the heating system and vice versa.
- | The existing boiler thermostat should be set to its maximum value and not bypassed: it is necessary for safety's sake.
- | This circuit can be dispensed with its differential feature and converted into a simple precision thermostat omitting R3.