



# Thermostat Lab Equipment- Build

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BAT-111: Building Automation Systems



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## SYNOPSIS

Thermostats are used to maintain a set point temperature and make the appropriate HVAC calls. Simple thermostats include basic functionality such as setting the Heat or Cool mode and allowing a temperature setpoint. We want to create a thermostat using simple switches and a controller.

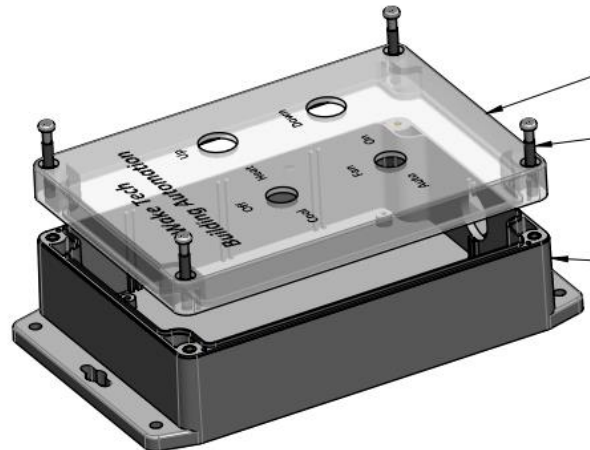
## OBJECTIVES

Build a hardwire enclosure that with the use of a controller that will function as a thermostat.

## MATERIALS

Here is the list of the materials that we used to build the thermostat needed for our lab:

- Enclosure
- 1 SPST toggle switch
- 1 DPST toggle switch
- 2 SPST Off/Momentary On Switch
- Cable – 4 feet 9 conductor wire
- Cable Glands
- 10 kohm Thermistor (Not built into the enclosure)
- 9 Terminal blocks (optional)
- Various disconnects (optional based upon switches)



## MATERIAL DETAIL

These are the specific parts we used, but they may be substituted.

- Enclosure
  - Purpose: House the switches
  - 6.73 x 4.76 x 2.17 in
  - [Polycase Enclosure](https://www.polycase.com/wc-24f) [https://www.polycase.com/wc-24f]
  - \$200 – 1 time printing & machining charge
  - Cost: \$35.02 each (Includes extra \$8 which is \$200 spread across 25 enclosures)
- SPST toggle switch
  - Purpose: Fan – Auto/On
  - [SPST toggle switch](https://www.grainger.com/product/CARLING-TECHNOLOGIES-Toggle-Switch-SPST-10C565) [https://www.grainger.com/product/CARLING-TECHNOLOGIES-Toggle-Switch-SPST-10C565]
  - Cost: \$3.63 each
- DPST toggle switch
  - Purpose: Cool/Heat/Off mode
  - [DPST toggle switch](https://www.grainger.com/product/CARLING-TECHNOLOGIES-Toggle-Switch-DPST-10C569) [https://www.grainger.com/product/CARLING-TECHNOLOGIES-Toggle-Switch-DPST-10C569]
  - Cost: \$5.24
- SPST Off/Momentary On switch – 2 required
  - Purpose: Up and Down button for Temperature Set Point
  - [SPST Off/Momentary On switches](https://www.grainger.com/product/GRAINGER-APPROVED-Extra-Heavy-Duty-Push-Button-5RLV3) [https://www.grainger.com/product/GRAINGER-APPROVED-Extra-Heavy-Duty-Push-Button-5RLV3]
  - Cost: \$5.88 each
- Cable
  - Purpose: Connection to switches inside the enclosure
  - [9 conductor wire](https://www.amazon.com/Recoil-20-Foot-9-Conductor-Ultra-Flex-4-Channel/dp/B085FY6MXW) [https://www.amazon.com/Recoil-20-Foot-9-Conductor-Ultra-Flex-4-Channel/dp/B085FY6MXW]
  - Cost: \$4.70 each (\$23.51 – 20 ft for 5 units)
- Cable Glands
  - Purpose: Hold cable securely into the enclosure
  - [CG1 Black Cable Grands](https://www.polycase.com/cg1-cable-glands) [https://www.polycase.com/cg1-cable-glands]
  - CG-14 based upon our cable diameter
  - Cost: \$2.41
- Thermistor
  - Purpose: Current Temperature
  - 1 [Thermistor – 10 kohm](https://www.grainger.com/product/DWYER-Duct-Temperature-Probe-Bare-6CTR6) [https://www.grainger.com/product/DWYER-Duct-Temperature-Probe-Bare-6CTR6]
  - Cost: \$13.95

## COSTS

We built 25 thermostats, so the costs are based upon purchasing the supplies in those quantities.

The Polycase enclosures has a onetime fee which is spread across each unit and there is also a reduction in price with a large quantity purchase.

- Enclosure \$35.02
- SPST toggle switch \$3.63
- DPST toggle switch \$5.24
- SPST Off/Momentary On Switches (2 required) \$11.76
- Cable – 4 feet 9 conductor wire \$4.70
- Cable gland \$241
- 10 kohm thermistor (Not built into the enclosure) \$13.95

Cost per unit is \$76.40 not including taxes and shipping.

