On the Canadian West Coast winter humidity and condensation in a stored recreational vehicle is an issue that often leads to mold, mildew, and rot. Owners have developed many strategies for dealing with the problem including the use of a small electric heater, which is our preferred method.

One problem with these heaters is the use of the built-in bi-metal rheostat used to control the heaters output. This rheostat is fine if there is little fluctuation in ambient temperatures but require either frequent attention or an excess of electrical consumption if outside temperatures are swinging thru a range of several degrees, say -5 C to +10C.

The goal of this project is to use an MCU to control a heater that will keep the interior of the RV a set amount above freezing and also above the dewpoint, while turning of the heat when a maximum allowable level is reached.

The “4-Winds Condensation Controller” uses a 3.3-vdc signal to operate a 120-vac power-tail turning a 750-watt ceramic heater on or off. The configuration originated with the adafruit [[ESP8266 Temperature / Humidity Webserver](https://learn.adafruit.com/esp8266-temperature-slash-humidity-webserver/overview)](https://learn.adafruit.com/esp8266-temperature-slash-humidity-webserver/code) using an ESP8266 Webserver with a DHT sensor as an input.

To work around the ESP8266 output buffer limits the ESP8266WebServer library is replaced with the [ESPAsyncWebServer](https://github.com/me-no-dev/ESPAsyncWebServer) library to load web page data from the SPIFFS and inject variable data into placeholders in the HTML file. This is based on the tutorial [ESP8266 Web Server using SPIFFS (SPI Flash File System) – NodeMCU](https://randomnerdtutorials.com/esp8266-web-server-spiffs-nodemcu/) at Random Nerd Tutorials by Rui Santos and Sara Santos.

Thank you to all the contributors that make hobby MCU projects so accessible.

For this project, the following two libraries must be downloaded from GitHub and installed in your IDE: ESPAsyncTCP and ESPAsyncWebServer for information on installing libraries in the Arduino IDE see: <http://www.arduino.cc/en/Guide/Libraries>

To access the ESP8266 from anywhere, a static IP address must be set with your router. The address and point to your external IP using a service like no-ip.com.

Dew Point:  
If the temperature and relative humidity are know: “The dew point may be calculated with the following formula proposed in a 2005 article by Mark G. Lawrence in the Bulletin of the American Meteorological Society:  Td = T - ((100 - RH)/5.) where Td is dew point temperature (in degrees Celsius), T is observed temperature (in degrees Celsius) and RH is relative humidity (in percent). Apparently, this relationship is fairly accurate for relative humidity values above 50%.  
    Lawrence, Mark G., 2005: The relationship between relative humidity and the dewpoint temperature in moist air: A simple conversion and applications. Bull. Amer. Meteor. Soc., 86, 225-233. - Michael Bell”

Observations: The test RV is approximately 1,200 cubic feet in volume. The 750-watt heater will maintain an interior temperature above freezing in ambient temperatures down to -6C but, at this temperature, cannot maintain a minimum temperature setting above 3-degrees. However, dewpoint is never reached.