Vapo firmware requirements.

- PID temperature control. With robust runaway detection protection (for example if power is being applied to heater for more than 10 or 15 seconds with no increase in temperature or unreasonable change it should shut down output power) runaway parameters shoul be easily changeable at compile time
- Options to set setpoint temperature manually and 5 user programmable setpoints with default standard setpoints that can be easily changed at compile time. In either manual or preset mode display should show temperature setpoint at first and after running a few seconds should show an animation that relates to power output during operation. In preset mode is should display preset number then temp and then the animation as mentioned above.
- PID values should be easily changed at compile time.
- PID auto tune would be great to have if possible and doesn't add too much development cost
- Should have a reset to factory defaults menu option.
- Maximum setpoint limit value easily changeable at compile time
- Error states with output power shutdown for thermocouple failure.
- Error states for runaway detection with output power shutdown upon detection.
- Red LED flashes in relation to output power being applied to triac
- Green blink at 1hz to show the firmware is running and not locked up
- Blue led . Not sure what to do with this. Is it possible to make it do something in relation to The PID proportional band? Recommendations accepted for this.
- When in error mode it should be possible to go into menu and check what errors were detected and do factory default reset if needed
- Display brightness adjustable
- LED brightness adjustable.
- Temperature display offset. Note; this is to show estimated nozzle temp due as opposed to actual heater temp
- Display unit changeable from F to C.
- If possible should be able to read microcontroller onboard temperature sensor to monitor the ambient temperature inside the unit to throttle power output if the unit gets above ~40c -50c for a certain amount of time . Temp and time and throttle behavior easily changeable at compile time.
- Presets selected by one button press. Up or down through the 5 presets.
- Enter Menu system by pressing both buttons
- Sleep timer user changeable from 30 minutes - 3hrs in 15 minute increments. Default time easily changeable at compile time.
- An optional stand by mode with reduced temp/output power after no detection of load change for a certain amount of time if possible, user setable in 15 minute increments from 30min - 3 hrs defaults easily changeable at compile time
- Watchdog timer for firmware running.
- Unit must be able to operate properly if started from cold state and if already warmed up and is unplugged and plugged back in.

Application description:
The unit is a consumer electronic device that will be used in a hand held convection heater. This must be super safe and must have robust protection from every possible failure state that could cause runaway and meltdown so we appreciate any recommendations for safety features.
Normal heater operation is from 300F to 700F