

## Summary

- The HEX 2.0 electronic controls, in conjunction with the HEX 2.0 active-passive design, help prevent against any condensation
- The HEX 2.0 electronic controls prevent the heat pump from operating continuously
- The HEX 2.0 active-passive design does not allow CPU Cooler temperatures to drop below ambient temperature

## Introduction

Everyone has experienced the slow drip of water from their window air conditioner or the central unit in their house. This condensation of water happens when the heat pump unit cools the air several degrees below the ambient temperature outside (technically below the dew point). Since the Phononic HEX 2.0 has an active heat pump element – namely a thermoelectric or Peltier cooler – many customers may wonder if the condensation of water is a danger for their CPU or motherboard. The HEX 2.0 has two safeguards against condensation that remove this risk from customers systems: the electronic controls and the active-passive design of the cooler.

## Design Description

The electronic controls for the HEX 2.0, as well as the details of the active-passive design, are covered in companion documents to this, but we will provide enough details for both to understand how they remove the risk of condensation for this product. First, the electronic controls and firmware that are on-board the HEX 2.0 ensure that the heat pump is not always on. The controls sense the temperature of the baseplate nearest the CPU and only turn on the heat pump when certain temperatures are reached. Depending on the cooling profile selected (by use of the optional USB connection and HEX 2.0 dashboard application), the temperature thresholds for turning on the heat pump can be higher or lower. The *Insane* mode applies power to the heat pump as soon as the temperature rises a few degrees above room temperature in a typically environmentally controlled room, while *High Ambient* only activates the heat pump at a higher temperature threshold. This mode would be useful for those with no air conditioning or high humidity.

The active-passive design, shown in Figure 1, does not allow the CPU cooler to reach temperatures below ambient. Since the lower, *passive*, arm of the of the cooler (shown on the left side in Figure 1) has ambient air forced through it by the fan, if the heat pump attempted to lower the temperature below ambient, heat from the air itself would be pumped into the *passive* arm keeping the temperature from moving much below ambient. When the electronic controls are paired with the active-passive design, the risk of condensing water is essentially eliminated.

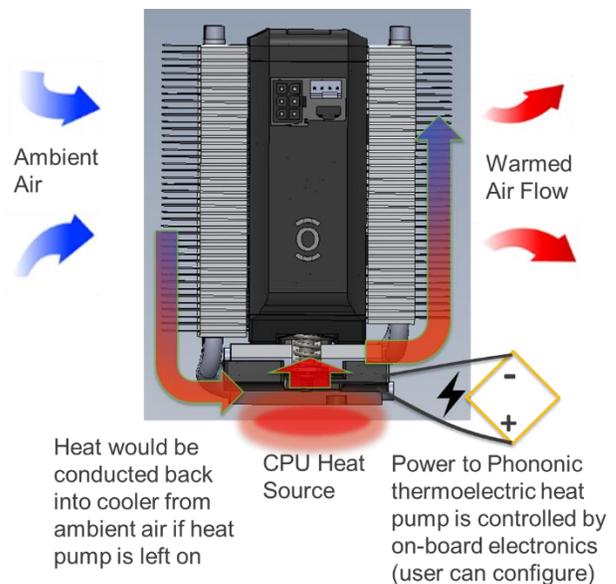


Figure 1 – In the HEX 2.0 Active-Passive design the pump cannot lower the temperature of the base below ambient as heat would flow back into base from ambient air.

## Conclusion

Phononic has strived to remove any possibility of water condensation for the HEX 2.0, but we are always looking for more information from users and the creative ways they build systems and the environments they work in. We invite you to contact us through customer care to provide feedback on your specific builds. You can check for firmware and software updates from the HEX 2.0 Dashboard – and you never know, we might add a cooling profile or make changes based on your feedback.