

## Summary

- Hex 2.0 is designed for easy and flexible installation. Intel hardware enables any of 4 orientations, AMD mounting hardware allows for 2 orientations
- Light weight design enables horizontal or vertical motherboard installs
- Phononic recommends orienting the Hex 2.0 with case airflow direction for optimum performance. However, the performance impact of changing cooler orientation based on interference with other hardware is 5% or less

## Introduction

Most realize that the orientation of the CPU cooler within their system is important for many factors. Foremost among them are usually geometric considerations for clearing memory DIMMs or other motherboard installations. Also important are performance effects of air flow and making sure case fans are aligned with CPU and GPU cooling fans for a uniform direction of air moving through the PC chassis. Of course, all these are important points of value and performance for the Phononic HEX 2.0, which will be detailed in the following article, as well as how the specific design of the HEX 2.0 brings even more consideration to orientation of the cooler in the PC.

## Design Description

The core value of the HEX 2.0 is the superior cooling performance when compared to other CPU coolers of similar or even larger size. In fact, the Hex 2.0 provides similar performance to all-in-one (AIO) liquid coolers, yet it can fit into small PC form factors such as mini-ITX. In addition to the small size of the HEX 2.0, the weight is also low enough (~810 grams) to allow both vertical and horizontal mounting. No stress or warping of the motherboard has been seen and the supplied back plates ensure the stability of the installation on motherboards without a built in plate. The HEX 2.0 was designed to take into account the keep out area defined by Intel (115x and 2011) and AMD (AM2+ and AM3+) sockets for maximum compatibility with motherboards, in particular to clear nearby memory DIMM locations. The base of the HEX 2.0 is 95mm x 95mm, which allows for this clearance. An additional benefit of the flexibility of the mounting hardware is that the cooler can be rotated to sit in any orientation for Intel sockets. For AMD sockets, the orientation is limited to 180° rotation of the HEX 2.0. This ability to rotate the cooler allows the PC builder to orient the cooler to maximize performance by aligning the CPU cooler air flow with the case air flow. If interference with RAM sticks or other components is not an issue, the user should mount the cooler where the direction of air flow enters through the passive heat exchanger and exits through the active heat exchanger. In this orientation, the coolest air is used to remove heat from the primary path when the thermoelectric heat pump is not activated, which is also the cooler heat exchanger when the thermoelectric heat pump is activated. So, to achieve maximum performance, install the Hex 2.0 fan according to the air flow direction arrows on the fan and cooler and install the cooler in the case so airflow direction matches the case airflow. Figure 1 shows the direction of air flow for the HEX 2.0 as explained above.

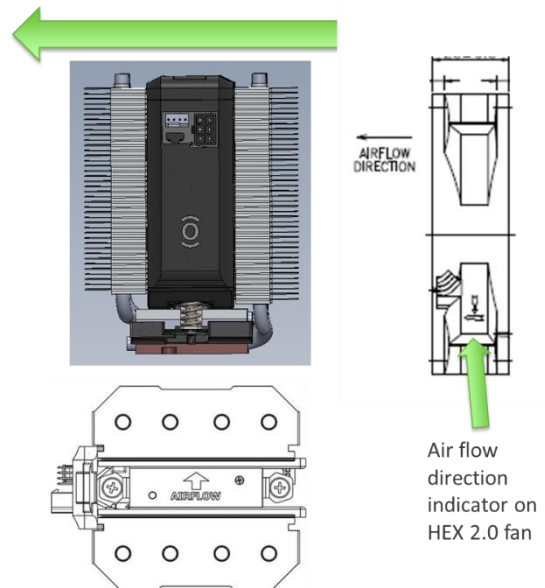
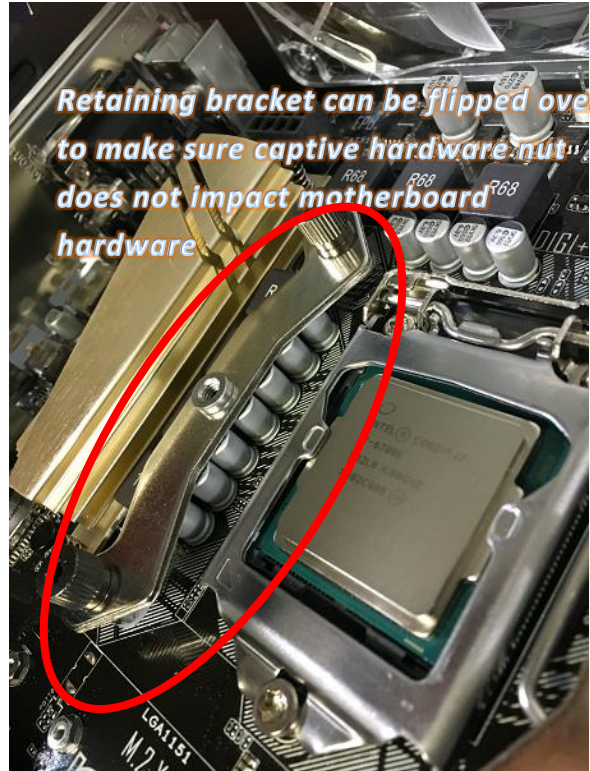


Figure 1 – HEX 2.0 orientation for air flow for maximum performance is shown in the upper left. Guides for aligning air flow are labeled on the HEX 2.0 and fan.

If the air flow is reversed inside the cooler, the performance drop is ~5% in testing at Phononic, but of course, much depends on case air flow and the environment and processor conditions. For further information on the active-passive design of the cooler, please see companion articles published on the Phononic website.

Air flow considerations can also be complicated by other factors in a PC build such as cable routing and aesthetics. The ability to rotate the HEX 2.0 allows for options to optimize the build for each user. If the CPU cooler must be oriented in such a way that the normal fan orientation within the cooler would be against the case flow, it is better to flip the fan around inside the HEX 2.0, although it would run counter to the markings at the base of the fan shroud (as shown in Figure 1). The fan airflow direction can be confirmed by finding the arrow indicators on the fan (as shown in Figure 1) or typically, the fan blows out on the face with the factory label. One aspect of the mounting which should be considered when rotating the unit are the retaining nuts on the brackets. On some motherboards, hardware such as capacitors can be close to the retaining hardware on the HEX 2.0 mounting brackets, as shown in Figure 2. The user can flip the bracket over to allow the retaining nut to be on the top of the bracket. We encourage the user to use the bracket in the intended orientation if at all possible (with the nut on the bottom of the bracket), but Figure 2 shows an acceptable alternative when certain interferences occur.



## Conclusion

We look forward to learning from you too. Since the Hex 2.0 has firmware that is upgradeable in just a few simple steps, your feedback will inform future firmware updates to enable greater control over cooling power and LED customization. So, please give us your feedback and we will work with you to give more options for your HEX 2.0.