

A Breath of Fresh Air: Active Cooling for Door Intercom Systems

Overheating of electronic components has been and still is a bottleneck for the performance of everyday devices such as phones, computers and gaming consoles. A door intercom is one of these devices and with the help of utilizing the airflow from fans, it is possible to reduce its working temperature by 10-11 °C and perhaps even further.

By: Aksel Hansen & Eric Berggren

When electronic devices are placed outside, the challenges of keeping the devices at proper working temperatures are great due to the impact of sunlight and harsh weather conditions. One example of a device facing these challenges is a door intercom system, which is a standalone voice communication system used mainly in buildings for access control, surveillance or to let residents communicate with visitors at the entrance. These devices contain components such as capacitors, displays, cameras, speakers, antennas, etc. They are in turn exposed to heat partly from the product's electronics but also from the surrounding environment in terms of sunlight and warm ambient air temperature, depending on its placement and geographical location. If improperly designed or placed in a high temperature environment, an intercom can overheat and stop working and certain components might even permanently break.

To address this problem, there are several techniques that can be used. There are passive cooling methods that do not require any external power source, which help transfer heat away from electronic components to the surrounding air. These methods are however limited in their performance, especially when surfaces of the device are heated by sunlight or if the ambient temperature reaches higher temperatures. Therefore, active cooling solutions which require external power were explored. One very popular and effective active cooling method is the use of fans to generate airflow that in turn cools the device, which is what was used in this project.

To make air cooling more efficient, it is necessary to make sure that as much of the generated airflow from the fans as possible is guided along the devices' surfaces. To ensure this, several prototypes were created that served as channels which restricted the path of the airflow. In the end, a final prototype was able to cool a reference intercom device by an average of 10-11 degrees Celsius. By cooling a device by this much, you could technically increase its allowed working temperatures by the same amount, which means that the device could be sold in markets previously unavailable due to being too warm. For other customers, it could also lead to an increased life span of the device because of the lower working temperatures of the components. The results from this project could also be used as a starting point when developing similar solutions for other electronic devices facing the same difficulties.

By further developing the air channels to be more effective and studying different fans and their position, the results of this project could be improved even further and greater temperature drops could be achieved. Other factors, such as cost, manufacturability and materials must however be considered if it were to be developed into a proper product, ready for the customers.