Surgical PC Design

Objective

Electronics for medical applications are often used in demanding environments – for example, the product must be completely sealed, have very low acoustic noise levels (i.e. no fans), and operate in high room temperatures. A PC with an integrated display, designed with these constraints for use in surgical applications, was found to overheat during its initial tests. ECS was asked to evaluate the performance of the present design and recommend modifications.

Methodology and Results

Thermal tests were conducted to understand the severity of the overheating. The data was also used to calibrate a thermal model of the unit. This model would then be used to simulate operation at the product's maximum temperature and elevation, and evaluate any necessary modifications.

Tests showed that critical components exceeded their thermal limits at room temperature, well short of the 40 C design goal. ECS was able to establish good correlation between the test results and the calibrated model, and then identified a number of simple changes that significantly improved the unit's cooling. By using aluminum for the chassis and other structural members, and applying thermally-conductive material between the heat sources and the aluminum, temperatures of critical components were reduced significantly. And it was projected that the surgical PC would meet its design goal if these changes were implemented.

Conclusion

Simple, effective, and easy to implement, the proposed modifications allowed the product to progress and ultimately come to market. This study also illustrates how conducting a thermal analysis at the project's outset can return significant benefits.