



AccuVein Vein Finder

CASE STUDY

Client: AccuView

Product: AV300 handheld vein finder

Project Overview:

AccuView presented us with a working prototype of their fascinating new medical device: a vein finder. Shine it on an arm and it provides an instantaneous, non-contact, real-time image projection of the vein's location below the skin surface. While other vein finders existed, none were as simple, portable or effective for those patients with small, deep or otherwise hard-to-find veins.

Hitting a Development Roadblock:

AccuView had reached a point in their development where performance inconsistencies from one prototype to the next was an obstacle. In addition, it was critical to managing both the visible and non-visible emitted laser light, which could pose a threat to someone's eyesight if a malfunction occurred, however unlikely.

Expert Engagement:

The time had come to introduce the rigors of a formal engineering development process. Thus, Benchmark Electronics' expertise was tapped to bridge the gap between a working concept and a viable, marketable product.

Working closely with AccuVein, Benchmark's product development process captured all of the system's parameters, enabling performance to become controlled and reproducible, providing a path for design optimization. The Benchmark product design team, engineering and manufacturing experts were a part of the process, ensuring smooth transitions from design to engineering to manufacturing to market.

Challenges and Solutions:

COMPLEX TECHNOLOGY

Benchmark identified four required performance quadrants:

- Reflection of ambient light
- Detection of veins via infrared laser
- Projection of the vein image with visible red laser
- Protection of the user and patient

Each quadrant could influence the other and had many parameters, adding complexity to the system's algorithms. Finding the "sweet spot" that met the needs of all four performance quadrants in order to achieve the optimum performance from the technology was a careful balancing act.

FORM AND FUNCTIONALITY

Usability — Various industrial design factors were explored, with emphasis on one-handed ease of use. Factors included:

- Range of user hand sizes, grip patterns and device control
- Device orientation and optimal distance from the skin
- Feedback sounds

Ruggedized — The handheld devices might be dropped, so it had to be sturdy enough to survive a drop and still work without any performance loss. This was accomplished by shock-mounting the entire optical system to isolate it from the outside housing.



MECHANICAL

Heat displacement — The device houses two lasers: one invisible light for detecting the blood, the other visible red light for “painting” the image onto the skin. Continuous operation testing parameters led to device over-heating. Open vents were ruled out for allowing heat to escape. The solution was to integrate a wrap-around metal heat sink that draws heat directly from the engine to the outside of the case. This was done in such a way to improve the overall look of the device while functionally providing the necessary thermal control.

PROGRAMMING

No less important was the system software/firmware. This work was done concurrently during the product's mechanical detail design. Some of the challenges overcome by the software team using CPLD (Complex Programmable Logic Device) hardware included the ability for field uploading microcode via USB, providing security to prevent the use of counterfeit batteries, and embedding user-selected, multiple-language support on the device.

FINAL STEPS

Toward the end of the design phase, the team moved the project through the Benchmark NPI (New Product Introduction) process and then smoothly transitioned into the manufacturing phase. Custom automated and manual test and assembly equipment were also developed and installed on the production line.



Benchmark Electronics
3000 Technology Drive
Angleton, TX 77515, USA

(979) 849-6550 www.bench.com

BEI-CS-0001 (08/2016)

© 2016 Benchmark Electronics, Inc. All rights reserved.