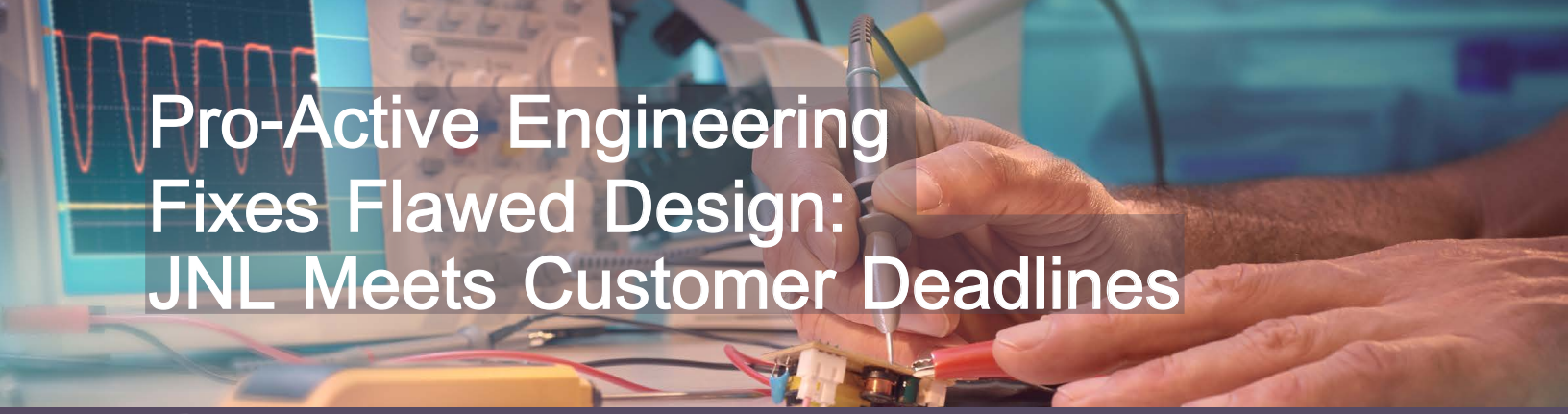


Pro-Active Engineering Fixes Flawed Design: JNL Meets Customer Deadlines

jnl TECHNOLOGIES
Advancing Senior Safety & Security

Case Study

About JNL Technologies

JNL is a leading provider of nurse call and resident monitoring technology in the senior housing marketplace. JNL has over 25 years of hands-on experience in aging, health care, nurse call, remote monitoring and wander management technology.

Location- Ixonia, Wisconsin
Industries Served-Medical, Senior Housing, Safety Devices
Size - 22 Full-time Employees

"Paul Schwanbeck and his team at Pro-Active Engineering bailed me out of a poor decision"

Jim Gleason, President of JNL

Executive Summary

When another electronic design firm left JNL with a defective design and customer obligations, JNL turned to Pro-Active Engineering to jumpstart the project, adjust the firmware, and tweak the design— getting the product to market on time.

About The Quantum Wanderer Monitoring Transmitter

The Wanderer Monitoring Transmitter is a medical wearable device the size of a smart wristwatch capable of monitoring the location of residents in a senior care facility. The Wanderer Monitoring Transmitter uses low-energy wireless technology to detect residents at monitored exits and alert medical professionals if a resident goes somewhere off limits.

The Challenge

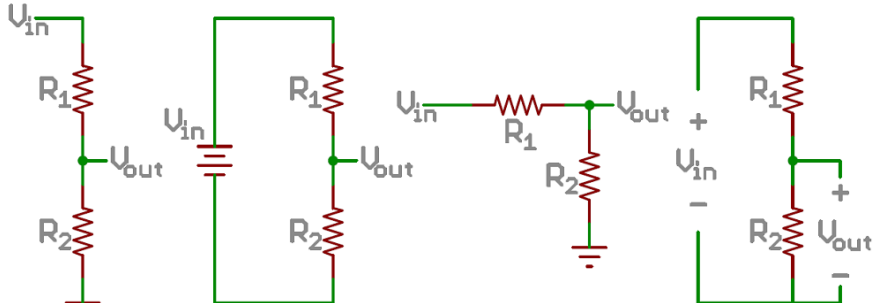
After doing new product development and prototyping with another engineering design firm, JNL ordered 25 units from Pro-Active Engineering, only to discover a critical design flaw. Thirty percent of JNL's newly developed Wanderer assemblies were non-functional. These units falsely communicated that their fully charged batteries were depleted or on low power, rendering them unusable. Internal testing at JNL had ruled out a short in the design or component failure. Frustrated with their design firm and fearing a costly redesign and lengthy delays, JNL reached out to Pro-Active Engineering to find a solution.

Not One, But Two Solutions

Paul Schwanbeck, VP of Operations at Pro-Active Engineering, organized a quick-response team to diagnose the problem. First, the team verified all major components were functioning properly; they investigated the microcontroller (the component that was reporting the low power). The microcontroller was receiving an inaccurate signal from the battery monitor circuit, causing a misreading of the battery voltage by roughly -.12 V. Since the Wanderer Monitoring Transmitter uses both Bluetooth Low Energy (BLE) and ultra-low energy technology the efficient nature of these technologies meant a -.12 V difference was enough to confuse the microcontroller into showing full batteries as empty. Pro-Active Engineering's in-house software developer quickly rewrote part of the firmware to build in .12 V of "padding" to correct the issue. Unfortunately, the source of this problem was multifaceted, and the firmware padding solution only solved the defect for some of the units.

"Often in the real world, there isn't one simple solution that solves everything —- electronics are complicated." Schwanbeck said. "Our partial solution only encouraged us to keep chipping away at the problem." After the team had ruled out component and software failure, the only possible culprit was the design itself. Pro-Active Engineering has more experience with energy efficient designs than many contract manufacturers, so they knew to perform a power consumption audit. During this audit, engineers noticed a potential design concern: a voltage divider with two 1% resistors. Based on their experience with voltage dividers, the quick-response team was concerned that the component tolerance of the resistors might be causing signal accuracy issues. Engineers had seen this phenomon before, the component tolerance of each resistor effectively decreases when it is placed in a voltage regulator circuit because a failure of one resistor compromises the whole circuit. The old proverb "A chain is only as strong as its weakest link" applies to this situation as each resistor is just another link in the chain, increasing the chance of failure.

An Example Voltage Divider



"Often in the real world, there isn't one simple solution that solves everything — electronics are complicated." Schwanbeck said. "Our partial solution only encouraged us to keep chipping away at the problem."

Paul Schwanbeck, VP of Operations

Results

After taking precise measurements of the battery, the battery control circuit, and the signal reaching the microcontroller, then comparing these measurements, a conclusion was reached. As suspected the voltage divider was compounding the failure rate of the resistors, thus generating an unreliable signal to the microcontroller and ultimately causing the false low battery warnings.

With the exact problem identified, engineers determined it could be fixed by either redesigning the entire board (eliminating the need for a voltage divider) or simply replacing the resistors with more precise ones and sidestepping the slow & costly redesign process. Pro-Active Engineering opted for the faster solution. Their engineers worked closely with supply chain management and sourced 0.1% resistors which increased the accuracy of the resistors by a factor of 10. This change only increased the cost of the assembly by pennies. With the improved resistors and firmware adjustments, the false low battery signal disappeared, and JNL was able to ship the units to customers on time.

Conclusion

After JNL's Wanderer Monitoring Transmitter was stalled because of a flawed design from another electronic design firm, the project was weeks behind schedule. Working closely with JNL Pro-Active Engineering worked through multiple problems and reworked the original 25 assemblies getting them fully functional and into the hands of waiting customers. "Paul Schwanbeck and his team at Pro-Active Engineering bailed me out of a poor decision" said Jim Gleason, President of JNL Technologies. JNL immediately ordered an additional 250 units to fulfill their next wave of orders and has committed to using Pro-Active Engineering for future electronic design projects.