

### Overview

A customer designing a new hazardous area computer system required all external connections to the host to be isolated in order to meet certification requirements. The single board computer used in the system provided the USB, RS-232, and RS-422 functionality needed by the customer, but these ports were not isolated. In a very short time frame, Sealevel designed a custom board that isolated these signals and routed them to the connectors mounted in the system enclosure via ribbon cables.

### Application Requirements

- ▶ Isolated communication signals:
  - ▶ USB 1.1
  - ▶ RS-232
  - ▶ RS-422
- ▶ 1000V isolation
- ▶ Maximum size - 1.5" W x 9.25" L x 1" H
- ▶ +5VDC power input

### The Sealevel Solution

A custom PCB was developed that inputs the non-isolated signals via header connectors. The signals pass through the appropriate isolation circuits on the board to output header connectors. The board is designed to fit mechanically into the space available in the customer's enclosure, and the isolated signals are brought out to USB and DB9 connectors on the enclosure's I/O panel via ribbon cables.

### Key Design Challenge:

#### Isolating the High-Speed USB Signal

USB 1.1 is a two-wire, half duplex (permits data transmission in both directions, but only in one direction at a time) communications standard that supports 12 Mbps data rates. In order to isolate the signal, the data must first be captured and then retransmitted. A CPLD (Complex Programmable Logic Device) was used along with high-speed digital isolators to implement the design. Correct USB timing is critical to avoid error conditions, so the isolation circuit was designed with strict attention to maintaining data integrity and compliance to the USB1.1 specification.

USB RS-232/RS-422 Isolation Board

