AVID TECHNOLOGIES, INC.

Engineering Samples – Industrial/Process Control Market

Project
Control Hardware

Application
Commercial Inkjet Printer

Customer Need

Mass marketing requires high-speed printing for customized printed materials and addressing. Multiple print heads are required along with strict timing based on material position. Ink jet print heads take serial bit streams containing the commands and data. PCs are used as the main print job driver; however, specialized hardware is needed to control the individual print heads. In this case, a PCI card was desired that would control up to four independent print heads. Each head is performing a different print job based on its location on the media transport system.

AVID's Solution

AVID started with the customer's system architecture and implemented a FPGA-based solution in a PCI card form factor. Due to high speed signals, careful attention was paid to board impedance, trace lengths and routing, and termination techniques to insure signal integrity. The FPGA implemented the critical timing of the signals, data buffers for print head data, and interfaced to a processor used for overhead control. Diagnostics were included to assist with system troubleshooting. AVID used simulation to verify the VHDL implementation as well as performed verification testing on prototype hardware.

Value Added or Technologies Applied

- System Architecture Review / Planning
- Hardware Redesign / New PCB Layout
- VHDL Development / Simulation / Verification
- Prototyping and Validation
- Management of an Engineering Build for Software Development and Field Trials
- Manufacturing Engineering Support for Full Production

Project
Control Electronics

Application
Down-Hole Drilling System

Customer Need

Our customer acquired Intellectual Property relating to techniques to detect the earth content, looking for oil and gas pockets. The drill head uses this information to determine the direction of the drill head, and other aspects important for well development. This application is brutal to the electronics in terms of heat and vibration. Reliable packaging was critical to the project. Additionally, RF technology is included in the techniques and required accurate low frequency transmitters and receivers for the sent and reflected waveforms. A communications interface with surface instruments is part of the down-hole system.

AVID's Solution

The design included custom RF design along with microprocessor control and an FPGA implementation. Power conversion stability and efficiency were required for proper operation. Special consideration was made for the PCB implementation to help insure parts would stay on the boards. Correction factors and other techniques were used to insure the accuracy of the RF signals. Multiple boards were required as the physical constraints dictated long and skinny outlines. This required careful system partitioning. The boards were encased in silicone rubber for protection and resistance from the elements.

Value Added or Technologies Applied

- System Architecture / Component Selection / Partitioning
- Hardware Design and Implementation, FPGA Code
- Prototype and Validation
- Production of Multiple Systems for Testing and Field Trials
- Manufacturing Engineering Support; Production Test Procedure

AVID TECHNOLOGIES, INC.

Engineering Samples – Industrial/Process Control Market

Project
Control System Electronics

Application
Nuclear Power Plant

Customer Need

Nuclear power plants are controlled by the NRC and have strict requirements for the control instrumentation and any changes to it. The life of these systems outlasts the availability of replacement components. Our customer was faced with system obsolescence and required form, fit, and functional replacements of eight different logic boards that were built with outdated technology. All new designs require extensive review and test prior to any possible commissioning. All design work must follow documented procedures and result in a complete design package.

AVID's Solution

AVID implemented the control logic which was previously done with basic gates and 15V logic, in a CPLD device with discrete transistors to interface and drive the higher voltage at the I/O connector. Additionally, AVID invented a proprietary real-time diagnostic feature that performs a continuous health check on the board and reports any electronic failures. This check is performed by a separate CPLD and offers to eliminate the requirement for periodic manual testing of boards by instrument technicians, which requires the boards be removed from an operating system to run the test. AVID also designed suitcase encased board testers which allowed field technicians and production personnel to completely test a board for proper operation.

Value Added or Technologies Applied

- Hardware and CPLD Architecture, Continuous Self Test
- Hardware and CPLD Design
- Design and Production Documentation
- Prototype and Validation, Test Result Reports
- Portable Tester Development and Documentation, Test Procedures
- Engineering Build of Qualification Units
- Manufacturing Support

Project
HART-Enabled Interfaces

Application
Industrial Communication Devices

Customer Need

The HART industrial communication protocol is the most prevalent digital communications interface used today for smart transmitters and actuator devices. This digital communications allows plant operators to retrieve additional information from the field devices for maintenance, asset management, diagnostics, and normal process monitoring. Plant personnel have the need for portable devices that communicate via HART. Additionally, many older plants cannot take advantage of smart transmitters and field actuators as the control systems are not HART-enabled. These interface devices allow plant personnel access to this enhanced data.

AVID's Solution

AVID has helped our client become the standard HART interface against which all other HART devices are measured. Using a highly customized discrete solution for the HART front end with an advanced ASIC for the protocol has allowed our customer to deliver HART interfaces with serial, USB, and Bluetooth connection to laptops and PDAs. Participating in the HART standard's committees has allowed us to not only develop products, but also contribute to the standard and compliance requirements. More recent development has been in the Wireless HART area where we have participated in the draft standard. We have completed a Wireless HART adaptor design which allows existing HART devices to communicate over the new wireless HART network. Innovations in low power design and power management have resulted in a loop powered device with 1V insertion loss. Additionally, the product has been designed for compliance with hazardous location requirements. The housing provides for mounting to the spare port of a smart device.

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AVID TECHNOLOGIES, INC.

Engineering Samples – Industrial/Process Control Market

Project
HART-Enabled Interfaces

Application
Industrial Communication Devices

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Value Added or Technologies Applied

- Participation in the Wireless HART Standards Committee and Working Groups
- Product Specification
- Product Packaging and Device Interface. Material Selections Compliant with Standards
- Hardware, Firmware, and Mechanical Design and Documentation. Advanced Antenna Design
- Prototype and Validation
- PC Application and Device Drivers
- Engineering Build for Agency Test and Field Trials
- FM, ATEX Submittal and Support
- Production Test System Development
- Manufacturing Support

Project
Automated Production Tester

Application
Spark Plug Production Line

Customer Need

A production tester of spark plugs which can be programmed for over 100 different product models and interfaces to a PLC used to control the production line. Both PLC feedback and visual pass-fail indication was required.

AVID's Solution

The primarily pass-fail measurement for spark plugs is impedance. This measurement is made by firing a high voltage across the plug, measuring instantaneous voltage and current, and calculating the impedance. This impedance is compared to an acceptance range defined by the model. AVID created a tester which develops 1000VDC and provides all required isolated measurement circuitry. A user interface with LED and LCD displays was designed for monitoring the tester operation and results, configuration and setup, and tester calibration with common bench instruments. A serial protocol was implemented which triggers the test start from the PLC and provides the test results back to use for product binning.

Value Added or Technologies Applied

- Hardware, Firmware Design
- Mechanical Packaging
- Prototype and Validation
- Production Test and Periodic Calibration Procedures, Fixtures
- Tester Production and Life Cycle Support

AVID TECHNOLOGIES, INC.

Engineering Samples – Industrial/Process Control Market

Project
Distributed Temperature Control System

Application
Production Process Control

Customer Need

Our customer supplied custom designed and thermal blankets which were fitted to piping in process plants. Previous installations by our customer required a central temperature controller with home run wiring to connect RTDs and AC controls to thermal blankets used to maintain process pipe at required temperatures. The goal was to develop a low cost distributed system that performed stand-alone control and eliminated long wiring. User installation and setup needed to be simple.

AVID's Solution

AVID developed a single channel temperature controller which provides ON/OFF AC control to the thermal blankets. Since AC is needed at the blanket anyway, a short pig-tail wire was all that is required. A separate short connection to a local RTD connects via pre-wired connector. The controllers are designed to daisy-chain from a single User Interface Panel. Device addressing is automatic. A common off-the-shelf CAT5 cable provides power and communications to the chain. Up to 40 controllers can be chained together. The User Interface allows setup of a multi-zone system, monitors the system operation and alarms, and provides the ability to interface to a computer for data logging or other database functions.

Value Added or Technologies Applied

- System Specification / System Architecture
- Hardware and Firmware Design for Local Controllers and User Interface
- Industrial Design and Mechanical Packaging
- Prototype and Validation
- Production Test System Development
- Manufacturing Support and Product Life Cycle Management

Project
Optical Inspection System

Application
Bottle Production

Customer Need

An optical inspection system that quickly identifies product flaws on a high-speed production line. Our customer developed proprietary techniques to detect these flaws by using the reflected light intensity. The final system required tightly packaged electronics for the optical source and the detector, which could accurately and reliably sense these variations in the reflected light intensity. Customer Intellectual Property implemented in a FPGA was to be incorporated in the design.

AVID's Solution

Maintaining a consistent light source was crucial to the proper detection of these flaws. This involved tight regulation of the LED current using closed loop PWM control techniques. As several light sources from different directions were used, any single LED needed ON/OFF control based on system timing. The optical sensing circuit required special care during the component selection and the PCB layout phases to minimize the system noise while still achieving the required amplification and bandwidth required by the high-speed system. The system packaging required the design to be implemented on several small boards, which interfaced together to complete the assembly. Proper partitioning was critical in order to keep the low level signals localized and away from noise sources. Careful layout along with simulations, analysis and refinement of the analog circuitry was required to achieve the system performance objectives.

Value Added or Technologies Applied

- Part Selection / System Partitioning
- Hardware and Firmware Design
- Prototype and Validation
- Engineering Build for Evaluation and Field Trials
- Low-Volume Initial Production
- Prototype and Validation
- Production Test System Development
- Manufacturing Support and Product Life Cycle Management