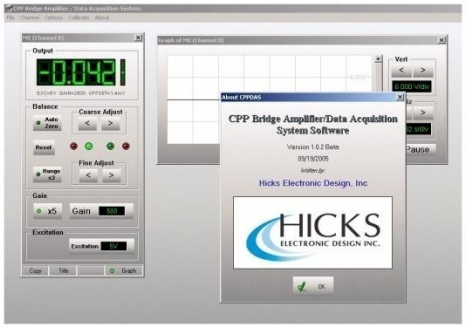
Hicks Electronic Design, Inc Qualifications, Capabilities and Past Performance

HED Qualifications

- HED has been in business since 1998.
- Over 50 years of combined design experience.
- HED has designed dozens of embedded and PC based devices:
    - Military equipment
    - Medical equipment
    - Scientific instruments
- HED specializes in real-time control and monitoring, data aqcuisition, hardware/software interfacing, and graphical user interfaces.
- HED has a proven track record of successfully completing projects on-time and in-budget.


CPP
Bridge Amplifier / Data Acquisition System


CPP Bridge Amplifier/Data Acquisition System Software
Hicks Electronic Design, Inc
HICKS
ELECTRONIC DESIGN INC.


LS67000
S/N 001
HEAT EXCHANGER MONITOR


GPS Timing
Cellular Network
Rack-mount unit
FM Wireless
AP30 Reference Unit
AP30 Field Unit
AP30 Hotstick Unit


Read
Records
Setup
A
C
B
Waiting for Hotstick...
Record
10
A : 0°
HED STATION #1
Phase Shift: 0°
Jul 11,2012 10:46:58 PM
40° 16' 40.92"N
105° 21' 35.64"W
HED STATION #1
0°


Uroflow 4
Uroflow 3
Uroflow 2
Uroflow 1
NovaFlo Station
Urolab System 6
Network Server

HED Principals

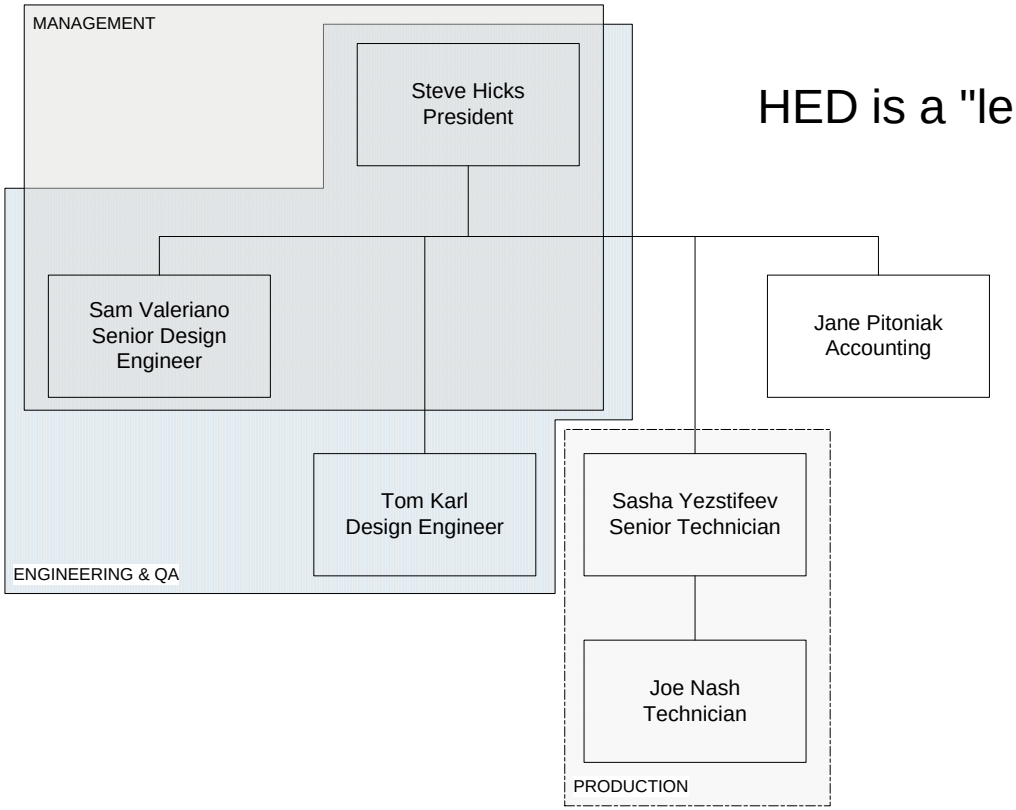
Steve Hicks, President and Owner

- B.S.E.E. The Ohio State University
- Worked as a design engineer for Motorola, Inc (now General Dynamics) in Scottsdale, AZ
    - Held DoD Top Secret, EBI clearances
- Founded Hicks Electronic Design, Inc. in 1998.

Sam Valeriano, Senior Design Engineer

- B.S.E.E./B.S.C.S. University of Pittsburgh, *Summa Cum Laude*
- Worked as a design engineer for Lockheed Missiles & Space Company (now Lockheed-Martin) in Sunnyvale, CA.
    - Held DoD Top Secret, COMSEC, EBI clearances
- Joined Hicks Electronic Design, Inc. in 2003.

HED Organization Chart

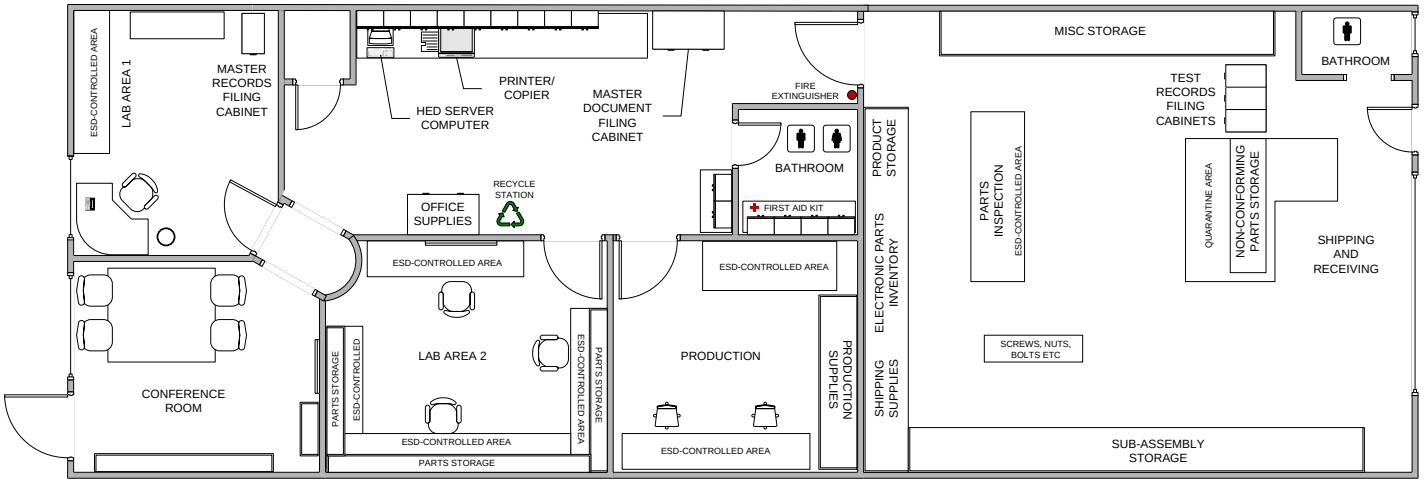


HED is a "lean-and-mean" organization:

- Low overhead costs
- Quick turn-around
- Highly efficient
- Minimal bureaucracy

HED Facilities

HED operates from a 1,600 square foot facility in beautiful Fort Collins, Colorado



HED Capabilities

Hicks Electronic Design offers a broad range of quality engineering services:

- Electronic Product Development
- Original Design
- Upgrades & Redesign
- Simulation & Testing
- PCB Layout
- Complete Turnkey Manufacturing
- Custom Windows, Linux, Apple and Android Software
- µP and DSP Hardware and Firmware
- Gate Array Design
- Analog and Digital Hardware
- Enclosure Design and Packaging
- Industry Certification Testing

HED Capabilities (cont)

System Design

HED evaluates customer needs and can recommend system design approaches using commercial off-the-shelf (COTS) products and/or custom designs to maximize performance and maintainability and minimize complexity and cost.

Custom Design

We have extensive experience designing custom analog and digital electronic systems.

Integration

HED is well versed in the art of integrating COTS equipment with custom circuitry and software.

HED Capabilities (cont)

Digital Circuit Design

HED has designed with virtually every family of microprocessors and microcontrollers:

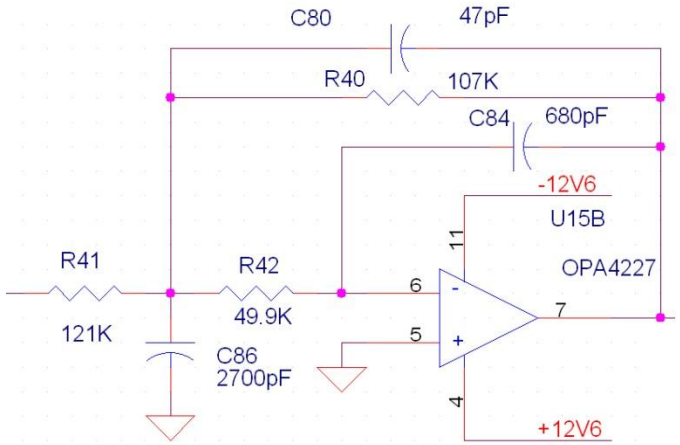
- Motorola/Freescale processors
- ARM processors
- Intel processors
- Texas Instruments DSP families
- Microchip (PIC)
- Atmel microcontrollers
- Cypress microcontrollers
- Rabbit microcontrollers

We have extensive experience with all manner of programmable logic devices from simple CPLDs to complex Field Programmable Gate Arrays (FPGAs).

HED has intimate knowledge of a wide range of digital communication protocols:

- RS232/RS422/RS485
- Ethernet and TCP/IP
- 802.11 wireless
- Bluetooth
- Zigbee
- Infrared
- RC Remote Control
- RFID
- SDLC/HDLC
- GPIB/IEE488
- USB

HED Capabilities (cont)



Analog Circuit Design

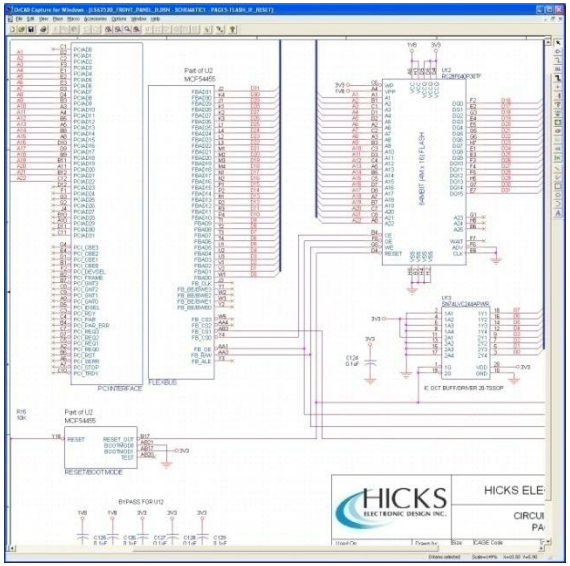
HED specializes in the design of high-precision, low-noise analog circuits:

- Sensor interfacing
- Waveform capture
- Closed-loop control systems

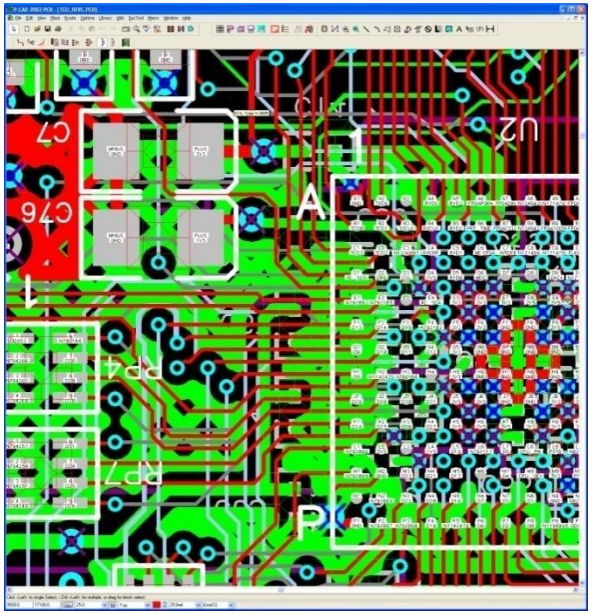
We have mastered the arts of data acquisition to bring real-world signals under the control of the digital domain:

- Analog filter design
- A/D Converter interfacing
- Digital noise reduction techniques
- Digital filter design
- Calibration
- D/A converter interfacing
- PID closed-loop control algorithms

HED Capabilities (cont)



We are experts at all facets of electronic circuit design, from parts evaluation and selection to schematic capture and printed circuit board layout.



HED uses nationally recognized ISO certified vendors for PCB fabrication and circuit card assembly.

HED Capabilities (cont)

HED follows best design practices and conforms to military standard design guidelines whenever possible:

- MIL-HDBK-454
- MIL-HDBK-338B
- MIL-E-5400T
- MIL-STD-1378E

We pay special attention to design for low Electromagnetic Emissions Interference (EMI) and RF Susceptibility.

- HED designs have successfully passed FCC emissions testing.

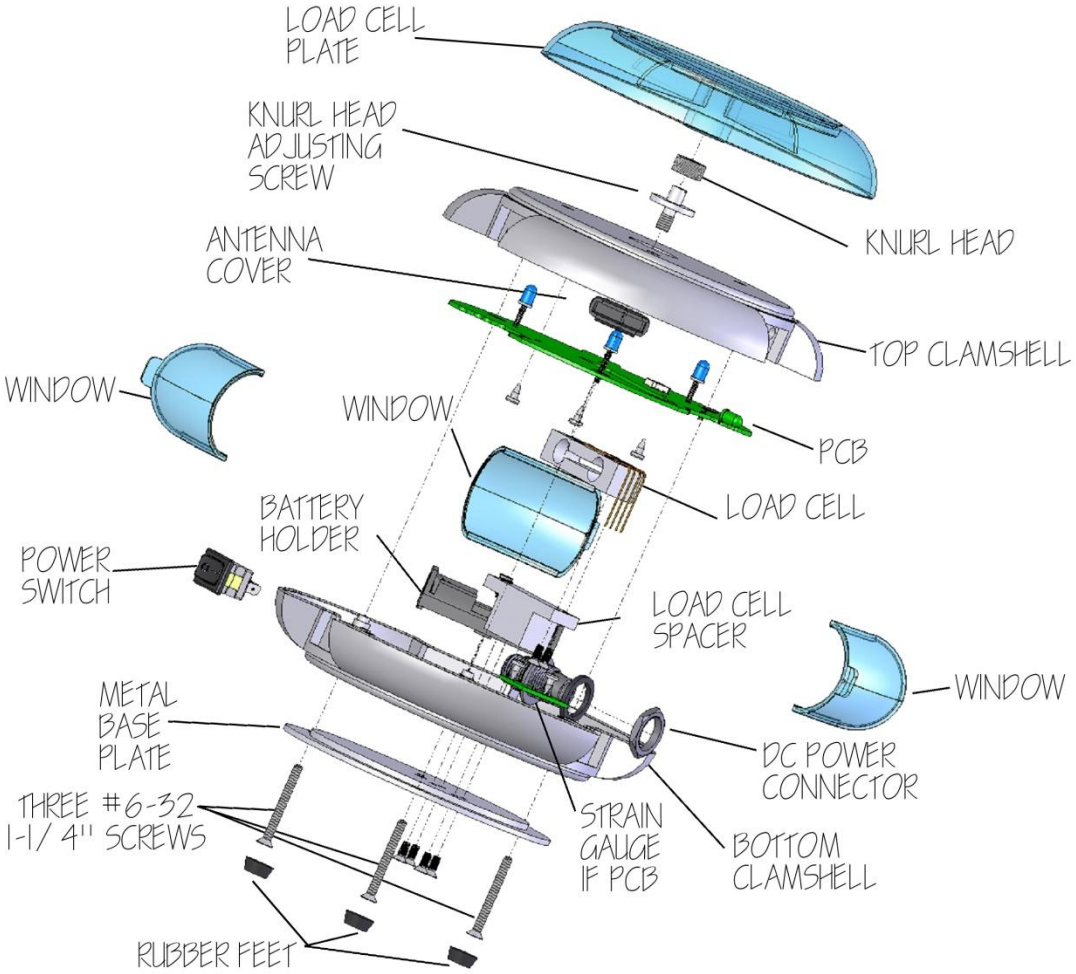
Hicks Electronic Design has implemented a Quality Management System (QMS) that is compliant to ISO 9001:2008.

HED Capabilities (cont)

Mechanical Design

HED can design product enclosures and other mechanical structures from simple rack-mount enclosures to complex injection-molded plastic parts.

Our mechanical designs have successfully passed stringent shock and vibration requirements.



HED Capabilities (cont)

Software and Firmware Design

Hicks Electronic Design's software and firmware design capabilities are unmatched, from hand-optimized under-the-hood controller firmware to complex yet intuitive user interfaces on a PC screen or tablet.

HED is fluent in 'C', C++, Java, Pascal, FORTRAN, BASIC and various assembly languages.

We have developed code on most major platforms including Windows, Linux, Mac OS X, Android, VxWorks, and countless embedded systems.

HED Capabilities (cont)

HED has developed a rich library of graphical user interface components:

- components work well on Windows, Linux and Apple platforms.

- library is based on Nokia Qt, the cross-platform application development framework used for the development of GUI programs.

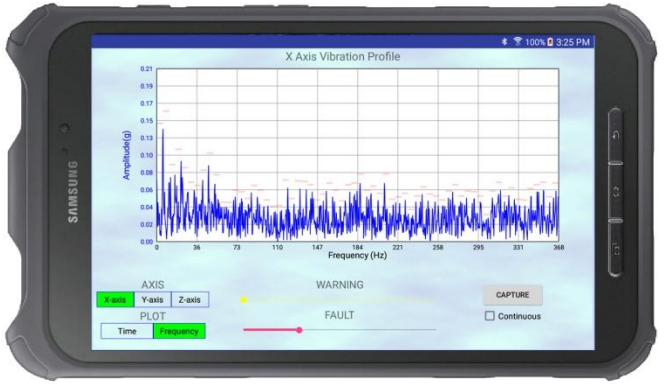
    - Qt is used in Opera, Google Earth, Skype, and Photoshop Elements along with thousands of other applications.

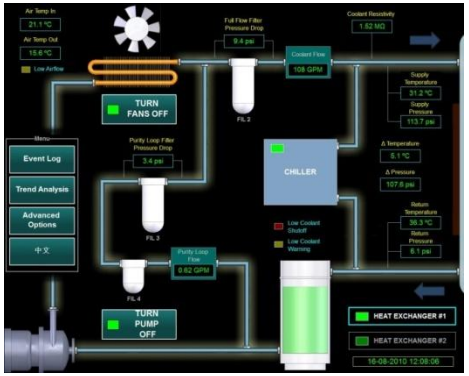
- HED has written over 180,000 field-tested lines of graphical user interface code.

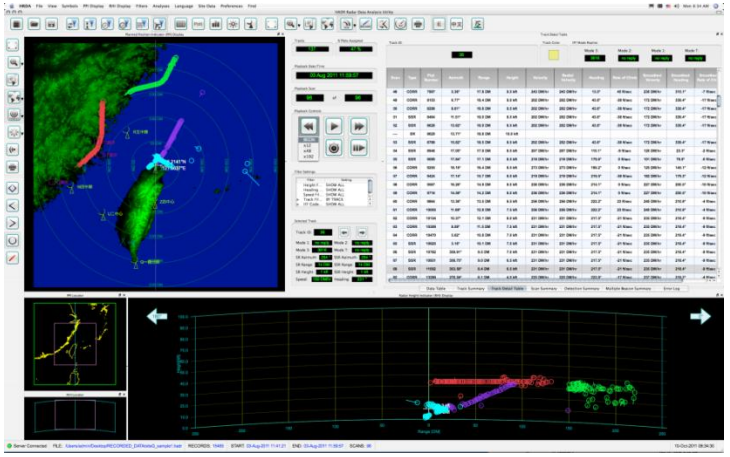
    - Large re-usable code base speeds development time, ensures that project will be completed on schedule.

HED Capabilities (cont)

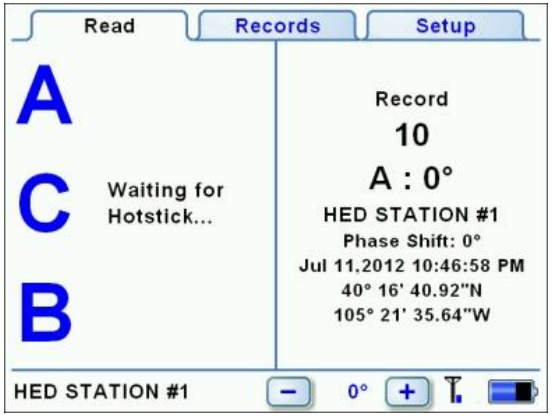
HED designs attractive and intuitive graphical user interfaces.

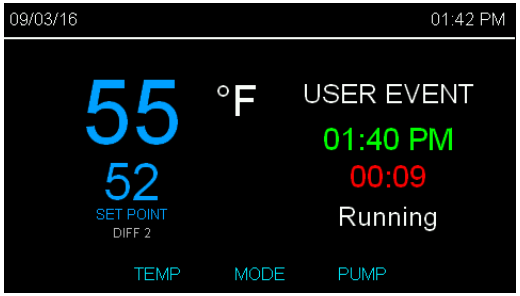


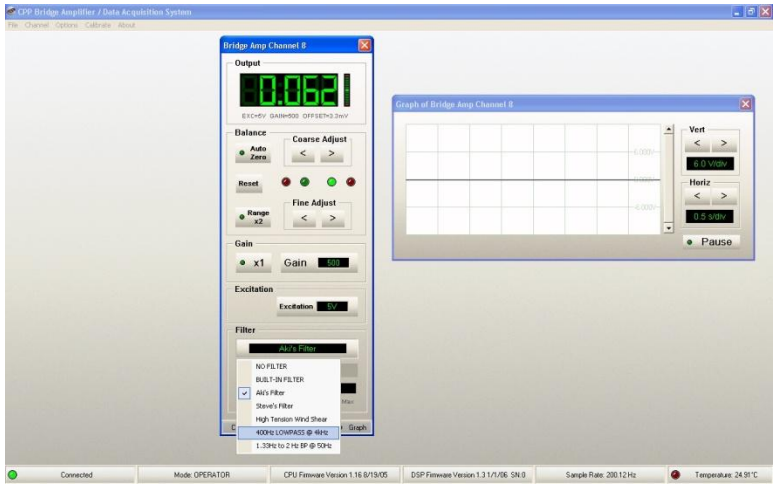




HED Capabilities (cont)



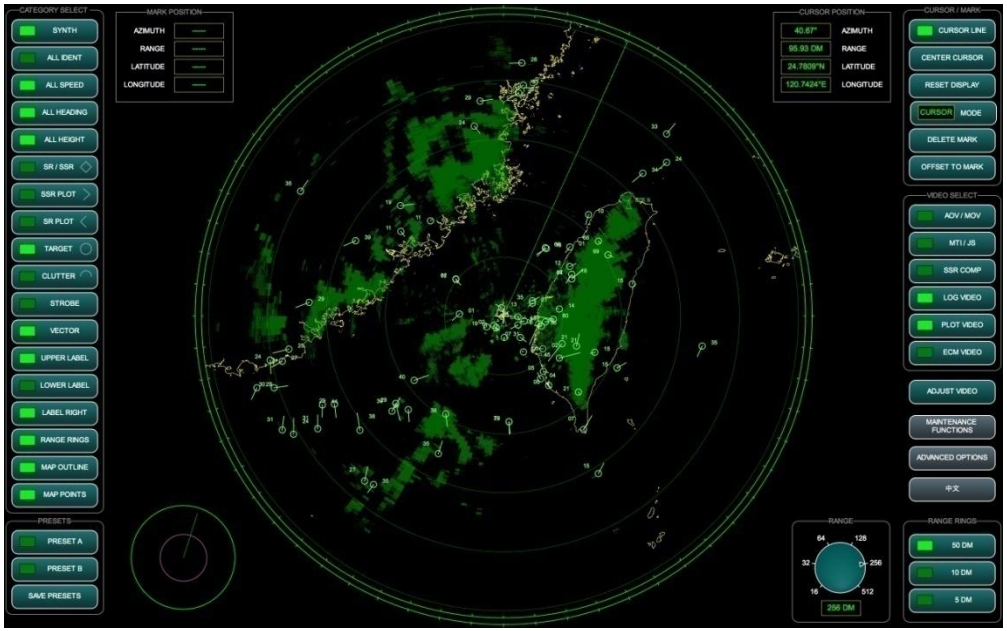


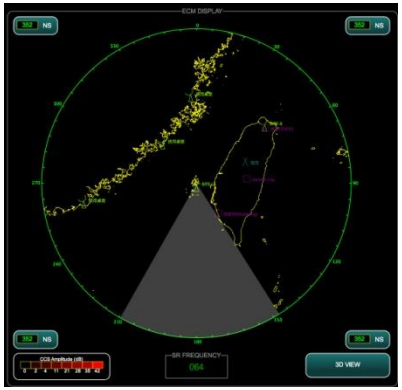


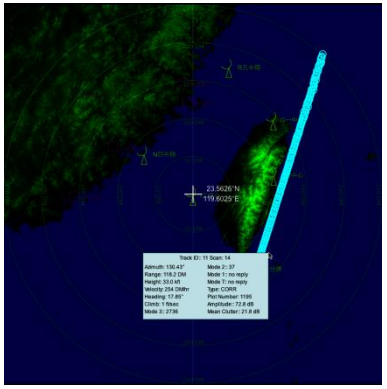
HED Capabilities (cont)

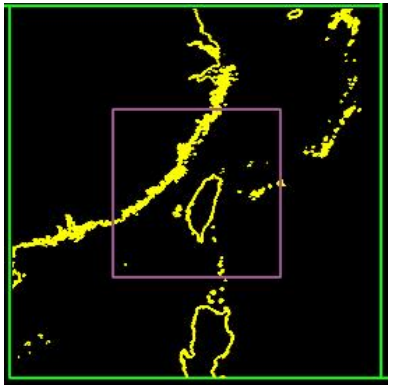
HED knows how to achieve the performance necessary for real-time display of video and synthetic data for radar consoles.

HED has a versatile re-usable library of graphic functions for displaying maps, annotations, symbols, video, sweep line and graphic overlays.









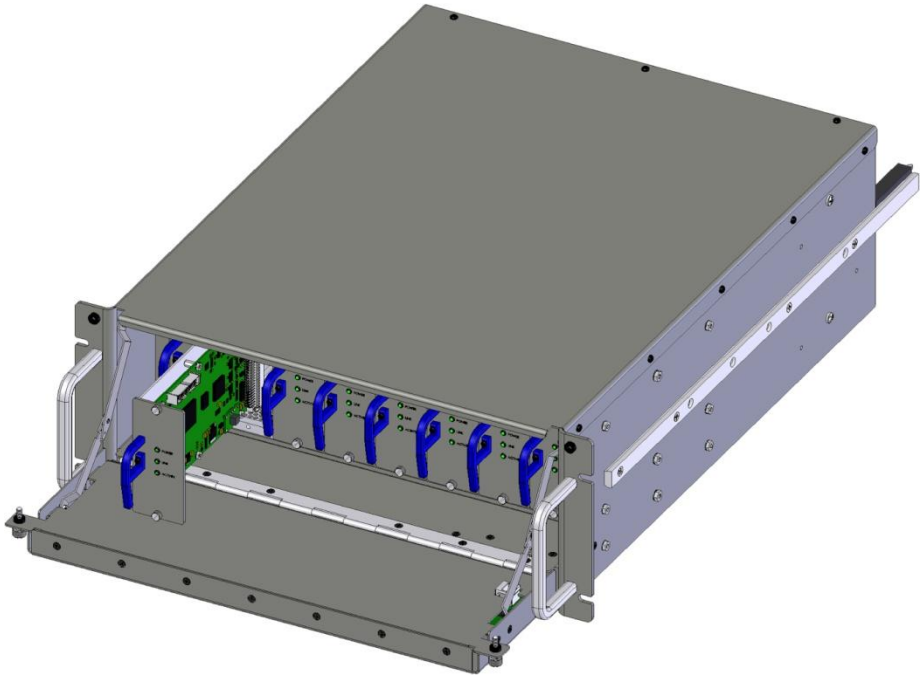
HED Past Performance

Power Amplifier Control Unit

HED designed, built and delivered four rack mounted units, each to control up to 8 ship-board Thales Power Amplifiers for United States Space and Naval Warfare Systems Command (SPAWAR).

This work was performed as a subcontract to General Dynamics C4 Systems.

The design required the development of a ten-layer custom circuit board based on the Coldfire processor and using Xilinx Field Programmable Gate Arrays (FPGAs), along with a custom card cage and enclosure with a fold-down front panel.



HED performed all electronic circuit design, PCB layout, and mechanical design for the PACU, in addition to writing and debugging over 5,000 lines of ‘C’ code.

HED Past Performance (cont)

TPS-75 Transmitter Control Unit

HED designed, built, and tested a custom Transmitter Control Unit to monitor and control the transmitter subsystems for the AN/TPS-75 Solid State Modulator Transmitter Upgrade.

The TCU is built into the door of the transmitter compartment and performs real-time analyses for each radar pulse, digitizing and analyzing the waveforms for critical signals in the transmitter, and inhibiting operation of the radar in the event of a fault. A microprocessor-based manual control panel provides back-up control in the event of the failure of the computer touch-screen.

The project involved the design of custom CCAs, control firmware, and a graphical user interface on a Linux platform, as well as the mechanical design of the door assembly.

This work was performed as a subcontract to Raytheon Technical Services Company.

HED Past Performance (cont)

Taiwan HADR Transmitter Control Unit

HED designed, built, and tested a custom Transmitter Control Unit to the monitor and control the transmitter subsystems for the Taiwan Hughes Air Defense Radar (HADR).

The TCU performs real-time analyses for each radar pulse, digitizing and analyzing the waveforms for critical signals in the transmitter, and inhibiting operation of the radar in the event of a fault.

The project involved the design of custom digital signal processing boards, control firmware, and an easy to use graphical user interface.

This work was performed under subcontract to Raytheon Technical Services Company.

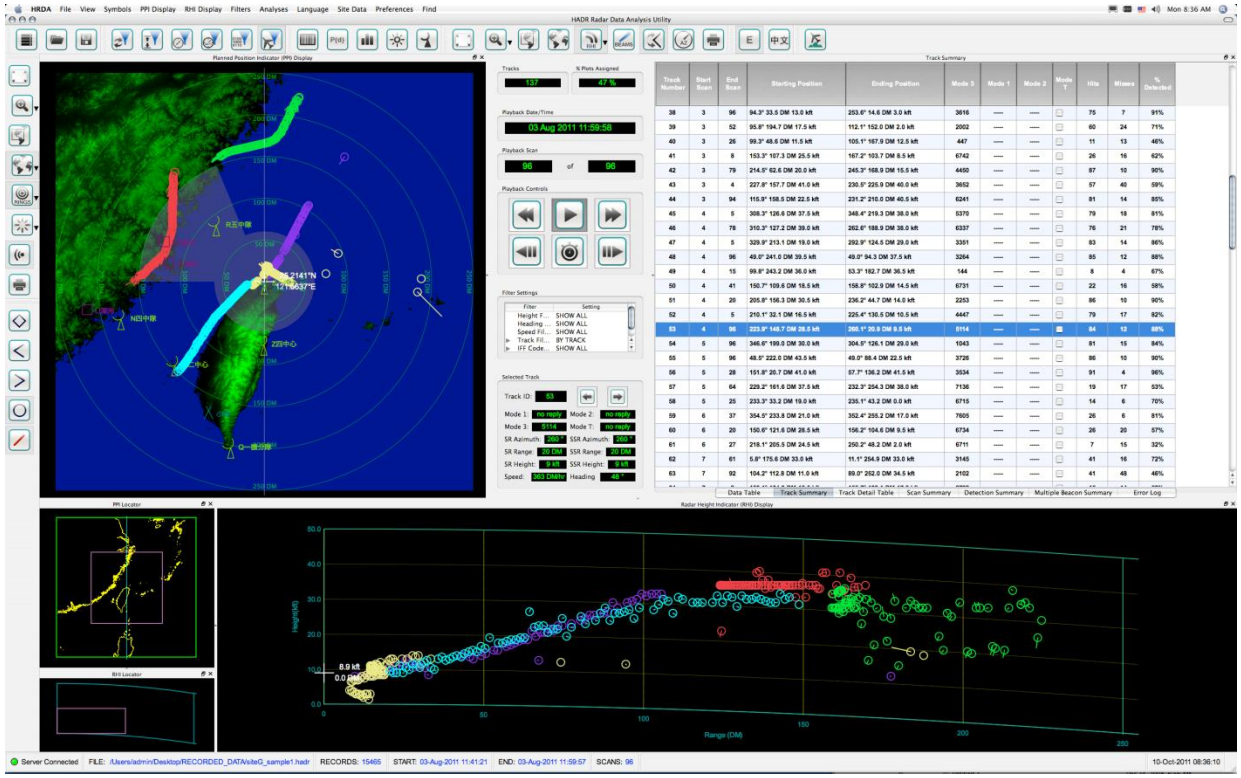
HED Past Performance (cont)

Taiwan HADR Console Replacement

HED designed and fielded a replacement console for the Taiwan Hughes Air Defense Radar (HADR). The designed involved digitizing and synchronizing video and antenna positioning information to provide a real-time situation display with actual and synthetic video. HED wrote over 80,000 lines of code for the console project. The console has been in continuous operation since 2007 at two sites without any major problems.

This work was performed under subcontract to Raytheon Technical Services Company

HED Past Performance (cont)

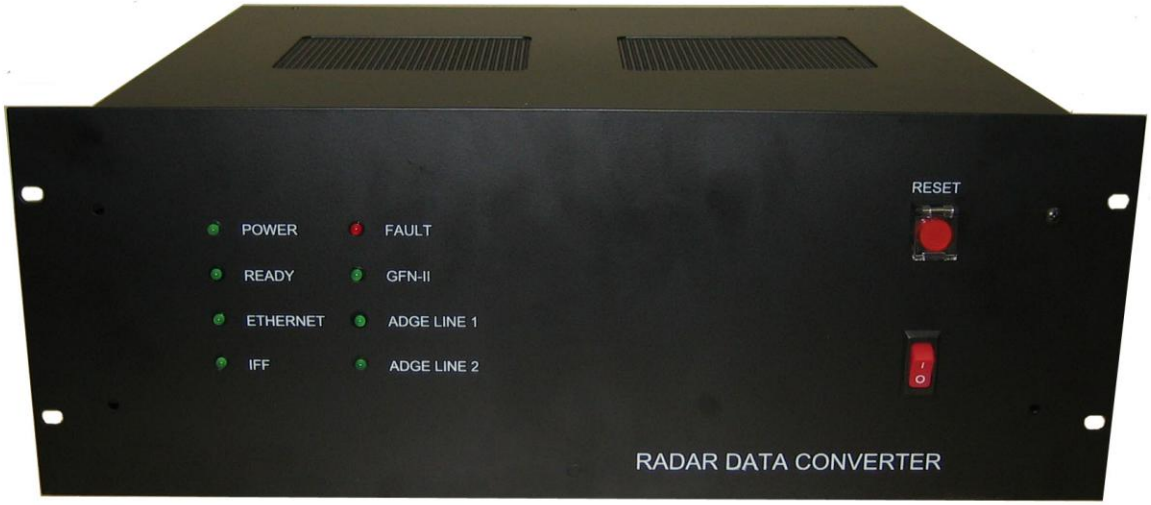


Radar Data Analysis Software

This software package performs aircraft tracking and statistical analyses on radar target data collected by the Hughes Air Defense Radar (HADR). The software accesses the database of target reports generated by the radar. A sophisticated tracking algorithm converts raw target reports into aircraft tracks which are analyzed to calculate hit/miss ratios and probabilities of detection for the radar. Range, height, and azimuth errors are calculated and used to align the radar and improve performance. The software was written in C++ for both the MacOS and Windows platforms.

This work was performed under subcontract to Raytheon Technical Services Company

HED Past Performance (cont)



Taiwan HADR Radar Data Converter

HED designed this embedded controller to replace a PC based device that converts radar target reports in GFN-II format to DDL format, and to interface with the radar's Identification-Friend-or-Foe (IFF) system.

The RDC has been in continuous 24/7 operation at two sites without incident since 2007.

This work was performed under subcontract to Raytheon Technical Services Company

HED Past Performance (cont)

Taiwan HADR Heat Exchanger Monitor

HED designed an embedded controller with a Linux PC to monitor and control two heat exchangers in the radar system. The heat exchanger monitor samples sensor readings of flow, pressure, temperature and coolant resistivity at various locations in the cooling system and and inhibits operation of the radar in the event of a fault reading.

A touch-screen GUI enables the user to view the status of the cooling system and to control the operations of the pump, fan and chiller.

This work was performed under subcontract to Raytheon Technical Services Company

HED Past Performance (cont)

Taiwan HADR Antenna Monitor

The Antenna Monitor added comprehensive remote monitoring of subsystems inside of the HADR antenna. Temperature, pressure, and flow rate sensors were added to monitor status of the antenna cooling system. Programmable fault limits prevent operation in the event of a cooling system failure, and time trending is used to detect degradation of performance and trigger preventative maintenance. A vibration monitor predicts mechanical failures in the coolant pump and heat exchanger fan to allow for preventative maintenance and reduced down time.

A companion Android application allows users to monitor the status of the antenna using a tablet device via a Bluetooth interface.

This work was performed under subcontract to Raytheon Technical Services Company

HED Past Performance (cont)

Industrial Controller for the Wine Industry

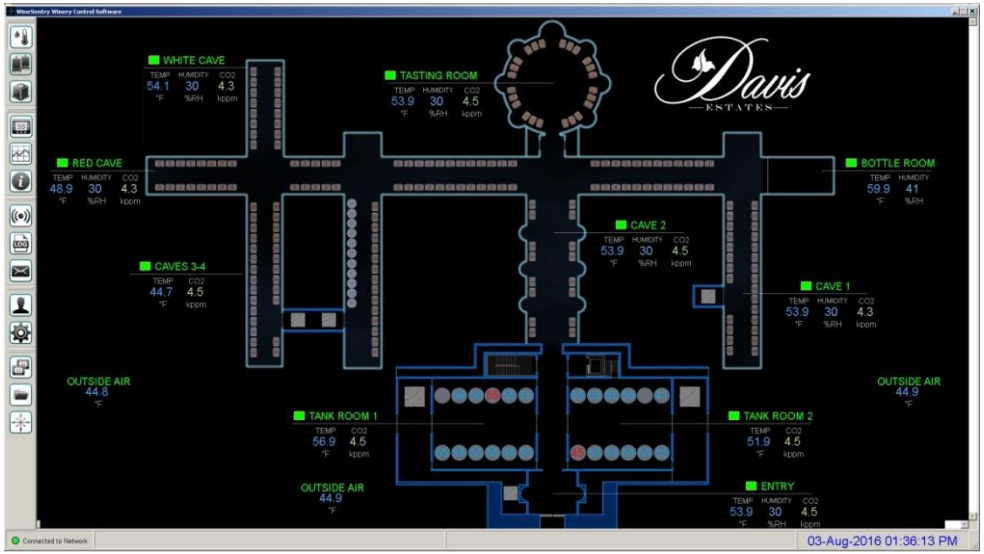
The Gen II Super Control is a user programmable industrial controller targeted to the wine industry. It is used to control the temperature of wine in fermentation tanks as well as temperature, humidity, and CO_2 levels in the areas where the wine is aged in barrels. The controller can accommodate a variety of temperature, humidity, and CO_2 sensors and provides on-off control to switch fans, pumps, humidifiers, heaters and valves. Up to five input sensors and five outputs are provided.

The control is housed in a water-proof enclosure and features a color graphics display and a non-contact capacitive sense keypad. The design uses the PIC24FJ256 processor for display control and user interface, a Cypress CY8C21434 to implement the capacitive sense keypad, and a PIC24FJ128 processor for the control algorithms.

HED designed this product and has manufactured it in large quantities. This work was performed for Refrigeration Technology Inc of Napa, CA. The controller is in use at a number of wineries in Napa and around the world.

HED Past Performance (cont)

Winery Control Software



Talking in real-time to all industrial controls over a Modbus interface, this software allows for master control of all tanks and climate zones in the winery. The software collects and stores all process data, logs events, and monitors alarms.

Users can be notified of alarms via text message or email, and the software serves up dynamic web pages for remote access from any smart phone or tablet device.

The software was designed for Refrigeration Technology Inc of Napa, CA and is currently in use in a number of wineries in the Napa Valley area.

HED Past Performance (cont)

Wind Pressure Monitoring System

HED designed this system to measure the stress on solar panels subjected to high wind environments. Each panel features a Power-Over-Ethernet (PoE) controller that interfaces to 10 differential pressure sensors and samples each at a rate up to 50Hz. The measurements are packetized and streamed to a National Instruments data collection system for recording and analysis.

This work was performed for Nextracker,Inc., a solar energy equipment supplier based in Fremont, CA. Eighteen panels were deployed at the Flatirons Campus of the National Renewable Energy Lab (NREL) south of Boulder, CO. The system has been operational since the fall of 2020.

HED Past Performance (cont)

Solar Well Pump Controller

This controller uses the power from one or more photovoltaic solar panels to drive the three coils of a brushless DC (BLDC) motor located within a pump assembly at the bottom of a well to pump water up to the surface. Alternately, the controller can use the solar panels to charge a bank of lead-acid batteries and operate the pump from the batteries in the absence of sunlight.

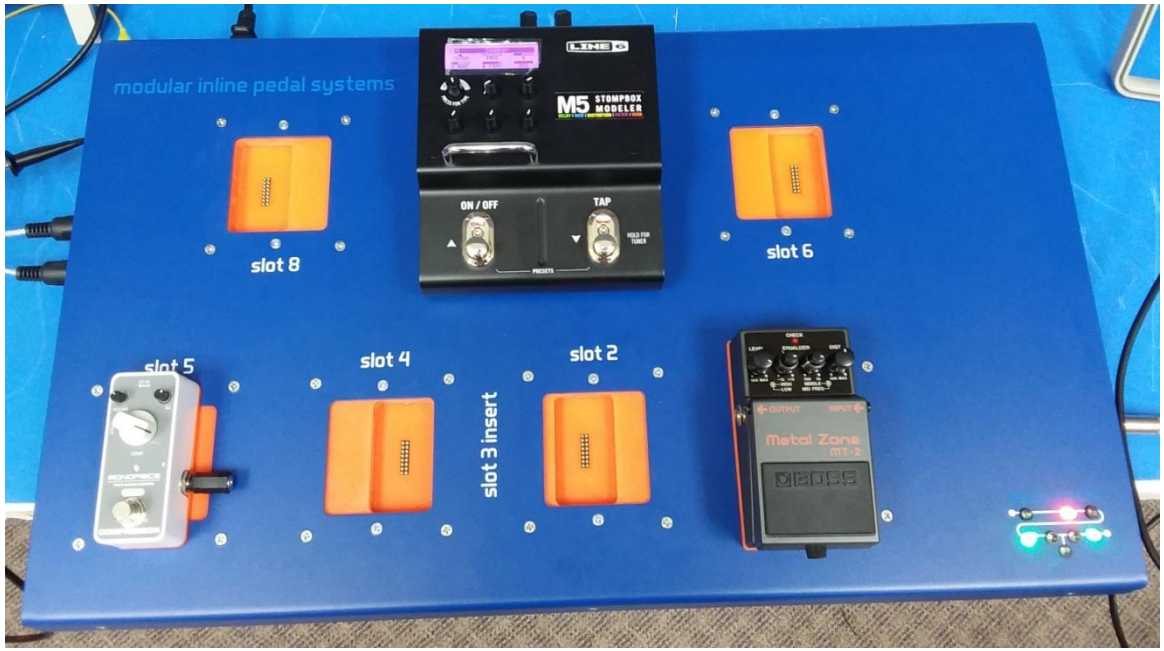
The controller implements a tracking algorithm to run the pump at an optimized speed for a given amount of sunlight. The controller can switch current up to 15A at a voltage range of 18V to 115V. The design uses the STM32F303 ARM processor and determines the motor phase without the use of Hall sensors using the back-EMF of the motor windings. The motor drive circuit features the STGIPL14K60 integrated triple ½ H-bridge with IGBT switches. This work was performed for Rural Power Systems, Inc of Fremont, CA.

HED Past Performance (cont)

Shock and Vibration Data Recorder

The EDR-5 is designed for remote, stand-alone shock and vibration measurement and recording over extended time periods ranging from several hours to several weeks.The recorder is setup from a PC over a standard USB port, or from a phone or tablet equipped with a Bluetooth wireless connection. After field recording, data is transferred over USB to the host PC for processing and analysis. The recorder is powered by a rechargeable lithium-ion battery pack. The recorder is equipped with an internal Micro-Electro-Mechanical-Systems (MEMS) three axis accelerometer and three to six external accelerometer channel inputs. External channel inputs provide signal conditioning, programmable gain and filtering, and programmable constant current excitation for use with low power voltage mode piezoelectric accelerometers. Sample rates up to 50 kHz per channel are supported. Data is saved to an internal 32 GB MicroSD card. The design uses the STM32F401 ARM processor. HED performed all electrical and mechanical design for this product, developed the internal firmware, and provided a Windows PC based application to interface with the recorder. This work was performed for Instrumented Sensor Technology of Okemos, MI.

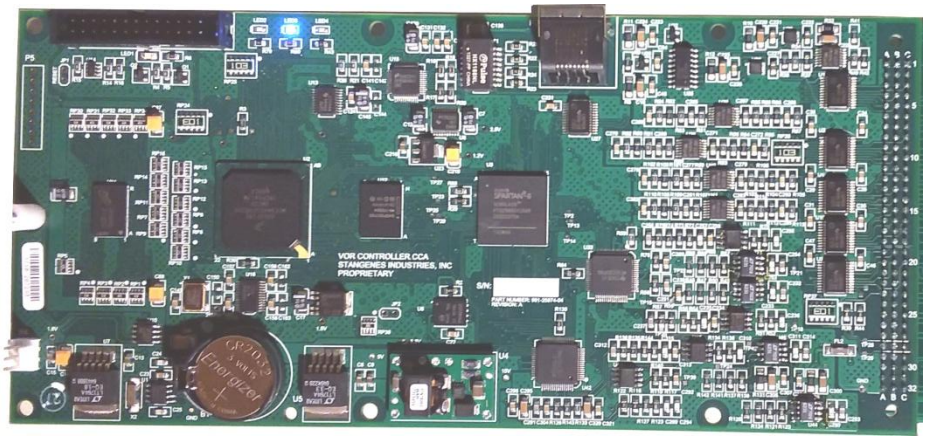
HED Past Performance (cont)



Modular Inline Pedal System

HED designed the electronics for a modular sound effects pedal board to distribute power and eliminate external cabling. The pedals can be quickly and easily swapped without having to disconnect and reconnect cables. The design uses a PIC24FJ128 processor and implements a MIDI interface for external control. A customizable adapter card was designed to allow each sound effects pedal to be individually adapted to fit the pedal board. This work was performed for Big Gig Productions in 2017.

HED Past Performance (cont)



Pulsed Power Marx Modulator Controller

The controller provides the control and status interface between a high power pulsed E-Gun modulator and client software over an Ethernet link. Signals representing the gun voltage and gun current are digitized at a 50 MHz rate and used to calculate the pulse width and peak value for each pulse, as well as the effective Pulse Repetition Frequency (PRF). Additional analog and digital signals are monitored and operation of the modulator is inhibited in the event of a fault condition. The design uses a Coldfire processor and Xilinx Spartan Field Programmable Gate Array (FPGA). HED performed this work for Stangenes Industries, Inc of Palo Alto, CA and supplies the controller boards in quantities to support Stangenes products.

HED Past Performance (cont)

Bridge Amplifier Data Acquisition System

HED designed and delivered a high precision, rack mount, 16 channel, USB-based strain gauge measurement and data logging system. The system features programmable DSP-based filtering of the strain gauge signal so that any customer-defined filter can be implemented. Other features include a programmable strain gauge excitation voltage of 5V, 10V, or 20V with extremely small excitation ripple, and can accommodate any strain gauge between 350 and 2000 Ohms. The amplifier gain can be varied between 1 and 10000 in 1:2:5 step increments with the resulting noise being less than 20mVp-p at max gain of 10000.

This work was performed for CPP, Inc. of Fort Collins, a world-renowned wind engineering consulting firm.

HED Past Performance (cont)

Image Intensifier Controller

This product controls the electronic "shutter" of a high digital CCD video camera used primarily for microscopy. It incorporates a processor, high speed gate array, and precision D/A. The companion Windows based interface allows the user to control the Image Intensifier Gate, Gain, and Gate Delay. The Gate (shutter duration) can vary from 20ns to 1ms and can be delayed from an external trigger input (Gate Delay) which can vary from 0µs to 2ms in increments of 20ns. The Intensifer Gain can be set between 2500 and 80,000 foot-lamberts-per-foot-candle to equate to a 0V to 5V output.

This work was performed for VideoScope International, Ltd.

HED Past Performance (cont)

Control Interface Adapter

The Control Interface Adapter is used as the physical interface to control legacy military radio equipment in real time. The CIA features a wide variety of I/O to communicate with current and future equipment including RS232, RS485, Ethernet, TTL I/O, Open collector drivers, and "FLEX I/O". The FLEX I/O is a custom programmable I/O signal that can swing between any logic high and low voltages between -30 and +30 VDC. The design also includes a reconfigurable FPGA to accomodate the interface to future equipment. The embedded software and gate array configurations are fully downloadable via the Ethernet bus.

This work was performed for General Dynamics C4 Systems.

HED Past Performance (cont)

Embedded PCI Controller

This embedded PCI controller was designed and manufactured for Motorola SSTG. It allows their new line of military radio transceivers to control peripheral equipment in real time using either a 10/100 Base T or Fiber Optic Ethernet link.

The External RF Controller is a PMC (PCI Mezzanine Card) design that communicates with the radio transceiver via a PCI bus. It includes a PCI bridge IC, a MPC860T PowerPC processor, 8 MBytes of Flash, 16 MBytes of SDRAM, serial EEPROM, a custom FPGA, and copper or fiber optic Ethernet interfaces

HED Past Performance (cont)

Ethernet PA Controller

This product is installed into an RF Power Amplifier chassis to allow the PA to communicate with the General Dynamics DMR (Digital Modular Radio) system via the GDDS proprietary Ethernet interface. The PEP (Programmable Ethernet Port) board is a proven low-risk approach for new power amplifier vendors and has already been qualified as being compliant with the GDDS specifications in terms of timing, frequency hopping, and proprietary Ethernet message protocol. The PEP board works with HF and VHF/UHF PA designs.

This work was performed under subcontract to General Dynamics C4 Systems.

HED Past Performance (cont)

Dust Detector

This product was designed for wind tunnel applications to accurately measure the amount of dust or dirt which might blow across a surface.

Comprised of an infrared transmitter and receiver, this product can measure dust density over a 80dB scale (ratio of 1-to-100e6). The infrared transmitter LED can be either pulsed or on continuously and is controlled by circuitry housed in an enclosure shown in the bottom of the above photo. The receiver is based on a highly sensitive and large aperture infrared photodiode paired with a low noise logarithmic amplifier. The vertical tube in the assembly dispenses a known amount of "dust" and the electronic system measures the "down-wind" dust intensity.

This work was performed for CPP, Inc. of Fort Collins.

HED Past Performance (cont)

PhaseTrakker System

Measures absolute phase (A,B,C) and phase angle of remotely located electrical power lines

AP30 Reference Unit

- *Communicates with Field Unit via cellular network; no phone line needed*
- *Connects to 120 V AC wall outlet or screw terminals (flying leads)*
- *Synchronizes voltage phase with GPS time*
- *Sends results to Field Unit on demand*
- *Retains one month of data*
- *Rack-mount or portable units available*

AP30 Field Unit

- *Receives phase reading from Hotstick Unit*
- *Synchronizes phase with GPS time*
- *Compares phase reading with Reference Unit and determines absolute phase and phase angle*
- *Displays data on easy-to-read LCD screen*
- *Stores 1,000 readings; automatically resolves any readings taken outside cellular range*
- *Simple calibration for A-phase declaration*
- *Automatically connects to second Reference Unit if required*

AP30 Hotstick Unit

- *Detects and sends voltage phase to Field Unit via FM signal up to 100 ft*
- *Voltages range of 120V to 500kV*
- *Works on live OH conductor, UG elbows or test points, bus bar and any low-voltage connections*
- *Removable sensor box and test lead facilitate low-voltage phasing*
- *12 in. extension included for close work in UG vaults, transformers, etc.*

HED designed all of the electronics and firmware for the PhaseTrakker system for EDM International Inc, of Fort Collins, CO

HED Past Performance (cont)

Sagometer

This product measures the amount of droop or “sag” on a high voltage power line. The amount of sag can be used to estimate the conductor temperature so that the line capacity can be maximized.

Although HED did not originally design this product, we were enlisted to redesign the circuit boards internal to the Camera Unit and the Datalogger Unit. The redesign effort drastically reduced the amount of cabling and decreased the recurring cost of the product.

This work was performed for EDM International Inc, of Fort Collins, CO

CAMERA UNIT

DATALOGGER AND COMMUNICATIONS UNIT

HED Past Performance (cont)

Urology System

This USB-based urology system allows physicians to quickly assess the mechanics of urinary flow and to diagnose abnormalities in voiding patterns. The HED-designed controller interfaces with uroflow and urovolume transducers, patient EMG sensors, can control a variety of fluid pumps and controls a catheter puller motor. This system complies with EN60601-1, EN60601-1-2, FCC, UL, CSA, and various other regulatory requirements.

This work was performed for Life-Tech, Inc of Stafford, TX, a medical instrumentation company specializing in urology.

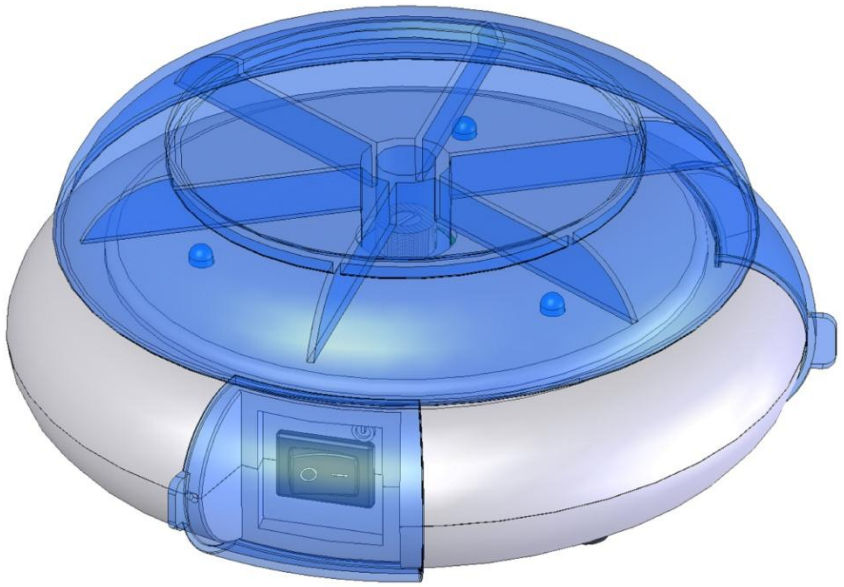
HED Past Performance (cont)

Wireless Uroflow Transducer

This device measures the volume and rate of urine flow and transmits the data wirelessly in real-time to the urology system computer.

HED originated the innovative enclosure design along with a custom strain gauge measurement controller with a Bluetooth communications link. The firmware features a specialized digital filter to accentuate irregularities in the urine flow rate. The firmware handles all communication protocols and controls the safe recharging of the batteries.

This work was performed for Life-Tech, Inc.



HED Past Performance (cont)

Custom PCI Data Acquisition Board

This product was developed for for Life-Tech, Inc. to upgrade their older ISA based data acquisition board to a fully plug-n-play compatible PCI based design. The board collects data from the client's “patient unit” for display and analysis on a PC

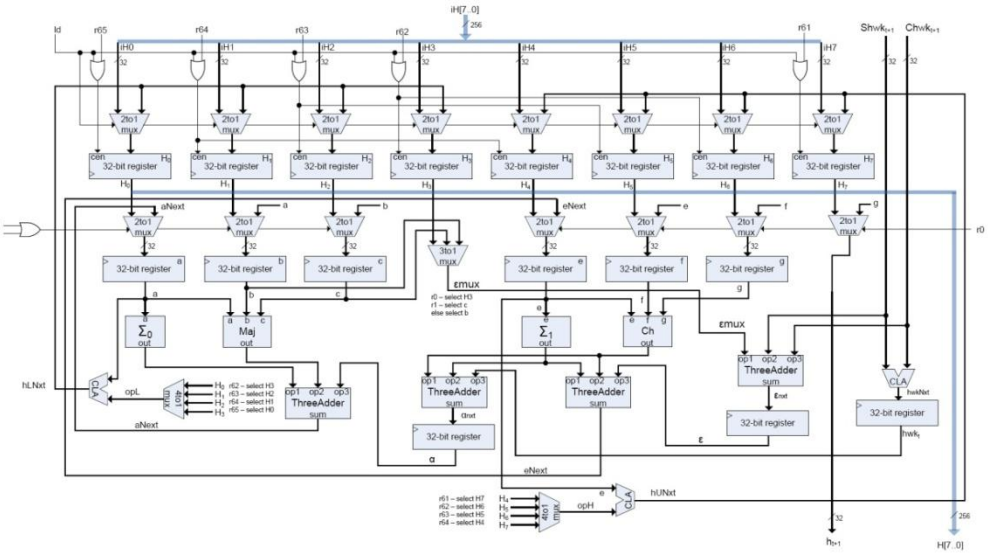
The board features 16 channels of analog input, each with programmable gain and offset. An analog output plus a digital data port and a one-shot output are used to interface with the customers external Uropump. In addition to I/O circuitry this design includes a 68HC908 processor, a PCI interface chip, and a custom CLPD design. On-board test signal generators and an audio monitoring port aid in system installation and calibration, and a 32K FIFO ensures continuous data transfer over the PCI bus. HED wrote a custom Windows device driver and INF file conforming to WDF (Windows Driver Model) standards. HED also supplied a custom Windows GUI to aid in product testing and evaluation.

HED Past Performance (cont)

Litecoin Mining ASIC

This custom chip implements the Scrypt algorithm used as proof-of-work required to mine the Litecoin digital currency. The design features 128 cores each running the Scrypt algorithm for a total hash rate of 1.8 Mhash/second. The core implementation was designed using VHDL and tested on a Xilinx KC705 Evaluation board using the Kintex-7 FPGA.

HED worked with ASIC foundries to have the chip manufactured. Due to the collapse of value of Litecoin, the chip was never built. If it had been, it would have significantly out performed other Litecoin mining chips on the market at the time.



HED Past Performance (cont)

Smart Sign

The Smart Sign is a safety product that plays audible safety messages any time nearby motion is detected. It can be placed wherever a safety hazard might exist, such as on a “wet floor” sign, door knob to a quarantined room, or other location.

A bright white light flashes every 5 seconds providing a visual indication of the nearby hazard. The Smart Sign can store up to four different audio messages. Each time motion is detected the recorded messages are played back, one at a time, in a rotating fashion.

Multiple messages can be beneficial in multi-lingual environments. For example, message #1 could be the English *Caution, Wet Floor* followed by message #2 in Spanish *Cuidado, Piso Mojado*.

HED Past Performance (cont)

Generator Self-Test Verifier

This product is mounted to a generator control panel where it continuously monitors the three phase generator output to determine whether the stand-by generator successfully performed its periodic auto-start self test. If the generator failed to start in the prescribed interval an audible alarm is sounded and accompanying relay is closed.

This system contains an embedded microcontroller, real-time-clock, LCD display, and analog signal conditioning. It samples the analog voltage output from the generator and utility to determine whether the generator failed to perform its periodic self-test.

This product is currently manufactured by HED in high volume for Transtar Products, Inc

HED Past Performance (cont)

Electronic Relief Valve

This product eliminates the need for the messy relief valve that expels hydraulic fluid when the hydraulic actuator encounters a heavy load.

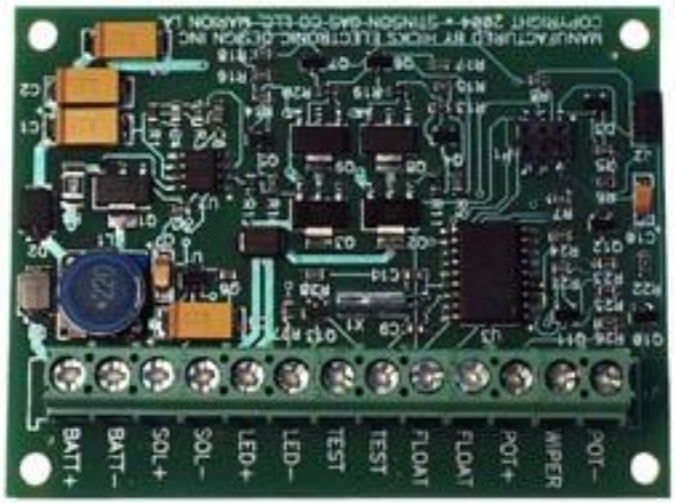
The ERV monitors the energy being consumed by the DC motor of the hydraulic actuator and cuts off power if the motor load becomes too great or if the integrated energy exceeds a preset threshold, preventing the motor from overheating.

The ERV is typically part of a control system that includes actuator buttons (Extend and Retract), a motor relay, and a DC power source such as a vehicle battery. The wire supplying current to the motor is fed through the circular torroid on the ERV which concentrates the induced magnetic flux across a hall-effect sensor. The PIC processor monitors the hall voltage which is in direct proportion to the current consumed by the motor. The ERV will open the external motor relay if the load becomes too great. The ERV can accomodate different sized motors from 20 to 100 Amps.

HED Past Performance (cont)

Solenoid Controller

This product was developed for a gas and oil drilling company. The circuit controls a latching solenoid which bleeds off accumulated water when the water float switch reaches a predetermined height. The solenoid open-to-close duration is adjustable between 1 and 20 seconds using a potentiometer



This circuit contains a DC/DC converter, H-Bridge, and microprocessor. The circuitry was designed to have extremely low power consumption and will last for more than three years when powered from a standard 6V alkaline lantern battery.

HED Past Performance (cont)

Audio SWR Analyzer

This device was developed for audio laboratories (and for university physics laboratories) and allows the user to demonstrate the acoustical properties of various materials. By placing a test material inside the SWR resonance tube and measuring the standing wave minima and maxima, the absorption properties of the test material can be determined.

The Audio SWR analyzer is comprised of two components: the electronics module and the resonance tube. The electronics module contains a very high fidelity sine wave generator which drives a speaker via a low distortion amplifier. The speaker sets up a standing wave inside the resonance tube where a movable microphone inside the tube can locate the minima and maxima. The test sample is placed at the end of the tube and, depending on its acoustical properties, changes the minima, maxima, and phase when compared to a perfectly solid (reflective) test sample. The signal from the microphone is processed prior to being displayed on an analog meter. A microcontroller controls all frequency setting, frequency counting, and 5 digit LED display updates.

HED Past Performance (cont)

Electric Guitar Distortion Box

Built for the electric guitar industry, the "HeadRoom" product can greatly enhance the artistic ability of the musician..

This device restores the dynamic range which is lost when an electric guitar is played through a distortion box. It employs precision analog multiplier circuitry which samples the raw guitar input and varies the distortion box output accordingly. The ratio of input to output (the slope of the response) is adjustable to accommodate user preferences. Other controls allow for compatibility with all types of guitar pickups and distortion box outputs.

HED Past Performance (cont)

Motion Detector

This device was designed and mass produced for the United States Postal Office and is part of a vehicle identification and location system.

This circuit contains a highly sensitive motion detector whose output is processed by an 8 pin embedded microcontroller which implements a custom filtering algorithm that reliably declares motion in a variety of deployment situations (parked with engine running versus actual driving). The output is used to enable power to a cellular data link and GPS based vehicle tracking system. The circuitry includes automotive regulators and surge supression devices to ensure reliable operation in an automotive environment.

HED Past Performance (cont)

Body Wire Detector

This product was developed for the counter-surveillance industry and will "buzz" the user when a UHF or VHF body wire transmitter is operated nearby. It is the world's first pager sized RF detector. Also available in a discrete black plastic enclosure.

This device is a wideband RF detector and boasts the industry's best sensitivity of -70 dBm at 500 MHz due to a logrithmic RF detection scheme. It contains a microcontroller which handles duty cycling of the receiver circuits, and can run for over 2 weeks on a single AA battery.

HED Past Performance (cont)

The TAG

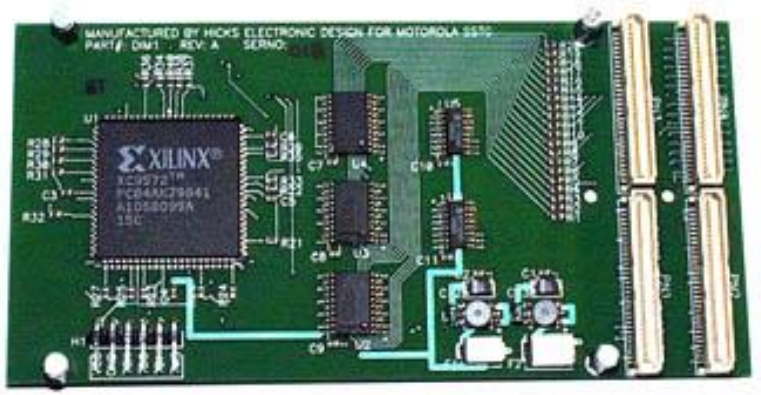
The "TAG" is a motion detecting alarm system for laptop computers and other high-dollar valuable items. It includes a keychain transmitter and an alarm unit. Once armed, any motion will cause the alarm unit to sound a piercing alarm tone that can only be reset using the keychain transmitter.

The 315 MHz coded signal from the transmitter is decoded and validated by an embedded microcontroller. If motion is detected while in the armed state a 100 dB alarm tone is produced by a piezoelectric annunciator. The wire tether attaches the alarm unit to the merchandise and also serves as the receiving antenna. The alarm unit is powered by a single AA battery which provides over 1 week of continuous use.

HED Past Performance (cont)

PMC Board

This circuit board allows for custom processing of discrete I/O signals in a Compact PCI computer system.



This product includes a Compact PCI interface and a custom gate array which allows the user to process discrete I/O signals in a variety of ways. It is housed on a PMC (PCI Mezzanine Card) circuit board and is compliant with IEEE1386. This circuit board typically resides on a VME form factor carrier

HED Past Performance (cont)

Constant Current Source

This product was developed for a railroad remanufacturing company. This circuit is part of a control loop which allows a PC computer to set the current in an exciter coil of a DC generator.

This relatively simple analog circuit uses a precision current monitoring technique and provides excellent linearity and temperature stability. It is designed to be mounted inside the customer's generator control panel.

HED Past Performance (cont)

4-20 mA Converter

This product was developed for an environmental engineering company. The circuit converts the signal from an oxygen sensor to a 4-20mA current loop signal for remote monitoring. The sensor zero and span are adjustable using potentiometers..

HED Past Performance (cont)

Flashonator

This device replaces the expensive flash bulb used to verify detonation in high explosives training sessions.

The design features a number of high brightness white LEDs and uses an inexpensive PIC processor along with an innovative circuit to reliably detect the noisy, groundless detonation signal.

This product was designed by HED on a shoe-string budget for a small start-up company.

Conclusion

- HED has the skills and experience to tackle a variety of small and medium design and production efforts, and to be a significant contributor to large design efforts.
- As a small company, HED can be far more cost-competitive and agile than traditional defense contractors.
- We welcome the opportunity to be considered for any projects, big or small.