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ELECTRICAL ENGINEER

Analog and Digital Design: Microprocessor circuitry, analog loops & filters, analog ↔ digital, drives & interfaces.
Logic Design: Logic design, synthesis, and simulation with Verilog and VHDL for FPGAs and CPLDs.
Power Electronics: DC-DC & AC-DC converters, battery chargers, LED drivers, and TEC controllers.
Instrument and System Design: Develop requirements and specs; guide/manage design; simulate and test.
Electro-Optical Design: Circuitry for laser diodes and photodiodes; experimental design and analysis.
Controls: Closed-loop control design for electronic, mechanical and electro-optical systems.
Written and Verbal Skills: Manage projects. Write clear specifications and articles. Strong team player.

Master of Engineering, Electrical Engineering: 3.87/4.00 GPA, December 1991, University of Colorado at Boulder. Project at Nat'l Center for Atmospheric Research involved developing dual-axis servo-motor radar controls.
Bachelor of Science, Electrical Engineering, honors, May 1981, University of Texas at Austin.
Registered Professional Electrical Engineer in Colorado

Principal Electrical Engineer **Redgarden Engineering** Boulder, CO (Oct, 2008-Present)
Provide electronics engineering consulting for projects involving medical devices, scientific instruments, industrial & aerospace controls, and tape drives. Recent work includes various boards for read head electronics, a crane hook monitoring system, power supplies for a mass spectrometer, motor controllers for satellite antenna deployment, controls for a cryo-ablation device, various laser driver and photodiode detection circuits, and a control board for laser-based pulse oximetry. Also providing technical patent analysis. Own & manage company and projects.

Senior Electrical Engineer **Encision** Boulder, CO (Sept, 2006-Aug, 2008)
1. Proposed and successfully completed research project demonstrating efficacy of a new method of monitoring shielded electrosurgical instruments. The method uses high-speed sampling of electrosurgical parameters along with real-time processing in a Xilinx FPGA. A provisional patent was filed on the method.
2. Used the new monitoring method described above as the basis for a new monitor development project. Brought together divergent ideas from the company management to achieve a consensus on products requirements.
3. Wrote company white paper, *Capacitive Coupling with Unshielded Laparoscopic Electrodes*.

Principal Electrical Engineer **Kestrel Labs** Boulder, CO (2003-Aug, 2006)
1. Developed analog, digital, and opto-electronics for pulse oximetry-based instruments.
2. Designed experiments to investigate and troubleshoot aspects of electronics devices, circuits, & instruments.
3. Assisted in writing successful SBIR grants to funded on-going projects with the National Institutes of Health.

Consultant **Kurt Aronow, PE** Boulder, CO (May-Oct., 2003)
Aztek Engineering: Assisted in design of telecom trunk board with emphasis on MPC8250 µP integration.
Mountain Engineering II: Verilog digital phase-locked loop design in a Xilinx FPGA.

Senior Electrical Engineer **Exabyte Corporation** Boulder, CO (2001-April, 2003)
Electronic and electro-optics design, and CPLD/FPGA/ASIC Verilog design, synthesis, simulation, documentation, troubleshooting, for tape drives. Designs included PowerPC, ARM cores, Virtex-II, SCSI and Fibre Channel.

Senior Electrical Engineer **Aztek Engineering** Boulder, CO (99-2001)
Telecommunications engineering services:
1. Completed a large FPGA design in VHDL for a backplane interface that was converted into an ASIC.
2. Co-developed a board with an MPC850 µP to add and drop telephony traffic into an STM-1 data stream.
3. Led and served on committees that wrote an extensive HDL coding standard and a schematic standard.
4. Designed a circuit board to study signal integrity issues at higher frequencies.

Electrical Engineer **Evergreen Research** Golden, CO (98-99)
Biomedical engineering services included design of high speed digital electronics for adding headers to ultrasound data in real time. Other work included design of a fast analog circuit for RMS-DC conversions & embedded software.

Hardware Engineer **Datex-Ohmeda** Louisville, CO (93-98)
Biomedical device research included successfully moving the technology for a new generation of pulse oximetry into development. Designed and validated analog, digital, and opto-electronic circuitry (including laser diode driver circuits and pre-amps for silicon and germanium detectors). In-vitro and electronic experiments were designed & completed. Development work included interfacing a 68EC030-based microprocessor core and a high-resolution, color monitor.

Electrical Engineer **CGH Medical** (Contract) Lakewood, CO (1992)
Re-designed two 80C188-based digital/analog circuit boards for a continuous dialysis machine. Performed worst-case/failure analysis & C test code. Also oversaw development of a patented ultrasonic air bubble detector.

Circuit Analyst **Martin Marietta** (Contract) Waterton, CO (1990)
Wrote worst case analysis on NASA space station robotics controller board. Calculated thermal dissipation, end of life, radiation effects, timing, etc. Modified circuitry with analysis. Documents: M/S 1553B, 883B, 38510, etc.

Electronics Engineer **Palomar Observatory** Pasadena, CA (88-90)
1. Designed electronics, software, & system to rotate the 200-inch cassegrain ring to 0.01° with an encoder and a micro-stepping motor. Worked with astronomers, foremen, and managers to develop requirements.
2. Defined "next generation" of TV viewing and guiding cameras for 200-Inch and 60-Inch telescopes. Solution involved using a gated, cooled image intensifier synchronized with a re-packaged CCD camera.
3. Re-designed signal conditioning circuitry to resolve longstanding noise and repeatability issues.

Research Engineer **Unocal Science & Technology** Brea, CA (85-88)
Performed "turnkey projects" that involved design, software, control and electrical:
1. Designed a system to select megabytes of data from analog tape containing gigabytes of data.
2. Designed a bridge conditioner with auto-zero and circuitry to auto-scale over five orders of magnitude.
3. Designed an electronic controller using laser feedback and a position sensor detector to drive a motor.
4. Designed a system to control 41 air movers (computer, relays, modem) with hardwired safety features.
5. Troubleshot a large, regenerative dynamometer's windings and electrical control system.
6. Helped oversee a pilot plant's electrical construction. Used NEC and worked with electricians and millwrights.

Analog Design Engineer **Delco Electronics** Santa Barbara, CA (82-83)
Automotive analog electronic design projects included designing current-mode PWM circuits, switching power supplies, digital interfaces, and worst-case analysis. Worked on electronic controller for automobiles. Researched LVDT circuits.

Electrical Engineer **Martin Marietta** Vandenburg AFB, CA (81-82)
Reviewed huge electrical and mechanical systems for space shuttle ground support hypergolic refueling operations.

Research Assistant **Center for Electro-mechanics** University of Texas (78-81)
Performed electrical troubleshooting, assembly, machining, etc., supporting rail-gun & electrical generator projects.

U.S. Patents: Six issued. See: https://RedgardenEngineering.com/articles-patents/

Electronics Articles: See: https://redgardenengineering.com/articles-patents/

More-Recent Engineering Software: Altium, Orcad, LT Spice, Pads, DX Designer, ModelSim, Xilinx ISE, Matlab, Verilog, VHDL.

Leadership: Former chair of an Inner City Outings group, a non-profit taking lower-income kids hiking, back-country skiing, etc. As chair, oversaw fundraising, newsletter, volunteer recruitment & training, gear acquisition.

Personal: U.S. Citizen. EMT-B training. Climber & skier. Speak some Spanish. Excellent health. Member IEEE.