

Columbia Engineering Co.

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Product Design Engineering and Consulting Bulletin

Electrical, Electronic and Mechanical

System Design:	Overall system architecture, partitioning, analog, digital, and control sub-systems, software definition, direction, integration and testing
Circuit Design:	Analog, data acquisition, logic, control, AC & DC power control and conversion.
Electro-mechanical:	AC & DC device design (contactors & solenoids), motor and engine controls.
Electro-magnetic:	Saturating & non-saturating device design & error analysis (Starting reactors, current and power transformers).
Product Design:	Definition, costing, B/M's, documentation, approvals. Industrial Capital Equipment, Military, High Volume Commercial and Consumer
Design Support:	Transients, noise, reliability studies, failure analysis, component engineering.
Legal:	Patents (obtaining, defending, litigation). Product liability (prevention, defense, supervision).
Software:	Embedded Real Time systems
Manufacturing:	Establish and improve methods, procedures, & processes. Design production tooling, fixtures and test equipment. Implement and improve MRP systems.

SIGNIFICANT PROJECTS:

Designed industrial remote telemetry & supervisory systems including:

- Overall system design
- Hardware design
- Software design & supervision
- Packaging and documentation

High reliability compact system used for monitoring fire protection equipment. Includes processors, data acquisition, modems, displays, signal circuitry, peripheral interfacing, power & battery circuits, and local alarms. This battery powered system has low drain by extensive use of CMOS MSI & LSI circuits.

Several Multi-function Circuit Boards:

- Modem & Duplexer (Hybrid) board (RS-232 interface)
- Lamp Matrix Decode & Driver, Switch Input, and I/O board
- Signal Progress and Phone Modem Switch Panel Module
- DC to DC Converter board with Voltage Monitors and Alarm Outputs
- Automatic Two Rate Mode Switching Battery Charger

Columbia Engineering Manufacturing Co.

C.E.M.C. Bulletin - cont'd

SIGNIFICANT PROJECTS - continued:

Telemetry System - Master Station:

- Multi-function and CPU boards with Real Time Clock, Serial Port, Dual Parallel Ports, Bus Interface, & Vectored Interrupts

Remote Station:

- LCD Display, LED Driver, and Switch Interface board
- Digital and Analog Multiplexer board
- A/D, Instrumentation Amplifier, Multiplex Control & Parallel I/O ports
- CPU board and Modem Board (similar to above)

High Power Magnetics: Designed and patented a line of high power AC motor starting saturable reactors. Designed a line of low cost current transformers.

Solid State Motor Controls: Design of special electric motor control product line including approvals, cost reduction, performance & reliability improvement, and expansion of line (thru 400 Hp).

Medium voltage Motor Controls: Design a line of medium voltage controllers (to 6,000 Hp and 7,200 Vac). First U.L. listed reduced current medium voltage controllers.

Medium Power Battery chargers: Designed special battery chargers. Used by both Caterpillar Tractor and to Cummins Engine.

Approval Agencies:

Conformity Assessment: Review electrical and electronic products for compliance with U.L., C.S.A. and F.M. safety standards and for fire protection standards. Obtain listings and approvals.

European Norms: Obtain European Community CE approval for microprocessor based industrial control equipment. Devise test plan for Electro-Magnetic Compatibility (EMC) requirements, monitor and supervise testing. Obtain U.L. (TUV / VDE) EMC certification. Review Technical Construction File (TCF) for products.

Legal:

- Provide product liability and patent consulting for various clients
- Perform Preliminary Patent Searches and Prepare Patent Disclosures
- Successfully Respond to numerous Patent Office Actions
- Successfully Defended Several Patents

Product Support: Provide design review and advice for high volume automotive lighting manufacturer.

Develop, patent and market a profitable computer accessory product, as a joint venture. Item listed in major office products catalogs.

Design, develop, and finance an electronic control module for military (Army TACOM) application. Perform Mil. testing. Qualified as a second source to Eaton Corporation (Cutler-Hammer AIL Division).

U.S. Patents: Seven; Electronic, Electrical, Electro-Magnetic, Mechanical, Consumer.