

# Sensors

For use in

# Aerospace, Military

And

# Industrial Markets



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## About CRL

Columbia Research Laboratories manufactures a broad variety of sensors and associated signal conditioning electronics that include force balance interial-grade accelerometers and inclinometers, piezoelectric vibration and pressure sensors, strain gage aircraft mainframe fatigue sensors, precision linear variable differential transducers and fiber optic sensors.

CRL is a *privately held, woman-owned small business* that has been dedicated to providing the most reliable sensors and systems for the military, commercial and industrial markets since 1953. The manufacturing and engineering offices are located together in Woodlyn, PA just minutes from the Philadelphia airport.



As a small company Columbia's progress is not hindered by a large bureaucracy. Instead Columbia management has fostered a sense of community in the workplace that encourages and supports innovation in developing and improving products and driving manufacturing efficiencies.

Throughout the years CRL has remained a customer-driven organization. Our philosophy of responding to the specific needs of our customers for performance, cost, size and timely delivery has resulted in a competitive advantage that has enabled long-term sustained success.

## Capabilities

CRL strives to limit our dependence on outside subcontractors by building and expanding in-house capabilities. It is this type of thinking that has allowed CRL to respond to our customer's product development and production modification needs with substantially less impact to lead time schedule and associated costs than our competition.

CRL presently houses 20,000 square feet of modern clerical, management and engineering offices, product development and environmental test laboratories, and efficient production hardware manufacturing and test centers.

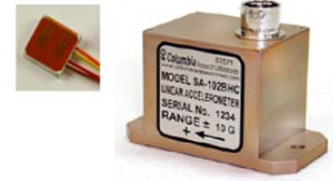


Our 2,000 square foot environmental test lab houses two computer controlled centrifuges utilized for setup and final calibration of our Linear Servo product line. The systems are capable of generating static accelerations up to 300Gs. In addition, another dual centrifuge system gives CRL the unique ability to generate a dynamic +/-G modulation of specimen while being subjected to a constant static acceleration. Another unique centrifuge at our facility provides static acceleration at temperature. This system has successfully accelerated sensors to over 300Gs at temperature. A 1,500 square foot clean room is utilized for assembly of our precision torque mechanism.

CRL's piezoelectric product test laboratory incorporates three calibration-grade vibration shaker systems with two additional smaller temperature/vibration measurement systems. This facility offers both Hopkinson Bar and Avco Drop Test Shock Generation Test Stands with digital computing oscilloscope displays. Production accelerometer insert level cross axis measurements are conducted on our 360 degrees variable rotation 10Hz slide table cross axis test stand. Design qualification base strain performance measurements can be made with a shaker-driven beam test configuration.

## History

Every year since 1957, Columbia transducers and systems have been flight qualified and performance proven on major United States Government military programs, in-flight missile systems and/or interplanetary manned and unmanned space vehicles. These transducers and systems have been subjected to the most technically demanding in-flight qualification test requirements for performance and reliability under the most severe environmental conditions. In addition, CRL transducers are used extensively in industrial control and monitoring systems, where rugged construction, low OEM cost and long accurate performance life are the criteria.



CRL has participated in many military programs over the years. We have concentrated our efforts on supplying sensors for military aircraft and missile systems as well as commercial applications with demanding environments. One of our most prestigious endeavors was the design and production of gold-plated airborne vibration systems utilized on every lunar excursion module of the Apollo Program. We have supplied operational sensors used to measure vibration, acceleration, temperature, and strain on a long list of military aircraft including the A-10, AV-8, B-52, F-16, F-18 and F-117.

We have supplied acceleration, vibration and tilt sensors on many of our country's most sophisticated military missile systems, including the Mark 12, Mark 21, BGU-15, AGM-130, AMRAM, Hellfire, ALCM, SLCM, Trident I & II, ASROC, Pershing II, MX and SICBM. Additionally we supply operational sensors for many satellite launch vehicles including the ATLAS II. CRL plans to add to this list of programs as we continue beyond our first 50 years.

## Team of Employees

CRL's most valuable asset is our team of talented and loyal employees. Columbia presently employs 50 highly skilled individuals. We are very proud of the fact that the average term of service of key management, engineering and manufacturing personnel exceeds 20 years. These key individuals have in many ways educated themselves in each of the others area of expertise. This history of shared team responsibilities and broad experience base has proven itself as an effective organization capable of achieving program goals in budget and on schedule. Our customers can remain comfortable with the fact that their programs will not be limited or delayed by the transition or rotation of new personnel in or out of their design team.



## Quality Policy

Our policy at Columbia Research Laboratories is to manufacture and deliver quality products that meet and earn customer satisfaction through reliability, good performance, competitive prices and in accordance with contractual requirements. The objective of Columbia's Quality Assurance Department is to make certain that all products furnished to our customers conform to the quality standards specified by the customer in conjunction with Columbia Research Labs. These objectives are accomplished by means of a Quality Assurance Program, which is integrated and coordinated with other company functions and results in a total management system. Quality guidelines and procedures are outlined in our Quality Control Manual.

Columbia is currently a AS-9100 and ISO 9001:2000 with design Certified Company that is registered in the Oasis Database. This certification was obtained by adapting our long standing Quality Standards of MIL-Q-9858, MIL-I-45208, MIL-STD-45662, and ANSI Z540 into the ISO standard.

### Piezoelectric Accelerometers

- High Performance
- High Accuracy
- High Temperature
- Seismic Event
- 4-20mA output
- Airborne
- Miniature Size
- Triaxial Configuration
- Integrated Circuits
- General Purpose



### Acoustic Sensors and Pressure Transducers

- Very high and very low pressure
- Vibration Compensated
- High Temperature
- Hermetically Sealed
- Corrosion-resistant
- Choice of sensitivity, electrical interface and pipe or straight threads
- Wide Frequency Response
- General Purpose
- Electrical Isolated
- Low Output Impedance
- Fast Pressure variations

### Signal Conditioning Instruments

- Constant Current Power Supplies
- In-Line Charge Converters
- Constant Current Power Supply/Signal Conditioner
- Strain Gage Amplifier
- Standard, Miniature, and Airborne Charge Amplifiers



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## Force Balance Servo Accelerometers and Inclinometers

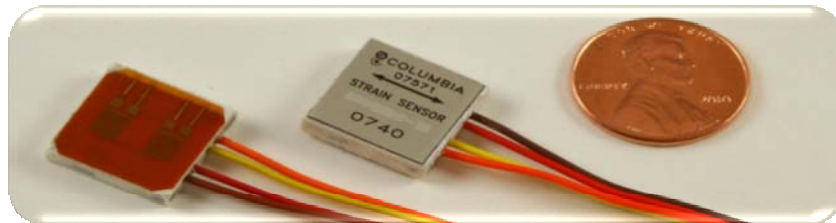
- High Reliability
- Ultra Rugged
- High Temperature
- General Purpose
- In-Flight Qualified
- Choice of size, configuration and performance levels
- High Sensitivity
- Seismic Event
- Miniature
- Airborne



## Linear Variable Differential Transformers

- Variety of Displacement Ranges and Core Sizes
- High Stroke/Length Ratio
- Choice of Frequency Range
- Extended Temperature Ranges
- High Reliability

## Strain Sensors



- Monitor Fatigue Loading
- High Output
- Variety of Sizes
- Self-Temperature Compensated
- Two Active Arms
- Curved or Straight Surface Sensors
- Environmental Resistant
- Easily Installed

## Summary

Columbia Research Labs is dedicated to providing the most reliable sensors and systems for the military, commercial and industrial markets. CRL will continue to focus on the performance demands of our market, by prioritizing quality monitoring and control throughout the manufacturing process, and by striving to exceed our customer's expectations for services and support.

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