

# INDUSTRIAL APPLICATIONS



## Predictable performance in unpredictable environments

Volatile, remote, and unforgiving edge environments demand robust technologies, flawless operation, and reliable security. That's why Crystal Group custom-engineers intelligent, rugged computer solutions that perform without fail in the most remote and extreme conditions when safety, accuracy, and efficiency are paramount.

As a leading provider of rugged, high-performing computer hardware, we design, manufacture, and customize our proven, field-tested products in-house. With the agility to collaborate swiftly, we incorporate evolving technologies, performance standards, and program requirements to ensure you have the exact combination of power, performance, and protection you need to be successful.

With a partner that is continuously looking forward, you'll also stay ahead of the technology curve. Our experience and expertise serving edge markets means we anticipate the next level of operational needs to lead innovative developments that are ready before you know you need them—because if you're on time, you're late.

Take the reliability, speed, and security of pivotal compute operations out of the data center and into the field with Crystal Group.



## We're here to solve your most difficult edge compute challenges.

Our integrated solutions are tailored to meet your exact needs, while managing SWaP efficiency and eliminating uncertainty and complexity. With the ability to collaborate swiftly, we incorporate emerging technologies, cybersecurity, environmental performance, and unique requirements so you always have the latest, most reliable systems to achieve today's objectives for tomorrow's success.

### **RUGGED**

Engineered for seamless performance in the most extreme, unpredictable, and remote conditions, our solutions are built and tested to meet or exceed demanding environmental requirements. By combining our rugged chassis—made of milled 6000-series aircraft-grade or bent aluminum—with our proprietary ruggedization processes, both equipment and data are protected against extreme EMI, dust, sand, salt fog, shock, vibration, and thermal conditions.

### **RELIABLE**

In addition to our certified to ISO 9001:2015 quality management standards certification, we design and test our products to meet or exceed IEEE 1613, IEC 61850, military, and SAE automotive standards, cybersecurity protections, and program requirements. As standards are updated, so are our designs, work instructions, and test procedures. If an issue arises, you're covered by our industry-leading five-plus-year warranty and 24/7 product support.

### **SCALABLE**

When speed matters, our flexible, scalable solutions can be customized to meet the unique needs of any program. The combined power of our flexible designs, COTS components, vertically integrated services, modern factory, and leading technology partners allows us to adapt and tailor your solution on schedule. This minimizes your downtime while maximizing your performance.

### **SECURE**

We combine leading-edge, platform-agnostic data protection with critical hardware features that meet strict certification standards. With vital features—like rugged FIPS 140-2 SAS solid state drives, IPsec encryption, intrusion detection, instant data destruction, anti-tamper protections—your critical, confidential data is secure from attempted breaches, even in the most extreme conditions—when it matters most. Your information is only accessible by authorized individuals when and where it's needed.

# Transportation

## AUTONOMOUS VEHICLES AND SYSTEMS

Innovators worldwide are racing to introduce safe, reliable autonomous and unmanned vehicles and systems into mainstream transportation. By incorporating our rugged and secure high-performance computer architectures and electronics systems, our customers are achieving their development goals on schedule, on budget, and ahead of the competition.

### Customer use cases:

Leading automotive manufacturers depend on our **AVC line of servers** to securely fuse massive amounts of sensor data and protect against physical and cyber threats for safe, seamless performance.

A robotics company uses the **AVC0161** on autonomous construction vehicles around the world to build wind turbine pads.

Developmental autonomous trucks are equipped with Crystal Group **rugged servers** to power up to four high-end GPUs it takes to operate each semi.

**Applications:** Advanced driver assistance | Artificial intelligence & machine learning | Delivery and rideshare service | Transportation infrastructure | Traffic monitoring | Unmanned aerial and underwater vehicles

## COMMERCIAL AVIATION

Accurate, uninterrupted operation of multiple onboard systems is critical to flight safety. Our unique combination of lightweight, carbon fiber computer hardware equipped with DC power meets strict EMC/EMI requirements, ensuring critical processing power for safe, reliable flight operations.

### Customer use cases:

Helicopters employ our **rugged servers** to collect data and process complex algorithms to monitor traffic patterns.

A Crystal Group **rugged server** was used in a specially modified commercial aircraft designed to test launch small satellite capabilities.

**Applications:** Custom instrumentation packages | Onboard diagnostics | Search and rescue efforts | Data and video capture | Wind tunnel testing

## RAILWAY TRANSIT

Rail networks require sophisticated automation to deliver scalable configurations, multiple functions, and high performance. Using Crystal Group **rugged embedded computers**, railways are benefiting from consistent rail safety, location monitoring, communication, lighting, fault detection, and collision avoidance.

### Customer use case:

A series of train stations are equipped with 10 different **server** configurations to monitor tracks, station maintenance, and train locations to improve safety and optimize operational efficiencies.

**Applications:** Collision avoidance | Control monitoring | Data acquisition | Signal control | Traffic management

## Autonomous vehicle computers

Our AVC product line is designed and tested to securely fuse massive amounts of AV sensor data, survive physical and cyber threats, and deliver faster time to market. These rugged servers combine the latest Intel® Xeon® Scalable processors, secure data handling, and failsafe performance. Built to withstand extreme temperatures, unforgiving terrain, and damaging collisions, our AVC solutions ensure reliable, real-time accuracy, and safety.



**Hit the road** A public highway authority uses Crystal Group network switches to track vehicle license plates passing through electronic toll booths along a 50-mile stretch in a major metropolitan area. Motorists receive a monthly bill versus traditional pay-as-you-go toll booths, which saves time and prevents congestion.

## Crystal Group Energy Series™ (ES)

Designed to modernize critical energy infrastructure, the Crystal Group ES servers and embedded computers combine rugged hardware, the latest Intel® scalable processors, and prominent security features. Using machine virtualization, these systems process massive amounts of data to transform power grid reliability and system resilience while impeding potential breaches.



## Oil & Gas

Improvements in computing technology have advanced seismic data processing and analysis, along with reservoir modeling and simulations. With the increased focus on production monitoring, our compact, rugged embedded computers and industrial servers replace the need for traditional monitoring by eliminating extensive labor and reducing the potential for errors.

### Customer use cases:

Fracking mobile command centers depend on Crystal Group **rugged servers** to process real-time video from 50 cameras at each drill site to help system controllers improve site functionality and safety.

More than 100 of our **rugged servers** process raw data from imaging detection systems at chemical plants and refineries, drilling sights and pipelines for real-time detection and recovery of invisible—and potentially catastrophic—gas leaks.

A global natural resources company employs our compact, robust **rugged embedded computers** to process massive amounts of data used for gas and oil exploration around the world.

**Applications:** Well production monitoring | Fracking operations | Down hole fiber analysis | Pipeline health monitoring

## Utilities

Creating, distributing, and monitoring electricity across a broad scope of energy forms—including nuclear, hydro, and renewable power—requires infallible computing performance. That's why major power companies depend on our rugged solutions to monitor and maintain uninterrupted automation systems at substations, often in remote locations with limited or intermittent onsite staff.

### Customer use cases:

A leading U.S. energy utility relies on an integrated system of our **Energy Series™ servers** to monitor operations, identify outages, and collect real-time data to refine their transmission and distribution substation operating models.

Crystal Group **rugged servers** monitor power grid electrical substations for a world energy leader to improve power distribution.

**Applications:** Substation control | Plant monitoring | Outage identification | Field monitoring

## Mining

Vibration, dust, extreme heat and cold, air pressure, and humidity present unstable conditions in tough mining environments. This makes mining operations increasingly dependent on sophisticated computing technology to improve safety, increase productivity, and reduce operating costs. Our innovative mining automation solutions withstand these challenges with high reliability and low maintenance.

### Customer use case:

To ensure the most efficient operation of their bucket wheel excavators—the largest machines used in the mining industry—our customer employs Crystal Group **thin clients** and **rugged servers** to process critical sensor data. Operators use the information to properly adjust conveyor belt speeds to ensure a steady, continuous feed of material.

**Applications:** Shovel control | Wireline monitoring | Surface mining operations | Topology mapping



**“Current” technology** Along with the immense opportunities driven by modernizing the Smart Grid, there are corresponding threats to its progress. To preempt malicious cyberattacks against the Grid, our portfolio of Platform Agnostic Security Solutions (PASS™) delivers both physical and data security at the edge.

# Environmental



## METEOROLOGY

Tracking, monitoring, and reporting current and forecasted weather activity is a central element of our daily lives for everything from cultivating plentiful crops to planning safe travel and preventing catastrophic disasters. Our industrial and rugged servers installed on weather radar systems enable uninterrupted and timely data acquisition, digital processing, and radar meteorology.

### Customer use cases:

Our **industrial and rugged servers** are installed on weather radar systems that process daily weather data, detect and monitor precipitation, and track weather patterns.

Mobile, stand-alone weather stations equipped with Crystal Group **industrial and rugged servers** are deployed to remote locations to process relevant, fact-based meteorology and climate data.

**Applications:** Data acquisition | Digital processing | Radar meteorology | Remote radar stations

## OCEANOLOGY

Global ship operators rely on accurate information about a wide variety of ocean conditions, including water levels, currents, and winds. Built to survive and thrive in ruthless conditions, our industrial and rugged servers provide the processing power and storage capacity our customers need for safe and successful operations.

### Customer use case:

Crystal Group **rugged servers** are used to store and process data for an integrated system of sensors at U.S. seaports that provides commercial vessel operators with accurate, real-time environmental conditions needed to plan efficient shipping routes, maximize cargo onboard, and safely navigate narrow shipping lanes.

**Applications:** Water level tracking | Tide monitoring | Water temperature monitoring

## Protect and serve

A Crystal Group rugged embedded computer processes synthetic vision software that combines geographic overlays with live video. The system delivers visual, geographic cues to improve situational awareness and mission effectiveness for law enforcement, search and rescue teams, border patrol, wild land fire management, and disaster relief efforts.

## Industrial compute solutions

Every program is unique. Every application has a defined purpose. In unpredictable, remote edge environments where safety, security, and success are on the line, you need rugged, high-performance compute solutions designed to achieve your specific objectives with flawless precision.

### SERVERS

Achieve high-performance edge computing with impressive power, data handling, security, and storage capacity. Using the latest Intel processors, our powerful, yet compact servers deliver seamless, real-time communications and networking, situational awareness, surveillance, and automation.



### EMBEDDED COMPUTERS

Compute and store critical data in a reduced footprint that integrates the latest Intel processors. Field tested to withstand punishing shock and vibration, extended temperature ranges, and extreme conditions, these systems are ideal for autonomous or unmanned vehicles, underwater vessels, and aircraft, as well as several other air, sea, and land applications.



### NETWORKING APPLIANCES

Relay critical information in real time over secure connections with plug-and-play functionality at the edge. These high-performance switches and firewalls are housed in rugged, lightweight, compact enclosures, such as transit cases or 19-inch racks, with strain-hardened aircraft aluminum.



### DATA STORAGE

Combine high-capacity data storage and military-grade security in turnkey systems. With capabilities that include high-bandwidth SAS architecture, enterprise-class SATA hard disk drives, or solid-state drives, intrusion detection, and instant data destruction, your critical, confidential data is secure from attempted breaches.



## About Crystal Group

Crystal Group, Inc. is a technology leader in rugged computer hardware specializing in the design and manufacture of custom and commercial rugged servers, embedded computing, networking devices, displays, and data storage for high reliability in harsh environments.

A small employee-owned business founded in 1987, Crystal Group provides the defense, government, and industrial markets with integrated solutions that bring seamless, real-time artificial intelligence, autonomy, and cybersecurity to demanding edge applications.

Crystal Group products meet or exceed IEEE, IEC, SAE, and military standards, including MIL-STD-810, 167-1, 461, and MIL-S-901; are backed by an industry-leading, 5-plus-year warranty; and are manufactured in the company's Hiawatha, Iowa, USA, facility certified to ISO 9001:2015/AS9100D quality management standards.



Contact us to customize  
your rugged compute  
solution for reliable,  
real-time performance.

 [info@crystalrugged.com](mailto:info@crystalrugged.com)

 800.378.1636 U.S.  
+1 319.378.1636 Int'l

