Wireless Mining Systems

Laird designs and manufactures customized, performance-critical products for wireless and other advanced electronics applications.
About Laird
Laird is a global technology business focused on enabling wireless communication and smart systems, and providing components and systems that protect electronics. Laird operates through two divisions, Wireless Systems and Performance Materials. Wireless Systems solutions include antenna systems, embedded wireless modules, telematics products and wireless automation and control solutions. Performance Materials solutions include electromagnetic interference shielding, thermal management and signal integrity products.

As a leader in the design, supply and support of innovative technology, our products allow people, organizations, machines and applications to connect effectively, helping to build a world where smart technology transforms the way of life. Custom products are supplied to major sectors of the electronics industry including the handset, telecommunications, IT, automotive, public safety, consumer, medical, rail, mining and industrial markets. Providing value and differentiation to our customers through innovation, reliable fulfillment and speed, Laird PLC is listed and headquartered in London, and employs over 9,000 people in more than 58 facilities located in 18 countries.

Wireless Automation and Control Solutions
Laird has over 65 years of experience in radio frequency remote controls. As one of the world’s largest manufacturers of industrial radio remote controls, our products are proven to increase efficiency, productivity and safety while reducing costs.

As a global leader in radio remote control systems, our products meet all industry regulation and safety standards. We provide unmatched quality and service to all of our customers. Our customer service team includes highly trained and qualified service technicians with the latest technology to resolve any problem quickly and efficiently to get your operations moving again.

Laird’s Wireless Automation and Control Solutions have been used by mining, railway, Electrical Overhead Traveling (EOT) crane, wind power and a variety of other material handling operators across the world. The company has over 7,000 customers with a total installed base of more than 150,000 wireless remote control systems globally.

SIAMnet
The SIAMnet is a communication system designed for underground mines allowing people and computers to communicate with each other. The transmission of radio waves is negatively impacted by the small tunnel sizes in mines and performance quickly deteriorates. The SIAMnet distributes the radio wave signals throughout the mine and reestablishes communication among users whether they are located at the surface or underground. Two-way voice communication was the primary use for a communication system prior to the introduction of computers into mines. Nowadays, data communication is of utmost importance as it is used for process control, ventilation on demand, blasting systems, seismic activity monitoring, tagging, emails, Internet and a number of other applications.

The SIAMnet is well suited to answer those needs due to its high data communication capabilities. The system is easy to configure, install and service. It is based on the cable television standards and is the most cost effective system when it comes to data communication for mining.
SIAMnet Infrastructure
The SIAMnet is a Distributed Antenna System, based on the CATV standards and utilizes commercially available components. It uses coaxial cable to transport the signal throughout the mine. Splitters are then used to divide the network into branches and to feed antennas or network devices. High frequency 800MHz radio signals propagate better into tunnels than lower frequency VHF. Antennas are also shorter and their installation is non-obstructive.

Omnidirectional antennas are installed at tunnel intersections and cover 360 degrees. Directional antennas cover a single tunnel but at an increased distance. These antennas are used for simultaneous voice and data communication. Since the radio coverage is provided by antennas and not by the cable, the cable may be protected using conduits or shotcrete. The system is more reliable since incidents do sometimes occur in a mine. Amplifiers are installed at predetermined distances to compensate for cable losses and they are powered from the cable. There is no need to install a separate AC power line.

The basic SBDA 2 amplifier operates within the 800MHz LMR band and supports the voice and mobile data communication. The add-on CMA/SDA companion module operates in the cable modem band, below 200MHz, and supports high speed data communication and video. The SDA circuitry provides diagnostic and remote configuration capabilities.

Voice Communication
The SIAMnet supports multiple simultaneous conversations, up to 32 channels. It is compatible with either the analog or digital 800MHZ communication technologies. There are two types of radios that can be used with the system: mobile radios for vehicular applications and portable radios for personal use.

The system may be configured to operate in a conventional mode or the more powerful trunking modes. Trunking allows a large number of user groups to share the system and is not limited by the number of voice channels. It is a much more efficient method of using the same infrastructure and therefore increases the overall effectiveness of the system. Trunking allows private conversations between users no matter where they are. A telephone interface may also be provided so that users can receive or place telephone calls outside of the mine.

SIAMnet Diagnostic System
The SIAMnet Diagnostic System (SDS) allows for the configuration, monitoring and troubleshooting of the SIAMnet from a distant location. It consists of the SIAMnet Diagnostic Manager (SDM) software, the SIAMnet Diagnostic Gateway (SDG) and each amplifier is equipped with the SIAMnet Diagnostic Adapter board (SDA).
The SDS is an excellent diagnostic tool which ensures the SIAMnet is running at its optimum level at all times. The technician uses the SDS to configure the amplifiers according to the mine setup. Should a change be required, the amplifiers can be re-configured or troubleshot from the surface or any another remote location, without having to travel to the mine. Technical support from Laird can also be provided through the SDS.

**Vehicular Communication System (VCS)**
The Vehicular Communication System or VCS, provides data communication between a centrally located computer server and mobile units such as loaders, trucks or drills. The system consists of a master radio modem installed at the head end of the SIAMnet communication system and slave radio modems installed on vehicles. The data may consist of Ethernet or serial data packets. The Ethernet and serial ports may be used concurrently on a first come first served basis.

The slave radio modems may be configured with two antennas. Such configuration eliminates the dead spot phenomena and provides continuous, error free communication wherever the vehicle is in the mine. The system is capable of half duplex 100Kbps, which is more than enough for mining applications.

**High Speed Data Communication**
The cable modem technology is used by cable television companies to provide high speed Internet to their TV subscribers. Laird uses the same technology to provide high speed data to underground users. It is an extension of the customer network (LAN) into the mine. Business and process application software may be implemented without bandwidth limitations.

The system consists of a Cable Modem Termination System (CMTS) installed at the head end of the SIAMnet communication system and cable modems installed at specific locations into the mine. The SIAMnet provides up to five physical networks, administered separately and independently from each other. This ensures that sensitive process control applications are protected from unauthorized entry.

The SIAMnet support all DOCSIS 1.1, 2.0 and 3.0 North American as well as European standards. A channel provides 25MBPS in both directions therefore a SIAMnet is capable of 125MBPS total. Locally, a cable modem may be hooked up to a Wi-Fi Access Point and connect wireless computers to the network. It can also be wired to a switch and connect multiple computers and devices to the network.

**Head End**
The SIAMnet head end is where the voice repeaters, aster radio modems (mobile and high speed), telephone interface, diagnostic gateway, video receivers, etc. are located and interconnected. The head end is installed in a central location either above or underground. The SIAMnet cable is laid out in a star or daisy chain configuration from the head end to all the tunnels requiring communication.
Productivity at Work
Full Range Solutions for Wireless Mining

- Locomotive Remote Control
- Drill Remote Control
- Intranet/Internet
- Voice Communication
- Underground Office Automation Control Room
**CANopen**
Laird CANopen Remote Control is made with safety and productivity in mind. As part of the CattronControl products family, this mining LHD system greatly simplifies the installation of a remote control on any CAN-based vehicle. When connected to a CAN network of the vehicle’s main computer or PLC, the Machine Control Unit (MCU) acts as a wireless gateway between the vehicle and the Operator Control Unit (OCU). All functions executed on the OCU are transferred on the CAN Network and vehicle vital signs are transmitted back to the OCU.

**Load Haul Dump – LHD**
Laird AT16LHD and AT32LHD portable remote control systems provide reliable, efficient and convenient control of LHD equipment. This control system duplicates the manual controls in the cab of the load-haul-dump, allowing the operator to direct the equipment from a safer location.

**Portable Video System – PVS**
Laird PVS800 Portable Video Remote Control System gives the operator clear video pictures of the work zone even when he is not in visual contact with the equipment. The PVS800 provides accurate and safe control with up to three highly accurate camera inputs on a high resolution, full color LCD monitor. Rugged, lightweight and compact components make the PVS800 is ideal for tight locations and the harshest environments including mining (for LHDs, bolters, scoop trams, etc.), chemical processing, law enforcement, surveillance, military, bomb disposal, and many similar applications where direct line of sight is neither feasible nor safe.
Industrial and Rail Solutions

Excalibur
The compact Excalibur is the entry model into the Laird ct24-class. It sets new standards in terms of handling, operating safety and flexibility. Two transmitter housing sizes are available: With 6 or 8 and 10 or 12 pushbuttons with excellent tactile feedback and an extremely long working life of more than 1 million switching cycles. Applications include everything from light overhead gantry cranes via tower cranes to dual-hoist cranes or grabbers.

LRC-L1
The LRC-L1, part of the CatronControl™ family, is a radio controller for cranes, lifting equipment and machines featuring advanced dual-processor electronics protected in an ergonomic and robust housing made from high impact-resistant polycarbonate resin. It is ideal for controlling motors with digital or analogue drive systems and has approvals and frequencies for worldwide deployment. The LRC-L1 also displays important feedback information on a graphic LCD or via status LEDs. It can be customized for application-specific transmitter layout and can accommodate up to 3 dual-axis joysticks plus a large number of control elements.

LRC-M1
Built like a tank, the LRC-M1 controller for EOT cranes provides the next level of safety and reliability for your demanding industrial applications. This unit can control up to four motions with two ergonomic, multi-axis joystick controllers. The trolley/hoist selector, two aux push buttons and toggle are all mounted on an impact resistant Lexan EXL® housing built for the toughest environments. The LRC-M1 controller provides the flexibility to easily standardize your EOT cranes currently using remote controls, saving facilities time and money.

MKU
The MetalKeypad-U (MKU™) Operator Control Unit (OCU/controller) is perfect for heavy industrial applications. A small hand-held controller with a tough, metal housing for durability, the MKU™ is the first Radio Remote Control product to combine the robust design requirements of the North American market with international safety requirements. The heavy-duty ruggedness of the MKU is suited for cranes, railroad, and any other industrial applications where the operator can be moved to a safer, more efficient location. All components are protected by a thick-walled, epoxy-coated extruded aluminum case and rubberized absorbing end “bumpers.”
Embedded Wireless Solutions

Access Point Gateway Platform
Laird’s Access Point Gateway (APG) is an innovative device platform capable of acting as a network node bridging several of the most common types of wireless, network and serial data protocols for the purpose of remote data acquisition and control. It is a modular and highly functional product in a compact physical form factor that combines reliability, standard protocol support, ease of use and ease of customization and flexibility. Featuring Laird’s industry leading Bluetooth® modules and the powerful ARM9 microcontroller, the APG is designed to deliver machine-to-machine (M2M) solutions and is ideal for point of sale (POS), vending, digital signage/displays, healthcare and various other market applications.

ConnexLink™ Wireless Cable Replacement System
ConnexLink™ stand-alone radio modules are set up in minutes to cut the cables between RS232 or RS485 devices. Their flexibility and economic price allow users to quickly upgrade wired terminals to cordless operation in industrial, commercial, and residential applications. Powered by a 100mW 2.4GHz radio or a 1000mW 900MHz radio, each unit is small and easily portable for use in mobile and temporary settings, as well as fixed installations. Optional software enables custom configurations based on user needs. ConnexLink implements a proprietary communication protocol to provide secure local data transmissions. Because it uses FHSS technology, the data remains reliable over distances of up to 20 miles (32 km) line-of-sight (900MHz version). Use of license-free frequency bands ensures that units are ready to use with no further certification requirements.

Asset Tracking Device
Designed to be the most cost-effective asset tracking hardware available, Laird’s Asset Tracking Device is a customizable platform creating limitless options for customers in many vehicle tracking markets. The Asset Tracking Device is cellular-based and features a chip-level GPS receiver. This hardware solution is connected to the vehicle through the OBD II port. Its small size and low cost make it an ideal solution for most vehicle tracking markets. Laird’s integrated design includes GPS and cellular antennas that are tuned for harsh vehicle environments and outperform other out-of-the-box antenna solutions. With download-over-the-air capability, this device can be installed in a vehicle without removal concern.

High Speed Bluetooth® USB Adapter
The Professional High Speed Bluetooth USB Adapter is the world’s first Bluetooth USB adapter that has been designed specifically to deliver the high data rates of modern technology. The Bluetooth USB adapter was developed with the most advanced Bluetooth features in a product that has been engineered to ensure the highest quality and reliability. This is a professional product for use where robustness and reliability are critical. The USB adaptor provides the reliability that ensures wireless applications work just as well in the diverse ‘real world’ deployment locations as in the controlled environment of engineering labs.
Antenna Solutions

Linear Polarized Panel Antennas
Laird offers a robust and diverse product offering of Linear Polarized Panel Antennas. Linearly polarized panel antennas feature high performance and versatility. All antennas in the series are provided with UV stabilized radome enclosures and can be mounted to either interior or exterior wall surfaces or masts in either fixed or articulating configurations. Models are available from 8 dBi to 17 dBi gain. Integrated coaxial pigtails can be modified for length and connectors can be modified to suit the application.

Phantom® and Phantom Elite® Antennas
The unique patented Phantom® and Phantom Elite® are tough low-profile antennas for outdoor or indoor applications. Measuring only 2.7” tall, these 800 MHz to 5.8 GHz antenna models’ revolutionary design features field diversity with both vertical and horizontal polarization components. This gives the antennas diversity, frequency agility, low visibility, wide bandwidth and a low angle radiation pattern that is superior to traditional gain antennas in most applications. The industry standard NMO mounting socket mates with all Laird magnetic, trunk lid, and hole mounts. The Phantom® and Phantom Elite® patented technology is beneficial when high performance is desired and extreme ruggedness and low profile is required.

Fiberglass Omnidirectional Antennas
Fiberglass Omnidirectional antennas from Laird feature a variety of available frequencies. The high performance and reliable design is enclosed in high density fiberglass and covered with a protective ultraviolet inhibiting coating. The durable gold anodized sleeve and cap will not oxidize in outdoor environments. Models are available with up to 12 dBi gain and custom tuning is an option.

Yagi Antennas
Laird’s premium series Directional Yagi antennas are fully gold anodized for corrosion resistance. Our engineering staff has also optimized the product family for forward gain by computer analysis and then field-tested each for conformance. The internal matching design will not ice up, detune or corrode. Custom VHF tuning is available. Enclosed Yagi antennas feature 2.4 GHz completely sealed for outdoor use. The high gain available moves your lower power ISM or WLAN signal from point to point with minimal signal loss.