Firefly Smart Lighting System

Software-controlled smart lighting that delivers real-time visual communications to underground mine sites.

Automation | Innovation | Communication

IoT AUTOMATION

IoT Automation is an Australian-born designer, connecter and supporter of technology solutions. We specialise in wireless sensor networks and smart lighting.

Our headquarters is on the Gold Coast, but our reach is global. Offices in Mongolia and Indonesia, give us valuable local knowledge and vital international perspectives.

Our adept and nimble team create Internet of Things (IoT) based solutions. Supported by leading Australian engineers, we focus on delivering global expertise to local companies.

It is our mission to create and deploy the next best technologies for the resources and construction industry.

Discover more at www.iotautomation.com.au

Australian Made Product

Wi-Fi (802.11 b/g/n) Certified

Bluetooth Low Energy Certified

IP65 Certified

European CE Certified to Machinery Norms

FCC Certified

Firefly Smart Lighting System

Smarter lighting for safer mine sites.

Firefly provides sites with the ability to indicate safe, unsafe and seismic zones, as well as providing a visual alert when evacuation is necessary — utilising intelligent illumination to communicate critical information to the underground workforce.

State-of-the-art control software is able to centrally manage the performance of the entire lighting network. This central control enables the end user to very quickly and easily utilise the smart lighting system to communicate critical safety information to the underground workers informing them of what actions they should take during a seismic event, a controlled blast or to quickly create an exclusion zone around an unsafe work area.

- Quick and effective zone management
- Real-time demarcation of seismic areas and associated alerts
- Fire & emergency event evacuation
- Guidance to a safe refuge or safe areas
- Improved illumination for post-event inspections
- Vehicle traffic awareness
- Data backhaul from geotechnical instruments

Firefly is a durable system that won't fail on the job. Each unit is enclosed in a compact, robust unit designed for the underground mining environment; the LED lighting can be controlled in zones or individually.

Discover how Firefly Smart Lighting can improve the safety of your mine site.

The Firefly Smart Lighting System uses intelligent illumination to communicate critical information to underground mine workers.

Firefly LED Lighting Module

The rugged, fit for purpose Firefly LED Lighting Module enables safer evacuations and emergency responses underground. The intuitive system improves visibility, workflow and most importantly, safety.

Firefly's +48VDC multi-coloured addressable LED assembly is designed to provide emergency or evacuation lighting levels for underground workers. The Firefly modules are safe, reliable and wholly designed and manufactured in Australia.

- Rugged design, built specifically for underground mining production areas
- Powered and controlled by the Firefly UPS Control Panel - wall mount version or integrated MineARC Refuge Chamber version
- Operates across a wide ELV voltage range of 6-60VDC
- 802.11g/n and BLE wireless capability to provide a redundant communications path in the event of cable damage
- Each Firefly module can track and position Wi-Fi/Bluetooth tags to 10m accuracy
- Wireless connectivity provides a data backhaul for other environmental sensors

✓ **Small, compact and robust**

✓ **IP65 and IK06**

✓ **Supports multiple colours and modes**

✓ **Quick connect/disconnect design**

✓ **Ultra-low power consumption**

✓ **Li-Po internal battery backup**

✓ **18 individual high-powered LEDs**

✓ **Wireless enabled, featuring Wi-Fi and Bluetooth Smart**

Supports Multiple Modes and Colours

A single Firefly Smart Light provides a range of selectable colour options; including red, green, amber, blue and white. In addition, multiple modes of operation are available, including static, flashing for alerts and trailing for directional assistance.

Sites can customise alerts as well as default lighting modes - both in regards to colour and function - based on their particular preferences and current safety procedures.

| RED | GREEN | AMBER | BLUE | WHITE |

MULTIPLE MODES OF OPERATION
'ON'
'FLASHING'
'FORWARD TRAILING'
'BACKWARD TRAILING'
'INSPECTION'
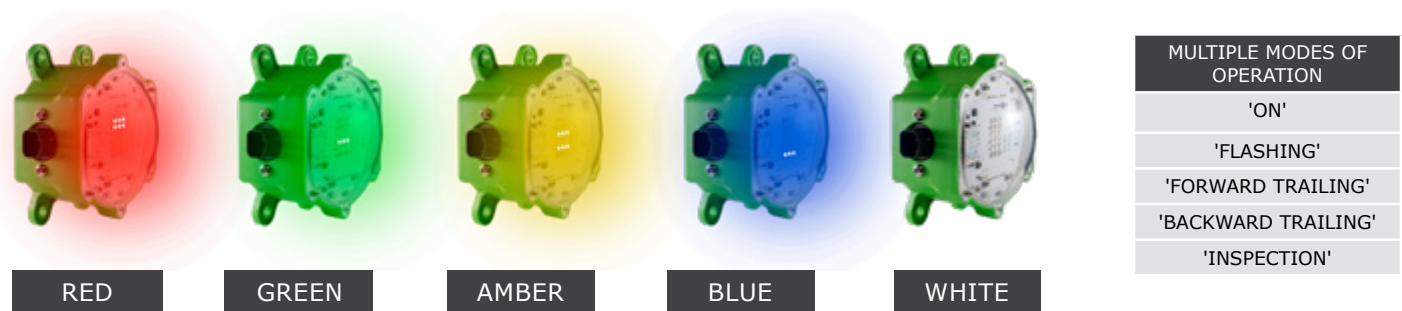
Mine Demarcation

Demarcation and Zoning

Firefly Smart Lighting helps to manage the day-to-day demarcation of safe and unsafe areas of the mine. With each module capable of multiple colours and modes, the system can provide a variety of demarcation functions. As an example, 'amber flashing' lights may indicate a dedicated travel way, 'red static' lighting to communicate that a seismic Level 1 event is in progress, and site-wide 'red flashing' can be used to alert personnel to a high priority emergency evacuation.

Vehicle Awareness

Firefly Smart Lights illuminate ahead and behind the path of heavy vehicles to indicate approach; reducing accidents and minimising traffic issues.

Dynamic Evacuation

Firefly Smart Lights provide guidance lighting as to the shortest route to a 'green' safe zone or mine exit.
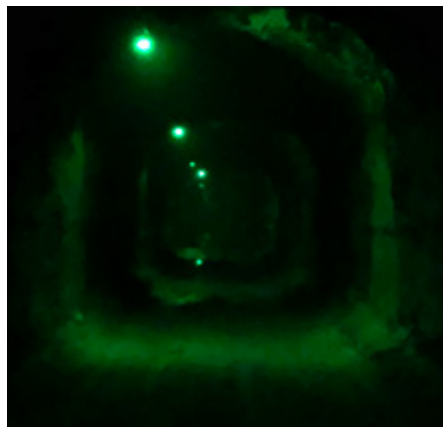
Firefly Smart Lighting provides a distinct visual indication
of the safety level within an area of the mine.

Firefly communicates real-time visual warning and evacuation information if a seismic event occurs

Application

The Firefly Smart Lighting System provides underground mining operations with a new additional layer of safety. Through smart illumination and user friendly control software, Firefly provides a robust and reliable solution to visual navigation and alerts in the underground mining environment.

Firefly Smart Lighting is ideal for:

- **Underground personnel**; improving general lighting levels to optimise efficiency, reinforcing safety procedures through visual alerts, and providing vital communications in times of need.

- **Mine managers**; managing daily operations and initiating alerts and emergency evacuations.

- **Geoscience managers**; managing seismic zones and initiating alerts.

- **Production managers**; improving visual identification of draw points and demarcating active loading and automation zones.

- **Ventilation managers**: automating the demarcation of non-ventilated areas and safe-to-enter zones.

- **Electrical managers**; providing easier-to-deploy, lower cost illumination into mining areas.

Geoscience

Mining

Refuge Chambers

Tunnelling

Safety

Firefly UPS Control Panel

The Firefly UPS Control Panel is an intelligent, decentralised power system explicitly designed to drive underground LED lighting circuits. It can be supplied as either a wall-mounted version or a custom integrated MineARC Refuge Chamber version. It supplies a +48VDC power feed with the ability to drive four individual strings of Firefly LED Lighting Modules at 35 modules per string.

The Firefly UPS Control Panels manage the lights by providing battery-backed power and communications to the Firefly LED Lighting Modules. The control panels can operate as a standalone lighting cell, or they can be connected to the central control server to form a site-wide smart lighting network.

Key Features

- Controls four different modes of operation and 5 different LED colours
- Externally mounted IP65 105dB siren LED beacon
- External connection ports to enable the installation of siren/strobe lights in the drifts
- External copper and fibre connection ports
- Multiple connectivity options: Wi-Fi, Ethernet, RS485, Modbus/TCP, CAN Bus

- Can drive other brands of LED strip lighting (addressable and non-addressable)
- 48VDC 20A power supply (5A per output string)
- 7.5" LCD colour display for on board programming and management
- Auto discovery of LED devices for trouble free installation and configuration
- Central monitoring via local web application

- Intelligent battery management: protection, conditioning and monitoring to ensure proper operation under all circumstances
- Internal temperature monitoring
- Easy to install wall mount design
- Fully integrated MineARC Refuge Chamber version
- External roll cage for protection
- IP65 ingress protection

Versatile and Powerful

The Firefly UPS Control Panel is modular by design. The communications hardware is separated from the AC electrical compartment to enable maintenance crews to better support the hardware. Its internal components can be interchanged to suit the required function and to assist with maintenance and repairs.

The control panel has an additional battery backup system. The 48VDC 50Ah backup will maintain each string of Firefly LEDs for 4-6 hours when the AC mains power feed to the UPS control panel is turned off.

Technologically Advanced

Each Firefly UPS Control Panel is remotely monitored and managed across a mines network via its web application.

The app features a user-friendly, yet comprehensive interface. Maintenance staff are alerted to discover new or replacement Firefly LED Lighting Modules and allows them to monitor electrical circuit health. Notifications are issued for any system or component faults, meaning users can quickly fault-find or identify any maintenance issues.

Firefly Lighting Control Software

The underground Firefly Smart Lighting System is networked to a Firefly Smart Lighting Control Server that centrally coordinates the Firefly UPS Control Panels located underground. These Firefly UPS Control Panels manage the lights by providing battery-backed power and communications to the Firefly LED Lighting Modules.

The Firefly UPS Control Panels can operate as a standalone lighting cell or they can be connected to the central control server to form a site-wide smart lighting network.

The control server can be configured on site as either a physical or virtual server install.

The Firefly Smart Lighting Control Server is comprised of the following software elements:

1. Linux Debian Server
2. Web Application
3. NGINX Web Server
4. MQTT Broker
5. SQL Database
6. System Monitoring

Smart Lighting Control Software

Firefly Web Application
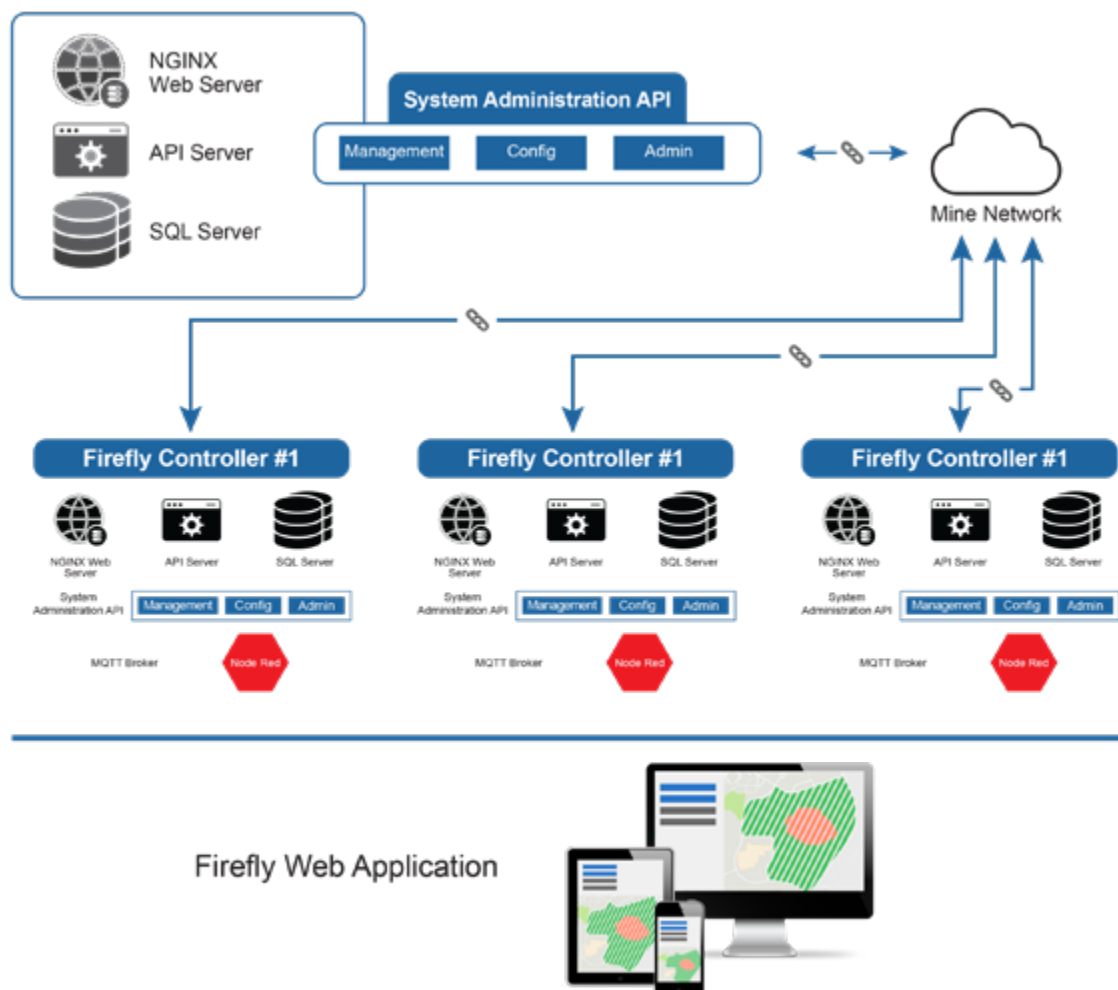
Software to support a dependable and versatile web application

Firefly's Smart Lighting web application is complete with an intuitive interface where users can reliably monitor and control the entire lighting network. The application supports the easy setup and configuration of all Firefly devices.

Most importantly, the interface provides a map-based management solution that can trigger zone, level or mine-wide emergency and evacuation events.

Various login profiles can be setup and given permission to access mission critical system functions if necessary. The software can support the following needs across different departments:

Geoscience
- Create and update seismic exclusion zones, as the cave front advances (or as required)
- Initiate seismic events
- Upload and calibrate mine level plans
- Create a Bluetooth connection between a geotechnical instrument and a Firefly light

Engineering
- Create and update hydro fracturing exclusion zones

Mining
- Create and update mining related exclusion zones

Underground Dispatcher and Command Centre
- Initiate emergency alarms or seismic alarms as directed
- Turning lights on and off as requested
- Changing the colour of lights as requested