



Maestro Plexus PowerNet™

Engineered for the harsh underground mine environment.



The last mile communication solution

Plexus PowerNet™ delivers a high speed, low latency digital communication network that provides PoE+ power to Access Points (APs), cameras and other IP based devices. The system eliminates the need for costly outside fiber optic contractors and can be installed and maintained by any internal tradesperson.

The first gigabit network providing both data and power using flexible coaxial cable.

EASY TO POWER, INSTALL, ADVANCE & REPAIR

Plexus PowerNet™

Your last mile communication
solution to the face.



Enabling the Digital Mine Starts with Connectivity

The Digital Mine is founded
on the use of critical data to
increase production, reduce
costs and enhance worker
safety.

The Challenge

Most often, underground mines choose fiber optic cable as the means to extend connectivity from the level entry out to the working areas. Separate power cable runs are then required for each end point device, like access points, cameras and other Internet of Things (IoT) devices.

Fiber presents a number of challenges to the underground mining industry. Terminating fibre underground is difficult and time consuming requiring a clean environment, expensive specialized training and expensive delicate tools. This is frequently, the biggest contributing factor limiting the advance of connectivity. These types of delays inhibit the agility and pace needed to enable the Digital Mine bringing network communications to the working face.

The Solution

Identifying the mining industry's growing demand for real-time data, *Maestro Digital Mine* works with mining companies around the world to address the challenges associated with traditional communication backbone solutions (broadband and fiber). The **Plexus PowerNet™** quickly and simply extends the mines existing communications network to the face.

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Accelerate the time to connectivity by making the complex, simple with the **Plexus PowerNet™**

The **Plexus PowerNet™** is high bandwidth, low latency, coaxial communication infrastructure solution. It provides a robust, simple to deploy, one cable solution for network connectivity. Plexus makes installation simple, using a single coaxial cable that carries both power and network connectivity. This eliminates the need to run both fiber and power to new network devices. The EZ Advance Nodes provide an easy way to terminate, troubleshoot and deploy standards based IP devices from the **Plexus PowerNet™** embedded network switch.

The core of the network is the Plexus PowerNet™ nodes, each of which has four PoE+ ports and provides power to the access points or end point devices. The nodes also have a USB port that can allow an easy upgrade of firmware and backup of configurations. Simple port diagnostics on the devices make it easy to see power consumption, voltage and data rates.



WI-FI



VIDEO



RFID



TELEMETRY



VOICE

Features and Benefits

- Power:** Easy to add DC power at any Node. A single power supply will power 8-10 Access Points (APs) reducing total infrastructure cost and time.
- Connect:** Easy to connect directly to a level network switch. Combine power and network connectivity onto a single cable. Each node provides a 4 port PoE+ network switch in fully managed or unmanaged mode.
- Advance:** Easy to add splitters and additional nodes. Easy to install, extend, terminate and maintain by in-house electrical trades or development miners.
- Repair:** No skilled labour required to troubleshoot or replace components, saving time and increasing production rates.

Easy to power, install, advance & repair

Customer Use Cases

Enable connectivity for the Intelligent Mine and the Connected Worker such as:

Autonomous and tele-remote vehicles;
Telemetry to drills, loaders and support equipment;
Support for Short Interval Control and connectivity to tablet, smart devices;
IoT sensors such as environmental, seismicity;
Voice over IP (VoIP);
Connected worker video, voice, and augmented reality;
Asset Tracking;
PoE+ based IP cameras & PoE+ LED lights for paste fill;
PLC connectivity.



Surface

Integrated remote operations center



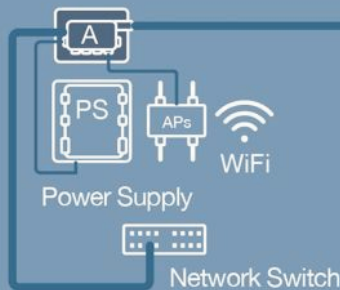
Tele remote LHD & drills



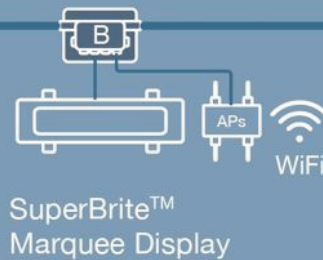
— Plexus PowerNet™ is —
ENABLING THE DIGITAL MINE

Underground

Level entry / Sub-Station



Plexus PowerNet™



Vigilante AQS™ Air Quality Station



1,500 m Maximum distance between Nodes

coaxial cable

coaxial cable



Connected worker



WiFi



Real time data + telemetry



WiFi



Booster & auxiliary fans controls

Dewatering pump controls

Paste fill & conveyance cameras

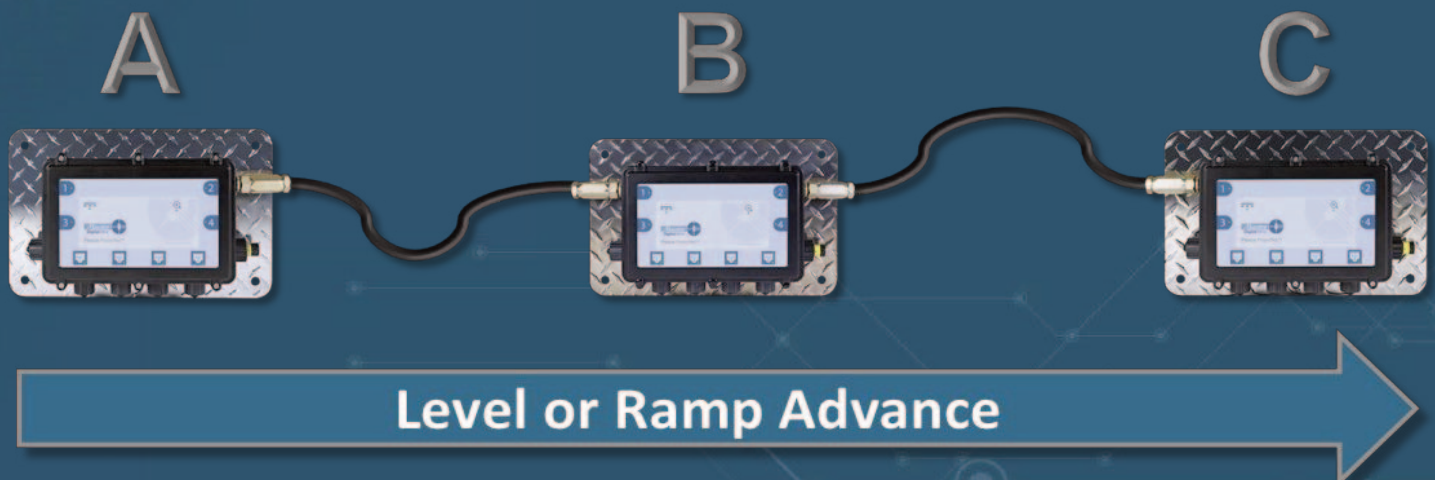
Push to talk VoIP phones & apps

Wireless tablets (product in progress)

Ventilation & environmental equipment

Mobile equipment tracking / tele-remote or autonomous

Plexus PowerNet™ – Your last mile solution to the face.



Our current clients have compared other gigabit network solutions and concluded that CAPEX can be decreased in the area of 40-60% without any compromise of network speed or capability. The **Plexus PowerNet™** can be used in mines with or without a fiber optic network. The **Plexus PowerNet™** provides the quickest “last mile” of communication and connectivity.

Maestro Digital Mine manufacturers Industrial Internet of Things (IIoT) **measurement and control instrumentation** for the optimization of underground mine ventilation and underground digital networks for last mile of communication.

Our products are made **exclusively** for the **underground mine automation, technology (IT/OT) and ventilation sectors** that delivers energy savings and productivity improvements while meeting the highest **health and safety standards**.

Our vision is changing the way that underground mines communicate and **to strip out complexity in automation jobs and make configuration flexible and easy**. We make the complex, simple!



TOP 10 COUNTDOWN

Plexus PowerNet™

Why our clients choose the **Plexus PowerNet™** to extend their underground communication networks.

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Simplicity & Speed of Advancement

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Advancing the network and repairs can be done completely in-house

- Easily advanced by **ANY** electrician or **MOST** development miners
- Coax termination completed in **under 3 minutes**
- Unlike fiber, terminations do not require an ultra-clean environment
- Simple, coax tool set instead of expensive and delicate fiber splicing tools
- Simple, cable TV style fittings that have been proven over millions of terminations in harsh, outdoor environments for decades

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Bandwidth, Latency and Jitter

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Plexus PowerNet™ can handle any use case

- Autonomous and tele-remote vehicles
- HD PoE and PoE+ cameras
- Vehicle and Personnel Tracking
- Video conferencing
- Short interval control software

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Provides data & power over same cable

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Plexus PowerNet™ combines data and DC power over the same copper cable

- Reduces the number of device power supplies
- Eliminates the need for electricians and fiber specialists to deploy power and network backbone infrastructure
- Eliminate running individual power to all access points, cameras and other IoT devices

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Rugged & flexible coaxial copper cable

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Plexus PowerNet™ utilizes conventional flexible copper coaxial cable

- Easy to advance and retreat from headings
- Withstands blast concussion better than fiber optic cable
- Readily available in any global market
- Inexpensive cable
- Proven with ten of millions of miles of installation in outdoor environments

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Fully Managed

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Plexus PowerNet™ Nodes are fully managed

- Configure, manage and monitor your network with industry standard software using Simple Network Management Protocol (SNMP)
- Apply Virtual Local Area Networks (VLANs) to isolate, secure and prioritize traffic.
- Quality of Service (QoS) allows you to prioritize network traffic and manages available bandwidth so that the most important data traffic goes first

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Network Security

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Customized Client Security Needs

- Secure your network connections and also protect any unused ports on your Nodes. For example, if there is an unused port on a node, you can disable that port to eliminate rogue devices to be added to the network
- Support for RADIUS authentication simplifies network security using centralized management of user credentials
- SSH encryption provides secure configuration of **Plexus PowerNet™** nodes

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No licensing required

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

- Unlike LTE networks and other software tools, the **Plexus PowerNet™** has no annual licensing and support fees
- Firmware updates are included for life

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Open and Standard Based Network

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Plexus PowerNet™ has been designed to be agnostic and open

- Conforms to all relevant IEEE Ethernet standards
- Allows usage of any communication protocols
- Allows the use of any Ethernet device to be deployed
- No lock-in, no licenses & sustainable

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Low total cost of ownership and installation

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

- Customer feedback has confirmed CAPEX **reductions of 40-60%** and an additional 50% reduction of installation costs
- Training to advance and repair cable is completed in **under 1 hour**
- **Plexus PowerNet™** can be deployed in a fraction of the time vs competitive solutions

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We leave no one stranded

EASY TO POWER, INSTALL, ADVANCE AND REPAIR

Post sale service & support

- Detailed software configuration manuals
- How To Videos:
 - Termination videos
 - Cable pulling videos
- Phone and email support
- On-site training & commissioning support
support@maestrodigitalmine.com

Technical Specifications

Hardware specifications:

4 PoE+ Ports	PoE 802.3af, 12.95 W typical (15.4 W maximum) PoE+ 803.2at, 25.50 W typical (30.0 W maximum)
	4 x RJ-45 Circular bayonet receptacle (IP67 – dust tight, waterproof) for 10 BASE-T / 100 BASE-TX / 1000 BASE-T Ethernet Auto medium dependent interface (MDI) and MDI crossover (MDI-X) Auto negotiate
	1 x USB Type-A console port / configuration / firmware update (IP67)
	1 x DC Bi-directional power receptacle (15A Max. insertion) (IP67)
	1 x Coaxial bulkhead port (Type-A, Type-C) or 2 x Coaxial bulkhead ports (Type-B) (IP67)
LEDs	DC Power, Health, Link/Activity, PoE enabled

Layer 2 specifications:

VLAN	Port-based and 802.1Q tag-based VLANs
IPv4	Protocol-based VLAN
IPv4 Applications	Management VLAN
LLDP	Link layer discovery protocol
QoS	Quality of Service. IPv4 Type of Service (TOS)

Software management specifications:

Web user interface	Built-in web user interface for easy browser-based configuration (HTTP) Administrator and user access levels Diagnostics, port up/down, voltage, amperage
SNMP	Simple Network Management Protocol – Version 3
RADIUS	RADIUS client
SSH	Secure Shell Protocol
SolarWinds®	NCM and NPM compatibility
Other management	Single IP management Dynamic Host Configuration Protocol (DHCP) client VLAN and Trunk configuration

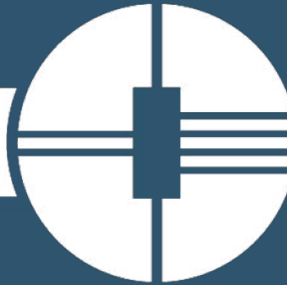
Environmental specifications:

Enclosure dimensions	10.787" x 6.811" x 3.937" (273.99 mm x 172.99 mm x 100.00 mm) (length x width x height)
Enclosure rating	IP67, NEMA 1,2,4,4X,12,13
Weight	6 lbs (2.7kg)
Certification	CE Mark, FCC Part 15
Operating temperature	+14° F to +122° F (-10° C to +50° C)
Voltage range	20 – 60 VDC

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Digital Mine



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Real time data means more time at the face