

Advances in Mine Wireless Communications Solutions That Work

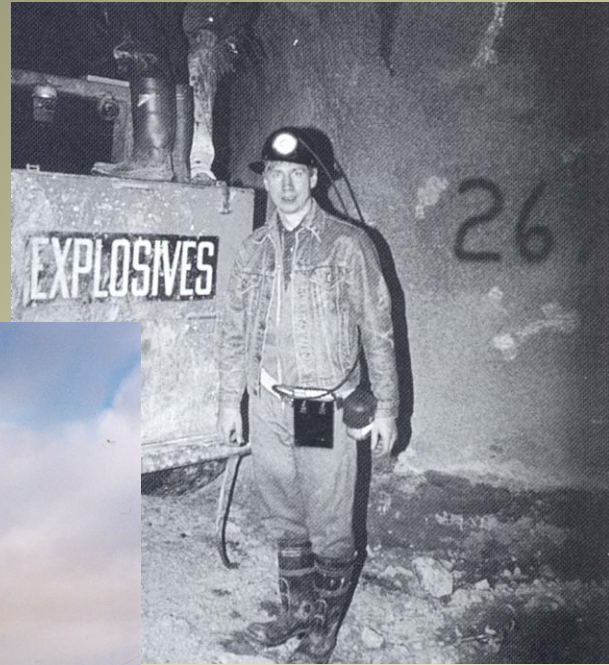
Tunnel Radio of America, Inc.

3-2006

Ideas for Today and Tomorrow
Presented by Mark D. Rose



Why do we do this stuff?



For Them!



2-Way Radio System Features...

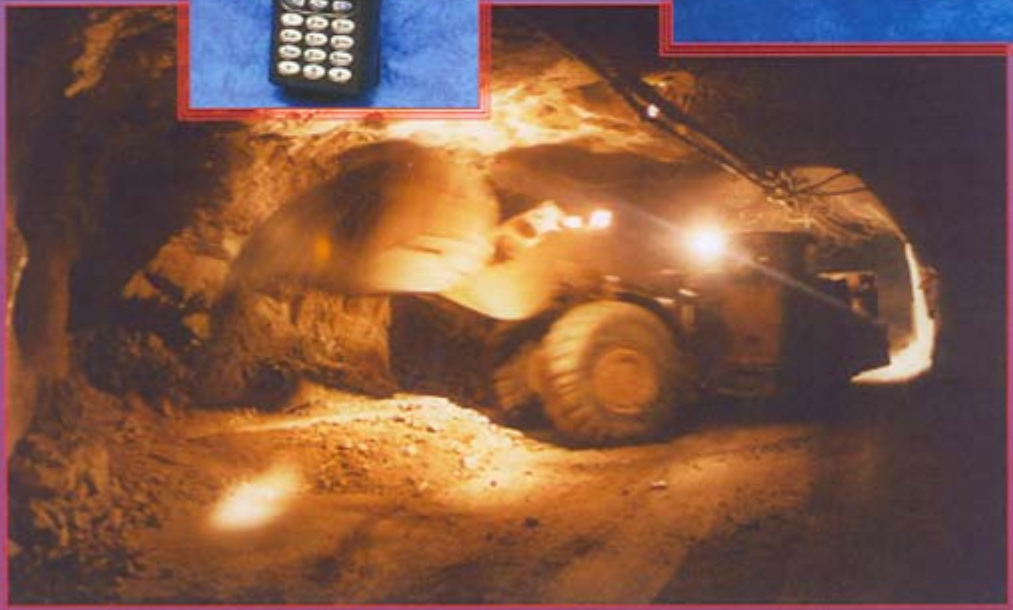


Basic System Requirements

- Person to Person wireless Communication across network
- Surface to Underground Use
- Mobile Relay Functional

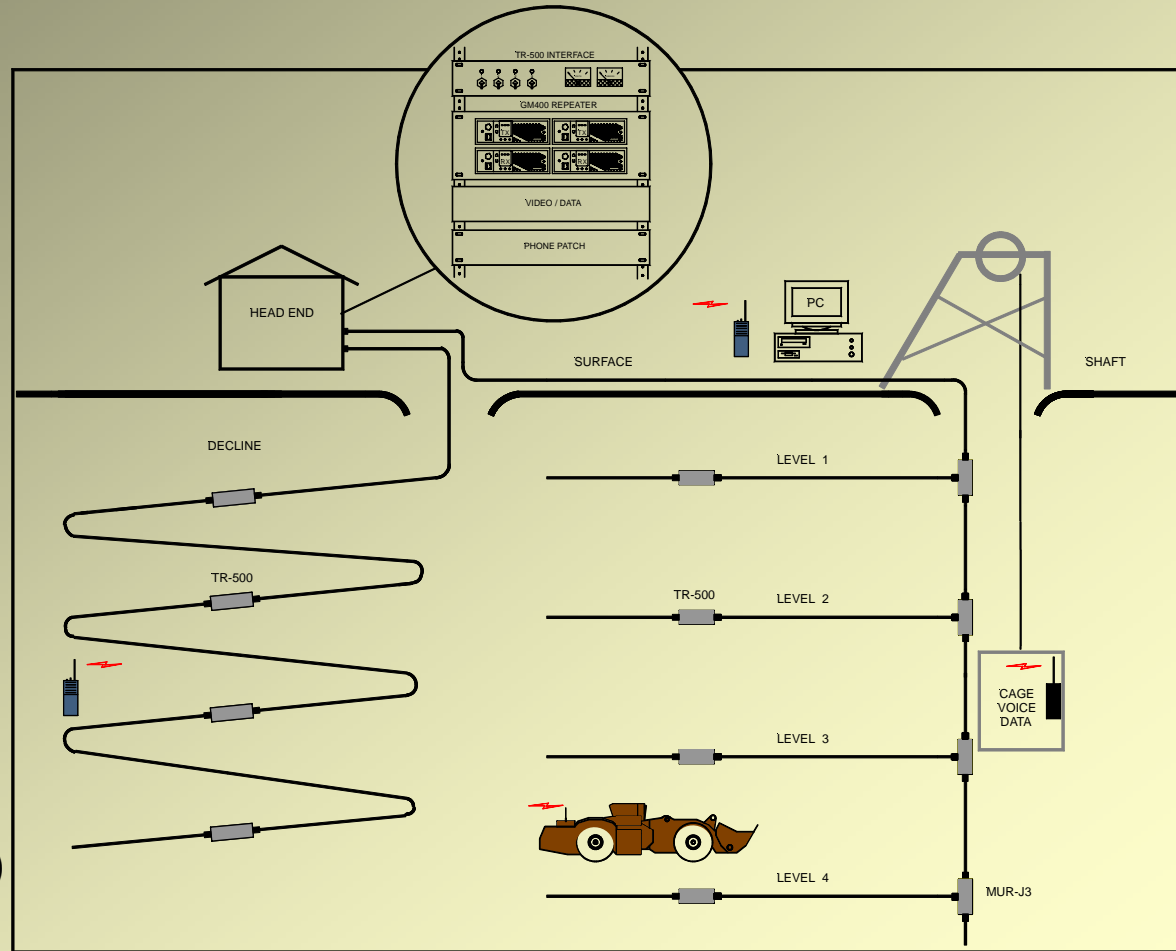
Advanced System Requirements

- Multi-Channel Capable
- Wireless Data Transmission
- Enhanced Range for Emergency Use
- Personnel & Equipment Tracking
- Emergency Operational features
- IP and Ethernet Compatible



Ultra High Frequency Communications (300 – 900 MHz) Result -

- Radio technology offering unmatched radio coverage,
- Voice + Wireless Data layer working
- Wi-PAD Tracking Compatible
- High reliability design, simple to install and service
- Fully Mine tested (2-Way)



'Leaky Feeder' VHF System



Coupling Loss at 20 Feet
65dB



UHF Antenna System



Coupling Loss at 20 Feet
<40dB



30 dB = 1000X more effective
power over VHF

UHF Bands 300 – 900 MHz

Greater Range

Obstacle passage

Hi Reflected Energy

PROPAGATION IN TUNNELS

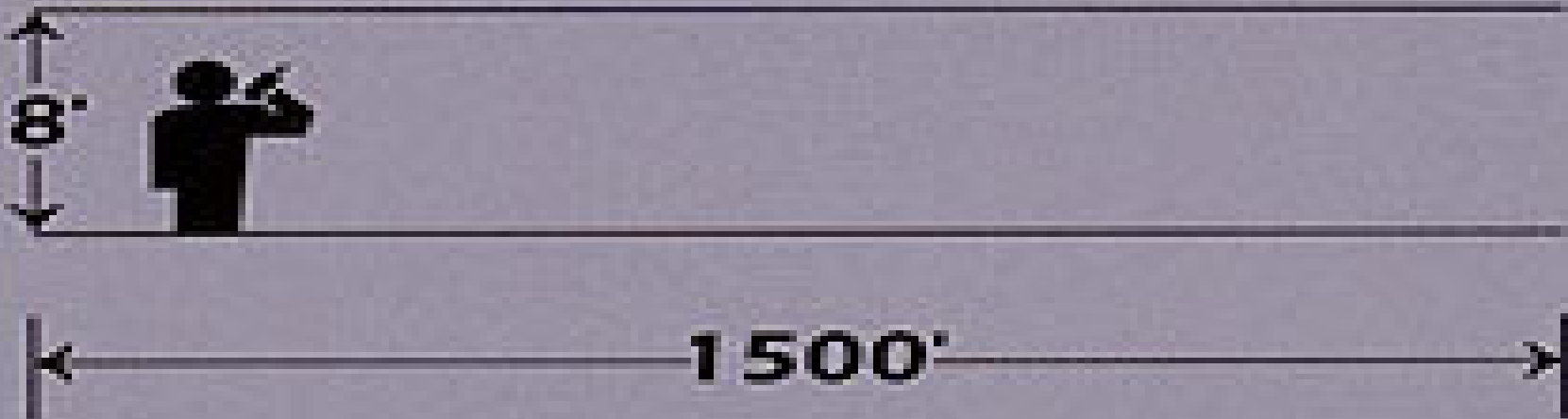
150 MHz

350 ft.

500 MHz

1000-

3000 ft.



Integrated Wireless Systems

Wi-PAD
Wireless Tagging Tracking

TMS
Data Acquisition

Mine Stat Voice-Alert
Remote Operation

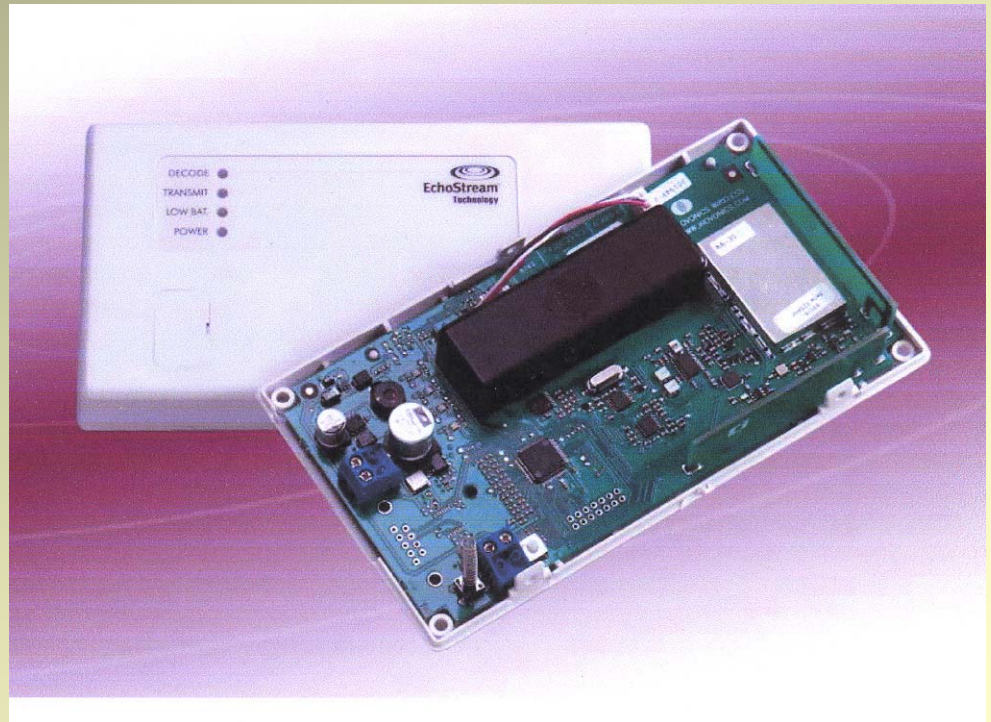
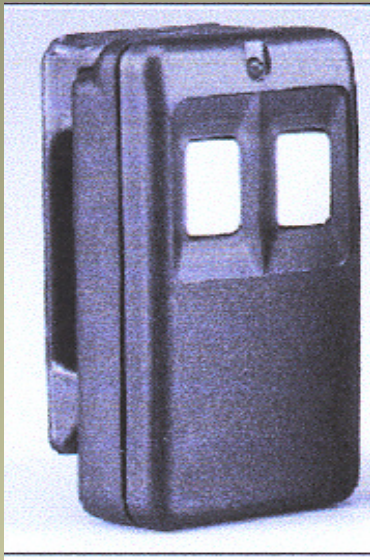
Radio Over IP



T-PAD

Wireless Personal Alert System

- Tag incorporates emergency and man-down alert
- Position Reporting to Capture software
- Cableless network between reader/repeaters
- High Post Event survivability & 24 hour Batt
- Quick damage repair cycle



T-PAD Personal Alert Device

Personal ID tag and communicator



- ◆ **Features**
- ◆ **Continuous Location Transmission**
- ◆ **Man-Down Alert**
- ◆ **Emergency Button Alert**
- ◆ **Signals are captured to near Reader Repeater and passed wirelessly to host**
- ◆ **3 year battery life**
- ◆ **Small size**
- ◆ **May be integrated into Portable battery case**
- ◆ **VoIP transmission capable**

T-PAD tracking and UHF 2-Way Network

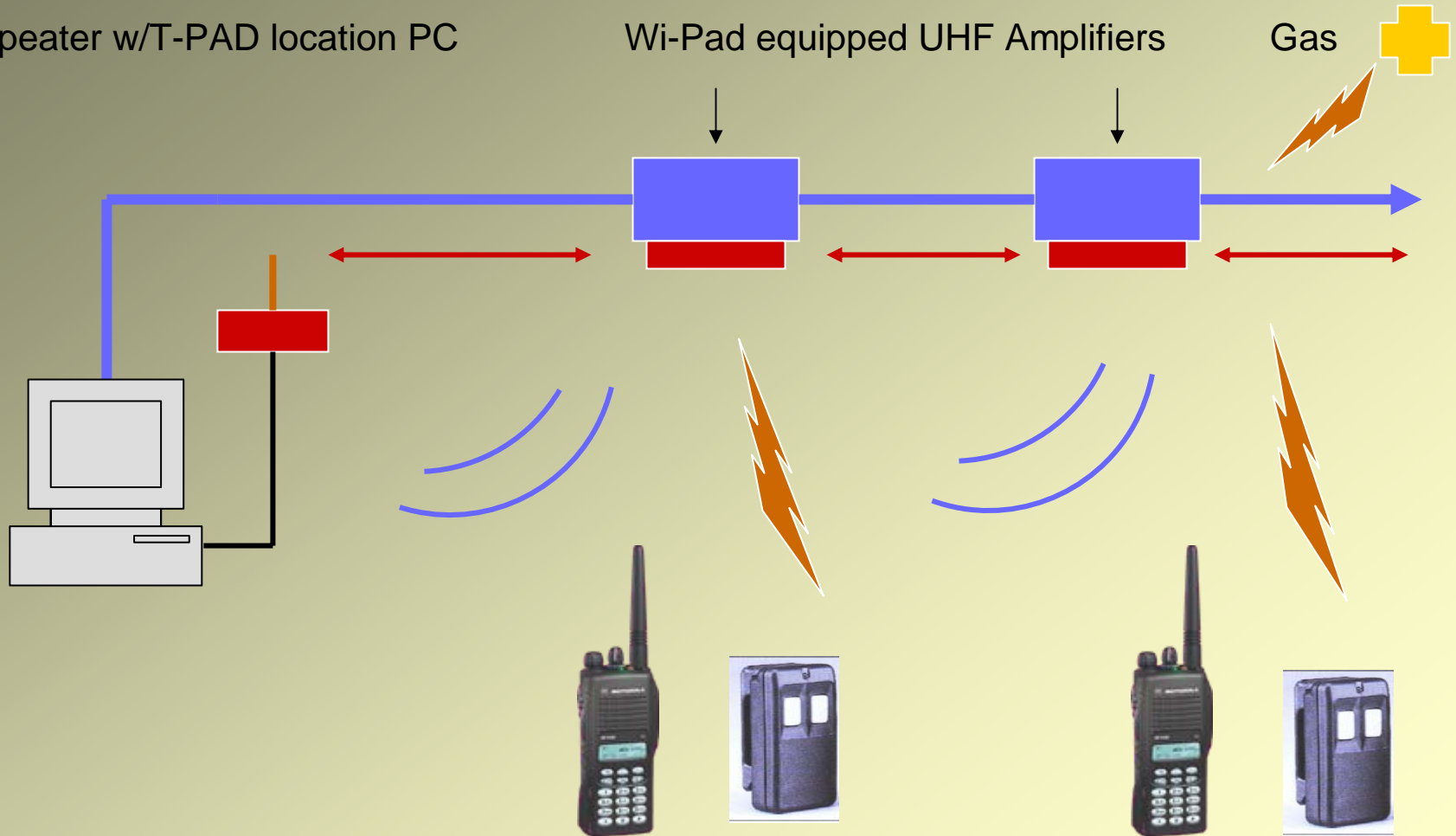
100% Wireless Wi-PAD layer

UHF Radio layer

Repeater w/T-PAD location PC

Wi-Pad equipped UHF Amplifiers

Gas



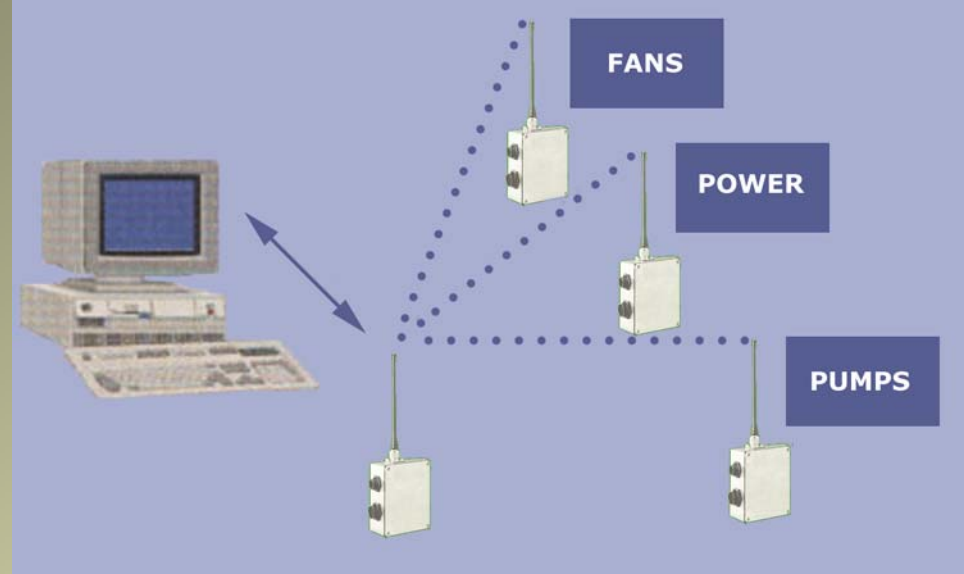
TMS

Tunnel Monitoring System

Wireless Data Monitoring and Control

Key Benefits

- Wireless monitoring of utilities and vehicles via PC
- Get Real-Time Overview of System with innovative SCADA based software
- TMS + complements Modbus based software platforms
- Compact, low cost radio RTU units with excellent service record



Features

- Control and Monitor Utilities
- Diagnostics for Radio system
- Comprehensive Offsite Capabilities
- TMS+ 128 KB long range wireless databuss
- Gas sensing, rock mechanics data collection & ?

Mine-Stat

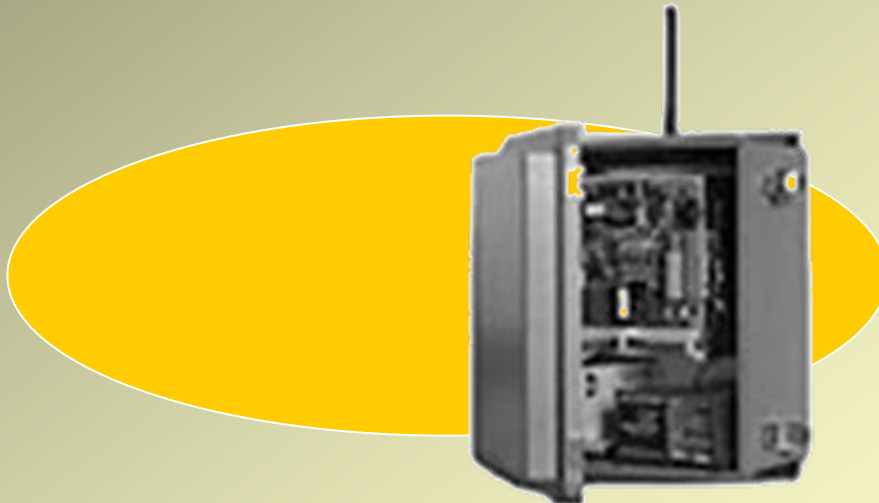
Control and status

Key Benefits

- Remote control equipment with Portable Radio from anywhere in the mine/surface
- Immediate remote ACK of command
- Voice response ACK of commands optional
- Dry contact closure or mom, AC relay, PLC control, remote stench release

Features

- Wireless remote control
- UltraComm or TROIP system compatible
- Integrated radio, antenna, battery, and power supply
- User programmable
- Fast installation – self contained unit



Advanced Digital Safety Signaling Options

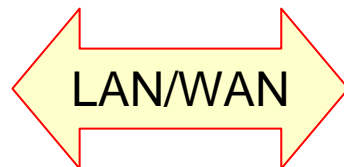
Programmable features in SOA Portables

- **One Button Emergency Signaling from Portable**
- **User I.D. is Displayed and Logged to Console**
- **Emergency All-Call From Console**
- **Radio Check Features**
- **Man-Down and Lone Worker capable**



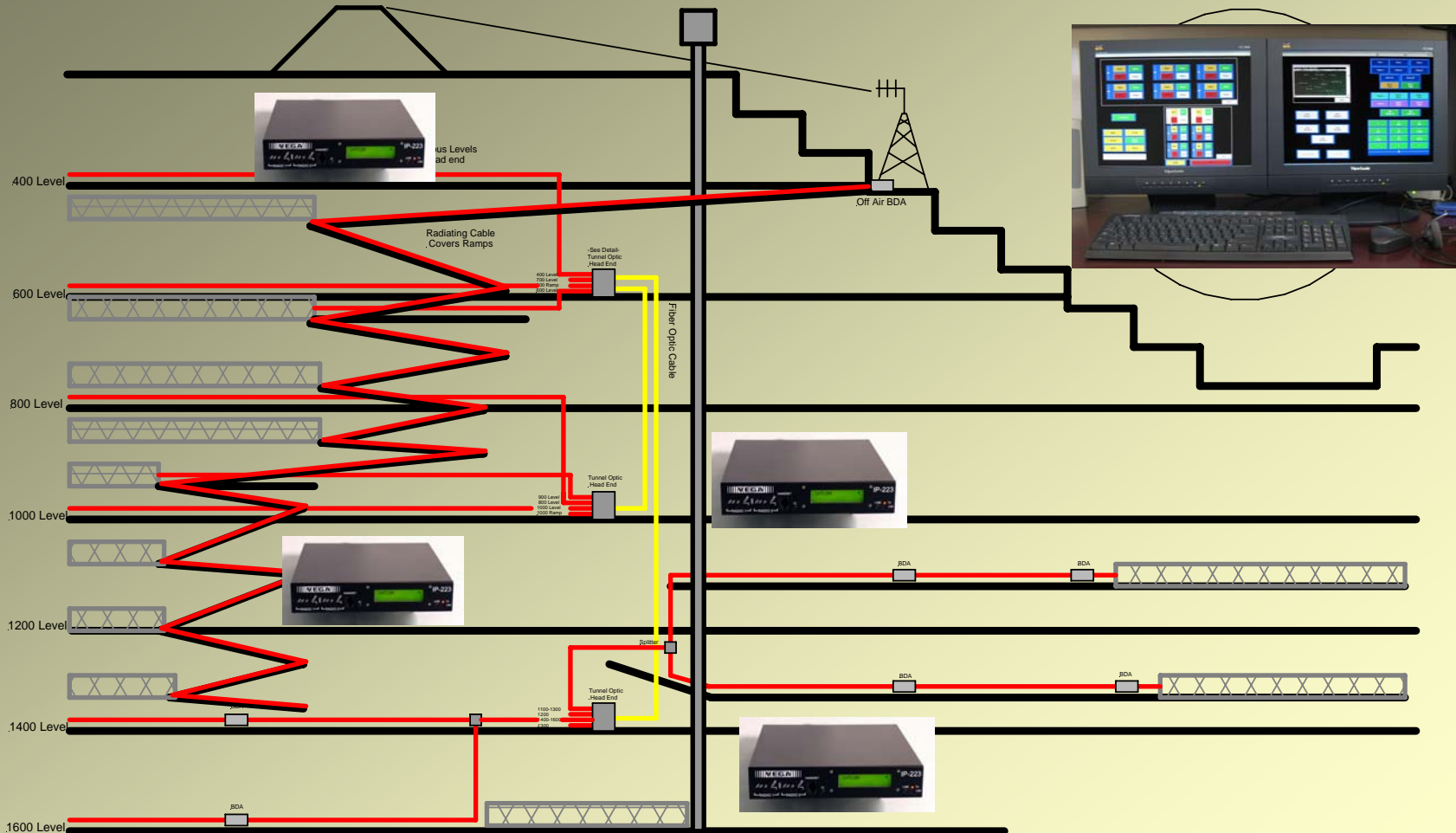
TROIP IP-Based Mine Radio – How it works

- ◆ Convert audio into data packets for network transfer
- ◆ Audio is divided into 10-40ms packets, compressed and put on the network
- ◆ Packets are transferred, decompressed, converted to analog and played
- ◆ Existing LANs, WANs and Internet allow for radio connection to dispatch facilities
- ◆ ROIP units incorp wireless node, all voice traffic stored for retrieval
- ◆ Position location captured to server display in control room



Tunnel Optic TROIP System Application

- Uses TROIP UHF Repeaters
- Simulcast operation of all nodes
- Uses Standard Ethernet Highway
- Location of transmissions Captured
- T Configuration Provides Redundancy



Ideal Applications for TRIOP

- ◆ Remote/redundant/emergency back-up radio control systems
- ◆ Affordable technology migration
- ◆ Maximizing Mine Ethernet installation
- ◆ Interoperability

Closing thoughts – Finally!

- ◆ Mining as an Industry, why are we 19 out of 20?
- ◆ How can we move up to the top 5?
- ◆ A safer work environment
- ◆ A high tech work environment
- ◆ The American Miner needs well deserved public support, we need media help to fix it!
- ◆ Mining – The savior of our economy?
- ◆ “The Lord your God is bringing you into a good land, a land with streams of water, with wheat and barley, a land where bread will not be scarce and you will lack nothing; a land where you can MINE (dig) iron and copper out of the hills. “ Duet 8:6-9

MINING, God’s plan for a sound economy!

A Tribute to the Men who started it all...

- ◆ The late Albert (Al) Isburg
- ◆ US Bureau of Mines



- R.W. Bob Haining
- British Coal Board

