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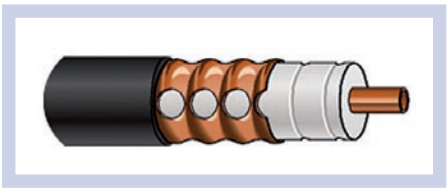
Professional Radio & Paging Communication Specialists



- **Two-way Radio Communications.**
- **Increases Safety and Production.**
- **Data, Telemetry and Video capability.**
- **Local and Remote Diagnostics.**
- **Easy to install and maintain.**
- **Reliable and robust engineering.**

System Operation

BECKERCOM is designed to provide seamless communications throughout an underground mine or tunnel. The Leaky Feeder cable acts as a mine-wide antenna. It eliminates the need to install and maintain dozens of hardwired cables and signal wires. The RF signals from the Head End, which is usually located on surface, are transmitted throughout the tunnel network over the Leaky Feeder system.

Normally coaxial cable is designed to keep as much signal as possible within the cable, and to block any external signals and noise from penetrating. However Leaky Feeder cable is designed to 'leak' or radiate the RF signal out, as well as allow signals in from any remote radio transceivers within 50-200 meters (depending on system frequency) from the Leaky Feeder cable. To sustain the RF signal levels over long distances, Line Amplifiers (or boosters) are inserted along the Leaky feeder cable run, nominally every 350m.

Where coverage is required in a tunnel off the main drive, such as a ramp, shaft or cross cut, Branch Units may be installed. The Amplifiers are line powered by 12, 24, 36 or 48 VDC as required, via the Leaky Feeder coaxial cable.

BECKERCOM allow miners to communicate over standard or encrypted commercial two-way radios, monitor and control electrical equipment such as fans and pumps and view video images from strategic locations throughout the mine.

BECKERCOM provide the option of VHF and UHF bands. The system is reliable and robust, specifically designed for the environment.

UHF versus VHF

UHF offers significant advantages over the traditional VHF solutions commonly used in mines and tunnels. UHF provides much greater coverage (up to 200 m from the Leaky Feeder cable compared to 50 m for VHF), greater useable bandwidth, higher data throughput and, most importantly, clearer communications.

Although UHF Leaky Feeder systems have a higher initial cost, VHF systems are generally more expensive over a typical Life Of Mine. The reason is simply that less equipment is required for UHF due to the extra coverage achieved. For example, UHF will propagate in to working levels (up to 200 m) thus removing the need to install a lot of branches and additional cable in to the working level. An added benefit is that you achieve communications at the working face(s) but do not expose the infrastructure to any blasting related hazards. The combination of these benefits significantly decreases the associated maintenance costs to the mine.

UHF also provides greater flexibility in utilising radios, for example combining a CB UHF with a commercial UHF radio. This equipment is less costly than having to install a UHF CB for surface and a VHF radio for underground. Video, Data and Telemetry also achieve a higher quality than VHF.

Overall, UHF provides superior performance and a more cost effective approach than VHF.

User-Friendly Equipment

Self Testing

Amplifiers include full local diagnostics to simplify the task of maintaining the system in an operating mine or tunnel. Amplifier performance can easily be monitored from a passing vehicle without the need for expensive test equipment. Amplifiers are characteristically spaced every 350 m along the Leaky Feeder cable.

+ Diagnostics

Line Amplifer

Working Levels and Branches

Any mine layout can be accomodated with the Becker Leaky Feeder system. Where additional roadways, travelways or levels require coverage, 3-way or 4-way Branch units can be installed. This allows the Leaky Feeder to be split and provide coverage in multiple areas.

+ Flexibility

3 Way Branch

Growing with the Mine

As a mine continues to develop and expand, so too does the Leaky Feeder system. The arterials are extended by adding extra cable and amplifiers as required. Additional power supplies are also required to ensure adequate power is available throughout the system. Power supplies convert the mine reticulated electrical supply (eg. 1,000 Volts) to the system voltage, usually 28VDC. Power couplers connect the DC signal to the Leaky Feeder.

+ Expandable

Power Coupler

Repairs & Extensions

Leaky Feeder cables need to be extended and sometimes repaired or modified when a mine develops in a new direction. Making quick connections and repairs is therefore important to ensure minimum downtime and reliable operations. The Becker Splice unit accommodates these requirements.

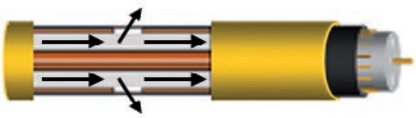
+ User friendliness

Splice Box

Leaky Feeder Cable

The Leaky Feeder cable provides the system with the capability to transmit and receive signals in an underground environment. The cable, unlike normal coaxial cables has a majority of the external copper shield removed. This allows signals to “leak” in to and from the cable.

+ Information Highway


VHF Leaky Feeder

Data Sheet

BECKERCOM UHF&VHF Leaky Feeder Systems

UHF & VHF Comparison Table

Amplifiers

Parameter	UHF Technology	VHF Technology
Operating Voltage	5 – 40 Volts DC	5 – 40 Volts DC
Local Diagnostics Display	Yes – Down Link Power, Uplink AGC, Voltage and Current	Yes – Down Link Power, Uplink AGC, Voltage and Current
Remote Diagnostics	Yes – Optional Card, PC Based	Yes – Optional Card, PC Based
Channel Capacity	80	32
RF Output	+0db	+10db
RF Gain	+22db	+26db
Suggested Amplifier Spacing	350 metres	350 metres
Data Throughput	2 Mbps	9600 Baud
Video Capabilities	Yes – 4 Channels	No

Headend

Parameter	UHF Technology	VHF Technology
Number of Feeders	4	4
RF Output	+0db	+10db
Operating Voltage	12 - 40 Volts DC	12 - 40 Volts DC

Radio Coverage

Parameter	UHF Technology	VHF Technology
Underground	Up to 200 metres from Cable	Up to 50 metres from cable
Surface	Up to 20 km	Up to 20 km
Sacrificial Cable Required	No	Yes
Stope Antennas Required	No	Yes

Other Advantages

Parameter	UHF Technology	VHF Technology
Additional Radio's Required for CB operation	None – UHF Radios incorporate CB Frequencies	Yes – Requires additional CB Radio for Communication
Tagging System Capabilities	Yes	Yes – Slow Data throughput
Seismic System Capabilities	Yes	No

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