TUNNEL RADIO

BNSF Seattle Great Northern Tunnel Distributed Antenna System
800 MHz TR ULTRACOMM COMMUNICATION SYSEM

Public Safety Communications

Reliable communications within the Public Safety sector is vital for First Responders. Fire and police departments, along with emergency medical services, all rely on the Public Safety communication network in coordinating their response. It is often the difference between life and death.

Challenge:

In Public Safety communications, established wireless solutions exist in the form of repeaters, dispatch stations, and two-way radios. However, the communication challenge increases significantly in areas where over-the-air communications signals are interrupted, such as tunnels, buildings, and other hard to reach locations. A means for extending the over-the-air communications into these disadvantaged areas must be developed.

Furthermore, in congested urban locations, with a very large number of Public Safety personnel, the challenge of sustaining simultaneous, clear, dependable communications becomes even greater. The challenge lies in maintaining simultaneous communications among many Public Safety users in an environment that is also filled with a multitude of other wireless signals including commercial radio, cellular networks, and Private System users. In an urban area like Seattle, WA, the communications spectrum is pushed to the limit.

Solution:

Tunnel Radio of America has a long history of successfully extending communications systems into disadvantaged areas such as the Great Northern Tunnel in Seattle. In this case, the solution was establishing a distributed antenna system (DAS) inside the tunnel to bring the tunnel into the existing Public Safety network. The solution included locating a Signal Booster at the tunnel's south portal to provide the interface between the existing surface repeater and the distributed antenna system inside the 5300' tunnel. The distributed antenna system included radiating coaxial cable running the length of the tunnel, with bi-directional line amplifiers regularly placed in the cable run to maintain signal levels throughout the tunnel

bore. The Signal Booster provided high downlink and uplink gain and power to bring the Public Safety communication signals into and out of the tunnel. The line amplifiers were Tunnel Radio bi-directional amplifiers designed specifically for Public Safety applications.

The congestion of the communications spectrum in Seattle presented the second significant challenge in this project. The city of Seattle has 28 communications channels within the Public Safety band. These frequencies are tightly spaced and separation must be maintained in providing simultaneous communications among the channels. In addition, the Signal Booster/distribute antenna system must prevent interference with the many other communication signals in this urban area. These conditions dictated the use of a channelized Signal Booster. This channelized Signal Booster has 30-channel capability with each channel defined by a programmable digital filter. Using this channelized Signal Booster provided the required channel separation within the Public Safety band, and also minimized intrusion of unwanted signals inside the tunnel.

The Tunnel Radio line amplifiers, in addition to providing the required signal amplification inside the tunnel, also added another layer of protection in restricting unwanted signals from entering the distributed antenna system inside the tunnel. Highly selective filtering was employed in these bi-directional line amplifiers, only amplifying signals within their tightly-defined bandwidths.

The Tunnel Radio Signal Booster/DAS provides complete system monitoring/alarm capability including line amplifier status and Signal Booster oscillation protection. The system supports the SNMP protocol and is NFPA compliant.

Result:

BNSF Telecommunications and the City of Seattle Communications Department are very impressed and satisfied with the outcome and quality of the ULTRACOMM TR-800 communications system. Tunnel Radio of America was able to achieve 100% coverage of the tunnel bore with average signal strengths of -75 dBm which surpassed the required -80 dBm spec from the City of Seattle. Voice checks of the system every 50 feet throughout the tunnel bore came back loud and clear while testing the system in worst case scenario. The Tunnel Radio TR-800 communications system also proved to work flawlessly while a passing train was occupying the adjacent track in the tunnel bore; this was critical for the customer to obtain communications outside the tunnel in any given situation. BNSF Telecommunications was impressed with the fact the even when the A/C power to the communications shack was out, the entire TR-800 communications system was able to stay online due to the ability of having D/C backup capabilities. This feature allows 100% communications inside the tunnel bore during the event of disaster with loss of A/C power.