

# Emergency radio communications in subway tunnels using multiple vehicle repeaters

## The “Yellow Box” for rapid deployment applications underground

Most modern subways use a Distributed Antenna System (DAS) to provide radio communications for both transit staff and first responders.

However these systems typically are installed late in the construction phase. If radio coverage for first responders is required before this occurs or if a backup system is required for the DAS a ‘double hop’ suitcase repeater is a cost effective solution.

## Customer profile

### Users

- Public safety personnel
- Transit operations including security and maintenance
- Road maintenance crews

### Applications

- Public safety radio coverage throughout subway systems, road tunnels, underwater tunnels

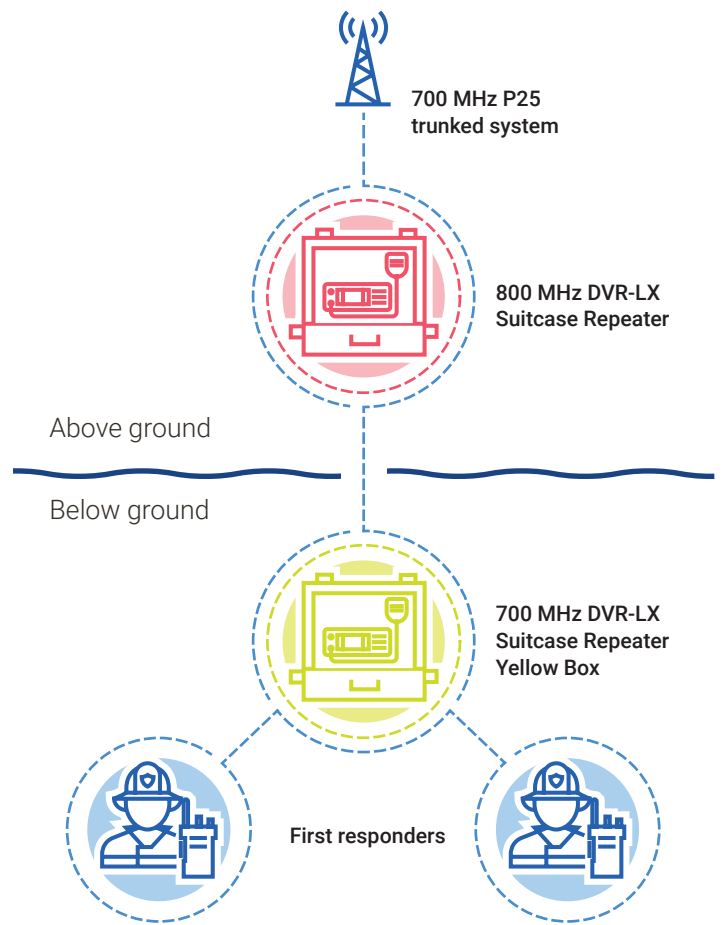
Vehicle repeaters are widely used in the fire service to extend in-building radio coverage. Subways provide a unique challenge due to the single point for the radio signals to enter/exit and the sharp 90 and 180 degree turns on the stairways. The result is that network communications usually stop a few feet down the stairs; in the best case (a modern station with wide stairways), the vehicle repeater in the vehicle will extend communications to the platform.

Communications stop once the user goes a few steps into the tunnels.

A relatively inexpensive solution involves the use of a second DVR-LX suitcase repeater and associated mobile radio (called the "Yellow Box" as it is a different colour than other DVR-LX suitcase repeaters to stop any confusion).

This is used to link users in the tunnels with the vehicle repeater in the truck. The portable radios in the tunnel talk to the repeater in the yellow suitcase repeater, which repeats it locally and also relays the communications via the attached mobile to the DVR-LX vehicle repeater in the truck, which in turn relays it to the network and dispatch.

Using Motorola Solutions APX portable radios means that voice calls are delivered to the network along with the portable radios' PTT and emergency IDs.



## Real-world experience

A large fire department deployed the double hop DVR-LX suitcase repeater in a subway tunnel. The fire department was responsible for underground coverage of a new subway tunnel extension that was under construction. They have a Motorola Solutions ASTRO 700 MHz P25 trunking network and use 800 MHz DVR-LX vehicle repeaters for their daily operations.

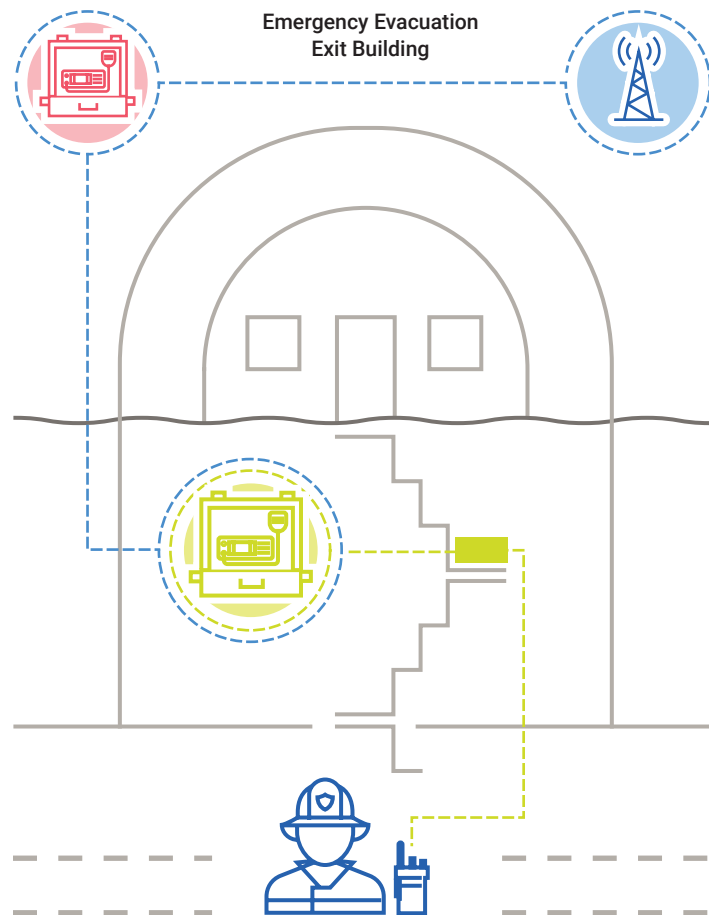
In one exercise, the DVR-LX suitcase repeater involved accessing the tunnels using an emergency evacuation exit building, between two stations. This is a worst-case entry point, as the stairways and access ways are narrower than would be found at a station. The emergency evacuation exit building is small and has no windows.

To simulate a vehicle repeater mounted in a truck, a standard orange 800 MHz DVR-LX suitcase vehicle repeater with mag mount antennas was deployed on a command truck.

Coverage from this DVR-LX suitcase repeater started to fade once down the first flight of stairs and halfway down the corridor to the main staircase. The yellow box was placed here. Approximately 15m (49 Ft.) of coaxial cable was connected to the yellow box DVR-LX suitcase repeater and a tripod mounted antenna at track level in one of the tunnels. The section of track has curves in both directions from this access point.

Users with APX portable radios walked approximately 1Km (0.62 Miles) southbound (more than halfway to the next station) and did not lose coverage. This test was then repeated going north from the emergency access. Again coverage was 100% all the way to the next station, about 1 km or two-thirds of a mile. The team then crossed over to the other tunnel. Here coverage was spotty and highly dependent on the proximity to crossovers between the tunnels. To cover both tunnels, two antennas and a splitter were recommended.

Public safety agencies and transit operators looking for an alternate communication solution in underground locations can look at the "Yellow Box" DVR-LX Suitcase solution as a vital asset in their radio communications resources.





To learn more, visit: [www.motorolasolutions.com/dvr-lx](http://www.motorolasolutions.com/dvr-lx)



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