APPLICATION PAPER

Lake Havasu City Police Department Installs First ESTeem MDC System in Arizona

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Lake Havasu City, Arizona, Police Department received a grant from the United States Department of Justice and the Arizona Governor's Office to provide domestic violence information to the officers working in the field. Having immediate access to local and state information is critical to these officers as they deal with domestic violence situations. After an exhaustive search, Lake Havasu City Police Department chose Electronic Systems Technology's ESTeem Mobile Data Computer System (MDCS) to provide the radio frequency (RF) link from the Department's AS400 computer server to the officers in the field.

EST began the building of a MDC system by conducting a formal RF site survey. The RF site survey is the foundation of a radio network for the MDC system. During a site survey, an EST Customer Support engineer performs on-site measurements and analysis to determine factors needed to design the ESTeem RF data communications system including RF signal levels between nodes, co-channel emitter frequencies/signal strengths, and RF data quality. Additional design input is given on repeater site selection, antenna selection and location, feedline requirements, and lightning/power protection for each node, as well as specific installation requirements as dictated by jurisdictional topography. After completion of the analysis, a formal Site Survey Report is prepared to document the findings and the installation/hardware requirements for the MDC system.

The project's RF coverage requirements covered Lake Havasu City's boundary (42 square miles) along with the airport and selected parks south and east of the city. The locations outside of the city were typically 2-3 miles beyond city limits. The city has numerous 30' tall hills throughout and the land drops off quickly at water's edge. Mountains on the north and Lake Havasu on the south border the city. The terrain rises >400' from the south boundary to the north, within the city's limits. There is no tall site, over 100', owned by the city and within city limits. At the beginning of the project, Kim Tibbits expressed a desire to not use the voice repeater site in the mountains north of town. The present site is very difficult to access and has an expensive monthly rental fee.

To provide the system's long-distance RF communications (7-8 miles to the airport), two repeater sites were necessary. The city's natural sloping terrain provides good coverage from the Police Station (master site) to most of its central city area. All three of the City's fire stations were tested and Fire Station #2 and #3 were found to provide the RF coverage necessary to provide the city with reliable RF coverage. The ESTeem RF equipment is installed indoors protecting the equipment from the area's extreme temperatures (>125ºF). The mobile data terminal software used by the Lake Havasu City Police Department for this project automatically selects the most reliable RF data path, either directly to the Police station or through one or more repeaters.

Once the site survey was completed and an FCC RF license obtained, EST began to construct the MDC system. The system consists of a base station node, two repeater nodes, and ten vehicle nodes (Figure 1). Each node utilizes the ESTeem Model 192C modem. The ESTeem 192C transmits encrypted data at 19,200 bps while maintaining a data accuracy of greater than one part in 100 million. The ESTeem 192C is interchangeable between each location and the digi-repeater feature allows the modem to operate as an operating node, a repeater or both simultaneously.

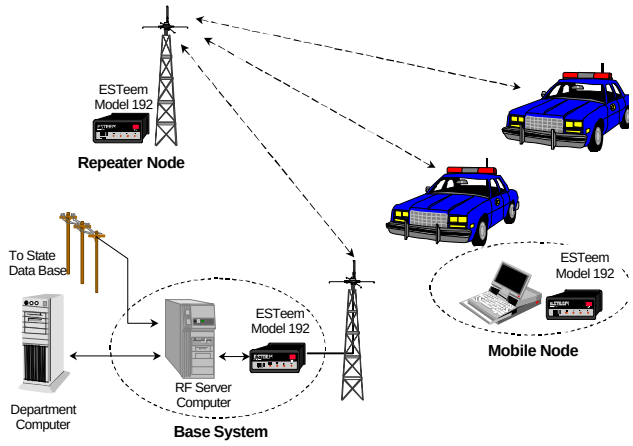

Figure 1: MDC System Block Diagram

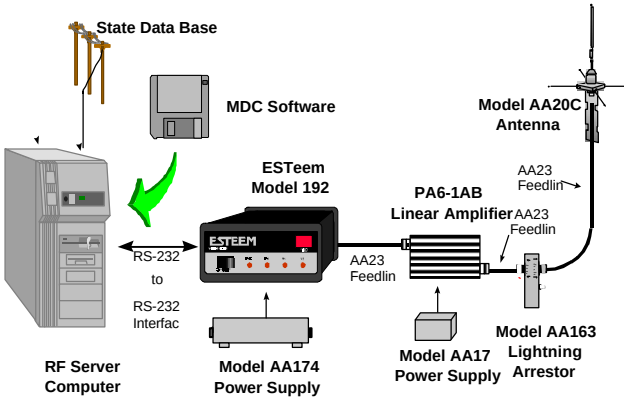

Figure 2: Base Node Block Diagram

The base station node (Figure 2) is connected to the Mobile Client RF server. The Mobile Client RF server is linked to the AS400 network server at the police department linking the AS400 server to the units in the field. The base station node utilizes the ESTeem 192C modem connected to the police network computer using an RS-232 cable. During the site survey, it was determined the roof of Lake Havasu City Police Department would give adequate antenna height to cover a majority of the city area. The most rapid responses in an MDC system will be direct communication from the vehicle to the Base ESTeem. To maximize the RF coverage area covered directly from the Base ESTeem, an omni-directional antenna was installed on the roof of the police department to provide RF coverage in all directions. An external linear amplifier was added to the ESTeem Model 192C to increase the output power to 25 watts.

Each repeater node consists of the ESTeem 192C radio modem, a power supply, amplifier, and an antenna (Figure

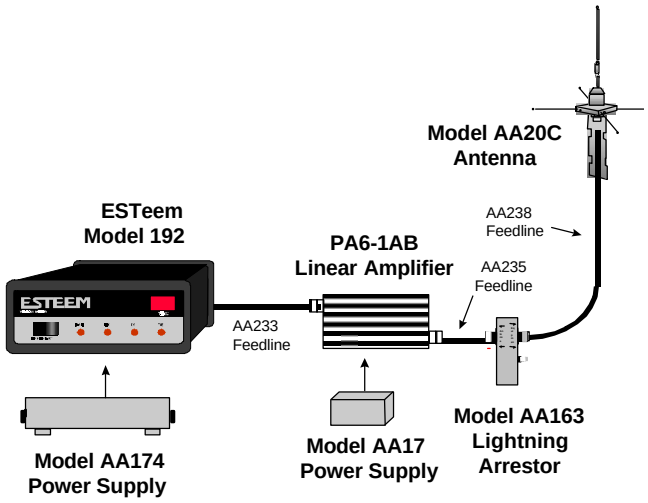

Figure 3: Repeater Node Block diagram

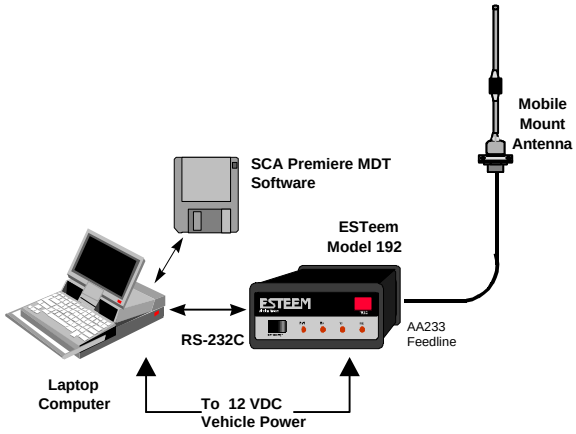

Figure 4: Vehicle Block Diagram

3). The repeater node equipment was installed in a single indoor enclosure mounted inside each fire station providing protection from the elements.

For the vehicle node, the ESTeem Model 192 is installed inside the passenger compartment of the vehicle. The ESTeem Model 192 is mounted behind the passenger seat, freeing trunk space and providing a better environment for the Model 192.

Once the MDC system backbone was constructed, EST engineers began to assess the system. The engineers verified the results of the site survey provided necessary RF coverage for the system. This critical reevaluation of the RF system insured the ESTeem MDC system would provide coverage in every corner of the city.
To complete the MDC system, a software package had to be selected to link the laptops to the state database and the domestic violence software to the patrol vehicles. Through a competitive bid process, Lake Havasu City Police Department selected, *HTE, Inc.*, as the software provider. The software, *Mobile Client*, provides the software interface to *HTE's CAD III* that Lake Havasu City Police Department wanted for the patrol officers.

The ESTeem MDC RF system has provided the Lake Havasu City Police Department the cost-effective solution it was looking for. Lake Havasu City Police Department has a reliable, data communications system working with software that has met all of the department needs.

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