

Project Description

Rex Systems, Inc. (RSI) is currently engaged in a research and development project for the U.S. Army. This project is administered through the Communications – Electronics Research Development Engineering Center, Command and Control Directorate (CERDEC C2D) located at Ft. Monmouth, NJ. The project is for the development of a digital hazard marker beacon which would augment the current marking system.

The digital hazard marker beacon will provide an automatic warning to approaching troops that a hazard area is being encountered. It will not rely on personnel making visual contact with the device as the current system requires. The present marking system is antiquated and in need of updating.

This digital marking beacon incorporates a GPS receiver for determining its location upon deployment. RSI is currently experiencing difficulty in testing the GPS component as it is not capable of indoor reception of signals.

Reason for Needing GPS Repeater Equipment

A need exists to test the GPS receivers in these marker units in an indoor lab. The following reasons explain why a GPS repeater is the best solution for Rex Systems, Inc.

The particular GPS receiver used in this project is an embedded module with integrated antenna. This antenna cannot be removed from the module; therefore it is not possible to directly connect an external (outdoor) antenna to the module. The only means of testing the GPS module is through direct reception of GPS signals by the integrated antenna.

Thorough testing of the GPS unit is required to ensure proper functionality of the device. Various stages of testing are required, including testing of unpackaged circuit board assemblies as well as packaged prototypes.

Reasons Why the Existing Communications Facilities are Inadequate

The RSI facility is constructed of metal and concrete, which is of itself, detrimental to the reception of GPS signals. For security reasons, the test lab has no windows or skylights; therefore direct reception of GPS signals within the test lab is not possible. Currently, the only method RSI has at its disposal for proper testing of these devices is to test the assemblies outdoors. This is highly undesirable for a number of reasons.

First, the GPS module is attached to a printed circuit board which contains numerous static sensitive electronic components. It is desirable to test the functionality of the printed circuit board assembly prior to final unit assembly. Due to the sensitive nature of the various electronic components on these printed circuit board assemblies, functional testing must be carried out in a static safe environment. A static safe work environment is available within our indoor test laboratory. Maintaining a static safe environment outdoors is extremely difficult.

Secondly, testing cannot be performed outdoors during periods of inclement weather. The winter climate in Wisconsin is harsh and not conducive to outdoor testing. Due to the short nature of these development contracts, testing during winter months is essential for these projects to be completed on time.

Due to the above reasons, the most reasonable means for RSI to test GPS receiver modules is through the use of a GPS repeater system. In this scenario, a high gain antenna would be mounted outside the facility and a cable run into the test lab where the signal would be re-radiated inside the facility. This would allow testing to be carried out at any time of the year, regardless of the outdoor weather conditions.

Due to the remote location of the RSI facility, use of a GPS re-radiating system would not result in harmful interference. An installation at the RSI facility can easily meet the link budget requirements of keeping measured radiation below -140dB at a distance of 100 feet from the facility. Most of the area surrounding the facility consists of wooded lots and open farm fields. No other businesses, residences or city streets are located within the proposed service area of the GPS repeater system, so no harmful interference will result.