A Next Generation AMR System

A Joint Venture Between

Pinnacle Technologies and Valon Technology, LLC

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This next-generation AMR system is optimized for collecting large quantities of data from multiple AMR endpoints using handheld, vehicle-installed, or fixed terminals. The system is flexible by design, and can be easily enhanced to handle new requirements. The wake-up and signaling algorithms received intensive design effort to obtain high data rates and reliable communication in the difficult mobile environment, while maintaining very low endpoint current consumption.

The system has two components: endpoints and readers.

Endpoints are radio-based devices at the data source that transport data to a reader. Endpoints can be powered from a battery or from mains. 3.6-volt AA lithium battery life is a minimum of ten years. Thirteen to fifteen years is likely, depending on temperature and transmitter usage.

Readers are available in several configurations. They can be mobile, handheld, or fixed.

For applications requiring infrequent reads (once per month, for example), a mobile or portable system is most cost-effective. The 100 K bits per second (kbps) data rate permits a large amount of stored data to be transmitted in a short time. A high data rate is especially important when the reader is located in a vehicle, where the time within communications range of an endpoint may be limited. For applications requiring more frequent collection of endpoint data, a fixed reader may be most appropriate. Fixed readers can be individually connected to a central data-collection facility. Alternatively, they can be arranged in a cellular fashion to communicate with individual endpoints and in a mesh network among themselves and a central location.

Photos showing a mobile Reader and an Endpoint

Figure 1

Range:

Line-of-sight range is at least 3,000 feet. The maximum allowable path-loss between reader and endpoint is 130 dB (100 kbps and 915 MHz). The maximum allowable path loss between units increases to 133 dB at 50 kbps. Since the reader can control the endpoint data rate, the optimal rate can be dynamically selected based on local conditions.

Endpoint:

The endpoint is configured as a generic data pump. Any source of data can be connected for transmission to a reader. Alternatively, the onboard processor can acquire data from external sensors. Other alternatives include adding sensors to the endpoint board, or combining the endpoint module onto a larger system board.

The data rate is 100 kbps or 50 kbps. The transmitter output power is 100 mw. It operates in the 902 MHz to 928 MHz ISM frequency band under FCC Part 15 spread spectrum rules. Other frequency bands can be accommodated.

Current consumption from a 3.6 volt source is 10 µA average during receive. Since transmissions typically are infrequent, power consumption is dominated by the receiver.

Mobile Reader:

The mobile reader (Figure 1) consists of a high performance receiver, 10-watt wake-up transmitter, data decoder, and control processor. The reader connects to a notebook computer that runs the collection program.

The collection program is a multi-threaded Windows application in two parts. The first part is a thread that communicates with the reader and controls it. The second part is a thread that is the user-interface (UI). The two threads communicate with one another through a simple API. This relieves the UI from dealing with the details of reader communications and control. We provide the control and API thread in a DLL. The user supplies the UI, which can be written in any convenient language and communicates with the control thread through the API.

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