GPS AS A TELEMETRY SENSOR*

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ABSTRACT

GPS is required in today's vehicle tracking and navigation applications. The Navigation Satellite Timing and Ranging (NAVSTAR GPS) is an all-weather. Radio based, satellite navigation system that enables users to accurately determine 3-dimensional position, velocity and time. So it is an intelligent sensor intended to be used as a component in a system for public service.

KEYWORDS

GPS, Telemetry system, Sensor, Navigation.

INTRODUCTION

Nearly a decade of Global Positioning System (GPS) experience combined with world-class experts in semiconductor products and communication developments have led Motorola to produce a new generation of GPS receiver modules, more compact and lightweight than ever before. Specifically designed for embedded applications, the GPS receiver affords the engineers large freedom in bringing GPS technology to the most demanding Original Equipment Manufacture (OEM) applications. A system for public service has been designed. The overall system consists of three major parts: the GPS receiver (OEM), the communication system, and the GIS system.

SYSTEM ARCHITECTURE

Most applications requiring precise position measurement are needed. Users now have the level of performance that precisely meets their application requirements. Here a system for public service is introduced. The block diagram is shown in figure 1.

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*project supported by National Natural Science Foundation of China.

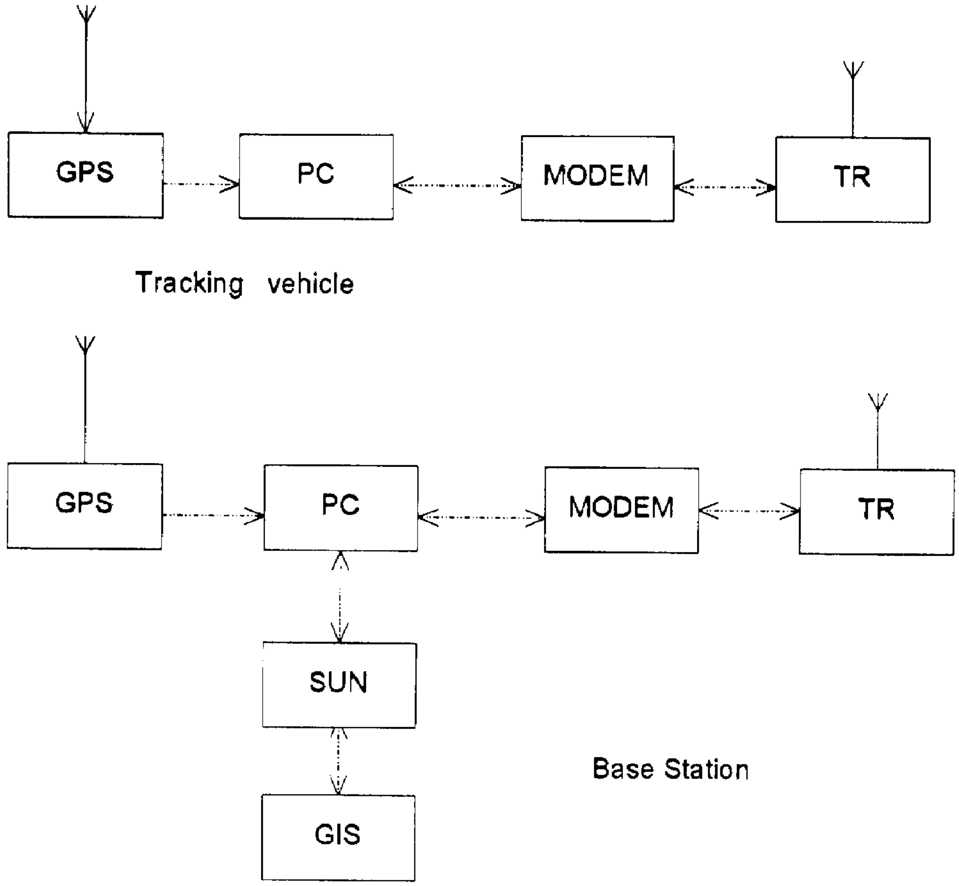

Figure 1. Block diagram of SCADA

GPS RECEIVER MODULE

The Motorola GPS receiver module provides position, velocity, time, and satellite tracking status. A simplified block diagram of the GPS receiver module is shown in Figure 2.

Signals received from the Antenna Module. The resulting intermediate The GPS Receiver Module is a 6-channel parallel design capable of tracking six satellites simultaneously. The module receives the L1 GPS signal(1575.42MHz) and operates off the Clear/Acquisition (C/A) carrier tracking. The code tracking is carrier aided. The GPS Module can be powered with unregulated 12 Vdc or optionally with regulated 5 Vdc power. Differential GPS and time recovery capacities are inherent in the architecture, and available as options.

The L1 band signals transmitted from GPS satellites are collected by a low-profile, micro-strip patch antenna, passed through a narrow bandpass filter, and then mplified by a signal preamplifier contained within the Antenna Module . Filtered and amplified L1 band signals from the Antenna Module are then routed to the RF signal processing section of the GPS Receiver Module via a signal coaxial interconnecting cable. This interconnecting cable also provides the requires ±5V for signal pre amplification in the Antenna Module.

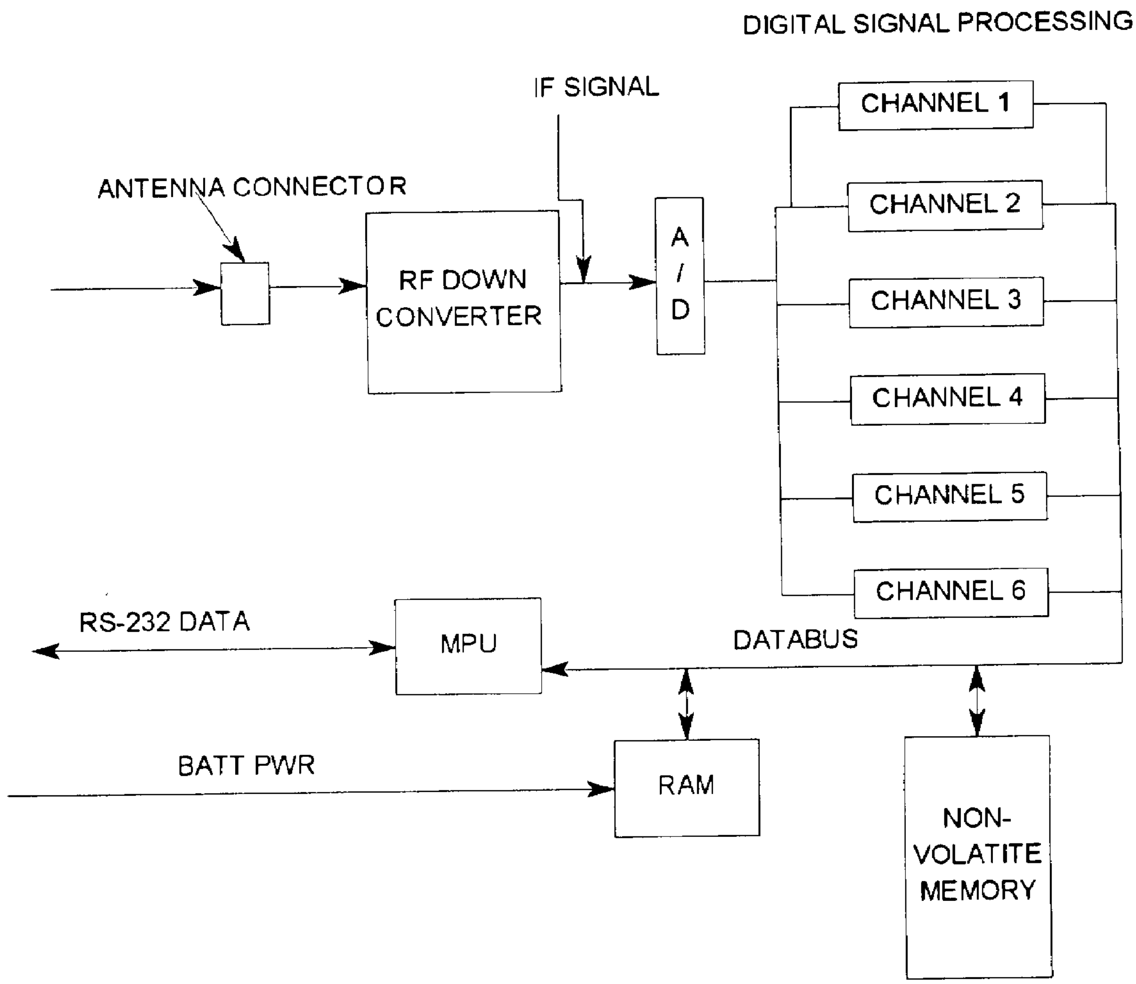

Figure 2. GPS Receiver Module Functional Block Diagram

The RF signal processing section of the GPS Receiver printed circuit board (PCB) contains the required circuitry for downcoverting the GPS signals received from the Antenna Module. The resulting intermediate frequency (IF) signal is then passed to the 6-channel code and carrier correlator section of the GPS Receiver PCB where a signal, high-speed analog-to-digital (A/D) converter converts the IF signal to a digital sequence prior to the channel separation. This digitized IF signal is then routed to the digital signal processor (also contained within the 6-channel code and carrier correlator section) where the signal is split into six separated channels for code correlation, filtering, carrier tracking, code tracking, and signal detection.

The processed signals are synchronously routed to the position processor (microprocessor [MPU]) section. This section controls the GPS Receiver PCB operating modes and decodes and processes satellite data and pseudo range and delta range measurements used to compute position and velocity. In addition , the position processor section contains the required interface to the RS232 port used for full-duplex, asynchronous data communication with the host equipment.

Keep-alive random access memory (RAM) is provided for retention of satellite ephemeral data. To prevent loss of this information when the GPS Receiver Module is power off an external ±12V/+5V BATT signal is required. Nonvolatile electrically erasable programmable read only memory (EEPROM) is used for storage of custom operating parameters, almanac information, and other information.

COMMUNICATION SYSTEM

As mentioned above, the GPS Receiver Module provides us great freedom in integrating GPS technology into the telemetry and remote control fields. Sometimes it is called Supervisory Control and Data Acquisition (SCADA). Here we are going to introduce a vechile tracking and navigation system. A block diagram is shown in Figure 2. This system is consists of three parts: GPS receiver, communication system, and Georapgical Information System(GIS).

As far as GPS receiver is concerned, there are a lot of choices we prefer Motorola PVT6 GPS receiver. As regards, communication system is used in the past by radio system. At frequencies above 30 MHZ the radio wave passes through the ionosphere instead of being reflected by it. Here, radio communication in VHF and UHF bands depends on direct wave mechanism. The range of the direct wave is the "line of sight" distance. A high antenna is needed in the base station in order to increase the distance. Digital communication via satellite has been developing extremely rapidly, it is also a choice if needed.

Broadband CDMA digital radio provides great flexibility in choice of center frequency and high traffic capacity per MHZ. The virtual elimination of outside wire and cable plant requirements is an advantage. It might be an ideal transmission system.

Satellite communication provides a powerful way to meet the data transmission. Although three satellite in geostationary orbits can provide global coverage, the desire to satisfy an increased communications demand and other reasons make four or more satellites with closer spacing an consideration for a global system. For example, INMARSAT system has four satellites.

GIS SYSTEM

Information has usually been collected, managed and separated in governments and large corporations by many separate departments. The costs in acquiring and maintaining this information makes it necessary for users to share information whenever possible. This was usually done by printed maps or reports. System 9 is a computerized system used to record, mange, analyze, report and share information which is geographically related to things in our world. Information stored in the system 9 database becomes more valuable because it can be related, combined and analyzed to provide a lot of needs. In our system, we need to know: where a car is located? What action it has? What is the car's relationship with base station? When, why and how they change? What can we do with this information? and so on.

CONCLUSION

The system performs very well in a wide variety of environments. the communication network is the infrastructure of the entire system. GPS OEM is the indispensable component. And the introduction of state-of-the art GIS makes the integrated system much better. Here we lock GPS as a position sensor.

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