

Data Acquisition System With Controller Area Network and SD Card

ajay_bhargav, Sun Nov 08 2009, 02:09 am

This project implements a high speed data acquisition system using Mega32 microcontrollers and a Controller Area Network (CAN).

Recording data is essential to testing and developing a racecar. Recording what each sensor is doing can tell an engineering how the car is performing, and most importantly, how to make it faster. A well outfitted car can have many sensors, with Formula One cars having well over 100 sensors. Cornell's FSAE car has over 50 sensors on it, many of which require high sampling rates to be useful. Commercial data acquisition systems are either expensive, slow, or have few inputs. A solution to this problem had been attempted by previous 476 students (Karl Antle and Ryan Mcdaniel) using a PIC18F2585, but it was only able to log reliably at 150 Hz. Many sensors on the car require much higher sampling rates, as the sensors are recording events occurring in a very short period of time. For example, when looking at a sharp bump using rocker position the event may only last .05 seconds when driving quickly. If taking the derivative of the data a very high sampling rate is required to give useful data, at least 500 Hz. It was this need for high speed data acquisition that motivated us to create a high speed data acquisition system to replace the current one.

Our system uses multiple transmitter nodes to acquire data from sensors and transmit the data in packets over a CAN bus. Each transmitter consists of a Mega32 microcontroller, an external Analog-to-Digital converter, a CAN controller and a CAN transceiver. The CAN packets are received by a single receiver node and stored to a Secure Digital (SD) card. The receiver node consists of a 2 Mega32s, a CAN controller, a CAN transceiver, and a SD card. The goal of the project was to create a system which can record 32 10 bit ADC channels recorded by 4 Mega32s and transmitted over the CAN bus. In addition, the system should be expandable to accept CAN packets sent from other modules, such as an ECM or a standalone O2 unit. 500 Hz on the 32 AD channels was set as a goal for sampling frequency.

more information [Data Acquisition System With CAN and SD Card](#)