Wireless Data Acquisition for the SAE Car

Functional Description and Complete System Block Diagram

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Intro:

The Wireless Data Acquisition for the SAE Car project consists of gathering data from the SAE car and transmitting it wirelessly from the microcontroller to a computer. The transmitted data shall include car velocity, engine velocity, acceleration, engine water temperature, oil pressure, and suspension travel. This data will be transmitted using the Aerocomm AC4790-200 wireless transceiver, which has a range of up to four miles when used with an external antenna. Figure 1.1 shows the basic functionality of two transceivers communicating with each other where the OEM Host will be an 80515 microcontroller.

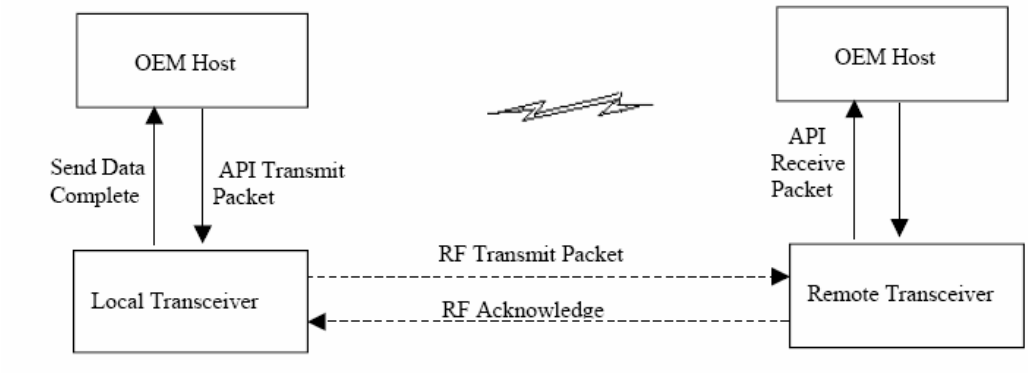

Figure 1.1: Communication between two AC4790-200 transceivers

Objectives:

The first goal for this project is to install, test, and modify the display project from last year which was completed by Dave Pavlik. The display and box that encompasses the microcontroller may need to be modified if they do not function correctly due to noise from the car while being operated. This task will need to be pursued first due to the inclement weather during the winter, which limits access to the SAE car.

The second and main focus will be gathering the necessary data from the car, processing and storing it into the microcontroller, wirelessly transmitting and receiving

the data using the Aerocomm AC4790-200, and displaying it on a computer. It is possible that the 8051 microcontroller may not have enough memory on board to store all of this data, so expansion memory may need to be added. A high level flowchart of the entire system may be seen in figure 2.1

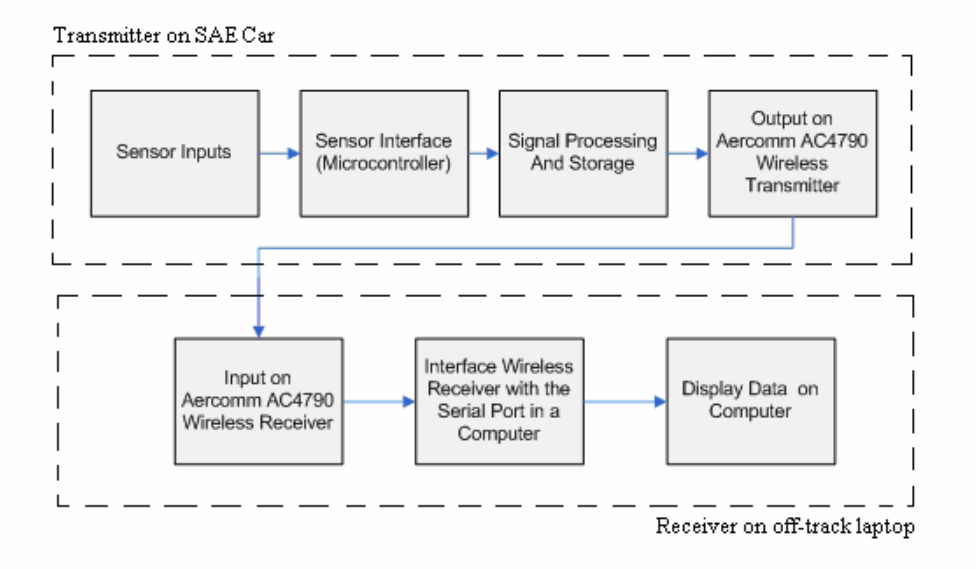

Figure 2.1: High Level System Block Diagram

Sensor Interface:

The sensor interface software will be implemented with the microcontroller. It will entail sampling the different sensors as needed. For example, the tachometer and velocity sensors will need to be sampled much more frequently than the oil pressure or engine temperature sensors. Signal processing and storage will also be done with the microcontroller. It will convert the values obtained from the sensors with software to the desired output units (figure 3.1).

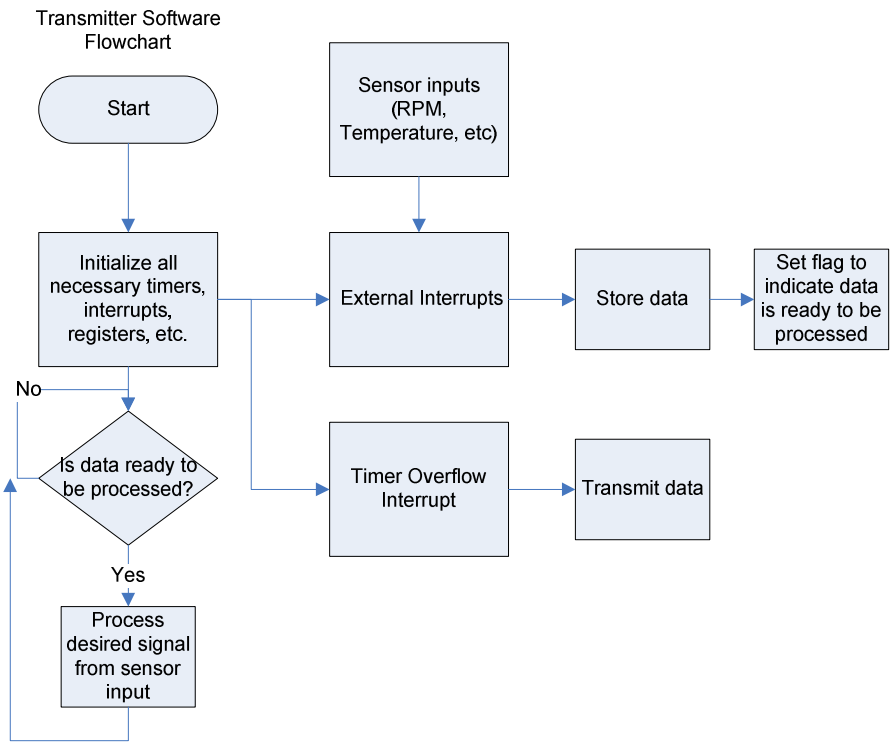

Figure 3.1: Software flowchart of transmitting software

Wireless Communication:

Once the data has been processed and converted, the Aercomm AC-4790-200 transceiver will be used to transmit and receive the data. The receiving transceiver will be interfaced with a computer through the serial port. If the software required for this is not available then it will need to be written. Software will also need to be written to take the data from the transceiver and display it on the receiving computer (figure 3.2).

Figure 3.2: Flowchart of receiving software

Conclusion:

This system, as designed, will be able to take signals from sensors on the SAE car and convert them into data that can be used to inform the user of critical data while in use. This will be transmitted up to four miles to another transceiver connected to the RS232 port in the user's laptop so the data may be conveniently updated and displayed. The data gathered by this system will store all received data on the user's laptop for further analysis.

Reference:

Aerocomm – "AC4790 900 MHz OEM Transceivers User's Manual"
http://www.aerocomm.com/docs/User_Manual_AC4790.pdf