

# **SAE Formula Car Display and Data Acquisition System Functional Requirements - System Level**

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## **Project Description**

Our team will be collaborating with the Bradley SAE team and Parker Hannifin Corporation to create a system that uses multiple analog and digital sensors to record data and display it on two different mediums. The data will be collected from various sensors that are connected to an on-board microcontroller. The microcontroller will then send this information, via RS-232, to a display unit given to us by Parker Hannifin Corporation in Morton, Illinois. This display, an IQAN MD4-7, will have custom display software created by our team to display the sensor data and other communication values in an array of screens that will be differentiated by mechanical/electrical systems. While the microcontroller is also sending the sensor data via RS-232 to the display, it will need to communicate wirelessly to an offboard computer that will then do data-logging of the information. To do this wireless communication, we will either use an Aerocomm AC4790-20 wireless transceiver or, if given to us by Park Hannifin Corporation, the IQAN-G11 bluetooth adapter. If we go the Aerocomm route, we will connect the wireless transceiver to the microcontroller and then communicate with an off-board laptop. If we are using the IQAN bluetooth adapter, we will connect the adapter to the display and communicate with the off-board laptop. Our system will be a passive system in the sense that it will not be in any of the decision making process of the SAE car. It will be only an informational display and off-board system, so we will only collect information from the sensors.

## **System Level Inputs & Outputs**

### **Microcontroller**

#### **Microcontroller Inputs:**

- 1) Oil pressure sensor
- 2) Water temperature sensor
- 3) Battery voltage sensor
- 4) Speedometer sensor
- 5) Tachometer sensor
- 6) Power
- 7) Ground

#### **Microcontroller Outputs:**

- 1) RS-232 sensor information
- 2) Wireless transceiver information (if we go this option)

## **IQAN MD4-7 Display**

### **IQAN MD4-7 Inputs:**

- 1) RS-232 sensor information
- 2) Power
- 3) Ground

### **IQAN MD4-7 Outputs:**

- 1) IQAN bluetooth adapter (if we go this option)
- 2) Display screens with sensor data

## **Off-board Computer**

### **Computer Inputs:**

- 1) Either: IQAN bluetooth adapter information or wireless transceiver information

### **Computer Outputs:**

- 1) Display information that has been logged in graphs that can easily show us the trends of the sensor information.

## **Functional Modes of Operation**

### **Race Mode**

The microcontroller collects data from the sensors and sends it to the display screen, which displays the important information to the driver. The data will also be sent to the laptop. The laptop will display the critical information real-time, and also save it for later viewing. The display and laptop will warn the driver and crew if the inputs indicate a vehicle failure.

### **Data Viewing Mode**

After the race, the recorded data will be available to view on the laptop. The sensors, microcontroller, and display are not used in this mode. The laptop also does not need the wireless input.

### **Test Mode**

The microcontroller will transmit fake data to test the system. The other components will behave the same as the race mode.