SDM-22 Data Acquisition Package
User Manual

Sun Devil Motorsports DAQ Team
Benji Miller, Joshua Tenorio

Revised June 5, 2022

Contents

1 System Overview

Sun Devil Motorsports' Data Acquisition team is responsible for collecting and analyzing data from the car. This year we have developed a very poggers DAQ package.

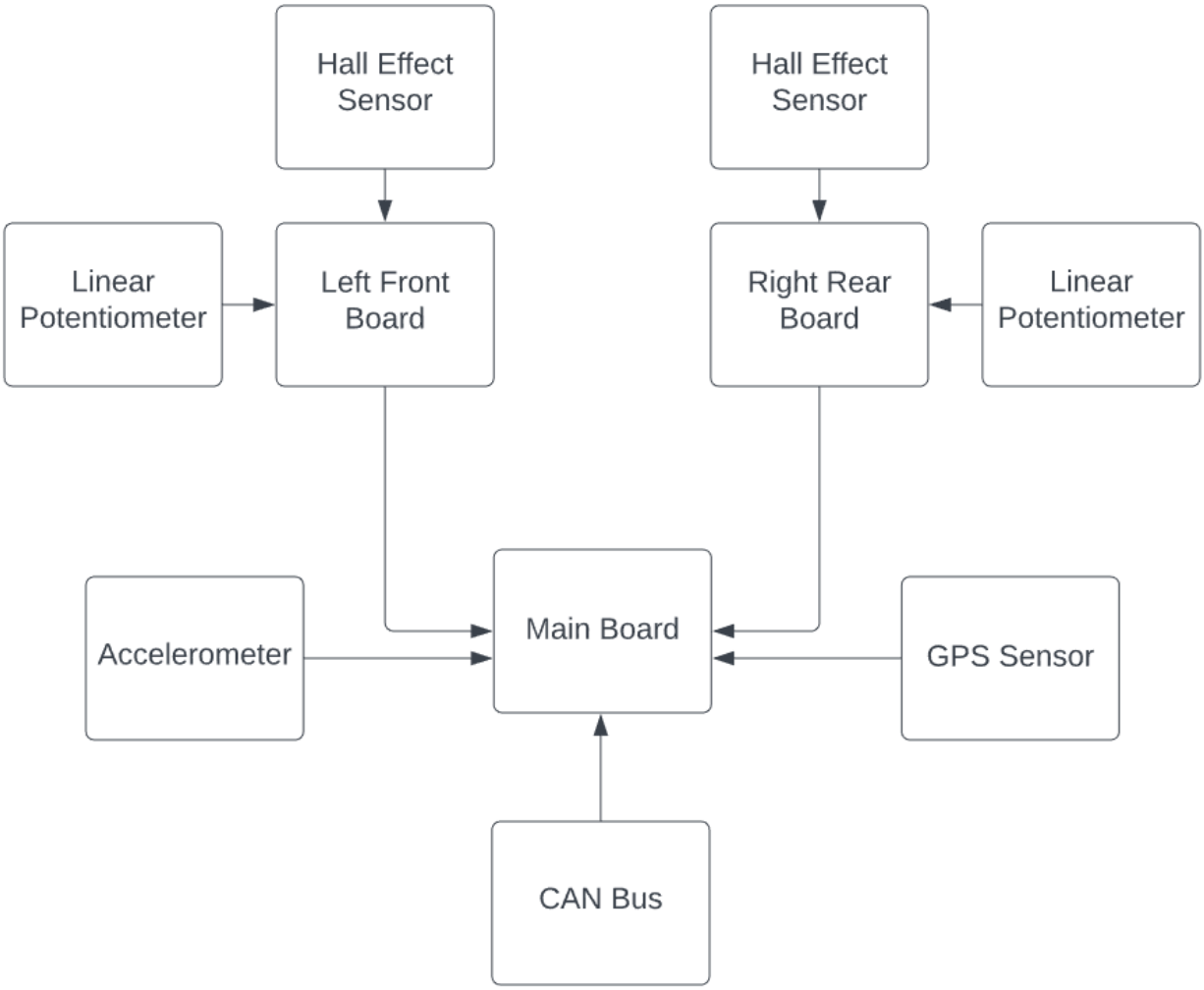

Figure 1: System Diagram

The left front and right rear boards are controlled by a Teensy 4.0, while the main board is controlled by a Teensy 4.1. The left front and right rear boards sends sensor data to the main board via Serial communication, where it will be logged onto an onboard micro SD card.

The DAQ system is powered by the ECU's 5V sensor output.

The data we are collecting include:

- Wheel speed with a hall effect sensor and magnets(left front, right rear)
- Suspension travel with a linear potentiometer(left front, right rear)
- Vehicle acceleration with an accelerometer
- Vehicle position with a GPS sensor
- Engine data via CAN

We have also included options for future expansion by adding pads for unused Teensy pins. For instance in the future we can plug in i2C sensors, analog sensors, or more boards via Serial communication.

2 Usage

To begin logging data, plug in the battery cable of the main board into the ECU's 5V output. If powered on, the onboard LED on the main board's Teensy will be lit up. Data will be logged to the Teensy's micro SD card on the main board. The most recent run will have the largest run number on the micro SD card.

Do not have USB power and 5V from the ECU plugged in at the same time! Doing so may risk power flowing back into the USB port. This is because VUSB and VCC on the Teensy boards are connected to each other.

Please note that it takes a large amount of force to plug in our connectors. You'll hear a click once it is properly plugged in and you will see minimal yellow on the connectors.

3 Wiring and Pinouts

3.1 Main Board

The Main Board, controlled by a Teensy 4.1, has 7 Analog ports, 1 CAN connection, 1 Serial port with 3.3V, 3 Serial ports with battery power, 2 i2C ports, and 1 battery port. Currently in use are:

- Serial1 - Left Front Board
- Serial2 - Right Rear Board
- A13, CAN - CAN Bus
- PWR - ECU 5V output

3.2 Wheel Boards

The Wheel Boards (located near the left front and right rear wheels) have 2 Analog ports, 1 i2C port, and 1 Serial port where it receives power from. Currently in use are:

- Serial1 - Main Board
- A6 - Hall Effect sensor
- A7 - Linear Potentiometer

3.3 Connector Pinouts

Serial (VBAT)

Red	Black	Blue	Yellow
1	2	3	4
VIN	GND	TX	RX

Serial (3.3V)

Red	Black	Blue	Yellow
1	2	3	4
3.3V	GND	TX	RX

i2C

Red	Black	Blue	Yellow
1	2	3	4
3.3V	GND	SCL	SDA

Analog

Red	Black	Blue
1	2	3
3.3V	GND	Analog

Power

Red	Black
1	2
VCC	GND

CAN

Red	Black
1	2
CANL	CANH

4 Packing List

In the DAQ Toolbox:

- Scissors
- Crimping tool
- Duct tape
- Electrical tape
- Voltimeter
- Micro USB cable
- Magnets
- Hook and loop tape

5 Meme