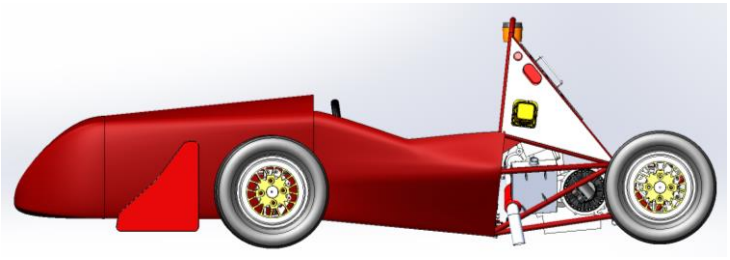
Rensselaer Formula Hybrid Telemetry System Design Overview

by Evan Engisch

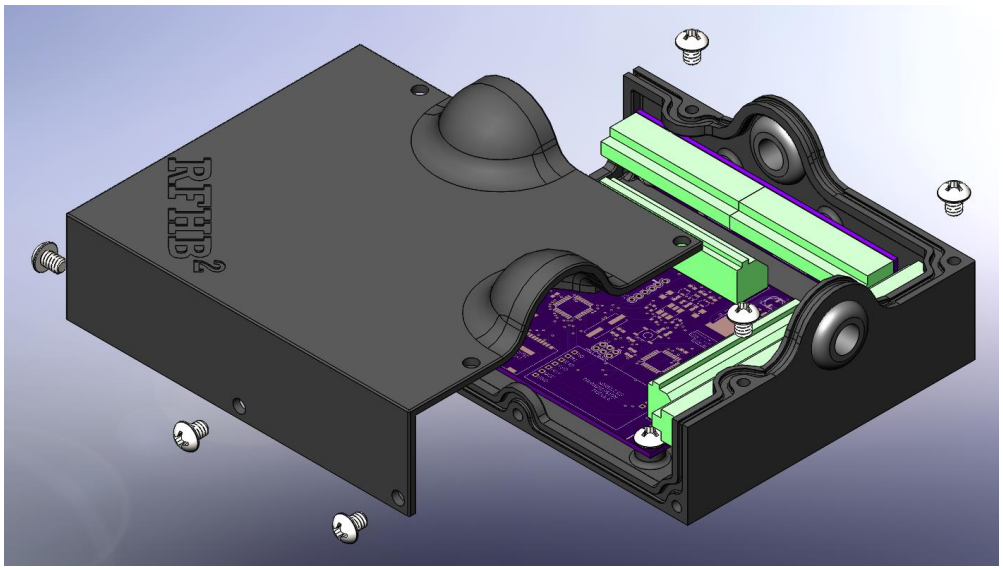
Initial Concept:

Rensselaer Formula Hybrid Black Box ($RFHB^2$) - A thorough, integrated, expandable vehicle telemetry monitoring system for use as a dynamic control system info source and test monitoring/vehicle tuning.



Basic System Characteristics:

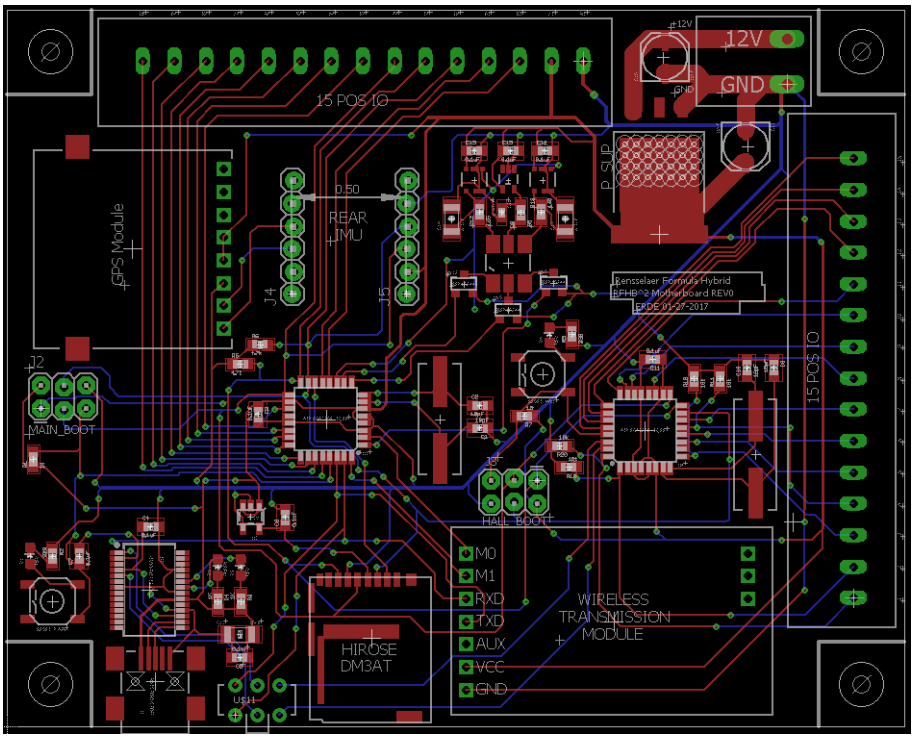
-Operates via two onboard Atmel ATMEGA328 microprocessors
-Custom PCBs integrating onboard and offboard sensory systems
-27 individually monitored sensors at initial build
-Expandability via vacant input lines
-Ability to integrate and stack multiple boards through open I^2C line
-3D printed custom waterproof enclosure

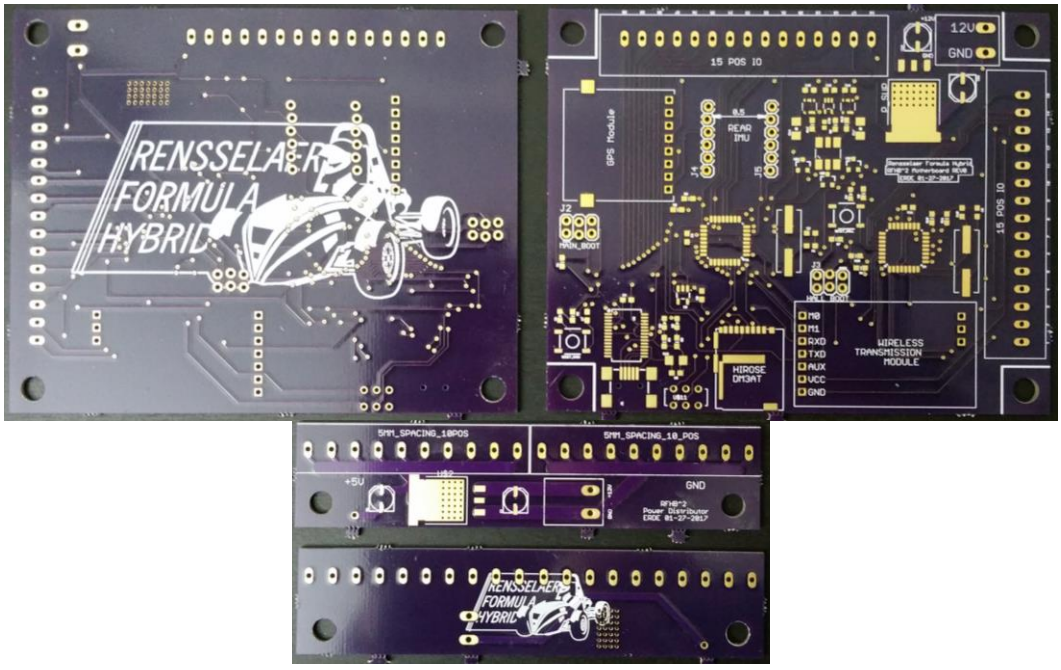


Vehicle Monitoring Abilities:

-4-wheel speed (hall sensors)
-4-wheel tire temperature
-4-wheel vertical suspension position
-Accelerator pedal position
-Brake pedal position
-Clutch/Shift timing
-Steering wheel position
-Ambient Temperature/Humidity
-Front/Rear 3-axis acceleration
-Front/Rear 3-axis tilt
-Front/Rear 3-axis angular velocity
-Compass heading
-GPS location
-Onboard SD data logging
-Live wireless data broadcasting (RF)
-I^2C line for external communication

PCB Design:


15 POS IO
12V
GND
GPS Module
REAR IMU
P_SUP
J2
MAIN_BOOT
J4
J5
HALL_BOOT
15 POS IO
M0
M1
RXD
TXD
AUX
VCC
GND
WIRELESS TRANSMISSION MODULE
HIROSE DM3AT
USB


RENSSELAER FORMULA HYBRID
15 POS IO
12V
GND
GPS Module
REAR IMU
MAIN_BOOT
WIRELESS TRANSMISSION MODULE
HIROSE DM3AT
5MM_SPACING_10POS
+5V
GND

Pre-Wiring Assembly: