

NI-DAQ Test Board

The NI-DAQ control board has undergone sufficient testing from the team to confirm its operation in addition to the previous ECU team's work with the device. The NI-DAQ has confirmed to be fully operational. The testing code used to simulate the engine and implemented in testing the previous generation's ECU board has been loaded onto the board and used in conjunction with the interface GUI to establish reliability. Additional testing in tandem with the MOTEC ECU presently used on the Formula Team Car could be completed to confirm the NI-DAQ's reliability, but the present data results have been sufficient to verify the test board's dependability for Spring Quarter ECU analysis. At the present time P09222 sees the likelihood of the present NI-DAQ test board being carried over into the next quarter as above average.

PCB Board

The present ECU PCB board has been reworked from its previous design to encompass several new additions to the control circuitry. Connections have been reworked and the new design has a high probability of success if carried into testing. However, the use of a single layer containing both analog and digital wires has brought up enough concern to consider implementing an upgrade. Analysis of the EUC layout has shown that the chances of the single layer scheme causing difficulties during operation are low, but a redesign of the board would decrease the odds of any errors occurring. The major disadvantage of such a redesign is the large amount of time required to completely redraw the board. In either case having a working ECU PCB board ready and populated by the beginning of Spring Quarter is certain, but the exact nature of the PCB is still unknown.

Oxygen Sensor

Due to the unique nature of the oxygen sensor, a new model of the oxygen sensor circuitry was constructed quite early in the quarter but never tested. Simulation models of the sensor circuitry have been made and tested, indicating the reliability of the design, but without the formula car operational, an accurate picture of the existing oxygen sensor could not be finished. However, with the recent reconstruction of the engine, the present model will be compared to the working engine and modifications (if any) will be completed. Even though the priority of the oxygen sensor is secondary in nature, as the present MOTEC ECU can analyze the oxygen levels in the engine, the addition of a working oxygen sensor to the present design will likely occur before the beginning of Spring Quarter in time for testing.

Microprocessor Control Code

Many of the microprocessor functions were verified last year by the ECU team and confirmed to be operational. While this year's analysis has not gone into much detail in the specifics of the control code, the Texas Instruments Test Board for the microprocessor has finally been confirmed as operational in tandem with the NI-DAQ board. The probability of a unified working code by the beginning of Spring Quarter is moderate.

ECU Case

The preliminary ECU case design has been completed with additional simulation testing required, verifying the efficiency of the structure. Thermal analysis has shown that the new case will be able to handle even the worst case scenarios for device overheating while also being light enough to meet the customer specifications. However, further modeling will show where weight can be reduced without affecting the thermal integrity of the design.

Electronic Components

All critical electrical components which suffered difficulties during the previous generation of testing have been verified as being operational after some slight redesigns. The voltage regulator, relay control system, and injector control system have all been tested in hardware with sufficient results to confirm their reliability. Both the injector and relay control schemes have been verified in simulation as more than adequate. The only remaining flaws in the hardware designs come from overcompensation for possible difficulties. Testing has shown that these new designs have a high likelihood of success, but may be reworked at some point before Spring Quarter for optimization and efficiency.