

**ATP Draft 1**

11/14/2018

**Updates**

11/14/2018 - Original

**Block Diagram**

Below is a link to the block diagram of systems that will be delivered in the AEC 401 (Dyno room)

[https://sites.lafayette.edu/motorsports/files/2018/11/ATP\\_2019\\_v1.00.pdf](https://sites.lafayette.edu/motorsports/files/2018/11/ATP_2019_v1.00.pdf)

## Motor Tests

Test	Criteria	Observed Results	Pass / Fail
Motor spins at least once	Observe the motor and ensure it makes at least one full rotation.		
Motor RPM Measurements	RPM measurement verified against RPM sensor		
Motor Torque Measurements	Observe motor torque reading		
Motor Voltage Measurements	MCS voltage measurement verified against multimeter		
Motor Current Measurements	TSI current measurement verified against multimeter		

## Pre-charge and Discharge Tests

Test	Criteria	Observed Results	Pass / Fail
Test pre-charge circuit using a 10 V power supply	Precharge circuit measured between 9.3 and 9.7 V before closing AIRs		
Test pre-charge circuit using a 100 V power supply	Precharge circuit measured between 93 and 97 V before closing AIRs		
Test pre-charge circuit with integrated system using a 100 V power supply	Precharge circuit measured between 93 and 97 V before closing AIRs		
Test discharge circuit using a 10 V power supply to discharge a	Discharge circuit drops below 3 V in less than 5 seconds		

capacitor			
Test discharge circuit using a 100 V power supply to discharge a capacitor	Discharge circuit drops below 30 V in less than 5 seconds		
Test discharge circuit using a 100 V power supply to discharge the MCS	Discharge circuit drops below 30 V in less than 5 seconds		

### Throttle Plausibility

Test	Criteria	Observed Results	Pass / Fail
Pedal 1 above normal operating range (Short to 5V)	Throttle becomes implausible and system indicates that pedal 1 is above its normal operating range		
Pedal 1 below normal operating range (Short to GND)	Throttle becomes implausible and system indicates that pedal 1 is below its normal operating range		
Pedal 2 above normal operating range (Short to 10V)	Throttle becomes implausible and system indicates that pedal 2 is above its normal operating range		
Pedal 2 below normal operating range (Short to 5V)	Throttle becomes implausible and system indicates that pedal 2 is below its normal operating range		
Pedal Differential	Throttle becomes		

Above normal operating range	implausible and system indicates that pedal 2's throttle is greater than pedal 1's throttle		
Pedal Differential Below normal operating range	Throttle becomes implausible and system indicates that pedal 1's throttle is greater than pedal 2's throttle		

### Cooling

Test	Criteria	Observed Results	Pass / Fail
Cooling system keeps MCS temperature within spec	Verify based on temperature data sent to SCADA that MCS temperature doesn't exceed a set threshold below the max temperature specified by the datasheet		

### Drive State Tests

Test	Criteria	Observed Results	Pass / Fail
SCADA UI displays drive states	Displays current drive state while following 2018 start-up procedure		
SCADA logs why drive state changes	Check SCADA logs after state change for reason.		
Ability to switch into drive mode	When brake and drive button is pressed, drive light		

	turns on		
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\*Additional state tests to come once the drive states are finalized.

### Safety Loop Tests

Test	Criteria	Observed Results	Pass / Fail
Left Side BRB breaks safety loop and de-energizes high voltage	Pressing the Left Side BRB turns off TSEL		
Right Side BRB breaks safety loop and de-energizes high voltage	Pressing the Right Side BRB turns off TSEL		
Driver BRB breaks safety loop and de-energizes high voltage but leaves GLV energized	Pressing the Driver BRB turns off TSEL but leaves GLV powered		
GLVMS completely de-energizes system when disengaged	Turning off GLVMS completely de-energizes system		
TSMS breaks safety loop and de-energizes high voltage	Turning off TSMS turns off TSEL		
Brake Over-Travel switch breaks safety loop and de-energizes high voltage	Pushing brake over-travel switch turns off TSEL		
Master Reset	Following the 2018 start up procedure, the SSOK lights up.		
IMD	When an IMD fault is detected the safety loop opens		

### Other Status Indicators

Test	Criteria	Observed Results	Pass / Fail
GLV Present Light	Light turns on when GLV battery is connected		
HV Present Light	Light turns on when there is HV present.		
IMD Fault	Light turns on when there is IMD Fault.		
Fault			
AIRs Light	Light turns on after cockpit reset is pressed indicating that there is safety loop voltage before TSVMS		
Drive Light	Light turns on when in the Drive Mode		
Safety Light	Light turns on when SL1 to SL2 is connected		
Brake Light	Light turns on when brake is pressed		
Ready to Drive Sound (RTDS)	RTDS sounds when system enters drive state		

### SCADA Tests

Test	Criteria	Observed Results	Pass / Fail
Writes data to a file	Verify that data written to a file is the same that was seen		

	during data collection		
Open safety loop	SCADA opens the safety loop when a value above/below a threshold is detected.		

## Deliverables

Item	Description
Graph of motor RPM vs time	Graph generated from data collected during motor tests
Graph of torque vs time	Graph generated from data collected during motor tests
Graph of power vs time	Graph generated from data collected during motor tests
Graph of power in vs power out	Graph generated from data collected during motor tests
D000: PDR Report and Presentation	Slideshow presented to ECE faculty and guests. Slideshow, report, meeting minutes, and other supporting documents uploaded to website.
D001: CDR Materials	Slideshow and demonstrations presented to ECE faculty and guests. Slideshow, report, meeting minutes, and other supporting documents uploaded to website
D002: User Manuals	User manuals for each subsystem uploaded to the website with the following sections: getting started, FAQ, functions and controls, high level block diagram, annotated drawing of control panels/screenshots of UI screens, and troubleshooting, calibration, and maintenance.
D003: Final Report and Maintenance Manual	Maintenance manuals for each subsystem uploaded to the website with the following sections: maintenance, calibration, PCB schematic, PCB BoM, mechanical drawing, mechanical BoM, block diagram, wiring diagram. Final report delivered to the

	professors via a flash drive or DVD with a high level project summary report and maintenance manuals.
D004: Acceptance Test Plan	List of system tests that includes pass/fail criteria, observed results, and an indication of whether or not each test was successful.
D005: Acceptance Test Report	Report delivered after all tests have been conducted which shows which tests were successfully completed, when, and who witnessed or performed the test.
D007: Project Website	All project documentation uploaded to the website as portable static documents (PDF, TXT, XML) with the original version present as well as links to relevant Cloud storage.
D008: Final Presentation and Delivery	Final presentation including project video delivered to ECE faculty and guests. Integrated hardware, software, and firmware will be installed in AEC 400 and 401. All supporting documentation will be delivered as per D003 and uploaded to the website.
D010: Project Posters	Soft and hard copies of the project poster delivered. Poster will contain a QR code and URL to the project website.
D013: Purchasing Report	Table containing all purchases delivered. The report will also include spending summaries based on category, week, and subsystem group as well as statistics for items of interest (e.g. delivery elapsed time, delivery cost, sales tax, etc)
D014: Project Management and Status Letters	Weekly project status letters delivered and uploaded to the website. Weekly status reports delivered on Mondays during class. Management will deliver project wide documents such as the ATP, Work Breakdown Structure, and competition documentation
CD001: Registration	Competition registration fee of \$2300 will be paid to SAE
CD002: Project Management Report	Document delivered to the SAE outlining



	project management plan, project schedule, and risk assessment
CD003: Structural Equivalency Spreadsheet (SES)	Demonstrate structural integrity of the proposed frame design to the SAE
CD004: Electrical Systems Form - Part 1 (ESF-1)	Deliver high level electrical designs to the SAE
CD005: Program Submission	Deliver high level car specifications to the SAE for the competition program
CD006: Team Picture	Deliver a picture of the team to the SAE