

## 2.007 Electric Vehicle Section

### Contest Procedures

**Date: 6 May 2012 9am – 5pm**

### Schedule

9:00 AM: Meet in IDC N52-337 and walk vehicles over to Drag Race meeting location: **Building 44 parking lot.**

10 AM: Drag race runs begin.

11 AM: Complete Drag Race runs and move vehicles to Hillclimb Race meeting location (N4 Parking Garage level 1). Familiarization/practice runs of garage.

11:30 AM – 1 PM: Lunch break / Recharge vehicles

1 PM : Hillclimb race runs begin

4 PM – 5 PM: Tear down and clean up garage, move vehicles back to IDC

All events/cleanup must end by 6pm.

### Preparations

You are responsible for keeping your vehicle **charged and ready** for Sunday morning. The event will begin immediately (there's no "top-off time" beforehand).

Bring your vehicle's charger to the event, as it will be used between the events.

If you have a bicycle helmet, bring it with you. No participants will be allowed to race without at least a bike helmet. Wear long sleeves in case you take a fall. **No open-toed shoes are allowed.**

Do not bring expensive things you cannot keep on you – laptops, etc. as we will not have a secure locker area! Cameras are acceptable but must be kept with you or with a friend at all times.

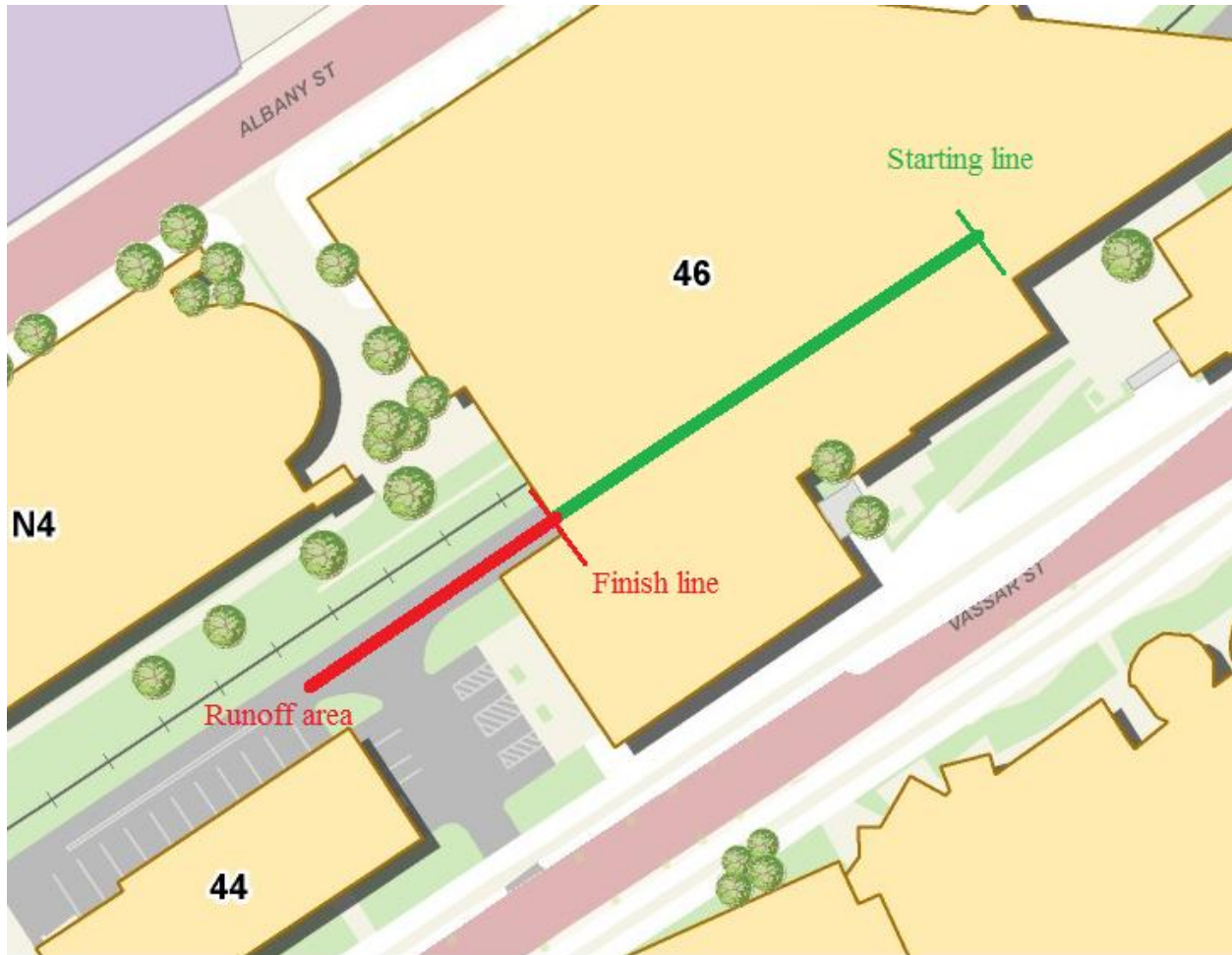
Only rudimentary service tools will be available, such as hand tools, a bike pump, multimeter, and power supply. There is no time to "go back and fix one thing" – if your vehicle proves to be unserviceable with those tools, you may have to forfeit.

### Event Summary

There are two events this year, the **drag race** and the **hillclimb race**. The drag race is a classic contest of power and acceleration, and the hillclimb race is a measurement of your vehicle's efficiency under a constant load.

## Drag Race

The race venue is the **Building 46 Underpass**:



The length of the race is **50 meters**. It will be demarcated using taped lines on the ground.

You will run **one at a time** (time trial) until the finish line. Use the runoff area for braking and turning around. You may either push your vehicle back to the start or ride it back to the start line.

You get **three** tries and the best time is recorded for posterity.

There will be an instructor at the start and finish lines to start you off and keep the time.

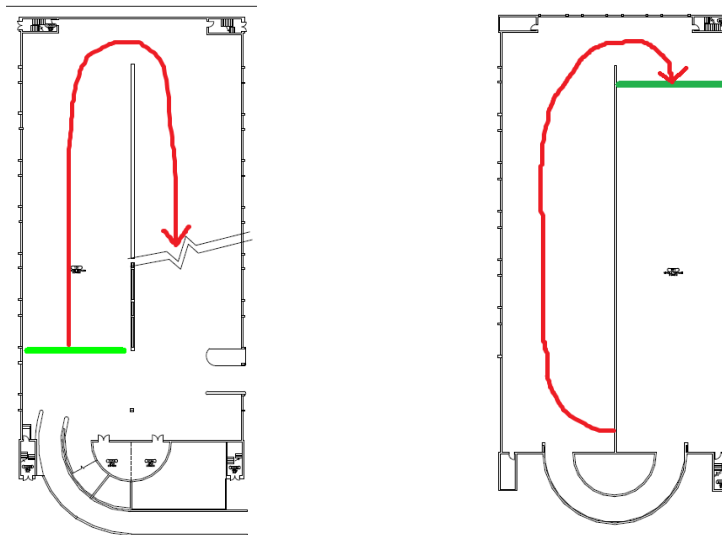
**Do not enter the track area if you are not running – instructors will make sure everything is clear before letting you through.**

**Scooters and other foot-supported vehicles cannot be kick-started, as this imparts significant initial velocity.** A gentle push may be allowed at the discretion of the instructors.

Example video of this venue: <http://www.youtube.com/watch?v=2J1dugLHOK4> (Note that our race does not have a slalom component)

## Hillclimb Race

The venue for this race is the N4 garage:



MIT has gone to great lengths to close an entire parking facility for our pleasure. This is an event which has no parallel anywhere else in the country!

All participants will meet on the first level near the **southeast stairwell** (lower left stairwell in graphic).

You will be cleared by an instructor to begin your run. You will circle all 8 parking levels of the garage until you reach the finish line at the top, at which point you must brake and turn around. Use the last parking level as a “brake hill”.

**DO NOT go down the spiral ramps at the end of the garage. They are extremely steep and curved. You will forfeit the contest if you enter a spiral ramp. They will be marked off with cones.**

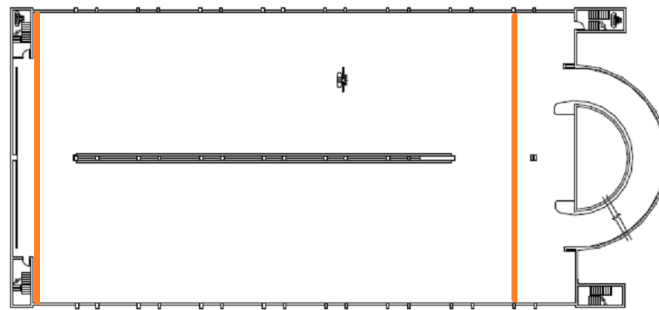
An instructor will then clear you to descend the garage via the parking levels back to the gathering area.

You may take up to **2** runs. The second run is optional. The vehicle may not be charge-topped between runs, but the runs do not have to be back-to-back.

Your **time** from start to finish and your **energy usage** will be multiplied into an “action score” which has units **Wh \* s**. Your goal is to minimize this score – it may mean not running at full throttle the whole time, or taking a wider / gentler path, etc. The lower the score, the more efficient at performing work your vehicle is! See [http://en.wikipedia.org/wiki/Action\\_%28physics%29](http://en.wikipedia.org/wiki/Action_%28physics%29) for the concept of “action”.

To record your energy use, your vehicle must be fitted with a Wattmeter (see next section).

The garage will be fitted with barriers at the very ends:



These barriers are made of polyethylene mesh debris netting, and are designed to prevent direct impacts with the narrow end turn walls. You must maneuver to **keep away** from them – they are only to intervene in a true emergency like brake failure or uncontrollable steering failure. The gap between barrier and inner column of the garage is approximately 12 feet.



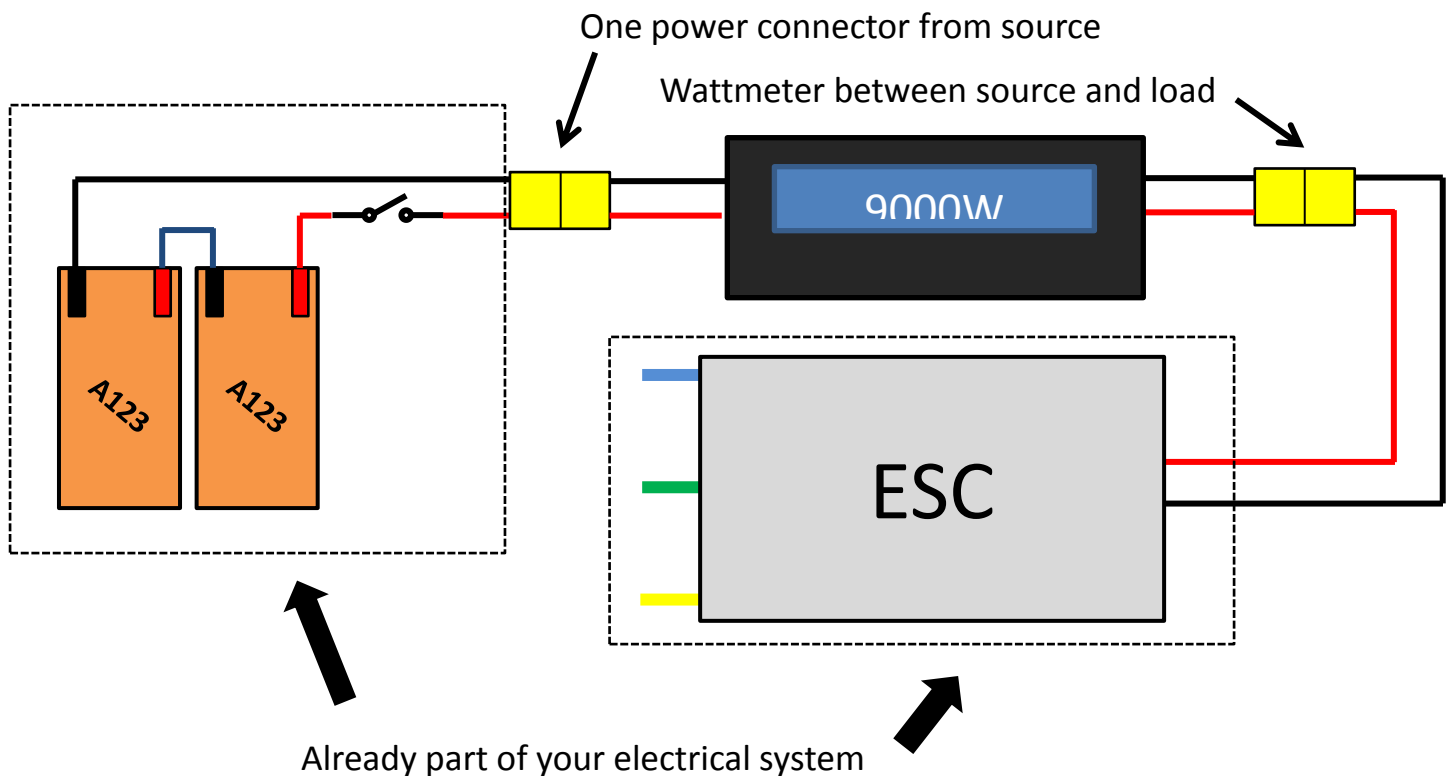
## 2.007 Race Instrumentation

If you want to have your vehicle's energy use statistics recorded for future EV classes as a benchmark or for your own data, you should ensure your vehicle has facilities to use the Wattmeter for the duration of the competition. The wattmeter is the official "instrument" of the challenge. The unit is approximately 3.25" x 2" x 1" and records peak watts, watt-hours of energy used, etc.

Link: [http://www.hobbyking.com/hobbyking/store/uh\\_viewItem.asp?idProduct=10080](http://www.hobbyking.com/hobbyking/store/uh_viewItem.asp?idProduct=10080)

### Electrical Installation

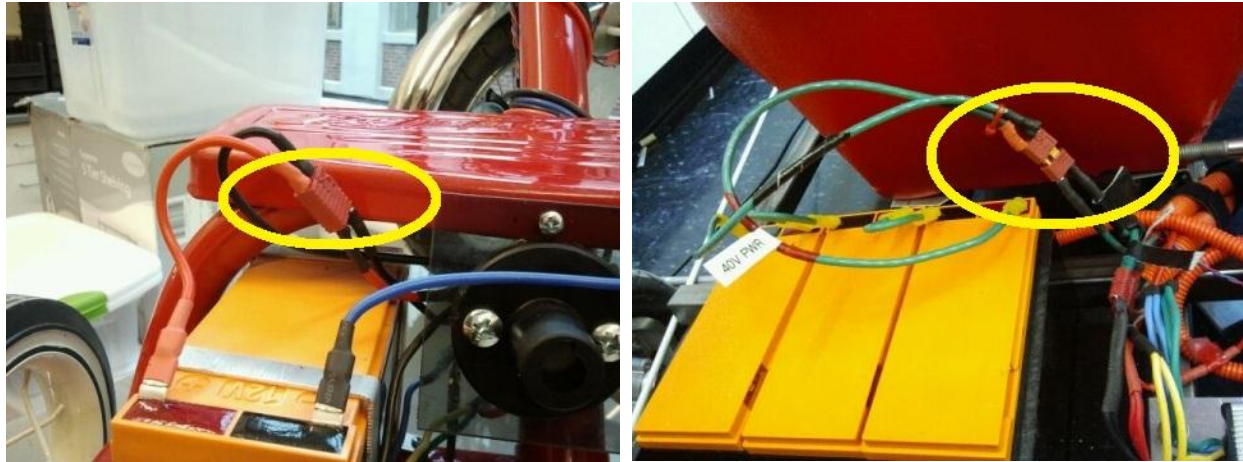
The wattmeter has a single power input lead and power output lead (It derives its own internal power supply). It needs to be mounted **inline** with your **main** power bus between battery and motor controller, i.e. DC side. The following diagram illustrates the idea:



Your electrical system may already have a single power connector in it. The Wattmeter is available with either the red Deans connector, the yellow XT60 connector, or the ¼" quick-disconnect terminals. Its leads span a maximum of 7 inches.



Examples:



These are example places where the Wattmeter can be installed.

### Mechanical Installation

The wattmeter may be contained inside the vehicle or temporarily mounted outside. If it is inside, it must be accessible (to reset) and the reading visible for at least one vehicle orientation (e.g. picking up and looking under a scooter is fine)

If mounted outside, it will most likely be mounted with temporary fasteners like zip ties or electrical tape. The single power plug should be long enough to run outside your vehicle e.g. to the side of a scooter deck, else you can make an “extension cord” to do so.

### Event Safety

**DO NOT OPERATE YOUR VEHICLES WITHOUT PERMISSION.** If you are reckless or disobeying orders to stop doing something, it is grounds for forfeiture of the contest.

**DO NOT LET ANY SPECTATORS OR PASSERBY TOUCH YOUR VEHICLE.** Chances are, we will attract a crowd, and there will be other MIT students or staff as well. You must be in total control of your vehicle at all times.

**IF YOU ARE INJURED, YOU MUST GO TO MIT MEDICAL.** We will have first aid available, but procedure dictates that any student injured in a class must go to MIT Medical. This includes asphalt scrapes, cuts, etc. no matter if they seem minor. An instructor will escort you if necessary.