

The Freescale Cup 2013 Mexico Rules



Version 02, May 13, 2013



The spirit of the game is that students demonstrate excellent hardware integration and superior programming.

Section 1: Team Rules and Requirements

1. A team must consist of a maximum of 3 students and 1 advisor. At least 1 must be a graduate student.
2. Cars will be designed and constructed by students ONLY.
3. Participants are expected to exhibit good sportsmanship. Any inappropriate behavior or cheating may result in disqualification.
4. The Freescale Cup Mexico 1st place winner team members from previous years are not allowed participate in the competition.

Section 2: Equipment Requirements

Each team shall use the same basic kit of parts as described below. The following requirements are in place to keep the playing field level.

Mechanical

1. The original and unaltered equipment must be used as the entry.
 - a. Tires
 - b. Two (2) Drive - DC motors (2 DC Car Model) (See "The Freescale Cup Knowledge Center" for detailed description-
<https://community.freescale.com/docs/DOC-1284>)
 - c. Transmission Ratio of Drive Motor
 - d. Servo Motor-Futaba S3010 (See The Freescale Cup Knowledge Center for detailed description---<https://community.freescale.com/docs/DOC-1284>)
 - e. Battery
 - i. 7.2V, <=3000mAh, rechargeable NiCd or NiMH
 - ii. Only one (1) battery at a time may be used to power the vehicle and any attached hardware
 - f. If any standard component of the car model is damaged, then a replacement part of the same model should be used.
2. The chassis can be modified, with some restrictions:
 - a. The footprint of the frame may not be altered
 - b. You may not change the distance between wheels
 - c. No part of the car shall exceed dimensions of 250mm/9.85in (W) x 400mm/15.75in (L)x 305mm/12in.(H)
 - d. You may drill holes and mount auxiliary pieces on the chassis assuming it is contained within the above dimensions.



Electrical

1. You may create custom boards and are not required to use the provided Freescale development board(s). Must follow the same rules as stated in number 2 below.
2. The electronics can be modified, with some restrictions:
 - a. One (1) Freescale 32-bit Bolero MPC560xB OR one (1) Kinetis L microcontroller must be used. Only One (1) processor - No auxiliary processor or other programmable device is allowed.
 - b. The car must use an optical sensor to navigate
 - c. DC-DC boost circuit cannot be used to power drive or steering motors.
 - d. Total capacity of all capacitors should not exceed 2000 uF; the highest charging voltage of capacitors should not exceed 25 V.
3. Sensor Limits
 - a. Maximum of sixteen (16) sensors, which includes cameras
 - i. Transmitter/Receiver pair is 1 sensor
 - ii. A CCD sensor is 1 sensor
 - iii. The provided Line Scan Camera is 1 sensor
4. NO REPRODUCTION IS ALLOWED IN THE DESIGN OF THE CAR MODEL. HARDWARE AND SOFTWARE OF CAR MODELS OF COMPETING TEAMS WITHIN SAME UNIVERSITY SHOULD BE ORIGINAL AND CLEARLY DIFFERENT.

Section 3: Referee and Technical Judgment

The Freescale Cup will be carried out by the organizing committee.

1. The submission of a Technical Report is mandatory to continue in the competition. Teams that do not turn in a Technical Report by the specified date will be disqualified.
2. The referees are responsible for on-track activities. This includes race track management such as starting and stopping vehicles, as well as timing and scorekeeping.
3. The judges are responsible for non-time based judging activities. This includes design judging and/or report judging.
4. Prior to race, judges will perform a technical inspection of all entries. This includes vehicle specifications, dimensions, and non-modifiable parts. Violations may result in disqualification.
5. Any racing disputes will be taken up and resolved by the racing executive committee.
6. Workers of the organizing committee or the event team shall not participate in coaching or training for any specific race team (except for microcontroller training) and shall not disclose any information that might compromise fairness of the competition. Communication shall be open to all teams.



Section 4: Vehicle Inspection

7. Before the race, the judges will perform a technical inspection of all entries. This includes vehicle specifications, dimensions, and equipment requirements listed in section
8. After the technical inspection, teams may not alter any part of the vehicle.
9. In the event of any violations, the organizing committee is entitled to disqualify the corresponding team.

Section 5: Race Day Competition Procedure

1. The entire racing competition is divided into two series: preliminary (qualifying) and the final competition.
2. Testing - Prior to each race, a test track will be available. Final calibrations may be made at this time.
3. The race track may be altered after testing, prior to the final race.
4. Vehicle Inspection (see section 4)
5. When the final race begins, a referee will direct each team when to enter the playing field in accordance with the racing order.
6. There shall be only one team member on the track at any given time. (excludes testing times)
7. Upon entering the track, a team has two minutes to set up the car and signal "Ready" to referee.
8. After the referee confirms "Ready", the vehicle should leave the starting area within 30 seconds.
9. Vehicle must complete one lap and stop 3 meters passed the finish line.
10. Each finalist will have two attempts to complete the track.
11. The vehicle must be reset (steps 6-7) between attempts.
12. The designated member of the team has the opportunity to change the battery and adjust the car for a second attempt. Car must stay on the track. No software change/reprogramming can be done on the car. Maximum of 2 minutes.
13. After the attempts, the team shall take the vehicle away from the track.
14. Event displays will post the best time for a single lap.
15. The best time of the two attempts will be recorded.

Section 5.2: Preliminary (Qualifying) Race

1. Race order will be determined by registration date and time in inverse order.
2. Each team is given two attempts to complete the track and post a time.
3. Teams that cannot complete the track after two attempts do not qualify for the finals.
4. The vehicle must complete one (1) lap on the racing track to be qualified for the finals.
5. The shortest time for a single lap will be recorded.
6. Disqualified cars will be replaced by the next car in ranking.



7. List of finalists will be submitted by the referees to the organizing committee of the event.
8. After the preliminary round, the car hardware or software can be improved for finals.

Section 5.3: Final Race

1. The technical judges will perform on-site technical inspection for all the cars eligible for the final.
2. The teams will be sequentially ordered based on preliminary times.
3. Teams with slowest times compete first in the finals.
4. The race track configuration for the final may change from the preliminary race. This can include shape, size, and distance.
5. Each finalist has two (2) attempts to complete the track.
6. Each vehicle must complete at least one (1) lap.
7. The shortest time taken to run a single lap will be taken as the final score of the racing car.
8. The score in the preliminary will not be included in the score of the final.

Section 6: Fouls, Failure and Disqualifications

The rules will be interpreted by Freescale and the organizing committee of the event.

Foul, is a minor infraction, which results in a time penalty.

Failure, results in the current attempt time not being recorded. Subsequent attempts are allowed.

Disqualification is a major infraction which results in all times not being recorded.

1. Referee will determine whether the racing car ran out of the race track and assign time penalties.
2. Any of the following conditions will be considered a **foul** and will result in time penalty added:
 - a. The race car fails to leave the starting area within 30 seconds after beginning of the race [+1 second].
 - b. The race car fails to stop 3 meters/ 9 feet after crossing the finish line [+1 second].
3. Any of the following conditions will be considered a **failure** and no time will be given:
 - a. If any part of three or more wheels leave the race surface.
 - b. The racing team fails to enter the playing field and get prepared for the racing in two (2) minutes after being called by the referee.
 - c. The player touches the race car after the technical inspection without consent of the referee.



- d. The race car fails to finish within 120 seconds after leaving the starting area.
- 4. Any of the following conditions will be considered a **disqualification**:
 - a. Any auxiliary lighting equipment or other auxiliary sensors are used around the race track.
 - b. Modification of the hardware or software after the race has begun (except for changing the battery.)
 - c. More than one team member in the playing field.
 - d. Any behavior that might interfere with the movement of the car.
 - e. Touching the car during an attempt prior to crossing finish line.
 - f. Any cheating during the competition.
 - g. Failure to pass the technical inspection.

Section 7: Scoring

1. Equality and fairness will be ensured as much as possible on the condition of actual feasibility. Disputes will be resolved by a vote of Freescale, members of the organizing committee, and judges.
2. Time starts when the racing car crosses the start/finish line.
3. Fouls will result in the time addition to the car's lap time.
4. Disqualifications and Failures will result in no score.
5. Time will be captured using an electronic gate and/or handheld timer.
6. The best overall time, will be crowned the Brazil 2013 Champion

Section 8: Winner

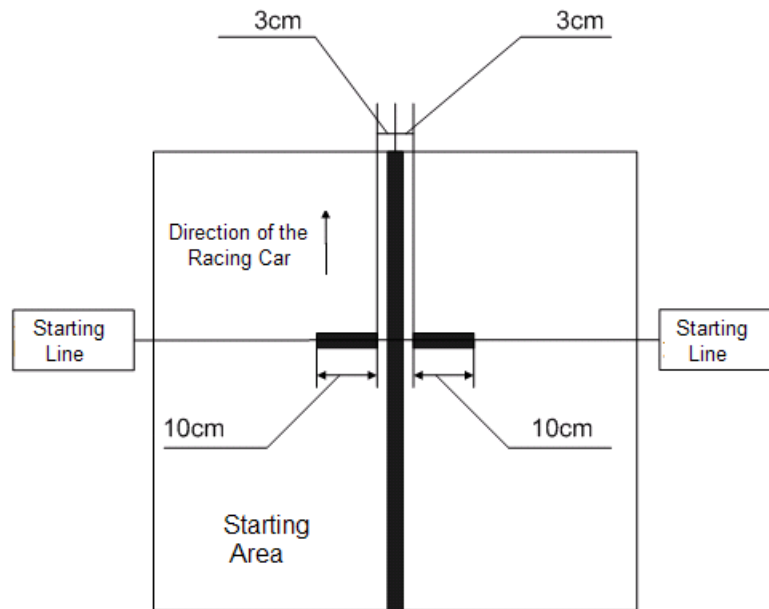
1. The team with the fastest lap time is the winner.
2. The Prize is non-transferable, with no cash redemption or equivalent. Freescale reserves the right to substitute a prize or prize component of equal or greater value or to provide a cash award of equal value. Except as specifically provided herein, the prize package does not include insurance, personal expense, incidental charges, gratuities, or any other items not specially described in the above Rules. By participating in this Contest, the Contestants agree to release and hold harmless Freescale, its advertising and promotions agencies and each of their respective parent companies, affiliates, subsidiaries, officers, directors, agents, and employees, from any and all liability whatsoever for any injuries, losses or damages of any kind arising from or in connection with the 1) awarding, acceptance, receipt, possession, use and/or misuse of any prize awarded herein; or 2) participation in the Contest or any prize related activities, including but not limited traveling to or from any prize related activity.

Section 9: Parameters of the Race Track

1. Each University should create their own test track for the students to use during



- development. Track drawings are provided at freescalecupwiki.freescale.com.
2. The actual layout of the final racing track will be unknown to competitors until competition day.
 3. For a limited time on race day, a test track made from the same material will be available on a first come, first serve basis for calibration and design modifications.
 4. Width of the racing track shall not be less than 600mm.
 5. Material specifications regarding the surface of the racing track will be provided on the web site of the event.
 6. Surface of the racing track is matte white, with a continuous black line (25mm wide) drawn in the middle as the pilot line.
 7. The minimum bending radius of the racing track shall not be less than 500mm.
 8. The racing track can intersect with a crossing angle of 90°.
 9. Any slope in the track will be equal to or less than 15 degrees in a straight section of the racing track, including upgrade and downgrade.
 10. There is a straight starting area of 1 meter long in the racing track, as shown in figure below. In addition, there is a black starting line 10 centimeters long at both sides of the starting point. Start time and end time will be determined when the front part of the racing car passes the starting line. The car must be able to automatically stop within three meters of the starting line after finishing the race.



Section 10: Questions or Clarification



Prior to the race, please post any questions regarding the rules to your regional community [<https://community.freescale.com/groups/tfc-brazil>]

During the race event, all interpretation of the rules will be at the discretion of the on-site executive event committee.

Section 11: Technical Report Requirements

Technical reports will be reviewed and rated by the experts invited by the organizing committee of the event. Technical reports should be clear with detailed text, diagrams, and bibliography. Technical reports must contain a brief description of major concepts and specific technical implementation schemes for design and production of car models including:

1. Description of mechanical design of car model.
2. Description of control circuit design.
3. Description of the electronics design
4. Description of control software design:
 - a. SW architecture and module interaction block diagram.
 - b. SW Design per module.
 - c. All code source files and project files.
 - i. Module naming conventions should be observed.
 - ii. Use of version control tool (e.g. subversion) must be observed, repository delivery is required.
 - iii. Use of variable naming conventions must be observed.
 - iv. Use of scheduler must be observed.
5. Total weight and dimensions of the reengineered car
 1. Power consumption
 2. Count and type of sensors used
 3. Number of servo motors besides the existing driving motors and rudder motors of the car model
 4. Written in English
 5. Formatted for either Microsoft Word or PDF
 6. ZIP file with version control tool repository.
 7. Submitted via email to the Freescale contact (Damaris.Ochoa@Freescale.com) three weeks prior to the race

Upon arrival at the final competition, each team must submit a CD, complete with the University Name and Team Name, with the following content:

- a. The Technical Report previously submitted via email.
- b. A technical update document reporting changes or improvements in the car prototype and software since the technical report was submitted.
- c. All related raw documents like mechanical design, circuit design, and MCU software project of car models.



Section 12: Document Revision History

Date	Notes
May 13, 2013	Original Release

The rules and conditions are subject to change by Freescale if necessary. Freescale reserves the right in their sole discretion to cancel, suspend and/or modify The Freescale Cup race at any time. These official rules are drawn up in the English language. If these official rules are provided in any other language and there is a conflict in the text, the English language text shall prevail.

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