

January 6, 2009

TEAM UPDATE #1

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

- 1) We would like to remind teams that illustrative resources, such as the Kickoff video, the game animation, etc. are intended to provide overviews of the game. The ultimate authority regarding game rules is the 2009 *FIRST* Robotics Competition Game Manual posted on the *FIRST* website (<http://www.usfirst.org/community/frc/content.aspx?id=452>).
- 2) The Game Design Committee would like to elaborate on the restriction about robot size during match play. Specifically, it's important to read and understand the statement in Rule <R08>, referring to the bumpers:

"...If implemented as intended, a ROBOT that is driven into a vertical wall in any normal PLAYING CONFIGURATION will always have the BUMPER be the first thing to contact the wall."

This rule restricts any arms, mechanisms, hoods, etc from extending beyond the BUMPER PERIMETER. Among other things, some associated intentions of this rule are to prevent teams from having manipulators which extend outside the BUMPER PERIMETER, and to prevent teams from being able to de-score game pieces or block/disrupt trailers. While the current belief is that rule changes or additions are not needed to prevent such robot behavior, if teams are pursue this type of strategy by employing a loophole, or by other means, an amendment to the rules will be made.

Section 0 - Introduction

No changes.

Section 1 - Communication

No changes.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

No changes.

Section 7 – The Game

The Game Design Committee would like to elaborate on the restriction concerning disruption of the ARENA as it applies to the TRAILER. The purpose of the trailer is to serve as an open collection site for MOON ROCKS, EMPTY CELLS, and SUPER CELLS. As such, an attempt to cover the open top of any trailer or remove scored balls would be considered a disruption of ARENA elements and not be allowed per <G29>.

Section 8 – The Robot

Section 8 – The Robot has been updated as follows:

- The definition of Bumper Perimeter has been updated as follows:

BUMPER PERIMETER – the polygon defined by the outer-most set of exterior vertices on the ROBOT (without the BUMPERS or Trailer Hitch attached) that are within the BUMPER ZONE. To determine the BUMPER PERIMETER, wrap a piece of string around the ROBOT at the level of the BUMPER ZONE - the string describes this polygon. The BUMPER PERIMETER may extend up to, but cannot exceed, the maximum ROBOT volume constraints defined in Rule <R11>.

- Rule <R11> has been updated. The change in language removes the implied restriction on robot width and length. The intent of the rule is not to designate one particular orientation over another, but simply to limit the overall volume of the robot. The change also clarifies that the Trailer Hitch is allowed (expected) to extend beyond the BUMPER PERIMETER and ROBOT volume limitations.

At the start of, and during, the MATCH the ROBOT shall fit within the orthogonal dimensions listed below:

<u>Dimension 1</u> <u>(horizontal)</u>	<u>Dimension 2</u> <u>(horizontal)</u>	<u>Dimension 3</u> <u>(vertical)</u>	<u>Maximum</u> <u>Weight</u>
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28 inches (71.12cm)	38 inches (96.52cm)	60 inches (152.40cm)	120 pounds (54.43Kg)
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- A. Exception: solely for the purposes of determining compliance with the weight and volume limitations, these items are NOT considered part of the ROBOT and are NOT included in the weight and volume assessment:
- The 12V battery and its associated half of the Anderson cable quick connect/disconnect pair (including no more than 12 inches of cable per leg, the associated cable lugs, connecting bolts, and insulating electrical tape),
 - BUMPER assemblies that are in compliance with Rule <R08>,
 - The TRAILER,
 - The Trailer Hitch (as defined in Rule <R18>),
 - The OPERATOR CONSOLE.
- To clarify the intended effect of keeping all parts of the Robot within the BUMPER PERIMETER, Rule <R16> has been updated as follows:

Once the MATCH has started, the ROBOT may assume a PLAYING CONFIGURATION that is different from the STARTING CONFIGURATION. The ROBOT must be designed such that the PLAYING CONFIGURATION of the ROBOT shall not exceed the dimensions specified in Rule <R11>. When in the PLAYING CONFIGURATION, no part of the ROBOT may extend outside the vertical projection of the BUMPER PERIMETER.
 - In Rule <R18>, Part D “outer edge” has been changed to “BUMPER PERIMETER”. It now reads as follows:

The Trailer Hitch must be located on the BUMPER PERIMETER of the ROBOT structure such that it may easily connect with the tongue of the TRAILER (attached to the TRAILER).
 - The 2009 Parts Use Flowchart has been edited to include a “NO” path for the “Electronics” block. Also, “2008” has been changed to “2009” in the block below.

Is the part or material off-the-shelf or is it custom made by the team after the start of the 2009 Kickoff?
(See Robot Section)

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

No changes.

January 9, 2009

TEAM UPDATE #2

GENERAL NOTICES

General Notes from FIRST Headquarters :

As a reminder to teams, the 2009 FRC Q&A Forum is now open. Responses to team-asked questions will be posted in this forum: <http://forums.usfirst.org/forumdisplay.php?f=1021> . Team leaders can ask questions by logging into the team account and posting here: <http://forums.usfirst.org/forumdisplay.php?f=1010> . Remember, the Q&A presents the GDC interpretation of published rules. All official rule changes are presented in Team Updates in the form of Manual Updates.

Section 0 - Introduction

No changes.

Section 1 - Communication

Section 1 – Communication, Rev B, page 4 includes the following update:

Our Team Updates schedule is Tuesday by 5PM and Friday by **5PM**.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7 – The Game, Rev B, includes the following addition:

<G25.1> De-scoring GAME PIECES – Once a GAME PIECE has been SCORED, it may not be intentionally de-scored (e.g. removed from the TRAILER). De-scoring a GAME PIECE will cause a PENALTY to be assigned. At the end of the match, any intentionally de-scored GAME PIECES will be considered SCORED as originally placed. GAME PIECES that are knocked free from tenuous placements as a result of normal game interactions (e.g. a GAME PIECE on top of a pile of MOON ROCKS that completely fill a TRAILER falls off when the TRAILER is bumped) will not be penalized.

Also, a typo was corrected in Rule <G01>.

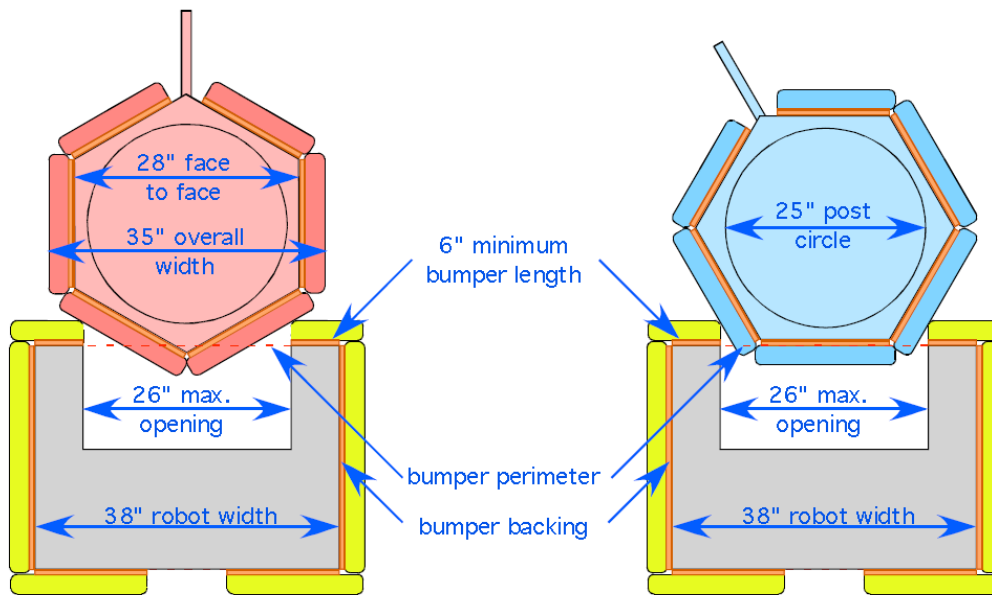
<G01> ROBOT Size - Each ROBOT shall not exceed the maximum weight or volume specified in Rule <R11>. The Head Referee may call for an inspector's recertification of the ROBOT size and weight prior to the start of any MATCH. ROBOTS determined to be in violation prior to the start of a MATCH will be prohibited from participating in the MATCH. Any ROBOT determined to be in violation during a MATCH will be assigned a PENALTY and will receive a YELLOW CARD (see Rule <S04>).

Section 8 – The Robot

We would like to highlight an area in which we have received several questions. Teams are cautioned to consider ALL the factors associated with the construction of the required bumpers, and how those factors will impact the design of their robot. For example, individually these clauses of Rule <R08> can each impact the topology of the robot:

- “Each bumper segment must be at least six inches long” (Rule <R08-A>)
- “Each bumper segment must have plywood backing” (Rule <R08-C>)
- “Corners must be protected by bumpers” (Rule <R08-I>)
- “2/3 of the bumper perimeter must be protected by bumpers” (<R08-K>)
- “No hard bumper parts past the bumper perimeter” (Rule <R08-O>)

But when taken together and the robot is designed to satisfy ALL of the requirements of the rule, these clauses can have a very pronounced effect. In the case of the archetype “wide drive” robot with a centered opening on the front of the robot, this can result in a significant limit on the size of the opening. This limits the ability for incursion inside the bumper perimeter by the trailer. See the example below.



Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

No changes.

January 13, 2009

TEAM UPDATE #3

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

2009 FRC Suggestions (formerly known as *Tips, Guidelines, and Good Practices*) is now available on the *Documents and Updates* section of the *FIRST* website (<http://www.usfirst.org/community/frc/content.aspx?id=452>).

Section 0 - Introduction

No changes.

Section 1 - Communication

No changes.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

The weight of the trailer is 36 lbs on earth (but only 6 lbs on the moon).

The *Basic Field Assembly Diagram*, posted at <http://www.usfirst.org/community/frc/content.aspx?id=11624>, has been updated to include details about the Payload Specialist seat at the Outpost.

Product information about the 36" tongs used at the Fueling Stations is available at http://www.ungerglobal.com/retail/products/specialty_tools/#nabber.

Section 7 – The Game

Section 7 – The Game, Rev C, includes the following edits:

<G07> Scores are determined based on the state of the GAME PIECES at the end of the MATCH. Scores will be assessed after all objects in motion when the arena timer displays zero seconds come to rest.

- A. The final score of a MATCH is the total of points assigned due to SCORED GAME PIECES, less any assigned PENALTIES.
- B. If a TRAILER tips over, the points SCORED for that TRAILER at the time it was tipped will be preserved for the remainder of the MATCH.

<G14> CELL Count Modification – If the assigned ALLIANCE score, before penalties, for the last non-surrogate MATCH played by the TEAM was more than twice (2x) the opposing ALLIANCE score, before penalties, then one EMPTY CELL or SUPER CELL will be withheld from the initial set of GAME PIECES made available to the PAYLOAD SPECIALIST for the TEAM. If the assigned ALLIANCE score, before penalties, for the last non-surrogate MATCH played by the TEAM was more than triple (3x) the opposing ALLIANCE score, before penalties, then a second EMPTY CELL or SUPER CELL will be withheld from the initial set of GAME PIECES made available to the PAYLOAD SPECIALIST for the TEAM.

<G18> Causing PENALTIES – The actions of an ALLIANCE shall not cause an opposing ALLIANCE to break a rule and thus incur penalties. Any rule violations committed by the affected ALLIANCE shall be excused, and no penalties will be assigned.

<G20> Handling MOON ROCKS – MOON ROCKS are the primary GAME PIECE used to SCORE in the TRAILERS of the opposing ALLIANCE.

- A. MOON ROCKS can be SCORED by ROBOTS or PAYLOAD SPECIALISTS.
- B. PAYLOAD SPECIALISTS can enter MOON ROCKS into play by launching them over the Alliance Station Wall, launching them over/through the OUTPOST shield, or using the provided tongs to pass them backwards through the FUELING PORT/AIRLOCK. MOON ROCKS can not enter the CRATER by being thrown around the end of the Alliance Station Wall. A violation will cause a PENALTY to be assigned.
- C. MOON ROCKS can be recycled to the PAYLOAD SPECIALISTS by passing them over/through the AIRLOCK and through the FUELING PORT in the Alliance Station Wall, or by passing them through the port in the OUTPOST shield. MOON ROCKS can not be recycled to the PAYLOAD SPECIALISTS via any other paths (e.g. over the OUTPOST shield or Alliance Station Wall). A violation will cause a PENALTY to be assigned.

<G23> SUPER CELL scoring – During the last 20 seconds of the MATCH, the PAYLOAD SPECIALIST may enter a SUPER CELL into play by removing it from the CELL RACK. They may then enter it into the CRATER, either over the Alliance Station Wall or through the FUELING PORT. A ROBOT or PAYLOAD SPECIALIST can SCORE any SUPER CELL that has been entered in play. If a SUPER CELL is removed from the CELL RACK before the last 20 seconds of the MATCH, then two (2) PENALTIES will be assigned to the offending ALLIANCE: under such conditions, the SUPER CELL may still be entered into play and subsequently SCORED.

<G24> Handling EMPTY CELLS – EMPTY CELLS are typically used as “exchange units” to obtain SUPER CELLS (see Rule <G22>). Alternately, they may be SCORED in a manner similar to MOON ROCKS.

A. ROBOTS may be in POSSESSION of a maximum of one EMPTY CELL, or may HERD a maximum of one EMPTY CELL at one time. A ROBOT may not be in POSSESSION and HERD EMPTY CELLS at the same time. A violation will cause a PENALTY to be assigned.

B. EMPTY CELLS can be SCORED by ROBOTS or PAYLOAD SPECIALISTS.

C. EMPTY CELLS can be recycled to the PAYLOAD SPECIALISTS by passing them over/through the AIRLOCK and through the FUELING PORT in the Alliance Station Wall, or by passing them through the port in the OUTPOST shield. EMPTY CELLS can not be recycled to the PAYLOAD SPECIALISTS via any other paths (e.g. over the OUTPOST shield or Alliance Station Wall). A violation will cause a PENALTY to be assigned

<G40> GAME PIECE Interaction – With the exception of PAYLOAD SPECIALISTS, no TEAM member may manipulate GAME PIECES at any time during the MATCH. Violations will result in a PENALTY.

A. At the start of the MATCH, the PAYLOAD SPECIALIST shall not be in possession of any GAME PIECE. Violations will result in a PENALTY.

B. At any time after the start of the MATCH, a PAYLOAD SPECIALIST may enter a GAME PIECE into play (e.g. launch a MOON ROCK into the CRATER or pass an EMPTY CELL through the port in the OUTPOST shield to a ROBOT).

C. PAYLOAD SPECIALISTS retrieving GAME PIECES passed from the CRATER through the AIRLOCK / FUELING PORT must use the provided tongs to pick up the GAME PIECE from the floor. Failure to do so will cause a PENALTY to be assessed.

D. The PAYLOAD SPECIALISTS is permitted to reach through the FUELING PORT with the provided tongs to manipulate GAME PIECES in the “dead space” between the AIRLOCK and the FUELING PORT. However, any contact with a ROBOT while doing so will be considered a violation of Rule <S02>.

Section 8 – The Robot

Section 8 – The Robot, Rev C, has been updated to with the following changes:

<R53>, Part B

The gearboxes for the Fisher-Price and Globe motors are not considered “integral” and may be separated from the motors.

<R59> The control system is designed to allow wireless control of the ROBOTS. The Driver Station, cRIO Mobile Device Controller, digital sidecar, breakout boards, power distribution module, speed controllers, relay modules, wireless bridge, batteries, and battery charger shall not be tampered with, modified, or adjusted in any way (tampering includes drilling, cutting, machining, gluing, rewiring, disassembling, etc.), with the following exceptions:...

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

The *Where to get more* document is posted on the *Additional Technical Resources* page on the *FIRST* website (<http://www.usfirst.org/community/frc/content.aspx?id=452>). The document includes information for teams about getting additional Kit Of Parts items.

January 16, 2009

TEAM UPDATE #4

GENERAL NOTICES

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General Notes from FIRST Headquarters:

No changes.

Section 0 - Introduction

No changes.

Section 1 - Communication

No changes.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7 – The Game, Rev D, includes the following edits:

<G07> Scores are determined based on the state of the GAME PIECES at the end of the MATCH. Scores will be assessed after all objects in motion when the arena timer displays zero seconds come to rest.

- A. The final score of a MATCH is the total of points assigned due to SCORED GAME PIECES, less any assigned PENALTIES.
- B. If a TRAILER tips over, the points SCORED for that TRAILER at the time it was tipped will be preserved for the remainder of the MATCH.

Section 8 – The Robot

Section 8 – The Robot, Rev D, includes the following edits:

<R66> Inputs to custom circuits can be connected only to the following sources:

- A. Power Distribution Board protected 12Vdc outputs
- B. Speed controller outputs,
- C. Relay module outputs,
- D. Analog Breakout outputs,
- E. Digital Sidecar PWM Out, I2C, Relay or Digital I/O ports,
- F. Other custom circuits, or
- G. Switches, potentiometers, accelerometers, sensors, and other additional permitted electronics.

<R67> All outputs from sensors, custom circuits and additional electronics shall connect to only the following:

- A. Other custom circuits, or
- B. PWM Out, I2C, Relay or Digital I/O ports on the Digital Sidecar, or
- C. ANALOG IN ports on the Analog Breakout.
- D. Ethernet Port 2 on the cRIO Mobile Device Controller (to which the Kit Of Parts-provided camera, and only that camera, may be connected).

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

A number of teams have reported faulty 5V indicator LEDs on their Power Distribution (PD) Board. After assessment of the situation, we are certain that all of these failures are due to case interference with the resistor that limits the current in the 5V LED.

There is no harm in using the PD Board without this resistor, and *FIRST* will not be replace PD Boards because of this issue. The conformal coating provides convenient protection from any loose component.

While we're certainly disappointed that the 5V LED may not be functional for all teams, we appreciate your understanding as we work through and with any blemishes of a very new, very exciting control system. Thank you.

January 20, 2009

TEAM UPDATE #5

GENERAL NOTICES

General Notes from FIRST Headquarters :

Don't Zap your Driver Station

Several teams have reported Driver Station lock up (requiring power cycling to recover) and we are currently investigating the issue, and have thus far tracked the problem back to Electrostatic Discharge (ESD). We are currently continuing to pursue the issue, but in the mean time, please practice prudence to mitigate the possibilities of this happening to your Driver Station.

The human body can carry an electrical charge (like when you shuffle your socks on the carpet so you can 'zap' a friend). Make sure you ground yourself before you touch the driver station or anything connected to the driver station. Touch metal before you touch your robot or Driver Station. It will save you a lot of time and energy.

The FRC Diagnostics Panel

The FRC Diagnostics Panel is a LabVIEW tool to assist with the diagnosis of robot problems. It allows for manual control of all the input and output connections on the Digital Side Car, Analog Breakout, and Solenoid Breakout boards. This tool is provided for use by teams and will be employed by the Robot Inspectors during FRC Regionals. An article about this software, and a link to download it, can be found on the FIRST Think Tank website.

<http://thinktank.wpi.edu/article/138>

Communication via the Field Management System

Every time the Driver Station and ROBOT communicate, a 1024-byte packet is sent between them. 40 bytes are reserved for use by the Field Management System. The remaining 984 bytes are available for teams to put in any of the user data that they want. The team can choose to send whatever they want in those 984 bytes.

Video is typically transmitted from the ROBOT by using the software ports specifically set up to support video throughput. This year, the Field Management System will not pass data sent through that port during a match (to ensure adequate system performance during competition events, until the new system is better characterized in actual competition settings). If a team really wants to transmit images from the camera back to the Driver Station during a competition, they can decompose the video frame and pass it as user data in the available 984 bytes per packet. However, the resulting throughput of the video will likely result in a frame rate so slow that it is not particularly useful.

Section 0 - Introduction

No changes.

Section 1 - Communication

No changes.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

Drawing GE-09040, Rev A has been updated to clarify the height of the Trailer Hitch.

Drawing GE-09036, Rev B has been updated to increase the size of the hole in the trailer tongue.

Practice field drawing TE-09001 has been updated to correct the orientation of the barriers.

Section 7 – The Game

A brief description of one way to restore damaged wheels for competition is posted under Section 7 – The Game at <http://www.usfirt.org/community/frc/content.aspx?id=452>.

Section 8 – The Robot

Section 8 – The Robot, Rev E, includes the following edits:

<R51> Motors specifically permitted on 2009 FRC ROBOTS include:

- A. All motors, actuators, and servos provided in the 2009 Kit Of Parts,
- B. An unlimited number of COTS servos with a maximum output torque of 55 oz-in and maximum rotational speed of 100 rpm at 6 Vdc (e.g. HITEC model HS-322HD or HS-325HB servos, as provided in the Kit Of Parts),
- C. An unlimited number of *FIRST* Tech Challenge (FTC) servos (HITEC HS-475HB servos),
- D. One or two additional 2-1/2" CIM motors (part #FR801-001 and/or M4-R0062-12) in addition to those provided in the Kit Of Parts. This means that up to four, and no more, 2-1/2" CIM motors can be used on the ROBOT.
- E. COTS motors used as one-to-one replacements (i.e. identical vendor and part number) for motors, actuators and servos provided in the 2009 Kit Of Parts that may have failed or become inoperable.

MI-00017, Rev A, The Axis Camera Pan and Tilt drawing, has been updated to remove the word "modified" in the description of the servo.

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

Information about acquiring additional batteries is now posted on the FIRST website at <http://www.usfirst.org/community/frc/content.aspx?id=452>. The link is located under Section 10 – The Kit Of Parts.

Helpful Links:

January 23, 2009

TEAM UPDATE #6

GENERAL NOTICES

General Notes from FIRST Headquarters :

Coefficient of Friction tests on Crater surface :

Several teams have discovered that their measurement of the coefficient of friction for the Rover Wheels against the Regolith yields different results from those published in the Manual. The published information is provided as an approximation for expected conditions. Your test conditions may be slightly different (i.e. new wheels vs. wheels with wear, etc), thus resulting in differing results. We encourage teams to perform their own tests and to trust their own data.

FRC Q&A Forum:

Several of the questions posted in the Q&A Forum seem to have been attempts at a specific design review by the GDC, rather than specific questions or concerns about rules, technical queries, etc. We would like to emphasize that the forum is in place for inquiries appropriate for each section of the Competition Manual, such as "The Game," "The Robot," etc. The Q&A Forum is not an appropriate venue to flush out particular designs and ideas or try to get a design "pre-inspected". Please be sure to restrict your questions to Competition Manual topics, parts questions, and rules clarification. We appreciate your attention on this matter, and if you require more clarification, please refer to 1.6.1 of the Section 1 – Communication.

Section 0 - Introduction

No changes.

Section 1 - Communication

No changes.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

No changes.

Section 7 – The Game

No changes.

Section 8 – The Robot

No changes.

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

No changes.

Helpful Links:

January 27, 2009

TEAM UPDATE #7

GENERAL NOTICES

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General Notes from FIRST Headquarters:

The Fifth Gear Simulation Software:

The Fifth Gear Simulation Software:

The Fifth Gear software, introduced by FIRST President, Paul Gudonis, at Kickoff, is a tool that simulates FRC Lunacy and Overdrive matches. FRC Volunteers created The 5th Gear, with continuing support from Lockheed Martin; together with FIRST and WPI they are offering this year's version to all FRC teams. Exhibitions are planned at several FRC regional competitions, including investigations into how such a simulation may be used most effectively in future FRC seasons.

For more information, please click on the '5th Gear Simulation' link posted under Section 6 - The Game at <http://www.usfirst.org/community/frc/content.aspx?id=452>. If you'd like to discuss the simulation or have questions, a discussion forum has been created at forums.usfirst.org, specifically at <http://forums.usfirst.org/forumdisplay.php?f=1091>.

We hope this will be a useful tool for teams and look forward to your feedback on the above forum.

Section 0 - Introduction

No changes.

Section 1 - Communication

No changes.

Section 2 – Team Organization

No changes.

Section 3 – At the Events

Section 3 – At the Events, Rev B, includes the following edits:

3.9 THE PIT

Teams, volunteers, *FIRST* Staff, and guests spend a lot of time in the Pit area. Get to know other teams, help each other when you can, and keep the aisles clear. Time is short, and help is very often right "next door" in the adjacent team pits.

Children under 12 MUST be accompanied in the Pit by an adult at all times!

3.9.1 Be Safe, Be Kind, Be Gracious

- Use common sense regarding safety and courtesy.
- Wear required ANSI-approved safety glasses when in the pit. Wear them on the playing field.
- Choose a student safety captain during the build season to monitor team safety at your work areas and also at the events.
- Respect advice from safety captains and safety advisors.

Section 4 – Robot Transportation

No changes.

Section 5 – The Awards

No changes.

Section 6 – The Arena

No changes.

Section 7 – The Game

No changes.

Section 8 – The Robot

Section 8 – The Robot, Rev F, includes the following edits:

<R18> To attach the TRAILER to the ROBOT, TEAMS must use a Trailer Hitch constructed from materials provided in the 2009 Kit Of Parts. Details on the construction of the Trailer Hitch are provided in Drawing "GE-09040."

- A. The Trailer Hitch is composed of the “Trailer Spacer” (Part 2 in the referenced drawing) and the “Trailer Mount Bar” (Part 3 in the referenced drawing). The Trailer Spacer is a 7-inch length of square steel tubing provided in the Kit Of Parts. The Trailer Mount Bar is a 7-inch length of robot chassis material (C-channel) to be cut from the provided KOP chassis material.
- B. The Trailer Hitch must be rigidly attached to a fixed location on the ROBOT, with the long dimension of the Trailer Hitch horizontal and the opening of the C-channel facing away from the ROBOT. The horizontal center line of the Trailer Hitch must be 2-13/16 inches above the floor, +/- 0.25 inches.
- C. The Trailer Hitch must be positioned so that the TRAILER may be locked in place with a standard 1/4– inch diameter hitch pin (McMaster-Carr part number 98416A009) . During a competition MATCH, this hitch pin will be provided with the TRAILER as part of the ARENA equipment. See Figure 8-5.
- D. The Trailer Hitch must be located on the BUMPER PERIMETER of the ROBOT structure such that it may easily connect with the tongue of the TRAILER (attached to the TRAILER).
- E. The Trailer Hitch must be placed such that, as the TRAILER swings from side to side, the first contact between the TRAILER and ROBOT is BUMPER-to-BUMPER and not TRAILER-tongue-to-BUMPER (to prevent placing excessive stress upon, and possibly damaging, the TRAILER tongue). See Figure 8-6.
- F. The color of the TRAILER (red or blue) will be used to indicate the ALLIANCE of the ROBOT.
- G. The Trailer Hitch must be designed for quick and easy installation and removal, to aid in ROBOT inspection during sizing and weighing checks (as a guideline, the Trailer Hitch should be removable by one person in ten minutes).

<R82> All devices connected to the USB ports of the Driver Station shall be powered solely through the USB port. All devices connected to the analog and digital ports of the Driver Station shall be powered solely through the provided 5Vdc connection pins on the Driver Station. External power sources of any type are not permitted on any equipment connected to these ports.

- Please note that the power available through the USB ports, digital I/O, and analog input pins is limited to 2 amps total. Care must be taken to ensure that any team-provided devices connected to these sources do not over tax the available Driver Station supplied power.

<R82.1>All Driver Stations must have their circuit board grounded to the metal case. The document that describes the process for grounding the Driver Station is posted under *Section 8 - The Robot* of the Competition Manual at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

No changes.

Helpful Links:

January 30, 2009

TEAM UPDATE #8

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Orbit Ball containers for PAYLOAD SPECIALISTS:

Two containers are provided for the temporary storage of Game Pieces at each PAYLOAD SPECIALIST location. Each container is approximately 26 x 14 x 12 inches (large enough to hold approximately 10 GAME PIECES). In the FUELING STATION, they are located behind the PAYLOAD SPECIALIST as they are facing the field; in the OUTPOST they are located to either side of the seat.

Section 7 – The Game, Rev E has been updated as follows:

<R11.1> The provided MOON ROCK storage containers may be moved around, within the FUELING STATION or OUTPOST in order to accommodate the PAYLOAD SPECIALIST, but they must remain on the ground and upright throughout the MATCH.

Section 8 – The Robot

Bumper Rules Clarification:

Teams, we acknowledge that in our attempt to clarify the bumper rules over the past three weeks, the complexity of options grew. We underestimated this outcome and realize it has led to confusion for some teams trying to exercise their creativity in frame design. We would like to remind all teams that the bumper rules have not changed since the initial release of the manual, and upon careful analysis we have determined that there is not a need to modify any of the rules.

In case you have not seen the guidance given by the FRC Director in his blog two weeks ago, we repeat it here for your benefit:

“Since there seem to be several intense Team discussions about bumper rules, here is a “flow chart” for determining bumper legality -- at least the gross geometry part of the bumper.

1. Estimate carefully how wide the bumper gap around the trailer hitch must be to

- comply with the "bumper to bumper" trailer-robot contact illustrated in Figure 8-6.
2. Wrap a string around the robot to determine the BUMPER PERIMETER.
 3. Mark the string to indicate the non-bumper regions, (including the TRAILER HITCH gap) being careful to insure that six inches of BUMPER are provided on each side of each vertex of the BUMPER PERIMETER.
 4. Check to ensure that 2/3 of the BUMPER PERIMETER is covered by BUMPERS."

Additionally, we would like to restate the fact that Figure 8-2 in the manual is meant to show four examples, which are indicated with an "OK" and associated arrow; no other information is communicated in that figure, and no interpretations should be taken from anything else in the figure.

Finally, we have started to receive a number of questions about "curves" vs. "corners". The guidance that will be provided to the Robot Inspectors is as follows: Curves are considered infinite vertices or corners, thus any exterior curve must be completely protected by bumpers and be flanked by two six-inch segments of straight bumper.

We hope this guidance has helped in your understanding of the rules and the Game Design Committee's intent. If you have any other specific questions about specific bumper rules, please continue to request clarification of those specific rules in the Q&A. We remind teams that the purpose of the Q&A is not to perform design review, and we are not able to approve or disapprove specific designs on that forum.

Required cRIO modules:

Please note, while the rules explicitly require only the 9201 module to be installed in the cRIO (in slot 1), the rules also imply that the 9403 must be in slot 4 (Rule <R58>). The 9403, installed in slot 4, enables the Robot Signal Light via the Digital Sidecar.

Required software versions:

Section 8 – The Robot, Rev G has been updated as follows:

<R56> The cRIO Mobile Device Controller, Driver Station, wireless bridge, and wireless router must be configured to correspond to the correct team number (assigned to the team by FIRST). The procedures for configuring these devices are contained in the FRC control system documentation. Software and firmware used during the competition must be at the appropriate revision in order to pass inspection and compete. The software/firmware and permitted revisions are listed in the table below.

Software/Firmware	Revision
LabVIEW for FRC	Update 3.0a and newer
cRIO FPGA Image	FRC_2009_v11.zip and newer
WPI Robotics Library	TBD and newer
Driver Station	2008-10-29a and newer

Section 9 – The Tournament through Section 10 – The Kit of Parts

No changes.

February 3, 2009

TEAM UPDATE #9

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Running the control system while recharging the battery:

We do not recommend simultaneously charging the battery while using it to power the control system.

Teams should only power the robot control system components from a battery. Using bench power supplies or a battery charger/battery combination (in an attempt to recharge the battery while running the system) is not recommended, and it may cause damage to components or unsafe conditions.

Section 0 - Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Match Sequencing:

During each MATCH, the Field Management System will cycle each Driver Station through the following states:

- * Autonomous - Disabled
- * Autonomous - Enabled (for 15 seconds)
- * Autonomous - Disabled
- * Teleoperated - Disabled
- * Teleoperated - Enabled (for 120 seconds)
- * Teleoperated - Disabled

Please note that while the ROBOT is in the “Autonomous – Disabled” state, robots are "awake" and can monitor their inputs allowing them to perform tasks such as automatic camera calibration, target search (w/out servos or motors), gyro calibration, and perform internal calculations. Outputs, with the exception of the Robot Signal Light, are disabled.

Section 8 – The Robot

Inspection Documents

The *Inspection Checklist* and the *Bill of Materials Template* are now posted under Section 8 at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

Chapter 8 - The Robot Rule Numbering Scheme

Recently, Revisions C - F had rule numbers that became askew. We apologize for this mistake, and have corrected the numbering in Rev H to match the numbering released at Kickoff. To be sure that you are referencing the correct rule number, we suggest you refer to *Chapter 8 - The Robot Rev H*.

Modifications to the Trailer Hitch:

The Game Design Committee has come to realize that assumptions made during the trailer hitch and trailer tongue designs did not take all possible legal robot designs into account. We apologize for this oversight, and have decided to make some changes to ensure all teams can meet our original intent: ultimately, contact between the robot and the trailer must be padded by bumpers, and not be between trailer tongue and trailer hitch. With our original hitch design, some teams would contact the trailer tongue to the trailer hitch before they could possibly have bumper-to-bumper contact.

In order to accommodate various robot shapes and sizes, we have included two acceptable modifications to the Trailer mount bar. They are included in Drawing GE-09040 Rev B which is posted under *Section 8 – The Robot* at

<http://www.usfirst.org/community/frc/content.aspx?id=452>.

Section 8-The Robot, Rev H, has been revised to include the following:

- <R18>** To attach the TRAILER to the ROBOT, TEAMS must use a Trailer Hitch constructed from materials provided in the 2009 Kit Of Parts. Details on the construction of the Trailer Hitch are provided in Drawings “GE-09040”.
- A. The Trailer Hitch is composed of the “Trailer Spacer” (Part 2 in the drawing) and the “Trailer Mount Bar” (Part 3 in the drawing). The Trailer Spacer is a 7-inch length of square steel tubing provided in the Kit Of Parts. The Trailer Mount Bar is a length of robot chassis material (C-channel) to be cut from the provided KOP chassis material, and must match any of the three configurations included in the Drawing.
 - B. The Trailer Hitch must be rigidly attached to a fixed location on the ROBOT, with the long dimension of the Trailer Hitch horizontal and the opening of the C-channel facing away from the ROBOT. The horizontal center line of the Trailer Hitch must be 2-13/16 inches above the floor, +/- 0.25 inches.
 - C. The Trailer Hitch must be positioned so that the TRAILER may be locked in place with a standard 1/4– inch diameter hitch pin (McMaster-Carr part number 98416A009) . During a competition MATCH, this hitch pin will be provided with the TRAILER as part of the ARENA equipment. See Figure 8-5.

Required Modifications to the Drivers Station:

- <R59>** The control system is designed to allow wireless control of the ROBOTS. The Driver Station, cRIO Mobile Device Controller, digital sidecar, breakout boards, power distribution module, speed controllers, relay modules, wireless bridge, batteries, and battery charger shall not be tampered with, modified, or adjusted in any way (tampering includes drilling, cutting, machining, gluing, rewiring, disassembling, etc.), with the following exceptions:
- A. Programmable parameters on the Driver Station may be set as appropriate.
 - B. User programmable code in the Mobile Device Controller may be customized.

- C. Dip switches on the Mobile Device Controller may be set.
- D. Speed controllers may be calibrated as described in owner's manuals.
- E. The supplied fans attached to the Victor speed controllers may be powered from the Victor power input terminals.
- F. The fuse on the Spike relays may be replaced with a 20 Amp Snap-Action circuit breaker.
- G. The alligator clips on the battery charger leads may be replaced with Anderson Power Pole connectors (note: this is a recommended modification).
- H. Wires, cables, and signal lines may be connected via the standard connection points provided on the devices.
- I. Appropriate fasteners may be used to attach the device to the OPERATOR CONSOLE or ROBOT.
- J. The ESD protection modification specified rule <R85.1>

Modifications to the Pneumatics Manual:

The *2009 Pneumatics Manual* has been updated to correctly reflect the number of FESTO valves provided in the 2009 Kit of Parts. The following edits have been made, and the new revision is posted as Rev B.

FESTO has also supplied **one** single solenoid valves. In order to wire the **valve** you must remove the white plastic pin protector that comes over the pins. Instructions in the package explain how to wire the valve. The fittings are the push to connect type so all you have to do is push in the tubing. The blue manual-override switch closes the valve for testing, but is spring-loaded and will not maintain the valve's position when released.

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

Section 10-The Kit of Parts, Rev B, has been revised to include the following:

1/4 -20 x 5/8 SHCS – **Quantity 40**

1/4 -20 Nylock Nut – **Quantity 8**

Motor/Gearbox assembly 12VDC **w/16 tooth** pinion, -9015 motor (Fisher Price)

Helpful Links:

February 6, 2009

TEAM UPDATE #10

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Section 0 – Introduction through Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

Robot Shipping Exceptions:

Shipping Exception deadline approaching! If your team plans to request permission to transport your robot home from your final Regional Event, this request must be received at *FIRST* by **February 13, 2009**. Please refer to Section 4.9.1.1 of the Manual for further information.

Shipping reminder:

Check to make sure you have your team's shipping paperwork (i.e., bills of lading / air waybills) if you are utilizing the FedEx donation! In the event that you have misplaced these important shipping documents please email frcteams@usfirst.org immediately. Please note that there is no guarantee that the documents can be replaced. All requests must be made via email by Friday, February 13th at 12:00pm (EST).

Attention teams attending the North Star and 10,000 Lakes Regionals:

Please note that the "Shipping & Drayage " document has been updated with the new ship to address. This address is as follows:

Shepard Exposition Services c/o UPSF
8500 Naples Street NE
Blaine, MN 55449

If you have already filled in your paperwork, please make the necessary changes.

Section 5 – The Awards through Section 10 – The Kit of Parts

No changes.

Helpful Links:

February 10, 2009

TEAM UPDATE #11

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Section 0 – Introduction through Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

Section 4- *Robot Transportation*, Rev B, has been updated to include the following changes:

4.12 *Shepard Exposition Services Freight Quotes*

ADDITIONAL SHIPPING CHARGES:

- If your delivery area does not have a loading dock, you will need a truck equipped with a lift gate. **If using the FedEx donation, this cost is covered under it.**
- All shipments will also have a fuel surcharge at a commodity price.

Section 5 – The Awards through Section 7 – The Game

No changes.

Section 8 – The Robot

Propeller Propulsion Protection:

One way in which robots may propel themselves in *Lunacy* is by way of propellers that provide thrust to the robot and move it across the low friction floor. There are several safety concerns that accompany such a design, and we'd like to share one example of what we consider a safe design. We expect that propellers or similar mechanisms will be protected in a comparable way.

One safe way to protect a general propeller contains the following:

- The exhaust and intake are both protected by a ¼" mesh (with the standard wire gauge)
- The perimeter of the propeller is protected by a 16AWG aluminum cowling. The length of the cowling is at least half of the diameter of the cowling.
- The propeller is positioned approximately 1/3 back from the front edge of the cowling.
- The mesh is securely fastened to the cowling.

Required Bumpers for Practice Day:

All robots participating in practice matches must be outfitted with bumpers.

40-Lb Carry In:

For those teams who will be taking advantage of the WITHHOLDING ALLOWANCE defined in Section 8, we ask that you contain these parts to one load at one time. We recommend this practice to ensure accuracy and compliance to the rules. Please ensure that all containers should be such that they are easily identified and weighed, if necessary. Refer to Section 8 (specifically, Rules <R25> and R<26> and the definition) for more information about the WITHHOLDING ALLOWANCE.

Section 9 – The Tournament

Non-working robots on the Playing field during competition:

Once a team brings their ROBOT onto the playing field, they have committed the ROBOT to the match, and they will not be permitted to remove the robot until the Head Referee signals for field reset at the end of the match.

Section 10 – The Kit of Parts

No changes.

February 13, 2009

TEAM UPDATE #12

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Section 0 – Introduction through Section 2 – Team Organization

No changes.

Section 3 – At the Events

At the Events, Rev C, has been updated to include the following edit.

3.3 *FIRST* SAFETY

Participants and team mentors should review the *FIRST* safety policies and the *FIRST* Safety Manual located at www.usfirst.org/community/frc/content.aspx?id=470. It provides sound safety practices for your workplace and *FIRST* events. Additional specific site restrictions can be found within the information referenced in Section 3.2. Every team should know, understand, and follow the safety rules.

- Do not run in the venue.
- Wear closed-toed shoes to protect feet and toes.
- Charge batteries in an open, well-ventilated area. Do not charge near an open flame or near equipment that may produce sparks. Do not use smoking materials in the battery charging area. Charge in an upright position. It is not safe to charge the SLA battery in an inverted position. Should your battery leak, ask the Pit Administration Supervisor for baking soda to absorb the acid.
- Open flames are not allowed in any of the buildings
- Only the drayage company may handle loading robots in and out.
- Robots may be operated via wireless control only on the competition or practice fields.
- Two-way radios or other form of wireless communications are not allowed (with the exception of the previous bullet).

Section 4 – Robot Transportation through Section 7 – The Game

Section 4- Robot Transportation, Rev C, has been updated to include the following change:

4.9.2. Shipping to Your Initial Event

All team robots/crates must be out of the team's possession by **end of day on** Tuesday, February 17, 2009.

Note: No further work can be done on the robots after this time. However, please be sure to work within the business hours of your carrier or the drayage site. *FIRST* will not make exceptions for teams that fail to make appropriate arrangements.

Team Number & School/Organization on FedEx Bill of Lading/Air Waybill

Teams must include their TEAM NUMBER and SCHOOL NAME on their FedEx Bill of Lading/Air Waybill. If the number is not in the "Shipper (From)" box, the Shepard representative at the Regional will require the team to fill in this information in the "Description" section.

When shipping from Regional to Regional, teams should fill in their **FedEx Bill of Lading/Air Waybill** as follows:

Shipper (From): (High School/Organization Name), Team # (XX)

Attn. to: Shepard Exposition Services

Address: (Address of the drayage site for the Regional just attended)

Consignee (To): Shepard Exposition Services

Address: (Address of the drayage site for the Regional shipping to)

Question 1: How do I schedule my initial, February 17th, robot shipment?

Option A - If your team qualifies for the FedEx donation, you can schedule a pick up from the current location of your robot crate. To schedule, contact FedEx directly. To find out the appropriate FedEx number to call please go to the Robot Ship page

(<http://www.usfirst.org/community/frc/content.aspx?id=3570>) and choose the appropriate link under the question "HOW DO I SCHEDULE MY PICKUP USING THE FEDEX DONATION?"

Option B - *If would like to save your FedEx shipment for later use, you may ship with any carrier of your choice (this includes shipping via the Shepard (SES) carrier). To get a shipping quote from SES, go to the website www.shepardes.com/first

Option C - *You can transport your robot crate directly (i.e., via your own truck, van, etc.) to your initial event drayage site. This requires a 48" bed height truck NO EXCEPTIONS. You can deliver between 8am-4pm on or before Tuesday 2/17/09.

**Please note the initial, February 17th shipment is the only time you may ship with a carrier outside of SES and the FedEx donation OR drive your robot crate to the drayage site.*

Question 2: How do I schedule a shipment if I plan to attend more than one Regional?

Option A - If your team qualifies for the FedEx donation, bring your bills of lading with you to your Regional. Make arrangements at the onsite SES drayage desk at the regional. After they receive the appropriate documents, SES will contact FedEx to schedule the pickup of your robot.

Option B - If your team has used all of your allotted FedEx donation shipments, you must ship through SES. Please contact Paula Mullis (704-394-9140 or email her at pmullis@shepardes.com) before your event begins to schedule your shipment.

Question 3: I am attending back to back Regionals (aka consecutive weekend events). How do I ship between them?

Teams attending "back to back" events must ship with SES. No exceptions. Please contact Paula Mullis (704-394-9140 or email her at pmullis@shepardes.com) before your event begins to schedule your shipment.

If you have any additional questions, please contact Team Support at frcteams@usfirst.org or 1-800-871-8326 x 0.

Section 8 – The Robot

The Robot, Rev I, has been updated to include the following edit.

<R56> The cRIO Mobile Device Controller, Driver Station, wireless bridge, and wireless router must be configured to correspond to the correct team number (assigned to the team by FIRST). The procedures for configuring these devices are contained in the FRC control system documentation. Software and firmware used during the competition must be at the appropriate revision in order to pass inspection and compete. The software/firmware and permitted revisions are listed in the table below.

Software/Firmware	Revision
LabVIEW for FRC	Update 3.0a and newer
cRIO FPGA Image	FRC_2009_v11.Zip and newer
WPI Robotics Library	3.0.1718 and newer
Driver Station	2009-02-010a3 and newer

The *Inspection Checklist*, Rev C is now posted at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

Section 9 – The Tournament through Section 10 – The Kit of Parts

No changes.

February 17, 2009

TEAM UPDATE #13

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Section 0 – Introduction through Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

Wireless communication clarification:

Regarding the wireless communication prohibition in Team Update 12, we'd like to clarify that general cell phone use is permitted. However, Wi-Fi use in the 2.4GHz or 5GHz bands is prohibited.

Section 5 – The Awards through Section 7 – The Game

No changes.

Section 8 – The Robot

WPA Encryption:

FRC will be implementing the use of WPA encryption at all FRC events in 2009. When you get the event, you will receive your WPA encryption key as well as instructions for entering the key into the robot radio. Each key is unique for that particular team at that particular event. The key is a setting in the robot radio that must be configured before the team's robot can take the field (even for a practice match). There will be assistance onsite for teams who need help.

National Instruments Support:

National Instruments is extending their next-day replacement service for cRIOs and modules that need to be exchanged through your team's competition season. However, ship date marks the end of their phone support service. Teams with questions for National Instruments should contact them via their website at www.ni.com/first (and have committed to responses on the forum within 24 hours). NI representatives will also be at more than half of the Regional events to help teams.

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

The following parts have been packed in the Spares cases for the events (per section 3.9.4). Based on consumption, they may be available to your team in case you need them. Please note that parts highlighted in red will require specific authorization from the FTA and credit card information for the team before the item can be loaned. *In case the part is not returned, FIRST will charge the credit card for the missing component.*

Accumulator	Light, Robot Signal
Adapter, camera	Limit Switch
Battery Connector Safety Plug	Limit Switch, rotary
Battery: Elimination Match	Master Link
Battery: International	Motor: 2.5" CIM
Brass bag	Motor: Denso, Left or Right
Breakout: Analog	Motor: FisherPrice Motor/Gearbox (-9015)
Breakout: Solenoid	Motor: Globe
Breakout: Mounting Hardware	Motor: Keyang, 12-tooth (-1023)
Cable: 2-wire jumper	Motor: Mabuchi
Cable: 4-conductor/female only (for grounding DS)	Pneumatic tubing
Cable: Ethernet	Pool Noodle
Cable: Y	Power Distribution Board
Camera Bracket: Axis Case	Pressure Gauge: Norgren
Camera Bracket: Base	Pressure Gauge: WIKA
Camera Bracket: Pan Plate	Pressure Switch
Camera Bracket: Servo Brace	Push button
Circuit Breaker: 120A	Radio, Robot
Circuit Breaker: 20Amp	Regulator Bracket, Main, Norgren
Circuit Breaker: 30Amp	Regulator, Main, Norgren, adjustable
Circuit Breaker: 40Amp	Regulator/bracket, secondary, yellow ring
Compressor	Relay Module (Spike)
Connector, Battery	Relief Valve
Connector, Wago	Speed Controller (Jaguar)
Coupler, Denso motor, 6 tooth	Speed Controller (Victor 884)
Coupler, Keyang motor, 12 tooth	Sprocket spacers
cRIO & modules	Sprocket: wheel, 22-tooth
Cylinder	Sprocket: output, 15-tooth
Cylinder Rod/Clevis	Teflon tape
Cylinder Bracket	Terminal strip
Digital Sidecar	Terminals, assorted
Drivers Station	Terminals, for grounding DS
Fan (large)	Tie wraps, 4" & 8"
Fan (sm)	Trailer Hitch Spacer
FESTO valve	Wheel
Gloves, pair	Wire, 10AWG, Black & Red
Latex Tubing	Wire, 6AWG, Black & Red
Lazy Susan	

February 20, 2009

TEAM UPDATE #14

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Reminder- All teams must operate via the tether while not on the competition field:

To operate your robot in tether mode, simply use any CAT5 Ethernet cable to connect from Port 1 on the cRIO to either Ethernet port on the Drivers Station. Wireless radios should be disabled.

Safety:

There are inherent safety risks at *FIRST* Robotics Competitions. We implore teams to be cognizant of safe practices at all times. Obvious risk mitigations include the wearing of safety glasses, gloves, and closed-toed shoes.

We also ask that teams be thoughtful when powering up their robot, particularly around those who may not be familiar with the robot's operation and capabilities. Unexpected movements of mechanisms have the potential to cause damage to people and robots. Please apply power to your robot with caution at all times.

Consolidated PDF of the FRC Q&A Forum:

A PDF of the entire FRC Q&A Forum, as of ship date, has been created and posted with the Team Updates at <http://www.usfirst.org/community/frc/content.aspx?id=450>.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7 – *The Game*, Rev F, has been updated to include the following edits:

<S02> TEAM member safety – for reasons of personal safety, contact with ROBOTS and/or entering the CRATER are prohibited during a MATCH.

- A. TEAM members may not directly contact any ROBOT at any time during the MATCH. Illegal contact will result in the TEAM being disqualified.
- B. TEAM members may not extend any part of their body into the CRATER during the MATCH. All violations will result in a PENALTY.

<G39> TEAM Positions During TELEOPERATED PERIOD - During the TELEOPERATED PERIOD, the PILOTS and the COMMANDER may travel anywhere within the ALLIANCE ZONE (note that the ALLIANCE ZONE includes the local FUELING STATION). The PAYLOAD SPECIALIST must remain within the FUELING STATION to which they are assigned for the entire MATCH. The PAYLOAD SPECIALIST stationed in the OUTPOST must remain in the OUTPOST seat during the entire MATCH (note that if the PAYLOAD SPECIALIST in the OUTPOST unbuckles the seat belt or stands up in this location, it may be considered a violation of **<S02>**). Each violation (stepping outside the designated area, or stepping across the PLAYERS LINE) will result in a PENALTY. Exceptions will be made in cases involving TEAM member safety.

Section 8 – The Robot

Section 8 – The Robot, Rev J, includes the following edits:

Definitions:

RAW MATERIALS: Unprocessed material, raw stock or supplies that have not been prepared for final form in anticipation of installation on the ROBOT. RAW MATERIALS are single items in their most basic configuration that are of similar composition throughout their structures. Typically, RAW MATERIALS are the original source materials for FABRICATED ITEMS.

Examples of RAW MATERIAL include, but are not limited to, the following:

- “off cuts” from larger pieces of original stock, left behind when a portion has been removed to fabricate a part for the ROBOT
- lengths of pipe, metal stock, wood, wire, etc that might normally be considered “scrap” or “excess”
- individual fasteners (nuts, bolts, washers, rivets, etc.)
- a partial spool of wire
- lengths of pneumatic tubing
- random lengths of roller chain
- a bolt of fabric from which a BUMPER cover has been cut
- a length of gear stock that has not been cut to size
- circuit board substrate material

<R35> Teams may acquire and bring an unlimited amount of COTS items and RAW MATERIALS to the competitions to be used to repair and/or upgrade their ROBOT at the competition site.

Section 9 – The Tournament through Section 10 – The Kit of Parts

No changes.

February 24, 2009

TEAM UPDATE #15

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

Compliance Confirmation:

We'd like to remind teams that, at the conclusion of your inspection, when you sign the statement at the bottom of the Inspection Checklist, you're also acknowledging that you're within compliance with the *Lunacy* rules. This confirmation includes that your team's Withholding Allowance is within the limitations at the beginning, and throughout, the competition. Event staff will be performing spot checks of Withholding Allowances during team load in.

Withholding Allowance Exception:

Often the GDC is caught in a bind. For reasons easy to understand, *FIRST* community members suggest changes and less literal interpretations of the rules.

Changing a rule is risky in the extreme. Someone is almost always hurt. "Softening" a rule almost always shifts responsibility for a decision to someone else and creates inconsistent competitions.

The GDC has long debates about "unintended consequences." The group tries hard to anticipate, but has no chance of staying ahead of 30,000 smart people. The guiding philosophy is to try to be very literal and consistent even when seemingly stubborn and pedantic.

Occasionally, a change seems to be worth the gamble that the change might cause angst. Allowing the battery connectors to remain attached to the batteries seems justified because properly/carefully insulated connections are more likely to be made "at home" than at an event and, unnecessary tasks are avoided. In conclusion, spare battery assemblies (battery, lugs, connectors, shrink tubing, and/or electrical tape) will not be included in the Withholding Allowance weight limit.

WPA Encryption Update:

As announced in Team Update 13, FRC will be implementing the use of WPA encryption at all FRC events in 2009. Each team must have their WPA encryption checked before they play any match, including a practice match. Once the WPA encryption has been confirmed, teams will receive a white sticker, which will then gain them access to the Competition Field. The stickers are available at the WPA table, which is located in the pit near the Inspection area.

The WPA table staff will be able to not only check the encryption for teams who set it themselves, but also help teams who have trouble or are uncomfortable setting the radio parameters.

When you go to the table to have your WPA encryption checked, you must bring with you, at minimum, your team's robot radio. You may bring your complete robot, but in that case, must also bring a battery.

The table will be available into Thursday afternoon.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

After seeing the variety of robots built during build season, we are concerned about the potential for excessive penalties in relation to Section 7's Rule <G32-E>. To mitigate this risk, we are introducing verbiage that communicates that aggressive contact outside the bumper zone will be penalized, but incidental contact, which is fully expected in *Lunacy*, will not.

Section 7 – *The Game*, Rev G, has been updated to include the following edits:

<G32> ROBOT to ROBOT Interaction - Strategies aimed solely at the destruction, damage, tipping over, or entanglement of ROBOTS or TRAILERS are not in the spirit of the FRC and are not allowed. In all cases involving ROBOT-to-ROBOT or ROBOT-to-TRAILER contact, the TEAM may receive a PENALTY and/or their ROBOT may be disqualified if the interaction is inappropriate or excessive. However, it is noted that *Lunacy* is a highly interactive game. Robust construction of ROBOTS will be very important in this high-speed competition. ROBOTS should be designed to withstand the contact that will occur during the MATCH. Appropriate contact is allowed under the following guidelines:

- A. High speed accidental collisions may occur during the MATCH, and are an expected part of the game.
- B. Contact within the BUMPER ZONE is generally acceptable.
- C. If a portion of the BUMPER PERIMETER polygon is unprotected by BUMPERS, any contact by another ROBOT within the unprotected region (including the vertical projection of the unprotected region) will be considered incidental contact and will not be penalized.
- D. Contact with a tilted or tipped ROBOT outside the BUMPER ZONE (particularly by the BUMPERS of the contacting ROBOT) will generally be considered incidental contact and will not be penalized.
- E. **Aggressive or intentional** contact outside of the BUMPER ZONE is not acceptable, and will result in a PENALTY. The offending ROBOT may be disqualified from the MATCH if the offense is particularly egregious or if it results in substantial damage to another ROBOT.
- F. A ROBOT may not attach to and/or climb onto a ROBOT or TRAILER. Doing so will be interpreted as an attempt to damage an opposing ROBOT, and will be penalized as such.
- G. Use of any sloped or angled feature of the ROBOT as a wedge to overturn an opposing ROBOT or TRAILER is explicitly prohibited, and will be assigned a PENALTY.

Section 8 – The Robot

The *Inspection Checklist* has been updated to Rev D and includes the following changes: \

- 1) moved RSL and firmware version checks to 1st two items
- 2) added check for WPA encryption of the robot radio as checklist item #3
- 3) added check for unpowered robot and driver station radios while in the pits (i.e. only tethered operation is allowed in the pits and on the practice field)

Section 9 – The Tournament

This year 4FX Design has installed a Twitter message feed that is uploaded from the Field Management System (FMS) for teams to use. The intention is that teams have a reliable information source for Scouting Programs, match archives, video broadcasts and anything else they can dream up.

For week one, the Twitter message from each event will only happen when the field staff commits the score to the database while engineering data is collected. The hope is that in the near future, the Twitter feeds will provide a semi real-time update of the matches as they happen.

The teams or anyone can follow the frcfms user at Twitter <http://www.twitter.com/frcfms> for all match updates.

In addition to the frcfms twitter account, users can follow their favorite event based on the hash tag that represents the event. They can do this by going to <http://www.hashtags.org>. Here is an example hash tag view for #frc <http://www.hashtags.org/tag/frc>. As an example for the Championship Archimedes event you would follow <http://www.hashtags.org/tag/FRCArchimedes> (which doesn't exist yet).

A Twitter message cannot be larger than 140 characters, therefore 4FX Design has devised the following format to fit within Twitter's capabilities.

Example tweet:

```
#FRCArchimedes TYP P MCH 99 ST T TIM 120 RFIN 33 BFIN 27 RED 9994 9995 9996  
BLUE 9991 9992 9993 RCEL 1 BCEL 1 RROC 9 BROCC 6
```

Format of the tweet:

```
#FRCABC - where ABC is the Event Code (see below for event codes)  
TYP X - where x is P for Practice Q for qualification E for Elimination  
MCH X - where X is the match number  
ST X - where X is A for Autonomous T for Teloperated C for complete  
TIM XXX - where XXX is the time left  
RFIN XXX - where XXX is the Red Final Score  
BFIN XXX - where XXX is the Blue Final Score  
RED XXX YYY ZZZ - where XXX is red team 1 number, YYY is red team 2 number, ZZZ  
is red team 3 number  
BLUE XXX YYY ZZZ - where XXX is blue team 1 number, YYY is blue team 2 number,  
ZZZ is blue team 3 number  
RCEL X - where X is the red Super cell count  
BCEL X - where X is the blue Super cell count
```


RROC X - where X is the red rock and red Empty Cell count
 BROC X - where X is the blue rock and blue Empty Cell count

There are no post match bonus points this year, so accessed penalties can be derived from adding up the score from the Super Cell, Empty Cell and Moon Rock counts and then subtracting the Final Score which will give you the alliances penalties.

Code	Event Name	Event Location	Start Date
NH	BAE Granite State Regional	Verizon Wireless Arena, Manchester, NH	2/26/2009
NJ	New Jersey Regional	Sovereign Bank Arena, Trenton, NJ	2/26/2009
KC	Greater Kansas City Regional	Hale Arena, Kansas City, MO	2/26/2009
IL	Midwest Regional	UIC Pavilion, Chicago, IL	2/26/2009
OH	Buckeye Regional	Wolstein Center, Cleveland, OH	2/26/2009
OK	Oklahoma City Regional	Cox Arena, Oklahoma City, OK	2/26/2009
DC	Washington DC Regional	Walter E. Washington Conv. Ctr., Washington, DC	2/26/2009
GT	Traverse City <i>FIRST</i> Robotics District Competition	Traverse City High School, Traverse City, MI	2/27/2009
MA	Boston Regional	Agannis Arena, Boston, MA	3/5/2009
SDC	San Diego Regional	San Diego Sports Arena, San Diego, CA	3/5/2009
ROC	Finger Lakes Regional	Gordon Field House, Rochester, NY	3/5/2009
OR	Oregon Regional	Portland Memorial Coliseum, Portland, OR	3/5/2009
NY	New York City Regional	Javits Convention Center, New York, NY	3/6/2009
GG	Kettering University <i>FIRST</i> Robotics District Competition	Kettering University, Flint, MI	3/6/2009
DA	Dallas Regional, Sponsored by JCPenney and the JCPenney Aftersch	Moody Coliseum, Dallas, TX	3/12/2009
GA	Peachtree Regional	Gwinnett Center, Duluth, GA	3/12/2009
SJ	Silicon Valley Regional	San Jose State University, San Jose, CA	3/12/2009
CA	Los Angeles Regional	Long Beach Arena, Long Beach, CA	3/12/2009
PIT	Pittsburgh Regional	PITT Petersen Event Center, Pittsburgh, PA	3/12/2009
WI	Wisconsin Regional	US Cellular Arena, Milwaukee, WI	3/12/2009
FL	Florida Regional	University of Central Florida Arena, Orlando, FL	3/12/2009
DT1	Cass Tech <i>FIRST</i> Robotics District Competition	Cass Technical High School, Detroit, MI	3/13/2009
IS	Israel Regional	Nokia Arena, Tel Aviv, IS	3/17/2009
WAT	Waterloo Regional	University of Waterloo, Waterloo, ON	3/19/2009
PA	Philadelphia Regional	Liacouras Center, Philadelphia, PA	3/19/2009
IN	Boilermaker Regional	Purdue Armory, West Lafayette, IN	3/19/2009
MD	Chesapeake Regional	US Naval Academy, Annapolis, MD	3/19/2009
MO	St. Louis Regional	Chaifetz Arena, St. Louis, MO	3/19/2009

Code	Event Name	Event Location	Start Date
AZ	Arizona Regional	Arizona Veteran's Coliseum, Phoenix, AZ	3/19/2009
LA	Bayou Regional	Lakefront Arena, New Orleans, LA	3/19/2009
VA	NASA VCU Regional	VCU Siegel Center - Richmond, Richmond, VA	3/19/2009
DT	Detroit <i>FIRST</i> Robotics District Competition	Wayne State University, Detroit, MI	3/20/2009

Section 10 – The Kit of Parts

No changes.

March 3, 2009

TEAM UPDATE #16

GENERAL NOTICES

General Notes from *FIRST* Headquarters:

No changes.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7 – *The Game*, Rev H, has been updated to include the following edits:

<G23> SUPER CELL scoring – During the last 20 seconds of the MATCH, the PAYLOAD SPECIALIST may enter a SUPER CELL into play by removing it from the CELL RACK. They may then enter it into the CRATER, either over the Alliance Station Wall or through the FUELING PORT. A ROBOT or PAYLOAD SPECIALIST can SCORE any SUPER CELL that has been entered in play. If a SUPER CELL is removed from the CELL RACK before the last 20 seconds of the MATCH **or is not exchanged as described in Rule <G22>**, then two (2) PENALTIES will be assigned to the offending ALLIANCE: under such conditions, the SUPER CELL may still be entered into play and subsequently SCORED.

Section 8 – The Robot through Section 10 – The Kit Of Parts

No changes.

March 12, 2009

TEAM UPDATE #17

GENERAL NOTICES

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General Notes from *FIRST* Headquarters:

Handling Game Pieces

We realized we had a conflict between <G20-B>, <G40-C> and an official Q&A response. This rule is adjusted below to eliminate the conflict. The principle is that if a GAME PIECE is being removed from the floor, then tongs must be used; if the game piece is being passed to the CRATER, hands may be used. This update will ensure consistent game play through Championship.

Section 0 – Introduction through Section 3 – At the Events

No changes.

Section 4 – Robot Transportation

Section 4 – Robot Transportation, Rev D, has been updated to include the following edits :

Section 4.13.2

NOTE:

If a team wants to dispute the weight of its crate, a scale will be on site at each event for reweigh within the specified time. In the Event a scale cannot be provided at the Regional. The Certified Weight that is indicated on the Material Handling Agreement Form will be used to determine if any overages occurred.

Section 5 – The Awards through Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7 – *The Game*, Rev J, has been updated to include the following edits:

<G11.1> The provided MOON ROCK storage containers may be moved around, within the FUELING STATION or OUTPOST in order to accommodate the PAYLOAD SPECIALIST, but they must remain on the ground and upright throughout the MATCH. Violations may result in a PENALTY and YELLOW CARD being issued.

<G20> Handling MOON ROCKS – MOON ROCKS are the primary GAME PIECE used to SCORE

in the TRAILERS of the opposing ALLIANCE.

A. MOON ROCKS can be SCORED by ROBOTS or PAYLOAD SPECIALISTS.

B. PAYLOAD SPECIALISTS can enter MOON ROCKS into play by launching them over the Alliance Station Wall, launching them over/through the OUTPOST shield, or ~~using the provided tongs to pass~~ passing them backwards through the FUELING PORT/AIRLOCK. MOON ROCKS cannot enter the CRATER by being thrown around the end of the Alliance Station Wall. A violation will cause a PENALTY to be assigned.

C. MOON ROCKS can be recycled to the PAYLOAD SPECIALISTS by passing them over/through the AIRLOCK and through the FUELING PORT in the Alliance Station Wall, or by passing them through the port in the OUTPOST shield. MOON ROCKS cannot be recycled to the PAYLOAD SPECIALISTS via any other paths (e.g. over the OUTPOST shield or Alliance Station Wall). A violation will cause a PENALTY to be assigned.

Section 8 – The Robot

No changes.

Section 9 – The Tournament

<T06> After a TEAM receives a YELLOW CARD, a yellow ~~flag placard~~ will be placed on their ~~TRAILER Player Station, under their team number~~, at the beginning of all subsequent MATCHES as a reminder to the team, the referees, and the audience that they have been issued a YELLOW CARD.

Section 10 – The Kit Of Parts

No changes.

March 17, 2009

TEAM UPDATE #18

GENERAL NOTICES

No changes.

Section 0 – Introduction through Section 7 – The Game

No changes.

Section 8 – The Robot

Wiring the Robot Signal Light

The Robot Signal Light, mandated by Rule <R58>, must be properly wired in order to be useful for teams and event staff to recognize robot states. Please note that, per the *Bulletin 855PB* document included with the part and found [here](#) on the Rockwell Automation website, there must be a jumper between terminals La and Lb in order for the light's default state to be steady on. With the jumper in place, any flashing is instead driven by the control system and can be used for diagnostic purposes.

Ethernet Extension Cables for the Driver Stations

Section 8 – The Robot, Rev K, has been updated to include the following change.

<R85> During competition MATCHES, the competition cable at the Alliance Station must connect directly to the competition port on the Driver Station. The competition Ethernet cable must connect directly to an Ethernet port on the Driver Station, or an intermediate Ethernet connector used for the sole purpose of stress/strain relief on the Driver Station's Ethernet ports. No other intermediate connectors, cables, or "pigtailed" are permitted. Only the Driver Station may connect to the competition cables – no direct connection of team-provided portable computers, PDAs, or alternate devices is permitted.

Please note that *FIRST* is not responsible for signal integrity when such a component is introduced into the Field Management System's control path. If, at a competition, there is an inadequate connection from the field to the Driver Station, teams may be asked to remove the intermediate device and connect the Driver Station directly to the field.

RS-545 Motor Clarification

The RS-545 motor provided in the Kit Of Parts (KOP) is labeled with the model number RS545PH-5125F. This motor, or those motors identical in marking and part number, is the only permitted RS-545 motor permitted in the 2009 *FIRST* Robotics Competition.

Updated Inspection Checklist

Revision E of the *Inspection Checklist* is now posted under *Section 8 – The Robot* at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

Section 9 – The Tournament through Section 10 – The Kit of Parts

No changes.

March 24, 2009

TEAM UPDATE #19

GENERAL NOTICES

No changes.

Section 0 – Introduction through Section 2 – Communication

No changes.

Section 3 – At the Events

Section 3 – At The Events, Rev D, Section 3.7, has been updated to include the following edits:

The Championship: Uncrating will be allowed on Wednesday evening from 6 p.m. to 9 p.m. At least one of the three team members entering the pits must be a post-high school adult (the others may be either students or adults). The adult team member can also use this time to check-in at the Championship early to avoid the rush on Thursday morning. **There is to be no team pit setup at this time. If your crate becomes your pit setup, please remember you may *only* uncrate your robot.**

The rules for Wednesday night pit entry at the Championship are as follows:

- **The priority task for team members is to uncrate their robot and move their crate to the aisle so it is accessible to Shepard for removal.**
- The three team members will be permitted to load-in team materials on Wednesday night
- Team members may only make one trip with load-in materials.
- There is no set limit to the amount of material teams may load-in, but it must be done in a safe and manageable way (Safety Advisors and other volunteers will be on site checking for, and helping mitigate, unsafe conditions).
- Team members are permitted to stow load-in materials safely in their pit and out of the way of aisle traffic.
- Team members are permitted to begin charging batteries.
- Pit set up will not be permitted (if your crate becomes your pit setup, remember that you may *only* uncrate your robot).
- Working on the robot will not be permitted
- Safety glasses are required while in the pit
- An adult team member (one of the three permitted in the pit) may use this time to check-in early to avoid the rush on Thursday morning.

Section 4 – Robot Transportation through Section 10 – The Kit of Parts

No changes.