

January 12, 2010

TEAM UPDATE #1

GENERAL NOTICES

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Mandatory Driver Station file:

There is a file required for the Driver Station software that was not on the original image loaded on the Classmates (the requirement for the file was added after the kit Classmates were imaged). Teams can expect an error message reporting the missing file "nicyapi.dll," which is required to run the Driver Station software.

The file, and more information, can be found online at <http://decibel.ni.com/content/docs/DOC-8891>. Be sure to save it to the c:\windows\system32 directory, and good luck!

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

Section 4, Rev A incorporates the following edits:

4.8.2 General Rules For Bagging Your Robot

Every team must abide by ROBOT SHIP DAY regardless of whether they are attending a traditional Regional Event OR Bag and Tag event for their first event (see Section 4.2).

Proper bagging procedure:

1. Set the BAG on the floor, leaving room for the robot in the center.
2. Place the robot in the center of the BAG and pull the bag up around the robot.
Be careful not to catch the bag on any corners or sharp edges.
3. Tightly seal the BAG with your next numbered TAG.

4. Complete An independent third party MUST fill out the next available line on your *Robot Lock-Up Form* as required in **Section 4.8.4** to verify the date and time that the BAG was sealed. Make sure that you complete every item on the line — especially the TAG serial number. Robot lock-up form will be available on the Robot Shipping page of the *FIRST* website at <http://www.usfirst.org/roboticsprograms/frc/content.aspx?id=3570>.

8.4.2.1 Your first event is a Bag and Tag event

If the first event your team will attend for the season is a Bag and Tag event, follow this procedure:

1. Bag and Tag your robot on ROBOT SHIP DAY, and complete the *Robot Lock-Up Form*
2. Transport your robot to your event venue in your own vehicle. If you plan to transport your robot in a personal vehicle, please ensure that you have adequate means to secure the robot. If the robot is being transported in open air, such as in the back of a pickup, be very careful to shield the BAG from excessive wind. Wind can cause the BAG to flap against the robot, causing damage to the BAG.
3. You must carry your own robot into the event sealed in the BAG. Teams will not have access to the loading docks or forklifts; we recommend bringing a rolling cart or dolly to facilitate load in.
4. You may NOT open your BAG until it has been checked and signed off. Upon check-in at Pit Admin, ask for the person in charge of checking Robot Lock Up Forms. **YOU MUST HAVE YOUR ROBOT LOCK-UP FORM READY FOR REVIEW AT THE EVENT. DO NOT FORGET TO BRING IT.**
5. After your Robot Lock-Up Form has been properly filled out to reflect the open time and date, your team may open the BAG and prepare to compete.
6. After the event, if your waitlisted or will be attending another event, re-seal your robot in the BAG with a new TAG and fill out the Robot Lock-Up Form.
7. Remove your robot from the event through the front door or designated exit.
8. **IF** you are attending a traditional Regional Event or the Championship next:
 - a. Crate your robot (in the bag). FedEx and Shepard Exposition Services will not pick up a robot that is not in a crate. See Section 4.6 for crate construction requirements.
 - b. Ship it to the drayage location for your Regional Event following the instructions in Sections 4.5 and 4.6.
 - c. **All robots going to a second event must be shipped by the Tuesday following the Bag and Tag event.** For example, a team attending the Greater Kansas City Regional March 4-6 must ship to their next event by March 9.
 - d. FedEx Freight requires prior notice for pickups, especially if your location does not have a loading dock. If you plan to ship after a Bag and Tag event, you must call one (1) week ahead to schedule your pickup.
 - e. DO NOT open your BAG at the next event until it has been checked and signed off by the appropriate person at that event.

8.4.2.2 Your Second Event is a Bag and Tag Event

If your first event is a traditional Regional Event, and then you will attend a Bag and

Tag event, follow this procedure:

1. Follow standard Robot Shipping procedures on ROBOT SHIP DAY.
2. At the end of your first Regional Event, bag your robot per the bagging procedure outlined above **before** packing in your crate. **Make sure to fill out your Robot Lock Up Form.** Crate your robot for shipment.
3. Ship your robot to your home location through the drayage system.
4. Before your Bag and Tag event, remove your robot from the crate, and transport to your event venue in your own vehicle. If you plan to transport your robot in a personal vehicle, please ensure that you have adequate means to secure the robot. If the robot is being transported in open air, such as in the back of a pickup, be very careful to shield the BAG from excessive wind. Wind can cause the BAG to flap against the robot, causing damage to the BAG.
5. You must carry your own robot into the event sealed in the BAG. Teams will not have access to the loading docks or forklifts, so we recommend bringing a rolling cart or dolly to facilitate load in.
6. You may not open your BAG until it has been checked and signed off. Upon check-in at Pit Admin, ask for the person in charge of checking Robot Lock Up Forms. **YOU MUST HAVE YOUR ROBOT LOCK-UP FORM READY FOR REVIEW AT THE EVENT. DO NOT FORGET TO BRING IT.**
7. After your Robot Lock Up Form has been properly filled out to reflect the open time and date, your team may open the BAG and prepare to compete.
8. After the event, if you're waitlisted or will be attending another event, re-seal your robot in the BAG with a new TAG and fill out the Robot Lock-Up Form.
9. Remove your robot from the event through the front door or designated exit.

4.8.3 Teams Attending 2-Day Events

Two-day events for the 2010 season include Pittsburgh, Sacramento, and all Michigan District Events. Teams attending these events will not have as much time to work on their robots at events as teams attending traditional 3-day events. Because of this difference, these teams are granted an additional 'Robot Access Period' to unbag their robot between robot ship day and their 2-day events.

4.8.3.1 'Robot Access Period' – Permitted Actions

During the Robot Access Period, teams may perform any activity they would normally do during the build season, including practicing with the robot.

4.8.3.2 'Robot Access Period' - Schedule

Teams may unlock their robot for a total of 6 hours during the 7-day period preceding any two-day event in which their team will be competing with their robot. The 6 hours may be broken up in any way the team wishes, with the exception that no single access period may be shorter than two hours. The robot must be locked up in between sessions and this must be documented on the *Robot Lock-Up Form* each time.

4.8.4 Robot Lock and Unlock Instructions

4.8.4.1 Completing the *Robot Lock-Up Form*

The *Robot Lock-up Form* is available on the Robot Shipping page of the *FIRST* website at <http://www.usfirst.org/roboticsprograms/frc/content.aspx?id=3570>. Make sure that you complete every item on the line. **Incomplete forms will be rejected by inspectors at events.** The *Robot Lock-Up Form* must be filled in by an adult, 18 years or older, who is not a student on the team. By signing this form the signor attests to the fact that he/she is 18 years old or older, is not a student member of the team, and that all rules a regulations regarding access periods and lock or unlock are being followed. Phone numbers are required for verification in case inspectors at events have questions regarding the form.

4.8.4.2 When the *Robot Lock-Up Form* must be used

The *Robot Lock-Up Form* must be filled in during the periods indicated in **Sections 4.8.2** and **4.8.3**. The forms also apply when the robot is being locked up *and* when it is being unlocked. Robots do not need to be locked up during the regular build season before ROBOT SHIP DAY.

Section 5 – The Awards

No changes.

Section 6 – The Arena

Section 6, Rev A incorporates the following edits:

6.3.1 BALLS

While playing Breakaway, ROBOTS manipulate BALLS to accomplish the objectives of the game. Each BALL is a standard Size 5 soccer ball. The BALL weighs between 14 and 16 ounces, has a circumference of 27 to 28 inches, and is inflated to a standard pressure of approximately 9psi. The specific ball that will be used in the official 2010 Breakaway competition events will be the “HS300, Size 5, Pearl White” ball from **DTSI** Sports, Inc. (however, it is not a requirement that teams use this exact model for development or practice). Note that surface color and finish of BALLS may be different than the “normal” black and white patchwork pattern found on competition soccer balls.

Section 7 – The Game

Section 7, Rev A incorporates the following edits:

<G08> ROBOT Starting Positions – Prior to the MATCH, each TEAM negotiates within their ALLIANCE to select one of the three starting areas for their ALLIANCE.

When the FIELD is viewed from the ALLIANCE STATION, the ROBOTS must be placed on the right side of the CENTER LINE. Each ALLIANCE must be positioned on the right hand side of the field when you in one of the following starting positions:

- In the far ZONE and in contact with the ALLIANCE STATION WALL and/or ramp.
- In the MIDFIELD and in contact with the farthest BUMP.
- In the near ZONE and in contact with the nearest BUMP.

DOGMA

The **DOGMA** paper originally posted was inadvertently an earlier version. The correct version has now been posted as Rev A. Most of the differences were editorial, however the new revision also clarifies that the timer formula only applies to other balls already in the Alliance Station at the time that the formula is applied. We apologize for any inconvenience!

Section 8 – The Robot

Section 8, Rev A incorporates the following edits:

- <R68> All outputs from sensors, custom circuits and additional electronics shall connect to only the following:
- A. other custom circuits, or
 - B. additional COTS electronics, or
 - C. input ports on the Digital Sidecar, or
 - D. input ports on the Analog Breakout, or
 - E. the RS-232 DB-9 serial port on the cRIO-FRC, or
 - F. the Ethernet bus connected to Port 2 of the cRIO-FRC, or
 - G. the CAN-bus if and only if all Jaguar speed controllers on the CAN-bus are wired in full compliance with Rule <R63> and Rule <R64>, **or**
 - H. the sensor inputs on the Jaguar speed controller.

Section 9 – The Tournament

Section 9, Rev A incorporates the following edits:

9.3.4 Match Seeding Points

All teams on the winning ALLIANCE will receive a number of seeding points equal to the penalized score (the score with any assessed penalties) of the winning ALLIANCE.

All teams on the losing ALLIANCE will receive a number of seeding points equal to un-penalized score (the score without any assessed penalties) of the winning ALLIANCE.

In the case of a tie, all participating teams will receive a number of ~~ranking~~ **seeding** points equal to their ALLIANCE score (with any assessed penalties).

9.3.7 Seeding Score

The total number of seeding points **(Match Seeding Points plus Cooptition Bonuses)** earned by a TEAM throughout their qualification matches will be their seeding score.

Section 10 – The Kit of Parts

No changes.

January 14, 2010

TEAM UPDATE #2

GENERAL NOTICES

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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

Section 6, Rev B incorporates the following edits:

6.1 OVERVIEW

The specifications for the *Breakaway* ARENA used in competition are listed below in Section 6.1.1. The referenced specifications and construction details of the ARENA can be found on the *FIRST* web site at www.usfirst.org/frc/2010/fielddrawings.html. Note that the web site also contains drawings for low-cost versions of the important elements of the ARENA. Teams may choose to build these versions for their own use during the

construction and testing of the ROBOT. These drawings can be found at www.usfirst.org/frc/2010/fielddrawings.html.

6.2.3 The BUMPS

Two BUMPS are located at approximately one-third of the length of the FIELD. Each BUMP is $1\frac{3}{4}$ inches high off the FIELD surface, 12 inches wide at the top, and extends across the spaces between the TOWER and the Guardrail System. The BUMPS are covered with the same carpet as the rest of the FIELD (although of different colors - red and blue). Each BUMP is colored red or blue, corresponding with the color of the nearest ALLIANCE STATION. The BUMPS are fixed to base plates that are secured to the carpet of the FIELD to keep them from moving. The base plates are covered with the same carpet as the FIELD. Note that this forms a small (approximately $\frac{1}{2}$ -inch tall) transition from the FIELD surface onto the base plates. The edge of the ZONE is defined by the lower edge of the BUMP nearest the ALLIANCE WALL; a collinear virtual line is drawn across the "mouth" of the TUNNEL to complete the edge of the ZONE where the BUMP structure is not in place.

6.2.6 The VISION TARGETS

A VISION TARGET is mounted to the transparent portion of each ALLIANCE WALL, centered above each GOAL opening. The VISION TARGET can be used by on-board vision systems on the ROBOTS to determine the location of the GOAL openings. The VISION TARGET has been specifically designed for easy acquisition and targeting by edge-detection algorithms searching for high-contrast circles. Each VISION TARGET is composed of a set of three concentric white-black-white circles. The VISION TARGET has an outer diameter of 38 inches. Each white circle in the target is $2\frac{1}{2}$ inches wide. The black circle is 5 inches wide. A FIRST logo is placed in the center opening of the VISION TARGET for aesthetics. The logo is not formally considered part of the VISION TARGET.

The *Vision Target* drawing, GE-10063, has been updated to include the specific target dimensions. It is posted at <http://www.usfirst.org/roboticsprograms/frc/content.aspx?id=452> under **Section 6**.

Section 7 – The Game

Section 7, Rev B incorporates the following edits:

<G06> Minimum Score - The minimum final score is zero points.

<G43> ROBOT BALL POSSESSION - ROBOTS may POSSESS only one BALL at a time. *Violation: PENALTY.*

It is important to design your ROBOT so that it is impossible to inadvertently or intentionally POSSESS more than one BALL at a time.

To avoid severe restrictions on robot design, Rule <G43> does not disallow multiple "possession mechanisms." However, if you include more than one active BALL handling MECHANISM it's important to insure that they cannot POSSESS BALLS simultaneously. *Breakaway* would be a dramatically different game if ROBOTS were allowed to POSSESS multiple BALLS. Referees must strictly enforce single POSSESSION. Since referees may find it difficult to determine if additional BALLS in contact with the ROBOT are being herded or POSSESSED, it is imperative that teams avoid ambiguity.

<G45> Active BALL control - ROBOTS may not control BALL direction with active MECHANISMS above the BUMPER ZONE. *Violation: PENALTY.*

MECHANISMS are considered "active" if they are in motion relative to the ROBOT while in contact with the BALL. Resetting or moving MECHANISMS while not in contact with a BALL is permitted as the MECHANISMS are not considered "active."

Section 8 – The Robot

Questions submitted to the FRC Game Q&A revealed that determining if a ROBOT is CARRYING a BALL is nearly impossible as the rules as originally published permitted complete enclosure of BALLS above the BUMPER ZONE. Therefore, **Section 8, Rev B** has been updated to include the following edit:

- <R19> ROBOTS must be designed so that in normal operation BALLS cannot extend more than 3 inches inside ~~the FRAME PERIMETER below the level of the BUMPER ZONE.~~
- a) the FRAME PERIMETER below the level of the BUMPER ZONE (see figure 8-5).
 - b) a MECHANISM or feature designed to deflect balls in a controlled manner that is above the level of the BUMPER ZONE.

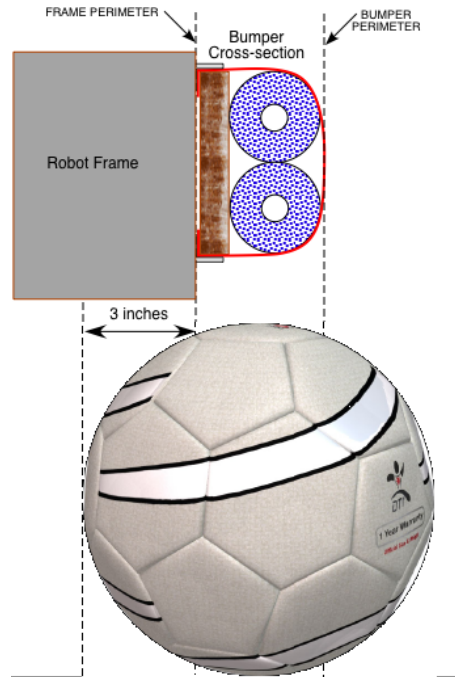


Figure 8-5

The double solenoid pneumatic valves, generously donated by Festo Corporation, require 24V, not 12V as typical in an FRC robot system. To accommodate the voltage, **Section 8, Rev B** has been edited to incorporate the edit below.

The **2010 Robot Power Distribution Diagram, RevA** has also been updated to include the alternate wiring options.

- <R45>** All electric power utilized by the ROBOT shall be distributed from the load terminals of the Power Distribution Board. Circuits may not bypass the Power Distribution Board to connect directly to the 120-amp loop.
- A. The cRIO-FRC power input must be connected to the 24 Vdc supply terminals on the Power Distribution Board. **With the exception of one solenoid breakout board**, no other electrical load can be connected to these terminals.
 - B. The Linksys Wireless Bridge power feed must be connected to the marked 12 Vdc supply terminals located at the end of the Power Distribution Board (i.e. the terminals located between the indicator LEDs, and not the main WAGO connectors along the sides of the Power Distribution Board). No other electrical load can be connected to these terminals.
 - C. If a 5V camera is used (such as the KOP camera), the camera power feed must be connected to the 5 Vdc supply terminals on the Power Distribution Board.
 - D. All other branch circuits must connect to, and have power sourced solely by, a protected 12 Vdc WAGO connector pair on the Power Distribution Board.

- E. Only one wire shall be connected to each WAGO connector on the Power Distribution Board. If multi-point distribution of circuit power is required (e.g. to provide power to the three KOP breakout boards via one 20-amp circuit), then all incoming wires must be appropriately spliced into the main lead, and only one lead inserted into the WAGO connector to connect the circuit.
- F. Sensors and custom circuits may be connected to the 5 Vdc sources on the Analog Breakout boards or the Digital Sidecars. By being logically downstream from the Power Distribution Board, they are protected by the 20-amp breaker at the circuit root.
- G. Servos may be connected to the 6 Vdc sources on the Digital Sidecars (via the designated PWM connections, and with a “6Vdc enable” jumper in place for the corresponding port). By being logically downstream from the Power Distribution Board, they are protected by the 20-amp breaker at the circuit root. No other electrical load can be connected to these sources.

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

The **2010 Kit of Parts Checklist, Rev A** has been updated to include the following edits:

- The FisherPrice motor has a 19-tooth pinion (not a 16-tooth pinion)
- The voltage for the FESTO solenoid valve is 24V (not 12V)
- The part number for the FESTO valve is now included, VUVG-L10-B52-T-M5-1P3-566458.

Section 10, Rev A has been updated to include the following edit:

8.4.2 Sensing

Sensor Panel - The 2010 Kit of Parts contains a sensor panel including a gyro and accelerometer. For details about these devices, please reference the *2010 Sensors Manual* which will be posted on the *FIRST* website at <http://www.usfirst.org/community/frc/content.aspx?id=452>.

Optical Encoder - Details for the optical encoders found in the kit can be found on the US Digital website at <http://www.usdigital.com/products/encoders/incremental/rotary/kit/e4p/>.

Magnetic Encoder - Details for the magnetic encoders found in the kit can be found on the austriamicrosystems website at www.austriamicrosystems.com.

Axis 206 Camera - Details about the Axis 206 camera found in the kit can be found on the Axis website at http://www.axis.com/products/cam_206/index.htm.

January 19, 2010

TEAM UPDATE #3

GENERAL NOTICES

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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

Each VISION TARGET, drawing GE10063, is centered horizontally and vertically on the Goal Plastic, drawing GE10001. This puts the center of the target at a nominal 56½” inches off of the floor.

As noted in **Section 6.1.1** of *The Manual*, "the exact dimensions and construction details of the ARENA are contained on the official ARENA drawings." If there are cases where the dimensions in the official drawings and narrative in *The Manual* are in conflict, please defer to the official drawings.

Section 6 – The Arena, Rev C has been updated to include the following edits:

Section 6.2.4 The TOWERS

A TOWER is located in the center of each BUMP. Each TOWER is composed of a base and a pipe superstructure. The PLATFORM is the horizontal surface of the base, and provides a solid surface to support ROBOTS during the game. The PLATFORM is approximately 41 inches wide by 32 inches deep, and is at a height of approximately 21 inches above the floor. A 36-inch wide by 18-inch tall TUNNEL under the PLATFORM, providing a passageway between the MIDFIELD and the adjacent end ZONES. The pipe superstructure is built of 1½-inch diameter steel pipe, and is 7 feet tall (at the center top of the horizontal pipe elements). The TOWER is designed to support the weight of several ROBOTS. The RETURN BARS are the two horizontal bars at the top of the rear of the TOWER (the side nearest the ALLIANCE WALL). The RETURN BARS support the lower end of the BALL RETURN and are covered in black tape.

Section 7 – The Game

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

<G30> ROBOT Volume – During a MATCH, no part of the ROBOT shall extend outside the vertical projection of the FRAME PERIMETER, except as follows:

- a. BALL Interaction Volume – Solely for the purposes of interacting with a BALL, MECHANISMS that are below the BUMPER ZONE may extend up to the BUMPER PERIMETER, for a period not exceeding two seconds. After returning inside the FRAMER PERIMETER, such MECHANISMS are not permitted to re-extend beyond the FRAME PERIMETER for at least two seconds.
- b. ROBOT Righting Volume - ROBOTS attempting to right themselves or their ALLIANCE partners may expand up to the FINALE CONFIGURATION maximum volume while, and only while, performing the righting operation. While beyond the NORMAL CONFIGURATION volume and righting, ROBOTS may not actively interact with BALLS or opponent ROBOTS.
- c. TOWER Contact ROBOT Volume - During a MATCH, ROBOTS in contact with their ALLIANCE TOWER may extend beyond their NORMAL CONFIGURATION volume but may not exceed the FINALE CONFIGURATION maximum volume.
- d. FINALE ROBOT Volume - During the FINALE, ROBOTS may extend up to the limits of the FINALE CONFIGURATION maximum volume.
- e. BUMPERS may extend outside the FRAME PERIMETER, within the constraints defined in Rule <R07>.

Violation: PENALTY and YELLOW CARD.

Section 8 – The Robot

Jaguar Firmware (for CAN use):

To download the most recent Jaguar firmware, please visit the [Jaguar website](http://www.luminarymicro.com/jaguar) (www.luminarymicro.com/jaguar) and click on the *MDL-BDC24 FRC2010 Firmware* link on the right side of the window (in the *MDL-BDC24 Black Jaguar* section).

Section 8 – The Robot, Rev C has been updated to include the following edits:

<R07> Teams are required to use BUMPERS on their ROBOTS. BUMPERS have several advantages, such as reducing damage to ROBOTS when they contact other ROBOTS or ARENA elements, and being excluded from the calculation of ROBOT weight and volume constraints specified in Rule <R10>. The BUMPER location and design have been specified so that ROBOTS will make BUMPER-to-BUMPER contact during most collisions. If implemented as intended, a ROBOT that is pushed against a vertical wall in any normal NORMAL CONFIGURATION will always have the BUMPER be the first thing to contact the wall. To achieve this, BUMPERS must be constructed as described below and illustrated in Figure 8 – 1.

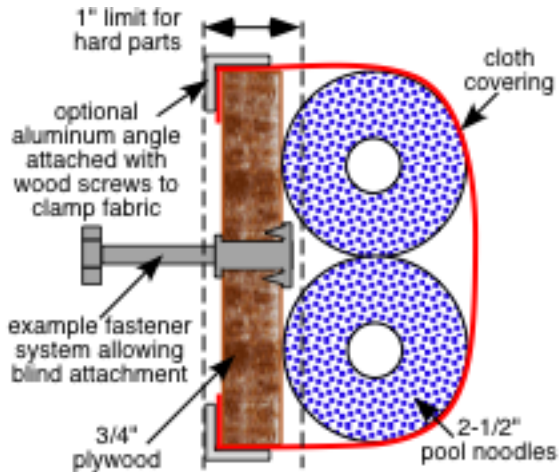
- A. BUMPERS must provide complete protection of the entire FRAME PERIMETER of the ROBOT (i.e. BUMPERS must wrap entirely around the ROBOT). The BUMPERS must be located entirely within the BUMPER ZONE when the ROBOT is standing normally on a flat floor, and must remain there (i.e. the BUMPERS must not be articulated or designed to move outside of the BUMPER ZONE).

Under Rule <R07-A> whenever the ROBOT is on a flat floor, the BUMPERS must remain entirely within the BUMPER ZONE. But when the ROBOT is driving over a BUMP or RAMP and/or ELEVATED or SUSPENDED (or in the process of being ELEVATED or SUSPENDED) on the TOWER

- it is no longer constrained by Rule <R07-A>, and
- it is expected and allowed that the BUMPERS will travel outside (typically above) the BUMPER ZONE, and
- if the ROBOT is "frozen" (i.e. all moving parts halted) and placed on a flat surface, the BUMPERS do not have to be within the BUMPER ZONE.

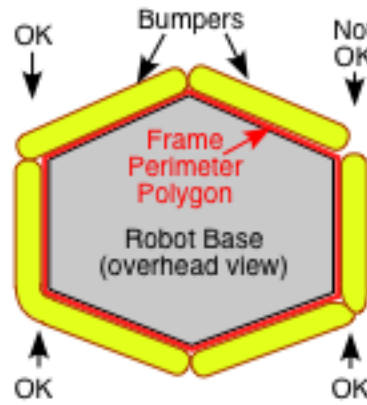
Note that these effects are only in force when the ROBOT is actually driving over the BUMP or RAMP and/or ELEVATED or SUSPENDED (or in the process of being ELEVATED or SUSPENDED) on the TOWER (i.e. the body of the ROBOT must not be in its normal flat-floor attitude and elevation). Simply touching the BUMP, RAMP, or TOWER is not a sufficient condition to avoid violating Rule <R07-A>.

- B. BUMPERS must be built in segments, with a minimum length of six inches, and a maximum length that does not exceed the maximum horizontal dimension of the ROBOT (except for the soft cushion in the corner, as permitted by Rule <R07-L>).
- C. BUMPERS must use a stacked pair of 2½ inch “pool noodles” as the bumper cushion material.
- D. Each BUMPER segment must be backed by a piece of ¾-inch thick by 5-inch tall piece of plywood. Each piece of BUMPER backing must be a minimum of 6 inches long. Small clearance pockets and/or access holes in the BUMPER backing are permitted, as long as they do not significantly affect the structural integrity of the BUMPER.
- E. The BUMPERS must be covered with a rugged, smooth cloth (1000 denier Cordura Plus® strongly recommended). The cloth must completely enclose all exposed surfaces of the BUMPER backing (plywood) and cushion (pool noodle) material. It is recommended that lengths of aluminum angle be used to clamp the fabric in place.
- F. The fabric covering the BUMPERS must be solid red or solid blue in color. Visually, the red or blue must be as close to the corresponding color in the FIRST logo as reasonable (i.e. to a reasonably astute observer, they appear similar). The only markings permitted on the BUMPER fabric cover are the team number (see Rule <R15>).



Cross-section View

Figure 8 - 1



Overhead View

Figure 8 - 2

- G. Each set of BUMPERS (including any fasteners and/or structures that attach them to the ROBOT) must weigh no more than 20 pounds.
- H. BUMPERS must be designed for quick and easy installation and removal, to aid in weighing and inspection (as a guideline, BUMPERS should be removable by one person in less than ten minutes).
- I. BUMPERS must attach to the FRAME PERIMETER of the ROBOT with a rigid fastening system to form a tight, robust connection to the main structure/frame (e.g. not attached with Velcro). The attachment system must be designed to withstand vigorous game play – nut and bolt fasteners are recommended. All removable fasteners (e.g. bolts, locking pins, pip-pins, etc.) will be considered part of the BUMPERS.
- J. If a multi-part attachment system is utilized (e.g. interlocking brackets on the ROBOT and the BUMPER), then the elements permanently attached to the ROBOT will be considered part of the ROBOT, and the elements attached to the BUMPERS will be considered part of the BUMPER. Each element must satisfy all applicable rules for the relevant system.
- K. As part of the 100% coverage, BUMPERS must protect all exterior corners of the FRAME PERIMETER. For adequate protection, a full segment of BUMPER must be placed on each side of the corner (see Figure 8 - 2).
- L. Joints between BUMPER segments and the radial projections of corners must be filled with “soft” BUMPER materials. This may be done with short pieces of vertically oriented pool noodle, by wrapping the pool noodles around the corners, or by beveling the ends between adjacent segments so they form a tight and complete protective surface (see Figure 8 - 2).
- M. The entire length of the BUMPER backing must be supported by the structure/frame of the ROBOT (i.e. the backing material must not be in “free space” between or beyond attachment points) (see Figure 8 - 3).
- N. “Hard” parts of the BUMPER (i.e. plywood backing, fastening system, and clamping angles) may extend up to a maximum of one inch beyond the FRAME PERIMETER. “Soft” parts of the BUMPERS (i.e. pool noodles and cloth covering) may extend up to 3½ inches beyond the FRAME PERIMETER.

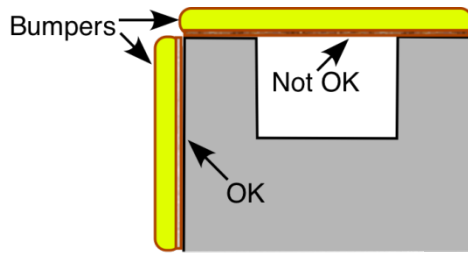


Figure 8 - 3

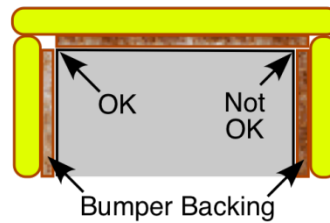


Figure 8 - 4

- O. The BUMPER backing must not extend beyond the “edge” of the ROBOT. The backing of adjacent BUMPER segments must not attach to each other if the attachment would require that the joint extend into the corner (see Figure 8 – 4).

Note: As bumper mounts are being designed, methods for carrying the ROBOT will have to be considered (BUMPERS typically do not make good handles!). Also, note that the use of BUMPERS may preclude the use of other technologies in their out-of-the-box configurations. Teams will need to carefully consider the interactions between BUMPER design options and other

<R72> In addition to the items included in the KOP, pneumatic system items specifically permitted on 2010 FRC ROBOTS include the following items. All included items must be “off the shelf” pneumatic devices rated by their manufacturers for pressure of at least 125psi, and used in their original, unaltered condition (except as required for assembly with other components).

- A. One or two additional Clippard air storage tanks (Clippard Part Number AVT-32-16), equivalent to those provided in the kit. This means that up to four, and no more, Clippard air storage tanks can be used on the ROBOT.
- B. Pneumatic pressure vent plug valves functionally equivalent to those provided in the KOP (Parker Part Number PV609-2).
- C. Solenoid valves. All such valves must have a maximum 1/8” NPT port diameter, and a maximum Cv of 0.32 (if non-KOP valves are used, the team will be required to provide part documentation validating that the valves meet these constraints).
- D. In addition to the pneumatic cylinders provided in the KOP and the “free” pneumatic cylinders available for order through the Free Pneumatic Components Order Form, additional air cylinders or rotary actuators may be used. Cylinders may be of any configuration, and may be of any size up to a maximum of 24-inch stroke and 2-inch diameter.
- E. Additional 0.160” inch inside diameter pneumatic tubing functionally equivalent to that provided in the KOP, with the pressure rating clearly factory-printed on the exterior of the tubing (note: alternate tubing colors are acceptable).
- F. Pressure transducers, pressure gauges, and connecting fittings.
- G. Pressure regulators with a maximum bypass pressure of no more than 60psi.
- H. For the purposes of the *FIRST* competition, a device that creates a vacuum is not considered to be a pneumatic device and are not subject to the pneumatic rules (although they must still satisfy all other appropriate rules). These include, but are not limited to, venturi-type vacuum generators and off-the-shelf vacuum devices (as long as they are powered by provided or permitted motors).

- I. For the purposes of the *FIRST* competition, closed-loop pneumatic (gas) shocks are not considered pneumatic devices, and are not subject to the pneumatic rules (although they must still satisfy all other appropriate rules).
- J. For the purposes of the *FIRST* competition, air-filled (pneumatic) wheels are not considered pneumatic devices, and are not subject to the pneumatic rules (although they must still satisfy all other appropriate rules).

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

No changes.

January 22, 2010

TEAM UPDATE #4

GENERAL NOTICES

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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

Section 6 – The Arena, Rev D has been updated to include the following edits:

6.2.5 The GOALS

The GOALS are located at the corners between the ALLIANCE WALL and the Guardrail System. The GOAL is a 48-inch wide by 24-inch tall opening in the ALLIANCE WALL through which the BALLS can exit from the FIELD. A 8-inch tall dihedral ramp extends out in front of the GOAL opening. There is a 2-inch tall

lip on the exterior edge at the top of the ramp. A set of chains hangs from the top of the opening down to 11 inches above the top of the ramp. The chains and the lip on the ramp help keep the BALLS from bouncing back onto the FIELD once they have passed through the opening in the ALLIANCE WALL. BALLS that have passed through the GOAL opening enter an asymmetric funnel that routes them to the BALL COUNTER. The BALL COUNTER contains quadrature-encoded photodetectors to automatically detect and score BALLS as they pass through. BALLS exit from the BALL COUNTER and come to rest in the CORRAL.

Section 7 – The Game

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

<G37> Permitted ROBOT to ROBOT Contact - *Breakaway* 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 for which no PENALTY will be assigned:

- a. High speed accidental collisions may occur during the MATCH and are an expected part of the game.
- b. Incidental contact, both inside and outside the BUMPER ZONE, is to be expected and is generally acceptable.
- c. Contact outside the BUMPER ZONE is an expected part of the game during the following scenarios:
 - i. for ROBOTS on a RAMP or BUMP,
 - ii. for ROBOTS that have been tipped and are not attempting to right themselves,
 - iii. for ROBOTS that have exceeded their NORMAL CONFIGURATION volume to right themselves or an ALLIANCE partner as permitted by Rule <G30> and have either exceeded the 10-second grace period permitted by Rule <G32> or completed the righting operation,
- iv. for ROBOTS that have exceeded their NORMAL CONFIGURATION volume to interact with a BALL as allowed by Rule <G30-a>, and
- v. for ROBOTS in the process of being ELEVATED or SUSPENDED prior to the FINALE.

Please note that a ROBOT that is ELEVATED before the FINALE is not protected from contact by opponent ROBOTS. Any FIELD damage or BALL RETURN damming caused by the ELEVATED ROBOT before the FINALE will be considered the fault of the ELEVATED ROBOT, regardless of whether or not the motion originated with an opponent ROBOT.

<G45> Active BALL control - ROBOTS may not control BALL direction with active MECHANISMS above the BUMPER **ZONE**. *Violation: PENALTY.*

MECHANISMS are considered “active” if they are in motion relative to the ROBOT while in contact with the BALL. Resetting or moving MECHANISMS while not in contact with a BALL is permitted as the MECHANISMS are not considered “active.”

Section 8 – The Robot

Section 8 – The Game, Rev D has been updated to include the following edits:

<R82> Teams are permitted to connect a portable computing device (Laptop computer, PDAs, etc.) to the DRIVER STATION for the purpose of displaying feedback from the ROBOT while participating in competition MATCHES. Portable computing devices may only connect to the DRIVER STATION through one of the USB ports or through the First Touch I/O module (or a carrier board for the First Touch I/O module) ~~the breadboard~~ – they shall not connect to the DRIVER STATION through any other port. Portable computing devices may only connect to the DRIVER STATION – they must not directly connect to any ARENA ports or equipment. Please note that **AC power will not be available at the PLAYERS STATIONS so these devices will have to run on internal batteries or be self-powered.**

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

The **2010 KOP Checklist, Rev B** has been updated to reflect the correct part numbers for the AndyMark “slick” and “stick” wheels (they were reversed in previous versions).

- 8” diameter “slick” wheel = PN am-0494
- 8” diameter “stick” wheel = PN am-0420

January 26, 2010

TEAM UPDATE #5

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

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

<S03> E-Stop - An Emergency Stop (E-Stop) button is located in each TEAM'S Player Station. Pressing an E-Stop button will cause the TEAM'S ROBOT to be disabled for the remainder of the MATCH. The E-Stop buttons are intended for remote shut down during a MATCH in the event of safety hazards and will not otherwise affect MATCH score or duration. Any TEAM member or referee may press the E-Stop button. **Violation:** *Inappropriate use of the E-Stop button (i.e. not for safety reasons) will result in a Red Card.*

<G27> Disabled ROBOTS and PENALTIES – If a ROBOT becomes **incapacitated unsafe** (e.g. the ROBOT ~~overturns and cannot be righted~~ begins to smoke, the battery falls out, etc.), it may be disabled by pressing the E-Stop Button in the corresponding Player Station, **per Rule <S03>**. *ROBOTS that are disabled in this manner cannot incur further PENALTIES nor may they earn additional points.*

<G45> Active BALL control - ROBOTS may not control BALL direction with active MECHANISMS above the BUMPER. **Violation: PENALTY.**

MECHANISMS are considered “active” if they are in motion relative to the ROBOT while in contact with the BALL. Resetting or moving MECHANISMS while not in contact with a BALL is permitted as the MECHANISMS are not considered “active.”

Note that portions of MECHANISMS that are designed to interact with the BALL below the BUMPER and are in compliance with Rule <G30> may extend above the level of the BUMPER, as long as the point of interaction with the BALL is below the level of the BUMPER.

<G47> BALL RETURN Interference – **Neither ROBOTS nor TEAM members** may not interfere with BALLS in contact with the BALL RETURN **downstream of the BALL RETURN counter**. **Violation: Two PENALTIES per affected BALL.**

It is important to consider this rule when designing mechanisms that interact with the TOWER. Be careful to make sure that your hanging apparatus doesn't dam the BALLS on the BALL RETURN.

Section 8 – The Robot

Section 8 – The Robot, Rev E has been updated to include the following edits:

<R08> ROBOT wheels, tracks, and other parts intended to provide traction on the **FIELD carpet** may be purchased or fabricated (“traction devices” include all parts of the ROBOT that are designed to transmit any propulsive and/or braking forces between the ROBOT and the FIELD). In no case will traction devices that damage the carpet or other playing surfaces be permitted. Traction devices shall not have surface features such as metal, sandpaper, hard plastic studs, cleats, or other attachments. Anchors (i.e. devices that are deployed/used to keep one's ROBOT in one place and prevent it from being moved by another ROBOT) shall not use metal in contact with the carpet to “stay put.” Gaining traction by using adhesives or Velcro-like fastener material is not allowed.

Curved Bumper Thread:

The Game Design Committee (GDC) would like to highlight a new post they've made to the thread in the FRC Game Q&A forum. The original GDC post to the *Curved Bumpers?* thread stated that there are no rules that prohibit curved bumpers, however the more recent GDC post in *Curved Bumpers, Expansion during finale* thread states that curved bumpers are prohibited.

To address the conflict, the GDC has opted to enforce the less restrictive rule as not to unfairly punish teams that have been working to the less restrictive initial answer, thus there are no rules that prohibit curved bumpers. Please note that while curved BUMPERS are not explicitly prohibited, curved BUMPERS must be at least as strong/robust as straight BUMPERS and be at least 6" long per Rule <R07>.

The GDC offers its apologies for the inconsistency and thanks you for your patience.

Pneumatic rules:

The GDC has retracted a response to a question posted at <http://forums.usfirst.org/showthread.php?t=13983> (about shocks and springs) because the answers overlooked the constraint defined in Rule <R76>. Rule <R76> constrains working air pressure to the pneumatic circuit only. The GDC apologizes for the oversight and appreciates your patience!

The GDC cannot accommodate the incorrect answers by adjusting the rules because there is no compromise on safety. The addition of the COTS requirement for shocks in Rule <R72-l> further clarifies what has always been the intent – that devices which may be subject to instant and potentially large dynamic pressures are designed, tested, and approved for such use.

One additional reason for why the forum answer will not be incorporated into the rules is because it is not regarded as a serious constraint that prevents teams from being successful in many other legal ways (i.e. springs, latex tubing, etc).

To make accommodations for solenoid valves rated for lesser pressures than defined in

Rule <R72> (this year's KOP valve as well as former KOP valves), **Section 8 – The Robot, Rev E** has been updated to include the following edit.

<R72> In addition to the items included in the KOP, pneumatic system items specifically permitted on 2010 FRC ROBOTS include the following items. All included items must be “off the shelf” pneumatic devices rated by their manufacturers for pressure of at least 125psi, and used in their original, unaltered condition (except as required for assembly with other components).

- A. One or two additional Clippard air storage tanks (Clippard Part Number AVT-32-16), equivalent to those provided in the kit. This means that up to four, and no more, Clippard air storage tanks can be used on the ROBOT.
- B. Pneumatic pressure vent plug valves functionally equivalent to those provided in the KOP (Parker Part Number PV609-2).
- C. Solenoid valves. All such valves must have a maximum $\frac{1}{8}$ ” NPT port diameter, and a maximum Cv of 0.32 (if non-KOP valves are used, the team will be required to provide part documentation validating that the valves meet these constraints). Solenoid valves that are rated for a maximum pressure that is less than 125psi rating mandated above are permitted, however if employed, an additional pressure relief valve must be added to the low pressure side of the main regulator. The additional relief valve must be set to a lower pressure than the maximum pressure rating for the solenoid valve.
- D. In addition to the pneumatic cylinders provided in the KOP and the “free” pneumatic cylinders available for order through the Free Pneumatic Components Order Form, additional air cylinders or rotary actuators may be used. Cylinders may be of any configuration, and may be of any size up to a maximum of 24-inch stroke and 2-inch diameter.
- E. Additional 0.160” inch inside diameter pneumatic tubing functionally equivalent to that provided in the KOP, with the pressure rating clearly factory-printed on the exterior of the tubing (note: alternate tubing colors are acceptable).
- F. Pressure transducers, pressure gauges, and connecting fittings.
- G. Pressure regulators with a maximum bypass pressure of no more than 60psi.
- H. For the purposes of the *FIRST* competition, a device that creates a vacuum is not considered to be a pneumatic device and are not subject to the pneumatic rules (although they must still satisfy all other appropriate rules). These include, but are not limited to, venturi-type vacuum generators and off-the-shelf vacuum devices (as long as they are powered by provided or permitted motors).
- I. For the purposes of the *FIRST* competition, closed-loop COTS pneumatic (gas) shocks are not considered pneumatic devices, and are not subject to the pneumatic rules (although they must still satisfy all other appropriate rules).
- J. For the purposes of the *FIRST* competition, air-filled (pneumatic) wheels are not considered pneumatic devices, and are not subject to the pneumatic rules (although they must still satisfy all other appropriate rules).

Section 9 – The Tournament

No changes.

Section 10 – The Kit of Parts

No changes.

January 29, 2010

TEAM UPDATE #6

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 7 – The Game

No changes.

Section 8 – The Robot

Section 8 – The Robot, Rev F has been updated to include the following edits:

FRAME PERIMETER – the polygon defined by the outer-most set of exterior vertices on the ROBOT (without the BUMPERS attached) that are within the BUMPER ZONE. To determine the FRAME PERIMETER, wrap a piece of string around the ROBOT at the level of the BUMPER ZONE - the string describes this polygon. **Note: to permit a simplified definition of the FRAME PERIMETER and encourage a tight, robust connection between the BUMPERS and the FRAME PERIMETER, minor protrusions such as bolt heads, fastener ends, rivets, etc are excluded from the determination of the FRAME PERIMETER.**

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

No changes.

February 2, 2010

TEAM UPDATE #7

GENERAL NOTICES

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No changes.

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:

<G41> Detaching MECHANISMS - ROBOTS may not intentionally detach parts or leave MECHANISMS on the FIELD. *Violation: PENALTY for each incident and potential RED CARD if an intentionally detached COMPONENT or MECHANISM impedes MATCH play.*

- a. Bumper covers must not detach, even unintentionally, from the ROBOT.
Violation: PENALTY.

Bumper covers are expected to be just as robust as BUMPERS. It is in your team's best interest to insure that the covers remain securely in place despite exposure to rough play, field elements, etc. A loose bumper cover is likely to have several negative effects on an alliance. Examples of ways in which a loose bumper cover hurt an alliance are listed below, but note that it is illustrative and by no means an exhaustive list.

- if part of a cover is touching any part of the TOWER at the end of the MATCH, the ROBOT will not be considered SUSPENDED and thus will not receive the associated SUSPENDED bonus points.
- if part of a cover is hanging below the plane of the PLATFORM, the alliance will not receive bonus points for that ROBOT
- if part of a cover falls below the ROBOT'S BUMPER ZONE, the ROBOT will have violated <R07-A>
- if a cover gets caught in a dynamic part of its ROBOT, the ROBOT may be rendered useless
- if a cover is completely dislodged and left on field, the ROBOT will have violated Rule <G41>.
- if a cover is not secured, it may be considered an entanglement hazard and thus a violation of Rule <G25>.

That being said, there are a *whole bunch* of reasons why you want your bumper covers to stay securely on your ROBOT!

Section 8 – The Robot

CAUTION: STORED ENERGY

We believe it's important to highlight the hazards inherent in stored energy, and remind teams to be thoughtful in ways to mitigate risk to people and to the machine. As you finish your robot design (and maybe even finish your robot), we want to remind you to be cognizant of ways in which your robot will store and release energy, intentionally and accidentally. Preventive measures that your team may employ to limit the risk of dangerous accidents include

- training of all members on your team regarding hazards on the ROBOT,
- addition of physical locks on the robot to secure dangerous mechanisms, or
- including benign ways in which team members can safely release stored energy (particularly important for removing the robot from the tower, demonstration for inspection, etc)

We thank you for taking this thought seriously and addressing it in both your robot design and in your team behavioral habits.

Section 8 – The Robot, Rev G has been updated to include the edits highlighted below. Please note that the exceptions added to the FRAME PERIMETER definition in Team Update 6 and the exception to Rule <R16> added here neither changes nor adds exception to the volume requirements defined by Rule <R10>.

<R16> During normal operation no part of the ROBOT shall extend outside the vertical projection of the FRAME PERIMETER, except as permitted by Rule <G30>.

- a) Exception: To facilitate a tight, robust connection between the BUMPERS and the FRAME PERIMETER, minor protrusions such as bolt heads, fastener ends, rivets, etc that are excluded from the determination of the FRAME PERIMETER and are within the BUMPER ZONE are permitted.

Note: This means no “mushroom-bots.” If a ROBOT is designed as intended, in normal operation you should be able to push the ROBOT (with BUMPERS removed) up against a vertical wall, and the FRAME PERIMETER will be the only point of contact with the wall.

<R97> For the safety of all those involved, inspections must take place with the ROBOT powered off, pneumatics unpressurized, and springs or other stored energy devices in their lowest potential energy states (i.e. battery removed). Power should only be enabled on the ROBOT during those portions of the inspection process where it is absolutely required to validate certain system functionality and compliance with specific rules (firmware check, etc). Inspectors may allow the ROBOT to be powered up beyond the parameters above if both criteria below are met.

- The ROBOT design requires power or a charged stored energy device in order to confirm that the ROBOT meets volume requirements **AND**
- the team has included safety interlocks that prevent unexpected release of such stored energy.

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

No changes.

February 5, 2010

TEAM UPDATE #8

GENERAL NOTICES

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A note from National Instruments regarding cRIO-FRC Repair and Replacements:

Teams that need to send their cRIO-FRC back to National Instruments for repair will receive a replacement cRIO-FRC sent overnight, provided it is in NI's system before 4pm Central standard time, otherwise it will be processed the next day.

Please note: Replacements are available at the mercy of other teams. NI has a limited supply of replacement cRIO-FRC units. If teams that receive replacement units do not send their original unit back to NI for repair in a timely matter, the stock may get low and replacement units could be delayed.

Teams purchasing spare or extra cRIO-FRCs (new) will receive their systems in approximately 2 weeks.

Section 0 – Introduction through Section 2 – Team Organization

No changes.

Section 3 – At the Events

Section 3 – At the Events, Rev A, Section 3.3 has been updated to include the edit highlighted below. Teams are prohibited from establishing their own wireless networks for two main reasons:

1. Limiting the wireless traffic in the venue reduces the risk of interference with and crowding of the wireless networks used for the competition field and the practice field.
2. Many venues prohibit wireless access points in addition to their in-house networks, but specifically permit the networks established by *FIRST* for the competition and practice fields. Parity between events would be affected if teams could have wireless networks at some events, but not at others.

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;
- Always wear ANSI-approved safety glasses anywhere in the pit area, on the playing field, practice fields, walkways, pit stations, and any area posted with signs requiring the use of eye protection;

- 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;
- Open flames are NOT allowed in any of the buildings;
- If the event is not a “Bag & Tag” event, only the drayage company may handle loading robots in and out;
- Robots may be operated via wireless control only on the competition fields; and
- Teams are not allowed to set up their own 802.11a/b/g/n (2.4GHz or 5GHz) wireless communication (access points or ad-hoc networks) in the venue. ~~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 8 – The Robot

No changes.

Section 9 – The Tournament

Match results via Twitter:

At the completion of each match, the Field Management System will post the results of each match to Twitter. Information about how to follow the Twitter feed is posted on the FRC game manual website under **Section 9 - The Tournament**.

Section 10 – The Kit of Parts

FisherPrice pinion – tooth count:

It has come to our attention that some of the FisherPrice motors in the 2010 KOP shipped with 15 tooth pinions instead of the 19-tooth pinions that mate with the provided FisherPrice gearbox. If your team received 15-tooth pinions and needs the 19-tooth pinions, please contact *FIRST* to trade motors at frcparts@usfirst.org. We offer our apologies for the inconvenience.

February 9, 2010

TEAM UPDATE #9

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

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

<G20> ROBOT Out of Bounds - ROBOTS may not touch any surface outside of the FIELD boundary during the TELEOPERATED PERIOD. *Violation: **PENALTY and Disablement.***

Section 8 – The Robot

Section 8 – The Robot, Rev H has been updated to include the following edits:

<R12> The color of the BUMPERS will be used to identify the ALLIANCE to which the ROBOT has been assigned, red or blue. Therefore, each ROBOT must be able to display red BUMPERS and blue BUMPERS. This may be done via either of two acceptable methods:

A. Each ROBOT may be built with two complete sets of interchangeable BUMPERS, one red and one blue. If this method is chosen, the BUMPERS must be identical except for the color of the covering fabric (see Rule <R07-F>).

B. Alternately, the ROBOT may use changeable BUMPER covers. The BUMPER covers

- may be removable, reversible, or fixed
- must completely enclose the BUMPERS
- must show only a single color such that when the BUMPER covers are in use, only fabric of the assigned ALLIANCE color may be visible. ~~The BUMPERS may be constructed with a fabric covering of one color (see Rule <R07-F>), and then covered with a removable fabric shroud of the opposite color when appropriate. The removable cover must completely enclose the BUMPERS and conceal the contrasting fabric.~~
- must be constructed solely of fabric and a fastening/restraining system to hold the cover in place. The fastening/restraining system must extend no further than one inch beyond the FRAME PERIMETER (i.e. no further than any other hard parts of the BUMPER - see Rule <R07-N>). Please note that the fastening/restraining system MUST be designed with robust performance in mind. The restraints must hold the removable cover in place during

vigorous interactions with other ROBOTS and FIELD elements during the MATCH without allowing the cover to come off.

<R19> ROBOTS must be designed so that in normal operation BALLS cannot extend more than 3 inches inside

- a) the FRAME PERIMETER below the level of the BUMPER ZONE (see Figure 8-5),
- b) a MECHANISM or feature designed **or used** to deflect BALLS in a controlled manner that is above the level of the BUMPER ZONE.

<R38> Teams may bring a maximum of 40 pounds of custom FABRICATED ITEMS (SPARE PARTS, REPLACEMENT PARTS, and UPGRADE PARTS, plus all WITHHOLDING ALLOWANCE items) to each competition event to be used to repair and/or upgrade their ROBOT at the competition site. All other FABRICATED ITEMS to be used on the ROBOT during the competition shall arrive at the competition venue packed in the shipping crate or lockout bag with the ROBOT.

A. Exception: the OPERATOR CONSOLE is not included in the incoming parts weight restriction.

B. Exception: Any competition legal 12V batteries and their 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) are not included in the incoming parts weight restriction.

Section 9 – The Tournament

Section 9 – The Tournament, Rev B has been updated to include the following edit:

9.3.8 Highest Coopertition Bonus

The Field Management System will keep track of the highest coopertition bonus earned by each TEAM during the qualification matches. **This value will be available on the Pit Display and the Ranking HTML pages linked on the FIRST website (<http://www.usfirst.org/roboticsprograms/frc/content.aspx?id=902>).** ~~but this value will not be displayed.~~

Section 10 – The Kit of Parts

No changes.

February 12, 2010

TEAM UPDATE #10

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 4 – Robot Shipping

No changes.

Section 5 - Awards

There has been some confusion regarding the eligibility criteria and how many mentors each team can submit for the Regional Woodie Flowers Finalist Award and the Championship Woodie Flowers Award. According to the "*FIRST* Robotics Competition Woodie Flowers Award Criteria", every team can nominate 1 mentor for a Regional Woodie Flowers Finalist Award (WFFA). A mentor can only win a WFFA once so any mentor that has previously won a WFFA cannot be nominated for a 2010 Regional (or Michigan State Championship) WFFA.

In addition to nominating 1 mentor for a WFFA, teams with mentors that have previously won a WFFA can resubmit 1 additional mentor for the Championship WFA. In total, it is possible to submit one mentor for a 2010 Regional WFFA AND 1 mentor (who must have won a WFFA from 2004 - 2009) for the 2010 Championship WFA.

However, as many teams have pointed out, the current submission website does not allow teams to submit more than 1 candidate via the submission forms. We will not be able to update the website this year, so we are implementing a temporary system as described in the steps below:

- All teams that want to submit both a previous WFFA for the Championship WFA and submit a new mentor for the WFFA should submit the new mentor (i.e. the WFFA candidate) via the online system.
- Any team submitting a previous WFFA winner for the Championship WFA should submit their 600 word refresh essay to 2010WFASubmitCMP@usfirst.org. The WFA committee will review those essays during their selection of the 2010 Championship WFA.

We apologize for any confusion this may have caused.

Section 6 – The Arena

No changes.

Section 7 – The Game

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

<G20> ROBOT Out of Bounds - ROBOTS may not touch ~~any surface~~ **anything** outside of the FIELD boundary during the TELEOPERATED PERIOD. *Violation: ~~PENALTY and Disablement.~~*

<G21> Grace Period after AUTONOMOUS - If a ROBOT should unintentionally touch ~~any surface~~ **anything** outside of the FIELD boundary during the AUTONOMOUS PERIOD, it will have a 10 second "grace period" to ~~right itself and~~ return to the FIELD at the beginning of the TELEOPERATED PERIOD. *Violation: ~~No PENALTY will be assigned.~~ If the ROBOT is unable to ~~right itself~~ **correct the situation** within the grace period, it will be disabled for the remainder of the MATCH. If at any time the Head Referee should determine that the attempts to recover from the situation constitute unsafe operations, Rule <S01> will take precedence.*

<G22> ROBOT Range - ROBOTS must remain within the FIELD perimeter and asymmetric funnels of the GOALS during a MATCH. *Violation: ~~PENALTY and Disablement.~~*

The combination of Rules <G20>, <G21>, and <G22> ultimately requires the ROBOT to remain inside the vertical projection of the field borders at all times. If the ROBOT violates this vertical projection at any time during the MATCH, it will be assigned a PENALTY. If the ROBOT touches anything outside the field during the Autonomous period, the ROBOT will be given a grace period at the start of the Teleoperated period to remedy the situation. If the grace period expires and the ROBOT is still out of compliance, the ROBOT will be disabled. If the ROBOT touches anything outside the field during the Teleoperated Period, the ALLIANCE will receive a PENALTY (per <G22>) and the ROBOT will be disabled (per <G20>). Lastly, any time during the MATCH that the ROBOT violates the FIELD perimeter over the Alliance Station wall, it will receive a PENALTY and be disabled (per <G23>).

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

No changes.

February 16, 2010

TEAM UPDATE #11

GENERAL NOTICES

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Weather affects build season:

From Bill's Blog, 2/15/10:

Over the last week, I received several requests to extend the FRC build season due to the unprecedented snow in the mid-Atlantic region. I had to take a number of items into consideration as I looked for a way to accommodate those requests.

Robot Ship Date is set every year well in advance so that FedEx, UPS and the drayage companies may all make special arrangements for the unusual volume of activity FRC creates on a single day in February. Moving Robot Ship date back may hamper on-time delivery of robots to week one events and is expected to increase costs. Plus there is the challenge of finding a fair and equitable way of determining which teams were affected by the snow and which were not.

The Game Design Committee and I decided that, although Robot Ship Day must remain February 23rd, this year, all FRC teams will be allowed to hold back 65 pounds of their robot's weight on Robot Ship Day. (That's roughly half of the total weight of an FRC robot.) Teams may continue to work on the items they hold back and then hand-deliver the items to their event.

As you pack your robot for shipment, please keep in mind the 2010 shipping overage rules mentioned in my December 15th blog and outlined in Section 4.4.2.3 of the Game Manual. If your crate exceeds 400 pounds (a possibility if you send a full crate to the event, then add the 65 pounds of items you hand carried in before you ship it home or to your next event) the drayage company will charge your team an overage fee for their portion of the pickup or delivery and FedEx will take the extra cost of shipping your overweight crate out of the FedEx donation thereby affecting all FRC teams. Please pack carefully.

Software updates:

Please note that National Instruments has posted updates that are required for all teams. Teams are reminded that they must have the most recent version of the software to compete.

- FRC LabVIEW Update 2.1 for 2010
<http://joule.ni.com/nidu/cds/view/p/lang/en/id/1534>
Required for all teams, regardless of if their using LabVIEW for programming because it also updates the cRIO image.
Teams will see a message and link on the LabVIEW Getting Started Window.
- Driver Station Update 1.1 for 2010
<http://joule.ni.com/nidu/cds/view/p/lang/en/id/1535>
Required for all teams to install on the classmate.

Please note that the links are the same as the current location - NI just updated the zip files to download.

NI has posted information about the “fixed and known issues” for the updates here: <http://digital.ni.com/public.nsf/websearch/487FB316344500E6862576C8004CC32D?OpenDocument>.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7 - The Game, Rev I has been updated to fix typos accidentally included after the incorporation of *Team Update #10*. It is now true to the edits described in *Team Update #10*.

Section 8 – The Robot

Section 8 - The Robot, Rev I has been updated to include the following edits:

WITHHOLDING ALLOWANCE – A limited amount of FABRICATED ITEMS that are withheld from the ROBOT shipping requirements (specified in **Section 4**) and retained by the team following the shipping deadlines. These items are then hand-carried to a competition event by the team. The OPERATOR CONSOLE is automatically included in the WITHHOLDING ALLOWANCE. Beyond that, the incoming material maximums specified in Rule <R38> limits the amount of FABRICATED ITEMS included in the WITHHOLDING ALLOWANCE.

Please note that for “Bag & Tag” teams attending 2-day events, the WITHHOLDING ALLOWANCE is fixed for the entire period between robot ship date and the start of the competition season. This means that teams cannot withhold certain FABRICATED items after ship date, but then exchange them for other items during their “Robot Access Period” as described in Section 4.8.3.1.

<R38> Teams may bring a maximum of ~~65~~40 pounds of custom FABRICATED ITEMS (SPARE PARTS, REPLACEMENT PARTS, and UPGRADE PARTS, plus all WITHHOLDING ALLOWANCE items) to each competition event to be used to repair and/or upgrade their ROBOT at the competition site. All other FABRICATED ITEMS to be used on the ROBOT during the competition shall arrive at the competition venue packed in the shipping crate or lockout bag with the ROBOT.

- A. Exception: the OPERATOR CONSOLE is not included in the incoming parts weight restriction.
- B. Exception: Any competition legal 12V batteries and their 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) are not included in the incoming parts weight restriction.

<R77> The relief valve must be attached directly to the compressor. **If the relief valve is already set to 125psi, teams are not allowed to adjust it. If the relief valve is not set to 125psi, teams are required to adjust to release air at 125psi.** The valve **may or may not have** been calibrated prior **to being supplied to teams.**

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

No changes.

February 19, 2010

TEAM UPDATE #12

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 7 – The Game

No changes.

Section 8 – The Robot

BOM Naming Convention:

Before you submit your electronic BOM to inspection, please save the file using the following naming convention: FRCxxxx_City.xls (Microsoft Excel 97/2000/XP), FRCxxxx_City.csv, or FRCxxxx_City.ods (ODF Spreadsheet), where “xxxx” is your team’s four-digit team number (i.e. 0011) and City is equal to the city in which your event takes place (i.e. Manchester). For the Championship, City should be your team’s Division (i.e. Curie). Thank you for doing this, as it will facilitate the data mining after the season!

Section 8 – The Robot, Rev J has been updated to include the following edit:

<R63-B> PWM configuration: If the Jaguar speed controller is controlled via PWM communications, the PWM port on the Jaguar speed controller must be connected directly to a PWM port on the Digital Sidecar with a PWM cable. No other devices may be connected to these PWM ports. No other devices may be connected to any other ports on the Jaguar speed controller **with the exception of connection to the coast/brake port.**

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

No changes.

February 23, 2010

TEAM UPDATE #13

GENERAL NOTICES

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Robot Shipping:

We'd like to make sure teams understand the rules about robot shipping versus what teams can bring with them to the event as part of the WITHHOLDING ALLOWANCE. The verbiage below has been updated and clarified since the *Bill's Blog* post on 2/22/10.

Rule <R38>, as amended in Team Update #11, permits the TEAM to bring up to 65 pounds of FABRICATED ITEMS to the competitions as their WITHHOLDING ALLOWANCE. There are no explicit restrictions or requirements on what is included or excluded from the WITHHOLDING ALLOWANCE. The choice of which FABRICATED PARTS of the ROBOT are included in the WITHHOLDING ALLOWANCE is entirely up to the TEAM.

It is noted that a ROBOT is an assembly of FABRICATED and COTS parts, and the full ROBOT is itself a FABRICATED ITEM. However, it was never the intention of this rule that a complete ROBOT (presuming it weighed less than 65 pounds) could be brought to the competition as a single, unitary, fully assembled item. Thus, teams attending traditional events may not bring fully assembled ROBOTS to the competition. Teams attending bag & tag events may not bring a fully assembled ROBOT that has not been bagged.

For all events (both traditional and bag & tag events), for those few cases where the complete ROBOT weighs less than 65 pounds, teams may bring up to 65 pounds of separate FABRICATED ITEMS which can be assembled into the final assembly of the full ROBOT once you are on-site. But they must be brought to the competition venue as a collection of two or more separate FABRICATED ITEMS in a less-than-complete state of assembly.

We understand that this may appear artificially restrictive and confusing. We are not trying to be excessively particular in this area. There are specific restrictions (e.g. contractual requirements, union rules, etc.) on how complete ROBOTS are delivered to competition venues, and how they are loaded into the venues, that limit our flexibility in this area. We ask for your understanding and patience as we work through these requirements.

Section 0 – Introduction through Section 9 – The Tournament

No changes.

Section 10 – The Kit Of Parts

The 2010 *Kit Of Parts Checklist, Rev C* has been updated to include the cRIO gaskets included in the Kit Of Parts.

February 26, 2010

TEAM UPDATE #14

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Somehow, **Section 7, Rev I** still doesn't have the changes issued in **Team Update 10** (and subsequently, **11**) incorporated. Third time's a charm.

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

<G39> Pinning - A ROBOT may not pin (inhibit the movement of another ROBOT that is in contact with a field element, border, or goal) for more than 5 seconds. ~~If a ROBOT has been pinned for 5 seconds, the team with the pinning ROBOT will be signaled by a referee to~~ **A ROBOT will be considered pinned until** the ROBOTS have separated by at least the pinned ROBOT and back away approximately 6 feet. **The pinning ROBOT(S) must then wait for at least 3 seconds before attempting to pin the same ROBOT again.** ~~Once the pinning ROBOT(S) has backed off by 6 feet for 3 seconds, it may again attempt to pin its opponent, and if successful, the 5 second count will start over.~~
Violation: One PENALTY for each violation.

Section 8 – The Robot

No changes.

Section 9 – The Tournament

Section 9, The Tournament, Rev C, has been updated to include the following edits:

<T02> Radio control mode of ROBOT operation is not permitted in areas anywhere outside the ARENA **or practice field.** ROBOTS must only be operated by tether when not within the ARENA **or practice field.**

Section 10 – The Kit of Parts

No changes.

March 2, 2010

TEAM UPDATE #15

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 8 – The Robot

No changes.

Section 9 – The Tournament

WPA Encryption:

In order for your ROBOT to function on the FRC competition field, each team must program their ROBOT radio with their team's specific WPA encryption key, provided at the event.

With much thanks to James Kiefer, there will be an automated process available at each event for programming the WGA600N unit. The encryption tool developed by Mr. Kiefer only requires the team to plug their radio into the kiosk and enter their team number. This tool eliminates the need for the majority of teams to have, or even know, their WPA encryption key.

If a team is using the alternate radio, WET610N, they must manually program the radio. Instructions for programming the WET610N, ***Configuring the WET610N, Rev 0***, are available on the *FIRST* website under "Section 9 – The Tournament."

Section 10 – The Kit of Parts

No changes.

March 9, 2010

TEAM UPDATE #16

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 6 – The Arena

No changes.

Section 7 – The Game

Section 7, The Game, Rev K has been updated to include the following updates:

<G15> BALL Handling – BALLS may be handled by any TEAM member when BALLS are in the CORRAL or ALLIANCE STATION. BALLS may not be handled until they have exited from the BALL COUNTER and are in the CORRAL. *Violation: PENALTY.*

In the event that BALLS become jammed in the GOAL at the mouth of the BALL COUNTER, a HUMAN PLAYER may use the handle end of the TRIDENT to dislodge the BALLS by placing it through the hole in the clear Lexan cover on top of the GOAL. Only balls dislodged before the automatic counter stops counting will be SCORED. Note that the TRIDENT or anything else may not be placed through this access hole at any other time or the TEAM will be charged with a violation of <S02>. Similarly, when dislodging BALLS, if the TRIDENT comes in contact with a ROBOT, <S02> will be invoked.

<G30> ROBOT Volume – During a MATCH, no part of the ROBOT shall extend outside the vertical projection of the FRAME PERIMETER, except as follows:

- a. BALL Interaction Volume – Solely for the purposes of interacting with a BALL, MECHANISMS that are below the BUMPER may extend up to the BUMPER PERIMETER, for a period not exceeding two seconds. After returning inside the FRAME PERIMETER, such MECHANISMS are not permitted to re-extend beyond the FRAME PERIMETER for at least two seconds.
- b. ROBOT Righting Volume - ROBOTS attempting to right themselves or their ALLIANCE partners may expand up to the FINALE CONFIGURATION maximum volume while, and only while, performing the righting operation. While beyond the NORMAL CONFIGURATION volume and righting, ROBOTS may not actively interact with BALLS or opponent ROBOTS.
- c. TOWER Contact ROBOT Volume - During a MATCH, ROBOTS in contact with their ALLIANCE TOWER may extend beyond their NORMAL CONFIGURATION volume but may not exceed the FINALE CONFIGURATION maximum volume.
- d. FINALE ROBOT Volume - During the FINALE, ROBOTS may extend up to the limits of the FINALE CONFIGURATION maximum volume.
- e. BUMPERS may extend outside the FRAME PERIMETER, within the constraints defined in Rule <R07>.

Violation: PENALTY and potential YELLOW CARD.

<G46> BALL Penetration Restriction – The BALL must not extend more than 3 inches inside the FRAME PERIMETER as defined in Rule <R19>. Incidental protrusions of the BALL within this boundary will not be penalized if the TEAM corrects the condition before resuming game play. Violation: PENALTY for a basic infraction, plus a YELLOW CARD if no immediate attempt to remedy and/or the action is deemed intentional.

A BALL trapped under a ROBOT, intentionally or unintentionally, will be considered POSSESSED until it is dislodged from the ROBOT. Teams are encouraged to design and drive with this in mind. Note that this does not alleviate the inspection requirements for 3 inch intrusion.

Examples of game play include, but are not limited to, actively engaging with another ROBOT, navigating toward a GOAL, controlling the position or direction of another BALL (e.g. kicking or herding), and changing regions (crossing a BUMP or under a TOWER).

Section 8 – The Robot

No changes.

Section 9 – The Tournament

Comments regarding Team Seeding Points:

Now that the competition season has begun, and teams exposed to the 2010 ranking system, we would like to elaborate on the intent behind the system. Coopertition™ is a core tenet of FIRST, as evidenced by the patent FIRST received for it last year. Breakaway's ranking system uses the combination of alliance scores and Coopertition Bonuses to rank teams based on their ROBOT performance during the Qualification Matches. The objective of the system is to reward high-scoring, close, competitive matches. Furthermore, we intended to make a disincentive for teams to win with a high margin.

Several members of the community have identified opportunities within the ranking system to achieve very high scores, but at the cost of the competitive nature of the event. In an effort to remedy the issue, we have amended the ranking system to add 5 seeding points for the winners' score. The expectation is that winning will be a priority, but still values the high, close-scoring, matches.

Section 9, The Tournament, Rev D has been updated to include the following updates:

9.3.4 Match Seeding Points

All teams on the winning ALLIANCE will receive a number of seeding points equal to the penalized score (the score with any assessed penalties) of the winning ALLIANCE plus 5 additional points for winning the match.

All teams on the losing ALLIANCE will receive a number of seeding points equal to un-penalized score (the score without any assessed penalties) of the winning ALLIANCE.

In the case of a tie, all participating teams will receive a number of seeding points equal to their ALLIANCE score (with any assessed penalties).

9.3.6 Seeding Point Exceptions

A SURROGATE TEAM will receive zero seeding points and zero coopertition bonus.

A TEAM that does not field a ROBOT because it has not passed inspection will receive zero

seeding points and zero coopertition bonus.

A TEAM is declared a no-show if **no** member of the team is in the ALLIANCE ZONE at the start of the MATCH; a no-show team will receive a RED CARD for that MATCH.

During the qualification matches, TEAMS can individually receive RED CARDS. A RED CARDED TEAM will receive zero seeding points and zero coopertition bonus.

In the very unlikely case that all three TEAMS on an ALLIANCE receive RED CARDS, all three TEAMS on the winning ALLIANCE would get their own ALLIANCE score as their seeding points for that MATCH.

Section 10 – The Kit of Parts

No changes.

March 16, 2010

TEAM UPDATE #17

GENERAL NOTICES

No changes.

Section 0 – Introduction through Section 10 – The Kit of Parts

No changes.

March 23, 2010

TEAM UPDATE #18

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 8 – The Robot

No changes.

Section 9 – The Tournament

Section 9, The Tournament, Rev E has been updated to include the following edits, which make the manual true to the original intent and the actual implementation at all 2010 FRC events:

9.3.8 Highest Cumulative Coopertition Bonus

The Field Management System will keep track of the **highest cumulative** coopertition bonus **scores** earned by each TEAM during the qualification matches. This value will be available on the Pit Display and the Ranking HTML pages linked on the *FIRST* website (<http://www.usfirst.org/roboticsprograms/frc/content.aspx?id=902>).

9.3.9 Qualification Seeding

All TEAMS in attendance will be seeded during the qualification matches. If the number of TEAMS in attendance is 'n', they will be seeded '1' through 'n', with '1' being the highest seeded team and 'n' being the lowest seeded TEAM.

The Field Management System will use the following seeding method:

- TEAMS will be seeded in decreasing order by seeding score.
- Any TEAMS having identical seeding scores will then be seeded in decreasing order by their highest **cumulative** coopertition bonuses.
- Any TEAMS having identical seeding scores and highest **cumulative** coopertition bonuses will then be seeded in decreasing order by cumulative ELEVATED/SUSPENDED points earned by their ALLIANCES throughout the Qualification Matches.
- Any TEAMS ~~also~~ having identical **highest seeding scores, identical cumulative** coopertition bonuses, **and identical cumulative ELEVATED/SUSPENDED points** will then be seeded based on a random sorting by the Field Management System.

Section 10 – The Kit of Parts

No changes.

March 30, 2010

TEAM UPDATE #19

GENERAL NOTICES

No changes.

Section 0 – Introduction through Section 10 – The Kit of Parts

No changes.

April 6, 2010

TEAM UPDATE #20

GENERAL NOTICES

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No changes.

Section 0 – Introduction through Section 7 – The Game

No changes.

Section 8 – The Robot

We recognize that a number of teams have experienced damage to the Ethernet ports on their Classmate computers as the Ethernet cables are repeatedly installed and removed. To allow teams with a damaged Ethernet port to continue to compete without requiring that they replace the entire Classmate, we are updating the rules to permit the use of USB-to-Ethernet adapters to provide an alternate connection pathway.

Section 8, The Robot, Rev K has been updated to include the following edits:

<R82> Teams are permitted to connect a portable computing device (Laptop computer, PDAs, etc.) to the DRIVER STATION for the purpose of displaying feedback from the ROBOT while participating in competition MATCHES. **Portable computing devices may only connect to the DRIVER STATION through one of the USB ports or through the First Touch I/O module (or a carrier board for the First Touch I/O module) – they shall not connect to the DRIVER STATION through any other port.** Portable computing devices may only connect to the DRIVER STATION – they must not directly connect to any ARENA ports or equipment. Please note that **AC power will not be available at the PLAYERS STATIONS so these devices will have to run on internal batteries or be self-powered.**

<R84> During competition MATCHES, the ARENA Ethernet cable must connect directly to the Ethernet port on the Classmate PC (making a direct connection via a “pigtail” cable is permitted) **or to an Ethernet/USB adapter that is connected to the USB hub or directly to the Classmate.** Only the Classmate PC **(either directly or via the interfaces described above)** may connect to the competition cable – no direct connection of team-provided portable computers, PDAs, or alternate devices is permitted.

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

No changes.