

2001 FIRST ROBOTICS COMPETITION

TEAM UPDATE #4

Date: January 15, 2001

WHERE TO SUBMIT QUESTIONS

FIRST has recently been receiving a high volume of indiscriminately addressed questions and we have even had unrelated organizations such as first.org forward emails erroneously sent to them. Please read Section 1 of the Administrative section of the manual for information on who to contact at FIRST for various types of questions and make sure that others on your team are also aware of this information. Questions submitted to the wrong person at FIRST will take longer to get answered and will cost your team valuable time. It also decreases our efficiency in serving you as our customers.

Further, please do not send the same question to multiple contacts at FIRST as this consumes time that could be better spent answering questions from other teams.

Thank you for your cooperation.

RULE UPDATES

Rule M14, which was modified in Team Update #2, has now been reinstated in its original form. Therefore, it is acceptable to fabricate and use suction cups.

The following line is added to the end of Rule GM6:

"In the event that a team does not show up for a scheduled match, their stop button will be pressed prior to the start of a match."

Rule SC7 has been changed so that the cutoff time for the 1.5 multiplier is now at 16 seconds remaining. Therefore, matches ending with 15 seconds or less will not receive a bonus to the score. The new table is as follows:

Time Remaining (sec)	Multiplier
120-91	3
90-61	2.5
60-31	2
30-16	1.5
15-0	1

NEW RULES

In order to allow more flexible uses of pneumatics and prevent safety hazards on the robot, the following rules have been created regarding the use of pneumatics on the robot. These rules will be considered when inspecting robots at each event.

- M20. The pressure relief valve on the pump may not be removed. This valve should vent at slightly higher than 120 psi but less than 125 psi. Therefore, the maximum “storage pressure” that you may use, such as in the volume tanks, is 120 psi.
- M21. The SMC regulator fixed at 60 psi must be connected to the output of the pump and/or volume tanks in order to limit the maximum “working pressure”. Working pressure is the air pressure that may be used to actuate the valves and air cylinders.
- M22. It is acceptable to directly couple one end of a cylinder to a suction cup and drive the piston in order to create and release vacuum. Further, it is acceptable to connect a valve (connected to the “working pressure”) in parallel with the suction cup and cylinder in order to introduce air into the system. It is not acceptable to intentionally generate pressure by using a cylinder as a pump, but the normal back-pressure from a load applied to a cylinder piston is ok. Cylinders may not be used to make reciprocating pumps (i.e. pumps designed to cycle a cylinder and valves continuously to create stronger and stronger pressure or vacuum).
- M23. Due to the nature of the pump design, the inlet may not be used to generate vacuum.

The following new rules have been added to other sections of the manual:

GM25. The "minimum robot" that may be used on a stretcher must contain the following components:

- Battery
- Robot Controller
- Radio
- Rotating Light
- Associated Wiring, Circuit Breakers, and Fuse Panel
- Team Name/Number signs

SC11. Teams that do not show up for a scheduled Qualification Match will receive zero (0) points for the match. Participating alliance partners will receive the match score as normal. A team is declared a no-show if no member of the team is in the alliance station at the start of the match.

C28. The joysticks may be modified (rewired, disassembled, cut, etc.) in order to use the potentiometers and switches in a different manner. If by modifying the joystick you end up breaking it or destroying it, you will not be provided with a replacement.

PNEUMATICS CLARIFICATIONS

The 2" bore cylinder on the pneumatics demo board shown at the Kickoff is not a part of the pneumatics kit shipped to teams. It may be ordered from the "FIRST Custom Cylinder Order Form" on the last page of "The Pneumatic Manual for 2001 FIRST Competition".

Although we are allowing the limited use of vacuum with the pneumatics, please be aware that the components supplied in the pneumatic kit were not designed to be used with vacuum. Do not use the SMC check valve in a vacuum application as it could damage the valve.

The CAD print of the 1-1/2" bore cylinder in "The Pneumatic Manual for FIRST 2001 Competition" has a misprint. The 4.38" dimension should stop at the mid-point of the 0.375" pin on the right side of the print, not at the end of the cylinder as printed.

Currently, teams may order a maximum of 4 custom cylinders per team. Cylinders may be ordered individually. Cylinders will be shipped via 2nd day air on the day after your order is entered. If you don't receive your cylinders within 4 days after you send the order to the fax number on the ordering page, please fax notification to the same number and we will follow up and notify you of the shipment date, address and tracking number. If the cylinders are being shipped to a school or business please include the name of it on your order form. Based on the number of cylinders used, additional cylinders may be made available to teams at a later date.

PLAYING FIELD INFORMATION

Some teams have reported difficulty in obtaining the 3 pound Weider cast iron weights used on the Bridge. They can be purchased from The Sports Authority.

The distance from the top of B3 to the bottom of P9 is nominally 14.5". The distance from the surface of the carpet to the top of P9 is nominally 19.75"

Weight support details: P14 is inserted 3 inches into P13. P13 is inserted flush with the top of P12. A bolt is put through all three to secure them.

Nominal dimensions of the 4x6 beam are 3-5/8" by 5-5/8".

Section 1.3.5 of The Game has been revised to add more detail as follows:

1.3.5 Bridge Description

The bridge is approximately 4-feet wide and 8-feet long with 5-inch wide steel plates mounted at each end and aluminum diamond-plate on the sides. The structure consists of a frame of 4, 2x8 dimensioned (versus rough cut) wood joists covered by a 3/4" plywood deck. The surface of the bridge is covered with carpet (Brassfield 20, Color- Pewter), except where the 5-inch steel plates extend from the end. The bridge rests on 4x6 lumber beams with angle-iron used as load bearing surface and to

prevent the bridge from sliding off-center. There are two 1-1/4-inch steel pipes mounted on the sides of the bridge with weights at the top.

NORTHEASTERN UNIVERSITY SCHOLARSHIP

The Northeastern University FIRST scholarship deadline has been extended to Feb 15th, 2001.

SMALL PARTS CLARIFICATION

The second bullet item in Rule K1 under the heading "Outside Sources - SMALL PARTS, INC. Catalog" refers to a \$1200 limit on parts from SMALL PARTS, INC. that may appear on your robot. This refers to the catalog price and not the discounted price offered as part of the SPARK certificate.

BALL INFLATION INFO

The large balls are sold as 34" balls by Sport Fun, but will be inflated to 30" nominal diameter. The small balls will be inflated to 13" nominal diameter.

TORQUE MOTOR INFORMATION

The easiest way to hookup the Torque motor is to use cut one of the PWM/Relay cables in the kit and use the female end. You only need to connect to pins 1 and 2 (M- and M+), not all 5.

ADDITIONAL HARDWARE LIST UPDATE

The following item was accidentally omitted from the Additional Hardware List:

Circuit Breaker	30 amp, 12 volt, Auto-Resetting, Any Amount - when used with Speed Controller
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The 30A circuit breakers may be purchased from Innovation First on their web site at <http://www.innovationfirst.com/firstrobotics/>

CORRECTION TO PREVIOUS ANSWER

A7 in Team Update #2 incorrectly stated that the Globe motors may not be disassembled. Removal and modification of the gearbox from the Globe motor is allowed.

REGARDING MODULAR ROBOT DESIGNS

Rule M12 in The Robot and Q12 in Team Update #3 discuss removable robot subsystems. Please keep in mind that Rule GM3 states that you will have a minimum of 2 minutes before a match to learning who your alliance partners are. Therefore, if you plan to select subsystems based on your partners' capabilities, you should design them to mount and dismount in 2 minutes or less. Otherwise, you should plan to make subsystem changes in the pit area before coming to the on-deck area near the playing fields.

MISSING SPEC SHEET

The following spec sheet for the Xenotronix Battery Charger was inadvertently omitted from Appendix H of The Robot.



HPX-30/60

HPX-10

HPX-150

Low Voltage Cut-Off's

Multi-Position

Lead Acid

Standard Products

Request A Quotation

The HPX-30 and HPX-60 lead-acid battery chargers were designed with an emphasis on optimizing recharge time while extracting the maximum battery life possible even in the most demanding applications. This, along with semiconductor and passive device selection based on military standards, assure outstanding reliability. Constant attention to manufacturing engineering and our high quality standards set these chargers apart from other designs presently available.

ADDITIONAL FEATURES:

- IEC Power Inlet with 6' Grounded Detachable Power Cord
- CSA/UL (NRTL) Approved 
- Temperature Compensated
- Single Tri Color LED indicator (Green="float", Yellow = "fast charge", Red= "fault")
- Private Labeling Available



HPX-30



HPX-60

Technical Specifications @ 25° C	HPX-30	HPX-60
Input Voltage and Frequency	115 or 230 VAC switchable +/- 10%, 47- 63 Hz	
Current Limit (Imax) (+/- 5%)	2A at 12VDC 1A at 24VDC	4A at 12VDC 2A at 24VDC
High Rate Voltage	14.70 +/- 0.30 VDC at 12V or 29.40 +/- 0.24 +/- 0.60 VDC at 24VDC	
High Rate Current (+/- 10%)	Imax through Imax/7.5	Imax through Imax/7.5
Float Rate Voltage	13.68 +/- 0.12 VDC at 12VDC or 27.36 +/- 0.24 VDC at 24VDC	
Float Rate Current (+/- 10%)	0 Imax through Imax/7.5	0 Imax through Imax/7.5
Dimensions	5.55" W x 2.90" x 3.6"D	6.65" W x 3.40" H x 5.30" D
Weight	3.8 lbs	7.4 lbs
Temperature Tolerances	Operating 0° to 40° C or 32° to 104° F Storage -40° to 80°C or -40° to 176°	

1031 miller drive ▲ altamonte springs, fl 32701 ▲

407-331-4793 ▲ fax: 407-331-4708

▲ info@xenotronix.com

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QUESTIONS & ANSWERS

- Q24. We are confused regarding the benefit received should a goal end up on a balanced bridge. Are just the points from the large and small balls in/on the goal doubled or do all the points including the ten points per robot in the other end of the field get doubled also?
- A24. First add the points due to the robots, balls, and/or stretcher. Next, apply all multipliers and round up to the nearest whole point.
- Q25. We are interested in using a tracked drive system. In the past our team used a track drive using a snowblower track. We want to know if it is possible to use something like that again.
- A25. If the belt has raised features that mate with a grooved pulley so that it doesn't slip, then I would consider it to meet our definition of a timing belt, which is included on the Additional Hardware List, and allow it.
- Q26. If the goal is lying on its side, will balls on top of the goal (rather than inside it) that are not touching a robot or the floor count for points?
- A26. Yes. Rule SC4 does not state that balls must be "in" the goal.
- Q27. We are considering removing the pins from a chain and replacing them with longer pins. Would the longer pins fall under the "Pins – linkage or hinge" listing in the Rods & Shafts section of the Additional Hardware List?
- A27. Yes.
- Q28. May the mentors or students use strategy aids to help keep score during a match? Some examples may be white boards, palm pilots, and laptops?
- A28. Small whiteboards and other aids are ok as long as you can get on and off the field within the allotted time (see rule GM4). You are allowed to connect a laptop, palm pilot or similar device to the Operator Interface for use with Dashboard software, so it would logically be ok to run other programs on it. However, see Rule DQ6 in Appendix A of the manual and Section 2.2.3 of The Robot section of the manual. We don't want teams on the field using electronic communications to others outside the field area for extra advice, spotting, etc.
- Q29. If we have a small appendage that is inside the goal and that touches a ball that is completely inside the goal (a ball that would still be in a scoring position if the appendage were removed), does that ball count for points or not? How about all of the other balls that in turn rest upon that one? Thanks.
- A29. Any ball contacted by a robot does not count. We have decided that it is too problematic to determine what is "supported by the robot" versus "supported by the goal" so we will only ignore balls directly in contact with a robot (or the surface of the field).

- Q30. Are conveyor and power transmission type belts legal to use in this year's competition?
- A30. Yes, if you purchase them from Small Parts Inc. or manufacture them from allowed raw materials. They are not on the Additional Hardware List.
- Q31. Where can I download a copy of the default program for the Robot Controller? Is it on the Parallax CD that we have?
- A31. The default program and all documentation for the control system are provided by Innovation First on their web site at <http://www.innovationfirst.com/firstrobotics/>. The Parallax CD and manual are provided because they make the programmable chip (BASIC Stamp IIsx) and PBASIC language that are used inside the Innovation First control system.
- Q32. The Additional Hardware List includes six Skyway Wheelchair Wheels. Do these come with bearings and, if so, may we use the bearings for something other than the wheel chair wheels?
- A32. Yes, the wheels come with two bearings each. You may purchase the wheels, take the bearings out and use them for something else.
- Q33. Is there a size limit (of a cart) if a team wants to build or bring something to transport their robot from the pit to the playing field?
- A33. There are no specific rules regarding the size of carts. However, try to keep the base from being significantly larger than the robot base or you may have trouble navigating through the aisles as you go from the pit to the field and back. Also, keep in mind that you will need to keep the cart in your pit area when it is not being used. Many teams find that a footprint about the size of the stretcher plus perhaps extra room on one end for a toolbox is about right.
- Q34. Are we allowed to add an external clock to our controller, or is there a clock built in?
- A34. No. See Rule K1 regarding what you may use to build your robot. There are two easy ways to determine elapsed time. Take a look at the Delta_T and Packet_Num variables in the default program. These will both give you time in units of 1/40th of a second.
- Q35. If a ball is underneath the bridge at the end of the match how will the referees determine if the bridge is balanced?
- A35. The referees will use their common sense to determine whether or not the ball is supporting the bridge. If the ball is under the bridge but there is no visible contact, then it will not matter. If the ball is visibly deformed by force from the bridge, then it will be deemed to be supporting the bridge. In the event that it is not visually obvious, the referees will remove the ball to determine whether or not the bridge is exerting any force on the ball.

- Q36. I have not been able to find any hard documentation as to whether the multipliers are added or multiplied. Is the maximum multiplier 7 (2+2+3) or 12 (2x2x3)?
- A36. The multipliers are multiplied, so the maximum is 12.
- Q37. On additional hardware, we are allowed "Timing Pulleys" up to 6. May we get timing gear stock and cut it into six pulleys?
- A37. Rule K3 states that items on the Additional Hardware List are "off-the-shelf" items. You are allowed to fabricate pulleys from allowed raw materials, but you must account for the raw material and not count them as the pulleys from the Additional Hardware List.
- Q38. Please clarify what is meant by the large ball being "on top" of the goal. On page 3 of The Game, (1.2.4 Match scoring, section a) the rules state that an alliance will receive Ten points for each large ball "in the goal." Rule SC3 states that the alliance will receive 10 points for each large ball that is "on top of a goal." Based on Figure 1.2 and the discussion on pages 3 and 4, "in the goal" seems to be defined clearly as "wholly supported by only the goal" instead of "contained within the PVC piping defining the goal."
- A38. The rules in the Appendix are the formal (more complete) versions of the simplified descriptions and examples in Section 1. The concept of the balls being supported by the goal is what matters. Also, see Team Update #3 where we have reworded rule SC3 for additional clarify.
- Q39. If two goals are tipped on their sides, would balls which are wholly supported by both goals count?
- A39. Yes.
- Q40. We are a bit confused as to what parts are acceptable to purchase and what are not. Are all the parts listed in the Small Parts Catalog available? As an example, if we wanted to purchase hollow aluminum (square or rectangular) is this permissible as I don't specifically see it listed in the Additional Hardware List but it is listed in the Small Parts Catalog.
- A40. Please read Rule K1 in The Robot section of the manual. Items on the Additional Hardware List are "in addition" to what you may purchase from Small Parts and what is in the kit. Further, hollow aluminum tubing can be purchased under the "Extruded Aluminum" listing on the Additional Hardware List if the cross-section is 2x3" or smaller.
- Q41. Various rotational bearings are supplied in the kit and listed in the Small Parts catalog. Bearings were not listed on the Additional Hardware List. We have a need for linear bearings. Is it possible for us to acquire commercial, off-the-shelf bearings for use on the robot?
- A41. No. If the bearings you wish to use are not listed in the Small Parts Catalog or Additional Hardware List, and are not included in the Kit, then they may not be used on the robot. See Rule K1.

- Q42. Are we allowed to use more than two Fisher-Price motors on our robot if we account for their cost in our additional hardware?
- A42. No. Fisher-price motors are not listed in the Additional Hardware List and are not available from Small Parts Inc. See Rule K1.
- Q43. We would like to use 80/20 Alcobond. It is 1/4 inch thick with extruded aluminum top and bottom plates and a corrugated plastic on the inside. Does this count as extruded aluminum? Is this legal?
- A43. No. Extruded aluminum implies an all aluminum structure, not a composite structure.
- Q44. What positions may we place the battery in?
- A44. Per the battery spec sheet in Appendix H of the manual (page H-75), the battery "can be operated, charged or stored in any position without leakage."
- Q45. Will we receive multiplier points for a goal that is held by a robot that is also on the balanced bridge?
- A45. Yes. See Rule SC6.
- Q46. May the students shoot balls into the goals? If so, is there a line that they must shoot behind?
- A46. The students may throw balls over the wall and into the goals. They may stand anywhere inside the alliance station.
- Q47. Do the goals have the capacity to hold all of the small balls inside of them?
- A47. No.
- Q48. May we wedge balls between the rails of a goal to receive points?
- A48. You may wedge balls in the rails so that the goal holds them off the surface of the field and thus in scoring position.
- Q49. May the robot fly?
- A49. There are no rules against flying, but the power to weight ratio of the kit components makes it unlikely. You might, however, reasonably be able to create a ground-effect hovercraft or some sort of jumping robot.
- Q50. May a larger student place a smaller student on his/her shoulders so that they are better able to toss balls into the goals (provided that they stay within the alliance station, etc.)?
- A50. No. That would be a safety hazard.
- Q51. If our robot picks up the goal, fills it with balls and then (for some reason) turns the goal upside down but manages to hold the balls in, will the balls that are not in direct contact with the robot or field still count?
- A51. Yes.

- Q52. At the end of a match, if our robot is on the bridge and is holding a goal off the ground but not actually on or over the bridge and the bridge is balanced, would that get us the 2x score?
- A52. If the robot is wholly supporting the goal and the robot is wholly supported by the bridge, then it counts. See Rule SC6.
- Q53. Imagine the following scenario: A robot attaches to a goal with a cable and then winches the goal onto the bridge and balances it, and then moves to the endzone without releasing the winch which would still be on the goal and perhaps touching the bridge. Is the robot considered "in" the end zone for 10 points? Is the bridge considered "balanced" even with a cable touching it?
- A53. The robot would be considered in the end zone and worth 10 points IF the cable didn't touch the surface of the field. However, if the cable were taut, the referees would determine that the bridge was being held in balance by the robot and therefore you would not get the multiplier for a balanced bridge. Also, the cable would likely present a risk of entanglement and violate Rule DQ3.
- Q54. What happens if the bridge becomes dislodged? Would that constitute damaging the field even if it were unintentional? Will it be "impossible" to dislodge the bridge?
- A54. Please read A15 in Team Update #3.
- Q55. Is the robot allowed to launch the large colored ball over the wall into the alliance station?
- A55. Yes.
- Q56. Are robots allowed to cross under the bar in the middle of the playing field or are they only allowed to go over the top of the bars?
- A56. Robots may pass under or over the bar. Keep in mind that there is a 4x6 wood beam along the floor under the bar, so the clearance is rather small and the robot will have to climb over an approximately 3.5" high step.
- Q57. Are students allowed to reach over the top of the safety shield and grab the large ball off of the robot, or is this seen as having direct contact? The rules say the robot can "pass" the ball over, but can we grab it off the robot?
- A57. That would not be considered direct contact, but the students are not allowed to reach over the field and the robots are not allowed to reach over the alliance station. The robot may hold the ball such that part of the ball sticks over the alliance station and can be grabbed by a student. Alternately, the robot may roll or toss the ball over the safety shield.
- Q58. Are aluminum tubes allowed to be counted as extrusions per the Additional Hardware List provided that they are under 2 inches in diameter?
- A58. Yes.

- Q59. The Additional Hardware List shows that we can use an unlimited number of Victor speed controllers as long as they are controlling a motor. Are there any restriction about using Victor Red speed controllers from previous years?
- A59. You may use Victor Red speed controllers, but must install the Transorb as in previous years.
- Q60. May we mount and wire a motor in such a way that the motor is back-driven by another motor and the resulting voltage is read by an analog input on the robot controller?
- A60. It's a good idea in theory, but the rules do not allow it. As a practical matter, you wouldn't want to do it because the analog inputs on the Innovation First control system accept 0 to +5 Vdc and the motors (acting as generators) will put out -12 to +12 Vdc and would likely damage the Robot Controller.
- Q61. We have a question regarding student interaction with the balls, rules S4 and GM17, GM18 and update Q21 and A21. (1) Is it allowable for students to throw balls from behind the safety shield into the goals. (2) May a goal be brought to the safety shield, by a robot, and students drop the balls in from the top.
- A61. Students are allowed to throw balls over the safety shield and into the goals. The robots may bring the goals up to the safety shields so that the students don't have to toss the balls very far.
- Q62. May we take apart the air pump and use the motor if we are not using pneumatics?
- A62. No. The motor inside the pump is integrated with the pump mechanism and is not designed to be separated.
- Q63. If the goals are touching the weighted supports on the bridge, does it prevent it from being "balanced"?
- A63. No. The weighted supports are part of the bridge, so it does not matter if the goals touch them.
- Q64. What fittings are we supposed to use for the SMC Solenoid Valves to connect them to the rest of the pneumatic system? All of the fittings provided do not fit into the holes properly.
- A64. According to the description of the valves in "The Pneumatic Manual for FIRST 2001 Competition", the valves use the 1/8" NPT fittings. According to the "FIRST Pneumatic Component Bill of Material" listed on page 15 of that document, there are numerous 1/8" NPT fittings included in the pneumatics kit. The demo board for the pneumatics, pictured on page 14 of that document, shows these fittings connecting from the valve to the 1/4" tubing.

- Q65. What is the specified wire gauge for the Globe Motor? The 10AWG as shown on Fig 2.1 of "The Robot" or the 16AWG as specified on Table 2.1 of "The Robot"?
- A65. Table 2.1 is correct.
- Q66. Reference the Globe Motor, why are we compelled to use a speed controller when its stall current is no more than the Seat Motor?
- A66. The stall current at 12V (extrapolated from the specs which are at 10V) is 22.2A, which exceeds the rating of both the relay contacts and fuse in the Spikes. That's why we require speed controllers for the Globe motors.
- Q67. May we press out the fixed end pivot pin on a pneumatic cylinder for purposes of making a custom bracket?
- A67. Yes.
- Q68. In order to reduce the required number of digital inputs to the robot controller (and associated wiring), are we allowed to wire two or more sensors (e.g. microswitches) together to form an external parallel or series logic circuit?
- A68. Yes. See Rule C18.
- Q69. May we put the 20/30 Amp circuit breakers on the output of the Spikes/Speed Controllers versus the input? This would still provide the desired circuit protection plus be beneficial in debugging the programs and address a significant safety issue (i.e. being able to see faulty positions of the relays/controllers before powering up the output device).
- A69. You must keep the circuit breakers in the fuse panel on the input side in order to protect against shorts in the wiring between the 60A breaker and the device. That's also why we now require breakers for the Robot Controller and fans. However, you are welcome to use additional/spare circuit breakers on the outputs during testing.