

THE COMPETITION-1997

TEAM UPDATE #1

Date: January 14, 1997

PLEASE DISTRIBUTE THIS TO OTHER TEAM MEMBERS!

FIRST will provide rules updates and other important information to teams via fax in addition to making it available on our web site. In order to make sure that the information is received, we will attempt to fax these updates to several people on each team. However, it is up to you, the recipient of this fax to distribute it to all the other members of your team in a timely manner. Please do not put your team at a disadvantage by letting this or future information from FIRST languish on your desk, in your mailbox, or other places that it may not be seen until too late. We recommend assigning at least one team member the responsibility of distributing information from FIRST to the rest of the team.

RULES QUESTIONS & ANSWERS

- Q1. Rule P14 states that tubes which leave the boundaries of the player station will be returned to the playing field. Does a tube have to be more than halfway over the line representing the border, or just over the line at all to be considered out? What if a player is holding the tubes off the floor but over the border?
- A1. Tubes which are not contained entirely within the lines of the player station border will be considered out of bounds and will be returned to the playing field unless they are not in contact with the floor.
- Q2. The tie-breaking rules stated in the game description on page 1 of the rule book (section 1.1) are a subset of those in rule P-23, covering only the last two of the five bullet items. Are ties to be decided using the entire procedure in rule P-23, or only the rules involving non-scoring tubes as stated on page 1?
- A2. The description on page 1 is incomplete. The tie conditions are as described in rule P23.
- Q3. Is the coordinated steering mode for the joystick ports which was used in last year's competition available this year? If not, would it be possible to make the specific details available so teams can reproduce it by programming the receiver controller?
- A3. Coordinated Mode is not available as an option on the Transmitter this year. However, it can be easily programmed into the Receiver. See the example code later in this Team Update, which can be easily edited into the control program.
- Q4. Are performance specs available for the drill, seat, and window motors?
- A4. These will be sent to teams in a team update later this week.
- Q5. How much memory is available for user programs in the receiver? Are there any specific divisions between instruction and data space? For reference, how much memory does the default program use?
- A5. The program + data share memory in a 2048 byte EEPROM. There are 26 bytes of RAM available. The default program uses about 243 bytes of EEPROM and 14 bytes of RAM.

- Q6. One of the bearings we received is clearly not machined properly. How do we obtain a replacement?
- A6. Send the defective unit back to FIRST and we will send you a replacement.
- Q7. Is it legal for the robot to extend an appendage into the interaction zone as long as there is no contact with the human player?
- A7. Yes.

CORRECTIONS AND UPDATES TO THE MANUAL

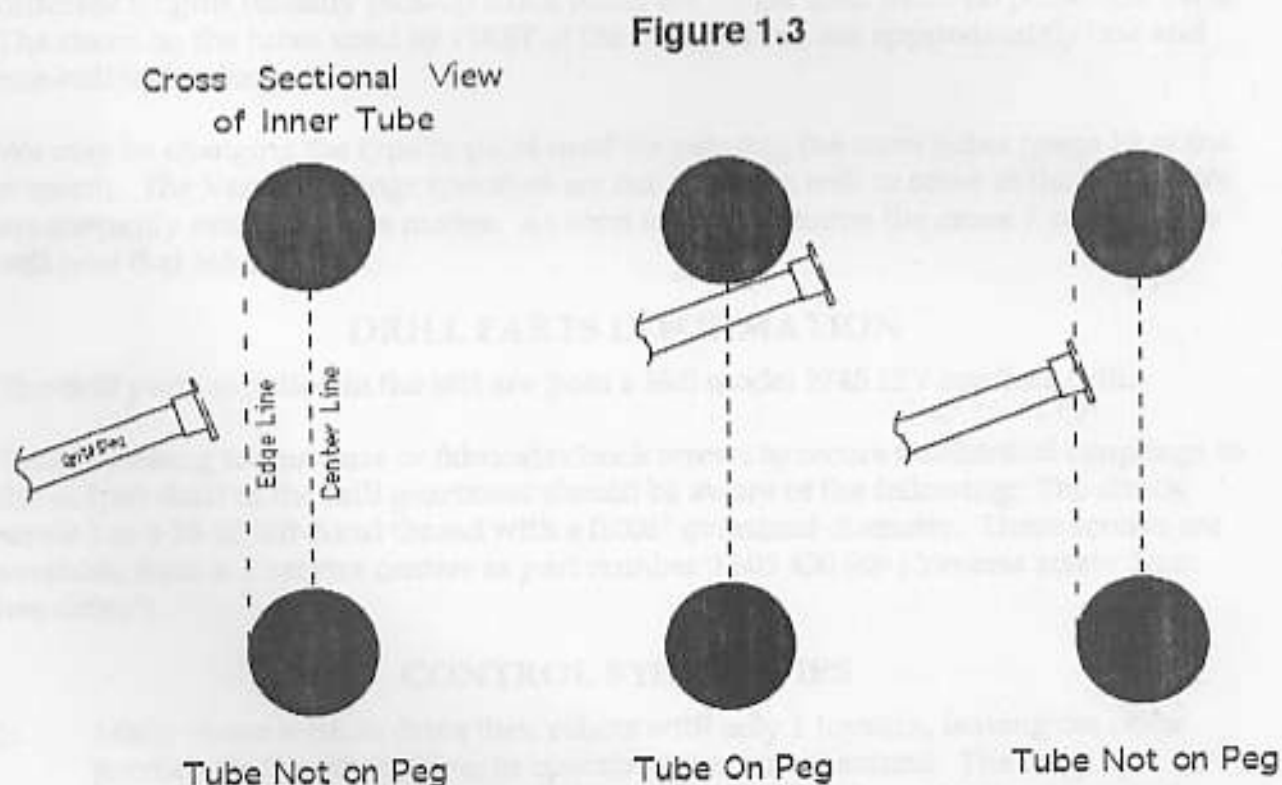
Update to Rule K4 and the Additional Hardware List: The total amount of chain and/or belt from outside sources (other than SMALL PARTS, INC.) which may be used on the machine is 12'.

The plastic key ring kits were omitted from the kit list. These are promotional items from Value Plastics and are not for use on the robots.

The training manual and dongles were not in the kits distributed at the Kickoff. These will be shipped to teams.

The tie-breaking conditions described on page 1 of the manual are incorrect. Refer to Rule P23 for the correct list of conditions.

Figure 1.3 incorrectly shows the status of tubes with respect to scoring position. Below is the corrected Figure 1.3.



The shipping deadlines for the National Championship have changed. Teams shipping to the National Championship drayage site will be allowed to ship BY Tuesday at 5pm, rather than getting it to that site by that time. Thus:

- If your last Regional is the Motorola Midwest Regional, your robot MUST SHIP by Tuesday, March 11, 1997 at 5pm.
- If your last Regional is the New England Regional, your robot MUST SHIP by Tuesday, March 18, 1997 at 5pm.
- If your last Regional is the Johnson & Johnson Regional, your robot MUST SHIP by Tuesday, March 25, 1997 at 5pm.

INNER TUBE INFORMATION

Inner tubes are basically commodity items made by many manufacturers. We have found, however, that tube quality can vary considerably from one manufacturer to another. Our experience is that tubes sold under the Cooper or Mastercraft brand names are more uniform in shape than some of the other brands, and recommend them. Both are manufactured by the Cooper Tire Co. You may find local dealers listed under either of these brand names in the Yellow Pages, or call their customer service number (800) 854-6288 for more information. The proper designation for these inner tubes is type KR-14/KR-15 for use in passenger car radial and bias tires. The dealer will probably list them under the following commodity code or stock keeper unit: 0L40-K45R. Also, you should see some screen printed information on the side of the tubes, and (among other things) you should find the letters TC or TM, which are Cooper's plant identifier codes. Also, be advised that the air stems on inner tubes come in different lengths (usually pick-up truck stems are longer than those on passenger cars). The stems on the tubes used by FIRST at the Competition are approximately one and one-half inches long.

We may be changing the type of paint used for painting the inner tubes (page 19 of the manual). The Vanex coatings specified are not adhering well to some of the tubes. We are currently evaluating the matter. As soon as we determine the cause / solution we will post that information.

DRILL PARTS INFORMATION

The drill parts supplied in the kits are from a Skil model 2745 12V cordless drill.

Teams wishing to purchase or fabricate chuck screws to secure mechanical couplings to the output shaft of the drill gearboxes should be aware of the following: The chuck screw has a 10-32 left-hand thread with a 0.006" oversized diameter. These screws are available from S-B service centers as part number 3 603 430 505 ("reverse screw 3mm hex drive").

CONTROL SYSTEM TIPS

- 1) Many teams wish to drive their robots with only 1 Joystick, leaving the other joystick for the other driver to operate various mechanisms. The most convenient scheme for 1 joystick driving control is to have the Y-axis control speed, while the X-axis controls turning rate. This can be accomplished with a simple modification to the control program running in the Receiver. Source code to do this is provided below:

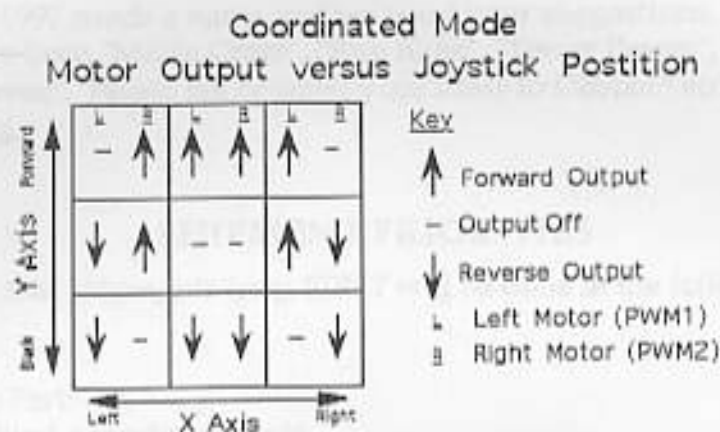
' This example allows Joystick 1 to easily steer a robot with tank-style steering by commanding speed with the Y axis and commanding turning rate with the X axis. The left side drive motor should be controlled by PWM1, and the right side drive motor should be controlled by PWM2.

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Serout SSC, SSCBAUD, [SSC_CMD, PWM1, (((2000 + y1 - x1 + 127) Min 2000 Max 2254) - 2000)]
Serout SSC, SSCBAUD, [SSC_CMD, PWM2, (((2000 + y1 + x1 - 127) Min 2000 Max 2254) - 2000)]
' Serout SSC, SSCBAUD, [SSC_CMD, PWM1, x1] ' This line must be commented out
' Serout SSC, SSCBAUD, [SSC_CMD, PWM2, y1] ' This line must be commented out

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The figure below shows the resultant outputs from PWM1 and PWM2:



- 2) The range of PWM output values which may be sent to the Serial Servo Controller (SSC) is 0-254. 255 is reserved as the Command Prefix (SSC_CMD). The example code above uses the Min and Max operators to limit the calculation to appropriate values.
- 3) PBASIC stores numeric values as positive integers. Byte variables have a value range of 0-255. Word variables have a value range of 0-65535. When performing a calculation that would ordinarily result in a negative number, it will instead wrap around to a very high number, because it knows of nothing less than 0. The example code above shows one way to get around this limitation.
- 4) The PWM and Relays outputs on the Receiver are only enabled when data is being received from the Transmitter. This allows the robots to be shutdown remotely. However, whenever the SSC (which generates the PWM signals) is disabled, it is reset. The default mode for the SSC after a reset is to set all PWM signals to 127. Thus, it is important to update the PWM values quickly after receiving data from the Master CPU. The relays will resume their prior state automatically unless power to the Receiver was cut or there was a brownout.
- 5) When power is first applied to the Receiver, or if the battery voltage gets too low and there is a brownout on the robot, the User CPU (which runs the control program) is reset. When the CPU is reset, all RAM variables are erased, and the control program restarts at the beginning.
- 6) If the control program takes a long time executing instructions within the loop, it may start to miss data coming in from the Master CPU. This is ok, but will result

in an increased response time for driver and sensor inputs. If the control program takes a really long time (more than 0.10 seconds in the loop) or crashes, the Master CPU will consider this an error and perform the following sequence of actions:

- Disable Relay and PWM outputs
- Turn Status LED Red for 1 second
- Resume waiting for data from Transmitter and attempting to communicate with control program

THE COMPETITION NEEDS A NAME

The Competition-1997 needs a name and we want your suggestions. Names of past Competitions have been "Maize Craze", "Rug Rage", "Tower Power", "Ramp 'N Roll", and "Hexagon Havoc". Please fax or email your ideas to Debbie Tetrault at 603-666-3907 or dmt@usfirst.org.

SHIPMENT PRIORITIES

Please be advised that shipments from FIRST will be done in the following order of priority:

- Late Parts
- Unfilled Autodesk Grants
- Autodesk trade-in's

This means that anyone who wishes to trade in their 3-D Studio Release 4 in favor of 3-D Studio MAX will be helped once all other shipments are taken care of.

THE COMPETITION-1997

TEAM UPDATE #2

Date: January 21, 1997

RULES QUESTIONS & ANSWERS

- Q8. May a machine touch or extend into the out of bounds region? Rule T15 addresses only a machine trying to reenter the playing field. May a machine react against the out of bounds region if it does so in an insignificant way; that is, it does so not to reenter the field, but to pick up a tube?
- A8. Reaching out of bounds, such as over a player station, is ok. Incidental contact with an out of bounds surface, such as the floor in the interaction zone of the player station, is ok. However, a machine should not be designed to react with an out of bounds surface. Tubes which are out of bounds, and not contained within a player station, will be returned to the playing field.
- Q9. Does the "vigorous amounts of interaction" referenced in rules M4 and T6-8 imply that a robot should be able to withstand being turned upside down or on its side?
- A9. Based on previous Competitions, it is not uncommon for a machine to be turned onto it's side, front, or back at some point during an event. It is more rare that a machine will be flipped completely onto it's top. It is very common for machines to run into each other at full speed and get into shoving matches, and for arms and various other mechanisms to experience the resultant forces. This should be taken into consideration when robots are designed and built.
- Q10. If machine A flips machine B in a manner consistent with the "no intentional damage" rules, but machine B is not made to withstand being stood on its top and therefore breaks, will machine A have violated rules T5 and T8 or any other applicable "no intentional damage" rules?
- A10. As long as the referees feel that the purpose of turning machine B over was to disable it, and not to intentionally break it, then the drivers of machine A will not be penalized.
- Q11. The fiberglass mat listed in the Additional Hardware List is thick enough to be effectively split into two 4'x4' layers, each 1/16" thick. Is this permitted?
- A11. The Additional Hardware list states that you may purchase 4' x 4' of fiberglass matting, up to 1/8" thick. Slicing a 4' x 4' x 1/8" mat into two 4' x 4' x 1/16" mats is permitted. Purchasing two 4' x 4' x 1/16" fiberglass mats is not permitted.
- Q12. May we use all four batteries simultaneously on the robot?
- A12. No. It would violate Rules C5, C11, C17, and C24.
- Q13. If we get exactly one inner tube in a scoring position at the top of the goal, and no tubes on pegs, what is our score?
- A13. Two points. As explained in Rules P19 and P20, the tube is worth one point by itself, and because it is on the top, it doubles the score.
- Q14. If we get all nine inner tubes in the top scoring position, what is our score?
- A14. The score would be 4608 (9×2^9).

- Q15. May we attach a device to the goal to hold tubes on a peg or on the top? Conversely, may we attach a device to the goal to prevent tubes from being placed on pegs or on top?
- A15. Yes and yes, but with several restrictions.
- The device must be easily removable at the end of the match, so that it does not delay setup for the next match on the field. (see Rule T21)
 - The device must not pose a risk of entanglement to the robots. (see Rule K10)
- Q16. Will points be awarded for tubes which are on top of the goal but not surrounding the Apex Bracket?
- A16. Yes, provided the rotational axis of the goal passes through the open middle of the tube. (See rule P19)
- Q17. We would like to build a 2nd robot/goal. May we purchase extra components from FIRST?
- A17. No. FIRST does not have sufficient components to provide all teams with a second set of additional motors, control system components, apex brackets, etc.
- Q18. If we purchase a 4'x8'x1/4" Lexan sheet from SMALL PARTS, INC. (SPI), may we count the price as if we had only purchased a 4'x4' piece?
- A18. Yes, because 4'x4'x1/4" polycarbonate sheet is listed on the Additional Hardware List. (See rule K1)
- Q19. May we use solenoids?
- A19. You may not purchase solenoids. You may attempt to build a solenoid by coiling the wire in the kit and placing it in series with another control system component (to prevent a short circuit). However, you must observe all wire size and other control system rules. Alternately, the solenoids may be removed from the valves and used as direct mechanical actuators.
- Q20. We interpret Rule K3 as follows: As long as we buy chain, belts, sprockets, pulleys from SPI, we have no restriction except \$\$ on the quantity used. Is this correct?
- A20. Yes.
- Q21. If an inner tube is looped around the Apex bracket AND one of the uppermost pegs, will it be worth two points and then double the score?
- A21. No. To be in the top scoring position, the tube must be fully above the 3 uppermost scoring pegs. See the updated Rule P19 below.
- Q22. On the project box, may we use kit parts to improve the man-machine interface? For example, to make a third joystick to move a pair of pots/switches.
- A22. Yes. The materials used must be legal kit parts and will count against quantity/cost limits. The weight of these materials will not be considered.
- Q23. Does all custom wiring on the Transmitter side need to be concealed within the project box?
- A23. No, but it is recommended for reliability reasons.

- Q24. May we use our own wire within the project box?
A24. No. See Rule C4.
- Q25. May we fashion something to hold the controls in a specific location or orientation provided that it does not deface the Joysticks? (e.g. we could hold them down with straps or wire ties)
A25. Yes. The materials used must be legal kit parts and will count against quantity / cost limits. The weight of these materials will not be considered.
- Q26. May we use a language other than Basic to program the Receiver?
A26. No. You must use the programming software provided in the kit to program the control system. This software only understands PBASIC.
- Q27. I would also like to know if my team's question's are totally private, as in, cannot be heard of from ANY other team?
A27. Questions and answers about interpretation of the rules, and anything else that may be of interest to teams, are always made public. The source of the question is not revealed, however.
- Q28. What is the score if we have three tubes in the top scoring position and none on the pegs?
A28. The score would be $(1 + 1 + 1) \times 2 \times 2 \times 2$, or 24. (See rules P19 & P20)
- Q29. Do "vertical rows" of tubes double the points for all tubes scored in that round, or only the tubes that make up the "vertical row"?
A29. Each vertical row of tubes doubles the overall score, the same as a tube in the top scoring position. (See rules P19 & P20)
- Q30. May the footprint of a robot change after start of a match?
A30. Yes.
- Q31. Rule K10 states net material is allowed, but it is not on list of additional materials or available in SMALL PARTS catalog. How much net material can be used and what are the specifications, if any?
A31. Nets must be constructed from legal kit materials. There are no specifications for nets other than that they must not pose a risk of entangling other robots.
- Q32. During the match, may parts be removed from robot and be left on playing field and/or goal?
A32. Yes.
- Q33. How much time is provided to retrieve loose robot parts after match? Does team member or judges remove them?
A33. Teams have 1 minute to remove these parts from the field once they are allowed back onto the field after a match. The teams are expected to remove all robot parts themselves. (See Rule T21)
- Q34. Is the top face of the 4 x 4 field border out of bounds?
A34. No. It is part of the playing field, so it is not out of bounds. However, machines shouldn't be designed to react off it. (See Rule M6) Thus, don't rely on it as a

surface you can drive on. However, if your robot inadvertently drives on the top of the 4x4's, you won't be penalized unless the playing field is damaged.

- Q35. Are time outs allowed during the seeding matches? If so, what are the guidelines?
- A35. No. Time outs are only for the double-elimination and finals matches on the third day of each event. (See Rules T22 & T23)
- Q36. Are time-outs only to be used before a match starts when a robot isn't quite ready? Or can time-outs be called during a match?
- A36. Time-outs can only be called before the start of a match. (See Rules T22 & T23)
- Q37. If another team calls a time-out, can you use that time to work on your robot?
- A37. If another team calls a time-out, you are still expected to get your machine setup and ready to compete on the playing field. You could perform simple work on it there, though, as long as it does not affect your readiness to start.
- Q38. What will the height of the playing area be?
- A38. The events will be held in gymnasiums at the various colleges, and in a specially constructed area at Disney. There should not be any problems with overhead objects interfering in the game.
- Q39. Can a human player place a tube directly into/onto a robot?
- A39. Yes. However, the human player may not directly contact the robot.
- Q40. Are there any restrictions on the use of the crimp connectors beyond following good engineering practices (using the appropriate size connector for the wire size, etc.)?
- A40. Yes. The only crimp connectors allowed are fully insulated spade connectors, such as the Thomas & Betts units supplied in the kits. (This is both to facilitate inspection and prevent accidental short circuits.) See the Corrections and Updates section below for details.
- Q41. Do you have any suggestions or guidelines regarding the drill motor gear box torque selector settings? For example, are the gears known to be appreciably less robust at any particular settings?
- A41. Most teams just pick the highest torque setting and leave it there. Some modify the gearbox so that it will never slip. The torque settings do not change the gear configuration inside the gearbox. The speed selector lever, though, controls whether there is a 2 or 3 stage reduction, and should not be switched while the motor is turning.
- Q42. Is the 2K of EEPROM in the receiver all available to the user, or is the default program loaded in part of that memory?
- A42. There are two 2048 byte EEPROMs for the User CPU. One with the default control program, which cannot be overwritten by the teams, and another for the user control program. The DIP switches on the Receiver select which EEPROM is active.
- Q43. May we connect more than one seat motor to the output side of a speed controller?

A43. No. See Rule C13.

Q44. Is it legal to obtain raw materials identical to those in the SPI catalog from sources other than SPI?

A44. This is not allowed under normal circumstances. If special circumstances warrant it, such as if SPI will be out of stock of some item for an extended period of time, then you must contact Eric Rasmussen at FIRST for permission to obtain the item elsewhere.

Q45. After scoring for a match has been completed: (a) will it be possible to have the control system activated in order to permit retraction of extended appendages? (b) will the referees remove items placed on top of the goal which are out of reach of the team members? If not, is it permissible to use the robot or for the team members to use a ladder to do so?

A45. Teams will have 1 minute to remove their robot and any parts it deploys from the playing field. During this time, controls will be re-enabled if necessary. Ladders probably won't be available. Robot parts which clamp onto the goal should be designed for easy removal at the end of the match. (See Rule T21)

Q46. Can the robot configuration be changed at the competitions as long as robot weight, volume and safety are not comprised? Can you change configurations for a specific match?

A46. See Rule M10. Robot configuration can be modified between matches if no parts are added to or removed from the robot.

Q47. Can/Does FIRST provide an inspection of the robots between competitions if work has been performed in the pit?

A47. Robots will be inspected at each Competition event. (See Rule M3) Once robots pass inspection at an event, they will usually not be inspected again at that event. Teams are expected to continue abide by the rules after passing the initial inspection. If a team wishes to have their robot re-inspected to insure rules compliance, they may ask FIRST officials to do so. If Team A suspects Team B of a violation, Team A may approach FIRST officials and ask them to take another look at the Team B's robot. This is an area where "Gracious Professionalism" is very important.

Q48. May we use any length of chain from SPI?

A48. Yes, as long as you do not exceed the \$425 limit on parts from SPI. (See Rules K1, K3, K4)

Q49. Is it permissible for the robot to drop off something (a length of rope for example) at the player station, which the human player then manipulates and returns to the robot?

A49. No. The rope would be considered part of the robot and it would therefore violate Rule P10.

Q50. In the additional hardware list, it states that we may use a 4'x4' piece of 1/2" plywood, 5/8" chipboard OR 7/16" particle board. Does this mean we can use a piece of plywood AND a piece of chipboard or particle board?

A50. No. You may use a 4'x4' piece of 1/2" plywood OR a piece of 5/8" chipboard OR a piece of 7/16" particle board.

Q51. Are there any limitations on the number of gears we purchase from SPI?

A51. Only that you must not exceed the \$425 limit.

Q52. Must we ship the robot to The Competition or can we bring it with us?

A52. If you refer to page 62 of The Rules, it states that teams competing at any regional must have the robot out of their hands by Tuesday, February 25th at 5pm. You may drive the robot to the drayage/storage facility or ship it, but it must be out of your hands by that date either way. Please refer to Appendix H for information about the drayage sites.

Q53. Rule K11 states that latex tubing in the kit is considered a spring, but latex tubing from SPI is not. If the latex tubing in the kit becomes worn or breaks, may we replace it with an equal length of latex tubing from SPI?

A53. No. The latex tubing from SPI is different from that provided in the kit. The latex tubing in the kit is supplied by Totalmed. Contact information for Totalmed is listed in the Supplier Directory in Appendix C.

Q54. In Team Update #1, there was an adjustment made to the shipment dates for robots going to the National Championship. However, the update only covered teams participating in Regionals. If you are only participating in the National Championships, what is the ship date? Is it February 28 as stated in the manual or has it been changed to March 4th or February 25?

A54. Teams who are competing only in the National Championship still have the same ship date - February 28th by 5pm - as it is stated on page 62 of The Rules.

Q55. May we weld metal to build our robot?

A55. Yes. Welding is considered a fastener.

Q56. Are there any types of electrical connections which are not permitted to be made with the spade connectors? Specifically, are we allowed to slide female connectors on the contacts of the circuit breakers (ensuring that the mechanical connection between the connector and device is secure and that any exposed portion of the device contact is insulated)?

A56. Spade connectors should only be connected with other spade connectors. That is, don't try cramming the end of a wire into the non-crimping end of a spade connector. The connectors on the auto-resetting circuit breakers are male spade connectors, so it is acceptable to connect to them with female spade connectors.

Q57. In a previous reply you indicated that the torque selector on the drill motor gearbox does not change the gear configuration. Is it safe to assume then that it has no effect on the motor speed?

A57. It shouldn't have any effect (unless it slips, of course). FYI, the slip clutch works as follows: A bunch of spring-loaded ball bearings are pressed into grooves in a part of the final gear stage. During normal operation, the bearings prevent this stage from rotating. The higher the torque setting, the more the preload on the bearings. When the output torque gets too high, the bearings are (temporarily) forced up out of the grooves, and the final stage slips, making a loud clicking sound.

- Q58. It does not appear to be possible to mount all the input switches and pots in the supplied project box. Is it permissible to purchase a larger box of similar design to be used only for the operator controls in place of the supplied box?
- A58. You may not purchase a larger project box (unless SPI sells one). However, you may use kit parts (including things on the Additional Hardware List and from SPI) to construct something on which the switches and pots may be mounted. Parts used to aid the drivers will count against the \$425 limit on parts from SPI or quantity restrictions on parts from the Additional Hardware List, but not against the robot weight limit.
- Q59. May the pneumatic chamber (accumulator) be charged prior to the start of a match?
- A59. Yes. (See Rule M1)
- Q60. May the robot configuration be changed on the trial day (Thursday) of the Nationals prior to inspection ; i.e. increase wheel diameter, lengthen an arm, shorten arm. etc.
- A60. Yes. (See Rule M10)
- Q61. May the inner tube included in the kit be used as part of the robot?
- A61. Yes, but not as an inflated inner tube. That would cause too much confusion on the playing field, and would also violate Rule M12.
- Q62. May the apex bracket provided for construction of the goal be used on the robot?
- A62. The apex bracket is intended to aid teams in the construction of a goal for purposes of prototyping robots and getting practice. If desired, it can be used on the robot. However, FIRST will not provide a 2nd bracket to teams which use the apex bracket on their robots. Also, FIRST has a limited quantity of spare apex brackets which are reserved only for teams using the brackets as part of a goal. FIRST will not provide replacement brackets to teams which use them on their robot, even if the bracket somehow breaks.
- Q63. When reaching into the interaction zone, is the robot permitted to contact the carpet inside the zone?
- A63. The Interaction Zone is not considered part of the playing field. (See Rule P9) Therefore, the robot should not "apply power" to the carpet, such as by driving on it. (See Rules T15, M6) Incidental contact with the carpet is ok, as is extending a mechanism over the carpet.
- Q64. If I understand the rules correctly, whenever a robot is tipped over, it is deactivated for the rest of the match. However, what if the robot could right itself? For example, using a linear actuator to push the robot into an upright position.
- A64. No, robots are only deactivated if they leave the playing field or for a variety of offenses. If a robot tips over (assuming it is still inside the playing field) then it is allowed to right itself.
- Q65. Can the human player throw the tubes with the intent on knocking over, but not damaging, another robot?
- A65. Yes.

- Q66. Regarding Small Parts Inc.: Are we allowed to buy \$425 of anything from SPI?
Or, are we limited to \$425 of the things listed on page 35 and 26?
- A66. You can purchase anything from SPI. There are some limitations on what you can do with it, however. See Rules M1 and M12, for example.
- Q67. Is rubber cement an allowed adhesive for construction?
- A67. Yes.
- Q68. Would going after another team's robot, with the intent to turn it over, be considered malicious (and hence, not allowed)?
- A68. It depends on the context. If it is clear that the only reason for overturning a robot is to break it, then yes. If you are trying to prevent it from achieving some task, such as scoring, then that is ok. This will be a judgment call by the referees when it happens.
- Q69. If it could be constructed with 'legal' parts, is a helicopter (flying) design allowed?
- A69. Yes, it is allowed. However, it must remain over the playing field and must not be considered a safety hazard (exposed whirling blades are dangerous) by the referees.
- Q70. Wire ties (zip ties) are considered fasteners, right?
- A70. Yes, as long as they are used to fasten things together. For example, if many wire ties are strung together to form a belt, they would not be considered fasteners.
- Q71. Can we use net material on the goal? What else are we allowed to use it on?
- A71. You may use a net or other devices that you construct on the goal. However, the net must not pose a risk of entanglement to the robots, and anything you put on the goal must be easily removed after the match is over. (See Rules T5, T21, K10)
- Q72. May energy used by the robots in The Competition be stored on-board the robot before the match begins in any or all of the storage means listed in Rule M1?
- A72. Yes. If it had no stored energy, it could not move.
- Q73. Is it ok to use sheet metal screws through the rubber on the wheels in order to provide additional traction? We have determined that screws skidding on the carpet do not damage the carpet.
- A73. Rounded screw heads against carpet might be ok, but not screw points. If a problem develops during an event, then the screws must be removed.
- Q74. Can fasteners/screws be used to ensure that the tire is tightly fastened to the wheel?
- A74. Yes.
- Q75. Can dry lubricants be used on robot surfaces which may contact other robots, the goal or inner tubes?
- A75. Not if the lubricant can come off onto the other robots or playing field.
- Q76. What is the penalty if a player steps into or applies weight in the Interaction zone?

A76. The referees will use a progressive scale of penalties depending on the effect of the infraction. (see below) If a player inadvertently steps over the line, and it does not affect the outcome of the match, then they will receive a minor penalty. If stepping over the line affects the outcome of the match, such as when throwing a tube that scores or otherwise affects the outcome, then the team may be disqualified. Repeated minor infractions will result in increasingly severe penalties. Penalties will be indicated by Referees throwing down flags color coded to the team receiving the penalty.

Minor Penalty #1: Warning

Minor Penalty #2: Lose 1 point (prior to doubling)

Minor Penalty #3: Lose additional 2 points (prior to doubling)

Minor Penalty #4: Lose additional 4 points (prior to doubling)

Minor Penalty #5/Major Penalty: Disqualification

Q77. In achieving a "vertical row" does the depth of the tube matter?

A78. No.

Q78. Does a "vertical row" double the entire score or just double the points received on that row - meaning instead of three points for the three tubes in the row you would get six?

A78. It doubles the entire score.

Q79. If a robot is out of bounds and must be turned off, what happens to any tubes that the robot may be carrying?

A79. Tubes that are securely held by the robot will not be returned to the playing field. This is a practical matter designed to prevent damage to the robots and/or tubes. If the tubes are easily retrieved or fall from the robot to the floor, they will be returned to the playing field.

Q80. If 3 tubes were to be placed out of bounds by the player in a stack, would they be placed into play in a stack or not?

A80. No. They would be returned to the field as 3 separate tubes.

Q81. What is the penalty if a driver, coach, or player accidentally or intentionally leans into or reaches into the playing field?

A81. It will be treated in the same manner as a player stepping out of bounds. Minor penalties between the drivers/coaches and players will be cumulative.

Q82. Is it acceptable to latch or clamp onto the goal?

A82. Yes, but with several restrictions.

- The device must be easily removable at the end of the match, so that it does not delay setup for the next match on the field. (see Rule T21)
- The device must not pose a risk of entanglement to the robots. (see Rule K10)

Q83. May robots attempt to steal tubes from an opponents player station? What happens if there is a tug-o-war between the robot and the player?

A83. Yes. The robot drivers and player involved must be extremely careful. If the player steps into the interaction zone, they will be penalized (See Rule P7 and the

penalties listed in this Team Update). If the robot has to apply power to the interaction zone (as per Rule T15) it will be disabled.

- Q84. Does the cost of the Kee Clamps or other components on the goal count against our \$425 limit?
- A84. No. The \$425 limit applies only to parts purchased from SPI that are used on the robot or driver controls. (See Rule K1)
- Q85. May we tie tubes together with a large cable tie or C-Clamp?
- A85. Yes, but it must be easy to undo after a match. Also, cable ties used in this manner are not considered fasteners. Therefore, they would have to be purchased from SPI.
- Q86. May we launch projectiles from our robot at or into the path of other robots?
- A86. Yes. Projectiles are subject to the limitations in Rules P11, S5, & S6. Shooting projectiles to knock tubes down or to impede the progress of a robot is ok. Do not shoot projectiles designed to do damage or entangle an opponent.

CORRECTIONS AND UPDATES TO THE MANUAL

Section 5.7 contains an error in the paragraph immediately under the heading "Double Elimination Tournament & Finals". The last sentence should read: "Double Elimination concludes at the quarter finals, when there are 8 teams left."

The second bullet of Rule C1 is changed to read:

- The user programmable code in the Receiver may be customized through the normal operation of the programming software (STAMP2.EXE).

The following item is added to Rule K1 under the heading Unlimited Quantity Items:

- Crimp-on spade connectors – if used to conduct electricity, used with the proper gauge wire and mating connectors, crimped properly, and fully insulated, such as the Thomas & Betts units provided in the kits. Other types of crimp-on connectors are not allowed.

The second bullet of Rule P19 is changed to read as follows:

- Each tube on or above the center of the top of the goal is worth 1 point. A tube will be considered "on or above the center of the top of the goal" if the rotational axis of the goal passes through the open middle of the tube, and the tube is resting on or above the three uppermost pegs.

Rule T15 is changed to read as follows:

- T15. If a robot goes out-of-bounds to the point that it has to apply force to any out-of-bounds surface to rejoin play, its control system will be disabled. When this happens, the human player is allowed to leave the player station (without penalty), walk around the outside of the playing field to the robot, and return the robot to the field near the point at which it exited. The robot may not be placed in contact with tubes or another robot. The player may then walk back to the player station, at which time the robot will be re-enabled.

Figure 1.2 is mislabeled. It shows the playing field layout for the Finals Rounds, which start at the Quarter-Finals when there are 8 teams left. The correct label for Figure 1.2 is "Playing Field - Top View, Finals Rounds".

There is an error in Table 4.2. Pin 4 is actually Analog Input 1, not 2.

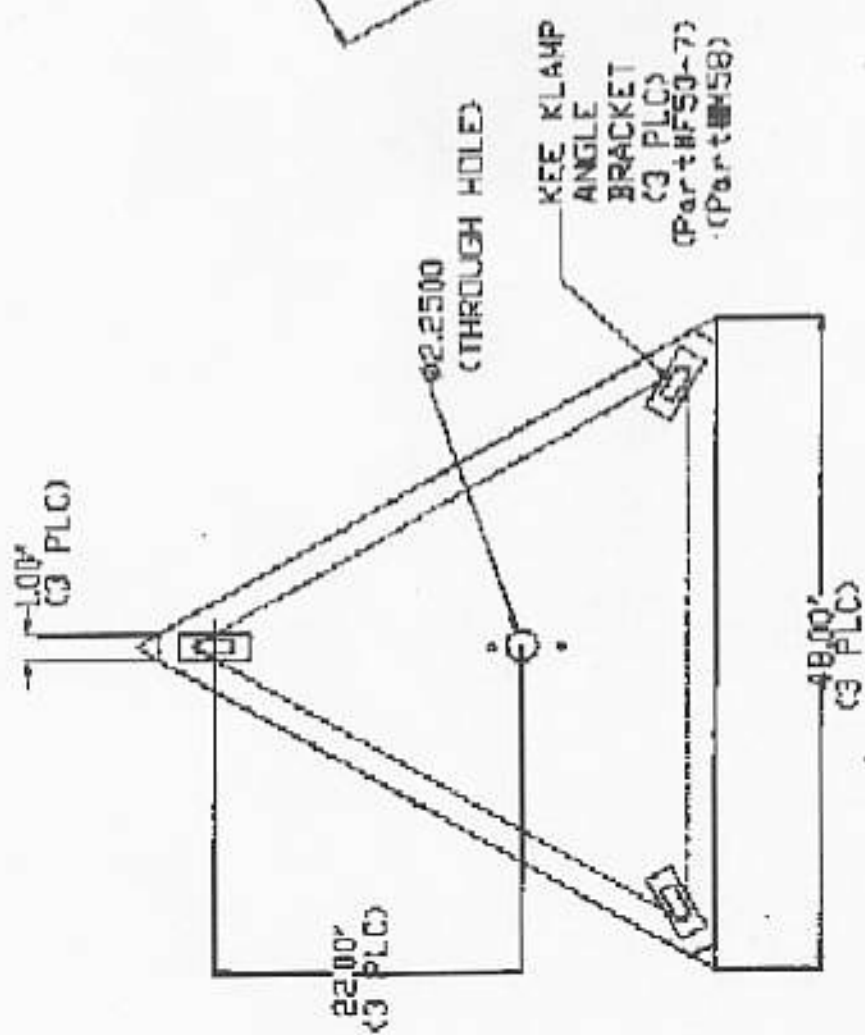
Some teams have had difficulty interpreting Table 4.4. This table describes the functionality of the Default Control Program loaded into the User Programmable CPU on the Receiver. "TX Switch #" represents the numbered Switch Input on the Transmitter, as described in Table 4.2. "RX Switch #" represents the numbered Switch Input on the Receiver, as described in Table 4.6. If a TX Switch is pressed (closed), the corresponding Relay Output pin will change state from GND to +12Vdc. RX Switches 9-16 can also be used to activate the corresponding outputs on Relays 5-8. RX Switches 1-8 act as safety overrides and disable the corresponding Relay Output pins, even if the corresponding TX Switch input is pressed. Analog Inputs on the Transmitter are mapped directly to the corresponding PWM outputs on the Receiver.

Table 4.6 is incorrect. Below is a corrected Table 4.6.

Table 4.6 - Input to Output Mapping of Default Receiver Program

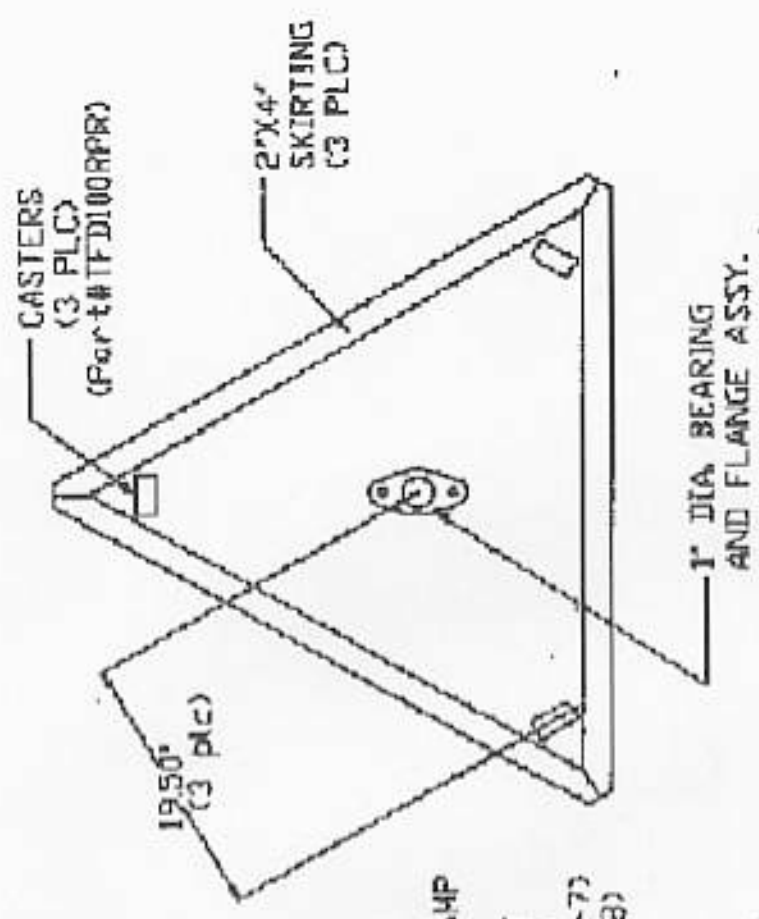
Pin Description	RX Variable
Pin 1: Switch Input 1	rx_sw1
Pin 2: Switch Input 3	rx_sw3
Pin 3: Switch Input 5	rx_sw5
Pin 4: Switch Input 7	rx_sw7
Pin 5: Switch Input 9	rx_sw9
Pin 6: Switch Input 11	rx_sw11
Pin 7: Switch Input 13	rx_sw13
Pin 8: Switch Input 15	rx_sw15
Pin 9: Ground	-
Pin 10: Ground	-
Pin 11: Ground	-
Pin 12: Ground	-
Pin 13: +5Vdc	-
Pin 14: Switch Input 2	rx_sw2
Pin 15: Switch Input 4	rx_sw4
Pin 16: Switch Input 6	rx_sw6
Pin 17: Switch Input 8	rx_sw8
Pin 18: Switch Input 10	rx_sw10
Pin 19: Switch Input 12	rx_sw12
Pin 20: Switch Input 14	rx_sw14
Pin 21: Switch Input 16	rx_sw16
Pin 22: Ground	-
Pin 23: Ground	-
Pin 24: Analog Input 1	sensor1
Pin 25: Analog Input 2	sensor2

The following figure was accidentally omitted from Section 2.



TOP VIEW.

GOAL BASE



BOTTOM VIEW

CORRECTIONS TO THE BLUEPRINT

The 1" clearance shown between the bottom edge of the skirt of the triangular base of the goal and the surface of the caster unit wheels is incorrect. This dimension (Goal Elevation and Detail Section Goal Base views) should be 1 9/16". When the goal is in position on the circular base, the clearance between the bottom of the skirt and the surface of the aluminum disk will be approximately 1 9/16".

PLAYING FIELD INFORMATION

The carpet used for the playing fields is available from:

S.S. Mills, Inc.
P.O. Box 1568
Dalton, GA 30722
800-241-4013 or 706-277-3677

The product description is: Item BR20, Code 87509, Brassfield 20/Pewter

NEW PARTS AVAILABLE FROM SMALL PARTS, INC.

SMALL PARTS, INC. has added the following items to their selection of available parts:

Part #	Dimensions	Price (\$)	
		Each	10
SHDX-6/16	Shoulder Screw St/St 3/8" x 1"	5.20	41.00
SHDX-6/32	Shoulder Screw St/St 3/8" x 2"	6.90	56.00
SHDX-6/48	Shoulder Screw St/St 3/8" x 3"	10.60	88.00
SHDX-8/16	Shoulder Screw St/St 1/2" x 1"	9.80	80.00
SHDX-8/32	Shoulder Screw St/St 1/2" x 2"	12.80	96.00
SHDX-8/64	Shoulder Screw St/St 1/2" x 4"	16.90	135.00

Note: 3/8" Shoulder Screws have 1/2" long 5/16-18 thread
1/2" Shoulder Screws have 5/8" long 3/8-16 thread

Screws are made of 18-8 Stainless Steel

AUTODESK

Grant Applications:

Please note that Autodesk grant applications are no longer being accepted.

Trade-ins:

Teams that wish to trade in 3-D Studio Release 4 for 3-D Studio MAX must do so no later than January 31st.

Shipments:

We are currently waiting for a shipment of software from Autodesk and cannot fill any more grants until it is received. We will make every effort to finish shipments by January 24th, assuming that our shipment arrives on time. No expedited shipping is available.

LATEX TUBING

FIRST has a limited supply of replacements for the latex tubing provided in the kits. If your latex tubing becomes severely worn or breaks, send it back to us and we will provide a replacement. Teams who expect to do a lot of prototyping or testing with the latex tubing may find it easier to purchase a roll directly from the supplier, Totalmed. The Totalmed part number for the latex tubing is TMED-2101. Contact information for Totalmed is listed in Appendix C - Supplier Directory.

MORE DRILL PARTS INFORMATION

Teams wishing to obtain spare drill parts should be aware of the following: The drills are not yet available in hardware stores. Parts can be obtained by calling the S-B Central Distribution Center at 800-815-8665. The full part number for the drill is HD2745-04.

The slip clutch on the Drill Gearboxes is rated for up to 190 in-lb of torque in the maximum setting.

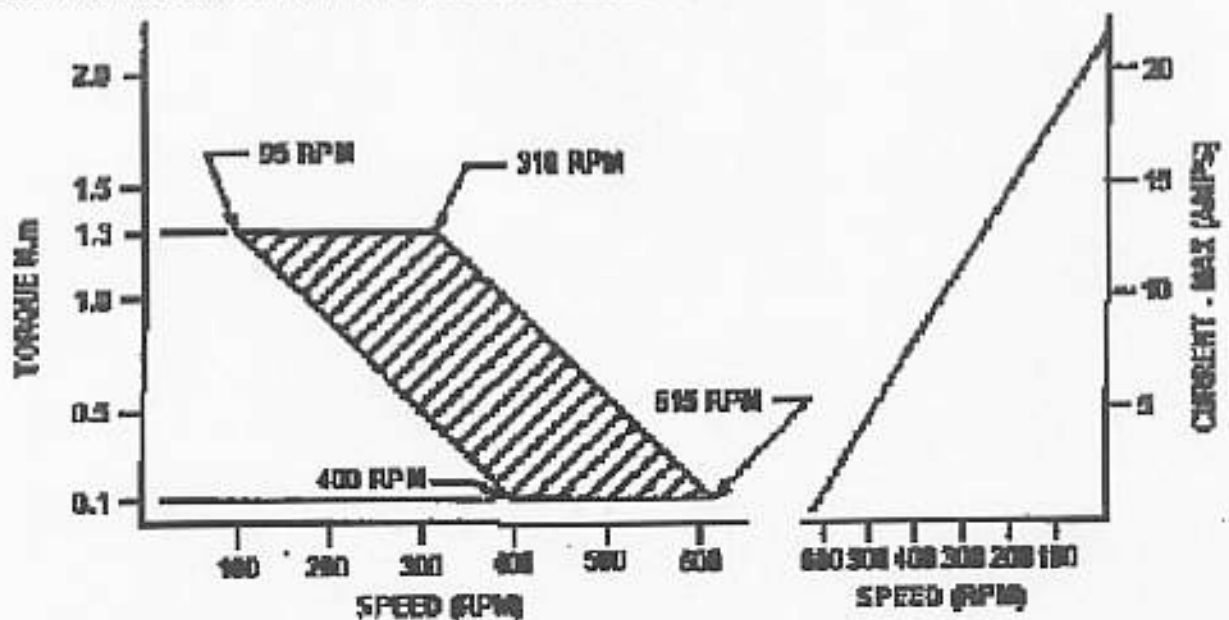
MOTOR PERFORMANCE DATA

FIRST does not have a drill motor performance graph that can be faxed to teams at this time. However, some useful information about the drill motors follows:

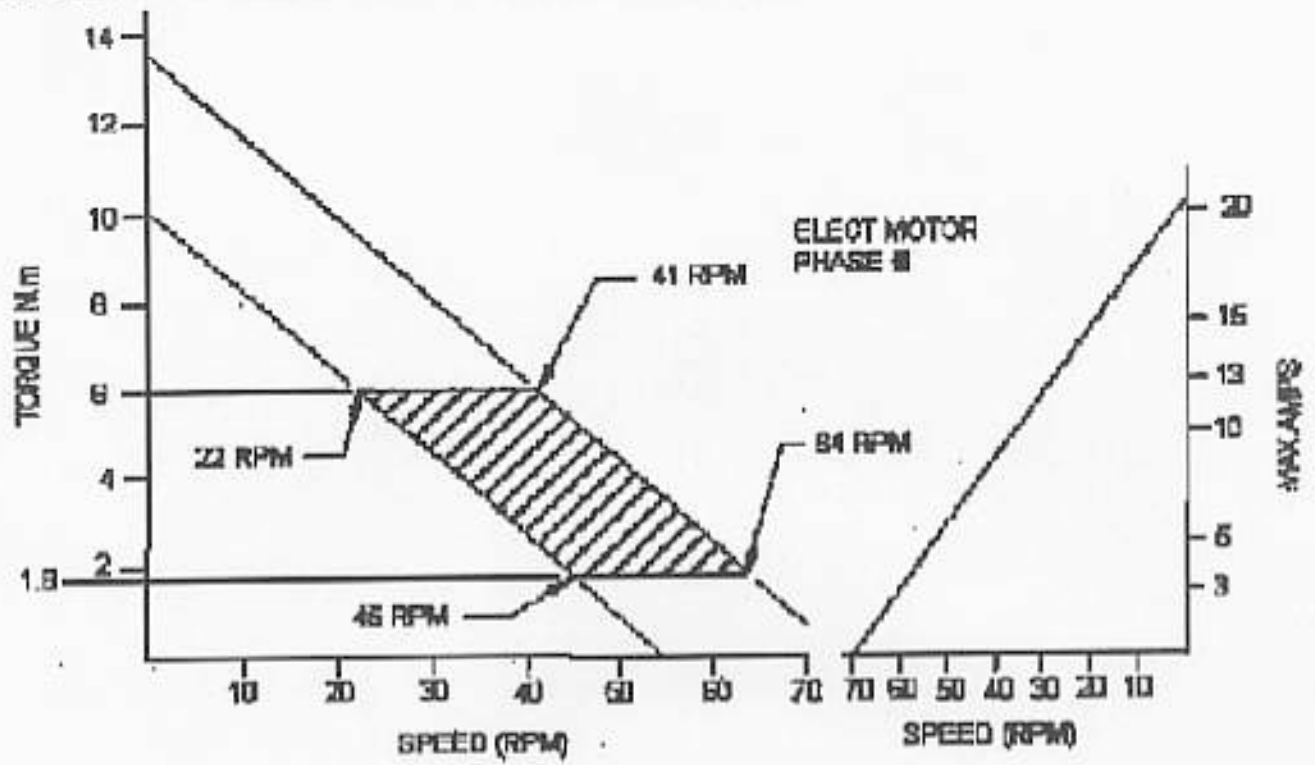
<u>No Load Uncoupled</u>	<u>Locked Rotor</u>
3.826 A	81.9 A
21665 RPM	0 RPM
46.5 W	352.9 W
0 oz-in	53 oz-in

The drill gearbox has a ratio of 64.1 in low gear, and 20.3 in high gear.

Performance data for the seat motors is as follows:



Performance data for the window lift motors is as follows:



THE COMPETITION-1997

TEAM UPDATE #3

Date: January 27, 1997

RULES QUESTIONS & ANSWERS

- Q87. Is it acceptable to send the robot without controls to the storage so that we can practice with a reserve machine?
- A87. The controls must be put in storage along with the rest of the robot. It would not be appropriate for your team to practice with a reserve machine, as it would give you an unfair advantage over your competitors.
- Q88. May we use a flexible material (i.e., latex tubing, wire, etc.) to lasso the goal, an inner tube, or another machine, without it be an "entanglement" foul? (lasso would be a 'closed' loop)
- A88. Lassoing another robot would definitely be considered entanglement. Lassoing the tubes or goal is not specifically prohibited. However, it would seem likely that a loop of long, thin, flexible material could easily get caught on part of a robot or wrapped around an axle. If this happens, then it will be disallowed for future matches.
- Q89. Can you clamp/ attach to the goal (not a wedge under the triangle) to prevent/ cause rotation?
- A89. Yes. See Rule P24.
- Q90. In scoring, (rule P20) does the phrase "doubles the score" refer to the entire score? Or do vertical rows only double the row points (6 instead of 3)?
- A90. Yes. All doubling conditions double the entire score.
- Q91. In scoring, does the horizontal order of the inner tubes on the rungs matter to vertical row formation? Ex. top rung= R-B-R....middle rung= R-R-B.....bottom rung=R-R-B... does this equal one Red vertical row plus two points or two complete Red vertical rows (and one Blue)?
- A91. Horizontal order is not considered. The above example would be two Red rows and one Blue row.
- Q92. In scoring, it is physically possible to loop an inner tube over both a top rung and the apex ring. How would that be scored?
- A92. It would only count as being on the upper peg, not the top. (See the updated Rule P19 in Team Update #2)
- Q93. Where can the player store tubes?
- A93. Tubes which are on the floor and fully contained within the boundaries of the Player Station (which includes the Interaction Zone) will not be automatically returned to the Playing Field. Also, tubes being held off the floor by the player will not be returned to the Playing Field, even if they are over a portion of the floor that is outside the Player Station boundaries.

- Q94. Is there any penalty for scoring an opposing team's tube on the goal?
A94. No. However, the opposing team will receive points as if they had placed the tube on the goal.
- Q95. If our robot has a large container on the end of its arms, can the human player place tubes into this container?
A95. Yes, as long as the player does not touch the container. (See Rule P10)
- Q96. If we raise a container of tubes above the goal, such that the rotational axis of the goal passes through the open center of the tubes, does the container have to be open on the bottom?
A96. No, the container does not have to be open for the tubes to score. However, it would greatly facilitate the referees jobs if they didn't need to get a ladder to count points at the end of a match.
- Q97. May we spin the goal?
A97. Yes. (See Rule P24) However, due to the high mass of the goal, excessive rotational velocity may be deemed a safety hazard and disallowed. (See Rule 53)
- Q98. We understand that, per the Additional Hardware List and Rule K6, we may not purchase a piece of 1/4" thick aluminum plate larger than 1' x 2' from a supplier other than SPI. Is there a limit to the number of pieces we may purchase?
A98. Yes. Unless otherwise specified, only 1 of each item on the Additional Hardware List may be used on the robot.
- Q99. May we use PVC square (but hollow inside) tubing approximately 3 and 1/2 to 4 inches on each side? It is available nearly anywhere where the approved PVC tubing is - HQ, Home Depot - etc.
A99. It is not on the Additional Hardware List. Therefore, unless you can get it from SPI, it is not allowed.
- Q100. Are the materials listed in the Additional Hardware List and the Unlimited Quantity List the only things that we can purchase from outside sources other than Small Parts? If so, what do we do if Small Parts sells something that we want but not in the size that we need it?
A100. Yes. If don't see an item you want in the kit or on the Additional Hardware List, and SPI doesn't sell it, then you have to fabricate it from raw materials or use something else.
- Q101. If we purchase materials from an outside source other than Small Parts, do we have to use the price in the Small Parts catalog to determine how much we have left of our \$425 credit, even if the item that we purchased cost less than what Small Parts sells it for?
A101. The only items that you may purchase from a source other than SPI are listed on the Additional Hardware List and in Rule K1 under "Unlimited Quantity Items". These items, up to the maximum quantity listed, do not count against the \$425 limit, even if purchased from SPI. (See Rule K1)
- Q102. Can we use any more ROHACELL than what was given to us?
A102. No.

Q103. Can we pump up the accumulator before the competition starts?

A103. Yes, but only with the pumps in the kit. (i.e. no hooking it up to a powerful shop compressor)

Q104. Are there any common mistakes or pitfalls that new teams commonly run into?

A104. Make sure that you test your machine before you arrive at an event, and give your drivers as much practice as possible. If you haven't built some sort of prototype (motors and wheels mounted on a board running around the floor, pickup mechanisms, etc.) by the end of the 3rd week, you are way behind schedule. If in doubt, consult the manual and team updates. If that doesn't answer the questions, call FIRST. It's far better to find out 2 weeks or even 2 days before you ship that something you wanted to do is against the rules instead of finding out at the event and having to scramble to re-engineer your robot.

Q105. Per Appendix H, robots competing in the New England Regionals must be delivered to the named drayage/storage outfit by 5pm, Tuesday February 25. The competition begins Thursday, March 13, two-plus weeks later. Why the sixteen day construction and testing black-out?

A105. The reason for the early ship date is to make it fair to all teams. If we allowed some teams to keep their robots until just before the event dates, then teams competing in Chicago would be at an extreme disadvantage, and teams competing in New England would be at a disadvantage compared to teams competing in New Jersey. Giving everyone the same ship date gives every team the same amount of design & build time.

Q106. Is it legal to pick up and relocate the goal; moving it out of the spinning area. or knock it over?

A106. No, the goal is not designed to be lifted. It would damage the bearing mount and is therefore forbidden by Rule T9.

Q107. The Rules state clearly that only the wire in the kit may be used. I want my group to wire up the motors etc. so that I can have one group getting experience with the control system while other parts of the design are finalized. Is it ok to use other wire as long as it is the same gauge and color as the wire included in the kit and as long as there is no more wire appearing on the robot than was included in the kit. That way we won't have any safety concerns from using inappropriate setups.

A107. Non-kit wire may not be used on the robots at the events. However, alternate wire of sufficient diameter may be used during prototyping.

Q108. We are having difficult interpreting Rule K6. Does K6 mean that we can purchase/use more than one sheets or boards (for example: can we purchase and use more than one 4'x4'x1/32" aluminum plate?)

A108. No. You may purchase one plate of 1/32" aluminum with maximum dimensions of 4' x 4'. (Some teams made the incorrect assumption last year that 4' x 4' piece could be changed to 2' x 8' because the surface area was the same.)

Q109. Similarly, does this Rule K7 mean we can purchase/use only one piece of closet rod or PVC pipe?

A109. No. You may purchase one length of rod/pipe in each of the diameters listed.

Q110. May energy be stored by means other than electrical?

A110. Yes. See Rule M1.

Q111. Does the robot have to be able to self extend after it passes the size limits or can parts be fastened on afterwards provided they were with the robot when it was measured?

A111. Robots must conform to the size restriction listed in Rule M2 both during inspection and at the start of each match. Once a match has started, robots may self extend. (See Rule M5)

Q112. Is it required that we operate a 3' x 3' wheelbase, or can we start 4' high, fall down (if you will) and operate at a 3' x 4' wheelbase?

A112. The starting envelope is a 3' x 3' base and up to 4' high. The robot may change shape and orientation as desired after the start of the match.

Q113. Can we take our pneumatic actuator, extend it, cap one port, and use it as a spring?

A113. No. (See Rule K11) Also, if it got slammed down, the pressure build up could lead to catastrophic failure of the cylinder, which would be a safety hazard.

Q114. Page 41 Line 25, Does the statement: "No more than one motor may be powered by each speed controller." apply to all motors or just Drill Motors?

A114. It does not specify drill motors, so it applies to all motors. This is also stated in rule C13.

Q115. The batteries are NiCads. If a robot runs one half way down in a competition round and that battery is recharged for use in a subsequent round, battery memory is going to set in - the battery's capacity is diminished if not fully discharged before recharging. A controlled full-discharge ("conditioning") will return the battery to full capacity, but will this be done in competition? Can we assume a full-charge battery (not just recharged from whatever discharge it was left with)?

A115. We do not fully discharge the batteries before charging them again. It's a simple matter of battery charging throughput during the events. However, the capacity of the batteries is such that they should easily last for a 2 minute round, even with losses.

Q116. Is the placement of colors in the mixed-tube piles absolute to the diagrams in the manual, or will it be randomized? In other words, can we rely on the second pile we pass on the way to the human having our color on top (etc., etc.) or will that change randomly each round?

A116. The tubes will be consistently stacked as per Figures 1.1 and 1.2.

Q117. May a part (arm, leg, claw, appendage, etc.) of the robot extend into the interaction zone (across / through the fence)? In other words can the robot break the vertical plane of the interaction zone? The rules seem to say no, but just for clarification.

A117. Yes, but with some restrictions. See Q7 in Team Update #1 and Q63 in Team Update #2.

Q118. May we purchase additional Masonite board?

A118. It is not listed in the Additional Hardware List. Therefore, unless it is available from SPI, you may not purchase more.

Q119. We have not yet received our RNets. Will there be an extension to the ship dates for the robots?

A119. No. All teams will receive RNets (+ dongles) at the same time. In the meantime, the control system can be operated by using the tether adapter as described in Section 4 of The Rules

Q120. May the human player stand on a tube while in the interaction zone, since he/she is not exerting force on the interaction zone directly?

A120. No, he/she would still be applying weight to the Interaction Zone. See Rule P8.

Q121. May we place the logos of sponsoring organizations on our robot?

A121. Yes. You are required to put your corporate, university, and high school logos and/or names on your robot. (See Rule M7) Just remember that your robot must be easily identified - meaning have at least your team number stand out over the others. Many teams design a custom team logo made up of a combination of the sponsors' and schools' logos.

Q122. May we make our own constant force torsion springs from spring wire (stainless steel 17-7PH) which is available from SPI?

A122. No. See Rule K11.

Q123. May we use electrical connectors not contained in the kit on the final robot as long as they conform to kit connector specs? If so, must they be from same manufacturer and same part number?

A123. You may use only fully insulated spade connectors, as described in the update to Rule K1 that appeared in Team Update #2. The spade connectors do not have to be from Thomas & Betts.

Q124. As long as we only cut parts from 4 ft x 4 ft x 1/2" sections of plywood, may we use several parts with a total area of 16 sq.ft?

A124. No. You may use one section of 4' x 4' x 1/2" plywood and cut it as desired. See Rule K6.

Q125. May we purchase additional 0.1mfarad capacitors (we are likely to damage them during installation)? Do they have to be from same manufacturer?

A125. If the capacitors provided with the Tekin speed controllers break, you may replace them with capacitors of an equal rating. They do not have to be from the same manufacturer.

Q126. On page 114 of the SPI catalog, it says that the fiberglass parts can be custom ordered in longer lengths than shown in the catalog. Rule K4 disallows custom orders for items on the Additional Hardware List. May we purchase a custom length fiberglass part from SPI?

A126. Since all teams have the SPI catalog, and it specifically mentions that custom lengths are available, it is acceptable to order custom lengths of the Fiberglass parts from SPI.

- Q127. May we use any special order part from SPI? (See SPI catalog page 396)
- A127. No. Unless the catalog specifically mentions that sizes other than those listed for a given part are available, do not special order parts via SPI. One of the reasons for using the SPI catalog is to insure that all teams have equal access to parts. Allowing a team to use a part that others did not know was available would be unfair.
- Q128. May we have SPI machine parts for us? (See SPI catalog page 396)
- A128. Yes. However, the cost of machining will be considered part of the \$425 limit on parts from SPI which may be used on the robot.
- Q129. May we modify the Skil battery chargers and use them on the robot as battery receptacles instead of using the drill handles?
- A129. No. This would violate Rules C1, C11.
- Q130. May swivel casters be set manually at the beginning of a match to assure that the robot does not exceed the 3' x 3' footprint?
- A130. Yes.
- Q131. What is the limit of allowable pressure in the pneumatic accumulator?
- A131. About 20 psi. The accumulator may only be charged using the pumps in the kit. The higher pressure pump puts out about 20 psi.
- Q132. May we use air cylinders that are not from the kit?
- A132. No. See Rule M12.
- Q133. We had a short circuit and destroyed a battery. How do we obtain a replacement?
- A133. As stated in Section 4.3 of The Rules, FIRST will not provide free replacement of batteries destroyed by miswiring or misuse. Please contact Skil for a replacement battery. Information on obtaining drill parts (including batteries) from Skil is included below.
- Q134. May we use a transmitter/receiver pair from an R/C car to remotely operate a cart used to transport our robot to and from the playing field?
- A134. No. If too many teams did this, there would be frequency conflicts between the controllers and it would be unsafe.
- Q135. May we solder wires together for power distribution instead of using the terminal strips?
- A135. Yes. The terminal strips are not required for power distribution.
- Q136. Does the plastic sprocket in the window lift mechanism count as a sprocket per the Additional Hardware List? That is, may we obtain more of the for use on our robot?
- A136. Yes and yes.
- Q137. May our robot collect tubes belonging to opposing teams?
- A137. Yes.

Q138. May the window lift motors be removed from the track mechanism and used?
A138. Yes.

Q139. May the bearings be removed from the wheelchair wheels and used?
A139. Yes.

Q140. With respect to Rule K1, is an eye-bolt considered a fastener? How about a turn-buckle? How about a bolt used as an axle?

A140. An eye bolt is considered a fastener if it is used to secure one part to another. For example, if used to attach a tension line to a structural member, it would be considered a fastener. If used as a mount for a rod or cable which translates or rotates relative to the eye bolt, then it would not be considered a fastener. A turn-buckle is an adjustable mechanism, not a fastener. However, when fabricating a custom turn-buckle, the eye bolts in the ends might be considered fasteners. A bolt used as an axle would definitely not be considered a fastener, because it is also being used as a structural member.

Q141. We understand that, per Rule M1, latex tubing from SPI may not, prior to the start of a match, store energy used to power the robot. If preloaded during a match, may latex tubing from SPI be used to store energy, such as to assist a motor in lifting a mechanism?

A141. Yes, as long as the energy stored in the tubing is not released in a sudden manner. See rule K11.

Q142. May we pass tubes under, over, between, or around the player station barrier?
A142. Yes.

Q143. Will there be stems on the tubes?
A143. Yes.

Q144. May we substitute Plexiglas sheet for the polycarbonate sheet on the Additional Hardware List?

A144. No.

Q145. How does FIRST determine that only \$425 parts from SPI is on robot? What data does a team need to have at the inspection to verify no limit is exceeded other than weight and volume?

A145. Teams should be prepared to present a Bill of Materials (BOM) for their robot, showing quantities of parts on the Additional Hardware List and costs of parts from SPI. Please exercise "Gracious Professionalism" when compiling this list.

Q146. Must we book keep using 16 sq. ft of plywood out of a 4x4 size sheet? If we cut lightening holes into the plywood equal to 2 sq.ft of removed wood, can that be subtracted from the area of the original size sheet?

A146. The Additional Hardware List does not specify 16 sq. ft. of plywood. It specifies that you may use one piece of 1/2" thick plywood up to 4' wide by up to 4' long. (See Rule K6) How this piece is cut, and the number of pieces it is cut into, is up to each team. We expect teams to make sure that they use only one piece of 4' x 4' plywood.

Q147. Are three tubes from the same team on the same peg considered a "doubler" in the same way that a "vertical row" is a doubler.

A147. No.

Q148. Does the definition of "vertical row" extend to tubes arranged one to each corner and one to each level except the apex, forming a straight line?

A148. Tubes in a helix pattern are not considered a vertical row. Tubes in a vertical row must all be on the same corner of the goal.

Q149. Are solid objects which start out as a part of the robot, but are then placed on the playing field with the intent to constraint the movement of opposing robots in violation of rule T5?

A149. Only if they present a danger of entanglement.

Q150. As a safety measure, we have installed blade guards on the fan. Will we be allowed to keep them installed on the finished machine ?

A150. If the blade guards are made from legal kit materials, then they are fine.

CORRECTIONS AND UPDATES TO THE MANUAL

A number of concerns have been raised about Q83 in Team Update #2, regarding a human player and a robot from opposing teams getting into a tug-o-war over tubes. Safety is a matter which FIRST takes very seriously. Although it is not specifically forbidden, teams should not design their robots with the assumption that they will ever participate in a tug-o-war. Moreover, unless a tug-o-war happens in an extremely benign way, the referees will intervene. This could result in the human player being penalized and/or the robot being disabled.

The dimensions showing the initial placement of tubes and robots on the playing field were omitted from Figures 1.1 and 1.2. The center of each pile of tubes will be located 4' from the corner of the inner face of the playing field border, along the axis which passes from the corner to the center of the field. The starting area for each robot will be a 4'-6" square, flat against the inner face of the playing field border, and centered along the length of the face.

In Appendix G - CALENDAR OF EVENTS AND DEADLINES, there are two errors. Although the dates are correct, the wrong weekday is listed for the Autodesk Award Submission and Chairman's Award Submission. It should read as follows:

Autodesk Award Submission 5:00 pm, Friday 3/7/97 at Autodesk
Chairman's Award Submission 5:00 pm, Friday 2/28/97 at FIRST

Figure 4.2 incorrectly shows that 12 AWG wire must be used when connecting the seat and/or window motors to the speed controllers. The 16 AWG wiring harnesses supplied in the kits must be used to provide power to the seat/windows motors, whether the power comes from the relay outputs or speed controllers.

Some muffin fans have a thirrd (white) lead. It is a signal wire that cannot be used with the Receiver. The white lead should be left disconnected and may be cut off if desired.

Table 4.4 contains a mistake regarding the input/output mapping of the default receiver program. Inputs corresponding to outputs PWM5 and PWM6 are swapped, as are the inputs corresponding to outputs PWM7 and PWM8.

CONTROL SYSTEM TIPS

The Receiver has a number of status LEDs that are useful in debugging problems that may arise. Below is a description of the function of these LEDs.

D5-8 and D13-16 are bi-color LEDs that indicate the status of the relay outputs. The mapping of LED to output channel should be obvious. For each channel, the LED will turn green if the forward pin is high and the reverse pin is low, or red if the reverse pin is high and the forward pin is low. If both pins are low or high, the LED will be dark.

D17-20 are yellow LEDs that indicate whether power is making it to various parts of the board. They should all be lit or there is a problem and you should contact FIRST. D17 indicates 12 Vdc is connected at the proper polarity. D18 indicates 12 Vdc is past the 3A input fuse and is available for the relay coils, 12->7.5 Vdc converter (RNet power) and 12->5 Vdc converter (logic & PWM power). D19 indicates 5 Vdc is coming out of the Power Trends 12->5 Vdc converter. D20 indicates 5 Vdc is past the 3A PWM fuse and is available for the PWM outputs.

D25 indicates the status of the Master CPU (see Team Update #1 for a more complete description). D26 is controlled by the User CPU and, by default, flashes green in sync with the Master CPU to indicate that all is well with the control program. The behavior of D26 can be modified, even to blink red, when running a custom program.

VIP INVITES

Every Team has Very Important People. These VIPs have either for the first time or through their continued support made it possible for your team participation in The Competition. FIRST would like to once again ensure that your VIPs enjoy the excitement and intensity of The Competition. We will be sending out invitations from Dean Kamen to VIPs on Friday, February 7, 1997. In the past, teams have found this very helpful when securing their corporate partner for future competitions. Please fax your list with addresses to Nicolle Rizzo by Wednesday, February 5, 1997.

INNER TUBE INFORMATION

Nominal dimensions of the Cooper tubes when inflated to 25-3/4" outer diameter are: Inner hole diameter = 12-3/4", and (with the tube lying on its side on a horizontal surface) the circumference of a vertical X-section through the tube in the vicinity of the stem is 21". The circumference through a vertical X-section of the tube through the bulge directly across the donut hole from the stem is 21-3/4". A Cooper tube weighs 2-1/4 lb.

RNET SHIPMENT

Due to unforeseen circumstances, the RNETs were not shipped at the announced time. We are working very hard to get the problem fixed and will get them out to teams as soon as possible. We appreciate your patience with this situation.

PROFILES, LOGOS AND TEAM NAMES

Just a reminder that this Friday, January 31, 1997, is the deadline for teams to give us profiles and logos and to confirm team names. We are running on a strict deadline, so please do not risk having your team left out of the program by sending them in late! All profiles and logos should be faxed to us at 603-666-3907. "Official" team names will appear as they did on team lists given in Kick-Off Registration Packets unless we are notified by Friday.

HOMEPAGE PASSWORDS

Each team has been issued a user ID and password to access the "teams only" area of FIRST's homepage. These passwords were given to team members in the Kick-Off Registration Packet. If you are a team member and need access to this area for updates, we will do the best we can to accommodate you, but because this is a restricted area, we will only give this password out to the main contact of each team as it is listed in our database. If you are not the main contact, but need the password, we ask that you speak to your main contact for that information. If the main contact does not have it for any reason, we will call that person and give it to him/her only. Thank you in advance for your patience.

Some teams have had some trouble using the ID's and passwords. Below are some tips for using them:

- Be sure you are typing the user ID as follows: team180 The word team should be in lower case and there should be no space between it and the number.
- The password is case-sensitive, so please remember to type them in accordingly.

MORE INFORMATION ABOUT DRILL PARTS

The drill parts (motor, gearbox, battery, charger, shell, etc.) included in the kit have only been on the market for a short period of time and may be hard to obtain from local hardware stores. Teams wishing to obtain spare drill parts should be able to order them through a local S-B Power Tool Parts Distributor. Teams can call the S-B Central Distribution Center at 800-815-8665 and ask for information on local distributors. The Central Distribution Center will not sell parts directly to teams. To obtain drill parts, teams must order part # HD2745-04 from their local distributor, who can in turn order it from the Central Distribution Center. This part number represents the entire drill, including battery and charger. Individual parts are not available at this time.

THE COMPETITION-1997

TEAM UPDATE #4

Date: February 4, 1997

URGENT!

This Team Update contains urgent information which must be distributed to team members working on either the control system or playing field. Please get it to them ASAP.

CONTROL SYSTEM UPDATE

All teams are required to make the following changes to their control systems:

- Disconnect the red (middle) lead of the 3-wire PWM cable coming out of each Tekln speed controller. This can be done by carefully pulling the pin out of the connector or by physically cutting the red wire. Insulate the pin or ends of the wire with electrical tape or shrink wrap tubing. Do not permanently remove the pin or red wire from the PWM cable.
- Turn on the Battery Eliminator Circuit (BEC) on each Tekln speed controller. This is done by setting the switch coming out of each speed controller to the on position. The on position is indicated by the small tab molded onto the red plastic holding the switch.

These changes are mandatory for all teams. Failure to make these changes could lead to faulty operation of the Receiver and loss of control of your robot. If you experience any problems with the control system after making these changes, please contact Eric Rasmussen at 800-871-8326.

INNER TUBE PAINTING INFORMATION

We have completed our work on coming up with an improved process for painting inner tubes. The following provides a robust paint surface and replaces the procedure stated in step 3) on page 19 of the Rules Manual: (The tubes painted by FIRST for use in The Competition will be spray painted, however, it may be more convenient for some teams to brush on or apply their paint with rollers when creating their own tubes.)

- a) Paint the cleaned inner tubes with a primer coat of Behr Plus 10 Elastomeric No. 68-white, manufactured by the Behr Process Corporation, 3400 Gerry Ave., Santa Ana, CA: (714) 545-7101. Depending on the sprayer used, this may be thinned in the ratio of eight parts of paint to one part of water to facilitate application. Allow to dry for at least one hour.
- b) Apply the color coats. These will be Behr semi-gloss latex enamels. FIRST will use custom blended red, white and blue colors for optimal TV appearance. The nearest standard Behr colors (which are fairly close to the custom colors) are: Candy Apple Red 8371, Dolphin (blue) 8334, and Off White 8473. Each color will require two spray coats thinned in a ratio of one part water to four parts paint.

The Behr brand of paints are available through Home Depot stores. Most carry the elastomeric paint in stock, although in the New England area it may be necessary for Home Depot to special order this particular paint from Behr.

GOAL CONSTRUCTION UPDATE

In order to facilitate setting up and taking down the goal, we have modified the bolt arrangement at the apex bracket. The following change applies to paragraph 9) on page 15 of the manual: In place of the 1" long hex headed bolt passing through only one wall of the vertical pipes, we are drilling completely through both walls of each pipe and using longer bolts. The replacement bolts are 2-1/4" long 1/4"-20 socket cap screws (for hex keys) with round cap nuts. There will be one flat washer under the bolt head and one under the nut. Each bolt will be inserted through a washer, the apex bracket and then the pipe, and the cap nut and second washer tightened against the pipe. The cap nuts cover the protruding threaded end of the bolts so there will be no exposed threads to cut into the rubber inner tubes.

MISSING PARTS

All parts not included in the kits at the Kickoff have been shipped and should have been received by teams by early last week at the latest. Teams which are still missing parts should contact FIRST ASAP so that we can track the shipments.

THE COMPETITION-1997

TEAM UPDATE #5

Date: February 6, 1997

RULES QUESTIONS & ANSWERS

Q151. We are unclear on how to wire the batteries into the robot's control system. Are we missing female connectors to plug into the batteries?

A151. There should be two battery contact assemblies in the drill parts bag. These are small, roughly oval boards with two contacts each and short leads coming from each contact. The contact assemblies fit inside the handle portion of the drill shells and mate nicely with the battery contacts. Teams are required to use the contact assemblies to draw power from the batteries, and are required to put a 30A circuit breaker in series with each positive terminal. (See Rules C11, C17) Use of the drill shell handles is highly recommended, but is not required. If desired, the handle portion of the drill shells may be separated from the upper section which holds the motor and gearbox. However, FIRST has a limited supply of replacement drill shells, so please be careful if modifying the shell.

Q152. Are wheels considered pulleys, with respect to the Additional Hardware List? That is, may we get additional wheelchair wheels from Skyway?

A152. No. Additional wheels must be fabricated from raw materials or purchased from SMALL PARTS, INC. (SPI).

Q153. On page 52 of The Rules, it says "If you couple the spindle to another shaft, support the shaft with two bearings and use a suitable flexible coupling." Is this a rule?

A153. No, that is a recommendation on proper use of the drill gearbox.

Q154. What colors will the competition goal be painted?

A154. The goal base and pipes will be painted black, and the metal fittings will be unpainted.

Q155. Will "decorative" add ons be allowed on the machines this year and if so, what rules apply? For example last year one team had a remote camera, one had a strobe light, etc. May we paint our robot?

A155. Yes. "Non-functional" decorations may be added to machines under the following conditions:

- Decorations must not cause the weight or initial size requirements for the robot to be exceeded.
- Decorations must not affect the outcome of the match. For example, flashing lights are ok as long as they do not blind opponents.
- Any decorations which involve broadcasting a signal to/ from the robot, such as remote cameras, must be cleared with FIRST prior to use.
- Decorations may draw power from the control system (batteries or relay outputs) as long as they do not affect the operation of other control system components.

Q156. Is Loctite considered a fastener?

A156. Yes.

Q157. Is a drill chuck considered a fastener per Rule K1?

A157. No. It is a mechanism with moving parts.

Q158. If our team has 5 tubes on the pyramid, 3 each on a different arm on the same side of the pyramid and 2 on the very top, what is our score and how was it determined?

A158. The score would be 30 points. It is calculated as 5 points for the 5 tubes, then multiply by 2 for the vertical row, then multiply by 2 for the 1st tube on the top, then multiply by 2 for the 2nd tube on the top.

Q159. May we weld metal on the robot?

A159. Yes. Welding is considered a fastener.

Q160. May materials used to create a cooling system or to add extra shielding to the electrical components of the kit come from outside the approved parts sources (SPI, the Kit, and the additional Hardware List)?

A160. No. The muffin fan in the kit is provided for cooling, and any ductwork or heat sinks must be made with legal kit materials. If there is a problem with the control system that requires electrical shielding, contact FIRST.

Q161. May a team ship two robots, and then choose which one they want to use in the competition when they get there?

A161. You may ship all the parts you want to an event site and assemble them there as desired. See Rule M10.

Q162. What tools (soldering irons, machine shop, etc.) will be available at the Motorola Midwest Regional? We saw no reference in The Rules.

A162. Tools will not be supplied in the pit area. Teams should bring their own tools, power strips, etc. for use in the pit area. The machine shop is expected contain large machine tools such as a lathe, milling machine, welding equipment, drill press, etc.

Q163. Are we permitted to make a keyway or hole (for pinning) in the shaft of the drill motor? This would be done on the output portion of the shaft to connect our drive.

A163. Yes. However, FIRST will not provide replacements for gearboxes which have been modified by teams.

Q164. Last year the human player was belted down and had to toss the balls over a post. This limited the amount of force a player could put into the ball making it difficult for the human player to severely damage a machine by throwing force alone. This year the human has no such limitations and it would be very easy for a human to vigorously throw a tube at a machine that is nearby and break components, even robust ones. Is this kind of interaction in the spirit of the competition as described in rule T5 and if not what limits will be placed on the human players? Rule T8 says the offending team could be disqualified, but that is little consolation to the team who can't play the next round due to damage.

A164. Rules T5 and T8 definitely apply to the human players. If a team intentionally damages a machine, they will automatically lose the match. Therefore, it is not in their best interest to do so. If a team intentionally damages multiple machines, then the penalty may become more severe, such as not competing in further matches.

Q165. Last year a ball went out of the playing field and into the audience. Because it was not returned to the field by the referees the match had to be replayed. What are the rules governing play this year when a tube goes off the field and is not returned to play?

A165. That was a special case, and the rematch was granted because it put one team at an unfair disadvantage. Otherwise, tubes outside the playing field will be treated the same as the balls were in previous years. See Rules T17, T18.

Q166. Regarding the human player storing tubes in the player area: Question/Answer 1 (Update#1) says "Tubes which are not contained entirely within the limits of the player station will be considered out of bounds...". How much of the tube must be outside the box? Does this mean if even the slightest bit of the tube extends outside the box, the referee will grab the tube and put it on the field?

A166. Any amount of the tube sticking over the line will qualify it as out of bounds. At this point, the referees will return the tube to the playing field.

Q167. In previous years teams have been observed using assistance from members of the audience to signal the robot positioning, for example lifting a flag one color when the robot is in position around the ball/tube and a different color when the robot is not in the correct position. This takes advantage of the fact that the audience is much closer to the action at one end of the field. This would seem to violate the spirit of the competition. What are the rules governing team members other than the five on-stage contributing to the control of the robot in such a manner?

A167. There are no rules which specifically prohibit this behavior. As a practical matter, it would be almost impossible to do so. The only thing that is disallowed is using wireless communications between the teams and audience. (See Rule T20) The layout of the playing fields this year will be such that there shouldn't be a big advantage to being in any particular field position relative to the audience.

Q168. In updated rule T15, will you please define "walk." is the human player really supposed to walk or is jogging/running acceptable?

A168. Walking quickly is allowed. Jogging, running, or sprinting is not.

Q169. What is the coefficient of friction between the inner tube and the carpet? What is the coefficient of friction between an inner tube and the pegs of the goal?

A169. FIRST does not specify these values.

Q170. If an inner tube is launched into the air and the round ends, will the officials wait until it lands to commence scoring? Is there a time limit on how long officials will wait for all field components to cease moving?

A170. Yes, the referees will wait until it lands to commence scoring. No time limit is specified. It is up to the judgment of the referees.

Q171. What are the consequences if the human player leaves the player station for reasons of personal safety?

A171. There will not be a penalty if the human player leaves the player station for reasons of personal safety.

Q172. Is it permissible to magnetize our robot or another team's robot?

A172. You may magnetize your robot. You may not make permanent changes to another team's robot.

Q173. Is it permissible to focus light to achieve heating effects, assuming no malicious damage of other robots or field components occurs?

A173. Yes.

Q174. What will the lighting conditions of the playing field be? Will they be constant?

A174. The lighting will be location specific. No one should have trouble seeing the field. The lighting should be fairly constant.

Q175. We know that portable radios are not allowed in the pit. How about singing/chanting. If we hire a live band, may we use it in the pit?

A175. We cannot stop teams from singing in the pit. However, we ask that they not become a nuisance to other teams or prevent important announcements from being heard. Bands are not allowed in the pit.

Q176. Are U-bolts considered fasteners if they are used to constrain a rod which is moving? (define moving as = rotating or translating)

A176. No. Then it would be more like a bearing surface and would not be considered a fastener.

Q177. Included with the kits are catalogs from Small Parts, Inc. May pages be torn from the book and combined with glue or fiberglass resin to build something rigid?

A177. No. See Rule K1. "...The Kit container, part packaging, and any documentation in the Kit container may not be used to build the device..."

Q178. If an angle iron size is not available from SPI, may we bend and produce the angle from an equivalent thickness of plate which is available?

A178. Yes.

Q179. We are aware that using all four batteries at a time is not allowed. However if we, by chance, discovered a way to harness the power of discharging capacitors, would we be allowed to link them in parallel or in a series as a secondary power source for our robot?

A179. No. See Rules M1, C5.

Q180. May materials that are supposed to be for the goal be used on the robot?

A180. The Apex bracket and 1" bearing in the kit can be used on the robot. (See Q62 in Team Update #2) Other goal parts, such as the Kee Klamp fittings, may not.

Q181. Can you please clarify the spring loading limitations?

A181. Only springs provided in the kit may be used to store energy that will be used to power the robot. (See Rule M1) For example, you may not use a spring from SPI to launch a projectile at the start of a match. However, you may use a spring

from SPI as a belt tensloner. You may not make your own springs or use Latex tubing from SPI as a spring. You may elastically deform materials not designated as springs (including Latex tubing from SPI) as long as the energy is not released in a sudden manner. (See Rule K11)

Q182. Must the "pit crew" spare parts, tools etc., be shipped at the same time as the robot?

A182. No. Teams may bring tools with them to the event sites. Spare parts may also be brought to the event sites provided the spare parts are identical to the parts on the shipped robot. Please exercise "Gracious Professionalism" when making and bringing spare parts.

Q183. Are teams responsible for any charges for shipping the robots from the storage sites to the competitions?

A183. No.

Q184. The answer to Q136 in Team Update 3 states that the plastic sprocket in the window lift mechanism counts as a sprocket per the Additional Hardware List. Does this apply if the lift mechanism is used in conjunction with the window motor, or only if the assembly is disassembled and the parts used separately?

A184. The window lift mechanisms are included in the Kit of Parts, and are not listed on the Additional Hardware List. Use of any or all parts of the window lift mechanisms is completely unrelated to the Additional Hardware List. A136 states that the plastic sprocket a window lift mechanism is considered a sprocket. This means that up to 4 more of these sprockets may be used on the robot.

Q185. Our supplier offers fiberglass cloth in 1/16" thickness. May we use this thickness rather than the 1/8" thickness specified in the Additional Hardware List?

A185. The Additional Hardware List specifies a thickness of up to 1/8", so 1/16" is ok.

Q186. Would it be legal for our robot to hover above the goal and to use its rotor downwash to blow opponent's tubes from the goal and to blow tubes off the playing field?

A186. Yes.

Q187. Does it matter if the muffin fan is wired in series or parallel?

A187. Yes. The muffin fan is designed to operate at 12 Vdc. If it is wired in series with another device, it will not get the proper voltage and will turn more slowly, if at all. The muffin fan must be wired in parallel and may draw power from either the terminal strips for from a relay output.

Q188. In rule update #2, A59 stated that we could charge the pneumatic chamber before the start of a match. Man we charge the chamber using a pump not on our robot?

A188. The pumps do not have to be mounted on the robot. However, you may only charge the pneumatic chamber with the pumps provided in the kit and the pumps may only be powered by 12 Vdc from batteries provided in the kit.

Q189. If 3" x 3" x 1/4" angle iron is not listed in SPI, but we could make this angle by welding stock listed in SPI, then may we just purchase larger angle iron?

A189. No. You may not purchase angle iron from sources other than SPI. If you wish to purchase stock from SPI and weld it into angle iron, that is ok.

Q190. We would like to use shaft collars to prevent wheels from sliding on a shaft. Would the shaft collars count as fasteners?

A190. Yes.

Q191. Are snap rings that are used to stop a gear, sprocket, bushing or pulley from sliding on a shaft considered a fastener?

A191. Yes.

Q192. Is it acceptable to replace the standard wheel casters we are allowed to use with ball casters (like the kind on most ottomans)?

A192. If you can get ball casters from SPI, then you may use them.

Q193. Would the use of a counterweight violate rule M1?

A193. No.

Q194. May the player stand in his/her area (not the interaction zone) or must he/she be seated?

A194. The player is not required to sit. The player may stand, kneel, hop on one leg, etc.

Q195. May parts, identical to those of Small Parts, be purchased from another source as long as it is deducted from the Small Parts account??

A195. No. Teams are expected to obtain SPI catalog items from SPI. In the event that an item will be backordered for more than one week, teams may call FIRST to obtain permission to obtain an identical item from another supplier.

Q196. We are confused by the statement made in Team Update #2 under the Autodesk heading: "Please note that Autodesk grant applications are no longer being accepted." Please clarify this statement. Is this referring to the AutoDesk Award Submission or something else?

A196. We meant that applications for the actual software are no longer being accepted. The animation contest is going on as scheduled.

Q197. Are "keenserts" allowable for use in strengthening threaded holes?

A197. Yes, they are considered fasteners.

Q198. Welding is considered a fastener so we can weld as much as we need, right?

A198. Yes, within reason. Melting 5 lb of welding rods into a heap of slag and then machining that into a part is not allowed.

Q199. May we use the 1" ID bearing from the kit on robot? This is the bearing that was intended to be used for the goal.

A199. Yes, but FIRST will not provide a second bearing for use on a goal.

Q200. May we make our own pulleys from materials purchased from SPI?

A200. Yes.

Q201. If we purchase material from SPI that comes on a spool, may we use the spool on our robot?

A201. No. The spool is not a catalog item, it is simply packaging for the part.

Q202. Some of our shorter drivers are having trouble seeing over the controller station. May we bring something for them to stand on? Will this count against the parts?

A202. The control stations are only 40" high. Are you sure that you have built your playing field correctly? If there is someone on the team with a physical disability, such as someone sitting in a wheelchair, we will have a special shorter control station available at the National Championship. If your team will need this station at another event, please contact FIRST.

Q203. For clarification can you define the difference between a linkage pin or hinge pin and an axle?

A203. A linkage pin is typically very short, serves as both an axle and fastener all in one piece, and faces primarily shear stresses rather than bending or axial moments. A hinge pin is more like an axle, but rotation about the pin is limited to less than 360 degrees, and the pin itself serves only to hold the two halves of the hinge together. An axle supports the side load of a continuously rotating part and typically undergoes significant bending and/or axial stresses.

Q204. Since we have unlimited use of resin and fasteners can the air accumulator be filled with resin and used as a fastener?

A204. Use of resin is not unlimited. It is only to be used in reasonable quantities with the fiberglass matting. For example, don't use more than a 1/4" layer of resin with the 1/8" fiberglass. Small sections of thicker resin may be used to form robust mounting points for composite structures involving the fiberglass matting. Resin may not be used in the air accumulator unless the fiberglass matting is also used.

Q205. If there has been an opponent's apparatus attached to the scoring tripod, and a team tries to remove the apparatus and damages or destroys it in the process, what is the ruling in such a case as this? Will that Team be penalized or disqualified if it was removing it just so they could score themselves? Is the apparatus considered part of the robot after being attached to the scoring tree or a free and separate entity?

A205. The referees will decide whether they think the apparatus was too flimsy or the team trying to remove it was being malicious. (See Rule T8) The apparatus is always considered part of the robot. Therefore, any apparatus deployed by a robot should be designed to withstand vigorous amounts of interaction with other robots, just as if it were part of the main robot. (See Rule M4)

Q206. Regarding the "U-bolt constraining a moving shaft" issue; Are we allowed to create our own 'U-bolt-like' restrainer from the threaded shaft? Is this a legal use of the kit parts or would it be an illegal use of a fastener?

A206. You are welcome to fabricate a U-bolt out of threaded rod or any other legal kit material. It doesn't count as a fastener because of the application mentioned in the previous question.

Q207. May we deliver our robot directly to the drayage site? If we do, does it need to be crated and have empty stickers on the crate? May we bypass the drayage company and deliver our robot directly to an event?

A207. You are welcome to deliver your robot to the drayage site as long as it gets it there by 5pm on Tuesday, February 25th. This will give FIRST the proof we need that your team is not working on the robot after that date. Even if your robot is delivered to the drayage site by a team member, it MUST be crated. This is to ensure that the robot does not get damaged, and to aid in transportation of robots to the event site. Uncrated robots will not be accepted at the drayage site when delivered (resulting in possible disqualification if your robot is not crated and redelivered on time). FIRST is taking care of transporting robots to the competition site from the drayage company. Absolutely no robots are to be delivered to event sites by teams. The drayage site will be holding your robot for us from February 25th until the event begins.

Q208. In case part of the robot is detached and subsequently pushed out of the playing field, would Rule T15 apply?

A208. Rule T15 applies only if the main part of the robot (with the drive motors and other electronics) goes out of the playing field.

Q209. If, in the process of delivering or retrieving tubes from the Player Station, the drive mechanism of our robot accidentally contacts the surface of the Interaction Zone, will the robot be disabled per Rule T15? Q8 in Team Update #2 seems to indicate that this is ok.

A209. Yes, the robot would be disabled for reacting off an out of bounds surface to rejoin play. Q8 asked if incidental contact with the Interaction Zone is ok and specifically excluded reentering the field as a reason for the contact.

Q210. May the wheels go up on the 1x4? Is it ok if the robot rides forward until it pushes against the pipes so we know we are close enough?

A210. Robots shouldn't be designed to react off the tops of the 4x4's, and this extends to the 1x4's. (See Rule M6) However, the tops of the 4x4's and 1x4's are not considered out of bounds, so there won't be a penalty for incidentally driving on top of them. The robot shouldn't be designed to push against the Player Station barrier in order to stop. (See Rule T13) The driver should try to stop the robot before it hits the pipes.

CORRECTIONS AND UPDATES TO THE MANUAL

If the 9pin cable from the Transmitter won't fit on the transmitting RNet at the same time as the antenna, teams are permitted to shave some plastic off the end of the cable.

In the Additional Hardware List, the allowed thicknesses for Particle Board and Chipboard are swapped. The proper line under the Sheets & Boards category should read:

1/2" Plywood OR 7/16" Chipboard OR 5/8" Particle Board	4' x 4'
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ALTERNATE WAY TO PURCHASE DRILL PARTS

As a convenience to teams having trouble obtaining spare drill parts from their local S-B Power Tool Parts Distributors, we provide the following information: Colony Tool Supply, Inc. of Plymouth, MA, an authorized distributor of S-B Power Tool parts, has indicated a willingness to order the drill kits from the S-B Central Distribution Center and ship them to teams all over the U.S. They can be contacted at 508-746-2219. When calling, ask to speak with Ken Werks or John Muller. The part number for the drill kit is HD2745-04. Please note that individual drill components cannot be ordered at this time.

CONTROL SYSTEM TIPS

RNets, Antennas, and Dongles

Instructions for connecting the receiving RNet to the Receiver are provided in the rules in Section 4.5 under the heading "RNets and Tether Adapter".

Only one antenna was shipped to teams with the RNets. This was intentional and teams are not missing a 2nd antenna. As per the instructions on the packing list included with the antenna, you are not supposed to use an antenna on the receiving RNet. This is being done to purposely reduce the signal strength received by the RNet.

Many teams are having trouble identifying the part known as the dongle, or think they have received the wrong one. The dongle is a small part with a 9 pin female connector and a gray plastic hood with a number on it. The dongle number should not match the number on the transmitting RNet.

Fuses in the Receiver

There are a number of replaceable fuses in the Receiver that are designed to protect it from damage. If you discover a blown fuse, carefully check the wiring of the entire electrical system and correct any faults that are discovered. Remember that fuses do not blow themselves. Replace fuses only with fuses of the same rating. If a replacement fuse blows, it means there is still a problem. Do not bypass the fuse – fix the problem. If unable to locate the problem, please contact Eric Rasmussen at FIRST for assistance. When calling Eric, try to have the control system, a set of screw drivers, and a multimeter near the phone so that useful diagnosis can be done on the first call.

Teams are encouraged to replace blown fuses themselves rather than sending the Receiver back to the FIRST for repair. Full fuse specifications are provided below. For convenience, part numbers for ordering the fuses from Digi-Key are also provided. Digi-Key can be reached at 800-344-4539. Other electronic part supply companies are likely to carry these fuses too.

Fuse Description	Manufacturer	Mfg. Part #	Digi-Key Part#
20A ATM Mini Auto	Littlefuse	297020	F993-ND
3.15A TR5 Sub-Mini	Wickman	19373-124-K	WK3024BK-ND
1.25A TR5 Sub-Mini	Wickman	19373-050-K	WK3050BK-ND

Joystick and Speed Controller Calibration

To help insure good performance, both the joysticks and the speed controllers should be calibrated. Joystick calibration is especially important when using the "Coordinated Mode" of control explained in Team Update #1. In "Coordinated Mode", the formulas

used expect joystick 1 to be centered properly so that $x1=127$ and $y1=127$ when the joystick handle is physically centered.

To calibrate the joysticks, perform the following steps:

1. Set the Receiver to run the default control program.
2. Attach both joysticks to the Transmitter and visually center the trimmers for the X and Y axes.
3. Attach the servos to PWM1 and PWM2.
4. Move joystick 1 to the four corners and observe the minimum and maximum positions of the servos.
5. Locate the center of the range of movement of each servo arm.
6. Release the handle of joystick 1 and adjust the X and Y trimmers so that the servos are centered.
7. Joystick 1 is now calibrated. Tape the X and Y trimmers to prevent further adjustment.
8. Connect the servos to PWM 3 and 4, and repeat steps 4-7 with joystick 2.

Calibrating the speed controllers insures that they will achieve maximum output in forward and reverse when the joystick is at the ends of travel, no output when the joystick is centered, and a proportional output when the joystick is not in the center or at either extreme. Also, the reverse delay (braking delay when switching from forward to reverse) can be set, or reverse can be disabled entirely. Instructions for calibrating the speed controllers are included in the Tekin REBEL Owner's Manuals. Note that the speed controllers should be recalibrated any time the joystick calibration is changed.

Error in RXSLAVE.BS2

The data contained in variables `aux1` and `wheel1` are swapped. `Aux1` should contain the data from Analog Input #1 on the Transmitter but actually contains the data from the thumbwheel on Joystick #1, and vice versa for `wheel1`. There is a similar data swap for `aux2` and `wheel2`. This is the reason that PWM outputs 5 & 6, and 7 & 8 do not agree with Table 4.6 as printed in The Rules. This can all be easily corrected by modifying the SERIN line to read:

```
Serin MASTERCPU\FPIN, BS2BAUD, [Wait(255,255), x1, y1, x2, y2,  
tx_sw.lowbyte, wheel1, aux1, tx_sw.highbyte, wheel2, aux2]
```

Understanding How RXSLAVE.BS2 Controls the Relay Outputs

The variable "relays" contains 16 bits that are used to set the state of the relay outputs. Each bit corresponds to a relay output pin. The aliases `rly1_fwd`, `rly1_rev`, `rly2_fwd`, etc. show which bit corresponds to which output pin. A bit equal to 1 corresponds to an output pin at 12V, while a bit equal to 0 corresponds to an output pin at GND.

The variable "tx_sw" contains 16 bits that correspond to the state of the switch inputs on the Transmitter's Auxiliary Input Port and Joystick Ports. Each bit corresponds to a switch input. The aliases `sw1_fwd`, `sw1_rev`, `sw2_fwd`, etc., in conjunction with Table 4.2, show which bit corresponds to which input pin. A bit equal to 1 corresponds to a closed switch input, while a bit equal to 0 corresponds to an open switch input.

Each time the control loop runs, "relays" is initialized to the state of the switch inputs on the Transmitter by the lines:

```
' Set relays to match TX switches
relays = tx_sw
```

This allows the robot drivers to control the relay outputs by pressing switches on the joysticks and rocker switches on the project box.

The variable "rx_sw" contains 16 bits that correspond to the state of the switch inputs on the Receiver's Sensor Port. Each bit corresponds to an input pin. The aliases rx_sw1, rx_sw2, rx_sw3, etc., in conjunction with Table 4.6, show which bit corresponds to which switch input pin. A bit equal to 1 corresponds to a closed switch input, while a bit equal to 0 corresponds to an open switch input.

Each time the control loop runs, "rx_sw" is updated by the following lines:

```
' Read Switch Inputs into rx_sw
Gosub ReadSwitches
```

After "relays" is initialized, but before the relay outputs are actually updated, the data in "rx_sw" is used to modify the behavior of the relay outputs in the following lines:

```
' Use 1st 8 RX switches (rx_sw1-8) as STOP switches for Relays 1-4
relays.lowbyte = relays.lowbyte &~ rx_sw.lowbyte

' Use 2nd 8 RX switches (rx_sw9-16) as GO switches for Relays 5-8
relays.highbyte = relays.highbyte | rx_sw.highbyte
```

In the first equation, "relays.lowbyte" addresses the first 8 bits of "relays", which correspond to the forward and reverse pins for the first 4 relays, while "rx_sw.lowbyte" contains the state of the first 8 Receiver switch inputs. A logical (bit for bit) AND NOT (&~) operation is performed and the results are stored back in "relays.lowbyte". This means that bits in "relays.lowbyte" that are false (0) are left false, and bits that are true (1) are left true unless the corresponding bit in "rx_sw.lowbyte" is also true. This translates to leaving off relays off, and on relays on unless a corresponding switch input is closed. Thus, the first 8 switch inputs on the Sensor Port can be used as safety overrides to force relays 1-4 off.

In the second equation, "relays.highbyte" addresses the last 8 bits of "relays", which correspond to the forward and reverse pins for the last 4 relays, while "rx_sw.highbyte" contains the state of the last 8 Receiver switch inputs. A logical OR (|) operation is performed and the results stored back in "relays.highbyte". This means that a bit in relays.highbyte will end up true if it starts true or if the corresponding bit in rx_sw.highbyte is true. Otherwise, it will stay false. Thus, the last 8 switch inputs on the Sensor Port can be used to force relays 5-8 on.

Once the values for the relay states have been computed, the outputs are updated by writing the data contained in "relays" to a set of shift registers that actually control the relays. This is done in the following lines just before the end of the loop:

```
' Set Relay Outputs
Shiftout RLYDATA, RLYCLOCK, LSBFIRST,[relays\16]
Pulsout RLYLATCH, 1
```

ATTENTION PUBLIC RELATIONS COORDINATORS

By now you have received the '97 press kits and should be actively embarked on a local PR program. Below are some examples of successful ways to promote your team:

- Weekly progress reports in local newspapers. Some papers will run stories or updates written by the students themselves.
- Announcements in local newspapers of the team's participation, as well as follow-up reports on Regional and National results.
- Stories in the sponsoring corporation's newsletter.
- Stories in the high school newspaper.
- Inviting a reporter from local TV, radio, or cable station to do a FIRST story: building the robot, technology in education, team profile, etc.

If you need more material, advice or suggestions, feel free to call or e-mail me. Also, I'm compiling a list of newspaper clips, and would appreciate hearing about your media placements, fundraising efforts, ideas, etc. I've received some clips from teams already and would love to see more. Thanks and good luck

Diane DiLeo
617-863-9933
diane@splnpros.com

UPDATES FROM AUTODESK

Trade-Ins

The deadline has passed for teams to trade in 3D Studio Release 4 for 3D Studio MAX. Release 4 packages will no longer be accepted in exchange for MAX as of the release of this update.

3d Studio Max Upgrades

3D Studio MAX 1.0 (Windows NT only) can be upgraded to 3D Studio MAX 1.2 (Windows NT and Windows95 compatible) by visiting the Kinetix web site at <http://www.ktx.com/frameset.htm> or by calling the Autodesk Customer Satisfaction Center at 1-800-538-6401.

Important: Grant recipients MUST request the 3D Studio MAX 1.2 Educational Update. The Commercial Update is not compatible with the software granted through this grants program.

Autodesk Award Rules Clarification

***USE OF IMAGERY, ANIMATION OR SOUNDS -and- ANY PROPRIETARY INFORMATION SUCH AS LOGOS OR TRADEMARKS**

The "Entry Requirements" with regard to the inclusion of any proprietary information, logos, or trademarks have been amended to read:

If Entrant's corporate sponsor or college/university sponsor or school has any rights or claims to the imagery, animation or sounds in an Entry, the Entry Form and the Autodesk Archive Consent & Release Authorization MUST also be signed by an officer of such employer or parent company or school; otherwise, the Entry will be disqualified. Entrant, and where applicable,

Entrant's sponsor or school represent and warrant that the imagery, animation and sounds in each Entry are owned by the Entrant and/or school and/or sponsor free and clear of any liens or claims of any third party; that they have legal right to grant the permission given in the Entry Form; and that they indemnify and hold harmless Autodesk, its subsidiaries, associated companies, successors, assigns, agents, and employers against liability should any third party claim that the use of the imagery, animation or sound by the aforementioned violates any right of such third party.

An Entry MUST NOT include any proprietary information, logos, or trademarks including the use of the Autodesk, FIRST, corporate sponsor, university or high school logos in the 30-second animation.

To clarify what this means and to address the question of a team (herein referred to collectively as the Entrant) wanting to represent their corporate sponsor or university partner or high school in their 30-second animation entry:

The 30-second animation Entry MUST NOT include the *official* logos of Autodesk, FIRST, Disney, the corporate sponsor, university or high school (by "official logo" we mean the logotype and/or imagery commonly used on the official letterhead of the sponsor, university or high school). Official logos may, however, be added to the credits following the 30-second animation Entry.

IF an Entrant wants to incorporate an adaptation or elements of the corporate sponsor, university or high school logos or name this will be accepted. However, it is advised that the Entrant work closely with the corporate sponsor or university or high school to ensure that the 30-second animation Entry and representation of the partner organization meet the approval of all parties involved.

*** REMINDER: CONSENT AND ENTRY FORMS**

All Entries for the Autodesk Award for Excellence in Engineering Creativity and Communication MUST be accompanied by the Entry Form and an appropriately signed and completed Archive Consent and Release Authorization Form both of which are included in the FIRST--The Competition 1997 "The Rules" book. These forms, along with your Entry, must be received at Autodesk, Inc. not later than 5:00PM on March 7, 1997. Entries will not be accepted for judging after the deadline.

If you have questions regarding the Entry Specifications and Guidelines for the Autodesk Award for Excellence in Engineering Creativity and Communication at any time during The Competition, please email first@autodesk.com or fax 415-507-6113 to the attention of "FIRST--Rules Clarification".

NEW STAFF MEMBERS AT FIRST

We would like to announce the addition of three new staff members...

Thelma Pedersen Meyer
Brian Farmer
*Ken Lambert

Admin Assistant
Engineer
Engineer

tmeyer@usfirst.org
bfarmer@usfirst.org
klambert@usfirst.org

* Ken will be starting at FIRST at the end of the February.

THE COMPETITION-1997

TEAM UPDATE #6

Date: February 8, 1997

HOTEL ACCOMMODATIONS

All teams should be booking hotel rooms by the end of this week, especially those attending the Midwest Regional. Cut off dates are expiring which means, teams will not be eligible for the discounted rates. Please do this as soon as possible. Upon making reservations, please identify your team as part of FIRST and be prepared to submit a rooming list. Detailed lodging information was mailed upon team registration to your team contact. Below are some hotels that are still taking reservations for FIRST.

Midwest Regional

Embassy Suites, Schaumburg: 800/654-8089
Hyatt Regency, Schaumburg: 847/605-1234
Radisson Hotel, Schaumburg: 847/397-1500
Wyndham Garden, Schaumburg: 847/605-9222
Holiday Inn, Schaumburg: 847/310-0500

New England Regional

Holiday Inn, Center of NH: 603/625-1000
Wayfarer Inn, Sheraton: 603/622-3766
Comfort Inn, Manchester: 603/668-2600
Days Inn, Manchester: 603/668-6110
Susse Chalet, Manchester: 603/625-2020
Highlander Inn: 603/625-6426

Mid-Atlantic Regional

Embassy Suites, Piscataway: 908/980-0500
Somerset Marriott: 908/764-6459
Quality Inn: 908/469-5050
Wyndham Hotel, Piscataway: 908/980-0400
Clarion Hotel, Edison: 908/287-3500

Walt Disney World

For information on how to make reservations, please see Appendix I of the Rules.

RULES QUESTIONS AND ANSWERS

- Q211. May we regulate the sensor inputs, turn them on and off, via the relay outputs?
A211. NO! Do not connect the relay outputs to the sensor port in any way! (See Rules C20, C21) The relay outputs are outputs, not switches. The sensor port inputs are not designed to be connected to a 12V power source, and will very likely be damaged if you do so. If you wish to ignore sensor inputs under certain conditions, you are welcome to write a custom control program for the Receiver.

CORRECTIONS AND UPDATES TO THE RULES

A158 in Team Update #5 contains an incorrect answer. The total score should be 40 points, not 30.



The Competition-1997

Team Update #7

Date: February 14, 1997

Rules Questions & Answers

- Q212. We have noticed that some of the inner tubes tend to grotesquely deform after a while. This may be from people squeezing them and playing with them. What happens is that they start to bulge at one part of the tube. If tubes start to bulge during competition, will they be replaced? If so, due to the variability in tubes, filling a tube to $25 \frac{3}{4}'' \pm 1''$ will result in different tube heights. Is there a "height" specification that we can use?
- A212. We will start with fresh tubes at each event, replacing them each day if necessary. The tubes should be fairly uniform in height. However, we do not specify height, only outer diameter for inflation purposes.
- Q213. The rules state that if your robot damages the playing field, you will be disqualified. On our robot we are using the wheelchair wheels from the kit. If the robot is stuck somewhere and just ends up spinning its tires, the carpet burns a little. In addition, at the point where the carpet lies on the 5' plywood, the same tire spinning starts going through the carpet because it can react against the edge. Will we be disqualified for this? If so, what can we do?
- A213. The wheelchair wheels are fairly benign in the scheme of things. If spinning wheels causes a problem, we may ask drivers not to spin wheels unless they are involved in a shoving match. If drivers blatantly ignore such a request, then they will be disqualified. The main purpose for the rule against damaging the playing field is to prevent mechanisms such as sharply spiked wheels that damage the playing field much more rapidly. If damage to the field occurs and it was not intentional, then the usual course of action is to require the offending mechanism to be modified before it is allowed to compete in further matches.
- Q214. If we make a bushing from a section of tubing with a washer welded to each end, are the washers considered fasteners per Rule K1? The purpose of the washers is to prevent the tube from sliding out of the hole it is mounted in.
- A214. If the washers are welded to the tube, they become part of the bushing. Bushings are not considered fasteners. Therefore, the washers would not be considered fasteners.
- Q215. May we use latex tubing purchased from SPI as a counterbalance to the weight of our lifting mechanism as long as it does not release energy at a rate faster than it was stored? Does it matter if the load on the tubing is generated solely by the weight of the mechanism or if it is preloaded by external forces before the match?
- A215. You may use Latex tubing from SPI as a counterbalance as long as it does not release energy faster than it is stored. (See Rule K11) It does not matter if the tubing is preloaded or not, as long as there is not a net energy release from the tubing. That is, it cannot supply energy to the robot (see Rule M1), so any energy released from the tubing must be replaced by the end of the round.

Q216. If a robot places a blocking device on the pegs, and clearly the only way to remove it would damage it, would removing it be considered damaging the robot?

A216. Yes. As per Rule M4, robots should be able to withstand vigorous amounts of interaction with other robots. If the referees consider the blocking device too flimsy, then the team breaking the blocking device will not be penalized. (See Rule T8)

Q217. Would a shaft collar used to keep a pulley in place on a rod be considered a fastener?

A217. Yes.

Q218. May a tube be used by the human player to purposely interact with the robot in the interaction zone if the robot is never actually physically contacted by the human player?

A218. Yes.

Q219. If we buy 4 sprockets from someone outside SPI and use the window lift motor assembly as given are we legal? May we buy more sprockets from SPI and still be legal?

A219. Yes and yes.

Q220. Does a bolt count as a fastener if it is used as a pivot of a lever arm lifting a load?

A220. It depends on the application. Fasteners (as unlimited quantity items per Rule K1) may be used as hinge pins or pins in a linkage, but not as structural items. If the arm slips around the bolt with a limited range of rotation (< 360 degrees), then it would be considered a linkage pin. If the arm rotates completely around the bolt, then the bolt would be considered an axle and not a fastener. If the bolt is used to transmit the driving force to the arm, then the bolt would be considered a structural member and not a fastener. If not considered a fastener per Rule K1, you are welcome to fabricate a bolt from raw materials or purchase one from SPI and count it against the \$425 limit.

Q221. If a dowel pin is used to pin something to a shaft, is it considered a fastener.

A221. Yes.

Q222. May we use our own material such as Delrin, steel, aluminum, and nylon, or do we need to purchase it from Small Parts to make our parts from?

A222. Materials not in the kit or on the Additional Hardware List must come from SPI.

Q223. May we modify the Y cables to use all of the wire as one extension cable? It would still be a three conductor PWM cable. We would cut and splice the pieces together and carefully insulate the splice joints.

A223. Yes, this is ok. As per Section 4.3 of The Rules: "The control system cables containing 3 wires or less may be shortened or lengthened as needed as long as the following conditions are met:

- Proper insulation (electrical tape, wire nuts, shrink wrap, or fully insulated spade connectors) must be used.
- Proper wire type, as specified above, must be used.

Q224. Are corner brackets considered fasteners?

A224. No, they are structural items.

Q225. In Team Update #5, Q176 says that u-bolts are not considered fasteners if they constrain a rod which is rotating or translating. Does this mean that we may not use a u-bolt in such an application?

A225. No. You may use a u-bolt as a bearing surface, but the u-bolt must be fabricated from raw materials or purchased from SPI against the \$425 limit.

Q226. May we apply a finish to the metal surfaces on the robot such as powder coat painting, chrome plating, or anodized surface?

A226. Yes.

Q227. If our robot launches an inner tube toward the goal and the tube passes over the goal and collides with an opponent's driver or human player, would our team be penalized? What if the

inner tube landed in the audience?

A227. The first condition would result in a penalty. (See Rule P11) Tubes launched into the audience will be replaced without undue delay. (See Rule T17)

Q228. Must welding supplies come from SPI? Do we need to list welding and welds as part of our materials list. Are there any restrictions on welding?

A228. Welding is considered a fastener. See Q198 in Team Update #5.

Q229. May the robot deliver non-active non-motorized supplies or devices to the human player?

A229. No. The robot may only deliver inner tubes to the human player.

Q230. We would like a clarification on the rules for the Latex Tubing from TotalMed that is included in the Kit. Since it is listed in the "Springs" list, does this mean that the tubing can be precharged prior to the start of the match, and be released in a sudden manner (i.e. the energy released far exceeds the rate at which it was stored) after the match starts? Does this apply to all the "Springs" on the list?

A230. Yes, the latex tubing and other items designated as springs in the kit may be precharged and used to release energy in a sudden manner. (See Rules M1, K11)

Q231. May the FIRST logo be used on team t-shirts and other team merchandise?

A231. The FIRST logo is not permitted for use on team shirts or any other merchandise. Teams have taken pieces of the logo for inclusion in their own unique team logos but it is not allowable in its pure form. If your team would like to "make the logo your own" in this manner it must be approved by FIRST.

Q232. If a piece of PVC pipe falls off our robot and into the arena, is this considered contaminating the playing field?

A232. No.

Q233. May tape be used as decorative stripping?

A232. Yes.

Q234. May threaded rod be used to support a roof over controls?

A235. Yes, as long as the threaded rod was from either the kit or was bought through Small Parts Inc. and was accounted for through the SPI credit limit.

Q235. May a team drive (deliver) their robot to the Worcester warehouse?

A235. Yes. However, all robots must be out of team hands by 5:00pm, Tuesday, February 25. Also the robots won't be accepted unless they are properly crated. (Refer to section 5 - Shipping & Transportation of machines -)

Q236. May our human player switch off with another human player between rounds?

A236. Yes.

Q237. It is O.K. to use the sample pieces of particle board, pine and chipboard that were included in the kit?

A237. Yes, you may use the sample pieces provided in the kit.

Q238. Are the Trantorque couplings considered fasteners, since they are used to fasten a pulley, gear, sprocket or whatever to a shaft?

A238. That is a very good question. Clearly, the Trantorque couplings are designed to fasten one device to another. However, the intent of Rule K1 regarding fasteners is to allow unlimited quantities of simple parts such as screws, bolts, washers, nuts, etc. in their normal roles. This interpretation was used to answer Q140 in Team Update #3, which stated that a turn buckle is considered an adjustable mechanism and not a fastener. Also, Q157 in Team Update #5 states that a drill chuck is considered a mechanism with moving parts and not a fastener. The Trantorque is basically an inside-out drill chuck and contains moving parts. Thus, the Trantorque is not considered a fastener with respect to Rule K1. Please note, though, that the

two Trantorque couplings provided in the kit do not count against the \$425 limit because they are part of the kit.

- Q239. When it comes time to compete in the arena, where does each team receive its set of batteries (i.e. in the Pit Area, or when the robots are placed in the arena)?
- A239. Fresh batteries are distributed in the Pit Area, so they should be obtained on the way to the playing field. During the finals matches on the last day of each event there will be a supply of batteries available near the field because teams tend to play back-to-back matches.
- Q240. If a team decides to take a time out to repair their robot prior to competition, will the other two teams in the arena be allowed to pull their batteries from their robots as well?
- A240. Yes, the other teams may remove the batteries from their robots at that time.
- Q241. Instead of having to pull batteries, is it okay to install a master kill switch to cut the flow of current?
- A241. No, that would violate Rule C5. With the possible exception of the muffin fan, the entire control system will be remotely disabled by the fact that it is not receiving a signal from the transmitter until the match starts.
- Q242. Given rules M11 and C4, if we have a functionally identical replacement part that is pre-wired with the exact wire supplied in the kit, may it be used to expedite replacement of damaged assemblies (between competition rounds), as long as the amount doesn't exceed the amount supplied in the Kit?
- A242. Yes, if the wire is the same type and color, and from the same manufacturer, then it is ok.
- Q243. May we mount another battery to power the receiver only?
- A243. No. (See Rule C5)
- Q244. May we use the KEE CLAMP catalog for usage on construction on the robot? It was included in the kit.
- A244. No, documentation in the Kit may not be used on the robot. (See Rule K1)
- Q245. If we plan to add a sponsor placement on our robot (decorations), may we use more than the allotted amount of polycarbonate or other materials for our logos and sponsors?
- A245. Yes, as long as it is a non-functional decoration, per Q155 in Team Update #5. For example, excess materials cannot serve as any part of the main or functional structure of the robot.
- Q246. Do we have to bring our own safety glasses or will FIRST be supplying them at all competitions?
- A246. FIRST will supply safety glasses at each competition event. Teams are also welcome to bring their own safety glasses.
- Q247. May we use the PWM Y cable to send the signal from one PWM channel on the Receiver to two speed controllers?
- A247. Yes.
- Q248. May materials other than the robot (i.e. cart, tools, spare parts, etc.) be shipped to the Orlando storage facility at some time after the February 28 robot shipping deadline, or do ALL materials need to be shipped by the 28th?
- A248. You may send a separate shipment of tools at a later date. Just keep in mind that the drayage companies will be loading up for the event on the Tuesday prior, so anything that arrives on Tuesday or Wednesday may not make it to the site. Also keep in mind that a separate "bill of lading" should be done for a separate shipment.
- Q249. May we use the 1" diameter x 5" steel drill rod in the kit on the robot along with the 1" bearing?
- A249. Yes. However, FIRST will not provide a second 1" diameter x 5" rod for goal building.
- Q250. In Appendix H of the rule book, it states that materials shipped to the drayage site must be

shipped up to 30 days in advance of the show. How does this affect our ship dates?

A250. The instructions given in Appendix H regarding shipping times are general instructions for all events and are not specific to our Competition. All teams must ship robots according to the dates outlined on page 62 of the rules. We have included a reminder of shipping instructions and deadlines below.

Q251. Are we correct in understanding that as long as the tie wraps are used as fasteners, then their use is unlimited.

A251. Yes.

Q252. If the size of the tie wrap we wish to use as a fastener is not available from SPI, is the use still unlimited?

A252. There is no requirement that fasteners (used as fasteners) come from SPI.

Q253. The design of our machine calls for sizes of angle that were not specifically in the SPI catalog. We manufactured these pieces (milled or welded and ground angles) from available sizes to make the custom sizes. Is this practice acceptable?

A253. Yes, as long as the material that you started with came from SPI, was in the kit, or was on the Additional Hardware List.

Q254. Is craft paper-faced 1/2" plywood acceptable as a substitute for the 1/2" plywood called out in the additional hardware list? The craft paper layer makes the board easier to paint.

A254. Yes, this is ok.

Q255. May we plate metal on our robot to improve it's appearance?

A255. Yes, it would be considered a non-functional decoration, similar to paint. Plating is not ok if it is used to change a mechanical property, such as friction.

Q256. May we use butt-splices to connect wires?

A256. No. You may only use solder, wire nuts, fully insulated spade connectors, or the terminal strips. (See Section 4.3)

Q257. May we use bricks or bags of sand as ballast?

A257. Only if the bricks or bags of sand are purchased from SPI.

Q258. If we make pulleys using Aluminum from SPI, do they count as pulleys from the Additional Hardware List?

A258. No.

Q259. May we use a programmable calculator at the Driver Station?

A259. No. Teams should not bring equipment other than the control system to the Driver Stations.

Q260. May we purchase raw materials from SPI and have an outside contractor fabricate parts using the materials? If so, does the cost of the contractor count?

A260. Yes and no, respectively.

Q261. May we put a potentiometer or switch in series with a motor?

A261. No. The switches and potentiometers in the kit are not designed to handle large currents. They may only be connected to the Auxiliary Input Port on the Transmitter or the Sensor Port on the Receiver.

Q262. May we put labels on the wires and pneumatic equipment on our robot to facilitate assembly, disassembly, and debugging?

A262. Yes. This is good practice and would fall under the non-functional decoration category.

A NOTE ABOUT "FASTENERS"

There has been some confusion about the use of "fasteners" on the robots. If a part is determined not to count as a fastener per Rule K1, it does not mean that the part cannot be used on the robot at all. It simply means that the part cannot be purchased under the Unlimited Quantity criteria of Rule K1.

Thus, the part would have to be purchased from SPI against the \$425 limit or manufactured from raw materials. (See Rule K9)

A NOTE ABOUT ELECTRICAL WIRE

Teams are restricted to using the wire supplied in the kits to distribute electrical power to the many control system devices. (See Rule C4) In addition, Table 4.1 lists the minimum wire sizes that may be used to hookup these devices. While this may seem restrictive, there are some areas of freedom which teams seem to be overlooking.

First, Table 4.1 lists **minimum** size, not required size. For example, if the control system on a robot uses less than 16' of 12 AWG wire for all the places where 12 AWG is required, then the unused 12 AWG wire may be used in place of 16 or 24 AWG wire.

Second, from Section 4.3: "The control system cables containing 3 wires or less may be shortened or lengthened as needed as long as the following conditions are met:

- Proper insulation (electrical tape, wire nuts, fully insulated spade connectors or shrink wrap) must be used.
- Proper wire type, as specified above, must be used."

This means, for example, that teams may shorten a 5', 16AWG motor harnesses and splice the wire onto another motor harness. Another example would be to lengthen one of the PWM cables by splicing in some of the 2 or 3 conductor 24 AWG wire in the kit.

GOAL CONSTRUCTION UPDATE

In order to reduce the chances of sharp edges on the goal cutting into the inner tubes, we are placing plastic plugs into the open ends of the three vertical pipes at the top of the goal. (The plugs will present a smooth surface to any tubes that strike that part of the goal.) Each plug has four slots in its side, two of which will have to be filed to enlarge them so they will fit around the topmost bolt that anchors each pipe to the apex bracket. The plugs snap into place. They are listed and illustrated on page 11 of the Kee Catalog, part number 77-7, and can be purchased from Kee for \$0.68 apiece.

THE WOODIE FLOWERS AWARD

The Woodie Flowers award celebrates **effective communication** in the art and science of engineering and design. This award will be given each year to an engineer or teacher identified and described by students as the one person who has given them the best understanding of the challenges, opportunities, and satisfaction involved in the discipline of engineering and design. The judges, led by Professor Flowers, will select the recipient based on recommendation made by those students submitting a one page essay describing the engineer or teacher and his or her specific contributions. Each team submits only one recommended recipient. The single-page description can be accompanied by one or two photographs. The spirit of this award is twofold; the accomplishments in communication by the engineer or teacher is essential; and equally important, the student's ability to communicate clearly and succinctly. Communication in both directions is an integral part of learning. In this award, we recognize an individual who has done an outstanding job of motivation through communication. Additionally, the award challenges the student body to be clear and concise in recognizing the value of communication.

Background

At the 1996 FIRST competition, the Woodie Flowers Award was presented to Dr. Woodie Flowers himself, to celebrate his dedication and commitment to excellence in engineering, education, and communication. SMALL PARTS INC. initiated this award to recognize the individual participating in the FIRST competition who best demonstrates excellence in teaching science, engineering, math, and creative design. This year we would like each team to nominate one individual from among the many engineers and teachers working with them that truly inspires their team. This individual would best exemplify excellence in engineering instruction by explaining complex ideas to students in an inspiring way. Judging criteria will be based on the team's description of how the teacher or engineer inspired each member of the team in some or all of the following ways:

- level of student participation
- creativity of effort
- clear explanation of math, scientific and engineering concepts
- demonstrated enthusiasm for science and engineering
- encouragement to work on projects as a team effort
- inspiration to use problem solving skills
- inspiration to become an effective communicator

To create an award-winning robot, each team must move forward through a complete product development cycle from designing a concept, developing a prototype, testing manufacturing and operating the machine. This requires teamwork, attention to detail, scheduling, and hard work. The award-winning essay should answer this question, "How did the nominated person inspire your team through this process?" If your essay describes examples of how this individual excels above all others in this education process, then we can look forward to presenting your team and your selected individual with an exciting award that honors Professor Woodie Flowers and his contribution to engineering, education, and communication.

How to enter your nomination essay

Prepare a one page written essay nominating one engineer or teacher on your team who exemplifies excellence in engineering, education, and communication. Students should prepare this essay as a team effort. You may include photos as part of your entry, but only if pictures help to tell your story. The cover of the essay should include the following:

- award name
- selected individual's full name
- individual's affiliation
- team name
- names of all team members
- school involved
- corporate partner

The Woodie Flowers Award essays are due on Thursday, March 27th at the FIRST office in Manchester, NH, addressed as shown below. The award will be presented during the award ceremony on April 12, 1997. Remember, this nomination is to specifically recognize an outstanding engineer or teacher associated with the FIRST competition and your school and team. Each team should recognize that the qualities exhibited by the engineer or teacher are paramount, but the students' ability to communicate those skills is equally important.

The Woodie Flowers Award
200 Bedford Street
Manchester, NH 03101

ROBOT SHIPPING

Please review pages 61 to 63 of The Rules before shipping your robots. If there is any confusion about shipping dates, please call Sally Washburn for clarification. Teams will be disqualified if their robots ship later than the assigned dates.

If your team is competing in ANY of the three regionals, the robot must be out of your team's hands by 5pm on Wednesday, February 25, 1997.

If your team is competing in the National Championship ONLY, the robot must be out of your team's hands by 5pm on Friday, February 28, 1997.

A few reminders about shipping:

- When we say the robot must be "out of your team's hands" by a certain date and time, we mean that it can be in the hands of a shipping company or hand delivered to the drayage site on that date. No one affiliated with your team is allowed to have contact with the robot after the given deadline.
- When shipping, batteries must be unplugged and packaged separately from the rest of the machine. A small box inside of your crate is acceptable. This is a federal law.
- Cardboard is not acceptable packaging for your robot. Wooden crates must be used to avoid moisture problems. Robots hand delivered to storage facilities must also be crated. **Uncrated robots will not be accepted at any storage site.**
- **All crates must be clearly marked with the team's complete name**, as well as any other information requested by the drayage company for that site. A return address or the name of one team member is not enough information for identification. **The team number must be on all shipping containers in a minimum of 6" numbers. The number must appear on all four sides and top of container.**

ATTENTION: PUBLIC RELATIONS COORDINATORS

FIRST Placement of the Week: A California team is coordinating a feature story with the LA Times, one of the largest daily papers in the country. The article will appear in this week's "South Bay Weekly" section.

It is important for PR coordinators to aggressively invite news outlets to their meetings. Sample pitches to catch their eye:

- A trial run or behind-the-scenes look at "the making of a robot."
- History of your team's involvement with FIRST.
- The work, dedication, learning, fun, etc. involved in preparing for the competition.
- The "real world" of high-tech enters the classroom through engineer/student partnerships.

Your media pitch should above all sound unique and interesting. Reporters need to know that it is a fun and exciting way to get involved in technology.

Another note: check out local television magazine programs geared toward students. Your TV station probably has a show on Saturday mornings that would be interested in science & technology in the

classroom, building robots, going to competitions, etc.

Lastly, thank you for continuing to send on the newspaper clips, television spots, etc. I would appreciate an original or faxed copy of your media placements as they appear. The clips should include the masthead of the paper, date, and entire article. Again, if you need more material, advice or suggestions, feel free to call or e-mail me.

Thanks,

Diane DiLeo
ph: 617-863-9933
fax: 617-863-0066
diane@spinpros.com

[\[Back to the FIRST Home Page\]](#) [\[Previous Page\]](#)

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webmaster@usfirst.org

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The Competition-1997

Team Update #8

Date: February 19, 1997

THE GAME HAS A NAME!

This year's game has been given the name "Toroid Terror"! Thank you to all teams that submitted names.

CORRECTIONS AND UPDATES TO THE RULES

Team Update #7 contained an error in the shipping deadlines for the robots. Below is the corrected line:

If your team is competing in ANY of the three regionals, the robot must be out of your team's hands by 5pm on Tuesday February 25, 1997.

The following text is appended to the new Rule T15 as it appeared in Team Update #2:

A robot which applies power to the Interaction Zone of its team's player station may be immediately returned to the playing field, but the control system will be disabled for a minimum of 20 seconds. During this timeout, the player may not interact with the tubes. If the player chooses not to return the robot to the playing field, they may interact with the tubes without interruption.

RULES QUESTIONS AND ANSWERS

Q263. May we use the syringe to pump up the accumulator before a match?

A263. No. Custom pumps are not allowed. See Rule M12.

Q264. May we buff/polish components of our robot using professional polishes (i.e., car wax)?

A264. Mechanical polishing is always ok. Car wax may be applied if it is to improve the appearance of the robot, or if it is used as an internal lubricant. However, the wax must not come off on the tubes, playing field, or other robots.

Q265. May a robot climb onto the top of the goal, and fling opponents' inner tubes into the audience?

A265. Yes.

Q266. If a robot is capable of disassembling another robot through several manipulating arms, is this considered the "destruction" of the opponents' robot?

A266. Yes. Do not attempt to disassemble an opposing robot.

Q267. If a robot is capable of lifting an opponent's robot, laden with inner-tubes, over the apex of the scoring apparatus, is this legal?

A267. Yes. However, dropping an opponent's robot from this height would definitely be considered malicious.

Q268. If the robot is capable of stretching an inner tubes over all three pegs and it does not destroy the inner tube in any manner, does it count as a tic-tac-toe?

A268. No. It takes a minimum of 3 tubes on the goal to get a tic-tac-toe. Also, this would definitely cause a permanent deformation in the inner tube and is therefore not allowed.

Q269. Is it legal, pertaining to the rules, to have a robot that covers opponent's inner tubes with colored masking tape (that is easy to remove) do those tubes count as our points?

A269. No, it is not legal. Per Rule K1: "Adhesive tape may not be used except as an electrical insulator."

Q270. May magnetic scramblers made with kit material, be used to hinder the opponents' control systems?

A270. No. Disabling an opponent's control system is not in the spirit of The Competition.

Q271. Do non-functional decorations count against the \$425 limit? May we use materials such as Plexiglas to display the team name, number and sponsors?

A271. Non-functional decorations do not count against the \$425 limit or Additional Hardware List. You may use Plexiglas for a non-functional decoration.

Q272. Per Rule K1, is a shoulder screw with a small pulley on it considered a "fastener"?

A272. No, it is an axle.

Q273. Is the human player allowed (by using an inner tube in his/her hands) to push-over or shove a robot if that robot is attempting to block the human player from throwing tubes onto the playing field?

A273. Yes, this is allowed.

Q274. May we use spiral wrap to fasten our wires together? Otherwise, may we use a hundred or so tie wraps spaced an inch apart to give the same effect?

A274. Yes and yes.

Q275. We know the robot is allowed to hold something over the interaction zone. What if it breaks the imaginary plane of the white line in front of the human player?

A275. No part of the robot should not extend past the back of the Interaction Zone.

Q276. What if one leg of a six legged walker goes out of the playing area. May the robot just pick it up and keep moving around?

A276. As long as the outside leg does not apply power to (step on) an out of bounds surface, then there will not be a penalty.

Q277. May we bring all tools and spare parts with us to the regional and national competitions or do they have to be shipped by a certain date as well?

A277. Teams are welcome to bring tools and spare parts to the events.

Q278. May a coach use a stopwatch, the stopwatch function on a wristwatch, or a countdown timer at the player station to track the remaining time during a match?

A278. No, see Q259 in Team Update #7. Time remaining in a match will be displayed on monitors visible from the Driver and Player Stations.

Q279. May we use smoked polycarbonate sheet instead of clear?

A279. Yes. We do not specify the color of the polycarbonate sheet in the Additional Hardware List.

Q280. May we use dry wall screws or Elmer's wood glue?

A280. If used as fasteners or purchased from SPI then these items are allowed.

Q281. May electrical tape be used to fasten rope to the window lift mechanism?

A281. No. Per Rule K1: "Adhesive tape may not be used except as an electrical insulator."

Q282. May we remove the gray outer jacket from the 16 AWG cable and use the individual (white & black) wires?

A282. Yes.

Q283. If the human player is standing with their foot (which is in bounds) through the center of an inner tube that is partially out of bounds, will officials take it away and return it to the playing field?

A283. The referees will not attempt to remove tubes from the player station if they are around part of a player's body.

Q284. May the human player use a tube to reach over the playing field to shove an inner tube into their player station?

A284. Yes, as long as the player's body does not extend past the barrier at the front of the player station.

Q285. If the human player is walking around the field to push the robot back in bounds, can he/she do anything with inner tubes, such as throw a tube from a place other than their player station, or pick up a tube that is out of bounds?

A285. No.

Q286. Is it permissible for a human player to throw tubes at other human players to try and spoil their aim, knock tubes out of their player station, or to give them an unwanted tube?

A286. No. That is not in the spirit of The Competition.

Q287. Are the coaches permitted to take written information to the player station for reference during a match?

A287. No. Per Q259 in Team Update #7: "Teams should not bring equipment other than the control system to the Driver Stations."

Q288. May we combine wire gauge of smaller diameter to make larger wire? i.e. 2 or 3 - 24 AWG in place of a 16 AWG?

A288. No.

Q289. Is a washer that is used to absorb thrust considered a fastener?

A289. If the washer is pressed against a part to hold the part in place, then yes.

CONTROL SYSTEM TIPS

Changing Joystick Sensitivity

Several teams have asked for hints on how to change the sensitivity of the joysticks when using "coordinated steering" mode. There are two basic strategies:

1. The easy method: Don't change the sensitivity, just limit the maximum output values. This can be done by a simple adjustment to the Min and Max part of the line. Raise the Min above 2000 to slow down the maximum reverse speed, and lower the Max from 2254 to slow down the maximum forward speed. For example:

$$((2000 + y1 - x1 + 127) \text{ Min } 2020 \text{ Max } 2234) - 2000$$

2. The harder but smoother method: Scale the output value down. Take the whole (((...))) part, multiply by a fraction, and add a constant to keep it centered. For example:

$$(((2000+y1-x1+127) \text{ Min } 2000 \text{ Max } 2254) - 2000) * 84/100 + 20 \text{ Max } 254$$

When doing this, remember that the neutral point (off) is approximately 127. Therefore, you will need to add a constant to the scaled value to keep it centered. Also, remember that PBASIC math is all 16 bit positive integer, so always multiply before you divide to minimize rounding errors.

Please note that both strategies require the speed controllers to be calibrated prior to modifying the joystick sensitivity. Otherwise, the speed controllers will scale the motor outputs back to maximum

reverse and maximum forward.

Using Potentiometers on the Transmitter

Due to an error in the selection of the potentiometers provided in the kits, teams will only get half the expected range of input values (approximately 127-254) from potentiometers connected to the Auxiliary input port on the Transmitter. To compensate, a simple scaling factor can be incorporated into the control program on the Receiver. For example:

$$\text{aux1} = (\text{aux1} - 127) * 2 \text{ Max } 254$$

will give an output range 0-254 from an input range of 127-254.

The range of input values for potentiometers connected to the Sensor Port on the Receiver is not affected by this error.

PROOF OF SHIPPING

All teams must fax to FIRST proof that their robot was out of team hands by the specified date and time. We must receive this fax by 5:30pm on the date of shipment. Teams that cannot provide proof of shipment will be considered late and risk disqualification.

If a team is dropping its robot off at the drayage site, no proof is required from the team. FIRST will obtain records directly from the drayage site. No robots will be accepted at the drayage sites after 5pm.

REGIONAL INFORMATION

ADMISSION

All events are open to the public and are free of charge. Teams are encouraged to bring spectators - parents, friends, cheerleaders, bands, etc. This is meant to be as exciting and energetic as any sports event!

Please be advised, however, that all sites are limited according to fire codes and the doors will be closed if/when we reach capacity. This is especially a possibility on Saturdays. On Friday and Saturday of each regional, anyone entering the building (team, spectator, VIP, etc.) will be given a wristband. You may leave the building and re-enter as long as you are wearing that day's wristband. Everyone is encouraged to surrender his/her wristband when leaving for the day, so that we may allow someone else in to see the event. Anyone from your team who must absolutely be at the event must arrive early to ensure a spot. No one will be allowed to "reserve" a spot for another person.

AGENDAS

Below you will find tentative agendas for each Regional...

TENTATIVE AGENDA Motorola Midwest Regional

Thursday, March 6, 1997

8:00 Pit Opens

9:00 - Noon Team Registration at the East Pit Station

10:00 Machine Shop Opens

Noon - 4:45 Practice Rounds
6:30 Pit & Machine Shop Close

Friday, March 7, 1997

8:00 Pit & Machine Shop Open
9:00 - 1:00 Seeding Matches
1:00 - 2:30 Break
2:30 - 5:00 Seeding Matches
5:30 Pit & Machine Shop Close
6:00 - 9:00 Team Party - Medieval Times

Saturday, March 8, 1997

8:00 Pit & Machine Shop Open
9:00 - 1:00 Double Elimination Tournament
1:00 - 2:30 Break
2:30 - 4:00 Finals
4:00 Pit & Machine Shop Close
4:00 Awards Ceremony

TENTATIVE AGENDA
New England Regional

Thursday, March 13, 1997

8:00 Pit Opens
9:00 - Noon Team Registration at Pit Station
10:00 Machine Shop Opens
Noon - 5:15 Practice Rounds
7:00 Pit & Machine Shop Close

Friday, March 14, 1997

8:00 Pit & Machine Shop Open
9:00 - 1:00 Seeding Matches
1:00 - 2:00 Break
2:00 - 4:30 Seeding Matches
5:00 Pit & Machine Shop Close
5:30 - 9:00 Team Party - Hampshire Hills

Saturday, March 15, 1997

8:00 Pit & Machine Shop Open
9:00 - 1:00 Double Elimination Tournament
1:00 - 2:00 Break
2:00 - 4:00 Finals
4:00 Pit & Machine Shop Close
4:00 Awards Ceremony

TENTATIVE AGENDA
Johnson & Johnson Mid-Atlantic Regional

Thursday, March 20, 1997

8:00 Pit Opens
9:00 - Noon Team Registration at Pit Station
10:00 Machine Shop Opens
Noon - 4:30 Practice Rounds

6:30 Pit & Machine Shop Close

Friday, March 21, 1997

9:00 Pit & Machine Shop Open

10:00 - 1:00 Seeding Matches

1:00 - 2:00 Break

2:00 - 5:30 Seeding Matches

5:30 Pit & Machine Shop Close

5:45 - 9:00 Team Party

Saturday, March 22, 1997

9:00 Pit & Machine Shop Open

10:00 - 1:00 Double Elimination Tournament

1:00 - 2:00 Break

2:00 - 4:00 Finals

4:00 Pit & Machine Shop Close

4:00 Awards Ceremony

[\[Back to the FIRST Home Page\]](#) [\[Previous Page\]](#)

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webmaster@usfirst.org

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THE COMPETITION-1997

TEAM UPDATE #9

Date: February 22, 1997

RULES QUESTIONS AND ANSWERS

- Q290. If we build a cart to carry our robot at the competition, does this in any way count towards the parts we're allowed to use or our total price balance?
 A290. No.
- Q291. Is it allowable to purchase a step-ladder to aid with tube removal at the end of the match?
 A291. With the exception of robot tube-holding devices, teams are not expected to aid in the retrieval of tubes at the end of a match.
- Q292. May we remove the foam insulation from the outside of the high pressure pump?
 A292. Yes.
- Q293. Will FIRST provide a PC at each event for teams to reprogram their Receivers?
 A293. No. Teams should bring their own computers for such purposes.
- Q294. If a detached part of the robot is attached to an inner tube, may the human player pickup the inner tube as long as he/she does not touch the robot parts?
 A294. Yes.
- Q295. In reference to question 272: If we have a screw that holds a non rotating bushing in place, and a roller rotates around the bushing, is the screw a fastener?
 A295. Yes.
- Q296. We want to put some decals on the robot, so we get some light weight foam board from an art store and put on the decal, then mount it to the robot. What if because of its position, it offers a small amount of protection or shielding of the robot? Is this still a free decorative feature?
 A296. It is impossible for decorations not to have any effect on a robot. An example of what is not allowed, though, are decorations that cover otherwise exposed mechanisms on the robot or substantially add to the strength of the structure. A section of foam board over an already strong, rigid surface is acceptable.
- Q297. If the front-to-rear dimension of our robot structure is 35.8 inches, and panel fastener heads have a head height of 0.15 inches so that our overall dimension is now 36.1 inches, is this a violation of the 36" max. rule?
 A297. Yes. The overall length/width should not exceed 36".
- Q298. What do we need to do for the return shipping of the robot? Does FIRST arrange this and we reimburse?
 A298. The drayage company will be at the event site on Saturday. Any teams who needs to arrange shipment will have a chance to do so directly through them.

Q299. Do tie wraps have to be used as fasteners? If we wish to place tie-wraps around the outer surface of the front wheels to reduce contact area with the playing field to facilitate turning is this legal?

A299. The tie wraps provided in the kit, and any purchased from SPI, do not have to be used as fasteners. Tie wraps used on wheels as described above would not be considered fasteners.

Q300. Regarding the Tuesday 5pm shipping deadline: Is it 5pm EST or 5pm local time?

A300. The deadline is 5pm in your local time zone.

CONTROL SYSTEM TIP

A number of teams seem to have missed the information in Section 4 of The Rules regarding how to hookup the RNet to the Receiver. When controlling the robot remotely using the RNet, the dongle must be attached to the long end of the 3-headed cable. (The dongle is a small part with a 9-pin female connector and a gray hood with a number 1-8 on it.) If the dongle is connected to the cable after the robot is powered up, or if the dongle is removed and replaced while the robot is powered, data will not be received. Either cycle the power on the robot (remove both batteries, then replace) or insure that the dongle is in place when the robot is powered up to make it work.

AUTODESK ANIMATION COMPETITION

As the deadline for the Autodesk Animation Competition approaches, many teams have questions about their entries. Appendix E of The Rules contains the official rules for this competition. If unable to find the answer in Appendix E, teams should contact Kaki Leyens or Laura London at Autodesk, Inc. Contact information is included in Appendix E. Do not contact FIRST with questions about the Autodesk Animation Competition.

PIT AREA INFORMATION

Each team will be assigned a 30"x72" table in the pit area at each event. This table is where the robot should be stored when it is not competing in a match. Because many teams make adjustments and repairs to their machines in the pit area, it is advisable to wear eye protection to prevent injury from flying particles.

CHAIRMAN'S AWARD

This is a reminder that all Chairman's Award submissions are due on Friday, February 28, 1997 by 5pm. No late entries will be accepted.

MOTOROLA MIDWEST REGIONAL NOTES

Photographers and film crews from the media will be attending the Motorola Midwest Regional on Thursday, March 6th. Teams are encouraged to bring banners and to wear team T-shirts, hats, etc. for the cameras.

IMPORTANT INFORMATION FOR ALL EVENTS

Check-In

At all events, team registration is from 9am to Noon on Thursday. When teams register, they will be asked to surrender their transmitting RNet, antenna, dongle and two batteries.

Check-Out

If your team has registered for another 1997 event, you will receive your RNet, antenna, Dongle and Batteries back at Check-Out.

If you are not going on to another event, you will be required to return the following items at Check-Out (unless we receive a security deposit of \$1,500):

- Receiver RNet
- Batteries (2)
- Battery Chargers (2)
- Transmit Box
- Receiver Box
- Joysticks (2)
- Tether Adapter
- 3 Headed Cable
- Power Supply
- Kit Containers (2)

CONTROL SYSTEM SECURITY DEPOSIT

Any team wishing to borrow FIRST's control system over the summer is required to provide FIRST with a security deposit of \$1,500 at Check-Out. Checks and PO's will be accepted. PO numbers without documentation, check requests, etc. will not be accepted.

The control system is the property of FIRST. Putting a security deposit down on the control system is NOT a purchase. Teams that arrive at Check-Out without a security deposit must return all components of the control system before leaving. No exceptions will be made. If a team provides FIRST with a security deposit at a later date, they will be shipped a control system at that time.

ATTENTION: PUBLIC RELATIONS COORDINATORS

FIRST Placements of the Week:

- WBZ-TV News, (CBS) , Boston, MA. 6 PM feature on NYNEX/Quincy Public Schools.
- Dallas Morning News. Feature on Lennox International/University of Texas and St. Mark's School/Hockaday School.
- KCBA-35 and KCCN-46, (FOX and CBS respectively), Salinas, CA. 6 PM and 10PM features on Silicon Systems/ Cross Design & Aptos High School.

For the Regionals:

- Offer a behind-the-scenes look to your local newspaper reporter and photographer. Invite them to ride with you to the regional and follow your team during the competitions.
- Invite your local TV or radio station to interview members of your team as you pack up the robot and prepare for competition. Then follow-up when you return, before Disney, etc.
- Document your FIRST experience on video.

Thanks again for sending on the newspaper clips, television spots, etc. I need an original or faxed copy of your media placements as they appear for a master clip book of all 1997 FIRST media placements. The clips should include the masthead of the paper, date, and entire article. Information about TV spots should include station, air date, and reporter/producer of segment.

Sincerely,

Diane DiLeo
ph: 617-863-9933
fax: 617-863-0066
diane@spinpros.com

THE COMPETITION-1997 TEAM UPDATE #11

Date: March 1, 1997

SAFETY FEATURE ADDED TO PLAYING FIELD

Based on feedback from some of the teams, FIRST has decided to add a safety feature to all Driver's Stations. Transparent Lexan shields will extend up 4 feet from the edge of the Driver's Station shelves adjacent to the playing field. This should protect drivers and coaches from potential injury due to robot mechanisms which might otherwise sweep over or fall onto the shelves. These shields will not extend over the playing field and should not interfere with the ability of the drivers and/or coaches to see the action on the playing field. Thus, gameplay should not be affected.

EMERGENCY PHONE NUMBERS

Emergency Numbers:

The following numbers are to be used in case of EMERGENCY ONLY. Please do not use these numbers to obtain a team update during the competitions.

Motorola Midwest Regional Harper College Palatine, IL	847/925-0518
New England Regional New Hampshire College Manchester, NH	603/645-9671
Johnson & Johnson Mid-Atlantic Regional Rutgers University New Brunswick, NJ	888/951-3086 Beeper
National Championship Epcot Center Orlando, FL	888/951-3086 Beeper

MOTOROLA MIDWEST REGIONAL INFORMATION

LOAD-OUT MOTOROLA MIDWEST REGIONAL

On Saturday, March 8, load-out of robots and crates is restricted to the following time frames due to restricted access to the loading dock area: 1:30 PM-2:30 PM (Competition Break) and after the Awards Ceremony is completed.

Midwest Exposition (drayage) will be available to assist with crate delivery and shipping.



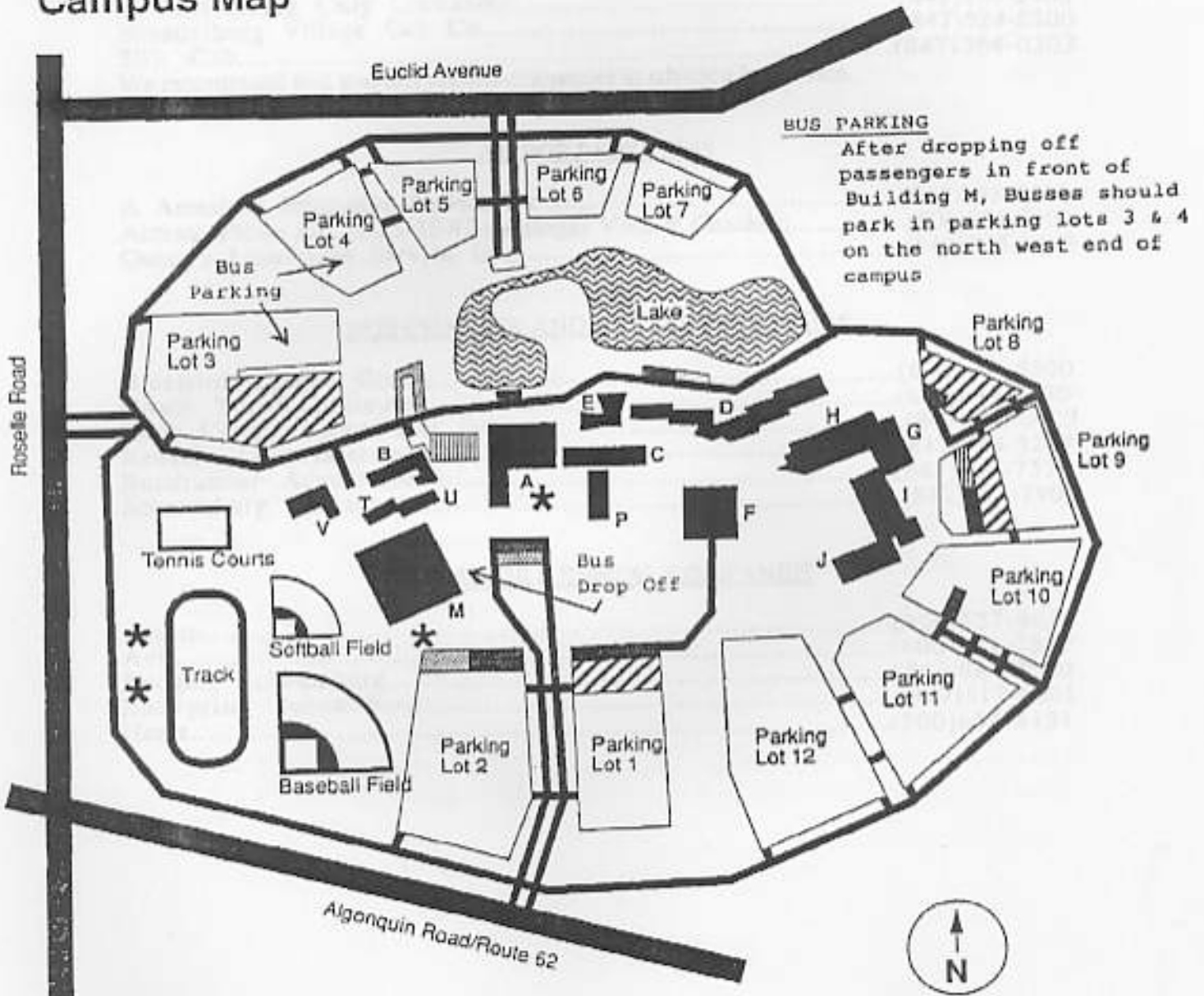
William Rainey Harper College
 1200 West Algonquin Road
 Palatine, Illinois 60067-7398
 708 397-3000

COMPETITION: Bld. M

BUS DROP OFF

All Busses should drop off passengers in the circle in front of Building M

Campus Map



BUS PARKING

After dropping off passengers in front of Building M, Busses should park in parking lots 3 & 4 on the north west end of campus

- | | | |
|----------------|-------------------|------------------------------------------|
| Parking | Administrators | Buildings, Roads and Athletic Structures |
| Student | Faculty and Staff | |
| Medical Permit | Dental Hygiene | |
| Visitors | | |

*Public restrooms located behind track and in Buildings A and M

**THE COMPETITION-1997
TEAM UPDATE #13**

Date: March 12, 1997

**1997 MOTOROLA MIDWEST REGIONAL RESULTS
TOP 10 TEAMS**

Place	Team	Team #
1	Beatty Machine and Manufacturing & Hammond Schools (Hammond, IN)	14
2	Baxter Healthcare Corporation & Lakewood High School Center for Advanced Technologies (St. Petersburg, FL)	10
3	Haworth, Inc. & Holland High School (Holland, MI)	54
4	Raytheon E-Systems, Inc. & Greenville High School (Greenville, TX)	35
5	Baxter Healthcare Corporation / Northwestern University & Johnsburg High School (Round Lake, IL)	13
6	Motorola, Inc. / Florida Atlantic University & Dillard High School / Crystal Lake Middle School / William Dandy Middle School (Plantation, FL)	79
7	Boston Scientific Corporation & Edgewood High School (Spencer, IN)	18
8	Motorola, Inc. & Rolling Meadows High School / Wheeling High School (Schaumburg, IL)	81
9	Procter & Gamble Company & Walnut Hills High School (Cincinnati, OH)	119
10	General Motors Proving Ground & Milford High School / Lakeland High School / Harbor High School (Milford, MI)	47

AWARD WINNERS

MOTOROLA MIDWEST REGIONAL CHAMPION AWARD: Beatty Machine and Manufacturing &
Hammond Schools (Hammond, IN)

RUNNER-UP: Baxter Healthcare Corporation & Lakewood
High School Center for Advanced
Technologies (St. Petersburg, FL)

NUMBER ONE SEED: Beatty Machine and Manufacturing &
Hammond Schools (Hammond, IN)

MOST PHOTOGENIC: Baxter Healthcare Corporation & Lakewood
High School Center for Advanced
Technologies (St. Petersburg, FL)

BEST PLAY OF THE DAY (FRIDAY): Motorola, Inc. & Rolling Meadows High
School / Wheeling High School
(Schaumburg, IL)

- BEST PLAY OF THE DAY (SATURDAY): St. Louis Community & Mary Institute and Saint Louis Country Day School (MICDS) (St. Louis, MO)
- CHRYSLER TEAM SPIRIT AWARD: Baxter Healthcare Corporation / Municipio de Anasco & Luis Munoz Marin High School / Raul Ibarra High School (Anasco, PR)
- ROOKIE OF THE YEAR: TRW Automotive & Harrison High School (Farmington Hills, MI)
- PROCTER & GAMBLE CREATIVITY AWARD: Raytheon E-Systems, Inc. & Greenville High School (Greenville, TX)
- HONEYWELL LEADERSHIP IN CONTROL AWARD: Procter & Gamble Company & Walnut Hills High School (Cincinnati, OH)
- MOTOROLA QUALITY AWARD: Budd Company, The & Oakland Science, Mathematics & Technology Academy (OSMTech) (Aburn Hills, MI)
- FEATHERWEIGHT IN FINALS: Motorola, Inc. / Florida Atlantic University & Dillard High School / Crystal Lake Middle School / William Dandy Middle School (Plantation, FL)
- SPECIAL JUDGE RECOGNITION: Boston Scientific Corporation & Edgewood High School (Spencer, IN)
&
TRW Automotive & Harrison High School (Farmington Hills, MI)
&
Venture Industries / Exide Battery Company & Lake Orion High School (Lake Orion, MI)
- OUTSTANDING DEFENSE: Metal Flow Corporation & Holland Christian High School (Holland, MI)
- BEST OFFENSIVE ROUND: Baxter Healthcare Corporation / Northwestern University & Johnsburg High School (Round Lake, IL)
- JOHNSON & JOHNSON BEST SPORTSMANSHIP AWARD: Prince & West Ottawa High School (Holland, MI)

ATTENTION: PUBLIC RELATIONS COORDINATORS

FIRST Placements of the Week:

- WTSP-TV, "10 Teen TV," St Petersburg, FL. Lakewood High/Baxter Healthcare Team was focus of half-hour local teen show.
- WJAR-TV, WPRI-TV, WLNE-TV, Providence Journal-Bulletin, Newport Daily News, Providence, RI. Middletown High School/Naval Undersea Warfare Center invited local media to an exhibition before shipping the robot.
- Miami Herald, "Students gearing up for robot contest."
Reporter/photographer profiled MAST Academy/University of Miami in circa 367,500 newspaper.

Suggestions for coverage:

- After your regional, have your local paper write an article on event and how your team did.
- Get reporters to write a feature before/after the National Championship. Some reporters will follow you to Disney if they know in advance.
- Midwest Regional. Each local television outlet is receiving a video clip of the teams. Contact your local station and have them do a story based on the footage they are getting.

Continue to send me your placements via mail. Originals are best, with dates and names of media attached.

Sincerely,

Diane DiLeo
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fax: 617-863-0066
diane@spnpros.com

Address for Clips:
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Geoghegan Associates
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**THE COMPETITION-1997
TEAM UPDATE #15**

Date: March 24, 1997

**1997 JOHNSON & JOHNSON MID-ATLANTIC REGIONAL RESULTS
TOP 10 TEAMS**

Place	Team	Team #
1	Ortho Diagnostic Systems & Hillsborough High School (Raritan, NJ)	105
2	Johnson & Johnson Professional, Inc. & Bridgewater-Raynham Regional High School (Bridgewater, MA)	63
3	Ethlcon & Bound Brook High School (Somerville, NJ)	41
4	General Motors Powertrain Group & Pontiac North High School (Pontiac, MI)	46
5	Raytheon E-Systems & East Lake High School / Boca Ciega High School / Dixie M. Hollins High School (St. Petersburg, FL)	122
6	Delphi Interior and Lighting Systems & Pontiac Central High School (Troy, MI)	32
7	Worcester Polytechnic Institute & Massachusetts Academy of Math & Science (Worcester, MA)	153
8	McNeill Consumer Products / Philadelphia College of Textiles and Science & Strawberry Mansion / Carver High School of Engineering / Mastbaum AVTS / Bartrum High School (Ft. Washington, PA)	77
9	Xerox Corporation & Joseph C. Wilson Magnet High School (Webster, NY)	154
10	AT&T / Texas Instruments & South Brunswick High School (Monmouth Jct., NJ)	40

AWARD WINNERS

JOHNSON & JOHNSON MID-ATLANTIC REGIONAL CHAMPION
Ortho Diagnostic Systems & Hillsborough High School (Raritan, NJ)

RUNNER-UP

Johnson & Johnson Professional, Inc. & Bridgewater-Raynham Regional High School (Bridgewater, MA)

NUMBER ONE SEED

Delphi Interior and Lighting Systems & Pontiac Central High School (Troy, MI)

ROOKIE OF THE YEAR

General Motors Powertrain Group & Pontiac North High School (Pontiac, MI)

BEST OFFENSIVE ROUND

Janssen Pharmaceutical, Inc. & Rancocas Valley Regional High School (Mt. Holly, NJ)

OUTSTANDING DEFENSE

Northeast Utilities / U.S. Coast Guard Academy & Montville High School / The Williams School (Waterford, CT)

BEST PLAY OF THE DAY

Raytheon E-Systems & East Lake High School / Boca Ciega High School / Dixie M. Hollins High School (St. Petersburg, FL)

FEATHERWEIGHT IN FINALS

General Motors Powertrain Group & Pontiac North High School (Pontiac, MI)

MOST PHOTOGENIC

Ortho Diagnostic Systems & Hillsborough High School (Raritan, NJ)

PROCTER & GAMBLE CREATIVITY AWARD

Worcester Polytechnic Institute & Massachusetts Academy of Math & Science
(Worcester, MA)

HONEYWELL LEADERSHIP IN CONTROL AWARD

McNeil Consumer Products / Philadelphia College of Textiles and Science &
Strawberry Mansion / Carver High School of Engineering / Mastbaum AVTS /
Bartrum High School (Ft. Washington, PA)

MOTOROLA QUALITY AWARD

Xerox Corporation & Joseph C. Wilson Magnet High School (Webster, NY)

JOHNSON & JOHNSON BEST SPORTSMANSHIP AWARD

Procter & Gamble Pharmaceuticals & Norwich High School (Norwich, NY)

CHRYSLER TEAM SPIRIT AWARD (FRIDAY)

Ethicon & Bound Brook High School (Somerville, NJ)

JUDGES' TEAM SPIRIT AWARD (SATURDAY)

Johnson & Johnson Professional, Inc. & Bridgewater-Raynham Regional High School
(Bridgewater, MA)

JUDGES' DEAD RINGER AWARD

Cordis Corporation / Johnson & Johnson & Watchung Hills Regional High School
(Warren, NJ)

SPECIAL JUDGES' AWARD (FRIDAY)

Rutgers University & Plainfield High School (Plainfield, NJ)

SPECIAL JUDGES' AWARD (SATURDAY)

Eastman Kodak Company & Fairport High School (Rochester, NY)

SPECIAL JUDGES' SPORTSMANSHIP AWARD

Procter & Gamble Company / Tobyhanna Army Depot / Penn State / Keystone
College / Northeastern Educational IU19 & Elk Lake HS / Lackawanna County Area
Vocational Technical School / Lackawanna Trail HS / Tunkhannock Area HS / Troy
Area HS (Scranton, PA)

THE COMPETITION-1997 TEAM UPDATE #16

Date: March 25, 1997

EMERGENCY NUMBERS

This is a reminder to all teams that the emergency numbers published for our events are for emergency use only. These numbers have been abused at the regional events this year. We are not a message service, so if you are concerned about receiving non-emergency messages, please make provisions on your own (such as having your team leader carry a pager).

WOODIE FLOWERS AWARD

A reminder that the Woodie Flowers Award essays are due on Thursday, March 27th at the FIRST office in Manchester, NH, addressed as shown below. The award will be presented during the award ceremony on April 12, 1997.

FIRST
The Woodie Flowers Award
200 Bedford Street
Manchester, NH 03101

DANIEL WEBSTER COLLEGE SCHOLARSHIP AWARD

In partnership, FIRST and Daniel Webster College have established a scholarship to benefit a deserving student who has participated on a FIRST team during his or her high school years and who would like to attend Daniel Webster College. The student may enroll in any course of study at the college.

Daniel Webster College will award a merit scholarship in the amount of \$7,500 per year for four years to a student who has been a member of a FIRST team at any high school in the country. The student must meet the regular academic requirements for admission as written in the college catalogue, as well as meeting the requirements for scholarship retention. In addition the applicant must submit a recommendation from an adult leader on the applicant's team. The scholarship is renewable for three consecutive years provided that the student performance meets normal requirements. This scholarship is a merit scholarship and is awarded based upon performance, record, and recommendations. The recipient will not be eligible for additional merit scholarship awards from Daniel Webster College, but the student may apply for need based financial aid.

TENTATIVE AGENDA FOR NATIONAL CHAMPIONSHIP

Thursday, April 10, 1997

7:45am	Team Pick Up at All Star Resort
8:00am	Pit Opens
9:00am - Noon	Team Registration at Pit Stop
10:00am	Machine Shop Opens
10:00am - ?	Robot Inspections
11:00am - 8:30pm	Practice Rounds
9:00pm	Pit & Machine Shop Close

Friday, April 11, 1997

7:45am	Team Pick Up at All Star Resort
8:00am	Pit & Machine Shop Open
9:00am - 5:00pm	Seeding Matches (Stages 1 & 2)
6:00pm	Pit & Machine Shop Close

Saturday, April 12, 1997

7:45am	Team Pick Up at All Star Resort
8:00am	Pit & Machine Shop Open
9:00am - 2:00pm	Double Elimination Tournament (Stages 1 & 2)
2:00pm - 3:00pm	Break
3:00pm - 5:00pm	Finals (Stage 1)
6:30pm	Pit Closes (Teams must be loaded out by this time.)
7:15pm	Awards Ceremony (Stage 1)
8:45pm - 11:00pm	Event Wrap Party at Future World West (EPCOT)

THE RULES UPDATE

Based on events at the three regional competitions, and after much consideration, FIRST has decided to alter the tie breaking conditions listed in Rule P23. Specifically, the third tie breaking condition has been changed so as not to discourage human players from participating in matches. The updated Rule P23 is listed below:

P23. In the event of a tied score the following tie breaking conditions will be applied in the order below until the tie is won:

- 1st: The team with the highest tube in a scoring position wins the tie. To be considered highest, it must be the highest tube on or above the center of the top of the goal. If no tubes are in that position, it is the tube on the highest level of pegs. Subtle variations in height for a given level of pegs will not be considered.
- 2nd: The team with the most tubes in scoring position in the highest level of the goal. This starts at the top level of pegs and progresses to the lowest level of pegs until the tie is broken.
- 3rd: The team with the most tubes of opponents' colors in their player station.
- 4th: The team with the highest tube not contacting the floor. (Tubes in the player station are not considered.)
- 5th: The team with the tube closest to the center of the base of the goal. (Tubes in the player station are not considered.)

We feel strongly that this change will result in an even more exciting competition and although strategies will certainly change, no team will be put at an unfair disadvantage based on robot design.

THE COMPETITION-1997

TEAM UPDATE #17

Date: March 25, 1997

IMPORTANT SAFETY ISSUES

During one of the recent regional competitions, a human player walked onto the playing field during a match while returning a robot to the playing field after it had fallen out of bounds and been disabled. This is beyond the intention of the Rule T15, and is a serious safety hazard. Under no circumstances should any member of a team enter the playing field during a match.

During another match, a shoving match between two robots caused one of the robots' arms to come into contact with the human player, who tried to avoid it without leaving the player station. As stated in Q171 in Team Update #5: "There will not be a penalty if the human player leaves the player station for reasons of personal safety."

RULE CLARIFICATION

The complete text of Rule T15, as amended by Team Update #2 and Team Update #8 is as follows:

T15. If a robot goes out-of-bounds to the point that it has to apply force to any out-of-bounds surface to rejoin play, its control system will be disabled. When this happens, the human player is allowed to leave the player station (without penalty), walk around the outside of the playing field to the robot, and return the robot to the field near the point at which it exited. The robot may not be placed in contact with tubes or another robot. The player may then walk back to the player station, at which time the robot will be re-enabled.

A robot which applies power to the Interaction Zone of its team's player station may be immediately returned to the playing field, but the control system will be disabled for a minimum of 20 seconds. During this timeout, the player may not interact with the tubes. If the player chooses not to return the robot to the playing field, they may interact with the tubes without interruption.

Before leaving the player station, the player should wait for a signal from a referee to indicate that the robot has been disabled and that it is ok to return it to the field. If no signal is given, and the player leaves the player station or otherwise contacts the robot, they will be penalized as described in Q76 in Team Update #2.

When returning a robot to the playing field, the player should stand outside the field border and lift and/or push the robot until it is inside the playing field. Reaching over the field is acceptable. While outside the player station, extreme caution should be exercised by the player because other robots will be active on the playing field.

Rule T15 does not give permission to players to enter the field or make repairs to the robot. It also does not guarantee the ability to return a tipped robot to an upright position. It merely allows the player to return the robot to the field so that the robot's control system may be re-enabled. (It is acceptable for a player to return a tipped robot to an upright position as long as the player does not enter the playing field.)