

U.S. FIRST

The COMPETITION
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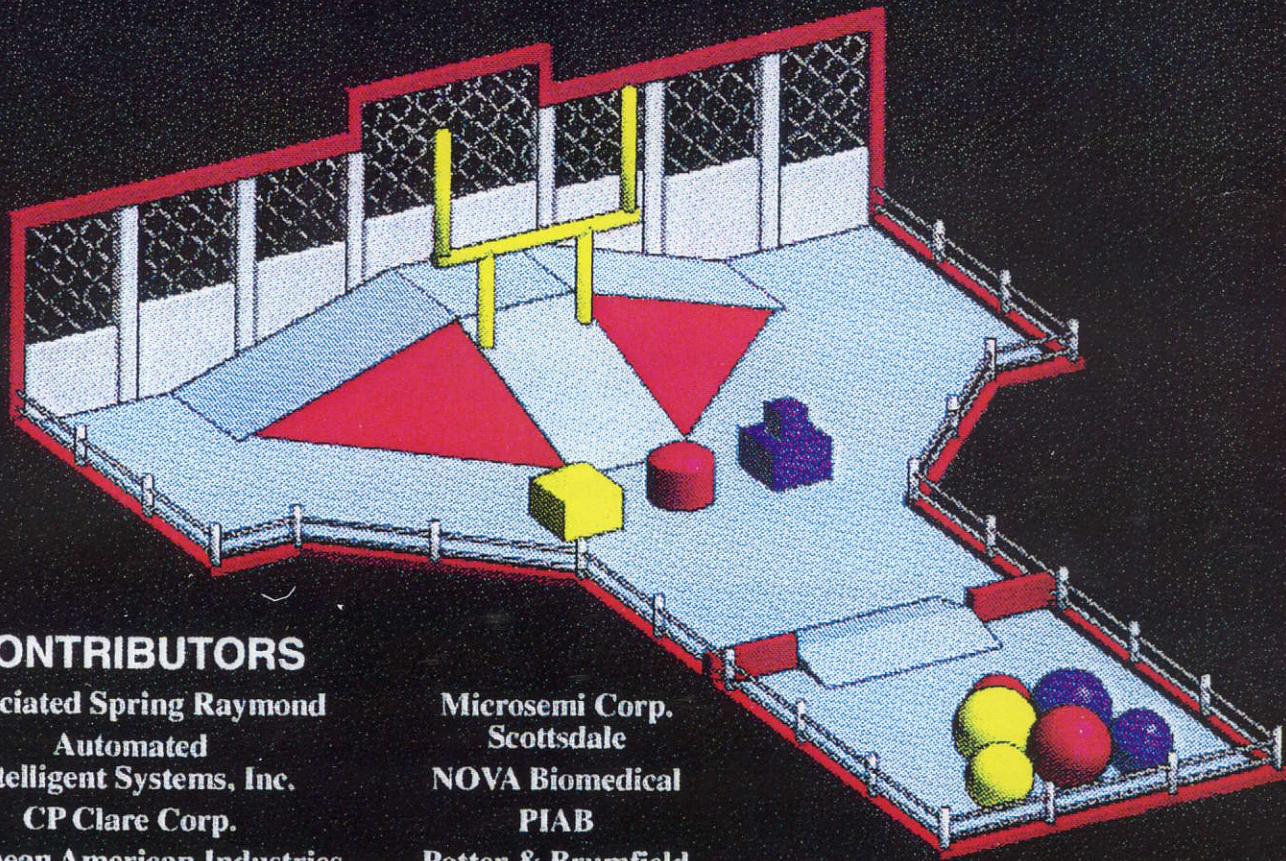
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Imaging Automation

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The RULES

THE 1995 U.S. FIRST ROBOTIC COMPETITION RULES

TABLE OF CONTENTS

Section 1	Overview	2
Section 2	Safety Rules.....	3
Section 3	Machine Design & Operation.....	3
Section 4	The Kit of Parts..... Explanation of additional components in the Official Kit of Parts Use of materials Limitations on materials List of components	4
Section 5	Tournament & Play..... Tournament general guidelines Specifics of game play Regional results and seeding at the National Championship	15
Section 6	Field..... Field diagrams	17
Section 7	Control System..... Rules, manual, specifications, hook up instructions	21
Section 8	Schedule of Events..... Regional tournament structure National Championship structure Registration & Practice Seeding matches & Double elimination tournament Timing between Regional Tournaments and National Championship Shipping & transportation of machines	44
Section 9	Administrative Details	47
	Before you come to the Competition... Pit Station Submission Deadlines: team profiles, guest lists, Chairman's Award	
	Before you leave the Competition... Returning unused kit parts and container Taking your machine back with you	
	Event locations, dates and addresses, & hotel information U.S. FIRST staff & numbers	
Section 10	Awards	51
	Chairman's Award Founder's Award Judges' Awards	
Appendix	Team Directory	52
	Supplier Directory.....	60
	Small Parts Inc. ordering procedure & supplement.....	63
	Autodesk Animation Celebration.....	69
	Manufacturers Specifications	71

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OVERVIEW

COMPETITION OBJECTIVE (*Also see Section 5*)

To design and build a remotely-controlled robot that can collect, transport and lift one 24" and/or one 30" diameter ball over a horizontal bar. The playing field is a carpeted modified T-shaped area. The goal area is made up of three ramps and two slopes leading to a square platform. In each match, three teams compete to put their own balls over a field goal. Two points are scored with the smaller ball and three points with the large ball. The winner of each match is the team with the highest score. In the case of a tie, the higher large ball in the goal area breaks the tie. If no balls are within the goal area, the large ball closest to the center of the top of the platform wins.

EVALUATION & AWARDS (*Also see Section 10*)

The winner of each match will be the team with the highest score at the end of two minutes. The overall winner will be determined in a double elimination tournament. The recipients of the various Judges' Awards and the prestigious Chairman's Award will be determined by an independent panel of judges.

CONSTRAINTS

Materials (*Also see Section 4*)

Each machine must be constructed exclusively from materials provided in the Kit of Parts ("The Kit") supplied by U.S. FIRST, with the following additions and exceptions:

- 2' x 4' x 1.1" Rohacell™ structural foam shipped directly to each team from the manufacturer
- up to \$425 worth of materials purchased from the Small Parts Catalog
- *Additional Hardware* available from outside sources. A specific list of materials and quantities is provided with the *List of Components*.
- fasteners, washers and adhesives from outside The Kit may be used for joining and fastening purposes only
- adhesive tape may be used only as an electrical insulator
- lubricants may be used only to reduce friction within your own device
- The Kit container may not be used to build the device.

Control System (*Also see Section 7*)

You may not tamper with the Control System even though it is part of The Kit.

Energy Sources (*Also see Section 3*)

The energy used by the machines in the Competition must come solely from:

- electrical energy derived from the onboard battery packs
- storage achieved by deformation of springs or the latex tubing provided in The Kit
- a change in the altitude of the device's center of gravity.

Size & Weight (*Also see Section 3*)

Machines must fit, unconstrained, inside a cylinder 36 inches in diameter and 30 inches in height. The weight of the machine including batteries may not exceed 70.0 pounds.

Shipping (*Also see Section 8*)

Shipping rules and deadlines vary by events in which your team is participating. See *Administrative Details* for specifics. UPS is sponsoring complimentary shipping; however, you may use the shipper of your choice.

SAFETY RULES

- S1. Safety first. Due to the nature of the event in which electrical equipment, springs and tools are used, safety will not be compromised.
- S2. Any machine which is determined to be a safety hazard by the referees at any time during the Competition must be sufficiently modified to the referees' satisfaction or it may be disqualified and not allowed to compete.
- S3. No energy stored in a rubber band may be used to launch any projectile. This does not apply to the latex tubing provided in The Kit.
- S4. Projectiles must have a frontal area greater than or equal to 10 square inches and be shaped to avoid eye injury. Competition balls are considered safe projectiles and are the only projectiles the latex tubing may launch.
- S5. Do not tamper with power supplies, batteries, chargers, battery boxes, or any control system component. In addition, do not apply labels or otherwise mark these components. We will re-use them and your identification may cause confusion.
- S6. Safety glasses must be worn by all team members in the team boxes during matches, and in the pit area when working on machines. They are also highly recommended if your neighbor(s) in the pit are working on their machine.
- S7. Remove batteries from the holders while making adjustments to your machine. Due to the strength of the motors in The Kit, it is important to keep fingers away from the gears while your machine is connected to a power supply.
- S8. The batteries may deliver more than 100 Amperes. Do not let the wires come into contact with any metal surfaces. Route wires carefully to avoid damage and short circuits, which may cause serious burns and/or fire.

MACHINE DESIGN & OPERATION

Size \leq 36" Ø x 30"; Weight \leq 70.0 pounds

- M1. Your vehicle may not exceed the above size and weight requirements before the seeding rounds begin. There are no restrictions on the orientation of the cylinder when measuring a machine.
- M2. All machines will be weighed and measured during the practice day at each Competition event and may be reinspected anytime during an event. If modifications to your machine are necessary to meet the above requirements, they must be completed before seeding matches begin.
- M3. Teams are expected to design and build machines to withstand vigorous amounts of interaction with other machines. (*Also see Rule T7.*)
- M4. Until the controls are enabled at the beginning of each match, machines and any appendages, extensions or projectiles must remain unconstrained within the 36" Ø x 30" starting size. Once a match begins, machines may extend beyond that limit under their own power.

- M5. Machines must be designed to operate by reacting against the surface of the playing field, the innermost face of the curb, the platform, ramps, slope, the speed bump, the balls, the other machines, and the air. (*See Section 6 for Field Diagrams.*)
- M6. Machines must display their team company and school names and/or logos. The judges, referees, and announcers must be able to identify them by name.
- M7. During a match, machines may be manipulated only by the normal operation of the wireless control system.
- M8. Gaining traction by using adhesives or by damaging the surface of the playing field or the balls is not allowed.
- M9. No substitute machines are permitted; however, functionally identical replacement parts are allowed.
- M10. During any Competition event, any mechanism which will alter the operation of the machine may not be added or removed after the first match of the seeding rounds unless mandated by the judges for rule compliance reasons. (*Also see Section 8.*)
- M11. If you are competing in both a regional tournament and the National Championship, changes may be made to your machine during the five days following the regional tournament in which your team participated. If you do make changes, remember that your machine must not exceed the above requirements at the National Championship. (*Also see Section 8.*)
- M12. Each team will be supplied with a table and a power outlet in the Pit Area where fine-tuning and repairs to your machine can be made during the Competition. Teams may bring any necessary and appropriate hand/power tools for making repairs and they must fit into your team's designated Pit Area. This space will not be large enough for floor tools or displays. (*Also see Section 9.*)
- M13. If a part requiring machining is broken during the competition, consult with U.S. FIRST staff. We will make every effort, given local shop and material availability, to repair or replace the part. (*Also see Section 9.*)

THE KIT OF PARTS

Explanation of Additional Components in the Official Kit of Parts

Each machine must be constructed exclusively from materials provided in the Kit of Parts ("The Kit") supplied by U.S. FIRST, with the following additions:

- 2' x 4' x 1.1" Rohacell™ structural foam. This material will be shipped directly to each team from the manufacturer
- fasteners, washers and adhesives from outside The Kit may be used for joining and fastening purposes only
- adhesive tape may be used only as an electrical insulator
- lubricants may be used only to reduce friction within your own device
- material available from outside sources, as explained below:

Additional Hardware

A specific list of materials and quantities is provided with the *List of Components*.

Small Parts, Inc. Catalog

Up to \$425 worth of materials purchased from the Small Parts, Inc. catalog may appear on your final machine. Parts that can be purchased here may not be purchased elsewhere. Each team receives an account with this credit balance which will be debited for the actual purchases you make. If you exceed your credit amount, you are responsible for paying the difference. See Rule K3 and the *Appendix* for more details on accounting and ordering.

Use of Materials

- K1. Many of the materials in The Kit are raw materials. They are intended to be used for manufacturing structural or mechanical parts for your machine.
- K2. You may use any component from the Small Parts catalog up to the \$425 limitation. This dollar amount limitation is the total amount of Small Parts components which may appear on your final machine. You may go beyond this dollar limitation for prototyping, but your team is responsible for paying the balance on the account.
- K3. If you use only a portion of what you buy from Small Parts, you may prorate the dollar amount used to the smallest quantity listed for purchase in the catalog. For example, if you buy 5' of rod which could have been purchased by the foot, but end up using only 6", you may calculate the amount used as the price per one foot.
- K4. There is no restriction on the total amount of sprockets/pulleys and chain/belt on your machine, whether bought or machined from official Kit parts. There is a restriction on the amount which can be obtained from outside sources--see the *Additional Hardware List* and Rule K5 for an explanation.
- K5. Due to the high power output of the drill motors, each team may purchase from a source outside of the Official Kit of Parts (such as a bike shop or hardware store) additional sprockets and/or pulleys (not gears) and additional chain and/or belt, with the following conditions:
 - On your final machine, you may use no more than a combined total of 4 sprockets and/or pulleys from outside sources.
 - On your final machine, you may use no more than a combined total of 10' of chain and/or belt from outside sources. There are no restrictions regarding pitch or width of chain and/or belt.
 - These components must be "commercially available," strictly *off-the-shelf* only. No custom or special orders.
 - These components must be used in a power train. Power train is defined as components transmitting mechanical power to any of the vehicles' mechanisms, including propulsion, arms, projectiles, etc.
- K6. Gears may be obtained only by machining them from official Kit parts or by purchasing them from Small Parts.
- K7. Printer parts may be used on your machine as long as they are not used electrically or to conduct electricity. We cannot guarantee the quality of these parts.
- K8. You may use one of the types of wood listed on the *Additional Hardware List*, in a 1/2" thickness with a total area of 4' x 4'. In addition, you may use any or all of the wood samples provided in The Kit.
- K9. Fasteners (rivets, screws, welds, nails, cable ties, etc.), washers, and adhesives are not included in your \$425 limit on Small Parts Inc. equipment on your machine.

THE 1995 U.S. FIRST ROBOTIC COMPETITION RULES

- K10. Fasteners may not be used as structural members or power transmission components except as pins in a linkage or as hinge pins.
- K11. Net material is allowed; however, if it is used to entangle opponents' machines, the referees may disallow it.
- K12. You may only use "off-the-shelf" springs, such as compression, tension, torsion, constant force; spring washers; and, the latex tubing provided in The Kit. Springs in addition to those provided in The Kit may be purchased only from Small Parts, Inc. You may not fabricate your own. The springs may be pre-wound prior to power up.
- K13. Pipe fittings (tees, reducers, elbows, and angles) may be purchased only to join pipe and may be used without limit in linking sections of these materials. Endcaps may also be used.
- K14. A limited number of replacement parts will be made available by U.S. FIRST upon justified request. Otherwise, lost or damaged kit materials may be replaced only with identical components of the same material, dimensions and treatment at the team's cost.

Limitations on Materials

- K15. Materials in The Kit may not be changed chemically with the following exceptions:
- rope ends may be singed to prevent loose ends or to bind them together
 - resin and hardener may be mixed to produce epoxy.
- K16. No electrical components from the printer, including wire, may be electrically connected to the control system.
- K17. All unused parts and materials, especially the printer and drill parts, must be returned to U.S. FIRST for proper recycling.
- K18. The balls provided in The Kit may not be used during any Competition event.

List of components

The following pages are a detailed packing list for all Components which make up the official Kit of Parts. A checklist has been included in your Kit which you should use as you go through The Kit to be sure you have received all parts. This checklist should be signed by a team member and returned to a U.S. FIRST staff member as you leave the Kickoff Workshop. Any materials you did not receive will be shipped to you as soon as possible.

LIST OF COMPONENTS

Bearings

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
2-Bolt Self-Aligning Flange		Bag 6	8	The Torrington Company
Radial Ball Bearing w/Spherical OD	1/2" i.d., self locking collar	Bag 6	4	The Torrington Company
Single Row Radial Flanged Ball Bearing	1/4" i.d.	Bag 6	4	The Torrington Company
Single Row Radial Flanged Ball Bearing	3/8" i.d.	Bag 6	4	The Torrington Company

Control System

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
15 pin connector, female	solder cup	Bag 4	1	Brevan Electronics
15 pin connector, male	solder cup	Bag 4	2	Brevan Electronics
15-pin Cable	DB15 Male to Female, 6', unshielded	Loose	1	Brevan Electronics
2 conductor jacketed wire	#16 AWG	Loose	15'	General Cable
2 conductor jacketed wire	#24 AWG	Loose	20'	General Cable
3 conductor shielded wire	#24 AWG	Loose	20'	General Cable
7 pin DIN connector, female	bulkhead mount, solder connect, 270°	Bag 4	1	Brevan Electronics
9-pin Cable	DB9 Male to Female, 6', unshielded	Loose	1	Brevan Electronics
9-pin Ribbon Cable	12", DB9 Male to Female	Bag 4	1	Brevan Electronics
9-pin Tether Adapter	DB9 Fem-Fem, pins: 5->5, 2->3, 3->2	Bag 4	1	Brevan Electronics
Battery Charger		Loose	2	Milwaukee Electric Tool Corp.
Blue project box	6" x 3" x 2"	Loose	1	Radio Shack
Circuit Breaker	12 volt, 20 Amp, auto-resetting	Battery	2	Snap-Action, Inc.
Delco Motor Wiring Harness	5'	Bag 4	4	Assembled by Nova Biomedical
Diode	1 Amp max	Bag 4	2	DEKA
Flightstick Joystick	7 ft cable with Male DB15	Loose	2	CH Products
Jack Screw with Lock Washer	3 screws per bag	Bag 4	12	Honeywell - Microswitch Division
Joypad Controller	7 pin (270°) male DIN connector	Loose	1	Imaging Automation
Limit Switch	Faint printing on side	Bag 4	4	Honeywell - Microswitch Division
Limit Switch	White printing on side	Bag 4	4	Honeywell - Microswitch Division
Milwaukee Battery Box	Battery Charger Case	Loose	2	Assembled by Nova Biomedical
Milwaukee Rechargeable Battery		Loose	4	Milwaukee Electric Tool Corp.

LIST OF COMPONENTS

Muffin Fan	12 vdc	Loose	1	Digital Equipment Corporation
Plastic Hood for DB15		Bag 4	2	Brevan Electronics
Power Supply	9 Volts DC, 1.2 Amps max	Loose	1	Golden Pacific Electronics, Inc.
Receiver and Relay Box Power Connector	2-pin European style header	Bag 4	2	Augat RDI
Receiver Box		Loose	1	Assembled by Nova Biomedical
Reed Switch	Normally open	Bag 4	4	CP Clare
Relay Box		Loose	1	Assembled by Nova Biomedical
Relay Box Output Connector	12-pin European style header	Bag 4	1	Augat RDI
RNETs + Antenna		Bag 4	1 pair	Motorola
Rocker Switch		Bag 4	4	Honeywell - Microswitch Division
Rocker Switch Cover	Blue	Bag 4	1	Honeywell - Microswitch Division
Rocker Switch Cover	Green	Bag 4	1	Honeywell - Microswitch Division
Rocker Switch Cover	Red	Bag 4	1	Honeywell - Microswitch Division
Rocker Switch Cover	White	Bag 4	1	Honeywell - Microswitch Division
Servo	Hitec/JR-style connector, 42 oz. in.	Bag 4	2	Hitec RCD, Inc.
Servo extension cable	Hitec/JR-style, 36" long	Bag 4	2	Hitec RCD, Inc.
Servo Y cable	Hitec/JR-style, 24" long	Bag 4	2	Hitec RCD, Inc.
Tekin Reversing Speed Controller		Loose	2	Tekin Electronics, Inc.
Transmitter Box		Loose	1	Assembled by Nova Biomedical
Wire, Black	#12 AWG	Bag 4	8'	General Cable
Wire Nut	for 12 AWG wire	Bag 4	10	Home Depot
Wire, Red	#12 AWG	Bag 4	8'	General Cable
Wiring harness for Textron pumps	fits Textron pumps, 6" leads	Bag 5	2	McCord Winn Textron

Documentation

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Data sheet for Reed Switch		Manual	1	CP Clare
Material Safety Data Sheet for Welding Rods		Manual	1	McMaster-Carr Supply Company
Numasize Lite	manual and software for IBM PC	Manual	1	Numatics
Performance Data for Delco Motors		Manual	1	U.S. FIRST
Rohacell® Technical Manual	1" x 24" x 49"	Manual	1	Rohm Tech, Inc.

LIST OF COMPONENTS

Small Parts Catalog		Loose	1	Small Parts, Inc.
Spec sheet for PIAB suction cup		Manual	1	U.S. FIRST
Spec sheet for Volume Chamber		Manual	0	American Cylinder
Spec Sheets for Bearings & Flanges		Manual	1	The Torrington Company
Spec Sheets for Constant Force Spring		Manual	1	Associated Spring Raymond
Spec sheets for Numatics components		Manual	1	Numatics
Spec sheets for Textron Pumps		Manual	1	McCord Winn Textron
Spring Hinge Instructions		Bag 2	1	Stanley Hardware

Fasteners

Part Name/Description	Dimensions	Location	Qty/Kit	Product Supplier
5 Minute Epoxy Gel	resealable 1 oz. dual syringe	Bag 1	1	McMaster-Carr Supply Company
Bar Lock Tie	11"	Bag 1	5	ESS
Bar Lock Tie	7"	Bag 1	5	ESS
Chuck Screw	left handed thread, Torx P20 head	Gearmotor	2	Milwaukee Electric Tool Corp.
Drill Rod	5/16" Ø x 18"	Tube	2	McMaster-Carr Supply Company
Helical Plastic Wire Wrap	1/4" Ø x 24"	Loose	1	McMaster-Carr Supply Company
Rubber band, Large	3-1/2" x 1/4" wide	Bag 1	5	Alliance Rubber Company
Rubber band, Small	3-1/2" x 1/8" wide	Bag 1	5	Alliance Rubber Company
Velcro Strip, Hook	1" x 3"	Bag 1	10	U.S. FIRST
Velcro Strip, Loop	1" x 3"	Bag 1	10	U.S. FIRST
Velcro Strip, Mushroom Cap	1" x 12"	Bag 1	1	McMaster-Carr Supply Company

Field Components

Part Name/Description	Dimensions	Location	Qty/Kit	Product Supplier
U-Bolt Wire Rope Clips	for 3/16" Ø rope, galvanized iron	Bag 1	1	McMaster-Carr Supply Company

Gears, Sprockets & Pulleys

Part Name/Description	Dimensions	Location	Qty/Kit	Product Supplier
1" Pulley with Fixed Eye for 5/16" Rope	1" Ø x 5/16" Ø	Bag 2	3	Stanley Hardware

Motors & Pumps

Part Name/Description	Dimensions	Location	Qty/Kit	Product Supplier
Delco Seat Motor	12 vdc motor w/ socket for Packard	Loose	4	Delco Electronics Corporation
Drill gear shift link		Bag 7	2	Milwaukee Electric Tool Corp.

LIST OF COMPONENTS

Drill shifter button		Bag 7	2	Milwaukee Electric Tool Corp.
Drill shifter spring-large		Bag 7	4	Milwaukee Electric Tool Corp.
Drill shifter spring-small		Bag 7	2	Milwaukee Electric Tool Corp.
High Output Lumbar Pump MWT Motor	12 vdc, 22 psi max, 3/16" o.d. barbed	Bag 5	1	McCord Winn Textron
Low Output Lumbar Pump Johnson Motor	12 vdc, 4 psi max, 3/16" o.d. barbed	Bag 5	1	McCord Winn Textron
Milwaukee Drill motor	12 V DC	Gearmotor	2	Milwaukee Electric Tool Corp.
Milwaukee Drill shell screws	5/8" x 4-20 sheet metal screw	Bag 7	16	U.S. FIRST
Milwaukee Gearbox	1000/300 RPM transmission	Gearmotor	2	Milwaukee Electric Tool Corp.

Other

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Carpet Sample	12" x 12"	Loose	1	U.S. FIRST
Co-Polymer Gutter Guard	6" x 24"	Loose	1	Home Depot
DEC LA75 Printer		Loose	1	Digital Equipment Corporation
Torx L-Key	Torx T20 Heads, 3-3/4" Length	Bag 4	1	McMaster-Carr Supply Company

Pneumatics

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Air Accumulator	approximately 1 liter volume, 1/8" Ø	Loose	1	American Cylinder (Sprague Air)
Barbed Fitting	1/8" i.d. to 1/8" NPSF	Bag 3	1	Parker Fluid Connectors
Barbed Fitting	1/8" i.d. to 1/8 NPTF	Bag 3	2	Numatics
Barbed Fitting	1/8" i.d. to 10-32 UNF	Bag 3	12	Numatics
Barbed Reducing Connector	3/16" i.d. to 1/8" i.d.	Bag 3	2	Value Plastics, Inc.
"F" connector	3/16" o.d. barbed fittings	Bag 3	2	McCord Winn Textron
F-Connector	3/16" o.d. barbed fitting	Bag 5	2	McCord Winn Textron
Mark 3 Double Solenoid Valve, DIN connector	12 VDC, 10-32 UNF-3B	Loose	1	Numatics
Mark 3 Single Solenoid Valve, Spring Return,	12 VDC, 10-32 UNF-3B	Loose	1	Numatics
Numatics Air Cylinder	1-1/16" bore x 4" stroke	Loose	1	Numatics
Numatics Air Cylinder	7/16" bore x 12" stroke	Loose	1	Numatics
Numatrol Tubing	1/4" o.d., 1/8" i.d.	Loose	15'	Numatics
PIAB Suction Cup	53 mm Ø, 1/8" NPSF	Bag 3	1	PIAB
Plug	10-32 UNF	Bag 3	5	Numatics

LIST OF COMPONENTS

Polyurethane Tubing	3/16" i.d.	Bag 3	4'	Value Plastics, Inc.
Power Connector for Valves		Bag 3	3	Numatics
Syringe	140 cc, Luer Lock Tip	Loose	1	Lowell Medical Instrument Company,

Rods & Shafts

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Aluminum Rod	1/2" Ø x 12"	Tube	1	McMaster-Carr Supply Company
Aluminum Rod	1/2" Ø x 24"	Tube	1	McMaster-Carr Supply Company
Brazing Rod	1/16" Ø x 18"	Tube	2	McMaster-Carr Supply Company
Brazing Rod	1/8" Ø x 18"	Tube	6	McMaster-Carr Supply Company
Closet Rod - Sample		Bag 1	1	Home Depot
Copper Water Pipe - Sample	1/2" Ø	Bag 1	1	Home Depot
Delrin (Acetal) Rod	1/4" Ø x 24"	Loose	1	McMaster-Carr Supply Company
Drill Rod	1/2" Ø x 18"	Tube	2	McMaster-Carr Supply Company
Drill Rod	1/4" Ø x 18"	Tube	2	McMaster-Carr Supply Company
Drill Rod	3/8" Ø x 18"	Tube	2	McMaster-Carr Supply Company
Drill Rod	5/16" Ø x 18"	Tube	2	McMaster-Carr Supply Company
Electrical Conduit Pipe - Sample	1" i.d.	Bag 1	1	Home Depot
Electrical Conduit Pipe - Sample	1/2" i.d.	Bag 1	1	Home Depot
Electrical Conduit Pipe - Sample	3/4" i.d.	Bag 1	1	Home Depot
Flexible Motor Shaft	13.5" long, Fits Delco Seat Motor	Loose	4	Delco Electronics Corporation
Flexible Steel Conduit - Sample	4"	Bag 1	1	Home Depot
LDPE Rod	1" Ø x 24"	Tube	1	U.S. FIRST
PVC Pipe - Sample	1" i.d.	Bag 1	1	Home Depot
PVC Pipe - Sample	1-1/2" i.d.	Bag 1	1	Home Depot
PVC Pipe - Sample	1/2" i.d.	Bag 1	1	Home Depot
PVC Pipe - Sample	3/4" i.d.	Bag 1	1	Home Depot
Threaded Rod	1/4" Ø x 24", 20 pitch coarse thread	Tube	1	McMaster-Carr Supply Company
Wooden Dowel	1/4" Ø x 12"	Tube	1	McMaster-Carr Supply Company
Wooden Dowel	1/4" Ø x 24"	Tube	1	McMaster-Carr Supply Company

LIST OF COMPONENTS

Rope, Belts, & Chain

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty/Kit</u>	<u>Product Supplier</u>
Nylon Braided Rope - Sample	5/16" Ø x 1'	Bag 1	1'	U.S. FIRST

Sheets & Boards

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty/Kit</u>	<u>Product Supplier</u>
Aluminum Plate	1/4" x 3" x 12"	Loose	1	McMaster-Carr Supply Company
Aluminum Sheet	1/16" x 12" x 18"	Loose	1	McMaster-Carr Supply Company
Chipboard - Sample	1/2" x 6" x 12"	Loose	1	Home Depot
HDPE	1" x 2" x 6"	Loose	1	McMaster-Carr Supply Company
Masonite Board	12" x 18"	Loose	1	Home Depot
Particle Board - Sample	1/2" x 6" x 12"	Loose	1	Home Depot
Pine Board - Sample	1" x 1-1/2" x 9"	Loose	1	Home Depot
Pine Board - Sample	1" x 2-1/2" x 9"	Loose	1	Home Depot
Pine Board - Sample	1" x 3-1/2" x 9"	Loose	1	Home Depot
Plywood	1/4" x 6" x 12"	Loose	1	Home Depot
Plywood - Sample	1/2" x 6" x 12"	Loose	1	Home Depot
Polycarbonate Sheet	1/16" x 12" x 12"	Loose	1	U.S. FIRST
Rohacell® P170 Structural Foam	1" x 24" x 49"	USPS	1	Rohm Tech, Inc.
Rubber Sheet, Black	3/32" x 6" x 18"	Loose	1	McMaster-Carr Supply Company
Rubber Sheet, Red	1/16" x 6" x 18"	Loose	1	McMaster-Carr Supply Company

Small Parts

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty/Kit</u>	<u>Product Supplier</u>
5/32" Allen Wrench (comes with spring hinge)		Bag 2	1	Stanley Hardware
Assorted Brass Screws (comes with spring		Bag 2	1	Stanley Hardware
Cabinet Catch Magnet w/plastic case		Bag 2	1	Stanley Hardware
Caster Wheel	6" Ø, 5/16" i.d. bearings, 1-1/2" wide	Loose	2	Skyway Recreation Products
Caster Wheel	8" Ø, 5/16" i.d. bearings, 1-1/2" wide	Loose	2	Skyway Recreation Products
Double Magnet Cabinet Catch		Bag 2	1	Stanley Hardware
Flat Washers	1/4" i.d., 7/8" o.d.	Bag 1	4	McMaster-Carr Supply Company
Flexible Shaft Coupling		Bag 1	4	U.S. FIRST

LIST OF COMPONENTS

Additional Hardware List

Only those parts listed here that are not available through Small Parts, Inc., may be

Folding Table Brace	9-1/2"	Bag 2	4	Stanley Hardware
Hex Nuts	1/4" i.d., 20 pitch coarse thread	Tube	8	McMaster-Carr Supply Company
Hinged Hasp	3" Strap	Bag 2	1	Stanley Hardware
Locking Screw for Spring Hinge (comes with		Bag 2	1	Stanley Hardware
Pivot for Steel Track		Bag 2	2	Stanley Hardware
Rectangular Magnet		Bag 1	4	Radio Shack
Roller Guide for Steel Track	7/8" Ø x 1/4" wheel	Bag 2	4	Stanley Hardware
Rubber Strap		Bag 1	2	U.S. FIRST
Shrink Fit Tubing	3/8" Ø x 10"	Bag 1	1	U.S. FIRST
Side Release Buckle	Fits 3/4" Strap	Bag 2	1	McMaster-Carr Supply Company
Steel Hinge	3-1/2" x 3-1/2"	Bag 2	2	Stanley Hardware
Steel Track w/Endstop	2'	Loose	2	Stanley Hardware
Trantorque Coupling	3/8" i.d., 3/4" o.d.	Loose	2	Small Parts, Inc.
Utility Draw Pull Latch	1-3/4" high x 3-9/32" wide, Nickel Plated	Bag 2	1	McMaster-Carr Supply Company

Springs

Part Name/Description	Dimensions	Location	Qty/Kit	Product Supplier
Compression Spring		Bag 1	1	Associated Spring Raymond
Constant Force Spring, Large	1.02" i.d.	Bag 1	2	Associated Spring Raymond
Constant Force Spring, Medium	0.85" i.d.	Bag 1	1	Associated Spring Raymond
Constant Force Spring, Small	0.51" i.d.	Bag 1	2	Associated Spring Raymond
Small Tension Spring		Bag 1	1	Associated Spring Raymond
Snugger (Spring for Steel Track)		Bag 2	4	Stanley Hardware
Spring Loaded Hinge, 30 in/lb max	4" x 4"	Bag 2	1	Stanley Hardware

Aluminum Plate	1/2" x 1/4"
Aluminum Plate	4" x 4" x 1/8"
Pine Board	1" x 3-1/2" x 10'
Plastered, Chipboard OR Particle Board	1/2" x 4" x 4'
Polyester Sheet	1/4" x 4" x 4'
Polyester Sheet	3/8" x 2" x 4'

LIST OF COMPONENTS

Additional Hardware List

Only those parts listed here that are not available through Small Parts, Inc., may be purchased from outside sources. You may not purchase 'nearly equivalent' parts, special or custom orders. There are some samples of these materials provided in The Kit. These may also be used in your device.

Fasteners

Hose Clamp	up to 10 of any size
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Gears, Sprockets & Pulleys

Chain/Belt to match Sprocket/Pulley	up to 10' total, any combo
Sprockets or Pulleys	up to 4 total, any size/combo

Other

Fiberglass Matting	4' x 4' x up to 1/8"
Fiberglass Resin + Hardner	as needed

Rods & Shafts

Closet Rod	1 1/4" Ø x 6'
Copper Water Pipe	1/2" Ø x 10'
Electrical Conduit Pipe (EMT)	1" Ø x 10'
Electrical Conduit Pipe (EMT)	1/2" Ø x 10'
Electrical Conduit Pipe (EMT)	3/4" Ø x 10'
Flexible Conduit	1/2" Ø x 10'
PVC Pipe	1" i.d. x 10'
PVC Pipe	1-1/2" i.d. x 10'
PVC Pipe	1/2" i.d. x 10'
PVC Pipe	3/4" i.d. x 10'

Rope, Belts, & Chain

Nylon Braided Rope	5/16" Ø x 20'
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Sheets & Boards

Aluminum Plate	1' x 2' x 1/4"
Aluminum Plate	4' x 4' x 1/32"
Pine Board	1" x 3-1/2" x 10'
Plywood, Chipboard OR Particle Board	1/2" x 4' x 4'
Polycarbonate Sheet	1/4" x 4' x 4'
Polycarbonate Sheet	3/8" x 2' x 4'

TOURNAMENT & PLAY**Tournament General Guidelines**

- T1. Referees have ultimate authority during the competition—their rulings are final.
- T2. Each match will last for two minutes. It will begin when the control system is enabled and end when it is disabled unless whistled dead by the referees.
- T3. During the tournament, teams will be notified of their field positions at least two minutes prior to the start of their match in the staging area. Teams will be allowed a maximum of one minute to set up their machines on the field and a maximum of one minute to remove all machine parts from the playing field following a match. You will have at least 4 minutes before your next scheduled match.
- T4. During a match, four team members (two "drivers" and two "coaches") are allowed in the team operator box next to the field. Operator badges will be supplied by U.S. FIRST at each event and must be worn by these team members for field access. Of these four team members at least two must be students from team partner pre-college school(s).
- T5. During a match, machines must be operated by two students from the pre-college team partner school(s) from the team operator box next to the field. No remote communication devices, such as air phones, walkie-talkies, cellular phones, etc., may be used by teams during a match.
- T6. U.S. FIRST will not supply team shirts in 1995; therefore, we strongly encourage you to develop and wear team uniforms, including identifying hats and t-shirts that display company and high school team names and/or logos. This will help the audience, announcers, judges and spectators identify you and your machine.
- T7. Strategies aimed solely at the destruction, damage, or entanglement of opponents' machines are not in the spirit of the tournament and will not be allowed. Turning over an opponent's machine is not considered damaging and will be allowed, but stabbing, cutting, etc., is illegal. If a breach of this rule occurs the contestant's control system may be disabled by the referees.
- T8. A machine may not win a match through an advantage gained by breaking a rule, even accidentally. The effect of the infraction on the outcome will be decided by the referees.

Specifics of Game Play

The *goal area* is anywhere within the vertical planes of the platform and ramp structure. The *field goal* is over the center ramp, within the confines of the goal area. *Out-of-bounds* is anywhere past the plane of the inside edge of the 4"x4" boundary. (See Section 6 for *Field Diagrams*.)

- P1. Machines will start at the end of the main raceway just in front of the goal area, opposite the balls.
- P2. Six balls (three 24" and three 30") of three different colors will be started in a triangle formation at the end of the main raceway opposite the goal area. At the beginning of each match, teams will be assigned a color of ball with which to score points.

- P3. Points are scored for balls which are thrown, tossed, pushed, passed, etc., in either direction over the top of the horizontal bar between the uprights of the field goal. Two points are scored for a small (24") ball and three points for a large (30") ball.
- P4. The entire ball must break the vertical plane above the horizontal bar between the uprights of the field goal to score points. Points are scored for the team who is assigned that color ball.
- P5. The winner of each match is the team with the highest score. In the case of a tie, the higher large ball in the goal area breaks the tie. If no balls are within the goal area, the large ball closest to the center of the top of the platform wins.
- P6. Final scoring will begin when all balls come to rest or upon a referees' decision. Students and coaches will not be allowed onto the field until all scoring is complete.
- P7. If, in an attempt to remove an opponent's balls from the field, a part of your machine drops out-of-bounds, your machine will be turned off. Any points scored will count.
- P8. If a machine goes out-of-bounds to the point that it has to apply power to any out-of-bounds surface to rejoin play, its control system will be turned off. Any points scored will count.
- P9. If one team intentionally moves another machine out-of-bounds, the team who did the moving will be turned off for the remainder of the match. Points they had scored will be forfeited. *TYPO - MACHINE pushed out turned off*
- P10. If a machine is disqualified by a referee, any points scored during that match will be forfeited.
- P11. The fence and back wall are safety features and are not part of the playing field.
- P12. Any interaction with the field goal which would be likely to, or does, damage the field goal will result in disqualification. This decision will be up to the referees.
- P13. Balls which are knocked out-of-bounds or popped, will be placed back in play next to the fence near the exit point without undue delay. Additional balls will be available for substitution.
- P14. Ball which go out-of-bounds over the back wall will be replaced on the field at the starting point of a match: the end of the raceway opposite the goal area.
- P15. It is not the responsibility of the referees if they damage trapping devices while attempting to retrieve balls.
- P16. Limited amounts of machine shoving will be allowed; however, if you damage opponents' machines, referees may take action against your team.
- P17. If a team's machine is damaged to the point that it cannot complete a round on a fair basis, that team may be eligible for a rematch. This decision will be up to the referees.
- P18. If one team intentionally damages another team's machine, it may result in disqualification. However, if the damaged team's machine is considered too flimsy to begin with, the other team may not be disqualified. The ultimate determination will be with the referees.

Regional Results and National Seeding

- P19. All teams competing in the National Championship will play seeding matches.
- P20. Teams which place in one of the top three places at a regional tournament and go on to compete in the National Championship will play bottom teams from the other regional tournament in their seeding matches in the National Championship.

FIELD

(Also see *Field Diagrams* on the following pages.)

The playing field is a carpeted, modified "T"-shaped area. The goal area is made up of three ramps and two slopes leading to a square platform. The main raceway, speed bump, the ramps, and the platform are covered with looped, low-pile carpet spread directly on the floor. The slopes are painted uncarpeted wood.

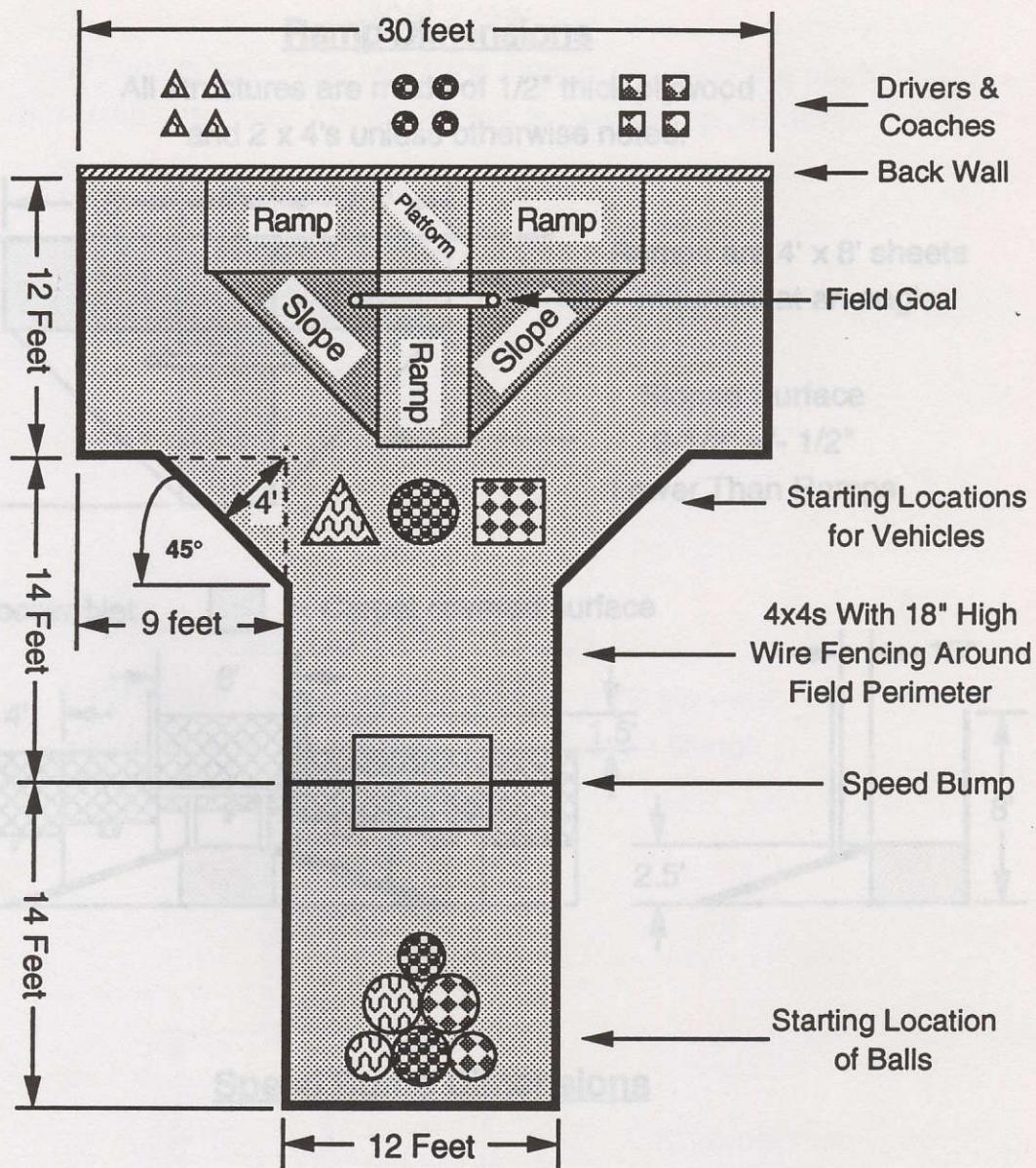
The perimeter of the carpet is defined by a curb of 4" x 4" lumber, resting directly on the carpet. Approximately every 4.5' on the perimeter, a 1" Ø x 19" tall steel post is inserted into the wooden curb with three 1" size eye loops at 9", 13" and 18" from the field level. At each level, a 3/16" plastic coated steel cable surrounds the entire field, lap spliced in one random spot. There is a protective pipe plug on top of each post. The fence is a safety feature and no part of any machine may react against it.

There are six balls of three different colors (three 24" and three 30") on the playing field. At the beginning of each match, they will be arranged in a triangle at the end opposite the goal area.

The top surface of the platform is 4' square and 30" above the surface of the playing field, with the ramps extending out at an angle. The field goal is located across the center ramp. It is made of 2" i.d. PVC pipe and is set out 15" from the front edge of the platform. The top of the horizontal bar of the field goal is 5' from the floor. The uprights are 6' apart and extend 4' from the horizontal bar. All dimensions are $\pm 1"$ non cumulative.

- F1. Deliberately damaging the playing field, controls, or balls (using spiked wheels, for example) is strictly illegal and may result in disqualification.
- F2. A machine may not intentionally contaminate the playing field, balls, goals, or another machine with lubricants.
- F3. At the start of each match, machines may be placed in any orientation within the designated starting area, without touching other machines or the 4" x 4" boundary.
- F5. The playing field carpet will be directly on the floor. No players will be allowed on the field or outside the designated team box during a match.
- F6. The balls are made by SportFun. The large ball have a diameter of 30" $\pm 2"$; the smaller balls have a diameter of 24" $\pm 2"$.
- F7. The windows in the back wall are covered with standard soccer net.

Field Diagrams

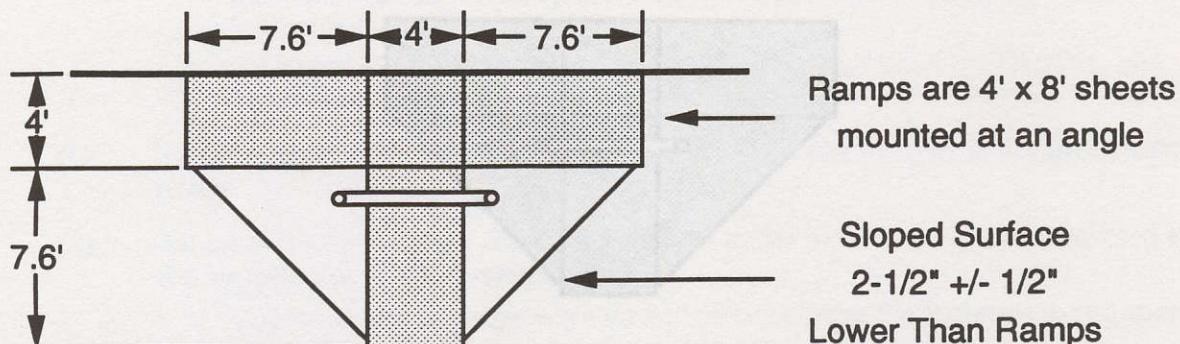


Key:	Looped Low pile Carpet Surface	Team 1: Person, Robot or Ball
Painted Wood Surface		Team 2: Person, Robot, or Ball
Back Wall		Team 3: Person, Robot, or Ball
Fence		

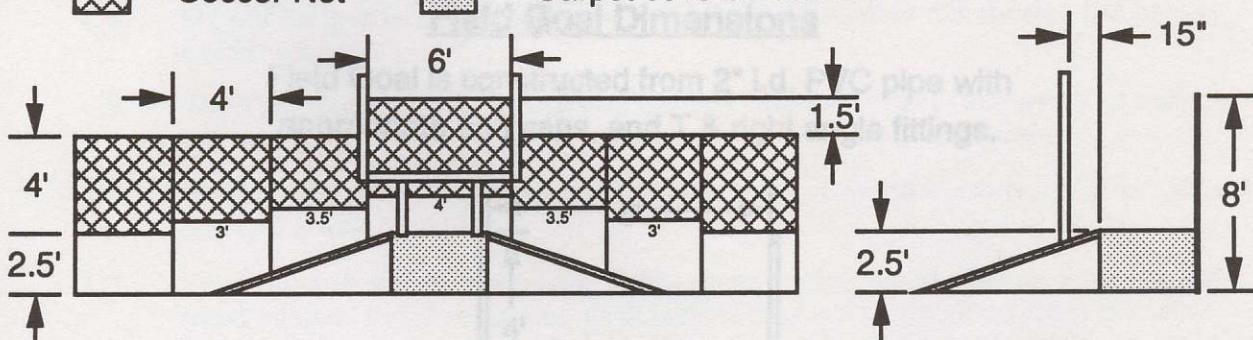
Field Diagrams

Ramp Dimensions

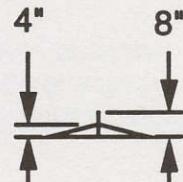
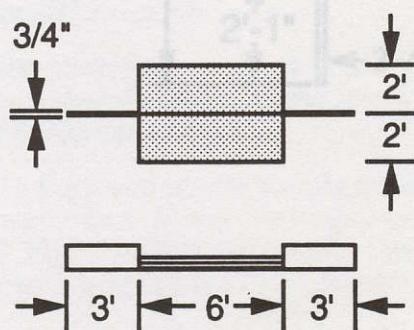
All structures are made of 1/2" thick plywood
and 2 x 4's unless otherwise noted.



= Soccer Net = Carpet covered surface



Speed Bump Dimensions



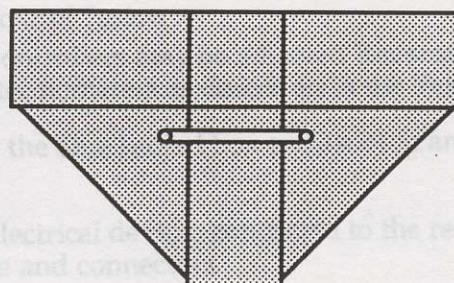
Field Diagrams

CONTROL SYSTEM

RULES

Goal Area

The **Goal Area** is anywhere within the vertical planes of the platform and ramp structure. The **Field Goal** is over the center ramp.



C2. You may modify the ramp structure in any manner to accommodate your needs.

C3. All motors and electrical devices connected to the receiver must be connected with the supplied wires and connectors:

- You must use 12 gauge wire for connections from the batteries to the speed controller and from the speed controller to the drill motor.
- You must use 16 gauge jacketed cable for connections to Delco seal motors, McCord-Wirth air pumps and Numatics air valves.

C4. Do not tamper with the battery power source. You may not shorten the battery cables.

Field Goal Dimensions

Field Goal is constructed from 2" i.d. PVC pipe with

C5. The 12 volt power source must be a 12 volt battery. You may not connect the power source to the relay box or the speed controllers.

C6. R-Net may not be used for bench testing. It may be used during competition events. A tether must be used for bench testing.

C7. The Milwaukee drill must be run via relay controllers, if used on your machine, must be used to power the Milwaukee drill. The Milwaukee drill may not be powered from the relay boxes. Delco seal motors, McCord-Wirth air pumps, Numatics air valves, and the fan may not be powered from the relay boxes or the speed controllers.

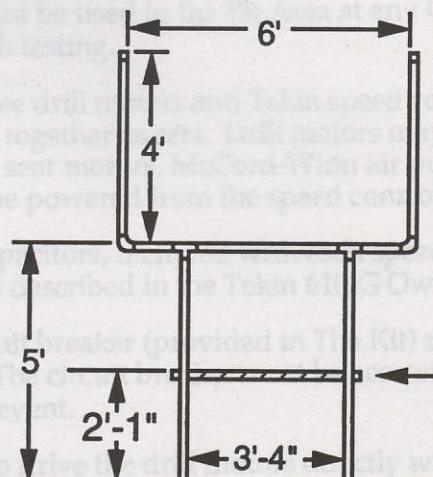
C8. Two 6.3in. Farnsworth, incandescent light fixtures, one per ramp, must be installed in each ramp. The fixture must be controlled by a relay controller, must be installed in each ramp.

C9. One 20A AC relay (provided in The Kit) must be installed in each ramp. Compensation must be made for the relay in the calculations for each ramp.

C10. Attempting to power the relay box with the relay box, or attempting to drive other devices with the speed controllers could damage the control system and is therefore prohibited.

C11. Only the 9 volt power supply included with the kit should be used to power the transmit box. If you experience any problems with the 9 volt power supply, contact U.S. FIRST for a replacement. Use of an alternate power supply could damage the transmit box or RNET and is therefore prohibited.

C12. Do not connect power or any other signals to the switch inputs (P1, P2) on the relay box.



Cross-section of Ramp

SCHEDULE OF EVENTS

Regional Tournament Structure: Manchester, NH & Charlotte, NC

The Regional Tournaments are two-day events.

- | | |
|-------|---|
| Day 1 | <ul style="list-style-type: none">• team arrival, Registration and Practice, Official Weigh-in• U.S. FIRST final field and technical check |
| Day 2 | <ul style="list-style-type: none">• Kickoff Breakfast for Teams• Seeding Matches• Double Elimination Tournament & Finals• Awards Ceremony (directly following final matches) |

National Championship Structure: Epcot '95, Orlando, FL

- | | |
|-------|---|
| Day 1 | <ul style="list-style-type: none">• team arrival, Registration and Practice, Official Weigh-in• U.S. FIRST final field and technical check |
| Day 2 | <ul style="list-style-type: none">• Seeding Matches at American Gardens Stage |
| Day 3 | <ul style="list-style-type: none">• Double Elimination Tournament & Finals• Awards Ceremony at Innoventions Fountain• Wrap Party at Future World West |

Registration

At each event, teams will need to register in the Pit Area by noon on the first day, or Practice Day, of the event. At this time you will:

- surrender both of your R-Nets and two of your batteries
- the 20A circuit breaker you installed in each drill motor, will be inspected at each Competition event
- sign-up for your practice times
- receive an orientation packet to the event site and your pit station
- inform U.S. FIRST where the machine will be after the Competition. See Section #, *Administrative Details*, for more details.

Once you have unpacked, a U.S. FIRST staff member will be around to photograph your machine. These photographs will be used by the judges, referees and event staff to identify teams and their machines while on-site at the event.

Practice

In order to make the most of practice time, two fields run at the same time with three teams on a field during an assigned practice slot. It is strongly recommended that each team is respectful of the others sharing the field during this time. Friendly interaction between machines is acceptable if both/all teams are willing. Unsportsmanlike conduct on the part of a team at any time during the Competition could result in penalty or disqualification.

Everyone will receive at least two half-hour practice slots based on the time you register. The earlier you check-in, the earlier your practice times will be. If additional time is

available, an announcement will be made and one additional time slot per team will be assigned on a first-come, first-served basis.

If you need to change a practice slot because of the need for additional prep or repair time, you will be responsible for finding a team with which to switch practice. The staff in the Pit Area will help you locate a team; however, if you cannot arrange the change, that practice slot may be forfeited.

Practice days are:

Region 1, Manchester, NHafternoon Friday, February 24, 1995

Region 2, Charlotte, NCafternoon Monday, February 27, 1995

National Championship, Orlando, FLafternoon Thursday, March 30, 1995

Official Weigh In

U.S. FIRST staff will be on-site all day to weigh your machine.

Seeding Matches

Each team will compete between 4 and 6 times, and will accumulate points towards its seeding rank. Since these matches are pre-set, lists will be distributed to each team during the practice day. From each match, based on the score the winner will receive 3 seeding points, second place will receive 1 seeding point and the third place will receive no points.

After all matches, teams will be ranked by place totals (not points); ties will be determined by total score, last match score, and flip of a coin, in that order. Results of seeding will determine the first round matches of Saturday's competition.

Seeding matches are on:

Region 1, Manchester, NHmorning Saturday, February 25, 1995

Region 2, Charlotte, NCmorning Tuesday, February 28, 1995

National Championship, Orlando, FLall day Friday, March 31, 1995

Double Elimination Tournament & Finals

Each team will start off in the double-elimination tree according to their seed. The winning team advances to the next round, and the losing teams move to the losing bracket. Every team will be able to lose at least two matches before being eliminated. Competition concludes when there are only four teams left.

The Finals follow the Double Elimination Tournament. The final four will play 1-on-1, best 2-of-3.

Tournament and Final matches are on:

Region 1, Manchester, NHafternoon Saturday, February 25, 1995

Region 2, Charlotte, NCafternoon Tuesday, February 28, 1995

National Championship, Orlando, FLall day Saturday, April 1, 1995

FPS Shipping Guidelines

- A single box may not exceed 100 pounds
- The size of each box may not exceed 130 inches in girth plus the longest dimension.
(Girth is the perimeter in the plane perpendicular to the longest dimension.)

Timing between Regional Tournaments and National Championship

To provide every team, regardless of events in which they participate, approximately the same number of design and build days, the following shipping regulations and dates apply:

Region 1 (Manchester, NH) Competitors

1. Teams may either ship or bring their machines with them to the tournament.
2. After the tournament, all teams competing in the National Championship will have five days to make repairs and/or changes to their machines, within all rules outlined in this document.
3. **By end-of-business on Friday, March 3, 1995**, machines must be picked up by a shipper for transport. This will give all Region 1 teams five additional days to work on their machines.

Region 2 (Charlotte, NC) Competitors

1. Teams must ship their machines by end-of-business on Thursday, February 23, 1995. Remember, UPS is offering complimentary second day service.
2. After the tournament, all teams competing in the National Championship will have five days to make repairs and/or changes to their machines, within all rules outlined in this document.
3. **By end-of-business on Monday, March 6, 1995**, machines must be picked up by a shipper for transport. This will give all Region 2 teams five additional days to work on their machines.

National Championship participants only

1. Teams must ship their machines by **end-of-business on Wednesday, March 1, 1995**.
2. This will give all teams competing in only the National Championship five additional days to work on their machines.

Shipping & transportation of machines

UPS is offering complimentary second-day-delivery according to their guidelines. Machines shipped to the National Championship must leave your facility by the end-of-business on the dates outlined above. Remember, however, you do not need to go the expense of rush shipments—there are approximately three weeks between events.

- ST1. All machines must be shipped to the site of the National Championship at Epcot '95.
- ST2. 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.
- ST3. The machines may not leave a Competition event site until the conclusion of the that event. If repairs are required, they must be performed on site, unless accompanied by a U.S. FIRST staff member to an off-site designated machine shop.

UPS Shipping Guidelines

- A single box may not exceed 100 pounds.
- The size of each box may not exceed 130 inches in girth plus the longest dimension. (Girth is the perimeter in the plane perpendicular to the longest dimension.)

ADMINISTRATIVE DETAILS

Before you come to the Competition...

Pit Station

Each team will have a table and power outlet in the pit area. We suggest you bring an extension cord (heavy duty and at least 25') and a power strip to make best use of your power drop. Machines which have been shipped to the Competition site will be delivered to your station; otherwise, you will be responsible for bringing your machine there.

No team displays or team/personal audio systems will be allowed in the Pit Area. U.S. FIRST staff make frequent important announcements which all teams need to hear.

U.S. FIRST reserves the right to limit the number of team members in the pit area. If the pit area may becomes too crowded for machines and teams to safely and quickly move back and forth to the field, we will request that some team members leave the area. In the event that additional assistance from another team member is necessary, let us know.

Submission Deadlines

Team Profiles

U.S. FIRST will publish short profiles on each team in the event programs. By Friday, February 3, 1995 please send or fax us your profile—you may use the following questions as guidelines when you write your description. Please keep in mind that we are on a deadline and that late submissions run the risk of not being included.

Important: please spell out the following as you would like them printed:

Company/University:

School(s):

Team and/or vehicle nickname:

You may send us a copy of your team logo (black & white, camera-ready if possible, no larger than 8 1/2 x 11)

- 1) How many students and engineers are involved in your effort? How is it organized?
- 2) What is unique about your team?
- 3) Give a brief history of how your team has gone about working on the project.
- 4) Describe any special aspects of your design or intended design that you want the event audience to appreciate (this will remain confidential until the first day of the competition).

Regional Team Breakfasts

Please send us a list of your attendees for the kickoff team breakfasts planned for each regional. As a registered team, you are allowed 30 complimentary breakfasts. If your number of team members planning to come exceeds 30, please call us. We may have to charge teams larger than 30 for the cost of the meal if the total number exceeds our budgeted amount.

Chairman's Award Materials: Date

The Chairman's Award is presented to the team which is judged to have created the best partnership effort between team partners: pre-college school(s), universities and/or

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businesses. All teams participating in the 1995 Competition are eligible for this award. The recipient of this award is decided by an independent panel of judges at the National Championship.

While U.S. FIRST continues to leave this award without specific criteria, there have developed certain themes which seem to best illustrate the partnerships efforts which stand out above others. In 1994, the team efforts continued to progress and develop beyond what we could have predicted so that the judges for the first time named finalists. The entries which were among that group consistently showed the impact that this program had on all team members and their families.

Documentation may consist of any combination of video footage (15 minutes maximum), photos and/or written chronicle. This material need not be professionally produced, but should clearly convey the effort made to develop a successful school/university or school/business partnership. The recipient will be announced at the National Championship during the Awards Ceremony on Saturday, April 1, 1995.

Before you leave the Competition...

Return Unused Kit Parts and the Kit Container

Before you leave the Competition for the final time, please return your unused kit parts and the kit container to the Pit Registration Area. We must recycle some of these parts and we use the containers from year-to-year. Thanks, in advance, for your help with this.

Take your machine back with you...and show it off!

U.S. FIRST encourages teams to take their machines back home with them. U.S. FIRST robots have appeared in pep rallies, parades, corporate annual meetings and even anti-gang assemblies!

If you would like to take your machine back for educational, display or recruiting purposes, let us know when you register. At that time, you will be asked to provide U.S. FIRST with a deposit of \$1,500 which will cover the lending of a remote control system that can be picked up after the Competition (since R-Nets will be confiscated). This deposit can be a check or purchase order which will be held until the return of the system. At that time the deposit will be canceled and returned to you.

Chairman's Award

The Chairman's Award is presented to the team which is judged to have created the best partnership effort between a school and university or between a school and business. Judging criteria include the level of student participation, teamwork, sportsmanship, team spirit, creativity of effort, and overall cooperation and effectiveness between school and partner. This prestigious award is judged on materials submitted to U.S. FIRST prior to the national championship. Documentation may consist of any combination of video footage (15 minute maximum), photos or written chronicle. This material need not be professionally produced, but should clearly convey the effort made to develop a successful school/university or school/business partnership. ALL DOCUMENTATION MUST BE IN U.S. FIRST OFFICES NOT LATER THAN 5:00 PM ON WEDNESDAY, FEBRUARY 22, 1995.

The Chairman's Award is presented at the Awards Celebration on Saturday evening, April 1, 1995. The team carries home a traveling trophy—a high-tech, custom crafted Dean Kamen Clock, which the *New York Times* called "Art That Ticks."

Founder's Award

Each year U.S. FIRST presents this award to honor a company, university or individual that has contributed significantly to the growth of the competition through year-round efforts. Last year's winner, Honeywell, Inc., will pass on the trophy clock to the '95 winner at the Awards Celebration in Orlando.

Judges' Awards

On Saturday evening, April 1, 1995, U.S. FIRST will hold an awards celebration at the Innoventions Fountain at Epcot '95. At this event, a special judging panel will present the following awards:

- Most Creative Design
- Best Offensive Round
- Outstanding Defense
- Best Play of the Day
- Best Team Spirit Display
- Best Sportsmanship
- Number One Seed
- Most Photogenic
- The Procter & Gamble Creativity Award
- Motorola Quality Award
- Rookie All-Stars (3)

A regional series of judges awards is also planned.

For Inspiration and Recognition of Science and Technology

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