

THE 1999 FIRST ROBOTICS COMPETITION MANUAL

APPENDIX B: KIT OF PARTS

1999 FIRST Competition Kit Parts

Bearings

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
2 Bolt Self Aligning Flange	Fits 1/2" Bearing	Gray Container - Bearing Bag	8	The Torrington Company
Pillow Block	1/2"	Gray Container - Bearing Bag	2	The Torrington Company
Radial Ball Bearing With Spherical O.D.	1/2" I.D., Self Locking Collar	Gray Container - Bearing Bag	4	The Torrington Company
Roller Clutch	3/8" I.D.	Gray Container - Bearing Bag	2	The Torrington Company
Single Row Radial Flanged Ball Bearing	1/4" I.D.	Gray Container - Bearing Bag	4	The Torrington Company
Single Row Radial Flanged Ball Bearing	3/8" I.D.	Gray Container - Bearing Bag	4	The Torrington Company
Window Motor Bushing	5/16" I.D. x 1/2" Long	Gray Container - Window Lift	2	Stock Drive Products

Control System

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
1 Conductor Wire	10', #6 AWG, Black	Gray Container - Loose	1	General Cable Company Inc.
1 Conductor Wire	10', #6 AWG, Red	Gray Container - Loose	1	General Cable Company Inc.
1 Conductor Wire	35', #10 AWG, Black	Gray Container - Loose	1	General Cable Company Inc.
1 Conductor Wire	35', #10 AWG, Red	Gray Container - Loose	1	General Cable Company Inc.
15 pin solder cup connector	DB15 female (up to 4)	Additional Hardware List	1	team
2 Conductor Jacketed Wire	30', #24 AWG	Gray Container - Loose	1	General Cable Company Inc.
2 Conductor Jacketed Wire	35', #16 AWG	Gray Container - Loose	1	General Cable Company Inc.
2 Pin Logic Power Connector	Black, European Style Header	Green Container -	1	Thomas & Betts Corp.
25 Pin Cable	DB25 Male to Female, 6', Shielded	Green Container -	1	Brevan Electronics
25 Pin Male D-Sub Solder Cup Connector	25 Pin Male D-Sub Solder Cup	Green Container -	2	AMP Incorporated
3 Conductor Shielded Wire	30', #24 AWG	Gray Container - Loose	1	General Cable Company Inc.
8 Pin Relay Output Connector	Black, 8 Position European Style Header	Green Container -	2	Thomas & Betts Corp.
9 - 15 Pin Cable	3' Long, DB9 Female to HDB 15 Male	Green Container -	2	Brevan Electronics
9 Pin Cable	DB9 Male to Female, 6', Shielded	Green Container -	3	Brevan Electronics

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Antenna, Helical UHF	3" Long	Green Container -	2	Motorola
Attenuator		Green Container -	1	Mini-Circuit
Battery Charger	Sealed Lead Acid Battery, 4 amp	Green Container -	1	Xenotronix or Associated Power Products
Battery Fuse	60 A, Maxi-Fuse	Green Container -	1	Bussmann
Battery Fuse Holder	Maxi-Fuse, 6 AWG leads	Green Container -	1	Bussmann
Battery, Sealed Lead Acid	12 Vdc, 17 Amp Hours	Green Container -	1	CSB Battery of America Corp
BNC Bulkhead Connector	BNC Male to Male, insulated	Green Container -	1	Brevan Electronics
BNC Coax Cable	6' BNC Female to Female	Green Container -	2	Brevan Electronics
BNC Right Angle Connector	BNC Male to Female	Green Container -	1	Brevan Electronics
Circuit Breaker For Motors	30 amp, 12 volt, Auto-Resetting	Green Container -	12	Snap-Action, Inc.
Diode	1 Amp, Maximum	Green Container -	2	Digi-Key Corporation
Flightstick Joystick	7" Cable with Male DB15	Green Container -	2	CH Products
Fuse Panel	ATC Blade-Type (6 fuseable circuits, 12	Green Container -	2	Bussmann
Ground Plane Assembly	12" x 12" with BNC Bulkhead Connector	Gray Container - Loose	1	FIRST
Heat Shrink Tubing	1/4"Ø x 3", Black, 2:1 Shrink Ratio RNF100	Green Container -	1	Raychem Corporation
Heat Shrink Tubing	1/8"Ø x 4", Black, 2:1 Shrink Ratio RNF100	Green Container -	1	Raychem Corporation
Heat Shrink Tubing	3/4"Ø x 3", Black, 2:1 Shrink Ratio	Green Container -	1	Raychem Corporation
Heat Shrink Tubing	3/8"Ø x 5", Black, 2:1 Shrink Ratio RNF100.	Green Container -	1	Raychem Corporation
Knob for Potentiometer	1" Hexagon, Fits 1/4" Shaft	Green Container -	2	Radio Shack
Latching Pushbutton Switch		Green Container -	2	Honeywell - Microswitch Division
LED, Panel Mount	Amber, 5V	Green Container -	1	Chicago Miniature Lamp, Inc.
LED, Panel Mount	Green, 12V	Green Container -	4	Chicago Miniature Lamp, Inc.
LED, Panel Mount	Red, 12V	Green Container -	4	Chicago Miniature Lamp, Inc.

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Limit Switch		Green Container -	10	Honeywell - Microswitch Division
Momentary Rocker Switch		Green Container -	8	Honeywell - Microswitch Division
Muffin Fan	12 Vdc	Green Container -	1	EBM Industries
Optical Sensor	Miniature DC Sensor	Green Container -	2	Honeywell - Microswitch Division
Potentiometer	100K Ω , Linear	Green Container -	6	Bourns, Inc.
Power Supply	7.5 Vdc, 1.0 Amp max	Green Container -	1	Golden Pacific Electronics, Inc.
Project Box	Black	Green Container -	1	Serpac
Pushbutton Switch Cover	Red	Green Container -	2	Honeywell - Microswitch Division
Quick-Disconnect Power Connector	#10 AWG red/black wire w/connector	Gray Container - Loose	1	Anderson Power Products
Quick-Disconnect Power Connector	#6 AWG Red/Black Wire w/ connector	Gray Container - Loose	2	Anderson Power Products
Receiver	2.25" x 5.75" x 8.75"	Green Container -	1	FIRST
Reed Switch	Normally Open, Magnet Activated	Green Container -	4	CP Clare
Ring Connector	# 6 Awg	Green Container -	7	
RNet 9600sslm, Programmable	High Density DB15 Female	Kick Off Check Out	2	Motorola
Rocker Switch Cover	Blue	Green Container -	1	Honeywell - Microswitch Division
Rocker Switch Cover	Green	Green Container -	1	Honeywell - Microswitch Division
Rocker Switch Cover	Red	Green Container -	1	Honeywell - Microswitch Division
Rocker Switch Cover	Split Red/Green	Green Container -	4	Honeywell - Microswitch Division
Rocker Switch Cover	Yellow	Green Container -	1	Honeywell - Microswitch Division
Servo	Hitec/JR-style Connector, 42 oz. in.	Green Container -	2	Hitec RCD, Inc.
Servo Extension Cable	Hitec/JR-style, 36" Long	Green Container -	4	Hitec RCD, Inc.
Servo Y Cable	Hitec/JR-style, 24" Long	Green Container -	2	Hitec RCD, Inc.
Spade Connector	Female, 12-10 AWG, Yellow	Green Container -	10	Thomas & Betts Corp.

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Spade Connector	Female, 16-14 AWG, Blue	Green Container -	10	Thomas & Betts Corp.
Spade Connector	Female, 22-18 AWG, Red	Green Container -	10	Thomas & Betts Corp.
Spade Connector	Male, 12-10 AWG, Yellow	Green Container -	10	Thomas & Betts Corp.
Spade Connector	Male, 16-14 AWG, Blue	Green Container -	10	Thomas & Betts Corp.
Spade Connector	Male, 22-18 AWG, Red	Green Container -	10	Thomas & Betts Corp.
Speed Controller		Green Container -	2	Innovation FIRST
Speed Controller	7.2 - 12 Vdc, Reversing	Green Container -	2	Tekin Electronics, Inc.
Terminal Strip	Tubular, Double Screw Terminal Strip (7 slots)	Green Container -	1	Thomas & Betts Corp.
Tether Adaptor	Black DB9 Female-Female	Green Container -	1	Brevan Electronics
Thermo-Plastic Shield for 25 Pin Connector	fits DB25 Connector	Green Container -	1	AMP Incorporated
Transmitter	1.75" x 5.50" 7.50"	Green Container -	1	FIRST
Window Lift Mechanism Washer	Fits over Flanged Bushing	Gray Container - Window Lift	2	Fastenal Company
Wire Nut	Wire Nut for Wire Sizes #18-10 AWG	Green Container -	10	Thomas & Betts Corp.
Wiring Harness For Receiver Relay Power Connector	1', #10 AWG, Red and Black	Gray Container - Loose	1	Nova Biomedical/Amp Inc.
Wiring Harness For Seat Motor	5', #16 AWG	Gray Container - Loose	1	Nova Biomedical/Pioneer Packard
Wiring Harness For Window Motor	5', #16 AWG	Gray Container - Loose	2	Nova Biomedical/Pioneer Packard
Yaw Rate Sensor		Gray Container - Loose	2	BEI Systron Donner

Documentation

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty /Kit</u>	<u>Product Supplier</u>
BASIC Stamp Programming Disk	3.5" HD Floppy	Green Container -	1	Parallax, Inc.
BASIC Stamp Programming Manual		Green Container -	1	Parallax, Inc.
Control Program Source Code	3.5" HD Floppy	Green Container -	1	FIRST
Kee Industrial Caster Catalog		Gray Container - Loose	1	Kee Industrial Products
Kee Klamp Pipe Fitting Catalog		Gray Container - Loose	1	Kee Industrial Products

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Operation & Maintenance Manual for the Pneumatic Pump	For the Pneumatic Pump	Green Container -	1	Gast Manufacturing, Inc.
Pneumatic Training Manual CD		Green Container -	1	SMC Pneumatics, Inc.

Fasteners

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
5 Minute Epoxy Gel	Resealable 1 oz. Dual Syringe	Gray Container - Hardware Bag	1	Kaman Industrial Technologies
Cable Tie	11" x 0.14"	Green Container -	10	Thomas & Betts Corp.
Cable Tie	8" x 0.09"	Green Container -	10	Thomas & Betts Corp.
Cable Tie Mounting Base	Self-Adhesive, Holes For #8 Screws	Green Container -	10	Thomas & Betts Corp.
Drill Housing Screws	#4 x 3/4, Pan Head - Phillips	Green Container - Drill	10	Fastenal Company
Drill Motor Mounting Flange Fastening Screws	Button 19, M4 x 5mm	Green Container -	4	Fastenal Company
Helical Plastic Wire Wrap	1/4" Ø x 24"	Gray Container - Hardware Bag	1	Tyton Hellermann
Velcro 1" Hook & Loop Tape (W/ Adhesive backing)	18" Lengths	Green Container -	1	Velcro USA, Inc.
Velcro 1" One WrapTape	18" Lengths, Red	Green Container -	1	Velcro USA, Inc.
Velcro 5/8" One WrapTape	black	Green Container -	1	Velcro USA, Inc.
Velcro Sticky Back Coins	5/8" Ø, 15 Sets Per Pack	Green Container -	15	Velcro USA, Inc.

Motors & Pumps

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Capacitor, Drive Motor Noise Suppression	0.1 µF, 50 V Ceramic Molded Radial	Green Container -	4	KEMET Electronics Corporation
Drill Drive Assembly	225 in. lbs Maximum Torque	Green Container - Drill	2	S-B Power Tool Company
Drill Housing Assembly	T-Handle Style Grip, Left/Right with Shift	Green Container -	2	S-B Power Tool
Drill Motor	12 Vdc	Green Container - Drill	2	S-B Power Tool
Fisher-Price 10 Web Jeep Driver		Gray Container - Loose	2	Fisher-Price, Inc.
Fisher-Price Axle		Gray Container - Loose	1	Fisher-Price, Inc.
Fisher-Price Motor/Gearbox	12 Vdc, w/ foot pedal & shifter	Gray Container - Loose	2	Fisher-Price, Inc.
Globe Motor with Drive Assembly	12Vdc	Gray Container - Loose	2	Globe Motors

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Seat Motor	12 Vdc	Gray Container - Loose	1	ITT Automotive
Van Door Motor - Bosch	12 Vdc, 75 RPM	Gray Container - Loose	1	Delphi Interior and Lighting Systems
Van Door Motor - Tiagene	12 Vdc, 75 RPM	Gray Container - Loose	1	Delphi Interior and Lighting Systems
Window Motor, Left Hand	12 Vdc, 12 Tooth Pinion, 16 pitch stub	Gray Container - Window Lift	1	ITT Automotive
Window Motor, Right Hand	12 Vdc, 12 Tooth Pinion, 16 pitch stub	Gray Container - Window Lift	1	ITT Automotive

Other

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Carpet Sample	12" x 12", 20 oz., Closed Loop	Gray Container - Loose	1	FIRST
Co-Polymer Gutter Guard	6" x 24"	Gray Container - Loose	1	Home Depot
Folding Table Leg Brace, Left Hand	Heavy Duty Leg Brace	Gray Container - Loose	1	Stanley Hardware
Folding Table Leg Brace, Right Hand	Heavy Duty Leg Brace	Gray Container - Loose	1	Stanley Hardware

Pneumatics

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Air Cylinder	12" stroke w/ clevis & nose mounts	Green Container -	1	SMC Pneumatics, Inc.
Air Cylinder	5" stroke w/ clevis & nose mounts	Green Container -	2	SMC Pneumatics, Inc.
Air Filter for the Pneumatic Pump	For the Pneumatic Pump	Green Container -	1	Gast Manufacturing, Inc.
Air Pump	Diaphragm Pump, 1/8HP, 12VDC, 30psi,	Green Container -	1	Gast Manufacturing, Inc.
Check Valve	1/8" Ø Barbs 75 max. psi, black	Green Container -	2	Air Logic
Direct Valve	12 Vdc	Green Container -	1	SMC Pneumatics, Inc.
Double Solenoid Valve	12 Vdc	Green Container -	1	SMC Pneumatics, Inc.
Fitting	Straight fitting for valves	Green Container -	9	SMC Pneumatics, Inc.
One Touch Fitting	Straight fittings for cylinders	Green Container -	6	SMC Pneumatics, Inc.
One Touch Fitting	Straight fittings for pressure switch	Green Container -	1	SMC Pneumatics, Inc.
One Touch Fitting	Straight fittings for Valves	Green Container -	3	SMC Pneumatics, Inc.
Pressure Switch	12 Vdc, Hysteresis	Green Container -	1	SMC Pneumatics, Inc.

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Single Solenoid Valve	12 Vdc	Green Container -	2	SMC Pneumatics, Inc.
Volume Chamber		Green Container -	1	SMC Pneumatics, Inc.

Rods & Shafts

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Aluminum Rod	1/2" Ø x 24"	Gray Container - Tube	2	Cohen Steel Supply Inc.
Brazing Rod	1/16" Ø x 18"	Gray Container - Tube	1	FIRST
Brazing Rod	1/8" Ø x 18"	Gray Container - Tube	1	FIRST
Delrin (Acetal) Rod	1/4" Ø x 20"	Gray Container - Tube	1	Plastic Supply
Drill Rod	1/2" Ø x 18"	Gray Container - Tube	2	Cohen Steel Supply Inc.
Drill Rod	1/4" Ø x 18"	Gray Container - Tube	2	Cohen Steel Supply Inc.
Drill Rod	3/8" Ø x 18"	Gray Container - Tube	2	Cohen Steel Supply Inc.
Drill Rod	5/16" Ø x 18"	Gray Container - Tube	2	Cohen Steel Supply Inc.
Flexible Motor Shaft	13.5" Long, Fits Seat Motor	Gray Container - Loose	2	Grand Rapids Controls
LDPE Rod	1" Ø x 24"	Gray Container - Tube	1	Plastic Supply Inc.
Lead Screw	18.75" Long	Gray Container - Loose	1	Kerk Motion Products, Inc.
Threaded Rod	1/4" Ø x 18", 20 Pitch Coarse Thread, Alloy	Gray Container - Tube	1	FIRST

Sheets & Boards

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Aluminum Sheet	1/16" x 12" x 12"	Gray Container - Loose	1	Cohen Steel Supply Inc.
Rubber Sheet, Red	1/16" x 6" x 18"	Gray Container - Loose	1	FIRST

Small Parts

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Caster, Swivel	165 Pounds, 10mm bolt hole	Green Container -	2	Keel Industrial Products
Channel For Tape Drive	28" Long	Gray Container - Loose	4	Delphi Interior and Lighting Systems
Double Magnet Cabinet Catch		Gray Container - Hardware Bag	1	Stanley Hardware
Drill Housing Cover	T-Handle Style Grip, Left/Right with Shift	Green Container - Drill	2	S-B Power Tool

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Flange Nut for Seat Positioning Unit	M6 x 1.0 Pitch	Gray Container - Seat	8	Lear Corporation
Flat Washers	1/4" I.D., 7/8" O.D.	Gray Container - Hardware Bag	4	Fastenal Company
Flexible Shaft Coupling	Black	Gray Container - Hardware Bag	2	DEKA
Folding Table Brace	9-1/2" Brass plated	Gray Container - Hardware Bag	1	Stanley Hardware
Gate Latch	Steel/Zinc Plated	Gray Container - Hardware Bag	1	Stanley Hardware
Hex Head Bolt for Seat Positioning Unit	M6 x 1.0 Pitch x 30mm	Gray Container - Seat	4	Lear Corporation
Hex Nuts	1/4" I.D., 20 Pitch Coarse Thread	Gray Container - Hardware Bag	8	Fastenal Company
Horiz. Act. for Seat Positioning Unit, Left Hand	Natural Color	Gray Container - Seat	1	Lear Corporation
Horiz. Act. for Seat Positioning Unit, Right Hand	Black and Natural Color	Gray Container - Seat	1	Lear Corporation
Lower Channel for Seat Positioning Unit	2.25" x 17" Channel	Gray Container - Loose	2	Lear Corporation
Magnet	1/4-20 Plastic Thread	Gray Container - Hardware Bag	4	Honeywell - Microswitch Division
Pivot	5/16" Ø	Gray Container - Hardware Bag	2	Stanley Hardware
Roller Guide	7/8" Ø x 1/4" Wheel	Gray Container - Hardware Bag	2	Stanley Hardware
Screen Door Catch	Zinc-Plated	Gray Container - Hardware Bag	1	Stanley Hardware
Trantorque Coupling	3/8" I.D., 3/4" O.D.	Green Container -	2	Small Parts, Inc.
Upper Channel for Seat Positioning Unit	1.3125" x 9.875" Channel with Gear	Gray Container - Seat	2	Lear Corporation
Wheelchair Wheel	6" Ø, 5/16" I.D. Bearings, 1-1/2" Wide	Gray Container - Loose	2	Skyway Recreation Products
Wheelchair Wheel	8" Ø, 5/16" I.D. Bearings, 1-1/2" Wide	Gray Container - Loose	2	Skyway Recreation Products
Window Lift Bracket, Left Hand	Color Natural	Gray Container - Window Lift	1	Delphi Interior and Lighting Systems
Window Lift Bracket, Right Hand	Color Natural	Gray Container - Window Lift	1	Delphi Interior and Lighting Systems
Window Lift Gear	Use with Window Tape, Window Lift Mechanism	Gray Container - Window Lift	2	Delphi Interior and Lighting Systems
Window Lift Guide Drive	Use with Guide, Channel, Window Tape	Gray Container - Window Lift	8	Delphi Interior and Lighting Systems
Window Lift Guide, Left Hand	Attach to Triangular Mount, Window Lift	Gray Container - Window Lift	1	Delphi Interior and Lighting Systems

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Window Lift Guide, Right Hand	Attach to Triangular Mount, Window Lift	Gray Container - Window Lift	1	Delphi Interior and Lighting Systems
Window Lift Mechanism Tape	16' Length	Gray Container - Window Lift	1	Dymetrol Company, Inc.
Window Lift Triangular Mount	White, Window Lift Mechanism	Gray Container - Window Lift	2	St. Clair Plastics Company

Springs

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Compression Spring	0.600" O.D. x 3.5 " Long x 0.059" Wire Diameter	Gray Container - Hardware Bag	2	Associated Spring Raymond
Constant Force Spring, Large	2.26" I.D.	Gray Container - Hardware Bag	2	Associated Spring Raymond
Constant Force Spring, Medium	0.85" I.D.	Gray Container - Hardware Bag	2	Associated Spring Raymond
Constant Force Spring, Small	0.34" I.D.	Gray Container - Hardware Bag	2	Associated Spring Raymond
Extension Spring	0.500" O.D. x 2.500" Long x 0.049" Wire	Gray Container - Hardware Bag	2	Associated Spring Raymond
Latex Tubing	1/4" I.D., 3/8" O.D., 5'	Green Container -	1	Gulf South Medical Supply
Snugger	Spring With Plastic Guide	Gray Container - Hardware Bag	2	Stanley Hardware
Spring Loaded Hinge	4" x 4", 30 in/lb Maximum	Gray Container - Hardware Bag	2	Stanley Hardware
Torsion Spring, Left Hand	210 Degrees, 0.500" Dia, 0.072" Wire	Gray Container - Hardware Bag	1	Associated Spring Raymond
Torsion Spring, Right Hand	210 Degrees, 0.500" Dia, 0.072" Wire	Gray Container - Hardware Bag	1	Associated Spring Raymond

Sprockets & Pulleys

Part Name/Description	Dimensions	Location	Qty /Kit	Product Supplier
Pulley With Fixed Eye	1" Ø, For 5/16" Rope	Gray Container - Hardware Bag	3	Stanley Hardware