

## 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 AGW	Loose	15'	General Cable
2 conductor jacketed wire	#24 AGW	Loose	20'	General Cable
3 conductor shielded wire	#24 AGW	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.



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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
Rohacel® Technical Manual	1" x 24" x 49"	Manual	1	Rohm Tech, Inc.



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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**

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty /Kit</u>	<u>Product Supplier</u>
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**

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

**Gears, Sprockets & Pulleys**

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

**Motors & Pumps**

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty /Kit</u>	<u>Product Supplier</u>
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.



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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**

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty /Kit</u>	<u>Product Supplier</u>
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**

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty /Kit</u>	<u>Product Supplier</u>
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



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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**

<u>Part Name/Description</u>	<u>Dimensions</u>	<u>Location</u>	<u>Qty /Kit</u>	<u>Product Supplier</u>
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



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**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



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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	5" 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"