Qty.	Price	Total	Description	Part Number	Manufacturer	Supplier	Details
6	$38.00	$228.00	Pistons	UDR-17-12	Clippard Instrument Lab, Inc.	MinuteMan Controls, Inc.	*Rod and piston to actuate the chamber.*
6	$3.46	$20.76	Rod & Clevis	RC-1781	Clippard Instrument Lab, Inc.	MinuteMan Controls, Inc.	*Attaches to end of rod to fasten piston to the chamber.*
12	$39.33	$471.96	Air Sample Solenoid	141015-12VDC	Norgren, Kip®	MinuteMan Controls, Inc.	*Solenoid valves that control the flow of the sample air, to and from the gas analyzers.*
12	$14.70	$176.40	Flow Control Valve	JFC-2A	Clippard Instrument Lab, Inc.	MinuteMan Controls, Inc.	*Attach to the in/out of each piston, allowing for fine control compressed air flow rate entering piston and the speed of chamber motion.*
6	$45.07	$270.42	Piston Solenoid	F20BW400B000060	Numatics®	MinuteMan Controls, Inc.	*Solenoid valves that control the on/off flow of compressed air that to piston.*
1	$126.11	$126.11	Piston Solenoid Manifold	AKF6H00002LSTD	Numatics®	MinuteMan Controls, Inc.	*Manifold for mounting above piston solenoids. The manifold allows for all pistons/solenoids to be linked to one source of compressed air.*
2	$7.34	$14.68	Blank Plate Kit	239-1055	Numatics®	MinuteMan Controls, Inc.	*Cover the 2 empty stations of the 8-station manifold, since it will house only 6 solenoids.*
6	$2.27	$13.62	CV1 Plug Assembly	230-443	Numatics®	MinuteMan Controls, Inc.	*Easy-connect wires for each piston solenoid.*
2	$21.10	$42.20	Plug Assembly	02100PZ3OK00000	Numatics®	MinuteMan Controls, Inc.	*Another piece for the above plug assembly on stations 7-8 of the manifold.*
2	$17.10	$34.20	5/32” Tube Quick Connect, 10 pack	3175-04-11	Legris, Inc.	MinuteMan Controls, Inc.	*Connects 5/32” tubing to each flow control valve on pistons. Quick-connects allow for easy plumbing connections and disconnections.*
12	$1.00	$12.00	1/8” NPT Brass Fitting	1/8B3	Mem-Co. Fittings, Inc.	MinuteMan Controls, Inc.	*Barbed adapter for in/out connection between air sample solenoids and 1/4” tubing.*
1	$1.34	$1.34	1/4” NPT Brass Fitting	1/4B3	Mem-Co. Fittings, Inc.	MinuteMan Controls, Inc.	*Barbed adapter for connection between air compressor outlet and 1/4” tubing.*
1	$386.10	$386.10	Air Compressor	1NNF4	Speede Air®	Grainger®	*120V, 2HP, 13 gallon compressor. Provides compressed air to pistons. Rated at 15 amps, but required 30 amps in the field due to large initial power draw on start-up.*

Qty.	Price	Total	Description	Part Number	Manufacturer	Supplier	Details
1	$147.37	$147.37	12v DC Brushless Diaphragm Pump	TD-3LS	Brailsford & Co., Inc.	Brailsford & Co., Inc.	*Independent pump to control the flow of sample air through instrumentation. Gas analyzers can use their internal pumps, but they may eventually fail in the field.*
1	$744.00	$744.00	AC/DC Controller	SDM-CD16AC	Campbell Scientific®	Campbell Scientific®	*Controller that receives instruction from CR3000 datalogger to turn off/on piston and air sample solenoids.*
1	$360.00	$360.00	1' x 20' Shedule-80 PVC Pipe	12" x 20' SCH80 PVC Solid	PipePlus, Inc.	PipePlus, Inc.	*20' Length of pipe from which to cut out chamber caps and collars. Schedule 80 PVC is dark gray, not white, and twice as thick as standard sch. 40 PVC.*
2	$12.56	$25.12	50ml Slow-Cure PVC Trimwelder	EXT-SC-5-ML	Extreme Adhesives, Inc.	Home Depot®	*Two-part apoxy for gluing flat PVC circles to pipe. Purchase gun if necessary.*
1	$230.00	$230.00	Compressor Container	FG3747SWOLVSS	RubberMaid®	Home Depot®	*Houses compressor for all weather conditions. Has extra space to keep essential spare parts in the field (tubing, tools, oil etc.)*
1	$114.60	$114.60	Mobile Tool Chest	2FDB7	Stanley®	Home Depot®	*Houses all instrumentation and electronics. Has wheels for convenient transportation.*
10	$8.70	$87.00	1/8" x 1/4" NPT Brass Male Branch Tee	B-400-3TTM	Swagelok®	Cambridge Valve & Fitting, Inc., Inc.	*Brass compression fittings for connecting all air sample solenoids. See diagram for visual.*
2	$4.90	$9.80	1/8" x 1/8" NPT Brass Male Elbow	B-400-2-2	Swagelok®	Cambridge Valve & Fitting, Inc.	*Terminates common air line in manifold assembly of air sample solenoids.*
12	$15.90	$190.80	1/4" SS Bulkhead Union	SS-400-61	Swagelok®	Cambridge Valve & Fitting, Inc.	*Bulkhead compression fitting on top of chamber cap that holds sample in/out tubes; one for in, one for out.*
6	$21.70	$130.20	1/8" SS Bulkhead Union	SS-200-61	Swagelok®	Cambridge Valve & Fitting, Inc.	*Bulkhead compression fittings on top of chamber cap that holds pressure equalization valve.*
6	$70.83	$424.98	1515 Series Aluminum Extrusion	05632583	80/20® Inc.	MSC®	*1.5" x 1.5" x 97" Aluminum framing.*
2	$124.73	$249.46	1530 Series Aluminum Extrusion	05632617	80/20® Inc.	MSC®	*1.5" x 3.0" x 97" Aluminum framing.*
3	$33.05	$99.15	1010 Series Aluminum Extrusion	05632559	80/20® Inc.	MSC®	*1.0" x 1.0" x 97" Aluminum framing.*
12	$9.67	$116.04	1515 4-Hole Inside Corner Gussett	75828509	80/20® Inc.	MSC®	*Gussett brackets for connecting 1530 series arms to bottom 1010 series frame.*

Qty.	Price	Total	Description	Part Number	Manufacturer	Supplier	Details
12	$21.96	$263.52	45˚ Support Bracket	07402498	80/20® Inc.	MSC®	*For rear connection between 1515 and 1530 series pieces. Also possible to have machinist make these, as they are expensive.*
12	$8.16	$97.92	1530 4-Hole Inside Corner Gussett	76076983	80/20® Inc.	MSC®	*Gussett brackets for connecting rear piston end to frame.*
24	$1.90	$45.60	1515 End Cap	07210156	80/20® Inc.	MSC®	*Protective end caps to cover cut ends of 1515 framing.*
36	$2.31	$83.16	1530 End Cap	71824874	80/20® Inc.	MSC®	*Protective end caps to cover cut ends of 1530 framing.*
12	$1.62	$19.44	1010 End Cap	07217649	80/20® Inc.	MSC®	*Protective end caps to cover cut ends of 1010 framing.*
24	$4.85	$116.40	Anchor Fastener	07173073	80/20® Inc.	MSC®	*Strong fastening option for 80/20, for rear 1530 piece. Requires holes to be bored into framing; specs for hole boring are contained in Anchor Fastener Counterbore Service of this manual.*
24	$1.98	$47.52	Roll-in Nut	07298060	80/20® Inc.	MSC®	*Nuts for connecting bearings to 1530 framing.*
24	$2.77	$66.48	Drop-in Nut	07298037	80/20® Inc.	MSC®	*Nuts for connecting shaft supports to 1010 framing.*
12	$1.06	$12.72	1010 1/4”-20 Double T-Nut	71824734	80/20® Inc.	MSC®	*Double t-nuts for connecting cap top to aluminum framing.*
12	$6.12	$73.44	SS 3/8” Shaft Collar	35462522	Climax Metal Products	MSC®	*Secure shaft and associated hardware to frame.*
24	$4.68	$112.32	SS 1/4” Shaft Collar	35462506	Climax Metal Products	MSC®	*Secure pins to both ends of piston.*
1	$144.85	$144.85	3/8” x 48” x 48” PVC Sheet	52419090	Select	MSC®	*Flat PVC sheet from which to cut out round chamber tops.*
1	$11.02	$11.02	1/2” x 3/4” x 25’ Neoprene Sponge Rubber	31943665	Select	MSC®	*Sponge rubber for creating air seel between chamber cap and collar. Flexible and water-resistent.*
60	$0.80	$48.00	Slide-in Nut	07162944	80/20® Inc.	MSC®	*Nuts to connect all 4 gussetts to framing; screws are included.*

Qty.	Price	Total	Description	Part Number	Manufacturer	Supplier	Details
4	$42.00	$168.00	100 ft. x 1/4” polyurethane tubing	5108K43	McMaster-Carr®	McMaster-Carr®	*Abrasion resistent polyurethane tubing. Soft durometer for barbed fittings. Used for all air sample plumbing and air compressor outlet.*
4	$17.00	$68.00	100 ft. x 5/32” nylon tubing	5112K62	McMaster-Carr®	McMaster-Carr®	*Abrasion resistent nylon tubing. Hard durometer for quick-connect and compression fittings. Used for all piston air plumbing.*
1	$9.44	$9.44	SS M4-20mm Screw, 50 pack	90116A217	McMaster-Carr®	McMaster-Carr®	*Screws for roll-in nuts.*
1	$2.91	$2.91	SS M4 Washer, 100 pack	92153A418	McMaster-Carr®	McMaster-Carr®	*Screw head washers for roll-in nuts.*
1	$7.54	$7.54	SS M4-14mm Screw, 50 pack	92095A193	McMaster-Carr®	McMaster-Carr®	*Screws for drop-in nuts.*
3	$6.35	$19.05	SS 1/4-20 x 3/4” Socket Cap Screw, 10 pack	90585A540	McMaster-Carr®	McMaster-Carr®	*Screws for double t-nuts.*
1	$3.13	$3.13	SS #6 Finish Washer, 100 pack	98466A007	McMaster-Carr®	McMaster-Carr®	*Counter-sunk washers for all screws inside of chamber caps.*
2	$10.74	$21.48	SS 1/4-20 x 1 1/4” screw, 10 pack	92805A544	McMaster-Carr®	McMaster-Carr®	*Nylon-patched screws for connecting cap to vertical 1010 framing.*
12	$21.96	$263.52	3/8” Shaft Support	6068K22	McMaster-Carr®	McMaster-Carr®	*Holds and supports 1010 framing and cap to shaft.*
12	$19.00	$228.00	3/8” SS Mounted Bearing	8600N5	McMaster-Carr®	McMaster-Carr®	*Holds and supports bearing and shaft on 1530 framing.*
6	$24.28	$145.68	3/8” x 18” SS Shaft	8364T2	McMaster-Carr®	McMaster-Carr®	*Main shaft for chamber’s rotation.*
1	$12.46	$12.46	SS 1/4” x 2 1/4” Pin	90145A550	McMaster-Carr®	McMaster-Carr®	*Connects rod-end of piston to vertical 1010 framing.*
1	$38.33	$38.33	36” x 1/4” Aluminum Shaft	5911K51	McMaster-Carr®	McMaster-Carr®	*Connects piston-end of piston to rear gussetts. One 3’ length to be cut into 6 pieces.*
		$6,856.24					

Part Number: UDR-17-12

Cylinder Specifications:	
Description:	Universal Mount Double Acting Standard Rod 1 1/16" Bore 12" Stroke
Materials:	304 Stainless Steel Tube Clear Anodized Aluminum End Caps Sintered Bronze Rod Bushing
Seal Material:	Buna-N U-Cups
Port Threads:	1/8" NPT
Maximum Pressure:	250 PSI
Rod Information:	303 Stainless Steel Rod 5/16" Diameter 1/4" Flats 5/16-24 Thread
Mounting Thread:	5/8-18
Temperature Range:	0°F to 200°F
Cylinder Length:	16" *(Not including rod)*
List Price:	$ 38.00 Dollars per unit EXCLUDES FREIGHT, TAXES AND DUTIES (IF APPLICABLE)
ZIP Code	
Quantity:	1
Extended Price:	$ 38.00
	Online Catalog Home Add To Cart

S/S Cylinder Accessories: RC-1781

Catalog:	View Catalog Page
Drawings:	• Click to see drawing A
Description 1:	S/S Cylinder Accessories
Description 2:	Rod Clevis Assembly, 1 1/16” Bore Size
Weight:	0.2200
Package Quantity:	1
List Price:	$ 3.46 Dollars per unit EXCLUDES FREIGHT, TAXES AND DUTIES (IF APPLICABLE)
ZIP Code	
Quantity:	1
Extended Price:	$ 3.46
	Online Catalog Home Add To Cart

Valve Overview

Standard Sub-Miniature Solenoid Valves

KIP offers a complete line of subminiature 2-way and 3-way solenoid valves. Ideally suited for the remote control of liquid, air, or vacuum.

Valves are available with a broad variety of materials of construction, port sizes, seal selections, termination styles, mounting brackets, pressure and flow capabilities to meet your most stringent application requirements.

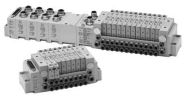
Our standard valves dimensionally meet the industry standards from mounting holes and ports, to valve sizes and configurations. KIP offers a wide selection of coil construction and meets virtually any voltage requirements.

KIP is eager to install your fittings, attach your specific terminations to the lead wire or accommodate your unique mounting or installation requirements.

Valves: JFC-2A

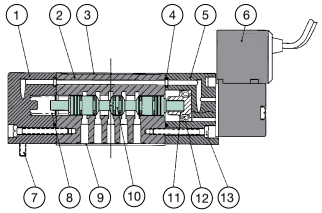
Catalog:	View Catalog Page
Drawings:	● Click to see drawing A
Description 1:	Valves
Description 2:	1/8" Flow Control Delay Out
Max Psi:	150 psig
Temperature Range:	32 to 230 F
Ports:	1/8
Weight:	0.1300
Flow:	10.5 SCFM adjustable @100 psig
Package Quantity:	1
List Price:	$ 14.70 Dollars per unit EXCLUDES FREIGHT, TAXES AND DUTIES (IF APPLICABLE)
ZIP Code	
Quantity:	1
Extended Price:	$ 14.70

Online Catalog Home | Add To Cart

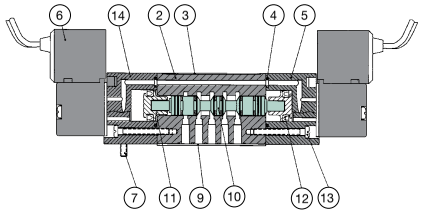


F2 Valve Service Kits and Parts, 2 and 3 Position 4-Way

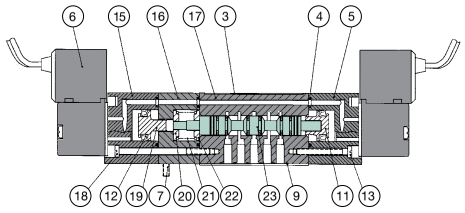
Kit No. MKF2-K1
(for models F20BW4, F21BW4, F2CBW4)



Kit No. MKF2-K2
(for models F20BB4, F21BB4, F2CBB4)

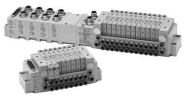


Kit No. MKF2-K35 (for models F20BB5, F21BB5, F2CBB5)
Kit No. MKF2-K36 (for models F20BB6, F21BB6, F2CBB6)



DET. NO.	BW4	BB4	BB5/6	PART NAME	PART NO.
1	1	N/A	N/A	Spring Cover Ass'y	204-594
2	1	1	N/A	Body (not sold separately)	
3	1	1	1	Nameplate	122-1059
4	2*	2*	3*	Gasket	113-517
5	1	1	1	Pilot Adaptor Ass'y	219-391
6	1	2	2	Pilot Valve Ass'y	*See p. 8*
7	2	2	2	Screw	127-832
8	1*	N/A	N/A	Spring	115-357
9	1*	1*	1*	Gasket	113-525
10	1*	1*	N/A	Spool Ass'y (BA4, BB4)	221-176
11	1*	2*	1*	Piston	117-238
12	1*	2*	2*	U-Cup Seal	124-333
13	4	4	2	Screw	127-834
14	N/A	1	N/A	Pilot Adaptor Ass'y	219-393
15	N/A	N/A	1	Pilot Adaptor Ass'y	219-392
16	N/A	N/A	1	Adaptor	119-613
17	N/A	N/A	1	Body	101-721
18	N/A	N/A	2	Screw	127-840
19	N/A	N/A	1*	Piston	117-240
20	N/A	N/A	1*	Spring Retainer	116-506
21	N/A	N/A	1*	Spring	115-360
22	N/A	N/A	1	Spring Retainer	116-507
23	N/A	N/A	1*	Spool Ass'y (BB5)	221-175
23	N/A	N/A	1*	Spool Ass'y (BB6)	221-177

*Indicated part included in kit.

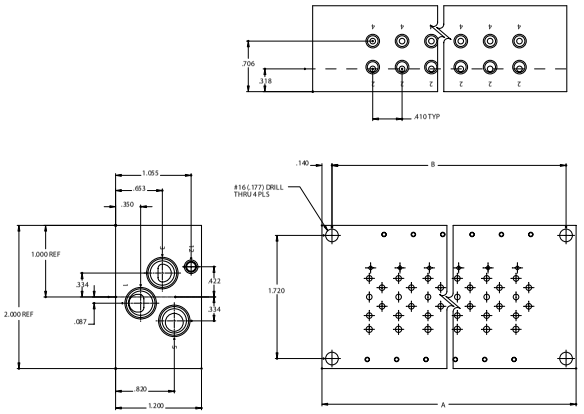


numatics

2002 Series

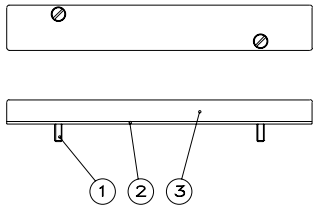
Bar Stock Manifold

STATIONS	PART NO.
2	106-1355
4	106-1356
6	106-1357
8	106-1358
10	106-1359
12	106-1360
14	106-1361
16	106-1362
18	106-1363
20	106-1364



Blank Station Plate Kit 239-1055

DET. NO.	NO. REQ'D	PART NAME	PART NO.
1	2	Screw	127-841
2	1	Gasket	113-526
3	1	Blank Station Plate	104-698



Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.

Plug Connector

LEAD LENGTH	PART NO.
12" Lead	230-443
48" Lead	230-476
120" Lead	230-486

PART NAME	PART NO.
Housing	140-384
Terminal	140-385

Plug connector is not included with solenoid assemblies or valve models. Must order separately.
Note: Wire Gage = 22 AWG

Pilot Valve Assembly

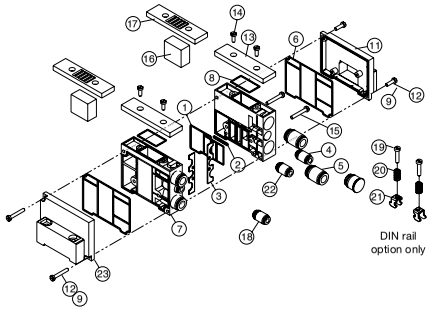
Hardwired

Straight Plug-in

90° Plug-in

VOLTAGE	HARDWIRED	STRAIGHT PLUG-IN	90 DEGREE PLUG-IN
12 VDC	236-378	236-374	236-376
24 VDC	236-379	236-587	236-583

End Plate Kits



PORT TYPE	PUSH-IN			PUSH-IN		
PORT	1	3/5	X, XE	1	3/5	X, XE
PORT SIZE	1/4	1/4	5/32	8mm	8mm	6mm
End Plate Kit w/o muffler, w/o DIN Rail	239-1210			239-1208		
End Plate Kit w/o muffler, w/ DIN Rail	239-1209			239-1207		
End Plate Kit w/ muffler, w/o DIN Rail	239-1214			239-1212		
End Plate Kit w/ muffler, w/ DIN Rail	239-1213			239-1211		

DET. NO.	NO. REQ'D	PART NAME	PART NO.
1	1	Gasket	113-518
2	1	Gasket	113-515
3	2	Fitting Clip	125-780
4	1	5/32 Slip-in Fitting	134-498
4	1	6mm Slip-in Fitting	134-499
5	4	Fitting	*See-p. 21*
6	2	Gasket	113-503
7	1	LH End Plate	104-696
8	2	Gasket	113-519
9	4	Lockwasher	128-192
10	1	RH End Plate	104-697
11	1	RH Mounting Cover	105-385
12	4	Screw	127-844
13	2	End Plate Cover	105-387
14	4	Screw	127-838
15	2	Screw	127-839
16	2	Muffler (optional)	125-791
17	2	Vented Cover (optional)	105-388
18	2	Exhaust Plug (optional)	239-1085
19	4	Screw	127-472
20	4	Spring	115-355
21	4	Clamp	125-720
22	1	Pilot Exhaust Plug	239-1086
23	1	LH Mounting Cover	105-381

3175 - MALE CONNECTOR-TUBE TO MALE NPT OR BSPT

In-line connection of tubing to a threaded port. External tightening with a flat spanner or a socket wrench, internal adjustment with an Allen wrench.
- compact,
- precoated thread ensuring direct sealing,
- full air flow,
- individual unit quality control and dating in order to guarantee quality and traceability,
- RoHS and ISO 14743.

Poster - Push-to-connect fittings, system LF 3000

View technical drawing

View the Flash animation

View related products

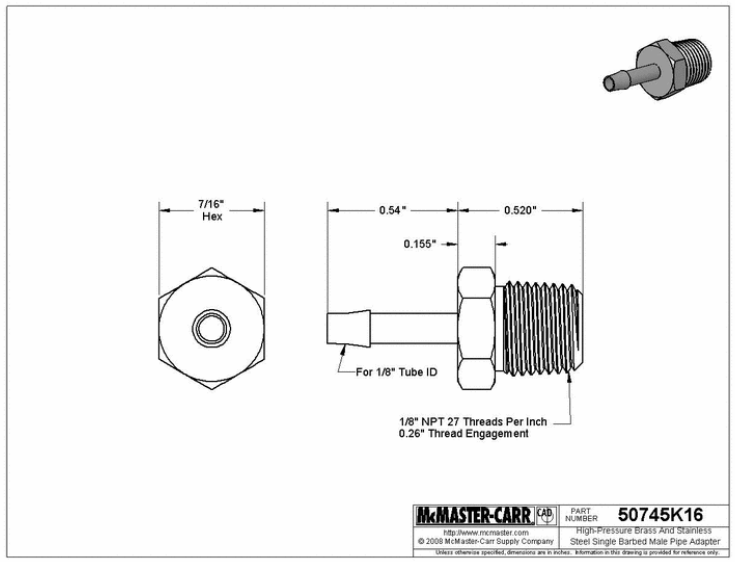
TECHNICAL SPECIFICATIONS

maximum working pressure	20 bar 2 MPa 290 psi
working temperature	-20 to 80 °C -4 to 176 °F 253 to 353 °K
vacuum capability	755 mm Hg
body	nickel-plated brass
'O'-rings	nitrile
gripping ring	stainless steel

Brass Pipe Fittings and Pipe

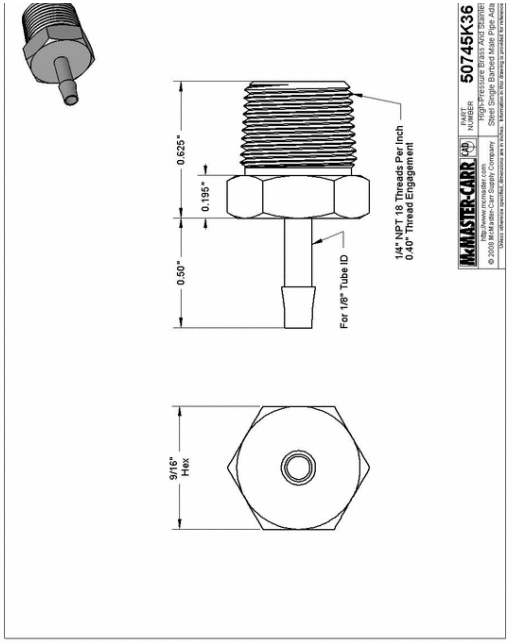
Part Number: **50745K16** $9.10 Each

Shape	Pipe to Tube Adapter
Pipe to Tube Type	Male Pipe x Tube Adapter
Barbed Tube Fitting Type	Single-Barbed
Pipe to Tube Connection	NPT Pipe x Barbed Tube
System of Measurement	Inch
Pipe/Thread Size	1/8"
Tube Inside Diameter	1/8"
Material	Yellow Brass
Maximum Pressure @ 125° F	750 psi
Operating Temperature Range	-40° to +250° F
Tubing Material Detail	Use with polyurethane tubing with a hardness of Shore A 65-90.
For Use With	Air, Freon, Oil
Vacuum Rating	Not Rated
Sterilize With	Not Rated
Specifications Met	Not Rated
Notes	Has a brass body with a Type 321 stainless steel barbed end. Clamps are required.



For Use With
For Tubing Type
For Tubing with Hardness
Specifications Met
Note
Caution

All
Polyurethane
Shore A 65-90
Not Rated
To connect, simply slide
clamp is required for sec
McMaster-Carr does not
many variables can affe
consumer must determir
conditions in which the p



Air Compressor, 120 V, 2 HP, 13 Gal Tank

Portable Air Compressor, Electric, Horizontal Tank Type, Voltage 120, Amps AC 15.0, HP 2.0, Free Air CFM @ 90 PSI 5.50, Free Air CFM @ 125 PSI 4.9, Free Air CFM @ 135 PSI 4.0, Free Air CFM @ 175 PSI -, Max. Pressure (PSI) 135, Tank (Gal.) 13, (F)NPT Outlet (In.) 1/4, Unit Weight (Lbs.) 126, Cast Iron Cylinder, Oil Lube Design, Replacement Pump - , Motor RPM 3450, Motor Type Induction, - Standards, Length (In.) 28, Width (In.) 18, Height (In.) 26-1/2, -

Grainger Item #	1NNF4
Price (ea.)	**$429.00**
Brand	SPEEDAIRE
Mfr. Model #	1NNF4
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	152.0
Usually Ships	Today
Catalog Page No.	3410

Price shown may not reflect your price. Log in or register.

Additional Info

Portable Electric Barrel Air Compressors

Feature ASME code tank, pressure regulator, and 2 pressure gauges.

Speedaire(R)

No. 1NNF8 is direct-drive with single-cylinder pump.

Nos. 1NNF4 and 1NNF6 feature 2-cylinder cast-iron pumps with belt-drive design. No. 2MLW4 is oil-lubricated and has single cylinder pump. No. 2MLW2 is a 2-cylinder cast-iron pump with belt-driven system.

Tech Specs

Item: Portable Air Compressor
Type: Electric
Tank Type: Horizontal
Voltage: 120
Amps AC: 15.0
HP: 2.0
Free Air CFM @ 90 PSI: 5.50
Free Air CFM @ 125 PSI: 4.9
Free Air CFM @ 135 PSI: 4.0
Max. Pressure (PSI): 135
Tank (Gal.): 13
(F)NPT Outlet (In.): 1/4
Unit Weight (Lbs.): 126
Cylinder: Cast Iron
Design: Oil Lube
Motor RPM: 3450
Motor Type: Induction
Length (In.): 28
Width (In.): 18
Height (In.): 26-1/2

Notes & Restrictions

There are currently no notes or restrictions for this item.

MSDS

Optional Accessories

Air Hose, 1/4 ID, 25 Ft, 1/4 MNPT, Yellow

Item #: 1TAY9
Brand: LEGACY
Usually Ships: Today
Price (ea): $21.99

Hose, Air, 1/4 In ID x 1/4 In MNPT, 50Ft

Item #: 2Z010
Brand: SPEEDAIRE
Usually Ships: Today
Price (ea): $46.10

Oil, Air Compressor

Item #: 4ZF21
Brand: EXXONMOBIL
Usually Ships: Today
Price (ea): $8.98

Oil, Synthetic Engine

Item #: 5XB58
Brand: EXXONMOBIL
Usually Ships: Today

TD-3LS, 12 vdc

Voltage: 12 vdc
Flow Rate: 2-3 lpm
Nominal Current Drain: 90 ma

Select All Product Options to See Price

Diaphragm: Select Diaphragm
Valve Set: Select Valve Set
Low Leak O-rings: Select Low Leak O-rings
Stroke: Select Stroke
Fasteners: Select Fasteners

Select Pump Head

Type 2 - for push-on tubing, 3/16" ID, 1/2" ext.

SDM-CD16AC

16-Channel AC/DC Controller

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

The SDM-CD16AC is a synchronous device equipped with relay control ports that control power to each of 16 external ac or dc devices. Each relay port can be controlled automatically by the datalogger's program or controlled manually with an override toggle switch.

The toggle switch has three positions, "ON" and "OFF" for manual override, and "AUTO" is for datalogger control. In the "ON" position, the common (COM) and normally open (NO) contacts are closed. In the "OFF" position, the normally open contact is open. In the "AUTO" position, the state of the relay is controlled by the SDM command issued through the datalogger's control ports or SDM terminal.

Features

- Activates ac or dc devices
- Provides contacts rated at 5 A @ 30 Vdc, 0.3 A @ 110 Vdc, 5 A @ 125 Vac, and 5 A @ 277 Vac
- Includes LED that indicates when a port is active
- Allows manual override for each port
- Conforms to EN55022-1:1995 and EN50082-1:1992
- UL/CUL* listed

Power Considerations

The SDM-CD16AC power requirements are large compared to most Campbell Scientific products. For most applications, an external power supply is recommended to power the SDM-CD16AC.

For some applications it may be convenient to use the datalogger supply to power the SDM-CD16AC. For long-term applications, the sealed rechargeable power supply available with Campbell Scientific dataloggers should be used, allowing the batteries to be float charged. It is not recommended that the datalogger alkaline supply be used to power the SDM-CD16AC for long-term applications.

SDM Operation

The SDM-CD16AC is a synchronously addressed datalogger peripheral. Datalogger control ports 1, 2, and 3 are used to address the SDM-CD16AC, then clock out the desired state of each of the 16 control ports. Up to 16 SDM-CD16ACs may be addressed, making it possible to control a maximum of 256 ports from the first three datalogger control ports.

Datalogger Connection

The CABLE5CBL-L is recommended for connecting the module to the datalogger. A 1-ft cable length should be sufficient when both datalogger and SDM-CD16AC are housed within an ENC12/14 enclosure; a 2-ft length may be required if the datalogger and SDM-CD16AC are housed at opposite ends of an ENC16/18 Enclosure.

The cable length should be as short as possible. Typically, the maximum cable length is 20 ft. Contact Campbell Scientific if the length needs to be longer.

Ordering Information

Synchronous Device for Measurement	
SDM-CD16AC	16-Channel AC/DC Relay Controller Module
SDM-to-Datalogger Cable	
CABLE5CBL-L	5-conductor, 24 AWG cable with drain wire and Santoprene jacket. Enter cable length, in feet, after the -L. Must choose a cable termination option (see below).
Cable Termination Options (choose one)	
-PT	Cable terminates in stripped and tinned leads for direct connection to a datalogger's terminals.
-PW	Cable terminates in connector for attachment to a prewired enclosure.

**Underwriters Laboratories (UL) and Canadian Underwriters Laboratories (CUL) listed product. UL and CUL listing number is 5Z21.*

Specifications

Compatible Dataloggers: CR800, CR850, CR1000, CR3000, CR5000 (OS version 1.3 or higher), CR7, CR10(X), CR23X, and 21X. The SDM-CD16AC is not compatible with the CR500, CR510, and CR200-series dataloggers.

Contact Operation: Single pole double throw; break before make

Contact Material: Gold-clad silver

Individual Contact Rating: 5 A @ 30 Vdc, 0.3 A @ 110 Vdc, 5 A (1/10 hp) @ 125 Vac, 5 A (1/6 HP) @ 277 Vac

Coil Voltage: 9 to 18 Vdc

Coil Resistance: 360 Ohms x ±10%

Expected Life (contact closures): Mechanical 10^7

Actuation/Release Time: Approximately 4 ms

Toggle Switch: ON/OFF manual override; AUTO for datalogger control

Power

Operating Voltage: 12 Vdc nominal (9 to 18 Vdc)

Current Drain @ 12 Vdc: 6 mA quiescent; 45 mA per active LED (switch on or auto active)

Environmental

Operating Temperature: -40° to 70°C

Humidity: non-condensing

Physical

Dimensions: 9.7-in. x 2.0-in. x 3.4-in. (24.6-cm x 5.1-cm x 8.6-cm)

Weight: 1.8 lbs (0.8 kg)

PVC TrimWelder Slow Cure 50 ML Cartridge with 2 FREE Qwik Mixers

Price:

This product is currently in stock

Item Number: EXT-SC-50-ML

Manufacturer: Extreme Adhesives

PVC TRIMWELDER™ SLOW CURE Adhesive is a slower curing, two-component adhesive formulated and colored for PVC Trim Board applications with a work life of 15 to 25 minutes at 70° F after mixing. It is a creamy, medium viscosity, solvent-free structural adhesive that is EPA and CARB compliant. Cured performance shows excellent adhesion and bond strength. Adhesive joints are ready to handle in 90 to 120 minutes.

PVC TRIMWELDER™ SLOW CURE Adhesive does not require special surface preparation. It's stronger then PVC after curing and fills gaps to 1/4". SLOW CURE is designed for larger parts requiring additional assembly time or as a finishing material to create fillets and blends . The creamy consistency, won't foam, run or drip Excellent sandability after curing. NOTE! For best structural core to core bonds we recommend PVC TRIMWELDER™ FAST CURE

Why Should You Select This Adhesive?

- ***Permanent Unitizing Structural Adhesive***
- Excellent Adhesion to PVC
- Impact Resistance - Peel Strength
- Matches white PVC Trim Boards
- Paintable
- Fast Setting
- Easy to apply
- Fills Nail Holes and Gaps
- Meets 2009 EPA VOC & CARB requirements

Quantity: 1 Add to Cart

Rubbermaid Horizontal Plastic Storage Shed

Model # FG3747SWOLVSS Internet # 202046943

$229.00/EA-Each

Ships FREE with $249.00 Order

This item cannot be shipped to the following state(s): AK,HI

Zoom View

Average Customer Rating

4.5 out of 5

Write a review for a chance to win a $1,000 Gift Card.

Read Reviews > **Write a Review >**

Description

It is the only double-walled storage shed in its class (horizontal storage sheds with 25 - 40 cubic feet of space). The Large Horizontal Storage Shed is durable and weather-resistant. An easy, hassle-free storage solution, it comes with a heavy duty, impact resistant floor and has a storage capacity of 32 cubic feet. The shed can accommodate one wood shelf (not included).

- Storage Capacity: 32 cubic feet
- Inside Dimensions: 51 inches wide x 24 inches deep x 42 inches high
- Durable: leak-resistant, dent-resistant, weather-resistant
- Maintenance Free: no rot, no rust, no problems
- Heavy duty, impact resistant floor included
- Easy to assemble
- Lockable (lock not included)
- Accommodates one wood shelf (not included)
- MFG Brand Name : Rubbermaid
- MFG Model # : FG3747SWOLVSS
- MFG Part # : FG3747SWOLVSS

Specifications

- **Assembled Depth (in.)** : 24 in
- **Assembled Height (in.)** : 42 in
- **Assembled Width (in.)** : 51 in
- **Item Package Type** : Cardboard Container
- **Item Weight** : 93 lb
- **Manufacturer Warranty** : For a period of one year from the date of purchase, if a Rubbermaid Home product proves defective in materials and workmanship during normal use by the purchaser of this product, RHP will arrange for replacement or repair.
- **Material** : Plastic
- **Product Depth (in.)** : 13.1
- **Product Height (in.)** : 48.875
- **Product Weight (lb.)** : 93
- **Product Width (in.)** : 63.5

GRAINGER
FOR THE ONES WHO GET IT DONE

printed October 24, 2010

Mobile Tool Chest, Rolling, 50 Gallon

Mobile Tool Chest, Rolling, Overall Width 37 In, Overall Depth 23 In, Overall Height 23 In, Storage Capacity 50 Gallon, High Density Structural Foam, Black, Locking System Nickel Plated Built-in, Number of Trays 1, Deep Tote Tray, Large, Pull-out, Wide, Steel Handle, Lid (2) 2 x 4 Grooves

Grainger Item #	2FDB7
Price (ea.)	**$114.60**
Brand	STANLEY
Mfr. Model #	037025H
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	32.0
Usually Ships	Today
Catalog Page No.	738

Price shown may not reflect your price. Log in or register.

Additional Info

Structural Foam and Plastic Tool Boxes

Tech Specs

Item: Mobile Tool Chest
Type: Rolling
Overall Width (In.): 37
Overall Depth (In.): 23
Overall Height (In.): 23
Storage Capacity: 50 gal.
Material: High Density Structural Foam
Color: Black
Locking System: Nickel Plated Built-in
Number of Trays: 1
Tray: Deep Tote
Handle: Large, Pull-out, Wide, Steel
Lid: (2) 2 x 4 Grooves

Notes & Restrictions

There are currently no notes or restrictions for this item.

MSDS

This item does not require a **Material Safety Data Sheet (MSDS).**

Required Accessories

There are currently no required accessories for this item.

Optional Accessories

There are currently no optional accessories for this item.

Alternate Products

Mobile Tote Tool

Item #: 1RG79
Brand: CONTICO
Usually Ships: Today
Price (ea): $105.00

Repair Parts

A Repair Part may be available for this item. Visit our Repair Parts Center or contact your local branch for more information.

Products

Part No.: B-400-3TTM

Description: Brass Swagelok Tube Fitting, Male Branch Tee, 1/4 in. Tube OD x 1/4 in. Tube OD x 1/8 in. Male NPT

Price: Log in to see pricing

Availability: Log in to see availability

Quantity: Buy Quote

SPECIFICATION SUMMARY	
Body Material	Brass
Body Type	Tee
Series	Swagelok tube and adapter fittings
End Connection 1 Size	1/4 in
End Connection 1 Type	Swagelok® tube fitting
End Connection 2 Size	1/4 in
End Connection 2 Type	Swagelok® tube fitting
End Connection 3 Size	1/8 in
End Connection 3 Type	Male NPT
Cleaning	Swagelok SC-10

Products

Find thousands of Swagelok products by utilizing our enhanced product search. Choose your product group and continue to narrow your results, or read more about Swagelok Products by clicking on the Details tab.

Products

Part No.: B-400-2-2

Description: Brass Swagelok Tube Fitting, Male Elbow, 1/4 in. Tube OD x 1/8 in. Male NPT

Price: Log in to see pricing

Availability: Log in to see availability

Quantity: Buy Quote

SPECIFICATION SUMMARY	
Body Material	Brass
Body Type	Male elbow
Series	Swagelok tube and adapter fittings
End Connection 1 Size	1/4 in
End Connection 1 Type	Swagelok® tube fitting
End Connection 2 Size	1/8 in
End Connection 2 Type	Male NPT
Cleaning	Swagelok SC-10

Products

Part No.: SS-400-61

Description: SS Swagelok Tube Fitting, Bulkhead Union, 1/4 in. Tube OD

Price: Log in to see pricing

Availability: Log in to see availability

Quantity: Buy Quote

SPECIFICATION SUMMARY	
Body Material	Stainless Steel
Body Type	Bulkhead union
Series	Swagelok tube and adapter fittings
End Connection 1 Size	1/4 in
End Connection 1 Type	Swagelok® tube fitting
End Connection 2 Size	1/4 in
End Connection 2 Type	Swagelok® tube fitting
Cleaning	Swagelok SC-10

Products

Part No.: SS-200-61

Description: SS Swagelok Tube Fitting, Bulkhead Union, 1/8 in. Tube OD

Price: Log in to see pricing

Availability: Log in to see availability

Quantity: Buy Quote

SPECIFICATION SUMMARY	
Body Material	Stainless Steel
Body Type	Bulkhead union
Series	Swagelok tube and adapter fittings
End Connection 1 Size	1/8 in
End Connection 1 Type	Swagelok® tube fitting
End Connection 2 Size	1/8 in
End Connection 2 Type	Swagelok® tube fitting
Cleaning	Swagelok SC-10

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $70.83 ea
In stock: 785
Mfr: 80/20 Inc.
Mfr #: 1515-97

MSC #: 05632583

Description:	T-Slotted Aluminum Extrusions Type: T-Slotted Aluminum Extrusions Width Angle 1: 1.500 In. Width Angle 2: 1.500 In. Length: 97 Thickness: 0.1600 In. Material: Aluminum Alloy
Type:	T-Slotted Aluminum Extrusions
Width (Decimal Inch):	1.5000"
Width (Decimal Inch):	1.5000"
Length (Inch):	97
Thickness (Decimal Inch):	.1600"
Material:	Aluminum Alloy
Finish/Coating:	Clear Anodized
Area (Decimal Inch):	1.156
Big Book Page #:	3812

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $124.73 ea
In stock: 233
Mfr: 80/20 Inc.
Mfr #: 1530-97

MSC #: 05632617

Description:	T-Slotted Aluminum Extrusions Type: T-Slotted Aluminum Extrusions Width Angle 1: 1.500 In. Width Angle 2: 3.000 In. Length: 97 Thickness: 0.1600 In. Material: Aluminum Alloy
Type:	T-Slotted Aluminum Extrusions
Width (Decimal Inch):	1.5000"
Width (Decimal Inch):	3.0000"
Length (Inch):	97
Thickness (Decimal Inch):	.1600"
Material:	Aluminum Alloy
Finish/Coating:	Clear Anodized
Area (Decimal Inch):	2.093
Big Book Page #:	3812

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $33.05 ea
In stock: 838
Mfr: 80/20 Inc.
Mfr #: 1010-97

MSC #: 05632559

Description:	T-Slotted Aluminum Extrusions Type: T-Slotted Aluminum Extrusions Width Angle 1: 1.000 In. Width Angle 2: 1.000 In. Length: 97 Thickness: 0.0870 In. Material: Aluminum Alloy
Type:	T-Slotted Aluminum Extrusions
Width (Decimal Inch):	1.0000"
Width (Decimal Inch):	1.0000"
Length (Inch):	97
Thickness (Decimal Inch):	.0870"
Material:	Aluminum Alloy
Finish/Coating:	Clear Anodized
Area (Decimal Inch):	0.435
Big Book Page #:	3812

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $9.67 ea
In stock: 1107
Mfr: 80/20 Inc.
Mfr #: 4336

MSC #: 75828509

Description:	Inside Corner Gussets Type: 4 Hole Inside Corner Gusset For Use With: Series 15 and Bolt Kit 3320 Width: 1.3100 In. Depth: 3.0000 In. Height: 3.00 In. Color: Gray Material: Aluminum
Type:	4 Hole Inside Corner Gusset
For Use With:	Series 15 and Bolt Kit 3320
Width (Decimal Inch):	1.3100"
Depth (Decimal Inch):	3.0000"
Height (Decimal Inch):	3.0000"
Color:	Gray
Material:	Aluminum
Big Book Page #:	3814

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

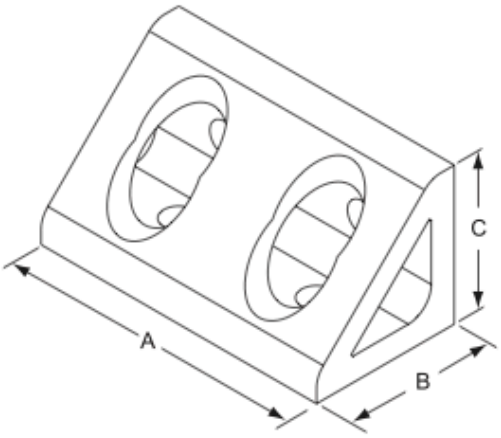
Order Qty of 1 = (1) Piece
Price: $21.96 ea
In stock: 103
Mfr: 80/20 Inc.
Mfr #: 2525

MSC #: 07402498

Description:	45° T-Slotted Aluminum Extrusion Supports Type: 45° Support Bracket For Use With: Series 15 - 1515 Extrusion Width: 1.5000 In. Height: 6 In. Color: Gray Material: Aluminum
Type:	45° Support Bracket
For Use With:	Series 15 - 1515 Extrusion
Width (Decimal Inch):	1.5000"
Height (Decimal Inch):	6.0000"
Color:	Gray
Material:	Aluminum
Big Book Page #:	3814

Fractional

4 Hole Inside Gusset Corner Bracket



Page 268

10 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3393 ⌘	4	1/4-20 x 1/2" BHSCS & Econ T-Nut

For more 10 Series mounting hardware options, see Table M on page 165.

15 Series Recommended Mounting Hardware:

Part No.	Qty	Description
3320	4	5/16-18 x 11/16" FBHSCS & Econ T-Nut

For more 15 Series mounting hardware options, see Table N on page 166.

⌘ = 10 Series Compatible Part

Part No.	A	B	C	Lbs.
4134 ⌘	1.875	1.000	1.000	.081
4334	2.810	1.500	1.500	.246

80/20 Inc.
The Industrial Erector Set®

Qty: [ ] ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $1.90 ea
In stock: 1915
Mfr: 80/20 Inc.
Mfr #: 2030

MSC #: 07210156

Description: T-Slotted Extrusion End Caps Type: T-Slotted Extrusion End Caps For Use With: Series 15 - 1515/1515-Lite Extrusions Width: 1-1/2 Height: 1-1/2 Thickness: 3/16 Color: Black

Type:	T-Slotted Extrusion End Caps
For Use With:	Series 15 - 1515/1515-Lite Extrusions
Width (Inch):	1-1/2
Height (Inch):	1-1/2
Thickness (Inch):	3/16
Color:	Black
Material:	Molded ABS
Big Book Page #:	3814

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $2.31 ea
In stock: 596
Mfr: 80/20 Inc.
Mfr #: 2045

MSC #: 07217649

Description:	T-Slotted Extrusion End Caps Type: T-Slotted Extrusion End Caps For Use With: Series 15 - 1530/1530-Lite Extrusions Width: 1-1/2 Height: 3 Thickness: 3/16 Color: Black Material: Molded ABS
Type:	T-Slotted Extrusion End Caps
For Use With:	Series 15 - 1530/1530-Lite Extrusions
Width (Inch):	1-1/2
Height (Inch):	3
Thickness (Inch):	3/16
Color:	Black
Material:	Molded ABS
Big Book Page #:	3814

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $1.62 ea
In stock: 1550
Mfr: 80/20 Inc.
Mfr #: 2015

MSC #: 71824874

Description:	T-Slotted Extrusion End Caps Type: T-Slotted Extrusion End Caps For Use With: Series 10 - 1010 Extrusion Width: 1 Height: 1 Thickness: 1/8 Color: Black Material: Molded ABS
Type:	T-Slotted Extrusion End Caps
For Use With:	Series 10 - 1010 Extrusion
Width (Inch):	1
Height (Inch):	1
Thickness (Inch):	1/8
Color:	Black
Material:	Molded ABS
Big Book Page #:	3814

80/20 Inc.

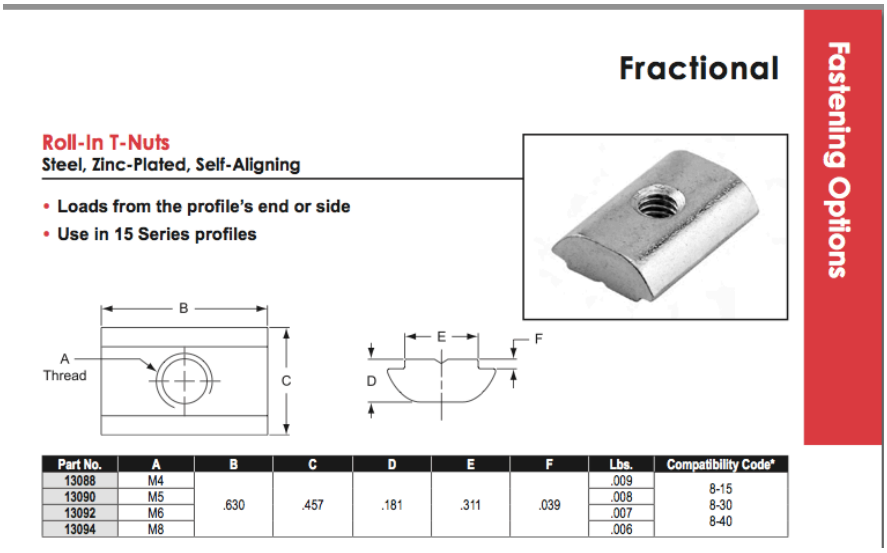
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $4.85 ea
In stock: 1687
Mfr: 80/20 Inc.
Mfr #: 3360

MSC #: 07173073

Description:	Anchor Fasteners Type: 15 Series Anchor Fastener For Use With: Series 15 Color: Gray Material: Zinc
Type:	15 Series Anchor Fastener
For Use With:	Series 15
Color:	Gray
Material:	Zinc
Big Book Page #:	3814



Fractional

Fastening Options

Roll-In T-Nuts
Steel, Zinc-Plated, Self-Aligning

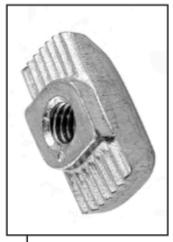
- **Loads from the profile's end or side**
- **Use in 15 Series profiles**

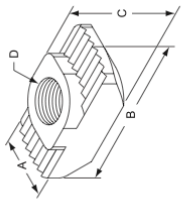
Part No.	A	B	C	D	E	F	Lbs.	Compatibility Code*
13088	M4	.630	.457	.181	.311	.039	.009	8-15
13090	M5						.008	8-30
13092	M6						.007	8-40
13094	M8						.006	

Fastening Options

3

Fractional





Drop-In T-Nuts

- 15 Series compatible
- Loads into the profile T-slot when ends are captivated
- Ridges bite into the profile surface maximizing the connection

Part No.	Material	A	B	C	D (Thread)	Lbs.	Compatibility Code*
3930	Zinc-Plated Steel	.310	.625	.250	M5	.007	8-15
3931					M6	.007	
3932					10-32	.007	8-40
3933					1/4-20	.007	
14162	Steel	.224	.453	.165	10-32	.003	6-10
14164					M4	.003	6-25
14166	Stainless Steel				M4	.003	
13114	Zinc-Plated Steel	.303	.630	.295	M4	.010	8-15
13116					M5	.008	
13119					M6	.007	8-40
14165					1/4-20	.007	

Item Details

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $1.06 ea
In stock: 2356
Mfr: 80/20 Inc.
Mfr #: 3280

MSC #: 71824734

Description:	Economy T-Nut Fasteners Type: 1/4-20 Double Economy T-Nut For Use With: Series 10 Width: 0.4430 In. Height: 1.875 In. Color: Black Zinc Finish Material: Steel
Type:	1/4-20 Double Economy T-Nut
For Use With:	Series 10
Width (Decimal Inch):	.4430"
Height (Decimal Inch):	1.8750"
Color:	Black Zinc Finish
Material:	Steel
Big Book Page #:	3814

Item Details

POWER TRANSMISSION ▶ SHAFT & CLAMP COLLARS ▶ **Item #35462522**

Options: ▶ Add To Cart ▶ Add to List ▶ Email To A Friend ▶ Print this page

CLIMAX METAL PRODUCTS COMPANY

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $6.12 ea
In stock: 184
Mfr: Climax
Mfr #: 1C-037-S

MSC #: 35462522

Description:	One-Piece Clamping Collars Type: Clamp Collar Style: One Piece Bore Size: 0.375 In. Bore Size: 3/8 Material: Stainless Steel Width: 0.3750 In., 3/8 Outside Diameter: 0.8750 In.
Type:	Clamp Collar
Style:	One Piece
Bore Size (Decimal Inch):	.3750"
Bore Size:	3/8
Material:	Stainless Steel
Material Grade:	303
Width (Inch):	3/8
Width (Decimal Inch):	.3750"
Outside Diameter (Decimal Inch):	.8750"
Big Book Page #:	3785
MSDS Sheet:	Get MSDS for this item

POWER TRANSMISSION ▶ SHAFT & CLAMP COLLARS ▶ **Item #35462506**

Options: ▶ Add To Cart ▶ Add to List ▶ Email To A Friend ▶ Print this page

CLIMAX METAL PRODUCTS COMPANY

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $4.68 ea
In stock: 112
Mfr: Climax
Mfr #: 1C-025-S

MSC #: 35462506

Description:	One-Piece Clamping Collars Type: Clamp Collar Style: One Piece Bore Size: 0.250 In. Bore Size: 1/4 Material: Stainless Steel Width: 0.3125 In., 5/16 Outside Diameter: 0.6880 In.
Type:	Clamp Collar
Style:	One Piece
Bore Size (Decimal Inch):	.2500"
Bore Size:	1/4
Material:	Stainless Steel
Material Grade:	303
Width (Inch):	5/16
Width (Decimal Inch):	.3125"
Outside Diameter (Decimal Inch):	.6880"
Big Book Page #:	3785
MSDS Sheet:	Get MSDS for this item

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) Piece
Price: $168.19 ea
In stock: 14
Mfr: Select

MSC #: 52419090

Description:	Sheets - Plastic Material Material: PVC Thickness: 3/8 Length: 48 Width: 48 Color: Gray
Material:	PVC
Thickness (Inch):	3/8
Length (Inch):	48
Width (Inch):	48
Color:	Gray
Big Book Page #:	1873
Metalworking Catalog:	1873

g

liers

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) 25 Foot Roll
Price: $13.38 ea
In stock: 79
Mfr: Select

MSC #: 31943665

Description:	Neoprene-Blend Closed Cell Sponge Rubber Rolls Width: 3/4 Thickness: 1/2 Color: Black Material: Closed Cell Sponge Rubber Length Ft.: 25
Width (Inch):	3/4
Thickness (Inch):	1/2
Color:	Black
Material:	Closed Cell Sponge Rubber
Length Ft. (Feet):	25
Maximum Temperature (°F):	158.000
Minimum Temperature (°F):	-40.000
Density Range:	8-11 lbs./cu. ft.
Back Type:	Adhesive
Big Book Page #:	1891
Metalworking Catalog:	1891

80/20 Inc.
The Industrial Erector Set®

Qty: ADD TO CART ADD TO LIST

Order Qty of 1 = (1) 2 Piece Kit
Price: $.80 ea
In stock: 7339
Mfr: 80/20 Inc.
Mfr #: 3320

MSC #: 07162944

Description:	Fastening Bolt Kits Type: Flanged Button Head Socket Cap Screw For Use With: Series 10 & 15 - Reference G Height: 0.625 In. Color: Black Material: Zinc
Type:	Flanged Button Head Socket Cap Screw
For Use With:	Series 10 & 15 - Reference G
Height (Decimal Inch):	.6250"
Color:	Black
Material:	Zinc
Big Book Page #:	3813

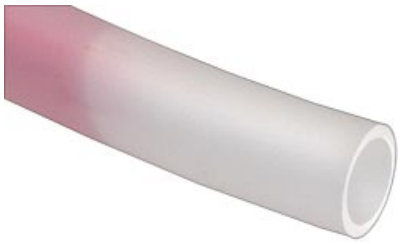
Tubing

Part Number: **5108K43**

1-99 Ft. $0.56 per Ft.
100 or more $0.42 per Ft.

Type	Abrasion-Resistant Clear Polyurethane Tubing
Material	Ester-Based Polyurethane
Shape	Single Line
Outside Dia.	1/4" (.25")
Inside Dia.	1/8" (.125")
Wall Thickness	1/16" (.0625")
Available Lengths	25, 50, and 100 feet
Reinforcement	Unreinforced
Color	Clear
Maximum Pressure	110 psi @ 73° F
Operating Temperature Range	-70° to +175° F
Bend Radius	1-1/2" (1.5")
Durometer	85A (Firm)
Tensile Strength	5,000 psi
For Use With	Air
Sterilize With	Gas
Specifications Met	United States Food and Drug Administration (FDA)
FDA Specification	CFR21 177.2600
Compatible Fittings	Barbed
WARNING	Tubing will crack if used with water.
Caution	McMaster-Carr does not guarantee chemical compatibility because many variables can affect the tubing. Ultimately, the consumer must determine chemical compatibility based on the conditions in which the product is being used.

Tubing



Part Number: **5112K62**

1-99 Ft. $0.24 per Ft.
100 or more $0.17 per Ft.

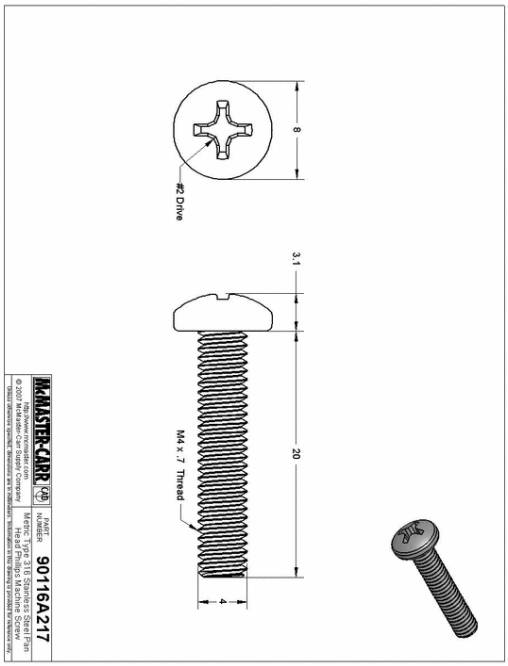
Type	Extra-Flex Nylon Tubing
Material	Nylon 11
Shape	Single Line
Outside Dia.	5/32" (.1562")
Inside Dia.	.106"
Wall Thickness	.025"
Available Lengths	25, 50, and 100 feet
Reinforcement	Unreinforced
Color	Semi-Clear White
Maximum Pressure	220 psi @ 75° F
Operating Temperature Range	-40° to +180° F
Performance Characteristics	Vacuum Rated
Vacuum Rating	28" Hg at 73° F
Bend Radius	3/8" (.375")
Durometer	57D (Hard)
Tensile Strength	5,655 psi
For Use With	Air
Sterilize With	Not Rated
Compatible Fittings	Instant, Compression
Chemical Compatibility Link	**5112KAC**
Caution	McMaster-Carr does not guarantee chemical compatibility because many variables can affect the tubing. Ultimately, the consumer must determine chemical compatibility based on the conditions in which the product is being used.

Machine Screws

Part Number: **90116A217**

$9.44 per Pack of 50

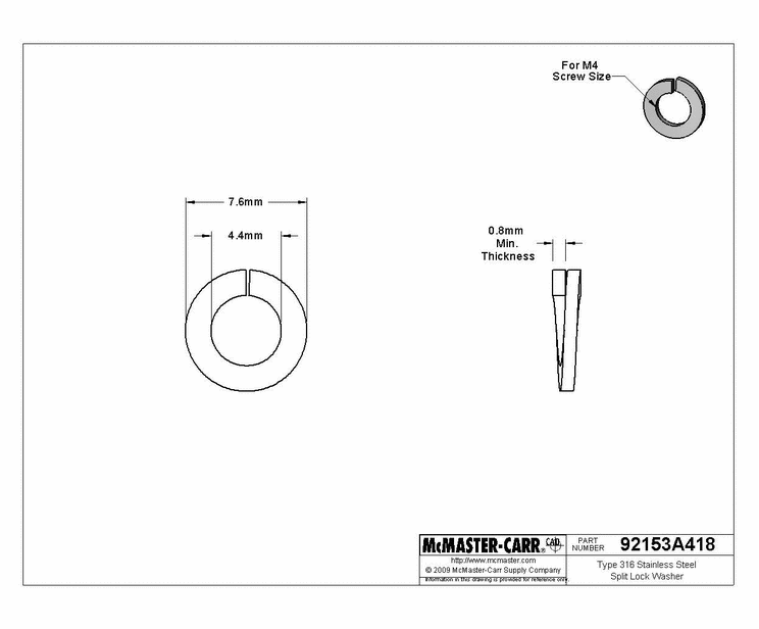
Head Style	Pan
Pan Head Style	Pan
Material Type	Stainless Steel
Finish	Plain
Stainless Steel Type	316 Stainless Steel
Self Locking Element	None
Drive Style	Phillips
System of Measurement	Metric
Metric Thread Size	M4
Metric Thread Pitch	.7 mm
Thread Length	Fully Threaded
Length	20 mm
Head Diameter	8 mm
Head Height	3.1 mm
Drive	#2
Rockwell Hardness	Minimum B80
Minimum Tensile Strength	85,000 psi
Thread Fit	Class 6g
Specifications Met	Deutsche Industrie Normen (DIN)
DIN Specification	DIN 7985
Screw Quantity	Individual Screw



Washers

Part Number: **92153A418** $2.91 per Pack of 100

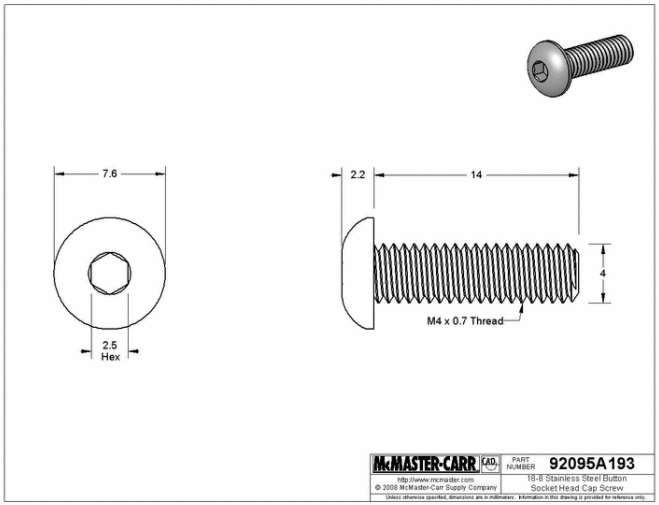
Shape	Spring Lock
For Screw Size	M4
Material Type	Stainless Steel
Finish	Plain
Stainless Steel Type	316 Stainless Steel
Spring Lock Type	Standard
Inside Diameter	4.4 mm
Outside Diameter	7.6 mm
Minimum Thickness	.8 mm
Application	Locking Washer
Rockwell Hardness	Minimum C44
Specifications Met	Deutsche Industrie Normen (DIN)
DIN Specification	DIN 127B



Socket Cap Screws

Part Number: **92095A193** $7.54 per Pack of 50

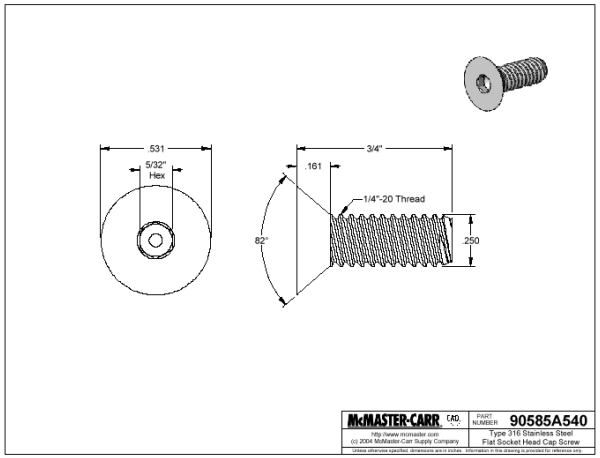
Head Style	Button
Material Type	Stainless Steel
Finish	Plain
Class	Not Rated
Stainless Steel Type	18-8 Stainless Steel
Drive Style	Hex Socket
Metric Thread Size	M4
Metric Thread Pitch	.7 mm
Length	14 mm
Thread Length	Fully Threaded
Thread Direction	Right Handed
Tip Type	Plain
Self-Locking Method	None
Screw Quantity	Individual Screw
Hex Size	2.5 mm
Head Diameter	7.6 mm
Head Height	2.2 mm
Rockwell Hardness	Not Rated
Minimum Tensile Strength	85,000 psi
Thread Fit	Class 6g
Specifications Met	International Organization for Standardization (ISO)
ISO Specification	ISO 7380-A2



Socket Cap Screws

Part Number: **90585A540** $6.35 per Pack of 10

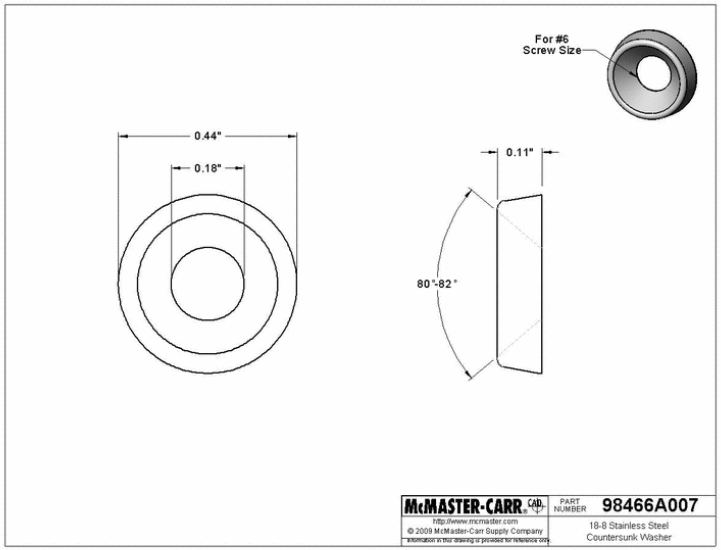
Head Style	Flat
Material Type	Stainless Steel
Finish	Plain
Class	Not Rated
Stainless Steel Type	316 Stainless Steel
Drive Style	Hex Socket
Inch Thread Size	1/4"-20
Length	3/4"
Thread Length	Fully Threaded
Thread Direction	Right Handed
Tip Type	Plain
Self-Locking Method	None
Screw Quantity	Individual Screw
Hex Size	5/32"
Head Diameter	.531"
Head Height	.161"
Undercut Head	No
Head Angle	82°
Rockwell Hardness	B70
Minimum Tensile Strength	70,000 psi
Thread Fit	Class 3A
Specifications Met	Not Rated
Note	To select the right size countersink, the body diameter of the countersink must be equal to or larger than the head diameter of the screw being countersunk. The angle of the countersink must also match the head angle of the screw.



Washers

Part Number: **98466A007** $3.13 per Pack of 100

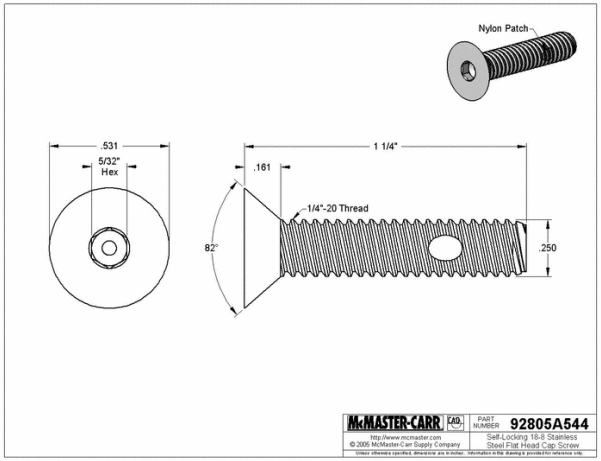
Shape	Finishing
For Screw Size	6
Material Type	Stainless Steel
Finish	Plain
Stainless Steel Type	18-8 Stainless Steel
Countersunk Shape	Countersunk
Inside Diameter	.18"
Outside Diameter	.44"
Finishing Type	Countersunk
Height	.11"
Application	Finishing Washer
Rockwell Hardness	Not Rated
Specifications Met	Not Rated
Note	Use with standard 80°-82° flat and oval countersunk-head screws.



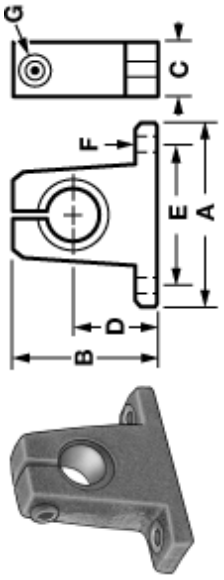
Socket Cap Screws

Part Number: **92805A544** — $10.74 per Pack of 10

Head Style	Flat
Material Type	Stainless Steel
Finish	Plain
Class	Not Rated
Stainless Steel Type	18-8 Stainless Steel
Drive Style	Hex Socket
Inch Thread Size	1/4"-20
Length	1-1/4"
Thread Length	Fully Threaded
Thread Direction	Right Handed
Tip Type	Plain
Self-Locking Method	Nylon Patch
Screw Quantity	Individual Screw
Hex Size	5/32"
Head Diameter	.531"
Head Height	.161"
Undercut Head	No
Head Angle	82°
Temperature Range	-65° to +250° F
Rockwell Hardness	B70
Minimum Tensile Strength	70,000 psi
Thread Fit	Class 3A
Specifications Met	Not Rated
Note	To select the right size countersink, the body diameter of the countersink must be equal to or larger than the head diameter of the screw being countersunk. The angle of the countersink must also match the head angle of the screw.



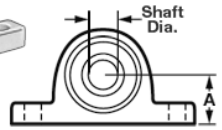
Precision Shafts



Part Number: **6068K22** — $21.96 Each

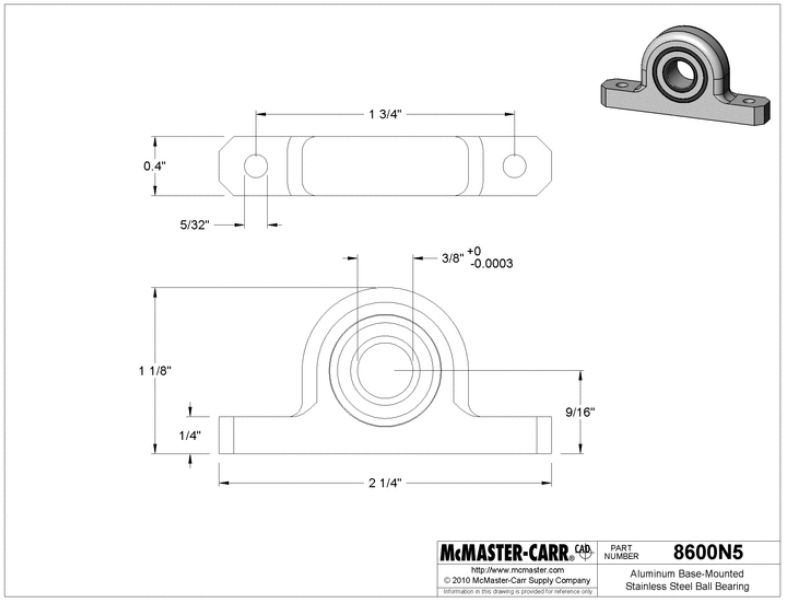
Shaft Support Type	Base Mount
Accessories	Shaft Supports
System of Measurement	Inch
Finish	Plain
Shaft Support Material	Aluminum
Hardness	Unhardened
For Shaft Outside Diameter	3/8"
Overall Width (A)	1-5/8"
Overall Height (B)	1-3/16"
Overall Depth (C)	9/16"
Base to Center (D)	3/4"
Center-to-Center (E)	1-1/4"
Mounting Hole (F)	0.16"
Bolt Size (G)	#6
Test Report	Without Test Report
Specifications Met	Not Rated
Note	Tolerance for dimension (D) is ±0.0002"

Mounted Bearings



Part Number: **8600N5** $19.00 Each

Mounting Style	Base Mount
Base Mount Type	Solid
Type	Miniature, Corrosion Resistant
Bearing Style	Ball
For Shaft Diameter	3/8"
Center Height (A)	9/16"
Dynamic Radial Load Capacity, lbs.	450
Maximum rpm	32,000
ABEC Precision Bearing Rating	ABEC-3
Housing Material	Aluminum
Bearing Material	Type 440C Stainless Steel
Temperature Range	-22° to +248° F
Bearing Construction	Double Shielded
Secures/Attaches With	Press Fit
Note	Bearing comes greased.

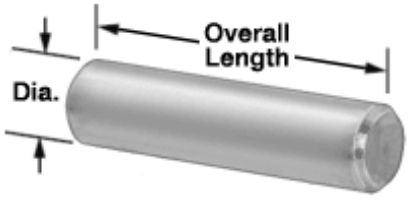


Precision Shafts

Part Number: **8364T2** $24.28 Each

Application	Rotary Motion Shafts
Type	Shafts
Shaft Type	Drive Shafts
System of Measurement	Inch
Material	Stainless Steel
Stainless Steel Type	Type 303 Stainless Steel
Finish	Plain
Surface Finish	10-16 rms
Hardness	Unhardened
Rockwell/Brinell Hardness	Rockwell B83
Outside Diameter	3/8"
Outside Diameter Tolerance	+0.0" to -0.0002"
Straightness Tolerance	0.0048" per foot
Overall Length	18"
Ends	Chamfered
Test Report	Without Test Report
Specifications Met	Not Rated
Note	Shafts are not intended for use with ball bearings.

Pins



Part Number: **90145A550** $12.46 per Pack of 10

Material Type	Stainless Steel
Finish	Plain
Stainless Steel Type	18-8 Stainless Steel
Pin Type	Dowel Pins
Dowel Pin Type	Standard
System of Measurement	Inch
Diameter	1/4"
Overall Length	2-1/4"
Length Tolerance	±.01"
Suggested Hole Size	.2495" to .2500"
Rockwell Hardness	Not Rated
Specifications Met	Not Rated
Note	Actual diameter is +.0001" over the nominal diameter with a tolerance of ±.0001".

Precision Shafts

Part Number: **5911K51** $38.33 Each

Application	Linear Motion Shafts
Type	Shafts
Shaft Type	Shafts
System of Measurement	Inch
Material	Aluminum
Aluminum Type	Alloy 6061 Aluminum
Finish	Anodized
Plating/Coating Thickness	0.002"
Surface Finish	10-16 rms
Hardness	Coated/Plated
Rockwell/Brinell Hardness	Rockwell C60
Outside Diameter	1/4"
Outside Diameter Tolerance	+0.0" to -0.001"
Straightness Tolerance	0.004" per foot
Overall Length	36"
Ends	Chamfered
Test Report	Without Test Report
Specifications Met	Not Rated
Note	Not intended for for use with linear ball bearings.

- Chambers & Collars:

1 Before you cut your PVC, you must determine the proper chamber volume needed for your particular experiment. This value will dictate the length of pipe to cut for the chamber top.

2 The in-house machinist will accurately cut pipe to length, using a lathe. Also have the machinist cut collar pieces. Depending on the Machine Shop's schedule, this step may take up to several weeks.

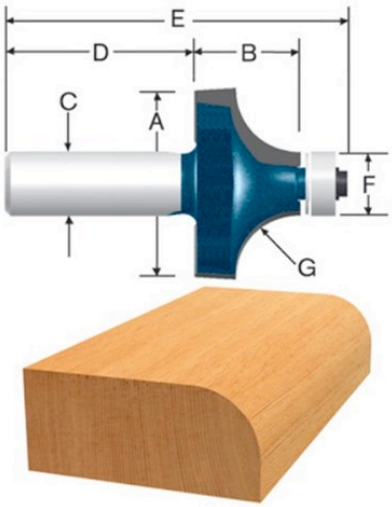
3 Once you have your collars and pipe cut, you are ready to place the sponge rubber on each collar. Cut the rubber to length and peel the laminant from the sponge rubber. Be sure that the two ends meet tightly, as to avoid any air leaks. Your collars are now finished and can be set aside until their field installation.

4 Retrieve your square PVC sheet, PVC glue, and be sure to have a set of at least 3 large c-clamps or Quick-clamps on hand to begin making the lids of your chamber caps. Best to make them in the Fellows Shop, where you will have access to a band saw, drill bits, clamps etc.

5 Use a Sharpie to trace circles onto the PVC panel using your pipe as a template; position the circles as close together as possible to minimize scrap. Using a band saw, make a cut just around your circle's edge. Do not worry about the precise shape of the circle during this step, just be sure that you do not cut into the marked edge. You will clean up the edge afterward.

6 Extrude PVC glue around the edge of your pipe and place your rough circle on top, after mixing the apoxy a bit. Clamp the two pieces together tighly and let dry as directed. As with any apoxy, wear a mask and ventilate the area where you are doing your gluing.

7 Once the pipe and rough top have adhered, use a router to clean up the edge of your new cap. If a router is unavailable, have the Machine Shop cut them. A trick with the router: use a curved bit that has a guiding bearing on the bottom. This style bit will allow you to rout around the top with the bearing rolling on your pipe, yielding a perfect circular top for your chamber (even if the pipe is slightly bent/ovular).



* If you have NO experience with a router, practice on scrap material first. Remember that a router is meant to move only in the counter-clockwise direction. You risk breaking the bit or the entire router if it is moved bilaterally.

1 Your caps should look almost complete now. Next, use a drill press or handheld power drill to bore the following holes in the cap top:

- 4 holes for the 4 screws that will hold the top of the chamber to the 2 frame arms.
- 2 holes for the sample bulkheads (1/4" or 17/64" bit).
- 1 hole in the center of the top for the pressure equalization bulkhead.
- On the side of the chamber, drill 3 vertically-alligned holes, about 1 1/2" apart, for the screws that will hold your cap-to-piston framing connection. Use a t-square and level to ensure very precise cuts here. The integrity of the whole chamber will be compromised if these holes are off center or crooked.

INSERT PHOTO OF CAP TEMPLATE WITH DIMENSIONS BETWEEN HOLES

* If you happen to make a mistake drilling a hole, you can always patch it with your PVC glue. Fill the hole with the glue, leaving excess on the top, then let sit to dry. Once it has dried, use a file or sanding block to smooth off the excess.

2 Attach the 2 bulkhead connectors for the air sample outlets, and 1 bulkhead connector for pressure equalization in the respective holes described above. Hand-tightening is fine at this stage.

INSERT PHOTO OF YOU BENDING METAL TUBING AROUND PIPE
ADD METAL TUBING TO PARTS LIST

3 To make a proper pressure equalization outlet, cut 4-6" length of hollow 1/8" metal tubing. Create a "pig's tail" out of the tube by curling it around a round object, roughly 1/2"-3/4" in diameter. Go around with 3 full curls, leaving about 3/4" of the tube straight at one end. Make a sharp perpendicular cut at the curled end as to avoid precipitation flowing in from the tip.

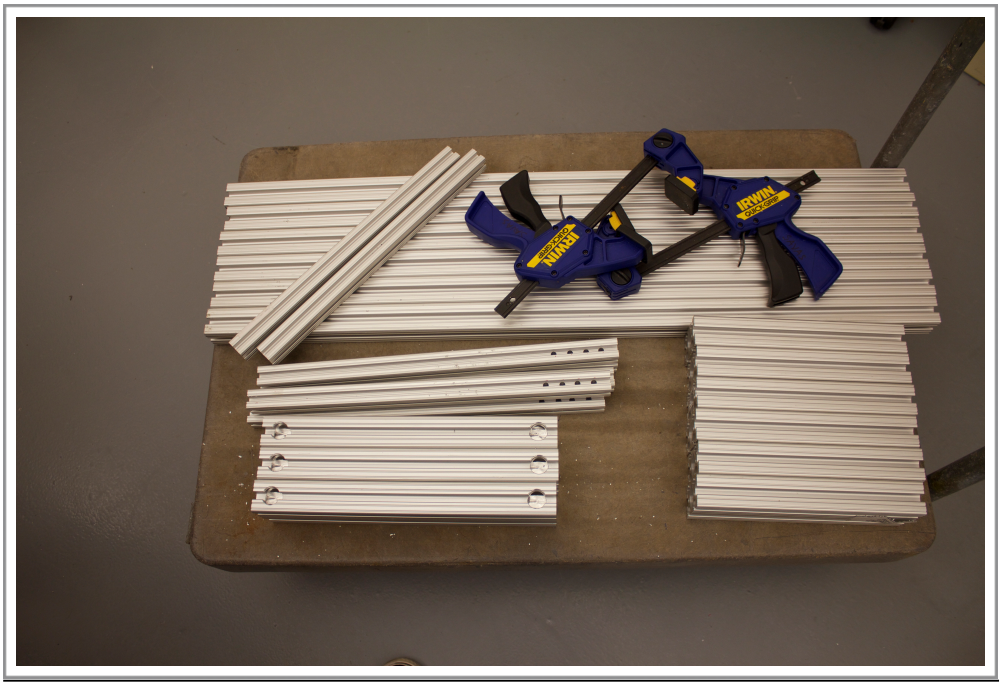
4 Attach the pressure equalization tubes to the cap by pushing their straight end into the central bulkhead. Note that this step can be saved for the final field installation.

5 Your chamber caps are finished and can be set aside until final assembly.

- Preparing the Frame:

  * 80/20® aluminum extrusion is a light, precision-cut, metal framing material available through MSC® on a day's notice. It is an ideal material for this application in that the entire frame comes together through slide-and-lock assembly, as opposed to permanent welding/ gluing/fastening. This allows your design to remain quite flexible throughout all stages of the build.

  *** MBL does NOT allow the use of personal power tools in the Fellows Shop. Find another space to do this or have the Machine Shop make the cuts if space is unavailable. ***



1 For a single frame, cut (or order) the following lengths of aluminum:

Framing Type	Qty.	Length	Description
1515 Series	2	3.0'	Long side pieces to create the main base of the frame.
1530 Series	2	10"	Vertical arms to hold the main shaft assembly.
1530 Series	1	13-5/8"	Back of the frame, secures rear-end of the piston.
1510 Series	2	15-3/8"	Horizontal, rotating arms connecting the shaft assembly to the cap.
1510 Series	1	17 1/2"	Vertical piece to connect the cap to the rod-end of the piston.

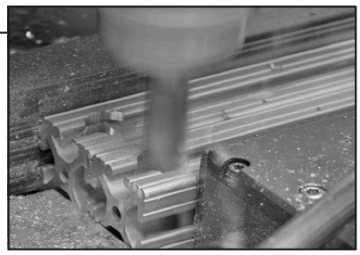
Framing Type	Qty.	Length	Description
If you are cutting the material to length yourself, use at least a 60-tooth carbide blade on a miter saw. Always check your square cuts and remove gummed aluminum from the cut-side to ensure a final square frame.			

Machining Services

Fractional

Anchor Fastener Counterbore Service

- **Anchor fastener counterbores are required when using an anchor or butt fastener for a profile connection**
- **A counterbore allows the anchor fastener face to be flush with the profile surface**
- **See below for counterbore T-slot designations**



Part No.	Fastener Type	Counterbore Size
7042 ⌘	Anchor Fastener	.563 Diameter x .425 Deep
7043 ⌘	Butt Fastener	
7040	Anchor Fastener	.812 Diameter x .660 Deep
7041	Butt Fastener	

⌘ = 10 Series Compatible Part

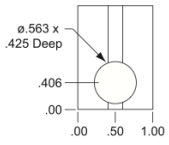
Ordering Example: (3) 1530 x 35.75 w/ #7040 at F, G, in Left End and at H in Right End

Machining Services

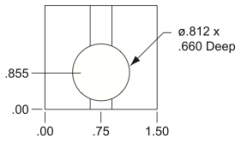
80/20® Inc.
*The **Industrial** Erector Set®*
THE STANDARD

Do-It-Yourself Counterbore Details

Anchor Counterbore Details

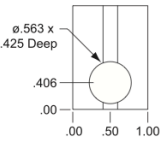


10 Series

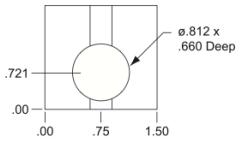


15 Series

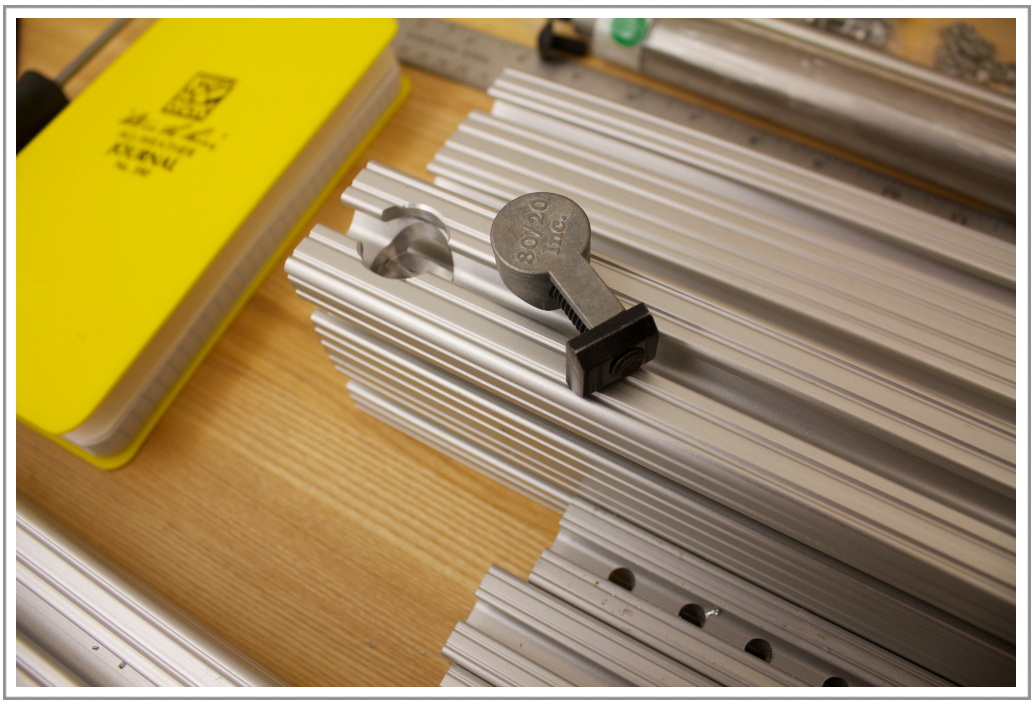
Butt Fastener Counterbore Details



10 Series



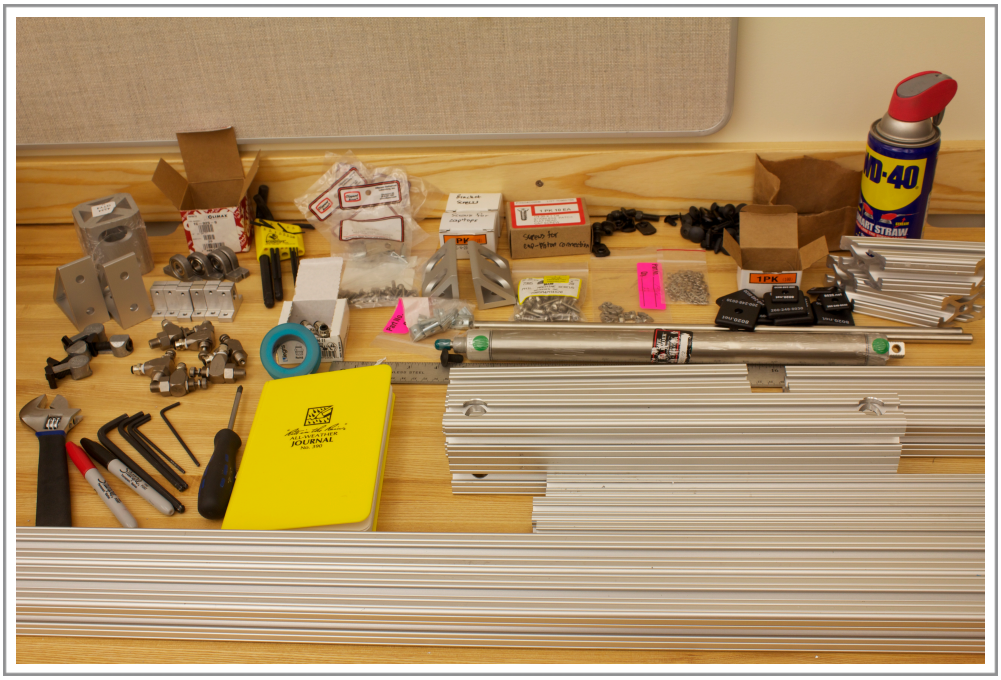
15 Series



2 Referencing the Counterbore Machining Services provided by 80/20® (above), bore 4 holes in each rear 1530 piece for a solid base connection on your frame. The drill press in the Fellows Shop is not powerful enough to create an accurate cut here. Use a different drill press or enlist the Machine Shop for this step.

3 Use a 17/64” bit to bore a series of 4 or 5 holes—3/4” apart—into the end of your 17 ½” 1010 pieces. These holes will hold the pin and clevis assembly of the piston, connecting the cap to its frame. Our group ultimately used the 2nd hole on all of the chambers, at exactly 1 ½” from the frame end. The drill press in the Fellows Shop does a fine job of cutting these holes. When you are finished, slip the pin through each hole to ensure you’ve used the right bit, it should slide in easily.

- Assembly



1 Complete the assembly of your chambers, following the attached dimensions, video, and instructions. Once the caps are built and the aluminum is cut, this assembly should not take long.

2 Begin by attaching your rear gussetts to the bored 1530 piece using 4 slide-in t-nuts.

3 Proceed by constructing the 3 base pieces of the frame. Sit the 2 long 1515 pieces parallel, with your rear 1530 piece in between them. Slide in the t-nuts for your 45˚angled pieces into the 1530. Then place the 4x anchor fasteners into their holes and tighten down. Your frame should now look and feel square.

4 Screw on the 45-degree angled pieces and tighten them down.

5 Tighten the support gussetts to the side-arms and slide them onto the frame bottom, using 4 slide-in t-nuts for each gussett. Make sure that all alumimum gumming has been

removed from the bottom of the 1530 before connecting them—the frame will not be square otherwise.

6 Attach the first bearing to the main shaft. This is trickier than it seems. Start by spraying both the shaft and bearing with WD-40 or other metal lubricant. Set the bearing on a table or hard surface and hold the shaft square to the bearing's opening; tap the top end of the shaft lightly with a rubber hammer. The bearing should pop onto the shaft's end if properly held square. Once the bearing is on, it should be able to slide around with some force. Do not pry the bearing on with your hands—you risk breaking the bearing or popping it out of its housing.

7 Slide the 2 shaft supports onto the shaft, then pop on the other bearing as described. You can now adjust these 4 pieces according to the dimensions attached. Once the bearings are in position, attach and tighten the shaft collars to either end of the shaft.

1 Loosely attach screws, washers, and nuts to the bearings. The proper order is as follows:
- Place small washer onto screw
- Slide screw into the bearing
- Place large washer on screw
- Loosely thread nut onto the screws

2 Your shaft is ready to be attached to the frame. From the top of the 2 side arms, slide the bearing nuts into their respective t-slots and tighten down at proper height. Add the large shaft collars to the outside of your bearings. This is a good point at which to check the level of your frame and shaft.

3 Pop in 4 screws and finish washers from the bottom of your cap and screw on the double t-nuts to just a few threads. Slide on the 2 1010 arms to the double t-nuts according to the dimensions shown.

4 Pop in 3 nylon-patched screws into the 3 vertically-aligned holes on the side of the cap and screw on 3 t-nuts to just a few threads. Use both a finish washer and flat washer here. Slide on the vertical piece so that it sits flush with the bottom edge of your cap, then tighten screws. This framing piece should be oriented so that the ¼" holes you drilled into it are at the top, facing to the sides.

5 The chamber cap can now be attached to the shaft. First attach the screws, washers, and drop-in nuts to the shaft supports. The proper order is as follows:
- Place small washer onto screw
- Slide screw into the shaft support
- Loosely thread nut onto the screws

* The "drop-in" nuts for the shaft supports are easy to work with in that they can be dropped in from any point in the t-slot, instead of having to be slid in from the end of the frame. Makes for a very easy connection between the frame and cap, as hopefully you will see.

6 Align the 1010 pieces attached to the cap with the drop-in nuts you just placed on the shaft supports. Line-up the back edge of the shaft support so it is no more than 1 cm from the from the rear edge of the 1010. Tighten down the screws, your cap is now secured to the frame.

7 Assemble your piston as follows:
- Screw on the Legris quick connects to the outlets of your flow control valves. If they do not already have teflon tape on them, apply it before connecting.
- Wrap the flow 2 control valve threads with teflon tape and attach 2 to each piston.
- Screw on the nut, barbed washer, and clevis to the end of the piston rod. You will not be using the pin that is packaged with the clevis assembly.

8 Cut the 36" x ¼" aluminum shaft into 5" length pins. The band saw in the Fellows Shop makes a clean and easy cut for this step. Be careful of touching the hot metal during and after the cut.

9 The piston is the last main component to be attached to the chamber. Begin by connecting the piston-end of the piston to the rear gussetts (which should already be in place) using the 5” pins just cut.
- Slide the 5” aluminum pin through the front hole of the gussett.
- Slide the pin through the piston, and then through the second gusset.
- Secure the pin and piston to the gussets by placing 2 collars on both sides of the pin, tightening their set screws securely.

10 Pull out the rod from the piston and align its clevis with the 1st or 2nd hole of the vertical 1010 piece. Slide in your stainless steel pin through the framing and clevis holes, then secure with 2 collars as described above.

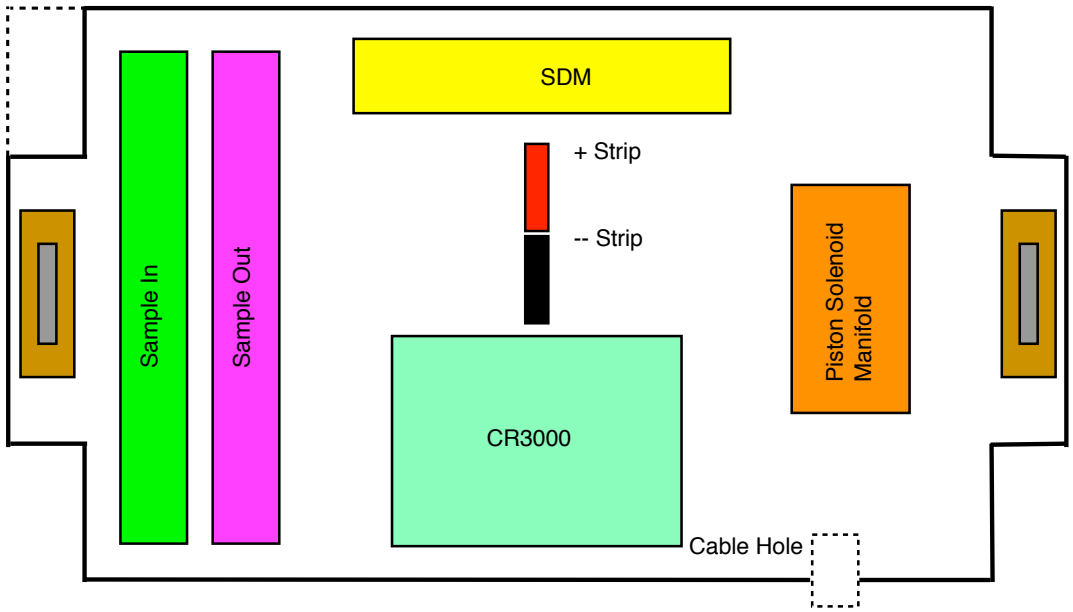
11 Attach plastic end-caps to the ends of frame.

12 Your chamber is ready for wiring and plumbing!

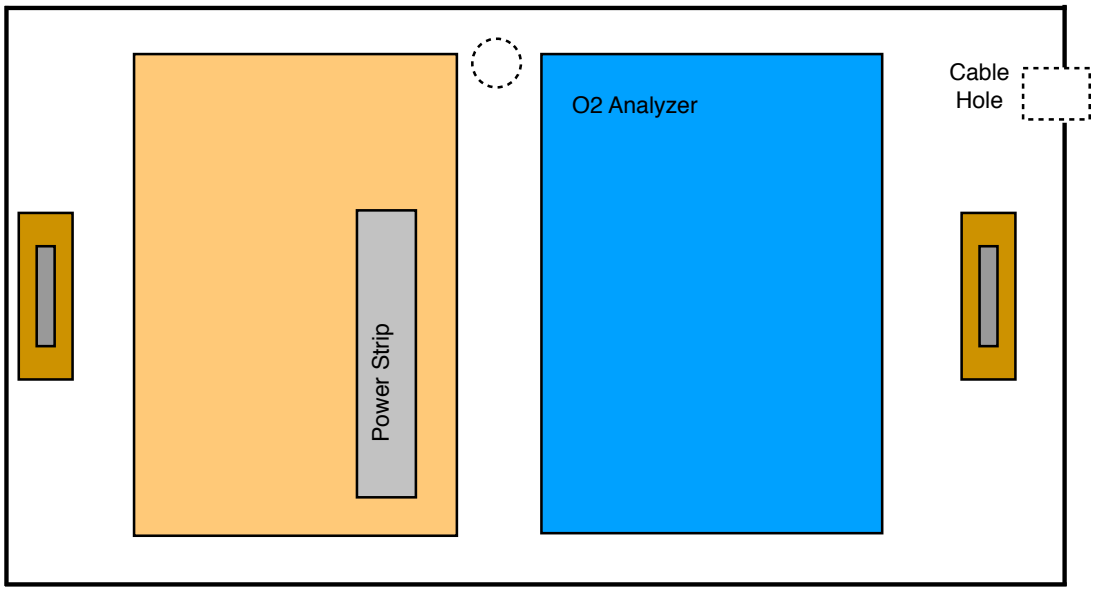
- Preparing the Container:

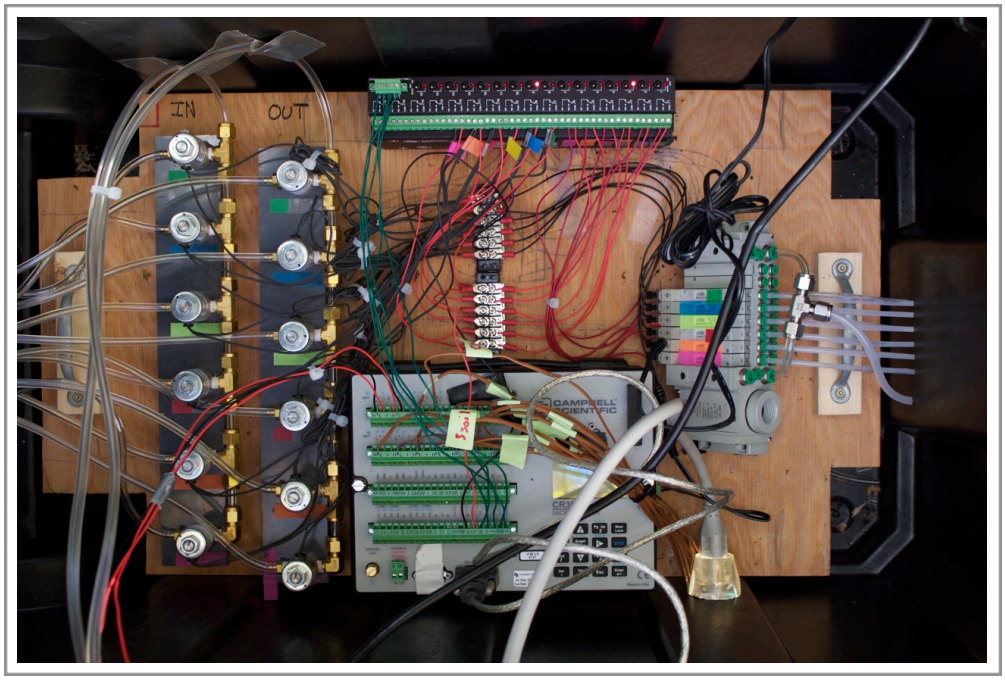
  * These instructions are specifically for preparing the container that is listed on the parts list. All modifications described in this section were necessitated by the small size of our group's container. It may be best to avoid these steps by purchasing a large container with enough space to fit all of the instrumentation after minimal modification. If you do opt for a larger container, the relative layout of all hardware ("Bottom Shelf") is still recommended for ease of wiring and plumbing between parts.

Bottom Shelf



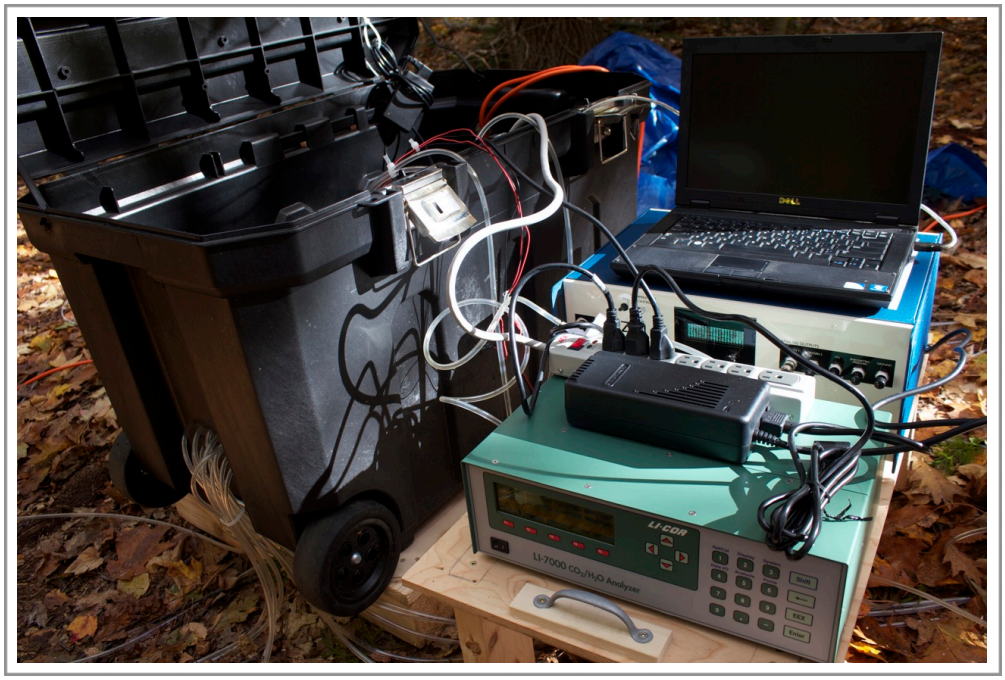
Top Shelf



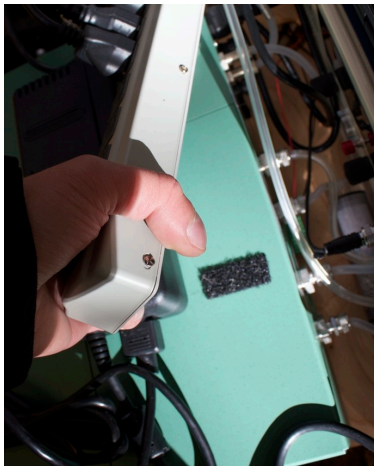


1 Begin modifying your container by creating the upper and lower shelving. A hardware store can provide you with 3/4" plywood cut to length to start with. Next, knotch the 2x4" slots in the lower level wood panel using a band or jig saw.

2 Attach a set of galvanized handles to the sides of both panels for easy lifting from the container. They should be able to pop in and out, with the legs of the top shelf sliding into the knotches on the bottom shelf.



3 Mock up the placement of the bottom shelve's instrumentation. Once the layout looks correct, apply Velcro to the shelf and all parts respectively. The velcro will keep everything stable and still allow easy access to individual parts in the event of a failure or repair.



* Note that this layout was designed with ease of wiring and plumbing between instruments in mind. If you decide to alter the layout, consider space and orientation of all subsequent wiring and plumbing changes.

4 Place the 2 infrared gas analyzers on the top shelf. No need to use Velcro here, except for applying the power cable strip--a snug spot for it is on top of the Li-Cor unit.

5 For access to cables and tubing, use a 1-1/4" drill bit to bore the following holes:
- Between the IRGA's in the top shelf, for cables and tubing between the 2 container levels.
- In the front, lower-right of the container, for the thermocouples and power supply.
- On the upper-right side of the container, for the soil probe power cables.

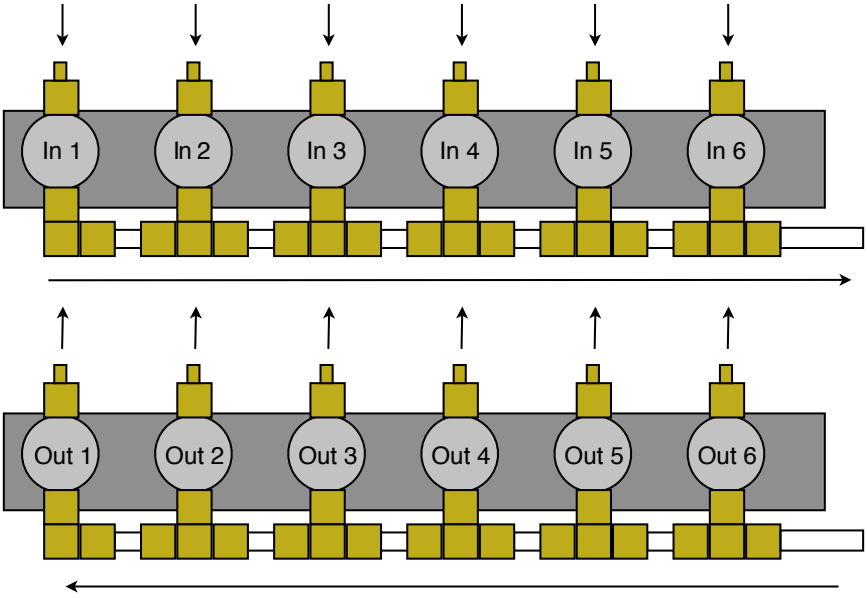
6 Use a 1/4” drill bit to cut 2 rows of 6 holes on the left side of the bottom of the container for your air sample in/out tubing.

7 Use a 5/32” drill bit to cut another 2 rows of 6 holes on the right side of the container for your piston air tubing. Also cut a 1/4” hole next to the rows for the 1/4” tubing between the air compressor and solenoid manifold.

8 Your container container is now ready to be wired and plumbed.

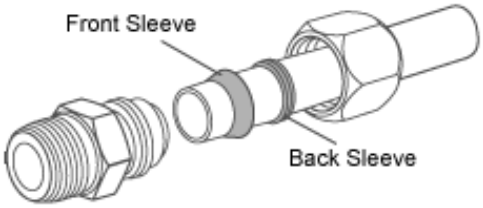
- Air Sample Plumbing:

1 It is important remember that there are 2 distinct sets of air moving through the chamber system: 1) the air being collected from the chambers as samples, and 2) the air powering the pistons and subsequent chamber movement. When these air sets and respective instrumentation/tubing are treated separately, plumbing and wiring are quite straightforward to setup and manage.



2 Begin with the air sample solenoids. Attached is a diagram of their flow schematic and arrangement in the container. There is the option of ordering the 12 solenoids on 2 manifolds, but our group made our own using scrap PVC and cheap brass fittings. Space the solenoids 2 1/2" apart and use the screw holes on the bottom of the solenoids to attach them to the PVC. Cut short lengths of the 1/4" tubing to connect the brass fittings and complete the manifold.

* The purpose of a manifold is to create a single reservoir of air between all of the solenoids, as to allow a simultaneous connection to the gas analyzers. This is easy enough to accomplish by simply connecting all of the solenoids through T-type compression fittings, terminating the air reservoir using an "elbow" compression fitting on the last of each solenoid set.



3 Push the end of the 1/4" tubing through the 1/4" top-left (first) hole in the container's left side and attach it to the first solenoid barb (Out, 1).

4 Roll your tube over to chamber 1, leaving an appropriate length of slack, then make a clean, square cut. Repeat this step for all solenoids/chambers.

5 Unscrew the 2 bulkhead connector nuts on the top of the chamber cap (be careful to not let the ferrel sleeves fall away). Pop out the 2 ferrell sleeves and slide them onto the sample tube end as shown in the figure.

6 With the tube inserted into the bulkhead and nut, tighten the connection down. No need to use teflon tape here--the nut and ferrell create a great compresssion fitting.

7 Finally, plug the 1/4" Sample In tube into the Sample In port of the first IRGA. Plug the 1/4" Sample Out to the Sample Out of the second IRGA. Connect the IRGA's themselves by plumbing the Sample Out of the first into the Sample In of the second--or follow the directions provided by their manufacturer.

* Check your air sample plumbing when the system is finished to confirm that the air samples are coming from the appropriate chambers. You can do this by opening all of the chambers, then manually activating one set of of air sample solenoids. Run the IRGA's and make your way over to the chamber whose solenoids you've turned on. Press your thumb against the openings of the bulkheads. You should feel one sucking in and the other pushing out. Do this for all of the chambers/solenoids.

- Air Sample Wiring:
  1 Wiring the air sample solenoids is essentially the same as wiring the piston solenoids with the exception of a few characteristics.
    - There are 2 air sample solenoids for each chamber--In & Out. Since they are being activated simultaneously by the datalogger's program, they can be wired together such that 1 pair of solenoids occupies 1 channel on the SDM relay controller.
    - Also there is no designated +/Gnd on the solenoid wires here.
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