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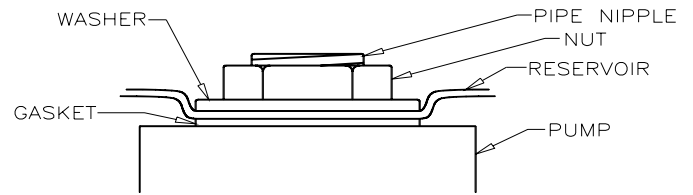
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## OPERATING THE SUPER E

### *Assembly:*

**Reservoirs-** When attaching the reservoirs, the rubber gasket goes between the pump and the reservoir. The steel washer goes inside the reservoir. When the nut is tight enough you will not be able to turn the reservoir easily. Put in a small amount of resin and look for leaks.



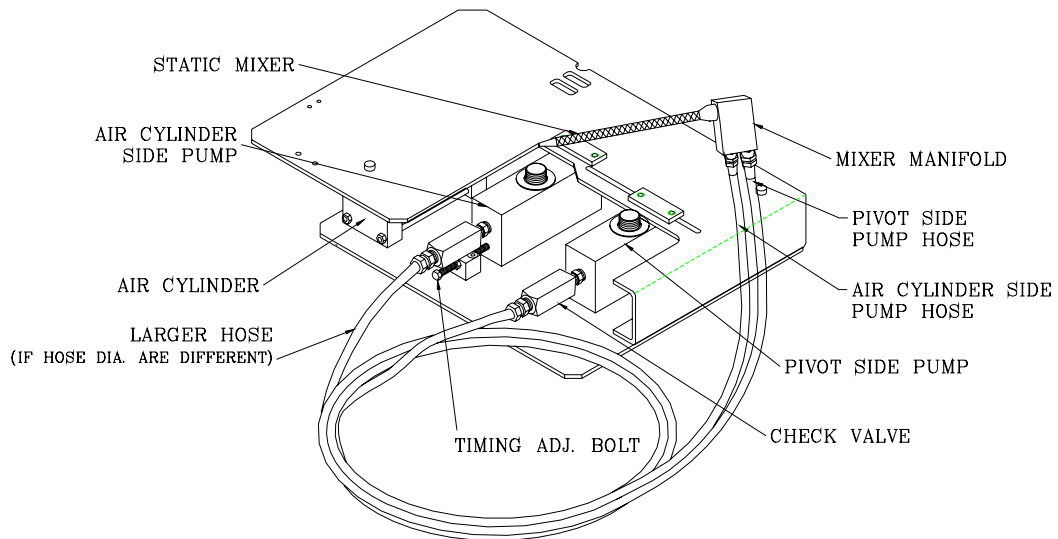
**Hoses-** If your fluid output hoses are not the same diameter, the larger diameter hose belongs on the air cylinder side.

**Air Supply-** Attach the air supply to the air regulator. If during operation the pressure on the gauge drops more than five pounds and you want more speed or power use a larger air supply line. Attach the machine to a filtered air supply with at least 65 psi. Supply less than 55 psi. will not shift the valves even though the machine can be slowed down to 30 psi or less using the regulator on the machine. The recommended psi for the Super E is 80-100. A maximum of 120 psi may be used.

### *Start Up:*

The material on the air cylinder side (left side) will always be the larger amount, i.e. if the ratio is 67:100 the 67 parts go on the pivot side (right side) and the 100 parts go on the air cylinder side. The fluid level must be two inches or more above the intake port of the pump to prevent air from being sucked into the pump, and a higher fluid level may be required for viscous fluids. Run the machine without the static mixer on the manifold until both materials are visible at the outlet. Putting the mixer on early can force material into the opposite hose. Get all air out of the hoses before attaching static mixer (see page 3). Metering will not be accurate if there is air in the check valves or hoses.

**To insure proper mixing, the timing must be set the first time your new machine is run.**



**Timing Check-** When you first start your new dispenser (or after installing a new pump) set the timing, or there will be soft spots in the hardened material.

Both pumps must start pumping at the exact same time. To check the timing, **disconnect the air supply**, and remove the static mixer. Starting with the operating arm all the way out, and the manifold pointing up and full of material, push the arm manually until material is pumped out of the mixer manifold. Using a screwdriver in the slots of the arm is helpful. Both materials should start at the same time. If the air cylinder side (your left as you face the front of the machine) starts before the pivot side, retard the air cylinder side pump, if the pivot side starts first then advance the air cylinder side pump. Point the manifold up to insure that material does not drip out. Position the puddles under light so that there is a visible reflection to help detect first movement, any “running on” after the arm stops moving is sign of air in the system (see page 3) and will make it impossible to set the timing correctly.

**Timing Adjustment-** The timing bolt on the end of the air cyl. side pump (next to the air cylinder) controls the timing. To retard the air cylinder side pump, loosen the pump mounting bolts (under the machine), and turn the timing bolt clockwise. To advance the air cylinder side of the pump, turn the bolt counterclockwise making sure that when you are finished the mounting bolts are snug. **NOTE: Do not over adjust the timing.** Note the original position carefully. The required adjustment should be less than one turn either way, there is a little lost motion between push and pull. If the pump is adjusted too far the piston will hit the end of the pump and the machine will not operate.

(Timing Continued)

**Timing Interface for systems using the Snuff Back (450 Gun) or Cutoff Gun ( 400 Gun ) without the E-stop Shot Size Controller:** If your system is equipped with the Snuff Back Gun or Cutoff Gun you will need to open the guns ports to conduct the timing procedure. This is accomplished by turning off or disconnecting the air supply to the machine, while the machine is dispensing. The guns ports will then remain open while checking the timing.

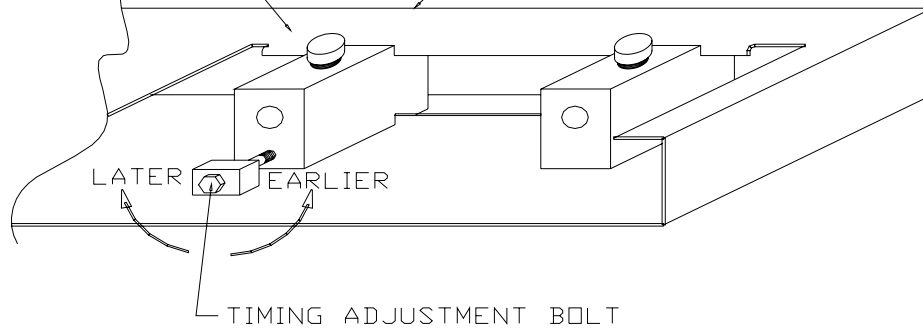
**E-Stop Users:** At the LCD operator interface , using the previous / next control, select the “Set Timing” screen, then select “on”. This is described in the E-Stop Operation supplement.

**NOTE: Do not use the timing to set the ratio.** The ratio is set by moving the pivot side pump.

## TIMING TIPS

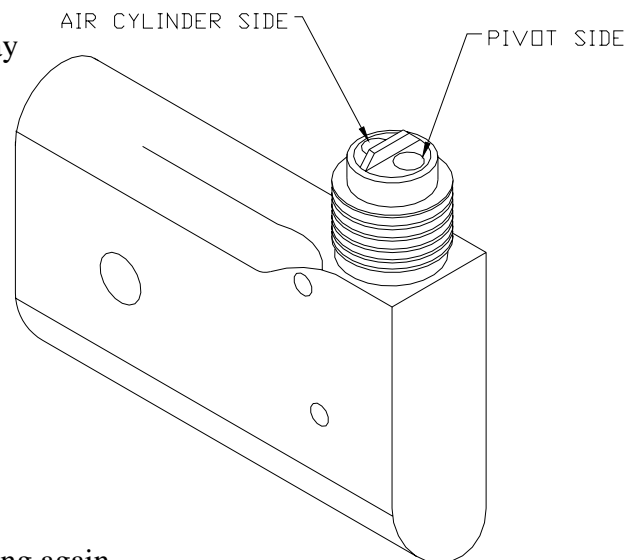
TO SET:  
LOOSEN CLAMP BOLTS ONE TURN AND ADJUST TIMING WITH TIMING BOLT. 1/2 TURN IS A VERY LARGE CHANGE; YOU SHOULD FIND THAT ONE FLAT (1/6) TURN EITHER WAY WILL MOVE THE TIMING FROM TOO EARLY TO TOO LATE.

MARK THE ORIGINAL POSITION OF THE PUMP WITH A STICKER OR MARKING PEN

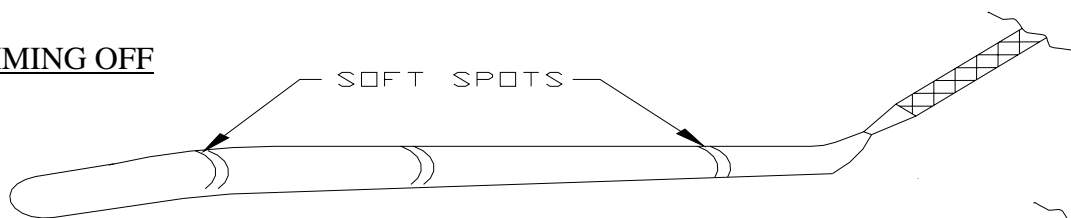


## Super E TO CHECK

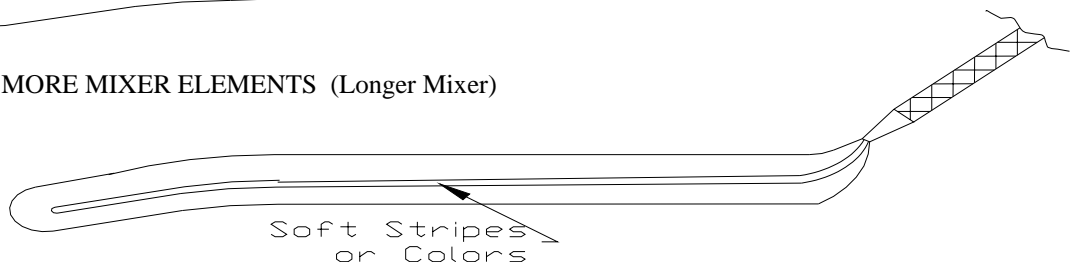
1. Purge out air (run the machine until both sides are pumping, see air bubble removal).
2. Run machine until arm is all the way out.
3. Disconnect air supply.
4. Point gun up.
5. Push in pump arm by hand.
6. Watch fluid- Both sides must start at the same time to avoid soft spots and mix correctly.
7. Pull the arm out far enough to open the intake port before checking timing again.



## TIMING OFF

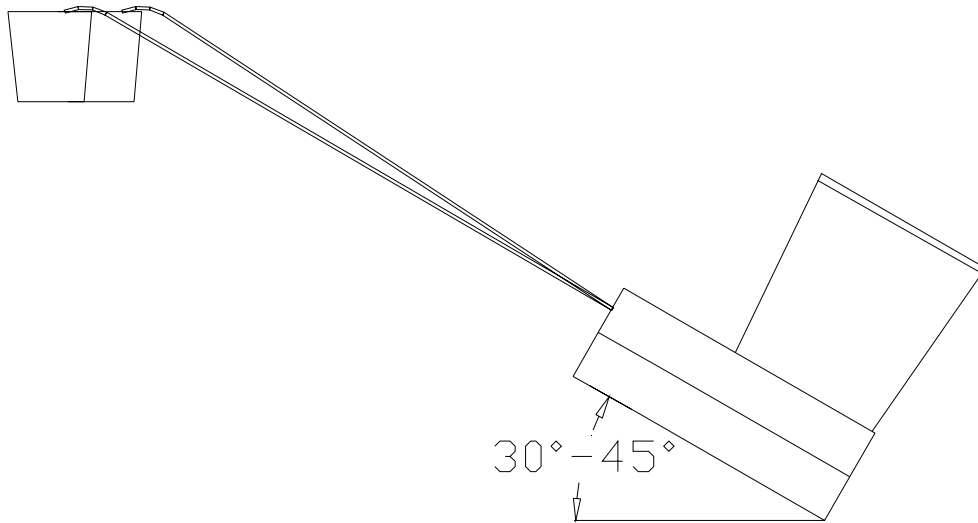
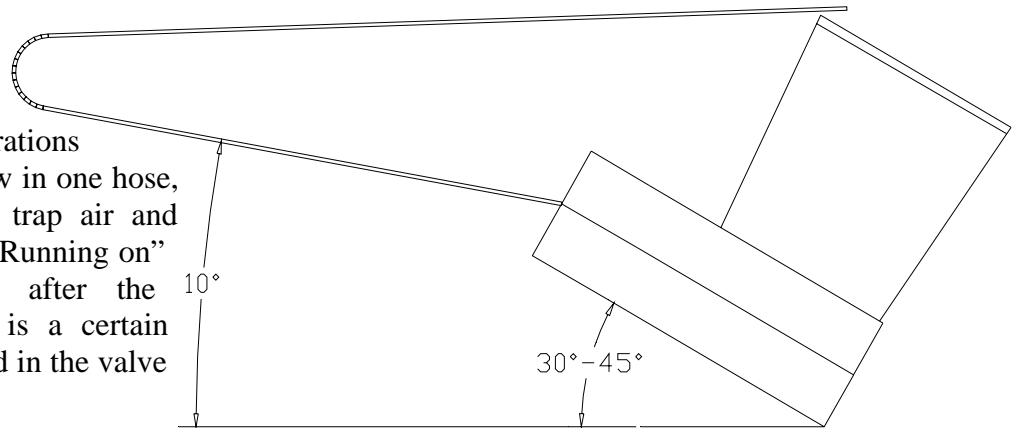


NEED MORE MIXER ELEMENTS (Longer Mixer)



## *Air Bubble Removal*

Certain machine configurations like hi ratio, with low flow in one hose, may have the ability to trap air and defeat proper metering. "Running on" or continuing to flow after the machine stops pumping is a certain indicator that air is trapped in the valve or hose.

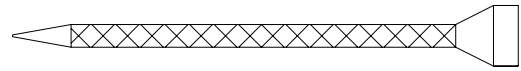


To remove air, tip the machine at 30°-45° and operate it rapidly, returning the material to the reservoirs or to a shipping can until the bubbles are washed out (10 to 20 full strokes may be required).

### **NOTE**

Make sure that the lines are at a smoothly rising slope, with no big hills or valleys, otherwise the air bubbles will not be able to escape.

**Mixer Selection-** The static mixer is identified by its diameter and number of mixing elements. For example: MX-1-830 the 8 is the diameter of the housing (1/2") and the 30 is the number of elements (length). Most urethanes will mix well with 30 elements although some require 40. Epoxy may mix in as few as 24 elements. Silicone may require a two-stage mixer. To find the right diameter, look at the viscosity of the material being pumped, and the speed. Large fast jobs require a larger mixer. Consider the speed at which the machine will be run. In general, run the machine as slowly as possible to avoid trapping air in the material as it is dispensed. The MX-1-830, and 840 are good bets, for medium or fast urethane flow the MX-1-648 does very well.

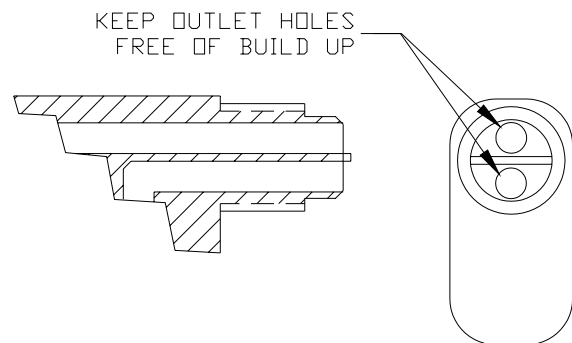


**Running-Continuous Run Machine** -When the thumb switch is pressed, the machine will run until the switch is released. Be sure to check the holes in the manifold for buildup each time before attaching the static mixer. Use grease on the threads to prevent resin bonding.

**Running-Single Shot Machine** -Provides one single shot each time the button is pressed and held. When the button is released the pump returns to fill and wait until the button is pressed again. A partial shot can be supplied by releasing the button early.

**Pump Speed-** The speed of the machine is controlled by the Speed Control Air Regulator, a small black knob, located near the main air valve on the air cylinder side of the machine that is connected to the pressure gage. The pump will run faster at high pressure. Below 25 psi the machine will stall. When operating at low pressure the machine may not start first thing in the morning. An increase in pressure may be required for start up.

**Do not operate the machine with the mixer manifold plugged.** If the machine is run with the hardener side of the manifold plugged, very high pressure will be developed and the hardener pump may be damaged. In the case of a plugged manifold, use a 1/4" drill bit or a drywall screw to clean it out.



**Shut Down:** Remove the static mixer and dispose of it.

Pump a small amount of material out of the manifold and wipe it off carefully. Put a small amount of grease in the cap (1/2 full) and put the cap on the manifold to seal out the air. Note - no cap is used on a silicone machine. Check the ports in the manifold for buildup before restarting. Use grease on threaded parts to prevent resin bonding.

**Long Term Storage (urethane only)-** If the machine will not be used for 2 weeks or more, it will need to be flushed out to prevent the isocyanate from then crystallizing in the pump and lines.

Dump the urethane out of the machine, then flush out the system with solvent (Urethane Flush 55 MEK, or Acetone) and cap off the hoses and reservoirs to prevent air from entering. Leave the machine full of the flushing compound, it does not absorb moisture that can set off urethane like acetone does.

Urethane Flush 55 is available from Michael Engineering. It is good solvent for most urethanes, has low toxicity, is not volatile, and is reusable. Rim mold cleaner is stronger. If it is allowed to soak, it will even soften hard urethane and can salvage frozen machinery.



**Desiccant-** to prevent the material from being damaged by moisture in the air, a chemical desiccant dries the air entering the reservoir. Activate the desiccant tube by removing the tape from the ends of the tube. When the desiccant is saturated the normally blue crystal indicator will turn pink. To restore the desiccant, remove it from the tube and place it in an oven at 400°F until the blue color returns (1 to 2 hours). Diligence is required here to prevent iso-cyanate pumps from freezing. Polyol and epoxy pumps convey very few problems.

**Ratio Testing-** It is important to check the ratio of your machine. Material mixed with the wrong ratio may never develop its full strength. Most machines are set to the proper ratio before they are shipped and will never need to be changed. The ratio check is the responsibility of the user. Check that it is correct in order to verify the factory setting.

Weigh two cups and place one under the resin side and one under the hardener side, a ¼ tube pushed into the manifold to separate the materials can help. Pump several shots of material into the cups and weigh the cups. Subtract the weight of the empty cup. Then divide the weight of the hardener by the weight of the resin.

Example (the correct ratio for your machine will differ)

	<u>Hardener</u>	<u>Resin</u>	
Full cup	76.7g	166.8g	
cup wt.	<u>-15.5g</u>	<u>-26.4g</u>	
net wt.	61.2g	140.4g	$61.2 / 140.4 = .436$ or 43.6:100

The machine will hold a stable ratio until something plugs up or fails to seal. If the ratio changes suddenly the problem is either a leaking exhaust check valve, cavitation (incomplete pump filling, slow leak, or too short of a delay valve setting), or internal damage to the pump (piston end seal). Dirty or leaking check valves are the cause of most off ratio problems.

**Changing Materials-** Set two containers on the floor. With a helper pick up the machine and tip it to pour the materials into the containers on the floor. Run the machine for a few strokes to clear it out and if the materials are compatible, pour in the new materials, clear the machine of air and go to work. If the materials are not compatible then flush the machine out with solvent before adding new material.

**Valve Problems-** The most likely cause of ratio problems with a machine that is in use is a leaking exhaust check valve. The exhaust valve keeps the material from flowing back to the reservoir from the output hose. When replacing an exhaust valve, make sure that the arrow points away from the pump toward the hose. Pushing the operating arm in 1" (it pushes hard) will prevent the resin from flowing out when the output check valve is removed. **Disconnect the air supply.**

If any of the information is not clear, or if you are having problems, please call, we want to help.

## ***ROUTINE MAINTENANCE***

### ***DAILY:***

**START UP-** Attach the air hose, remove the cap from the mixer manifold, wipe off the grease and check the holes for hardened material. If the holes are plugged they must be cleaned before operating the machine or damage to the pumps may occur. A drywall screw, or a ¼” drill bit work well for pulling out hardened material. Put on a mixer, pump out one shot of material into a waste container and go to work. For air bubble sensitive jobs point the mixer up to chase the air out on the first shot.

**SHUT DOWN-** Remove the mixer and dispose of it. Pump a small amount of material out of the manifold and wipe it off carefully. Put a small amount of grease in the threads of any parts you remove to prevent resin bonding. If using urethane, clean pistons and apply mesamoll.

Clean up spilled resin and repair any parts that may from time to time get dropped or damaged in handling the machine. Take care to avoid kinking the hoses.

### ***PERIODIC MAINTENANCE:***

Once a month place a few drops of oil on the arm pivot and the links to keep them from binding from spilled resin and to extend their life.

A properly operating machine will be very stable and consistent in output and ratio over a long period. If your machine changes or starts to make mistakes (soft spots in the resin), it has a defect and should be corrected immediately. Adjusting the ratio to make up for problems is seldom the answer. Make sure you try a new exhaust check valve before rebuilding otherwise working pumps. Dirty or obstructed exhaust check valves are the most common cause of trouble. Two extra check valves are supplied with the machine. Reorder when you have used your spares to avoid interrupted production. Soaking in MEK, Acetone, Methylene Chloride or Rim Mold cleaner may sometimes clean dirty valves. They may also be disassembled for cleaning.

Michael Engineering does not recommend that pumps be rebuilt as a matter of periodic maintenance. It is difficult to determine ahead of time when a pump will fail, as many pumps have run for years with no internal repairs. If a pump is leaking badly or pumping the wrong ratio after the exhaust check valves are changed the pump should be rebuilt.

***REBUILDING THE SUPER E FLUID PUMP***    Rebuild kits are available

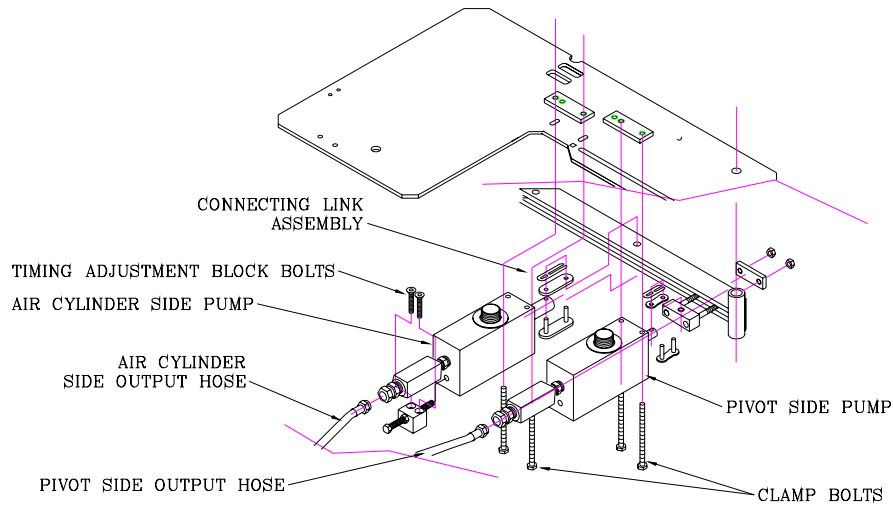
### ***WHEN TO REBUILD***

The only maintenance that the Super E normally requires is wiping off spilled resins and a little oil on the links and the pivot once a month. We do not recommend that you rebuild your Super E as a matter of routine maintenance, unless pumping severe abrasives with a known pump life. If your dispenser is leaking badly or is not holding the right ratio, the pumps should be rebuilt. These pumps can run for years on unfilled epoxies without rebuilding.

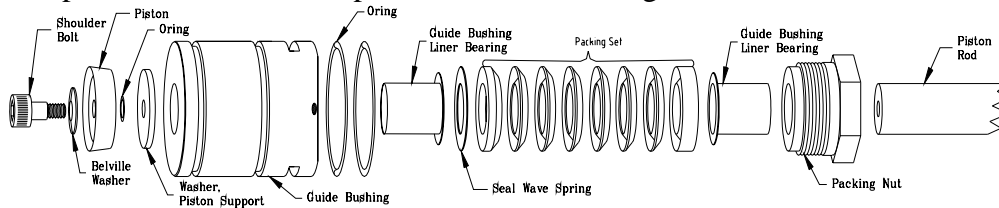
### ***VALVE PROBLEMS***

The most likely cause of ratio problems with a machine that is not new is a leaking exhaust check valve. The exhaust check valve keeps the material from flowing back into the reservoir from the output hose. When replacing an exhaust check valve, disconnect the air supply, push the operating arm in 1” to keep resin from flowing out from the reservoir while the exhaust check valve is off. Make sure that the arrow points in the direction of flow, away from the pump toward the hose. If this procedure does not solve the problem, proceed to rebuild the pump.

**PUMP DISASSEMBLY** Remove the output hose, and connecting link. If you are removing the pivot side pump, loosen the two clamp bolts from the bottom, and slide the pump assembly out toward the front of the machine.



To remove the air cylinder side pump, remove the bolts holding the timing adjustment block and loosen the bolts clamping the pump in the frame. Lift the pump and reservoir off the machine frame and empty the fluid reservoir. After removing the reservoir take out the two bolts on the piston end of the pump. Pull the piston and guide bushing out of the pump. Take out the bolt that holds the piston end seal on the piston and remove the piston from the bushing.



**CLEANING**

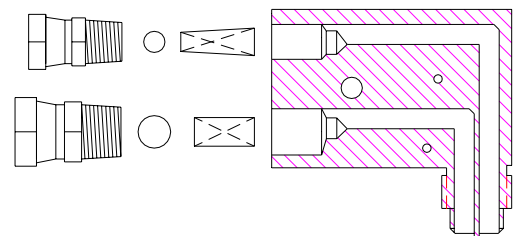
Unhardened urethane can be removed with either: Urethane Flush 55, MEK, Acetone, or Methylene Chloride (acetone attracts water and will harden urethane). Rim Mold Cleaner will soften cured urethanes. The sticky film that is often left on the parts after washing may come off with some WD40 and a rag. Urethane Flush 55 and Rim Mold Cleaner are available from Michael Engineering.

**REASSEMBLY**

Grease or Vaseline should be used to lubricate the seals. Only non-petroleum (silicone) “O”ring lube may be used on the black rubber EP “O”rings (the fluid to be pumped may also be used). The piston must be installed in the guide bushing before the piston end seal is installed. Between the piston end seal, the backup washer, and the piston, use some silicone sealer or Teflon gasket compound (pipe dope) to prevent internal leaks. Use Loctite on the bolt to keep it from coming off in service. Be sure that the connecting link between the arm and the piston is straight in-line with the piston, or a high side load will be placed on the pump bearing and seals. Check the timing and ratio when returning the pump to service after rebuild.

**MANIFOLD ASSEMBLY**

Place the ball next to the fitting. The small end of the spring goes on the ball. The mixer end of the manifold may require periodic cleaning. Do not operate the machine with the manifold plugged



# Ratio Setting Guide

## TABLE OF PIVOT SIDE PUMP LOCATIONS

Super E

### 0.875AIR CYLINDER SIDE PUMP

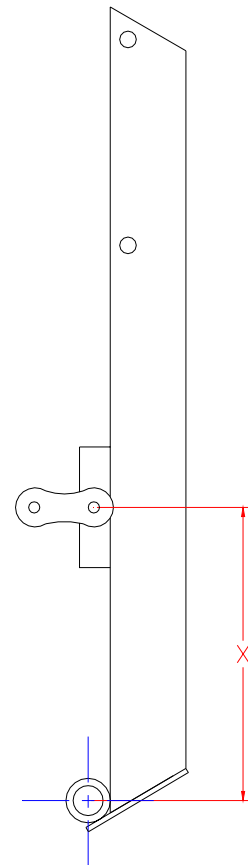
### 1.25PIVOT SIDE PUMP

### 2.5AIR CYLINDER

RATIO BY VOLUME	PUMP LOCATION	OUTPUT CU INCH	PSI FLUID CC	PER PSI AIR
48/100	2.35	1.71	27.8	7.76
52/100	2.55	1.75	28.6	7.55
56/100	2.74	1.8	29.3	7.36
60/100	2.94	1.84	30.1	7.17
64/100	3.14	1.89	30.9	7
68/100	3.33	1.94	31.6	6.83
72/100	3.53	1.98	32.4	6.67
76/100	3.72	2.03	33.1	6.52
80/100	3.92	2.07	33.9	6.38
84/100	4.12	2.12	34.6	6.24
88/100	4.31	2.17	35.4	6.11
92/100	4.51	2.21	36.1	5.98
96/100	4.7	2.26	36.9	5.86
100/100	4.9	2.31	37.6	5.74
104/100	5.1	2.35	38.4	5.63
108/100	5.29	2.4	39.1	5.52
112/100	5.49	2.44	39.9	5.41
116/100	5.68	2.49	40.6	5.31
120/100	5.88	2.54	41.4	5.22
124/100	6.08	2.58	42.2	5.12
128/100	6.27	2.63	42.9	5.03
132/100	6.47	2.67	43.7	4.95
136/100	6.66	2.72	44.4	4.86
140/100	6.86	2.77	45.1	4.78
144/100	7.06	2.81	45.9	4.7

## Changing Ratios

The ratio of you Super E is adjustable within its ratio range. To change the ratio, slide the right side pump (the one close to the arm pivot) toward the pivot for less material and toward the air cylinder for more material. To find the correct setting look on the ratio table and find the ratio by volume for your material in parts per hundred. Then look across the chart to find the X dimension. Set the pump with the distance between the center of the pivot and the center of the right connecting link equal to X. The metering pump operates by volume, so be sure to find the correct ratio by volume when setting the pump.



Ratio Setting Guide

TABLE OF PIVOT SIDE PUMP LOCATIONS

Super E

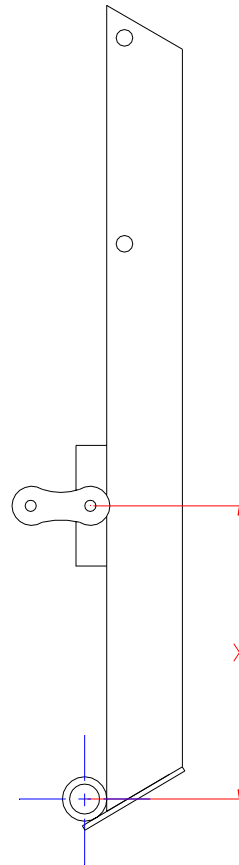
1.25AIR CYLINDER SIDE PUMP

0.625PIVOT SIDE PUMP

RATIO BY VOLUME	PUMP LOCATION	2.5AIR CYLINDER OUTPUT		PSI FLUID PER PSI AIR
		CU INCH	CC	
6/100	2.4	2.49	40.7	5.31
6.5/100	2.6	2.5	40.9	5.28
7/100	2.8	2.52	41.1	5.26
7.5/100	3	2.53	41.3	5.23
8/100	3.2	2.54	41.5	5.21
8.5/100	3.4	2.55	41.7	5.18
9/100	3.6	2.56	41.8	5.16
9.5/100	3.8	2.58	42.0	5.14
10/100	4	2.59	42.2	5.11
10.5/100	4.2	2.6	42.4	5.09
11/100	4.4	2.61	42.6	5.07
11.5/100	4.6	2.62	42.8	5.04
12/100	4.8	2.63	43.0	5.02
12.5/100	5	2.65	43.2	5.00
13/100	5.2	2.66	43.4	4.98
13.5/100	5.4	2.67	43.6	4.96
14/100	5.6	2.68	43.8	4.93
14.5/100	5.8	2.69	44.0	4.91
15/100	6	2.70	44.1	4.89
15.5/100	6.2	2.72	44.3	4.87
16/100	6.4	2.73	44.5	4.85
16.5/100	6.6	2.74	44.7	4.83
17/100	6.8	2.75	44.9	4.81

**Changing Ratios**

The ratio of you Super E is adjustable within its ratio range. To change the ratio, slide the right side pump (the one close to the arm pivot) toward the pivot for less material and toward the air cylinder for more material. To find the correct setting look on the ratio table and find the ratio by volume for your material in parts per hundred. Then look across the chart to find the X dimension. Set the pump with the distance between the center of the pivot and the center of the right connecting link equal to X. The metering pump operates by volume, so be sure to find the correct ratio by volume when setting the pump.



**1.25 AIR CYLINDER SIDE PUMP**

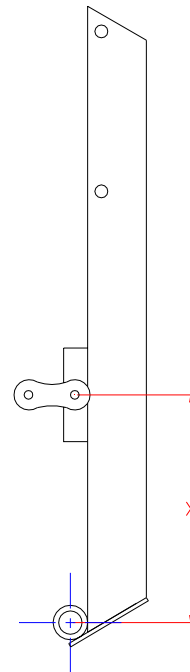
**1.25 PIVOT SIDE PUMP**

**2.5 AIR CYLINDER**

RATIO BY VOLUME	PUMP LOCATION	OUTPUT CU INCH	CC	PSI FLUID PER PSI AIR
25/100	2.5	2.94	48.0	4.03
26/100	2.6	2.96	48.4	4
27/100	2.7	2.99	48.8	3.97
28/100	2.8	3.01	49.1	3.94
29/100	2.9	3.03	49.5	3.91
30/100	3	3.06	49.9	3.88
31/100	3.1	3.08	50.3	3.85
32/100	3.2	3.1	50.7	3.82
33/100	3.3	3.13	51.1	3.79
34/100	3.4	3.15	51.4	3.76
35/100	3.5	3.18	51.8	3.73
36/100	3.6	3.2	52.2	3.71
37/100	3.7	3.22	52.6	3.68
38/100	3.8	3.25	53.0	3.65
39/100	3.9	3.27	53.4	3.63
40/100	4	3.29	53.7	3.6
41/100	4.1	3.32	54.1	3.57
42/100	4.2	3.34	54.5	3.55
43/100	4.3	3.36	54.9	3.52
44/100	4.4	3.39	55.3	3.5
45/100	4.5	3.41	55.7	3.48
46/100	4.6	3.43	56.0	3.45
47/100	4.7	3.46	56.4	3.43
48/100	4.8	3.48	56.8	3.41
49/100	4.9	3.5	57.2	3.38
50/100	5	3.53	57.6	3.36
51/100	5.1	3.55	58.0	3.34
52/100	5.2	3.58	58.4	3.32
53/100	5.3	3.6	58.7	3.29
54/100	5.4	3.62	59.1	3.27
55/100	5.5	3.65	59.5	3.25
56/100	5.6	3.67	59.9	3.23
57/100	5.7	3.69	60.3	3.21
58/100	5.8	3.72	60.7	3.19
59/100	5.9	3.74	61.0	3.17
60/100	6	3.76	61.4	3.15
61/100	6.1	3.79	61.8	3.13
62/100	6.2	3.81	62.2	3.11
63/100	6.3	3.83	62.6	3.09
64/100	6.4	3.86	63.0	3.07
65/100	6.5	3.88	63.3	3.05
66/100	6.6	3.9	63.7	3.04
67/100	6.7	3.93	64.1	3.02
68/100	6.8	3.95	64.5	3
69/100	6.9	3.98	64.9	2.98
70/100	7	4	65.3	2.96

**Changing Ratios**

The ratio of you Super E is adjustable within its ratio range. To change the ratio, slide the right side pump (the one close to the arm pivot) toward the pivot for less material and toward the air cylinder for more material. To find the correct setting look on the ratio table and find the ratio by volume for your material in parts per hundred. Then look across the chart to find the X dimension. Set the pump with the distance between the center of the pivot and the center of the right connecting link equal to X. The metering pump operates by volume, so be sure to find the correct ratio by volume when setting the pump.



# Ratio Setting Guide

## TABLE OF PIVOT SIDE PUMP LOCATIONS

Super E

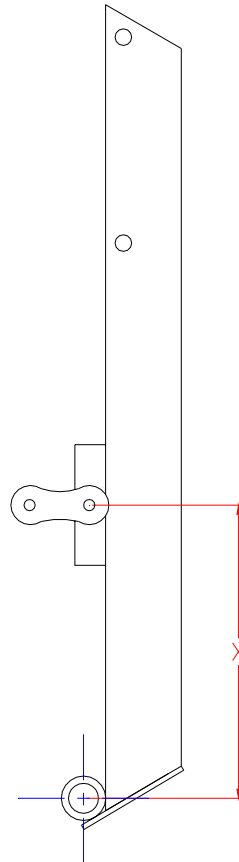
### 1.25AIR CYLINDER SIDE PUMP

### 0.875PIVOT SIDE PUMP

RATIO BY VOLUME	PUMP LOCATION	2.5AIR CYLINDER OUTPUT		PSI FLUID PER PSI AIR
		CU INCH	CC	
12/100	2.45	2.63	43.0	5.02
13/100	2.65	2.66	43.4	4.98
14/100	2.86	2.68	43.8	4.93
15/100	3.06	2.7	44.1	4.89
16/100	3.27	2.73	44.5	4.85
17/100	3.47	2.75	44.9	4.81
18/100	3.67	2.78	45.3	4.77
19/100	3.88	2.8	45.7	4.73
20/100	4.08	2.82	46.1	4.69
21/100	4.29	2.85	46.5	4.65
22/100	4.49	2.87	46.8	4.61
23/100	4.69	2.89	47.2	4.57
24/100	4.9	2.92	47.6	4.54
25/100	5.1	2.94	48.0	4.5
26/100	5.31	2.96	48.4	4.46
27/100	5.51	2.99	48.8	4.43
28/100	5.71	3.01	49.1	4.39
29/100	5.92	3.03	49.5	4.36
30/100	6.12	3.06	49.9	4.33
31/100	6.33	3.08	50.3	4.29
32/100	6.53	3.1	50.7	4.26
33/100	6.73	3.13	51.0	4.23
34/100	6.94	3.15	51.4	4.2
35/100	7.14	3.18	51.8	4.17

## Changing Ratios

The ratio of you Super E is adjustable within its ratio range. To change the ratio, slide the right side pump (the one close to the arm pivot) toward the pivot for less material and toward the air cylinder for more material. To find the correct setting look on the ratio table and find the ratio by volume for your material in parts per hundred. Then look across the chart to find the X dimension. Set the pump with the distance between the center of the pivot and the center of the right connecting link equal to X. The metering pump operates by volume, so be sure to find the correct ratio by volume when setting the pump.



## ***Changing Ratios on the Super E***

### **The Theory**

The ratio of the Super E mixing machine is controlled by the size of the pistons and their distance from the pivot on the operating arm. The ratio is adjustable within limits by moving the pivot side pump closer to and further from the pivot. If a mix ratio is needed outside the distance that the pump can slide, a different size pump is required. There are several different combinations available. The table below gives the diameters available and the range of adjustment of each combination.

<u>Configuration</u>		<u>Ratio Range</u>
7/8 cylinder side	1 ¼ pivot side	1/1 to 2/1
1 ¼ cylinder side	1 ¼ pivot side	100/23 to 100/70
1 ¼ cylinder side	7/8 pivot side	100/11 to 100/34
1 ¼ cylinder side	5/8 pivot side	100/5.5 to 100/17.5

### **Cleaning**

When you change materials, how much cleaning you have to do depends on the type of materials you are using. Some materials are compatible and can be mixed in with small amounts with no problem. Others will react with each other and must be carefully cleaned out before changing to another resin.

The simplest way to empty the reservoirs is to have two people pick up the machine and tip it on its back, emptying the reservoirs into the original shipping containers simultaneously. Then the machine can be flushed out with an appropriate solvent. Wipe the left over resin out of the reservoirs with a paper towel or newspaper. Pour two quarts of solvent into each reservoir. Run solvent through the machine until clean, dump any remaining solvent out of the reservoirs. To more thoroughly clean the pumps and hoses you may disconnect the hoses from the gun and re-circulate material back to the reservoirs.

For flushing urethanes we offer low toxicity, nonvolatile, reusable solvent called UF 55. Acetone or MEK works well for epoxies and urethanes. Neither solvent will harm the pumps.

### **To Change or Replace the Pump**

Drain the material out of the reservoir. Remove the reservoir. Remove the clip from the connecting link and pull the link down to disconnect the piston. Disconnect the output hose. Remove the two bolts that clamp the pump in and pull the pump out of the frame. When reassembling be sure to keep the link straight in line with the pump. Set the timing before putting the machine into service.

Pump and reservoir can be removed as a unit.



# TROUBLE SHOOTING HELPS

Problems	Possible Cause	Possible Solution
Pumping out on one side only	<ul style="list-style-type: none"> <li>Reservoir empty</li> <li>Malfunctioning valve</li> <li>Clogged outlet hole in manifold</li> </ul>	<ul style="list-style-type: none"> <li>Fill reservoir</li> <li>Clean/replace valve</li> <li>Remove</li> </ul>
Pump arm jumps but does not move enough to pump, moves very slowly.	<ul style="list-style-type: none"> <li>Obstruction in the pump/piston</li> <li>Piston end is hitting end of pump cylinder</li> <li>Piston has frozen-hardener in resin side or resin in hardener side</li> <li>Air pressure too low for viscosity of the liquid</li> </ul>	<ul style="list-style-type: none"> <li>Remove obstruction</li> <li>Reset timing</li> <li>Soak in MEK acetone or Urethane flush</li> <li>Check for proper air pressure setting</li> <li>Heat liquid to flow better 10° F can cut viscosity by ½</li> </ul>
Pump arm does not move at all	<ul style="list-style-type: none"> <li>Check air supply</li> <li>Air circuit is not functioning properly</li> <li>Valve sticking in air circuit valve stack</li> </ul>	<ul style="list-style-type: none"> <li>Attach air supply</li> <li>Check red tubes for leaks, cracks or broken fittings</li> <li>Increase air pressure to pilot circuit</li> <li>Check arm pivot</li> </ul>
One liquid starts before the other	<ul style="list-style-type: none"> <li>Improper timing</li> </ul>	<ul style="list-style-type: none"> <li>Adjust timing</li> </ul>
Resin and hardener is not properly mixed. Soft spots, strips in the bead, hot/cold spots, color changes in the static mixer	<ul style="list-style-type: none"> <li>Needs more elements in the static mixer</li> <li>Timing is incorrect</li> </ul>	<ul style="list-style-type: none"> <li>Use a static mixer with more elements</li> <li>Use a longer mixer</li> <li>Adjust timing</li> </ul>
Amount of material does not measure correctly according to needed ratios.	<ul style="list-style-type: none"> <li>Improper timing</li> <li>Used Volume Ratio figures instead of Ratio by Weight figures</li> </ul>	<ul style="list-style-type: none"> <li>Adjust timing per instruction book</li> <li>Check your tables, figures and math.</li> <li>Use a larger sample for measurements</li> </ul>
Material leaking from around the piston	<ul style="list-style-type: none"> <li>O-ring damaged</li> <li>Lip seal damaged</li> </ul>	<ul style="list-style-type: none"> <li>Replace</li> </ul>
<p>If pump is new, a small amount of leakage is normal with heavy viscosity materials. It sticks to the piston as it travels through the seals (pistons are lubricated by the material they pump). If pump has been in operation, especially with abrasive materials, seals and O-rings may be worn. The pump may also be worn.</p>		
Material dripping from mixer manifold after plastic static mixer is removed	<ul style="list-style-type: none"> <li>Small amount is normal</li> </ul>	<ul style="list-style-type: none"> <li>Wipe off manifold, put grease on cap and cap off manifold</li> </ul>
Reservoir leaking material onto the pumps	<ul style="list-style-type: none"> <li>Bad gasket between reservoir and pump or improperly installed</li> <li>Crack in bottom of reservoir</li> <li>Reservoir not tight to the pump</li> </ul>	<ul style="list-style-type: none"> <li>Replace gasket</li> <li>Replace reservoir and gasket</li> <li>Tighten reservoir nut ¼ turn past snug</li> </ul>
Obvious air in the hose	<ul style="list-style-type: none"> <li>Manifold (gun) kept lying below machine overnight allowing gravity air flow</li> <li>Blockage in check valve</li> <li>Air coming through reservoir</li> </ul>	<ul style="list-style-type: none"> <li>Tip machine and stretch hose out at 30°-45° from machine allowing air to travel up hose, pump till air displaced</li> <li>Clean / replace valve</li> <li>Keep reservoir at least 2" full of material from bottom</li> </ul>

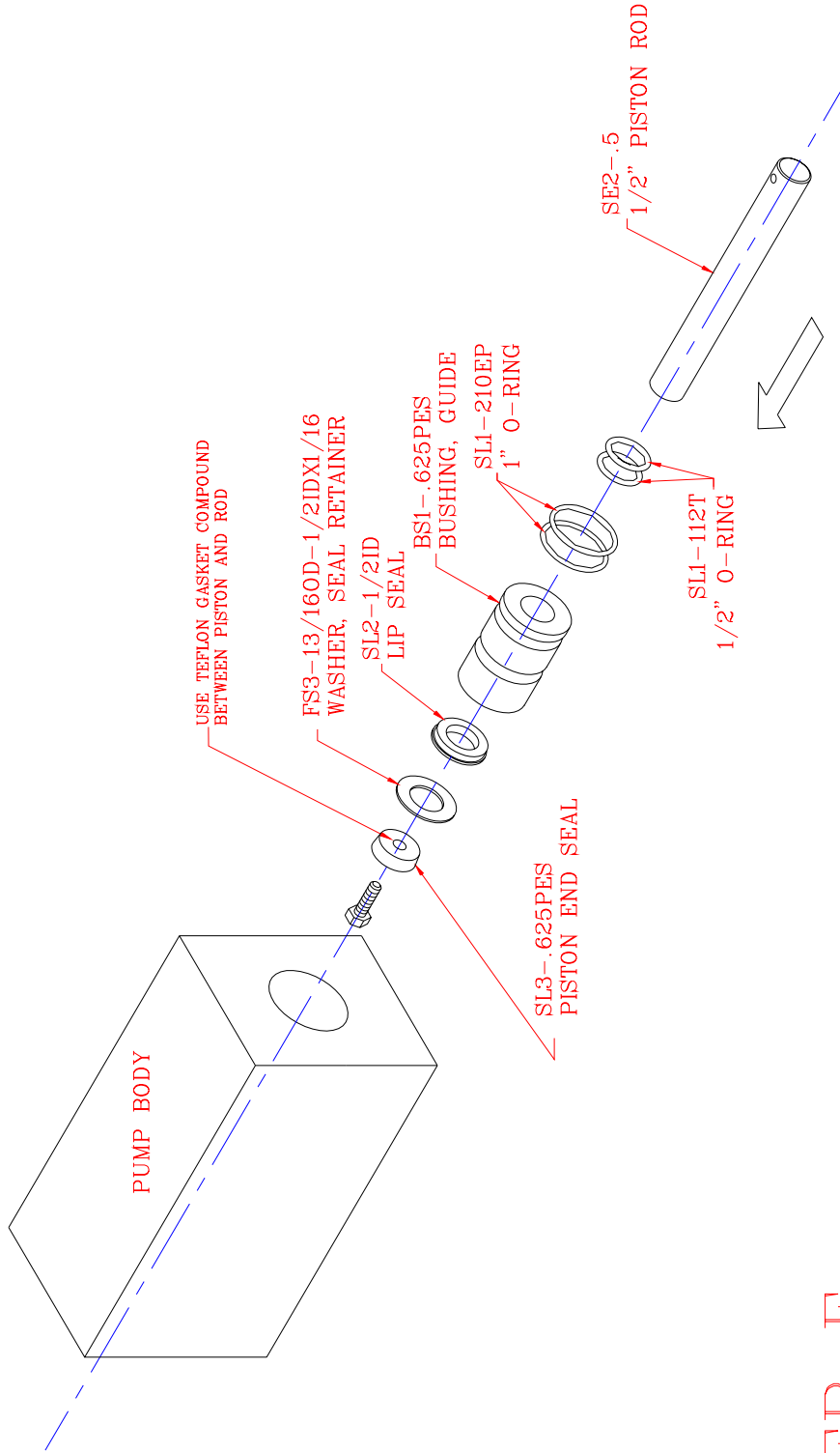
<b>Problem</b>	<b>Possible cause</b>	<b>Possible solution</b>
Arm does not move when the run button is pressed	<ul style="list-style-type: none"> <li>• Check air supply</li> <li>• Run switch is malfunctioning</li> <li>• Air circuit or cylinder is not functioning properly</li> <li>• Valve is sticking in air circuit valve stack</li> <li>• Check operating arm for obstructions</li> </ul>	<ul style="list-style-type: none"> <li>• The air coming to the machine must be more than 65 psi</li> <li>• Disconnect red hose and push the run button. Air should come out of the hose from the switch</li> <li>• Check red and clear tubes for leaks, cracks or broken fittings</li> <li>• Increase air pressure to pilot circuit. The pilot regulator is the round brass colored fitting with the red cap, take off the cap and turn the silver knob clock wise.</li> </ul>
Operating arm moves a small amount	<ul style="list-style-type: none"> <li>• Piston is frozen – hardener in resin side or resin in hardener side, or moisture cure of isocyanate.</li> </ul>	<ul style="list-style-type: none"> <li>• Disassemble the pump and clean with RIM mold cleaner or Methylene chloride</li> </ul>
Arm does not complete cycle	<ul style="list-style-type: none"> <li>• Piston end is hitting end of pump cylinder</li> </ul>	<ul style="list-style-type: none"> <li>• Reset timing, pump has been adjusted out side its range. Reset timing – Adjust pump body away from operating arm</li> </ul>

**HINTS ON TIMING PROBLEMS** (Material not starting at the same time)

**SUPER E**

- \*Pump needs to be adjusted – see timing instruction manual
- Loose bolts: holding pump body to frame timing adjustment
- Pump arm: Pump arm pivot hole worn connecting link-
  - Off
  - Holes are worn

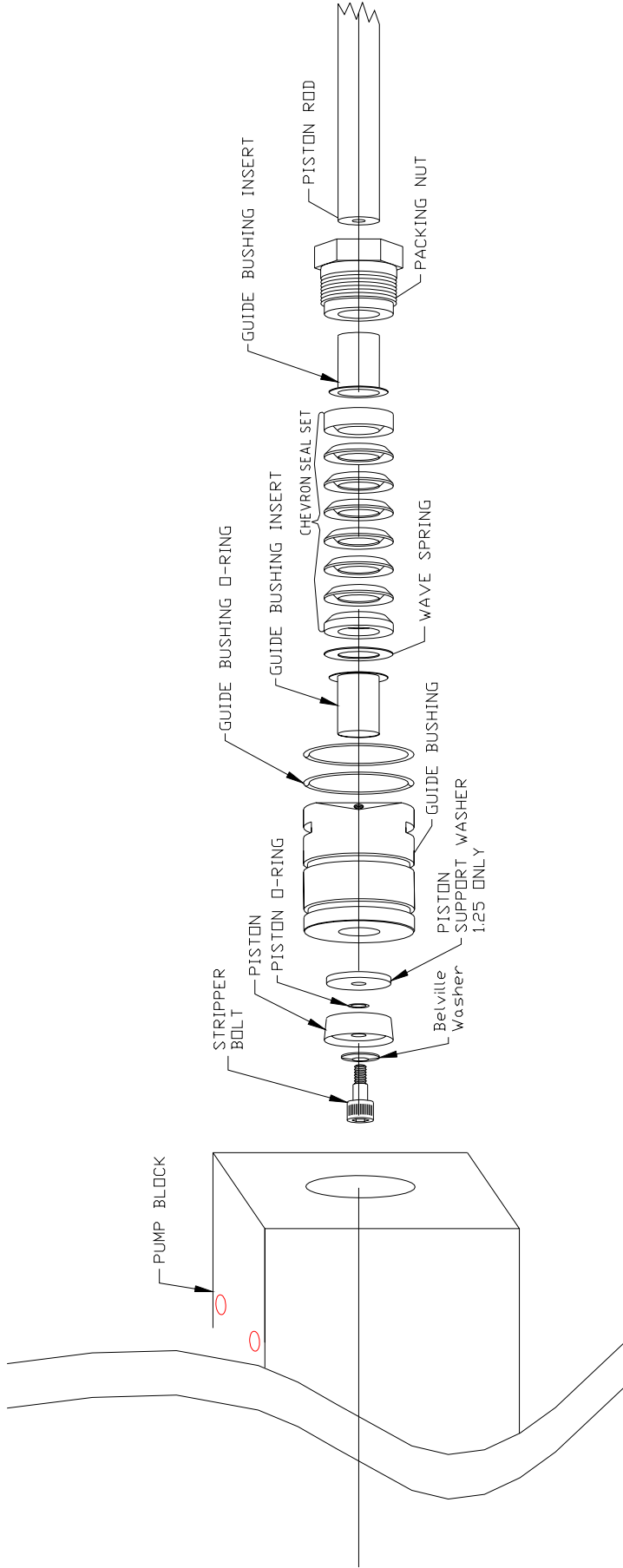
\*Do not let pump piston hit the end of the cylinder when adjusting the timing



INSTALL THE ROD IN THIS DIRECTION,  
THEN ATTACH PISTON END SEAL

**SUPER E**  
 5/8 PISTON END SEAL PUMP ASSEMBLY  
 ALL PARTS INCLUDED IN REBUILD  
 KIT, EXCEPT PUMP BODY

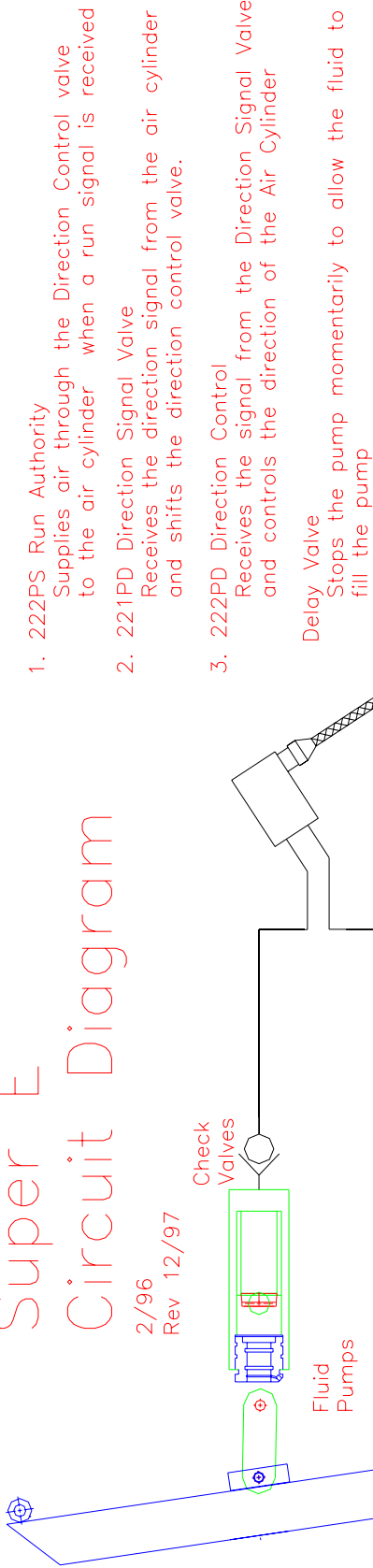
PUMP REPLACEMENT PARTS DIAGRAM



**SUPER E**  
**7/8 OR 1.25 PISTON END SEAL PUMP ASSEMBLY**  
**ALL PARTS INCLUDED IN REBUILD**  
**KIT, EXCEPT PUMP BODY**

# Super E Circuit Diagram

2/96  
Rev 12/97



1. 222PS Run Authority  
Supplies air through the Direction Control valve to the air cylinder when a run signal is received
  2. 221PD Direction Signal Valve  
Receives the direction signal from the air cylinder and shifts the direction control valve.
  3. 222PD Direction Control  
Receives the signal from the Direction Signal Valve and controls the direction of the Air Cylinder
- Delay Valve  
Stops the pump momentarily to allow the fluid to fill the pump

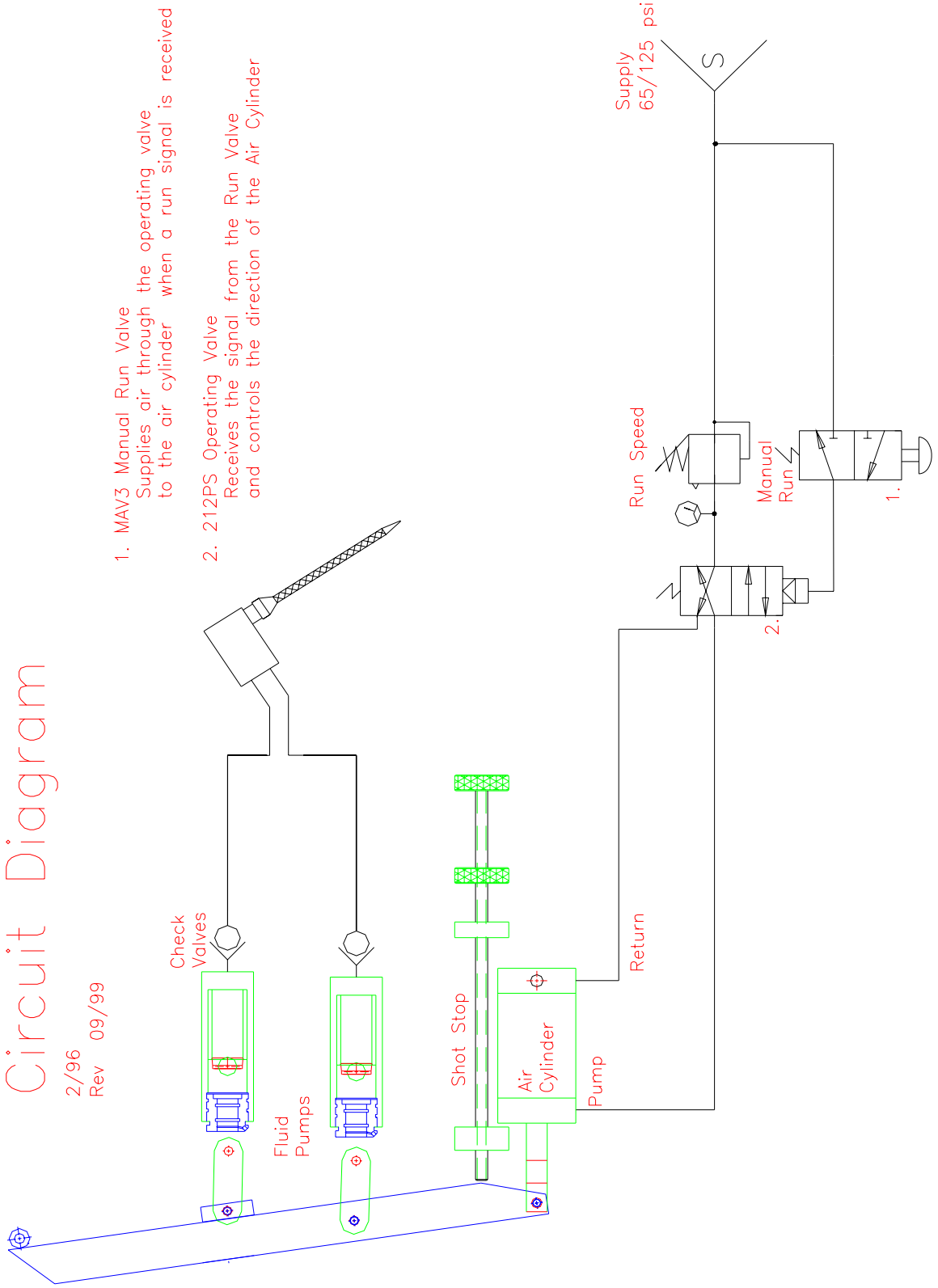
MICHAEL ENGINEERING LTD  
5825 VENTURE WAY  
Mt Pleasant MI 48858

ph 989 772 4073  
fx 989 772 3500

# Super E Single Shot Circuit Diagram

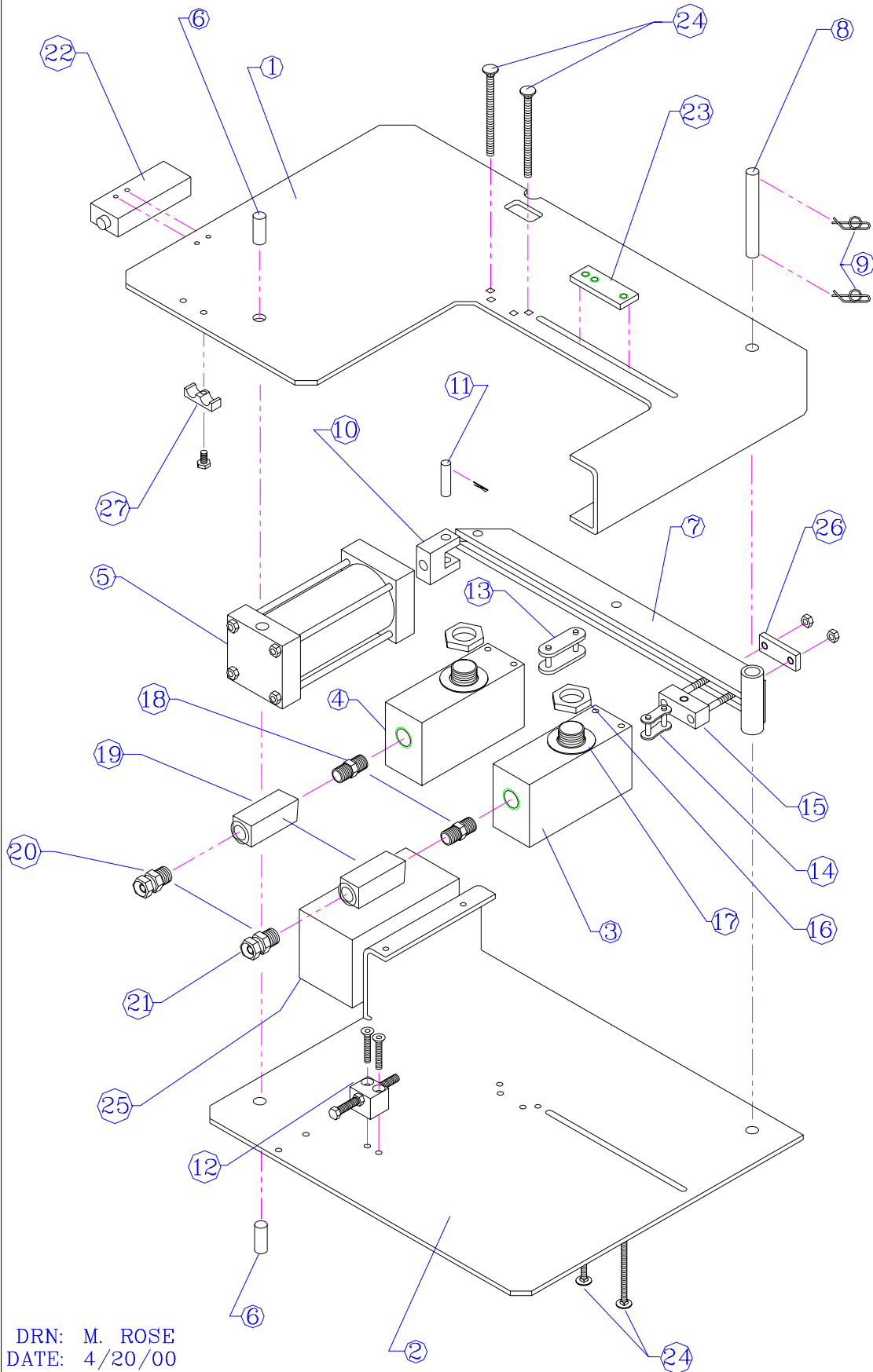
2/96  
Rev 09/99

- 1. MAV3 Manual Run Valve  
Supplies air through the operating valve  
to the air cylinder when a run signal is received
- 2. 212PS Operating Valve  
Receives the signal from the Run Valve  
and controls the direction of the Air Cylinder



INVENTORY NO. -

# SUPER E MACHINE LAYOUT



DRN: M. ROSE  
DATE: 4/20/00  
SCL: 1:7

#	PART DESCRIPTION	PART NUMBER	#	PART DESCRIPTION	PART NUMBER	#	PART DESCRIPTION	PART NUMBER
1	FRAME, TOP	ST3-SETOP	10	CLEVIS	AL1-.75X1.5X1.625	19	VALVE, EXHAUST(2)	VA10-PAR
2	FRAME, BOTTOM	ST3-SEBOTOM	11	PIN, CLEVIS	ST1-.313X1.875LG	20	FITTING, FPX	FGP-766372
3	PUMP, PIVOT SIDE	SE-SE14-(PUMP SIZE)	12	TIMING, ADJ. ASSY	SE17	21	FITTING, FPX	FGP-766054
4	PUMP, AIR SIDE	SE-SE14-(PUMP SIZE)	13	LINK, AIR CYL SIDE	CH1-C2060H	22	VALVE, DELAY	PN1-KLC101
5	AIR CYLINDER	PN2-2.5X4MD	14	LINK, PIVOT SIDE	CH1-C60H	23	PLATE, NUT	ST2-.25X1X2.75LG
6	PIN, AIR CYLINDER	ST1-.50X1.281LG	15	ADJUSTMENT SLIDE	AL1-.75X.75X2	24	BOLT, CARRIAGE(2)	FS4-.25X3.75
7	ARM ASSY	SE20	16	NUT, HEX(2)	SE7-RSNUT	25	AIR CIRCUIT ASSY	SE1-ALM
8	PIN, ARM	ST1-.50X4.00LG	17	GASKET, RUBBER(2)	SE7-RS3/4	26	PLATE	AL1-.25X.5X2
9	CLIP, HAIRPIN(2)	FS13-RUE24	18	FITTING(2)	FG1-122EE	27	CLAMP, TUBE	AL1-.50X.75X1.50LG

MODELS-

MICHAEL ENGINEERING/ROOK METERING  
5625 VENTURE WAY  
MT PLEASANT MI 48858

PH# (989) 772-4073  
FX# (989) 772-3500

# SUPER E COMMON REPLACEMENT PARTS

10-02  
REPLACES 05-02

## Pump Body Replacement Parts

For machines with serial# 539 and up (Green Machine)

### Rebuild Kit SE8-G1.25PES

\$223.58

1	GUIDE BUSHING	BS1-1.25G	\$44.40
1	GUIDE BUSHING NUT	BS1-1.25NUTG	\$19.80
2	BUSHING SLEEVE	BS3-H370FI1214-12	19.30*
1	CHEVRON SEAL PACK	SE2-75VPAC	\$38.40*
1	WAVE SPRING	PM3-SPG1.25	\$3.72
1	3/4" PISTON ROD	SE2-PISTON.75 □	\$44.40
1	1 1/4" PISTON END SEAL	SL3-1.25PES or HT**	40.80*
2	1 3/4" O-RING	SL1-129EP	11.76*
1	5/16" O-RING	SL1-011EP	1.00 *

*Replacement Seal Kit for 1.25" Pump		
1.25 G SEAL KIT	SL4-SEG-1.25	\$111.26

### Rebuild Kit SE8-G.875PES

\$221.18

1	GUIDE BUSHING	BS1-1.25G	44.40
1	GUIDE BUSHING NUT	BS1-1.25NUTG	\$19.80
2	BUSHING SLEEVE	BS3-H370FI1214-12	\$19.30*
1	CHEVRON SEAL PACK	SE2-75VPAC	\$38.40*
1	WAVE SPRING	PM3-SPG1.25	\$3.72
1	3/4" PISTON ROD	SE2-PISTON.75 □	\$44.40
1	7/8" PISTON END SEAL	SL3-.875PES or HT**	\$38.40*
2	1 3/4" O-RING	SL1-129EP	11.76*
1	5/16" O-RING	SL1-011EP	1.00*

*Replacement Seal kit for .875" Pump		
.875 G SEAL KIT	SL4-SEG-875	\$108.86

For machines with serial # 538 and less (Grey Machine)

### REBUILD KIT 1.25 Pump SE8-1.25PES

\$175.44

1	BUSHING GUIDE 1.25 PES	BS1-1.25PES	\$44.40
1	SEAL, LIP 3/4 ID	SL2-.75B	\$26.40*
2	3/4" O-RING	SL1-116T	\$7.68*
2	1 3/4 O-RING	SL1-129EP	\$11.76*
1	1 1/4" PISTON END SEAL	SL3-1.25PES or HT**	\$40.80*
1	3/4" PISTON ROD	SE2-PISTON.75 □	\$44.40
1	SEAL RETAINER WASHER	FS3-1.25	\$7.20

*Replacement Seal Kit for 1.25" Pump		
1.25 Seal Kit	SL4-1.25	\$86.64

### REBUILD KIT .875 Pump SE8-.875PES

\$162.72

1	BUSHING, GUIDE .875	BS1-.875PES	\$36.00
1	SEAL 3/4ID	SL2-.75B	\$26.40*
2	3/4" O-RING2	SL1-116T	\$7.68*
2	1 1/4" O-RING	SL1-024EP	\$9.84*
1	7/8" PISTON END SEAL	SL3-.875PES or HT**	\$38.40*
1	3/4" PISTON ROD	SE2-PISTON.75 □	\$44.40
1	SEAL RETAINER WASHER	FS3-.842	\$7.20

*Replacement Seal Kit for .875" Pump		
.875 Seal Kit	SL4-.875	\$82.32

### REBUILD KIT .625 Pump SE8-.625PES

\$147.26

1	BUSHING GUIDE .625	BS1-.625PES	\$37.20
1	SEAL, LIP 3/4 OD	SL2-.75-OD	\$24.00*
2	1/2" O-RING	SL1-112T	\$6.14*
2	1" O-RING	SL1-210EP	\$9.12*
1	.625 PISTON END SEAL	SL3-.625 PES or HT**	\$37.20*
1	1/2 PISTON ROD	SE2-PISTON.50 □	\$26.40
1	SEAL RETAINER WASHER	FS3-.625	\$7.20

*Replacement Seal Kit for .625" Pump		
.625 Seal Kit	SL4-.625	\$76.46

### RETRO REBUILD KIT SE8-RETRO-KIT

\$235.58

Used to convert past 1.25" style pump (Serial# 538 or less, Grey Machine) with new seal.

2	BUSHING SLEEVE	BS3-H370FI 1214-12	\$19.30*
1	GUIDE BUSHING NUT	BS1-GUIDENUTG	\$19.80
1	CHEVRON SEAL PACK	SE2-75VPAC	\$38.40*
1	GUIDE BUSHING 1.25	BS1-1.25PES	\$44.40
1	WAVE SPRING	PM3-SPG1.25	\$3.72*
1	PISTON END SEAL 1.25	SL3-1.25PES or HT**	40.80*
1	3/4" PISTON ROD	SE2-PISTON.75 □	\$44.40
1	GUIDE NUT WRENCH	SEO-WRENCH	\$12.00
2	1 3/4" O-RING	SL1-129EP	\$11.76*
1	5/16" O-RING	SL1-011EP	1.00*

Retro Replacement Seal Kit for 1.25" Pump		
1.25 Seal Kit	SL4-SEG-1.25	\$114.98

□	Hardened steel piston for use on abrasive materials	SE2-HPISTON-(size)	\$84.00
**	add HT suffix to PES to designate Hi-Temp PES	SL3-(size)PES-HT	same price as reg. PES



OTHER PUMP / MACHINE PARTS

DESCRIPTION	PART#	PRICE	
1 1/4" PUMP COMPLETE w retro kit		\$540.00	
1 1/4" PUMP COMPLETE w Lip Seal	SE1-1.25PES	\$540.00	Replace your entire Pump and rebuild your old one for a spare.
7/8" PUMP COMPLETE w Lip Seal	SE1-.875PES	\$540.00	
5/8" PUMP COMPLETE w Lip Seal	SE1-.625PES	\$540.00	
1 1/4" PUMP COMPLETE w Chevron Seal	SE1G-1.25PES	\$540.00	
7/8" PUMP COMPLETE w Chevron Seal	SE1G-.875PES	\$540.00	
PACKING NUT ADJUSTMENT WRENCH	WR1-CROWSFOOT-SE	\$6.00	
SE EXHAUST CHECK VALVE	VA10-PAR	\$42.77	
HOSE 9'X1/2" SS BRAID TFE LINED	HS2-.5X9	\$114.60	
HOSE 9'X3/8" SS BRAID TFE LINED	HS2-.375X9	\$88.20	
HOSE 9'X1/4" SS BRAID TFE LINED	HS2-.25X9	\$75.60	
SE FEET -SET OF 4	SEO-G-STLFG	\$30.00	
RESERVOIR PARTS			
PAIL 5 GALLON W/LID & RING	RS2-5SE	\$24.00	
LID & RING 5 GALLON	RS2-5LSE	\$7.20	
GASKET, SUPER E RESERVOIR	SE7-RS3/4	\$3.00	
WASHER, SUPER E RESERVOIR	SE7-RSWASHER	\$2.40	
NUT, SUPER E RESERVIOR	SE7-RSNUT	\$2.40	
CHEMICALS			
DESICCANT 3/4 LB BOTTLE	OL4-DRYER	\$24.00	Enough for several refills
DESICCANT TUBE ASSY.	OL0-DRYER	\$24.00	
ISO OIL 8 OZ.	OL1-ISO	\$14.40	Clear lubricant for piston.
URETHANE FLUSH 1 GAL	OL1-URFL55	\$59.00	Ester solvent for cleaning and flushing, can be reused.
URETHANE FLUSH 5 GAL	OL1-URFL55-5	\$228.32	
RIM MOLD CLEANER 1 GAL	OL1-RMC	\$119.68	Powerful solvent Will soften cured urethane
RIM MOLD CLEANER 5 GAL	O L1-RMC5GAL	\$372.96	
GUN PARTS / PNEUMATIC PARTS			
REGULAR MIXER MANIFOLD (GUN)	MX50-25X25-A	\$102.00	
HI-RATIO MANIFOLD (GUN)	MX50-20X12-A	\$102.00	
LOW VISCOSITY MANIFOLD (GUN)	MX50-12X12-A	\$102.00	
CENTER STREAM MANIFOLD(GUN)	MX50-GN50X25	\$138.00	Specify Reg. or Hi-ratio tube w order
Center tubes for Center Stream	MX50-LICSREG	\$4.80	Reg. Ratio center tube
	MX50-LICS	\$4.80	Hi-Ratio center tube
CENTER STREAM MANIFOLD w/ 24"expansion tip	MX50-GN50X25W24BL	\$215.00	
MANIFOLD CAP, BRASS	MX50-CAPB	\$18.00	10 per pack or \$2.00 ea.
MANIFOLD NUT, BRASS	MX50-NUTB	\$18.00	10 per pack or \$2.00 ea.
MANIFOLD NUT, PLASTIC	MX50-NUTP	\$12.00	10 per pack
RUN VALVE, BUTTON	PN1-MAV-3-B1	\$25.20	
RUN VALVE, TOGGLE	PNI-TV-3S	\$25.20	
GUN COMPLETE : MIXER MANIFOLD, VALVE BRACKET, RUN SWITCH, AIR LEAD HOSE AND FITTINGS.	MX52-SEGUN - 25X25 Reg. ratio 12x12 Low ratio 20x12 Hi ratio	\$138.00	
	MX52-SEGUNCS For use with Center Stream	\$162.00	
FOOT SWITCH (COMPLETE)	MM50-FTSW	\$132.00	
1/4" URETHANE HOSE, TWIN LEAD	HS1-TWIN	\$24.00	10 ft. Hose to gun or foot switch
PNEUMATIC FITTINGS KIT: PART # FG-PN-KIT Includes:		\$18.00	
5	1/8" BARB X 1032 CONNECTOR	FG2-4BN1032	
10	1/8" BARB X 1032 EL CONNEC	FG2-4BN1032L	
3FT	1/4" URETHANE HOSE	HS1-.25X3	

This is not an exhaustive parts list. If you are unable to find the parts you need please call Parts Dept.

Due to manufacturing cost, prices may change without notice

# STATIC MIXERS

PART#	OVERALL LENGTH	OUTSIDE DIA.	INSIDE ELEMENT DIA.	NUMBER OF ELEMENTS	PRICE AT QUANTITY			
					EACH	50	250	BOX
MX1-432	6.5"	.300	.187	32	1.60	1.27	1.06	.85 (1500pcs.)
MX1-448	9.0"	.300	.187	48	1.65	1.38	1.17	.90 (1500pcs.)
MX1-624	7.5"	.370	.250	24	1.54	1.27	1.06	.85 (1500pcs.)
MX1-632	9.5"	.370	.250	32	1.65	1.38	1.17	.90 (1500pcs.)
MX1-648	12.8"	.370	.250	48	1.80	1.55	1.32	1.06 (1000pcs.)
MX1-656	14.9	.415	.250	56	4.00	3.52	3.20	3.00 (800pcs.)
MX1-824	9.125"	.520	.375	24	1.80	1.55	1.32	.95 (1000pcs.)
MX1-830	11.25"	.520	.375	30	1.91	1.64	1.48	1.06 (500pcs.)
MX1-840	14.125"	.520	.375	40	2.12	1.80	1.65	1.32 (500pcs.)
MX1-1018	9"	.660	.500	18	1.85	1.75	1.59	1.25 (500PCS)
MX1-1024	11.625"	.660	.500	24	2.33	1.96	1.65	1.33 (500pcs.)
MX1-1030	14.062"	.660	.500	30	2.55	2.07	1.43	1.43 (250pcs.)
MX1-1036	16.6"	.660	.500	36	2.92	2.44	1.65	1.65 (250pcs.)
MX1-162-616	15"	1.00	.750	16	6.80	6.80	5.40	4.00 (500pcs.)
MX1-162-623	17"	1.00	.750	23	8.40	8.40	6.70	5.00 (500pcs)
MX1-162A-639	30"	1.00	.750	39	12.33	11.65	11.00	11.00 (250pcs)

To add your own needle, order Luer Lock tip - add LL suffix and .50 to each price or .45 to quantities of 50 or more. **EXAMPLE: MX1-840-LL**

### Two stage mixers for difficult to mix materials.

MX1-012-832	16.125"	.55-.46	.37-.31	12-32	4.10	3.67	3.18	2.90 (700pcs.)
MX1-312-032	19.5"	.67-.55	.5-.375	12-32	4.67	3.85	3.55	3.15 (500pcs.)

### Dynamic Mixer

MX1-442-C1A	6.5"	.650	.500	12	1.85	1.55	1.25 (250pcs.)
MX1-442-C1A-M	6.5"	.650	.500	12	2.85	2.55	2.25 (250PCS)

### Quadro style ▢

Part #	Size	Each	PRICE AT QUANTITY		
			100	250	1000
MX1-300-002	5.3"/24z by .305" w/bell inlet	1.12	.95	.77	.70
MX1-300-006	5.1"/24z by .397" w/bell inlet	1.31	1.10	.90	.82
Mx1-300-014	5.5"/24Z by .476" w/bell inlet	1.50	1.27	1.03	.94
MX1-300-018	5.7"/24Z by .464" w/bell inlet	1.60	1.35	1.10	1.00
MX1-300-026	5.3/24z Bayonet	.44			
MX1-300-377	8.75/ by .554 w/bell inlet	1.44	1.35	1.30	1.25



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