

TROUBLESHOOTING INSTRUCTIONS

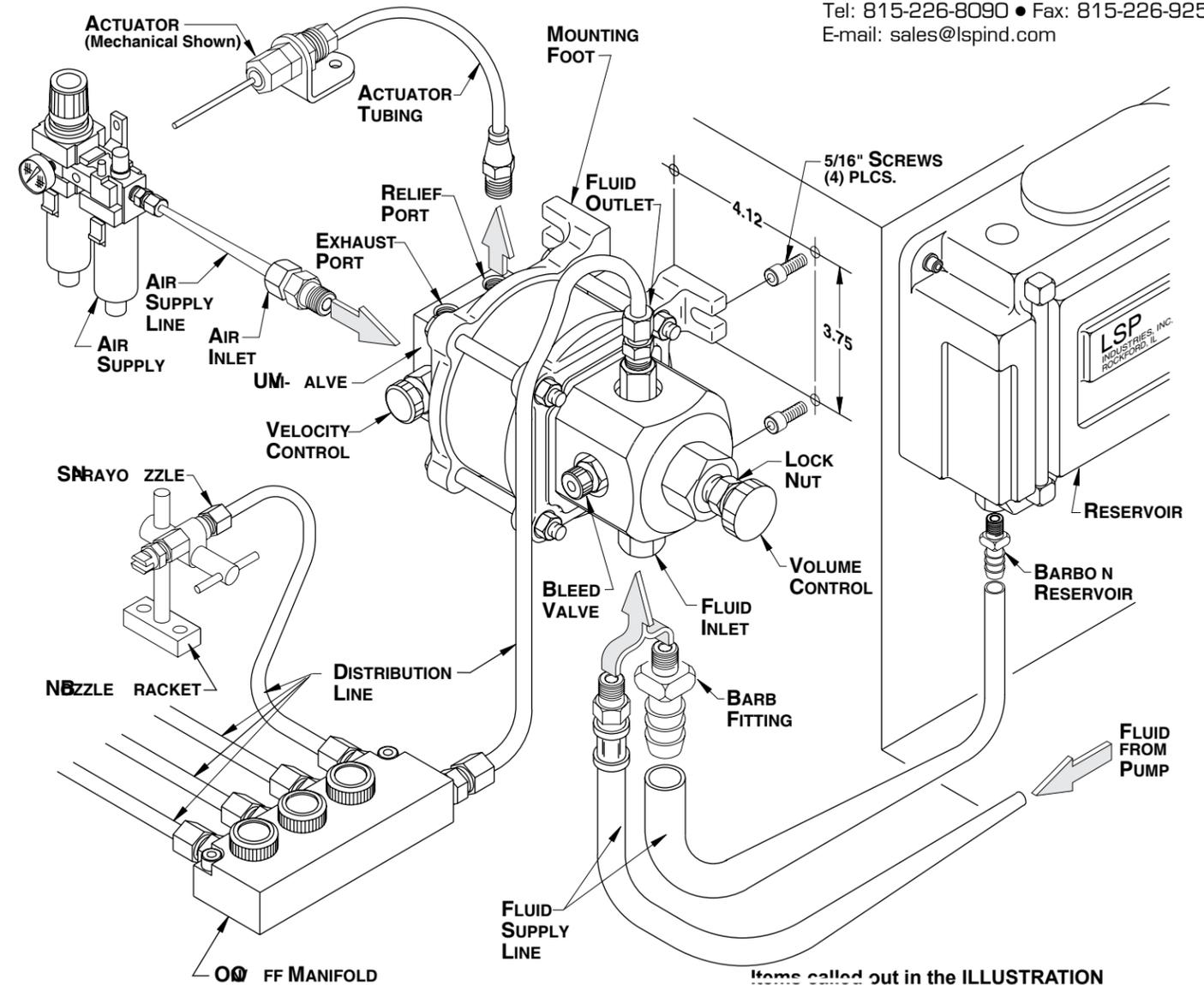
PROBLEMS	SOLUTIONS
I. Fluid will not flow from the Bleed Valve when opened.	<p>A. Insure the BLEED VALVE is open far enough. Unscrew (clockwise) until the Valve stem stops turning.</p> <p>B. Insure that fluid is getting to the MacroSpray. Check below per the method of fluid supply being used.</p> <ol style="list-style-type: none"> If using a RESERVOIR (Gravity Feed) <ol style="list-style-type: none"> Insure the RESERVOIR is full, and the fill-level is above the top of the MacroSpray. If the fluid is very heavy, it may be too viscous to run through the FLUID SUPPLY LINE. If using a PUMP (Pressure Feed) <ol style="list-style-type: none"> Insure the PUMP is "on" and is pumping at a good pressure. Make sure any valve in the FLUID SUPPLY LINE is open. <p>C. Insure the FLUID INLET is not obstructed. See "INSPECTING the MacroSpray". Look for a clogged FLUID INLET.</p>
II. The built-in air valve (UniValve) does not actuate when the Actuator is cycled.	<p>A. Check the operating air pressure. It should be at least 40 P.S.I.</p> <p>B. Ascertain if the problem is with the UNI VALVE or ACTUATOR as follows.</p> <ol style="list-style-type: none"> Turn off the AIR SUPPLY and disconnect the Actuator from the MacroSpray. If ACTUATOR TUBING is being used, disconnect it at the ACTUATOR not at the MacroSpray. Turn AIR SUPPLY back on. Air should be escaping where the ACTUATOR was disconnected. Prevent this air escaping by placing your thumb over the vent hole. If the MacroSpray operates when you plug and unplug this hole, the problem is with the ACTUATOR. Continue with the INSTRUCTIONS supplied with that ACTUATOR. If the MacroSpray will not operate by this method, check the UNI VALVE as described below. <p>C. If ACTUATOR TUBING is being used, do the following; else, go on to Step D.</p> <ol style="list-style-type: none"> Insure the TUBE has been installed properly. See the INSTRUCTIONS for the ACTUATOR being used. Inspect the TUBE for leakage (cuts, cracks, bad connections, etc.) Inspect the TUBE for blockage (obstructions, kinks, crimps, etc.) If the ACTUATOR TUBE is longer than four feet, response will be slowed. If too long, the UNI VALVE will not operate. <p>D. Investigate the UNI VALVE. See "INSPECTING the UniValve" for direction. If simple cleaning and lubrication solves the problem, but it repeats consistently, installing an AIR FILTER/LUBRICATOR would probably cure the problem for good.</p>
III. Fluid does not eject from SprayNozzle when MacroSpray is activated.	<p>A. Insure fluid is present. Check per PROBLEM I. at Steps B. and C.</p> <p>B. Insure the UNI VALVE is operating. If not, see PROBLEM II.</p> <p>C. The MacroSpray may require priming. See OPERATING INSTRUCTIONS at Step B. NOTE: If priming solves the problem, but it re-occurs often, see PROBLEM V.</p> <p>D. Ascertain if the problem is with the MacroSpray or SPRAYNOZZLE as follows.</p> <ol style="list-style-type: none"> Dis-connect the DISTRIBUTION LINE at the MacroSpray's FLUID OUTLET. Operate the MacroSpray and check the ejection from the FLUID OUTLET. If an appropriate amount of fluid is forcefully ejected, see "INSPECTING the SprayNozzle". Look for an obstruction in the DISTRIBUTION LINE or SPRAY NOZZLE. If no fluid is ejected, or very little is with little force, see "INSPECTING the MacroSpray". Check everything as directed.
IV. The pattern of the spray ejected from the SprayNozzle is unsatisfactory.	<p>A. If the SprayNozzle drips during or after ejection. This indicates there is air in the system or "soft" DISTRIBUTION TUBING is being used. See OPERATING INSTRUCTIONS at Step H.</p> <p>B. If the spray is erratic, off-center, or unevenly dispersed: See "INSPECTING the SprayNozzle" and look for a contaminated NOZZLE TIP.</p> <p>C. If the spray is not atomized finely enough: Indicates not enough power for the weight of fluid being used. Increase air pressure, or use lighter fluid.</p>
V. The MacroSpray must be primed frequently to maintain good performance.	<p>This indicates air is getting into the MacroSpray somehow. The more common causes of this are listed below.</p> <ol style="list-style-type: none"> If a PUMP is being used to supply the fluid, it may be introducing air into the system. The FLUID SUPPLY LINE may be cracked or punctured, or it's connections may be loose. An O-RING SEAL may be bad, allowing air to be drawn into the MacroSpray. See "INSPECTING the MacroSpray" and check O-RINGS(2), (8) two places, (10) and (18). If these O-RINGS are good and the problem still exists, then dis-assemble the MacroSpray and check those in SEAL ASSEMBLY(16).

INSTALLATION, OPERATION, and TROUBLESHOOTING

with REPLACEMENT PARTS LISTING for MacroSpray Model No. P-175-B



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Items called out in the ILLUSTRATION are identified in the INSTRUCTIONS by ALL CAPITAL LETTERS

INSTALLATION INSTRUCTIONS

A. Installing an Actuator

The **MacroSpray** requires an **ACTUATOR** to operate. If you do not have one, see the **ACCESSORIES** Section for a listing of those available.

The **MacroSpray** ejects when it's **RELIEF PORT** is vented to atmosphere, and recharges when this **PORT** is closed. This is controlled by the **ACTUATOR**. Follow the **INSTRUCTIONS** supplied with your **ACTUATOR** for details on how it is installed.

B. Installing the MacroSpray

NOTE:

The **MacroSpray** should preferably be mounted on a wall or upright (not on a table or bed) and it's **FLUID INLET** port should be pointing downward (as shown in the **ILLUSTRATION**).

If the **MacroSpray** is mounted on a level surface, it's performance may be somewhat reduced, especially when dispensing smaller amounts of fluid.

INSTALLATION (continued)

1. Locating the MacroSpray

Consider the following when locating a **MacroSpray**.

- Insure that lines to be connected to the **MacroSpray** will not interfere with work, and will not be caught by or rub against moving parts.
- Locate **MacroSpray** as close to **SPRAYNOZZLES** as practical. Most applicable when dispensing heavy fluids.
- Locate **MacroSpray** at a lower level than the **SPRAYNOZZLE** for easier start-up.
- Locate **MacroSpray** as close to the **ACTUATOR** as practical (must be within four feet). Most applicable when operating at higher cycle rates (faster than 100 cycles per minute).

2. Mounting the MacroSpray

Drill and tap for four 3/8" screws on a 4-1/2"(4.50) X 5"(5.00) bolt pattern (see **ILLUSTRATION** on cover). Mount the **MacroSpray** with screws through it's **MOUNTING FEET**.

C. Installing a Fluid Supply

The fluid to be ejected may be supplied by **RESERVOIR** or **PUMP**. Do as described below per the method being used.

1. Using a Reservoir (Gravity Feed)

A 5 Gallon **RESERVOIR** is available (see **ACCESSORIES**). All items required for installation are supplied with the **RESERVOIR**.

Use thread sealant when making any of the following connections, **they must be air tight**.

- Locate the **RESERVOIR** higher than the **MacroSpray** and as close to it as practical. Insure the **FLUID SUPPLY LINE** will be out of harms way when installed.
- Mount the **RESERVOIR** using the mounting holes provided.
- Attach a **BARB FITTING** in the **FLUID INLET** of the **MacroSpray**. Also into the outlet port in the bottom of the **RESERVOIR**.
- Push one end of the **FLUID SUPPLY LINE** onto the **BARB** under the **RESERVOIR**. Route the other end of this **LINE** to the **FLUID INLET** and cut off any excess (**not too much!!**). Push this end onto the **BARB FITTING** in the **FLUID INLET**.

2. Using a Pump (Pressure Feed)

PUMPS as described below are available from **L.S.P.** Contact us or our representative if interested.

- PUMP** pressures from 40 to 100 P.S.I. may be used. At higher pressures (approx. 150 P.S.I.) fluid will be forced through the **MacroSpray** and out the **SPRAYNOZZLE**. Lower pressures are recommended for ease of handling.
- The **FLUID SUPPLY LINE** and all fittings used with it, should have at least a 3/8" passage.
- Connect this **LINE** at the **PUMP** and then to the **FLUID INLET** of the **MacroSpray**. A valve or disconnect on this **LINE** can be useful, but it must have proper passage.

Use thread sealant when making any of the above connections, **they must be air tight**.

D. Installing the Air Supply

The **MacroSpray** operates on compressed air which is controlled by a built-in air valve termed the "**UNI VALVE**".

1. Air Pressure

The **MacroSpray** will operate at any pressure from 40 to 120 P.S.I. Less than 40 P.S.I. may be used if performance is acceptable; more than 80 P.S.I. is usually a waste of air; and more than 120 P.S.I. may reduce unit life.

2. Air Supply Line

This **AIR SUPPLY LINE** and all the fittings used with it, **must have** at least 1/2" passage. If this **LINE** is over ten feet long, or any elbow fittings are used, increase passages to 5/8" or more. A valve or disconnect on this **LINE** can be useful, but it must have proper passage.

3. Air Handling Equipment

Using an **AIR FILTER/REGULATOR/LUBRICATOR** is strongly recommended. The **FILTER** and **LUBRICATOR** for more care-free service and longer life. The **REGULATOR** for air conservation and controlling performance.

4. Connecting the Air Supply Line

Connect one end of the **AIR SUPPLY LINE** to the **AIR SUPPLY**. Connect other end of **LINE** to the **AIR INLET** of the **MacroSpray**. Using thread sealant will help prevent loss of air.

E. Installing the Distribution System.

This System consists of **NOZZLE ASSEMBLIES**, **DISTRIBUTION LINE**, and their connections to the **MacroSpray**.

1. Items required

The items below are required to operate the **MacroSpray**. They are ordered separate from the **MacroSpray** and might not be included. If not present, they must be obtained.

a) Nozzle Assembly

Various types of **NOZZLE ASSEMBLIES** are available. At least one of these items are required. (see **ACCESSORIES**)

b) Distribution Line

DISTRIBUTION LINE must be 1/4" O.D. For best results use metal tubing (soft copper is easiest to handle).

If this **LINE** must be flexible, **L.S.P. HyPressure Tubing** is the **only non-metal tubing allowed for use**. Other tubing is found to be too "soft" for good performance and may burst.

c) Line Fittings

Standard 1/4" compression fittings should be used when making any connections while running **DISTRIBUTION LINE**.

2. Mounting a Nozzle Assembly

Do as described per the type of **NOZZLE ASSEMBLY** being used.

a) SprayNozzle.

This **NOZZLE** requires support. If metal **DISTRIBUTION LINE** is used, it may be stable enough to be used as this support.

If this **LINE** is flexible, a **NOZZLEBRACKET** (see **ACCESSORIES**) or similar support will have to be used.

b) FlexTube.

Drill and tap for 1/8-27 pipe thread. Screw the threaded stud of the **FlexTube** into this hole.

c) MagnaTube.

Simply set the **MagnaTube** into place where desired.

3. Installing the Distribution Line.

For best results, try to comply with the following.

- Keep the amount of **LINE** used to a minimum. Run **LINE** as directly as possible. Use as little slack as practical.
- Use metal **LINE** where possible. If flexible Line is required, see if metal Line can be used up to a point and then continued with flexible **LINE**.
- Keep contaminaton out of the **LINES**. If cutting creates chips, be sure to flush clean before installation.
- Make all connections properly. Keep the **DISTRIBUTION LINE** bottomed in the **FITTING** while tightening the compression nut to one full turn past hand-tight.

4. Using the On/Off Manifold

ON/OFF MANIFOLDS provide for splitting the **DISTRIBUTION LINE** and allowing **LINES** to be turned on/off. For best results, try to comply with the following, and the suggestions at **Step 3** above.

- If **MacroSpray** is close to **SPRAYNOZZLES**, connect **MANIFOLD** directly to **MacroSpray's FLUID OUTLET PORT** using a pipe nipple. Run **DISTRIBUTION LINE** to **SPRAYNOZZLES** from the **MANIFOLD**.
- If **MacroSpray** is distant to the **SPRAYNOZZLES**, locate **MANIFOLD** as close to the **SPRAYNOZZLES** as practical. Run **DISTRIBUTION LINE** from the **MacroSpray** to the **MANIFOLD**, and then on to the **SPRAYNOZZLES**.

INSPECTING the UniValve

See **REPLACEMENT PARTS** for Key No's shown in parenthesis

A. Dis-assemble UniValve as follows.

- Unscrew **PIPE PLUG(42)** from **VALVE HOUSING(32)**.
- Remove **RETAINER RING(39)** from **VALVE HOUSING(32)** (use a small screw driver and uncoil ring from groove). See page 5.
- Remove **VALVE PLUG(38)** and **VALVE SPOOL(36)** by inserting a rod (3/16" or smaller) into the hole from which **PIPE PLUG(42)** was removed and pushing the parts out of **VALVE HOUSING(32)**.

B. Inspect the Spool, Cylinder, and their O-Rings.

- Do not remove an **O-RING** from it's groove unless found bad. If bad, do not scratch the groove while prying it out.
- Check parts for contamination. If dirty/gummy, clean thoroughly.
- Check parts (including the **O-RINGS** on them) for cuts, marring, breakage, or deformation.

NOTE: It is natural for **O-RING(35)** to fit in it's groove very loosely. The reason being that it is a special, low friction configuration.

ACCESSORIES

The items listed below are made available to help with the application of the **MacroSpray**.

A. Actuators

Any Actuator described below may be used to operate the **MacroSpray**. They include all the necessary fittings, tubing, brackets, etc. required to adapt to the **MacroSpray**.

1. Mechanical Actuator — Model No: P901

Used for manual or mechanical actuation. Operates by having a probe deflected off-center in any direction. This may be done by hand or by using a moving machine member.

2. Electrical Actuator — Model No: P912

Used for electrical actuation. Operates when supplied with a 110Vac 60Hz signal. Other voltages are available.

3. Air Timer Actuator — Model No: P908

Used to actuate repeatedly at a set cycle rate. Air Operated. Actuates continously while air is applied. Cycle rate set by screwdriver in a recessed slot.

Electronic Actuators

These Actuators are rugged, Solid-State Electronic devices. They all activate by magnetic pick-up or limit switch. The features of each are described below.

4. Count Down Actuator — Model No: E310

Actuates after being triggered a given number of times. Count is settable from 1 to 99. Includes a time delay for controlling the moment of actuation after triggering.

5. Pulsating Actuator — Model No: E305

Actuates a set number of times when triggered. Time between actuations is adjustable, allowing the pulses to be spread over a given period of time. Includes a time delay for controlling the start of pulsation after triggering.

6. Timer Actuator — Model No: E315

Actuates continously at a set cycle rate. Can be set for remote control so that actuation stops when machine does.

7. Electronic Actuator — Model No: E300

Is a combination of the Counter and Pulsator described above. Counts from 1 to 9. Pulsation time and duration have separate adjustments. Either or both features are selectable. Includes time delay to control the moment of actuation.

C. The Velocity Control.

This part and it's seals see little or no use. Do not remove part unless damaged or it is leaking air. If so, do as follows.

- Unscrew **VELOCITY CONTROL(41)** from **VALVE HOUSING(32)** to check **O-RING(31)** and **BACKUP RING(40)**.
- Repair or replace as required and re-assemble in reverse order.

D. Re-assemble the UniValve as follows.

- Clean the bore in **VALVE HOUSING(32)** as well as is practical.
- Apply a coat of light machine oil to all parts.
- Insert **VALVE SPOOL(36)** into **VALVE HOUSING(32)** making sure **O-RING(35)** is not pinched (give this **O-RING** special attention because of it's loose fit). Install **VALVE PLUG(38)** and retain with **RETAINER RING(39)**. Install **PIPE PLUG(42)** and torque to 60-80 in.lbs.

E. Re-connect the Air Supply and Actuator, and test operation.

B. Nozzle Assemblies

NOZZLE ASSEMBLIES are available in various types and spray patterns. A simple description of each type is given below, followed by a chart of Catalog Numbers for each type and spray pattern.

1. SprayNozzles — Model No's P20x

Consist of a Nozzle Tip and a Check to prevent after dripping.

2. FlexTubes — Model No's 21x

Consist of a SprayNozzle (above) attached to a Sta-Put Flex-Tube.

3. MagnaTubes — Model No's P22x

Consist of a FlexTube (above) mounted on a magnetic base.

Nozzle Tip	SprayNozzle	FlexTube	MagnaTube
110° Fan Spray	P-201	P-211	P-221
80° Fan Spray	P-202	P-212	P-222
60° Fan Spray	P-203	P-213	P-223
25° Fan Spray	P-205	P-215	P-225
55° Cone Spray	P-207	P-217	P-227
Rt. Angle Spray	P-209		

C. HyPressure Tubing — Model No: P940

Supplied for use as flexible **DISTRIBUTION LINE**. This is the only flexible tubing we have found capable of giving satisfactory performance. Has 1/4" O.D. which adapts to **NOZZLE ASSEMBLIES**.

D. NozzleBracket — Model No: P925

Used to support the **SPRAYNOZZLE**. Gives complete control for aiming the **SPRAYNOZZLE**. Moves up/down 5", tilts 180°, and rotates 360°. Mounts on **MagnaBase** for yet more convenience.

E. MagnaBases

Holds **ACCESSORIES** for easy positioning and adjustments.

1. MagnaBase — Model No: P905

Holds with a force of 100 pounds on bare metal.

2. DualMagnaBase — Model No: B909

Holds with a force of 200 pounds on bare metal.

F. Fluid Reservoir --- Model No: P315

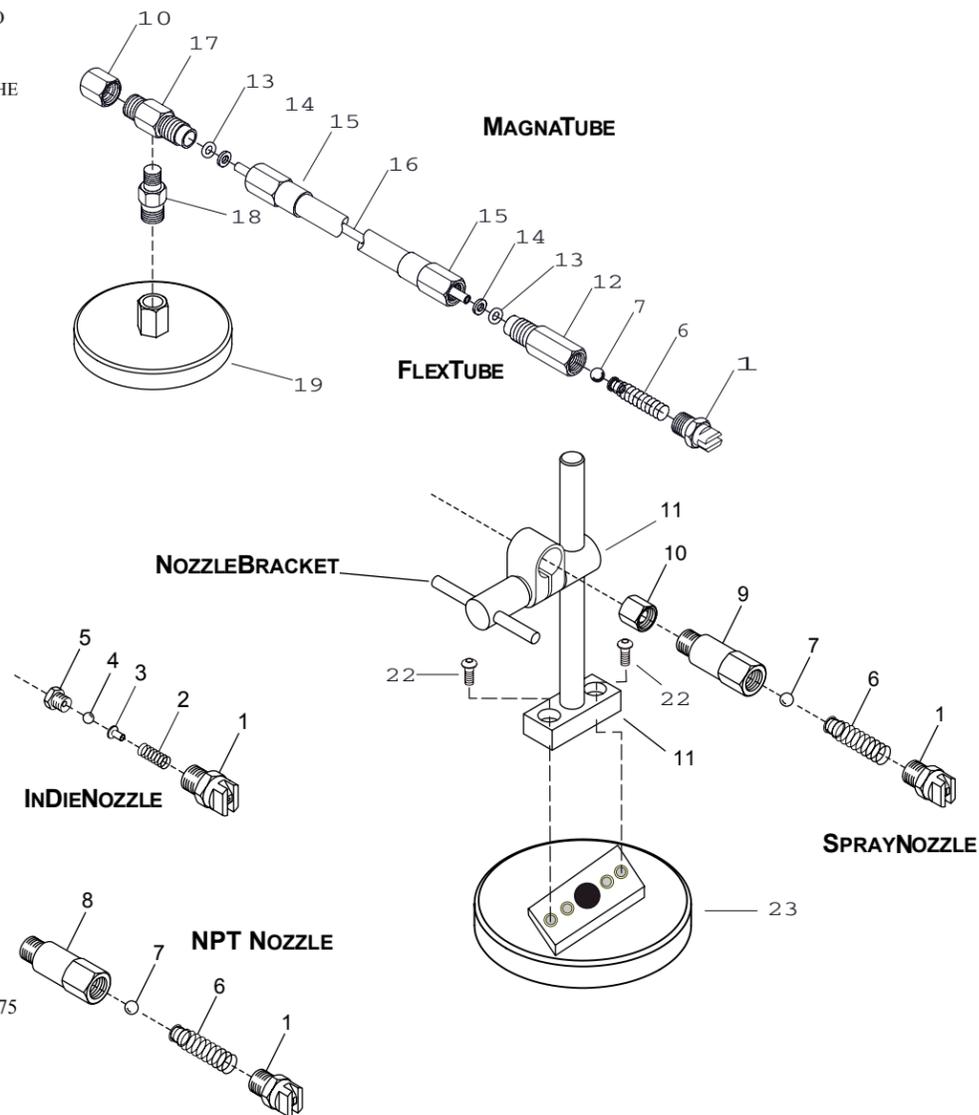
For use as a container for supplying the lubricant to be dispensed. Consists of a 5 Gallon container with sight-glass, snap-on lid, filtered outlet, and mounting hardware.

PARTS LIST "E"

USE THE APPROPRIATE FIGURE AT THE RIGHT TO IDENTIFY THE PART BY IT'S KEY NO.

USING THE KEY NO. AND TABLE BELOW, FIND THE PART NUMBER, NO. OF PIECES USED, AND THE DESCRIPTION OF THE PART NEEDED.

KEY NO.	NUMBER	PCS	-OR-	PART NAME	DESCRIPTION
	NOZ-101	1		NOZZLE, 110° FAN:	
	NOZ-102	1		NOZZLE, 80° FAN:	
1	NOZ-103	1		NOZZLE, 65° FAN:	
	NOZ-104	1		NOZZLE, 25° FAN:	
	NOZ-105	1		NOZZLE, 55° ROUND:	
	NOZ-106	1		NOZZLE, SIDE FAN:	
2	SPG-005	1		SPRING,CHECK:	
3	EYE-001	1		EYELET,CHECK	
4	BAL-021	1		BALL,CHECK:	
5	SET-019	1		SEAT,CHECK:	
6	280-SPG-01	1		SPRING ASSEMBLY:	
7	BAL-022	1		BALL,CHECK:	
8	HSG-050	1		HOUSING,CHECK	
9	HSG-020	1		HOUSING,CHECK	
10	FIT-017	1		FITTING,NUT:	
11	290-BRK-02	1		BRACKET ASSY:	
12	HSG-036	1		HOUSING,CHECK:	
13	RGO-006	2		O-RING,SEAL:	
14	RGB-006	2		RING,BACKUP:	
15	281-TUB-01	1		FLEXTUBE ASSY:	
16	TUB-011	1		TUBE,COPPER:	
17	ADP-041	1		ADAPTER,MOUNTING:	
18	BRK-014	1		BRACKET,MOUNTING	
19	282-BAS-07	1		MAGNETIC BASE	
22	SCR022	1		SCREW, BUTTON Hd: 10X24-.875	
23	207BAS05	1		MAGNETIC BASE	



Inspecting the Distribution System

Refer to PARTS LIST "E" for Key No's shown in parenthesis.

A. The DISTRIBUTION LINE

This LINE is very important to good performance. Check that it is of the proper type. See **INSTALLATION INSTRUCTIONS** at Step "D".

If this LINE is metal, check for kinks or crimping that may have closed it off. If it is flexible LINE, check it for cuts or cracks.

In either case, check all connections to insure they are air tight.

B. The NOZZLE TIP

NOTE: Whenever a Nozzle Tip (#1) is removed, the Check Ball (#4, #7) should be replaced. In time, the Ball takes a "set" and will not seat properly once disturbed.

1. Unscrew the Nozzle Tip (#1). Caution, this Tip is spring loaded.
2. Inspect the Check Spring (#2, #6). Replace if broken or deformed.
3. Clean the Nozzle Tip (#1) and blow dry. Inspect by looking through it. If you do not see a tiny, uniformly shaped hole, there is a clog.

Tips on unclogging a Nozzle Tip:

...Try to dislodge it with a high pressure stream directed backward to the normal flow through the Nozzle.

...If you must use a tool, use one as "soft" as possible (plastic, fiber)

...Apply no more pressure than necessary. The Tip is easily damaged.

Some clogs are impossible to get out without harming the Tip. Keep a spare Nozzle Tip handy for such cases.

4. At re-assembly, clean the Nozzle Tip of all residue and apply thread sealant. Torque to 80-120 in.lbs.

C. The FLEXTUBE \ MAGNATUBE

A FlexTube or MagnaTube may be clogged or leaking. These problems are handled differently as described below.

1. Checking for a clogged FlexTube.

First do Step "B" above. Do no more dis-assembly. Check for the clog by running a wire or blowing through the Copper Tube (#16).

2. Repairing a leaking FlexTube.

- a. Unscrew the Check Housing (#12) from the FlexTube (#15).

NOTE: Removing the Nozzle Tip (#1) is not necessary.

- b. Unscrew the FlexTube (#15) from the Mounting Adapter (#17).
- c. Remove the two small "O"Rings(#13) and Backup Rings(#14). See if they are dirty, cut, or deformed. Clean or replace as needed.
- d. Check the surfaces where these "O"Rings seal. If scratched or marred, have smoothed or replace the part.
- e. Re-assemble in reverse order, and torque parts to 60-80 in.lbs.

NOTE: Do not remove the Copper Tube (#16) from FlexTube (#15) unless one or the other needs replacing. If it is necessary, be careful to not mar the soft Copper Tube which is easily scratched.

OPERATING INSTRUCTIONS

A. Supply the Fluid to be Sprayed

Do as described below per the method you are using to supply fluid to the MacroSpray.

1. If Using a Reservoir (Gravity Feed)

Fill the RESERVOIR with the fluid to be sprayed. The fill level must be above the top of the MacroSpray.

2. If Using a Pump (Pressure Feed)

Insure there is fluid for the PUMP. Activate the PUMP. Open the FLUID SUPPLY LINE to the MacroSpray (open valve, connect disconnect, etc.)

B. Prime the MacroSpray

1. If Using a Reservoir.

Open the BLEED VALVE by turning it's knob counter-clockwise. Keep the BLEED VALVE open until fluid flows from the hole in it's side. When this fluid is void of air bubbles, close the BLEED VALVE and tighten securely.

2. If Using a Pump.

Do as above, but be aware the fluid is under pressure. This can get messy if not done cautiously. It is best to place a towel over the area.

C. Supply the Operating Air

Connect or turn on the AIR SUPPLY to the MacroSpray.

D. Set the Controls

Fully open the VOLUME CONTROL and VELOCITY CONTROL by turning their knobs counter-clockwise until they stop. If an AIR REGULATOR is present, set it for maximum air pressure.

E. Operate the MacroSpray

Operate the ACTUATOR to cycle the MacroSpray. Continue this cycling until fluid is ejected at the SPRAYNOZZLE. If this does not eventually happen, return to Step B. and prime again.

F. Purge all Trapped Air

Initial sprays are normally of poor quality and drip. This is due to air in the system. Continued cycling should drive this air out, with the spray changing to a fine burst with no drip at all. If this does not eventually happen, continue at Step H. below.

G. Make Adjustments

1. Aim the SprayNozzle

Position the SPRAYNOZZLE so that it's spray is giving the desired coverage.

2. Reduce the Amount of Fluid used.

Adjust the VOLUME CONTROL until the desired amount of fluid is being dispensed. Once set, secure this CONTROL in place with the LOCK NUT.

3. Reduce the Operating Air Pressure.

If an AIR REGULATOR is present, reduce pressure until spray quality begins to deteriorate or the MacroSpray begins to malfunction; then increase the pressure 10 to 15 P.S.I. above that point. This insures sufficient power at economical air consumption.

4. Adjust the Velocity Control

The VELOCITY CONTROL adjusts the speed of ejection. Using very light fluids or high air pressures, the spray might be so violent and atomized so fine that it "bounces off" causing "fogging". Adjust the VELOCITY CONTROL to tune out this problem.

H. Poor Spray Quality

If poor spray quality persists, see the following for descriptions of the most common causes.

1. Incorrect Distribution Line being used.

If the DISTRIBUTION LINE being used is of improper material, or is too long in length, it may be too "soft". Meaning that the LINE expands too much during ejection, absorbing some of the force required for a good spray. After ejection, it contracts again, to squeeze out an after-drip. For additional information see **INSTALLATION INSTRUCTIONS** at Step E.

2. Air is Drawn into the System.

During operation the system sees a vacuum. Connections which are not air tight may allow air to be sucked in. Use thread sealant on all fittings and piping, and make all tube connections properly and tight.

3. Air is Introduced into the System.

The problem need not necessarily be at the MacroSpray.

If a RESERVOIR is left to run dry, or a PUMP leaks and pumps air, or the FLUID SUPPLY LINE becomes punctured or is cracked, etc.... are a few ways in which air might be introduced into the System from external sources.

4. Air is Trapped in the System.

The following examples show how "pockets" can trap air in the System. They do not show every possible situation, but give an idea of what to look for.

Example #1:

If a portion of the system has been fabricated, configurations such as those shown in Fig #1 can trap air in the system.

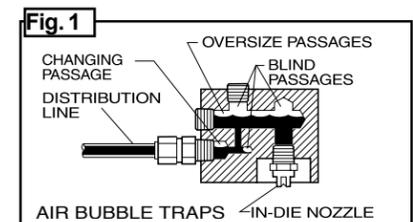
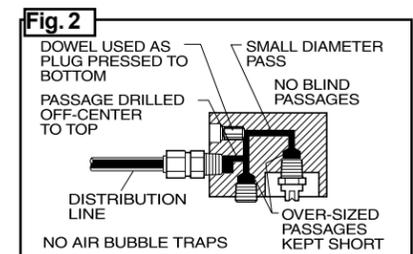


Fig #2 shows the same system without the potential problems of the one above it.

NOTE:

We recommend that you contact L.S.P. if you plan to fabricate a portion of the System.

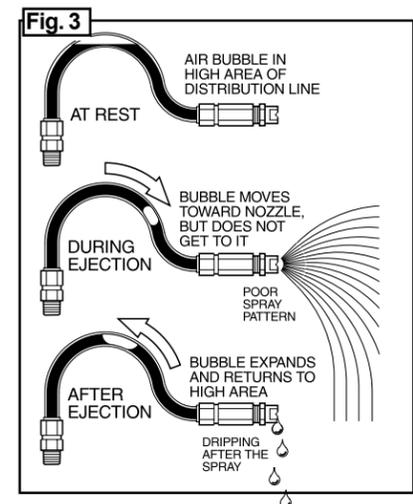


Example #2

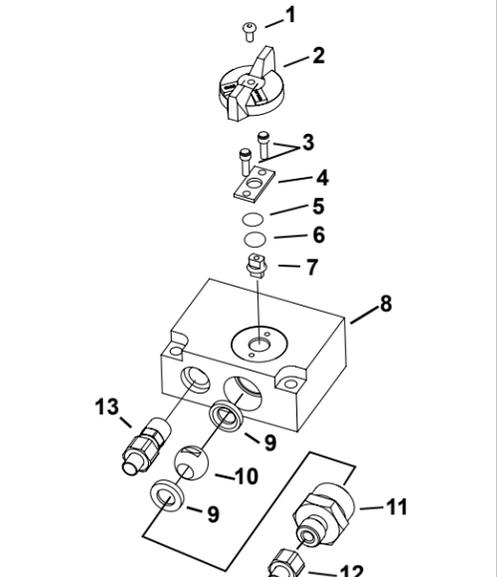
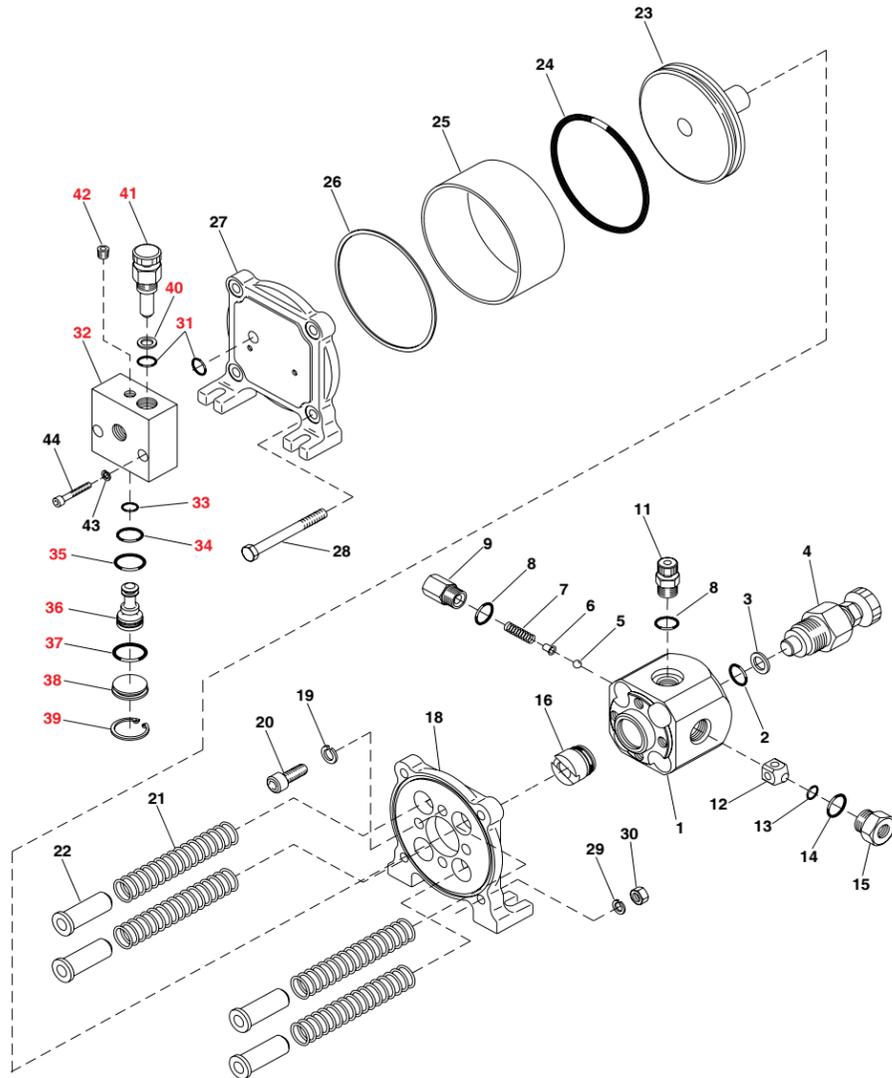
A high area in the DISTRIBUTION LINE can keep an air bubble from being ejected. See Fig #3.

To cure the problem, try cycling at a fast rate and at full volume to drive the bubble up to the SPRAYNOZZLE.

If that doesn't work, raise the NOZZLE (or lower the LINE) so that the bubble will run up to the NOZZLE to be expelled.



REPLACEMENT PARTS LIST



To eliminate redundant parts in the drawing we have used the 2 port Manifold in place of the 4 port manifold. Just one valve system is shown in place of three valve systems.

PART LIST "B" 290-MAN-10 Manifold Assembly (reference Figure #2)

Key Part No.	No. Number	No. Pcs	Description -or- Part Name
1	SCR-060	3	SCREW, Button Head
2	MLD-051	3	MOLDING, Knob: small
3	SCR-086	6	SCREW, Cap: soc hd.
4	PLT-071	3	PLATE, Retainer: small
5	RGB-032	3	RING, Backup: solid
6	RGO-057	3	RING, "O": seal.
7	STM-002	3	STEM, Valve: on/off.
8	HSG-227	1	HOUSING, Valve.
9	SET-036	6	SEAT, Valve: on/off
10	BAL-052	3	BALL, Valve: on/off.
11	OUT-014	3	OUTLET, Valve: 1/4 comp
12	FIT-017	3	CAP, 1/4 comp.
13	FIT-021	1	FITTING, Adapter

Key No.	Part Number	Qty Used	Description of Part
1	BRL-040	1	BARREL
2	RGO-077	1**	SEAL, O-RING
3	RGB-023	1**	BACKUP RING
4	250-SCR-01	1	VOLUME ADJUST
5	BAL-023	1**	CHECK BALL 3/8"
6	EYE-005	1**	BALL SEAT 3/8"
7	SPG-031	1**	CHECK SPRING 3/8"
8	RGO-012	2**	SEAL, O-RING
9	OUT-007	1	FLUID OUTLET
11	250-VAL-02	1	VALVE, BLEEDER
12	CHK-010	1**	INLET CHECK
13	RGO-053	1**	SEAL, O-RING
14	RGO-066	1**	SEAL, O-RING
15	INL-023	1	FLUID INLET
16	250-SLV-02	1**	SEAL ASSEMBLY
18	PLT-053	1	FRONT PLATE
19	WAS-012	4	WASHER, LOCK
20	SCR-062	4	SCREW, CAP
21	SPG-032	4**	RETURN SPRING
22	GID-015	4	SPRING GUIDE
23	250-PIS-01	1	PISTON & RAM
24	RGO-078	1**	SEAL, O-RING
25	CYL-043	1	AIR CYLINDER
26	RGB-024	1**	SEAL, CYLINDERE
27	PLT-054	1	BACK PLATE

Key No.	Part Number	Qty Used	Description of Part
28	SCR-063	4	TIE ROD SCREW
29	WAS-013	4	WASHER, LOCK
30	NUT-012	4	NUT, HEX
31	RGO-007	2**	SEAL, O-RING
32	250-HAI-01	1	VALVE HOUSING
33	RGO-065	1**	SEAL, O-RING
34	RGO-075	1**	SEAL, O-RING
35	RGO-060	1**	SEAL, O-RING
36	SPL-028	1	VALVE SPOOL
37	RGO-042	1**	SEAL, O-RING
38	PLG-023	1	VALVE PLUG
39	RGR-037	1**	RING, RETAINER
40	RGB-020	1**	RING, BACKUP
41	250-SCR-02	1	VELOCITY ADJUST
42	FIT-022	1	PLUG, PIPE
43	WAS-002	2	WASHER, LOCK
44	SCR-070	2	SCREW, CAP
	250VAL01	1	VALVE, AIR

ITEMS IN RED SHOW ALL PARTS FOR A COMPLETE AIRVALVE

NOTE: Items marked (**) are available in a Repair Kit under the Part No. 250-ACY-02

INSPECTING the MacroSpray

See REPLACEMENT PARTS for Key No's shown in parenthesis.

A. Inlet Check Valve

The function of the INLET CHECK VALVE is to allow fluid from the FLUID SUPPLY LINE to enter the MacroSpray, and not allow it back out again.

1. Remove the FLUID INLET(15) from the BARREL(1).
2. Clean FLUID INLET(15) and check small O-RING(13) inside. Do not remove this O-RING unless it is cut or broken. If bad, do not scratch the groove while prying it out.
3. Check the passages in FLUID INLET(15) and BARREL(1) for obstruction.
4. Remove CHECK(12), and see if it is cut, pitted, or deformed.
5. Check if O-RING(14) on FLUID INLET(15) is cut or broken.
6. Replace parts found to be bad. Clean all parts. Re-assemble in reverse order. Make sure CHECK(12) is oriented correctly and moves freely in it's hole. Torque FLUID INLET(15) to 150-200 in.lbs.

B. Outlet Check Valve

The function of the OUTLET CHECK VALVE is to allow the fluid in the MacroSpray out into the DISTRIBUTION LINE, and not to allow it back in again.

1. Disconnect the DISTRIBUTION LINE from the MacroSpray.
2. Remove FLUID OUTLET(9) from BARREL(1).
Caution: this fitting is spring loaded...be prepared.
3. Check if CHECK SPRING(7) is broken or deformed.
4. Check if CHECK BALL(5) is cut, pitted, or deformed.
5. Check if O-RING(8) on FLUID OUTLET(9) is cut or broken.
6. Replace any parts found bad. Clean all parts. Re-assemble in reverse order. Torque FLUID OUTLET(9) to 100-150 in.lbs.

C. Inspecting for Air Leaks

The following gives reference to the most common causes for air leaking into the MacroSpray.

1. See Step A. above, check O-RING(14) as directed at Line 5.
2. See Step B. above, check O-RING(8) as directed at Line 5.
3. Remove the BLEEDER VALVE(11). Check if either O-RING(8) or O-RING(10) is cut, broken, or worn. Replace if bad.
4. Remove VOLUME ADJUST(4) from end of BARREL(1). Check if O-RING(2) is cut or broken. Replace if bad.
5. Check the rod through the middle of VOLUME ADJUST(4) for contamination, scoring, or deformation. Clean, repair, or replace as necessary.
6. See Step D. below, check SEAL ASSEMBLY(16) as directed at Line 8.

D. Dis-assembly of the MacroSpray

If the MacroSpray must be taken apart, do as follows.

1. Remove four TIE ROD SCREW(28)'s holding BACK PLATE(27) to FRONT PLATE(18). When doing this, the parts may be pushed apart from pressure supplied by RETURN SPRINGS(21); if not, they are stuck together. If stuck, gently tap them apart.
Caution: these parts are spring loaded and may fly apart when loosened...be prepared.
2. Remove, clean, and inspect each part as instructed below. Do not remove an O-RING from it's groove unless found bad. If bad, do not scratch the groove while prying it out.
3. Remove BACK PLATE(27). Check SEAL RING(26). This Ring acts as a gasket, not an O-Ring. Check for tears and cuts.

4. Remove AIR CYLINDER(25). Check the outside for dents and dings. Check the inside diameter for scoring.
5. Remove PISTON & RAM(23). Check O-RING(24). Check finish of RAM (small diameter rod) for scoring and nicks. Check the PISTON (larger diameter) for deformation.

6. Remove four RETURN SPRING'S(21). Check each for deformation and breakage. Inspect the holes which locate these SPRINGS in BARREL(1) and in PISTON & RAM(23) for excessive wear or elongation.

7. Remove SEAL ASSEMBLY(16).
1. This Seal assembly is screwed into the barrel. If doing a rebuild a rectangular steel blank is included with the Repair Assembly Kit. This with a crescent wrench can be used as the screw driver to remove the Seal Assembly. If not using an Assembly Repair Kit we suggest you make your own simple blank to act as a screw driver.

2. Check the O-RINGS on the inside and outside of this part for cuts, nicks, or excessive wear. If any O-RING is bad, replace the entire SEAL ASSEMBLY(16).

9. There should be no need to remove FRONT PLATE(18) from BARREL(1) unless there is breakage or deformation to the four CAP SCREW'S(20) or LOCK WASHER'S(19). Do check that these SCREWS are tight.

E. Re-assembly of the MacroSpray

When putting the MacroSpray together again, do as follows:

1. If re-using SEAL ASSEMBLY(16), clean it thoroughly. A new SEAL ASSEMBLY comes with O-RINGS installed and ready for use. It is always recommended that a Loctite* type sealant be applied to the seal prior to inserting into barrel. Screw into BARREL(1) using the blank, as a screw driver, in the Assembly Repair Kit or a blank made at your shop.



2. Insert four RETURN SPRING'S(21) into BARREL(1). Put a SPRING GUIDE(22) into each.
3. Apply a light coat of oil or grease to RAM and O-RING(24) on PISTON & RAM(23).

NOTE: When doing the following, you will be fighting the spring pressure from the RETURN SPRINGS. The assembly order given below may be altered to compensate if desired.

4. Install PISTON & RAM(23) such that the SPRING GUIDE'S(22) nest in the holes in the PISTON, and the RAM aligns with, and slides into the SEAL ASSEMBLY(16).
5. Install AIR CYLINDER(25) over the PISTON & RAM(23), making sure O-RING(24) is not pinched.
6. Install BACK PLATE(27) onto AIR CYLINDER(25), making sure SEAL RING(26) is in it's groove and not pinched.
7. Attach BACK PLATE(27) to FRONT PLATE(18) using four TIE ROD SCREW'S(28) and HEX NUT'S(30) with LOCK WASHER'S(29). Tighten SCREWS and NUTS evenly (one turn to each at a time) so that the parts are drawn together squarely. Torque SCREWS to 80-100 in.lbs.

*LOCTITE IS A REGISTERED TRADEMARK OF THE LOCTITE COMPANY.