Service Guide

9970

Medium-Pressure Stub Pump

Description

The major components of pump model 9970 consist of an air-operated motor and a double-acting reciprocating pump tube. The pump tube is divorced from the motor which:

- allows separation without product leakage
- protects the motor from product contamination

This medium-pressure pump (10:1 ratio) is designed to deliver a wide range of products that are compatible with Buna-N and urethane seals.

Mounting

This pump mounts directly onto original containers or bulk tanks that have a 2 " NPTF bung fitting. The required length downtube screws directly into the 1-1/2 " NPTF female threads in the foot valve body.

As an alternative, the pump can attach to a wall (with the use of a wall bracket) and be used with an optional suction hose. See **Table 2** for details.

Specifications

Air Motor

Piston Diameter x Stroke		Air Inlet	Maximum Air Pressure	
Inches	Centimeters		psi	Bars
3 x 3-5/16	7.6 x 8.4	1/4 " NPTF (f)	150	10.3
For details on the air motor, refer to Service Guide SER **339413**				

Pump Tube

Material Inlet	Material Outlet	Max. Material Pressure		Delivery/Minute (Approximate)*		Displacement per Cycle	
		psi	Bars	Gallons	Liters	In ^{3}	Cm ^{3}
1 " NPTF (f)	3/8 " NPTF	1500	103	3.6	13.6	3.7	60.6
* For detailed information, refer to **Figure 3**							

Table 1 *Medium-Pressure Stub Pump Specifications*

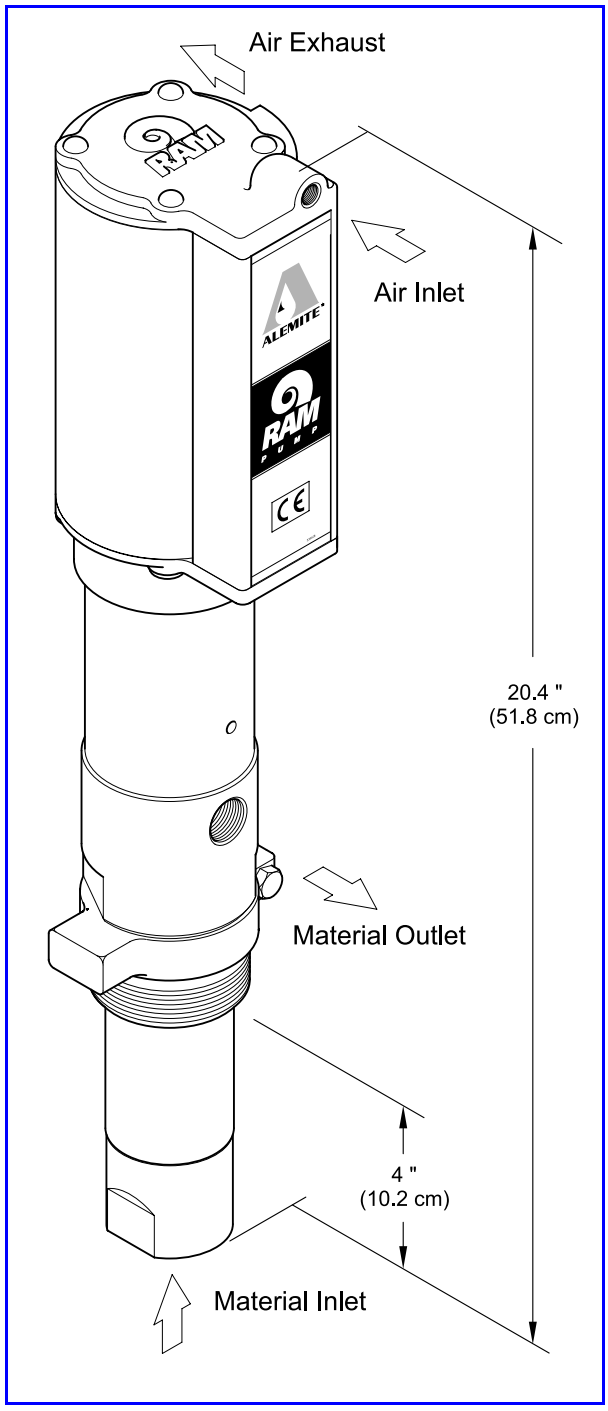

Figure 1 *Medium-Pressure Stub Pump Model 9970*

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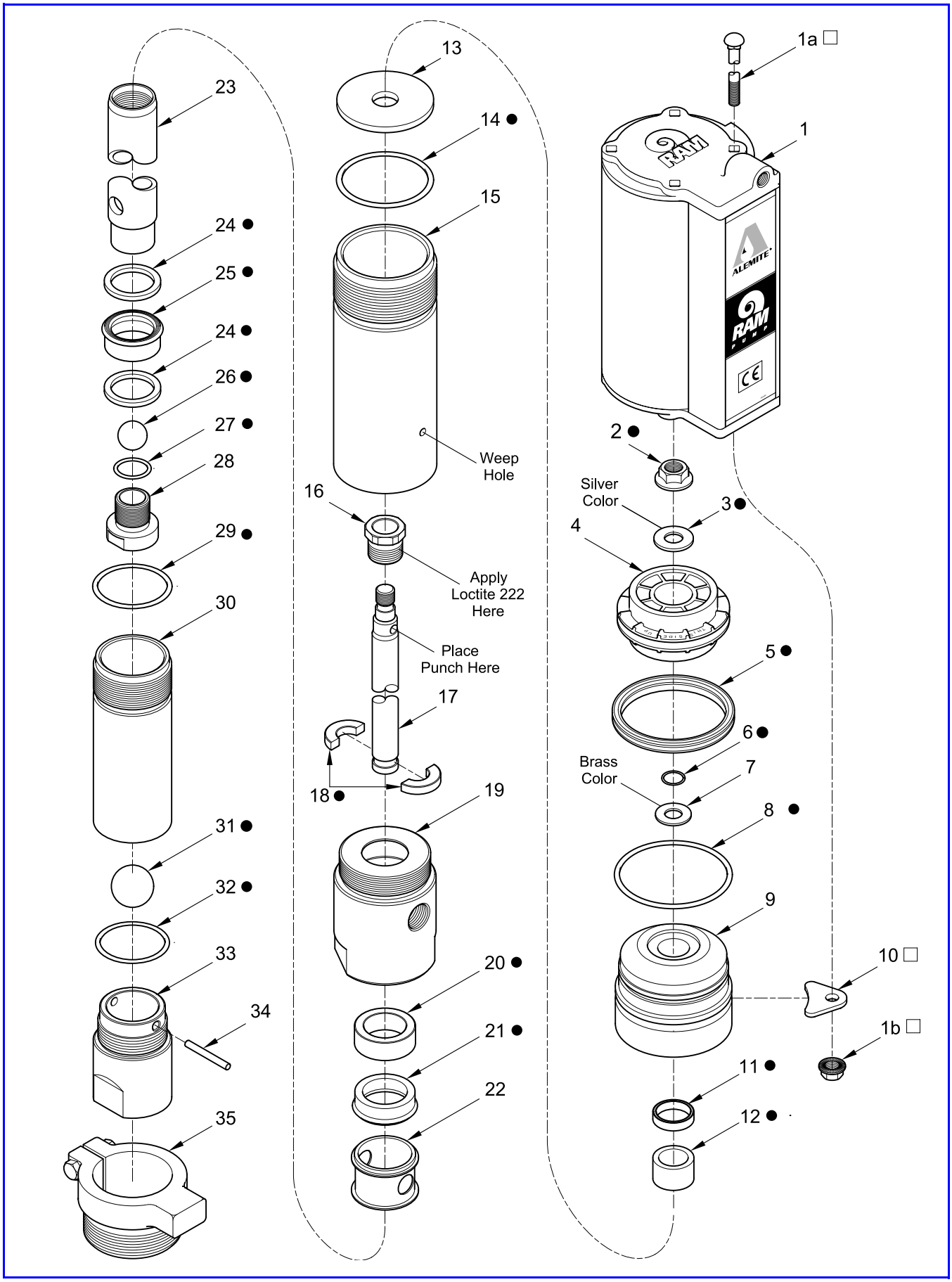


Figure 2 *Medium-Pressure Stub Pump Model 9970 - Exploded View*

Item No.	Part No.	Description	Qty	Notes		Numeric Order Part # (Item #)
1		Motor Assembly, Air	1		See SER **339413**	*14536* (3)
1a		Bolt, Carriage, 1/4 " -20 x 7-1/2 "	4	□	Included w/ Motor Assembly	X171000-7 (6)
1b		Nut, Serrated Flange, 1/4 " -20	4	□		X171003-10 (8)
2	339513	Nut, Flange, 3/8 " -24	1	●		X171008-37 (5)
3		Washer, 3/8 " ID x 7/8 " OD	1	●		X171009-3 (27)
4	339429	Piston, Air	1			X171009-23 (32)
5	X171008-37	Quad-Ring, 2-5/8 " ID x 3 " OD	1	●	Pack of Ten (10)	X171009-40 (14)
6	X171000-7	O-Ring, 3/8 " ID x 1/2 " OD	1	●		X171013-26 (29)
7	338109	Washer, 3/8 " ID x 3/4 " OD	1			*171700-32* (26)
8	X171003-10	O-Ring, 2-3/4 " ID x 3 " OD	1	●	Pack of Ten (10)	*171700-48* (31)
9	338301	Body, Upper	1			*172190-28* (25)
10	339412	Keeper	4	□		*172190-29* (21)
11		Seal, 1/2 " ID x 3/4 " OD	1	●		326750-E1 (35)
12		Bearing (Brass)	1	●		338109 (7)
13	338302	Washer	1			338278-2 (34)
14	X171009-40	O-Ring, 2-1/4 " ID x 2-7/16 " OD	1	●	Pack of Ten (10)	*338280* (12)
15	338300	Guard	1			338292 (19)
16	338330	Bushing	1			338293 (17)
17	338293	Rod, Upper	1			338294 (30)
18		Washer, Split	2	●		*338295* (20)
19	338292	Body. Lower	1			338296 (22)
20		Bearing (Brass)	1	●		338297 (28)
21		Seal, 0.937 " ID x 1.312 " OD	1	●		338298 (33)
22	338296	Spacer	1			*338299* (24)
23	338329	Rod, Lower	1			338300 (15)
24		Washer (Nylon)	2	●		338301 (9)
25		Seal, 7/8 " ID x 1-1/4 " OD	1	●		338302 (13)
26		Ball	1	●		*338308* (11)
27	X171009-3	O-Ring, 9/16 " ID x 11/16 " OD	1	●	Pack of Ten (10)	338329 (23)
28	338297	Seat, Valve	1			338330 (16)
29	X171013-26	O-Ring, 1-3/8 " ID x 1-9/16 " OD	1	●	Pack of Ten (10)	*338331* (18)
30	338294	Tube	1			*339375* (1b)
31		Ball	1	●		339412 (10)
32	X171009-23	O-Ring, 1-3/16 " ID x 1-3/8 " OD	1	●	Pack of Ten (10)	*339413* (1)
33	338298	Body, Valve	1			*339425* (1a)
34	338278-2	Pin, 1/4 " Dia. x 1.18 " Long	1			339429 (4)
35	326750-E1	Adapter Assembly, Bung	1			339513 (2)

Legend:
Part numbers left blank (or in *italics*) are not available separately
● □ designates a repair kit items

Repair Kits

Part No.	Kit Symbol	Description
393587-1	●	Kit, Major Repair [Includes tube of 393590 Teflon Grease]
393708	□	Kit, Keeper
393530-28		Kit, Seal [includes five (5) of item number **25**]
393530-29		Kit, Seal [includes five (5) of item number **21**]

Accessories

Extension Description	Drum			Tank	
	16-Gallon	55-Gallon	200/205 liter	250-Gallon Bench-Top	275-Gallon Obround
V-Cut	338147-3	338147-4		338147-8	338147-9
Threaded at both ends *	338246-3	338246-4		338246-8	338246-5
*** NOTE**: For use with low level cut-off valve part number 321206					
Additional Accessories					
Low Level Cut-Off Valve	321206				
Siphon Kit	SWA 306				
Wall Bracket	325749				
Metal Discharge Hose (4-Feet)	338360				

Table 2 *Model 9970 Accessory Components*

Performance Curves

A pump's ability to deliver material is based on the pressure (psi/Bars) and quantity (cfm/lpm) of air supplied to the motor and the amount of material discharge [back] pressure to be overcome within the system.

This chart contains curves based on three different air pressures. The curves relate delivery in gallons (liters) per minute (X axis) to air consumption in cubic feet (liters) per minute (right Y axis) and to material discharge pressure in psi/Bars (left Y axis).

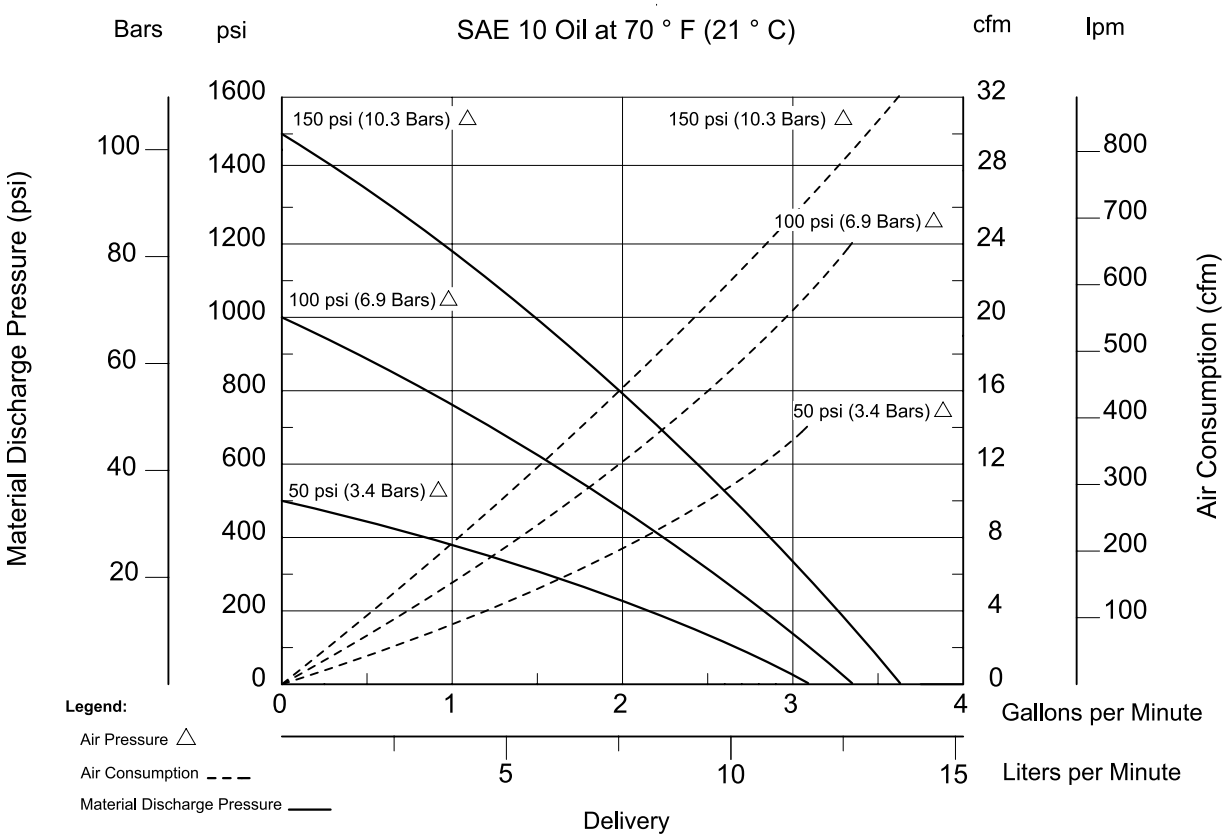


Figure 3 *Delivery versus Discharge Pressure and Air Consumption*

Overhaul

NOTE: Refer to **Figure 2** for component identification on all overhaul procedures.

Prior to performing any maintenance procedure, the following safety precautions must be observed. Personal injury may occur.

WARNING

Do not use halogenated hydrocarbon solvents such as methylene chloride or 1,1,1-trichloroethane in this pump. An explosion can result when aluminum and/or zinc-plated parts in the pump come in contact with halogenated hydrocarbon solvents.

Release all pressure within the system prior to performing any overhaul procedure.

- **Disconnect the air supply line from the pump motor.**
- **Into an appropriate container, operate the control valve to discharge remaining pressure within the system.**

Never point a control valve at any portion of your body or another person. Accidental discharge of pressure and/or material can result in injury.
Read each step of the instructions carefully. Make sure a proper understanding is achieved before proceeding.

Disassembly

Separate Air Motor from Pump Tube

1. Clamp the pump assembly in a soft-jaw vise at Bung Adapter (**35**).
2. Remove Nuts (**1b**) that secure Upper Body (**9**) to Air Motor Assembly (**1**).

   NOTE: The bottom end cap of the Air Motor Assembly remains on the pump tube during the next procedure.

3. With a side-to-side motion, pull the Air Motor Assembly from the Body.
4. Remove Keepers (**10**) from the Body.
5. Remove the bottom end cap from the Body.

Pump Tube Assembly

Air Piston Assembly

6. Remove Nut (**2**) and Washer (**3**) that secures Air Piston (**4**) to Upper Rod (**17**).

   NOTE: Place an appropriate size punch or other suitable tool into the hole of the Rod.

7. Remove the Air Piston from the Rod.
8. Remove Quad-Ring (**5**) from the Air Piston.
9. Remove O-Ring (**6**) and Washer (**7**) from the Upper Rod.

Guard and Upper Body Assembly

10. Unscrew Guard (**15**) from Lower Body (**19**).
    - Remove the Guard and Upper Body assembly from the Upper Rod.
11. Unscrew the Guard from Upper Body (**9**).
12. Remove O-Ring (**14**) from the Guard.
13. Remove Washer (**13**), Bearing (**12**), and Seal (**11**) from the Upper Body.
14. Remove O-Ring (**8**) from the Upper Body.

Rod Assembly

15. Unscrew Bushing (**16**) from Lower Rod (**23**).
16. Remove Upper Rod (**17**) from the Lower Rod.
    - Use care not to lose Split Washers (**18**).

Lower Body Assembly

17. Unscrew the Lower Body from Tube (**30**).
    - Remove the Lower Body assembly from the Lower Rod.
18. Remove Spacer (**22**), Seal (**21**), Bearing (**20**) from the Lower Body.

Lower Rod Assembly

19. Remove the Lower Rod (with attached components) from Tube (**30**).
20. Unscrew Valve Seat (**28**) from the Lower Rod.
21. Remove Ball (**26**) and O-Ring (**27**) from the Valve Seat.
22. Remove Washer (**24**), Seal (**25**), and additional Washer (**24**) from the Lower Rod.

Tube and Valve Body Assembly

23. Remove O-Ring (**29**) from the Tube.
24. Unscrew Valve Body (**33**) from the Tube.
25. Remove O-Ring (**32**) from the Valve Body.
26. Remove Pin (**34**) and Ball (**31**) from the Valve Body.
27. Remove Bung Adapter (**35**) from the Tube as required.

Clean and Inspect

1. Clean all metal parts in cleaning solvent. The solvent should be environmentally safe.
2. Inspect all parts for wear and/or damage.
   • Replace as necessary.
3. Inspect Air Piston (**4**) for fatigue cracks.
   • Replace as necessary.
4. Inspect Upper Rod (**17**) and Lower Rod (**23**) closely. Use a magnifying glass to detect any score marks.
   • Replace as necessary.
5. Closely inspect the mating surfaces of all check valve components for any imperfections. Ensure a smooth and clean contact is obtained when assembled.

   EXAMPLE: Place Ball (**31**) into Valve Body (**33**). Fill the Valve Body with solvent. Make sure no leakage occurs.

Assembly

NOTE: Prior to assembly, certain components require lubrication. Refer to **Table 3** for details.

Pump Tube Assembly

Upper Body

1. Install and seat Seal (**11**) [lip end first], Bearing (**12**), and Washer (**13**) into the bottom of Upper Body (**9**).
2. Install O-Ring (**8**) into the upper groove of the Upper Body.

Guard and Lower Body

3. Install O-Ring (**14**) below the threads on Guard (**15**).
4. Screw the Guard into the Upper Body.
   • Do not tighten at this time.
5. Screw Lower Body (**19**) into the Guard.
   • Tighten the Lower Body securely into the Guard and at the same time the Guard into the Upper Body.

   *IMPORTANT: Make sure the stepped end of Spacer (**22**) faces the lip of Seal (**21**).*
6. Install and seat Bearing (**20**), Seal (**21**) [heel end first], and Spacer (**22**) [stepped end first] into the Lower Body.

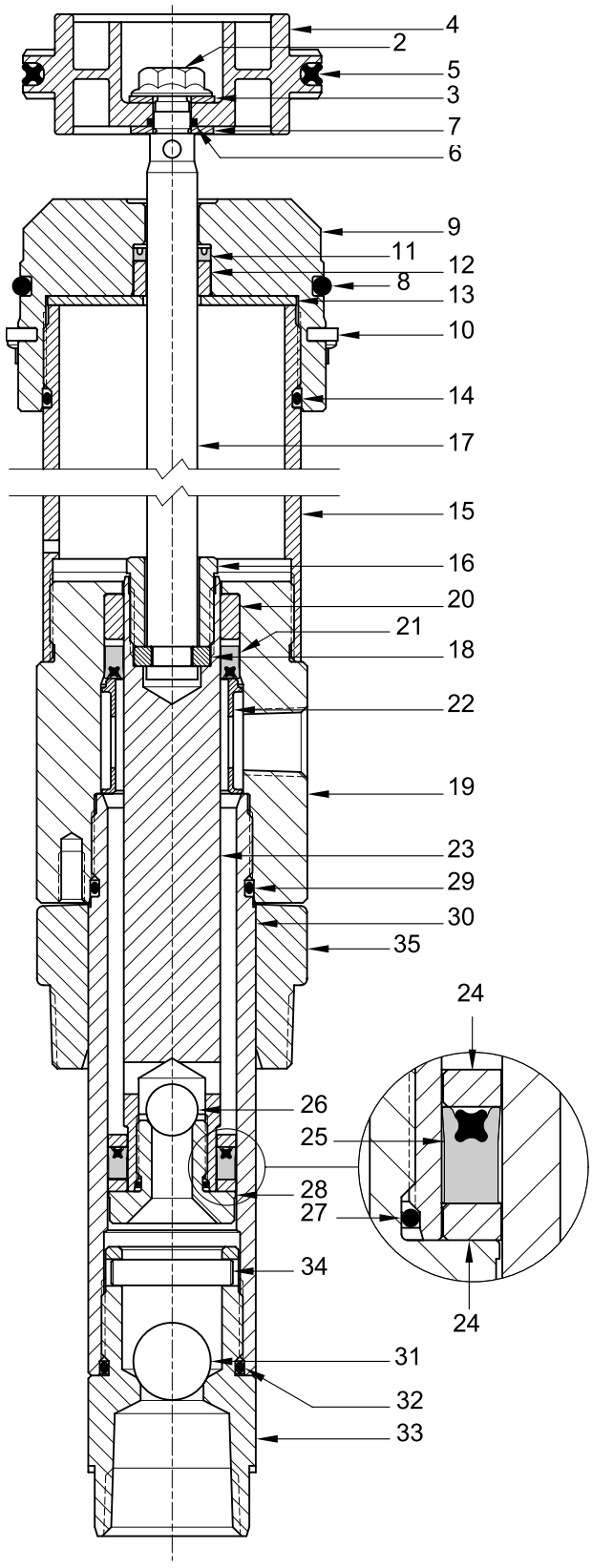
Rods

7. Install Split Rings (**18**) into the groove of Upper Rod (**17**).
8. Install the Rod assembly into Lower Rod (**23**).
9. Install Bushing (**16**) [with Loctite 222] onto the Upper Rod and into the Lower Rod.
   • Tighten the Bushing securely.

   NOTE: Place a tool in the hole of the Lower Rod to prevents its rotation.

Item No.	Description	Item No.	Description
Clean Oil			
6	O-Ring, 3/8 " ID x 1/2 " OD	21	Seal, 0.937 " ID x 1.312 " OD
8	O-Ring, 2-3/4 " ID x 3 " OD	25	Seal, 7/8 " ID x 1-1/4 " OD
11	Seal, 1/2 " ID x 3/4 " OD	27	O-Ring, 9/16 " ID x 11/16 " OD
14	O-Ring, 2-1/4 " ID x 2-7/16 " OD	29	O-Ring, 1-3/8 " ID x 1-9/16 " OD
		32	O-Ring, 1-3/16 " ID x 1-3/8 " OD
Magnalube-G Teflon Grease *			
5	Quad-Ring, 2-5/8 " ID x 3 " OD		
Coat the Inside Diameter of the Air Motor Assembly			
* Part number 393590 is a 0.75 ounce (21.8 gm) tube of Magnalube-G Teflon grease			

Table 3 *Lubricated Components*



Refer to **Figure 2** Parts List for Parts Identification

Figure 4 *Pump Tube (w/o Air Motor)- Section View*

10. Install and seat Washer (**24**), Seal (**25**), [lip end first], and additional Washer (**24**) onto the bottom of the Lower Rod.

11. Install O-Ring (**27**) onto Valve Seat (**28**).

12. Position Ball (**26**) onto the Valve Seat and screw the assembly into the Lower Rod.
    - Tighten the Valve Seat securely.

    NOTE: Place a tool in the hole of the Lower Rod to prevents its rotation.

CAUTION

Install the Upper and Lower Rod assembly into the pump assembly with a twisting motion. Use care not to damage the Seals.

13. Install the Upper and Lower Rod assembly into the bottom of the Lower Body.
    - Allow the upper Rod to extend from the Upper Body.

Tube and Valve Body

14. Install O-Ring (**29**) below the threads on Tube (**30**).

15. Screw the Tube into the Lower Body.
    - Use care passing the Seal on the Lower Rod.
    - Do not tighten the Tube at this time.

16. Install O-Ring (**32**) onto Valve Body (**33**).

17. Install Ball (**31**) and Pin (**34**) into the Valve Body.

18. Screw the Valve Body assembly into the Tube.
    - Tighten the Valve Body securely into the Tube and at the same time the Tube into the Lower Body.

19. Install Bung Adapter (**35**) onto the Tube.

Air Piston

CAUTION

Use care not to switch Washers (3 and 7). Component damage can occur.

20. Install Washer (**7**) [brass color], O-Ring (**6**), and Air Piston (**4**) [observe THIS SIDE UP] onto the Rod.

21. Install Washer (**3**) [silver color] and Nut (**2**) that secures the Air Piston to the Rod.
    - Tighten the Nut securely.
    - Place an appropriate size punch or other suitable tool into the hole of the Rod.

22. Install Quad-Ring (**5**) onto the Air Piston.

Attach Air Motor to Pump Tube

*IMPORTANT: The Air Motor Assembly must be secured with at least one Carriage Bolt (**1a**) and Flange Nut (**1b**) [preferably at the front].*

CAUTION

Install the RAM Air Motor Assembly with care. Damage to Quad-Ring (5) and/or O-Ring (8) can occur.

HINT: Angle the Air Motor Assembly onto the Quad-Ring and press the exposed portion into Air Piston (**4**) with your thumb or finger.

23. Install and seat the Air Motor Assembly onto Upper Body (**9**).
    - Make sure the outlet of the Body orients properly with the inlet of the Air Motor.
24. Attach the Air Motor Assembly to the Body of the pump tube with Keepers (**10**), Carriage Bolts, and Flange Nuts.

CAUTION

Do not overtighten Flange Nuts (1b). Component damage can occur.

25. Torque the Flange Nuts in a crisscross pattern from 60 to 70 inch-pounds (6.8 - 7.9 Nm).

Bench Test and Operation

1. Make sure air pressure at the regulator reads zero.
2. Slowly supply air pressure [recommended minimum of 25 psi (1.7 Bars)] to the pump's motor.
    - The pump assembly should cycle.

If the pump assembly does not cycle, refer to the **Troubleshooting Chart** for details.

With air pressure at zero:

3. Connect a product hose to the pump's material outlet.
    - Direct the hose into an appropriate collection container.
4. Place the pump in the product to be dispensed.
5. Slowly supply air pressure to the pump's motor.
6. Allow the pump to cycle slowly until the product is free of air.

If the pump assembly does not prime, refer to the **Troubleshooting Chart** for details.

WARNING

Should leakage occur anywhere within the system, disconnect air to the motor. Personal injury can occur.

With air pressure at zero:

7. Attach a control valve to the outlet hose of the pump.
    - Make sure the nozzle on the control valve is open.
8. Slowly supply air pressure to the pump's motor.
9. Allow the pump to cycle slowly until the product is once again free of air.
10. Set the air pressure to the normal operating pressure.
11. Operate the control valve into a container.
12. Shut off the control valve.
    - Visually inspect the pump for external leaks.
    - The pump should not cycle more than once or twice in one hour.

If the pump does not stall, refer to the **Troubleshooting Chart** for details.

13. Check the motor for air leakage.

If the motor leaks, refer to the **Air Motor Service Guide** for details.

Installation

Additional items that should be incorporated into the air piping systems are listed in **Table 4**.

Part Number	Description
5604-2	Moisture Separator
7604-B	Regulator and Gauge

Table 4 *Air Line Components*

Troubleshooting Chart

Pump Indications	Possible Problems	Solution
Pump does not cycle	1. Air motor not operating properly 2. Pump tube jammed and/or contains loose components 3. Insufficient air pressure	1. Inspect air motor and rebuild or replace as necessary 2. Rebuild pump tube 3. Increase air pressure
Pump will not prime	1. Excessive cycling speed 2. Pump leaking internally	1. Reduce air pressure 2. See **Internal Leaks**
Pump cycles rapidly	Product source empty	Replenish product
Pump will not stall (cycles more than once or twice per hour)	1. Pump requires break-in period 2. Pump leaking internally 3. Pump leaking externally 4. Distribution system leaking	1. Operate the pump against moderate fluid pressure for up to one hour 2. See **Internal Leaks** 3. See **External Leaks** 4. Correct leak
External Leaks		
Product leakage visible at weep hole in Guard (**15**)	1. Damaged Seal (**21**) 2. Damaged Lower Rod (**23**)	1. Replace Seal (**21**) 2. Inspect Lower Rod (**23**) and replace as necessary
Product leakage visible at bottom of Lower Body (**19**)	1. Tube (**30**) not sufficiently tight 2. Damaged O-Ring (**29**)	1. Tighten Tube (**30**) into Lower Body (**19**) 2. Replace O-Ring (**29**)
Product leakage visible at bottom of Tube (**30**)	1. Valve Body (**33**) not sufficiently tight 2. Damaged O-Ring (**32**)	1. Tighten Valve Body (**33**) into Tube (**30**) 2. Replace O-Ring (**32**)
Air leakage at weep hole in Guard (**15**) *	1. Damaged Seal (**11**) 2. Damaged Upper Rod (**17**)	1. Replace Seal (**11**) 2. Inspect Upper Rod (**17**) and replace as necessary
Internal Leaks		
Pump does not prime or cycles continuously, or slowly (once or twice/hour)	1. Foreign material between Ball (**26**) and Valve Seat (**28**) 2. Foreign material between Ball (**31**) and Valve Body (**33**) 3. Worn or damaged Ball (**26**) 4. Worn or damaged Valve Seat (**28**) 5. Worn or damaged Ball (**31**) 6. Worn or damaged Valve Body (**33**) 7. Worn or damaged Seal (**25**) 8. Worn or damaged O-Ring (**27**) 9. Worn or damaged Tube (**30**)	Locate and eliminate source of foreign material. Disassemble pump tube, clean, inspect, and replace worn or damaged components
* Pump may cycle once (on upstroke)		

Changes Since Last Printing

Changed Bench Test Air Pressure Setting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