Service Guide

7216-B

Low-Pressure Pump

Description

The major components of low-pressure pump model 7216-B consist of a reciprocating differential air motor and a double-acting pump tube.

It it designed to deliver petroleum-based fluids and synthetic oils.

This low-pressure (2:1 ratio) pump includes a 2 " PT (m) bung adapter that allows installation directly onto 55-gallon (200/205 l) drums.

The pump is also equipped with a low-level cut-off valve. Should the fluid level become low this valve prevents the pump from:

- operating at excessive speed and in a dry condition.
- pumping air. Aerated fluid will cause a meter to measure inaccurately.

Specifications

Differential Air Motor

Piston Diameter x Stroke		Effective Piston Area *		Air Inlet	Maximum Air Pressure	
In	Cm	In^2	Cm^2		psi	Bars
2-1/16 x 4	5.2 x 10.2	1.67	10.8	1/4 " NPTF (f)	200	13.8

For details on the air motor, refer to Service Guide SER **318450-4**.

See **Figure 3** for performance curves.

* The effective piston area of a differential air motor is equal to one-half the actual area of the piston.

Pump Tube

Fluid Outlet	Max. Fluid Pressure		Max. Free-Flow Delivery/Minute *		Recommended Continuous Delivery/Minute		Displacement per Cycle	
	psi	Bars	Gallons	Liters	Gallons	Liters	In^3	Cm^3
3/8 " NPTF (f)	400	27.6	7	26.5	4-1/4	16.1	5.4	88

See **Figure 3** for performance curves.

* At 100 psi (6.9 Bars) air pressure

Table 1 *Low-Pressure Pump Model 7216-B Specifications*

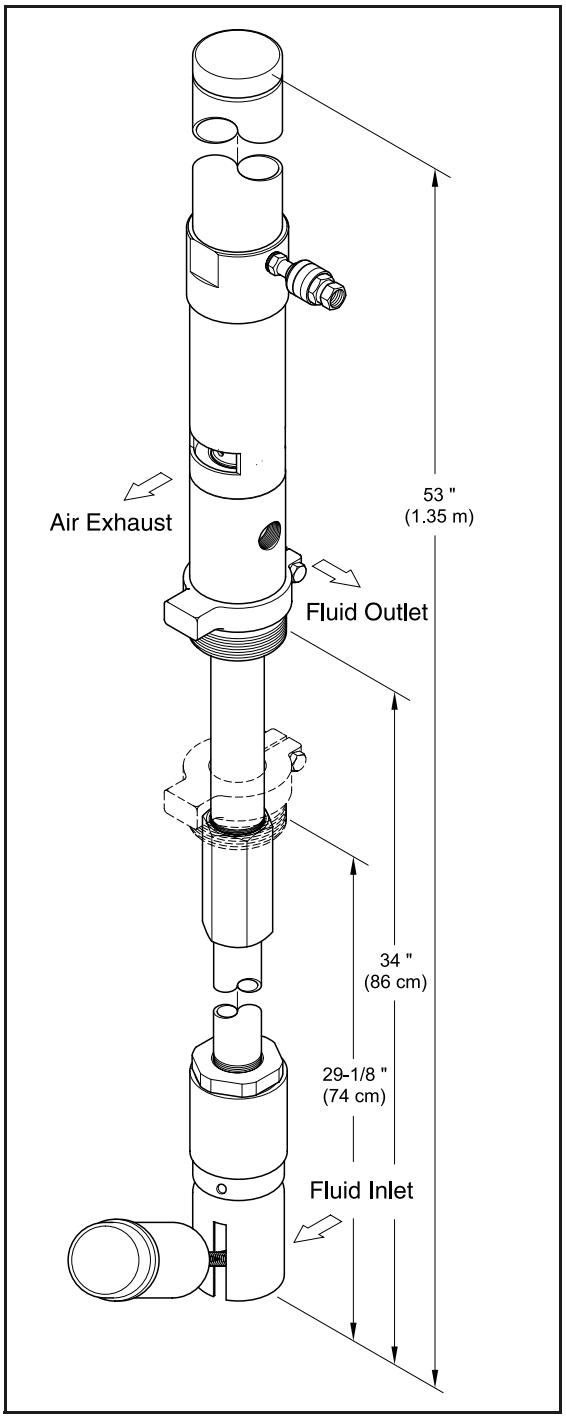

Figure 1 *Low-Pressure Pump Model 7216-B*

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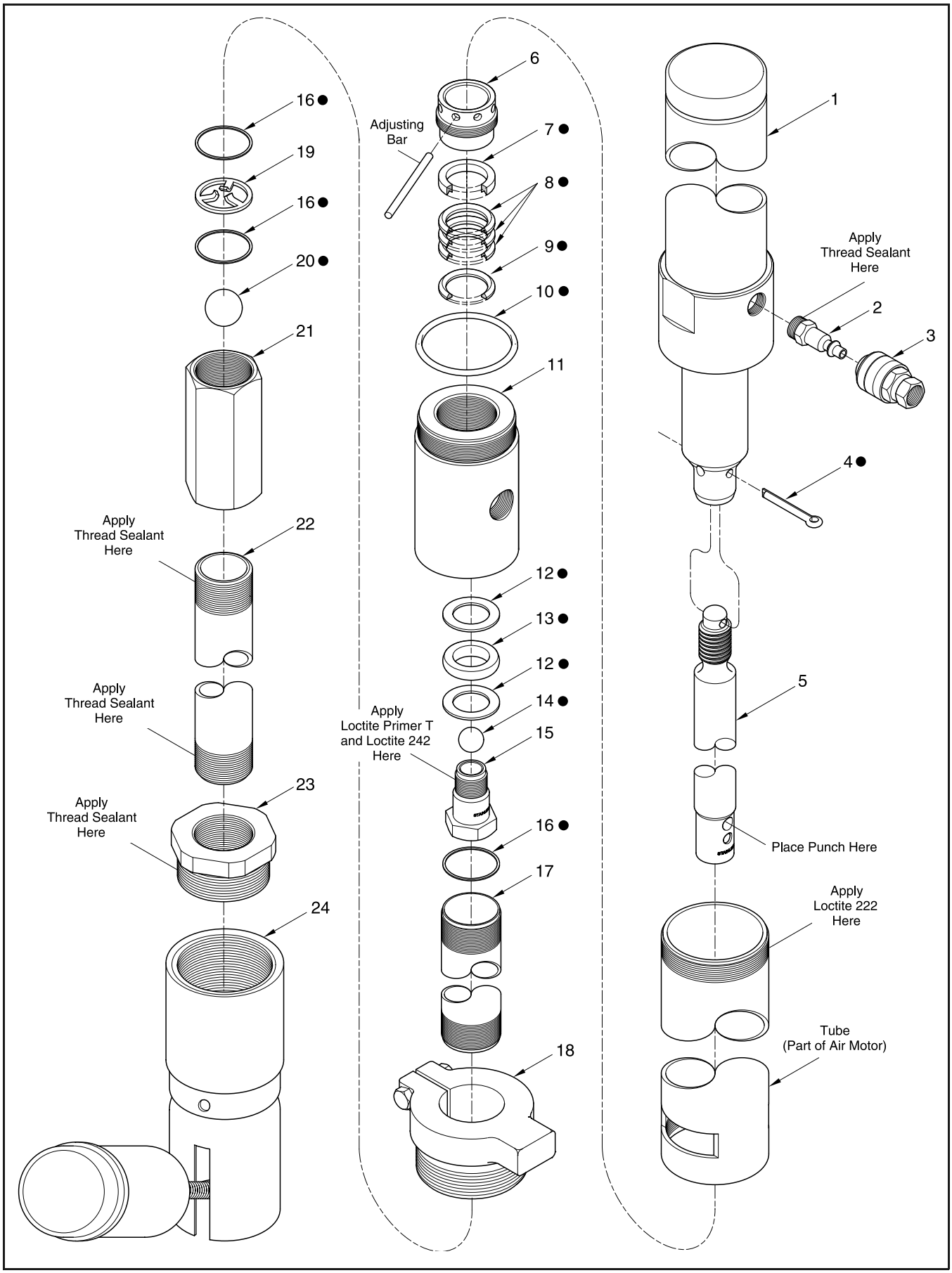

Figure 2 *Low-Pressure Pump Model 7216-B - Exploded View*

Item No.	Part No.	Description	Qty	Notes		Numeric Order Part # (Item #)
1		Motor Assembly, Air	1		See SER **318450-4**	(1)
2	328034	Connector, 1/4 " NPTF (m)	1			X171003-3 (10)
3	328030	Coupler, Air, 1/4 " NPTF (f)	1			*171700-32* (14)
4		Pin, Cotter, 1/8 ” Dia. x 1-1/4 ” Long	1	●		171700-56 (20)
5	324484	Rod, Piston (Stainless Steel)	1			*172212-17* (4)
6	336442	Screw, Packing	1			*172265-3* (22)
7		Ring, Back-Up, Female (Brass)	1	●		*303292* (16)
8		Packing, Chevron	3	●		321206 (24)
9	324494	Ring, Support, Male (Brass)	1	●		322159 (17)
10	X171003-3	O-Ring, 1-7/8 ” ID x 2-1/8 ” OD	1	●	Pack of Ten (10)	322167 (19)
11		Body	1			*322171* (8)
12		Washer (Brass)	2	●		*323596* (12)
13	324491	Packing (Rubber)	1	●		324484 (5)
14		Ball, 1/2 ” Dia.	1	●		324491 (13)
15	324492	Seat (Stainless Steel)	1			324492 (15)
16		Gasket (Copper)	3	●		*324493* (7)
17	322159	Cylinder	1			324494 (9)
18	326750-C1	Adapter, Bung	1			326750-C1 (18)
19	322167	Washer, Stop	1			328030 (3)
20	171700-56	Ball, 7/8 ” Dia.	1	●		328034 (2)
21	338015	Body, Valve	1			328207 (23)
22		Nipple, 1/2 ” NPT (m), 22-5/8 ” Long	1			*329644* (11)
23	328207	Bushing	1			336442 (6)
24	321206	Valve, Low-Level Cut-Off	1			338015 (21)

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

Repair Kit

Part No.	Kit Symbol	Description
394051-2	●	Kit, Major Repair

Accessories

Part Number	Description
338977	16-Gallon Drum Cover (w/ gasket)
318040-4	55-Gallon Drum Cover

Table 2 *Low-Pressure Pump Model 7216-B Accessories*

Performance Curves

A pump's ability to deliver fluid is based on the pressure (psi/Bars) and quantity (cfm/lpm) of air supplied to the motor and the amount of fluid 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 fluid discharge pressure in psi/Bars (left Y axis).

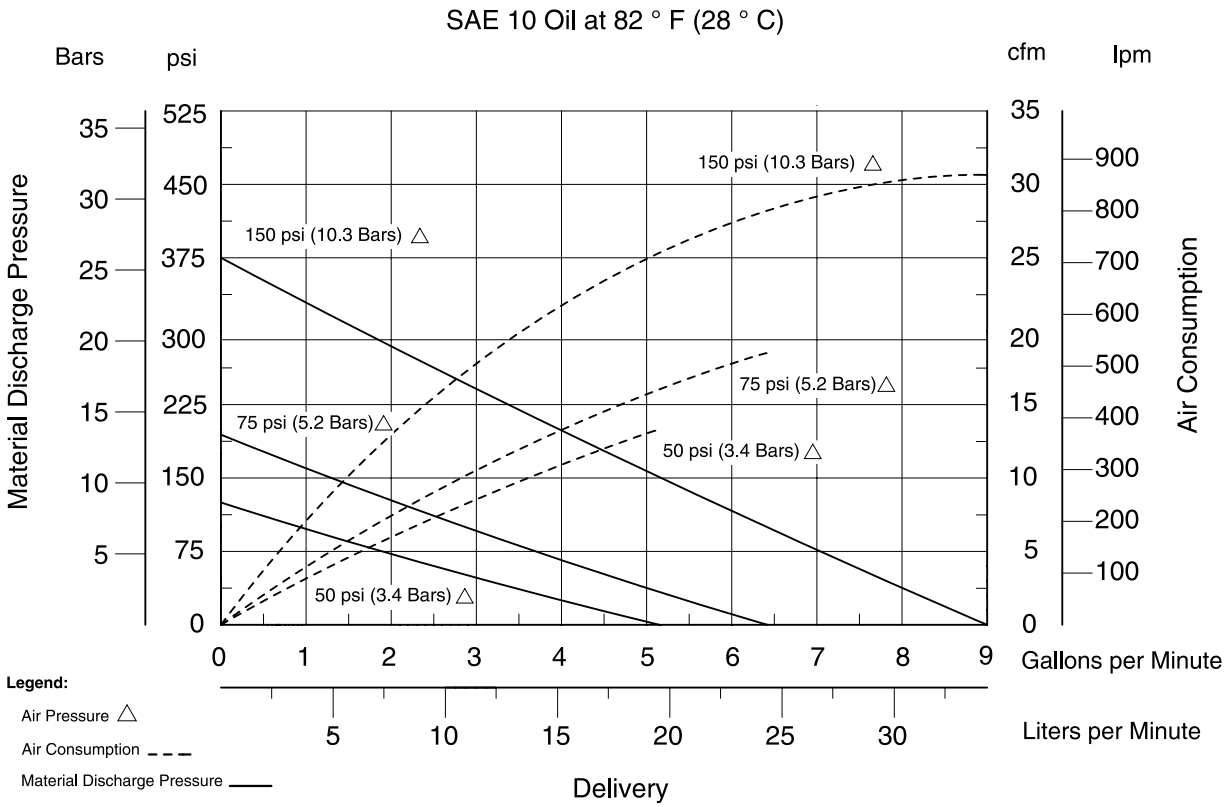

Figure 3 *Delivery versus Discharge Pressure and Air Consumption*

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 fluid can result in injury.

Read each step of the instructions carefully. Make sure a proper understanding is achieved before proceeding.

Disassembly

Separate Pump Tube from Air Motor

1. Clamp Air Motor Assembly (**1**) horizontally in a soft-jaw vise at the wrench flats on the air inlet body.
2. Unscrew the tube from the air inlet body.

CAUTION

Support the pump tube assembly during removal. Damage to components can occur.

3. Remove Cotter Pin (**4**) that secures the Air Motor's rod to Piston Rod (**5**).
4. Unscrew the pump rod [with attached components] from the Air Motor's rod.
   - Rotate the entire pump tube assembly.
5. Remove the Air Motor's tube from Body (**11**).

Pump Tube Assembly

Body Assembly

6. Remove O-Ring (**10**) from the Body.
7. Unscrew Packing Screw (**6**) from the Body.
8. Unscrew Cylinder (**17**) from the Body.

   HINT: Use Bung Adapter (**18**) as leverage.
9. Remove Piston Rod (**5**) [with attached components] from the bottom of the Body.
10. Remove Gasket (**16**) from the Body.
11. Remove Female Back-Up Ring (**7**), Packings (**8**), and Male Support Ring (**9**) from the Body.

Piston Rod Assembly

12. Unscrew Seat (**15**) from the Piston Rod.
    - Insert a punch or similar tool through the hole in the Rod.
13. Remove Ball (**14**), Washer (**12**), Packing (**13**), and additional Washer (**12**) from the Seat.

Valve Body Assembly

14. Unscrew the Cylinder (with Bung Adapter) from Valve Body (**21**).
15. Remove Gasket (**16**), Stop Washer (**19**), additional Gasket (**16**), and Ball (**20**) from the Valve Body.

Low-Level Cut-Off Valve Assembly

16. Unscrew Nipple (**22**) from the Valve Body and Bushing (**23**) as required.
17. Unscrew the Bushing from Low-Level Cut-Off Valve (**24**) as required.
18. Remove Bung Adapter (**18**) from the Cylinder 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 Piston Rod (**5**) for score marks.
   • Replace as necessary.
4. Inspect bore of Cylinder (**17**) for 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 (**20**) into Valve Body (**21**). Fill the Valve Body with solvent. Make sure no leakage occurs.

Assembly

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

Pump Tube Assembly

Body

1. Install O-Ring (**10**) onto Body (**11**).
2. Install and seat Male Support Ring (**9**) [flat side first], Packings (**8**) [concave side first], and Female Back-Up Ring (**7**) [concave side first] into the Body.
3. Install Packing Screw (**6**) into the Body until it contacts the Packing group.

   *IMPORTANT: The Packing Screw will require adjustment. Refer to the section entitled **Bench Test and Operation** for details.*
4. Install and seat Gasket (**16**) into the bottom of the Body.
5. Clamp the Body in a soft-jaw vise.

Item No.	Description
8	Chevron Packings
10	O-Ring, 1-7/8 ” ID x 2-1/8 ” OD
13	Packing (Rubber)

Table 3 *Components Lubricated in Clean Oil*

Piston Rod and Seat

6. Install Piston Rod (**5**) into the top of the Body.
   • Use care passing the Packings.
7. Install and seat Washer (**12**), Packing (**13**), additional Washer (**12**), and Ball (**14**) onto Seat (**15**).
8. Screw the Seat assembly [with Primer T and Loctite 242] into the Piston Rod.
   • Follow the thread sealant manufacturer’s recommendations.
   • Tighten the Seat securely.

Cylinder

9. Install Bung Adapter (**18**) onto Cylinder (**17**).
10. Screw the Cylinder assembly into the Body.
    • Use care passing the Packing.
    • Do not tighten the Cylinder at this time.

Valve Body

11. Install Ball (**20**), Gasket (**16**), Stop Washer (**19**) [flat side first], and additional Gasket (**16**) into the larger threaded hole of Valve Body (**21**).
12. Screw the Valve Body assembly onto the Cylinder.
    • Tighten the Valve Body securely into the Cylinder and at the same time the Cylinder into the Body.
13. Screw Nipple (**22**) [with thread sealant] into the Valve Body.
    • Do not tighten at this time.
14. Screw Bushing (**23**) onto the Nipple [with thread sealant].
    • Tighten the Bushing onto the Nipple securely and at the same time the Nipple into the Valve Body.
15. Screw Low-Level Cut-Off Valve (**24**) onto the Bushing [with thread sealant].
    • Tighten the Low-Level Cut-Off Valve securely.

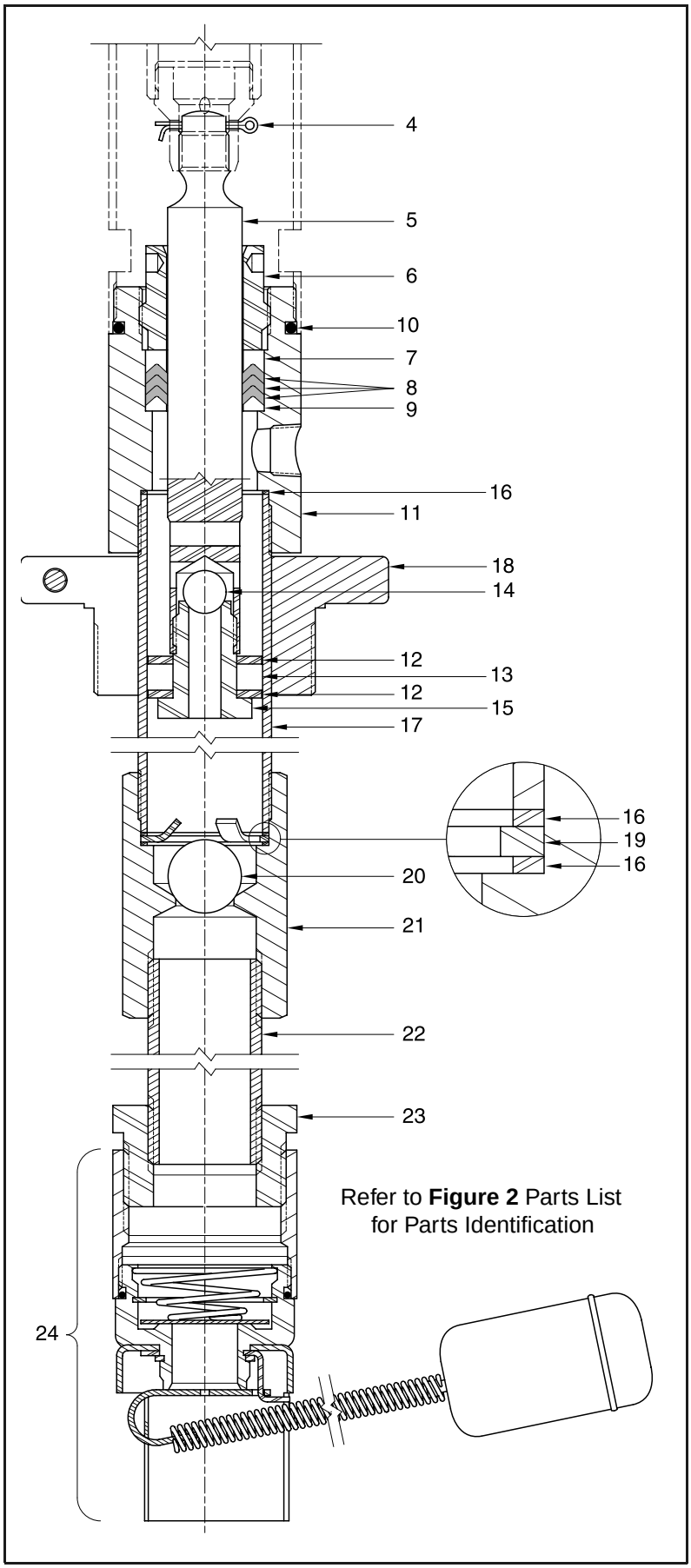

Figure 4 *Pump Tube Assembly - Section View*

Connect Air Motor to Pump Tube

16. Pull Piston Rod (**5**) from Body (**11**) until it seats.

17. Screw the tube of the Air Motor onto the Body of the pump assembly.
    - Do not tighten at this time.

18. Screw the Air Motor's rod onto Piston Rod (**5**).
    - Make sure the cotter pin holes align.

19. Install Cotter Pin (**4**) that secures the Air Motor's rod to the Piston Rod.

20. Make sure the Air Motor's packing and washer are seated properly.

21. Screw the Air Motor's adapter onto the Air Motor's tube [with Loctite 222].
    - Tighten the adapter securely onto the the tube and at the same time the tube onto the Body.

Bench Test and Operation

WARNING

Do not exceed the lowest pressure rating of any component in the system.

Ensure all components are in operable condition. Replace any suspect parts prior to operation.

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

Initial Prime

1. Place the pump in the fluid to be dispensed.

2. Connect a product hose to the pump's fluid outlet.
    - Direct the hose into an appropriate collection container.

3. Screw Connector (**2**) [with thread sealant] into the inlet of the Air Motor Assembly.
    - Tighten the Connector securely.

4. Install Air Coupler (**3**) onto the air supply line.

5. Make sure air pressure at the regulator reads zero.

6. Connect the Air Coupler assembly to the Connector.

7. Slowly supply air pressure to the pump's motor.

8. Allow the pump to cycle slowly until the fluid is free of air.

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

Starting Pressure

9. Set the air pressure to 25 psi (1.7 Bars).

10. Insert the Adjusting Bar through the slot in the Air Motor's tube and into a hole of the Packing Screw.

11. Adjust the Packing Screw until the pump assembly begins to cycle.

If the pump assembly does not leak:

12. Follow the procedural steps within the section entitled **Leakage and Stall**.

If the pump assembly does not cycle or cycles and leaks at the Packing Screw:
- Packing (**13**) may require a "break-in" period.

13. Increase the air pressure to 100 psi (6.9 Bars).

14. Tighten the Packing Screw as required to prevent leakage.

15. Allow the pump to operate for 5 minutes.

16. Repeat procedural steps 9 through11.

Leakage and Stall

WARNING

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

With air pressure at zero:

17. Attach a control valve to the outlet hose of the pump.
    - Make sure the nozzle on the control valve is open.

18. Slowly supply air pressure to the pump's motor.

19. Allow the pump to cycle slowly until the fluid is once again free of air.

20. Set the air pressure to the normal operating pressure.

21. Operate the control valve into a container.

22. 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 leaks or does not stall, refer to the **Troubleshooting Chart** for details.

23. 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*

Packing Adjustment

IMPORTANT: Break-in and wear of upper packings require the user to readjust the Packing Screw:
- *after approximately 6 hours of initial operation **
- *anytime the upper packings leak*

1. Make sure the air pressure is zero.

2. Operate the control valve into a container.
    - This releases any pressure within the system.

3. Insert the Adjusting Bar through the slot in the Air Motor's tube and into a hole of the Packing Screw.

4. Tighten Packing Screw (**6**) clockwise 1/4-turn.

5. Set the air pressure to 25 psi (1.7 Bars).

6. Hold the control valve open while aiming into a suitable collection container.

7. Loosen the Packing Screw until the pump assembly begins to cycle.

* Applies to new and overhauled pumps.

Troubleshooting Chart

Pump Indications	Possible Problems	Solution
Pump does not cycle	1. Packings (**8**) too tight 2. Air motor not operating properly 3. Pump tube jammed and/or contains loose components 4. Insufficient air pressure	1. Adjust Packing Screw Assembly (**6**) 2. Inspect air motor and rebuild or replace as necessary 3. Rebuild pump tube 4. 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/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 bottom of Body (**11**)	1. Damaged Gasket (**16**) 2. Cylinder (**17**) not sufficiently tight	1. Use Kit **393624** 2. Tighten Cylinder (**17**) into Body (**11**)
Product leakage at exhaust port in Air Motor Assembly (**1**)	1. Packings (**8**) too loose 2. Worn or damaged Packing(s) (**8**) 3. Worn or damaged Piston Rod (**5**)	1. Adjust Packing Screw Assembly (**6**) 2. Use Kit **393624** 3. Replace Piston Rod (**5**)
Product leakage between Cylinder (**17**) and Valve Body (**21**)	1. Worn or damaged Gaskets (**16**) 2. Valve Body (**21**) not sufficiently tight	1. Use Kit **393624** 2. Tighten Valve Body (**21**) onto Cylinder (**17**)
Product leakage between Valve Body (**21**) and Nipple (**22**)	Nipple (**22**) not sufficiently tight and/or thread sealant missing or inadequate	Apply thread sealant* to Nipple (**22**) and tighten into Valve Body (**21**)
Product leakage between Nipple (**22**) and Bushing (**23**)	Nipple (**22**) not sufficiently tight and/or thread sealant missing or inadequate	Apply thread sealant* to Nipple (**22**) and tighten into Bushing (**23**)
Product leakage between Bushing (**23**) and Low-Level Cut-Off Valve (**24**)	Bushing (**23**) not sufficiently tight and/or thread sealant missing or inadequate	Apply thread sealant* to Bushing (**23**) and tighten into Low-Level Cut-Off Valve (**24**)
Internal Leaks		
Pump does not prime or cycles continuously, or slowly (more than once or twice/hour)	1. Foreign material between Ball (**14**) and Seat (**15**) 2. Foreign material between Ball (**20**) and Valve Body (**21**) 3. Worn or damaged Ball (**14**) 4. Worn or damaged Seat (**15**) 5. Worn or damaged Ball (**20**) 6. Worn or damaged Valve Body (**21**) 7. Worn or damaged Packing (**13**) 8. Worn or damaged Low-Level Cut-Off Valve (**24**)	Locate and eliminate source of foreign material Disassemble pump tube, clean, inspect, and replace worn or damaged components
Do not apply thread sealant to the first two (2) threads. Contamination can occur.		

Changes Since Last Printing

Changed Initial Operating Pressure
Added Adjusting Bar and Packing Screw with Eight Adjustment Holes

Every effort has been made to ensure that the information within this publication is accurate.

Please send any comments or inquiries to **chris.schrader@btrinc.com**