INSTRUCTIONS-PARTS LIST

307–050

Rev. J
Supersedes Rev. G
and PCN H

This manual contains important warnings and information.
READ AND KEEP FOR REFERENCE.

INSTRUCTIONS

BULLDOG®

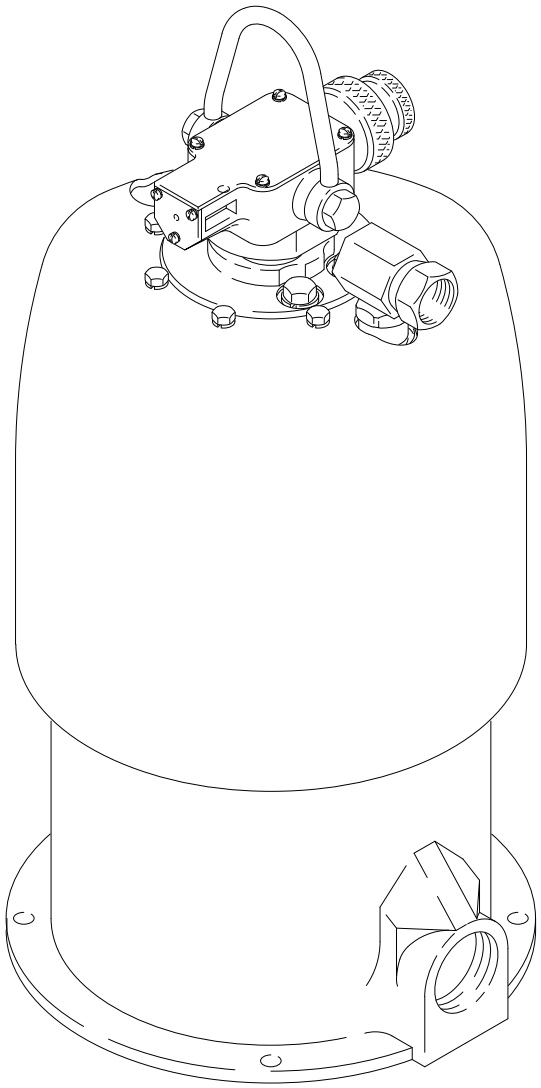
Adjust-A-Stroke Air Motor

Model 210–302, Series E
Stroke Adjustor (only) 207–583

Stroke adjuster infinitely varies the stroke length from 1–9/16 to 4–1/4 inches (39.5 – 106 mm).

Three digit indicator allows repeat settings with +/– 1% accuracy.

These air motors and special order air motor 952–356 can be used with any of the displacement pumps shown in the chart on pages 20 and 21. The chart also gives the required connecting parts and pump dimensions.



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GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440–1441

Graco Inc. is registered to I.S. EN ISO 9001

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Symbols

Warning Symbol

⚠ WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the instructions.

Caution Symbol

⚠ CAUTION

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the instructions.

⚠ WARNING

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are unsure about usage, call your Graco distributor.
- Do not alter or modify this equipment.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure stated for your equipment. Do not exceed the maximum working pressure of the lowest rated component in your system.
- Do not lift pressurized equipment.
- Handle hoses carefully. Do not pull on hoses to move equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 66°C (150°F) or below –40°C (–40°F).
- Wear hearing protection when operating this equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

⚠ WARNING

INJECTION HAZARD

Spray from the gun, leaks or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Fluid splashed in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin is a serious injury. The injury may look like just a cut, but it is a serious injury. Get immediate medical attention.
- Do not point the gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Always have the tip guard and the trigger guard on the gun when spraying.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 7 if the spray tip clogs and before cleaning, checking or servicing the equipment.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately.

⚠ WARNING

FIRE AND EXPLOSION HAZARD

Improper grounding, poor ventilation, open flames or sparks can cause a hazardous condition and result in a fire or explosion and serious injury.

- Ground the equipment and the object being sprayed. Refer to **Grounding** on page 5.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop spraying immediately.** Do not use the equipment until you identify and correct the problem.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Before operating this equipment, electrically disconnect all equipment in the spray area.
- Before operating this equipment, extinguish all open flames or pilot lights in the spray area.
- Do not smoke in the spray area.
- Do not turn on or off any light switch in the spray area while spraying or while operating if fumes are present.
- Do not operate a gasoline engine in the spray area.

TOXIC FLUID HAZARD

Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.

Installation

General Information

NOTE: Reference numbers and letters in parentheses in the text refer to the callouts in the figures and the parts drawing.

NOTE: Always use Genuine Graco Parts and Accessories, available from your Graco distributor.

Grounding

⚠ WARNING

FIRE AND EXPLOSION HAZARD
Before operating the pump, ground the system as explained below. Also read the section **FIRE OR EXPLOSION HAZARD** on page 4.

1. *Pump:* use a ground wire and clamp as shown in Fig. 1. Loosen the grounding lug locknut (W) and washer (X). Insert one end of a 12 ga (1.5 mm^2) minimum ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. Connect the other end of the wire to a true earth ground. Order part number 222–011 Grounding Clamp and Wire.

2. *Air and fluid hoses:* use only electrically conductive hoses.

3. *Air compressor:* follow manufacturer's recommendations.

4. *Spray gun or dispensing valve:* ground through connection to a properly grounded fluid hose and pump.

5. *Object being sprayed:* follow your local code.

6. *Solvent pails used when flushing:* follow your local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts the grounding continuity.

7. *To maintain grounding continuity when flushing or relieving pressure*, hold a metal part of the spray gun firmly to the side of a grounded *metal* pail, then trigger the gun.

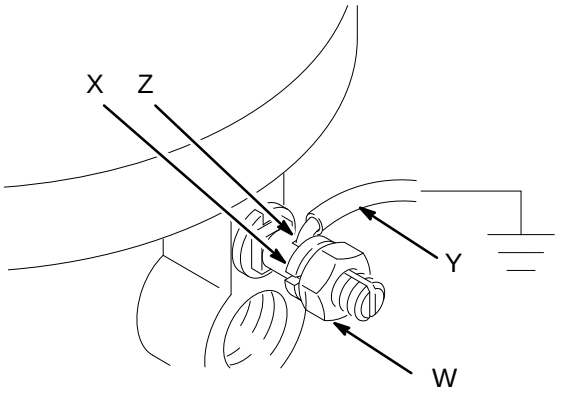
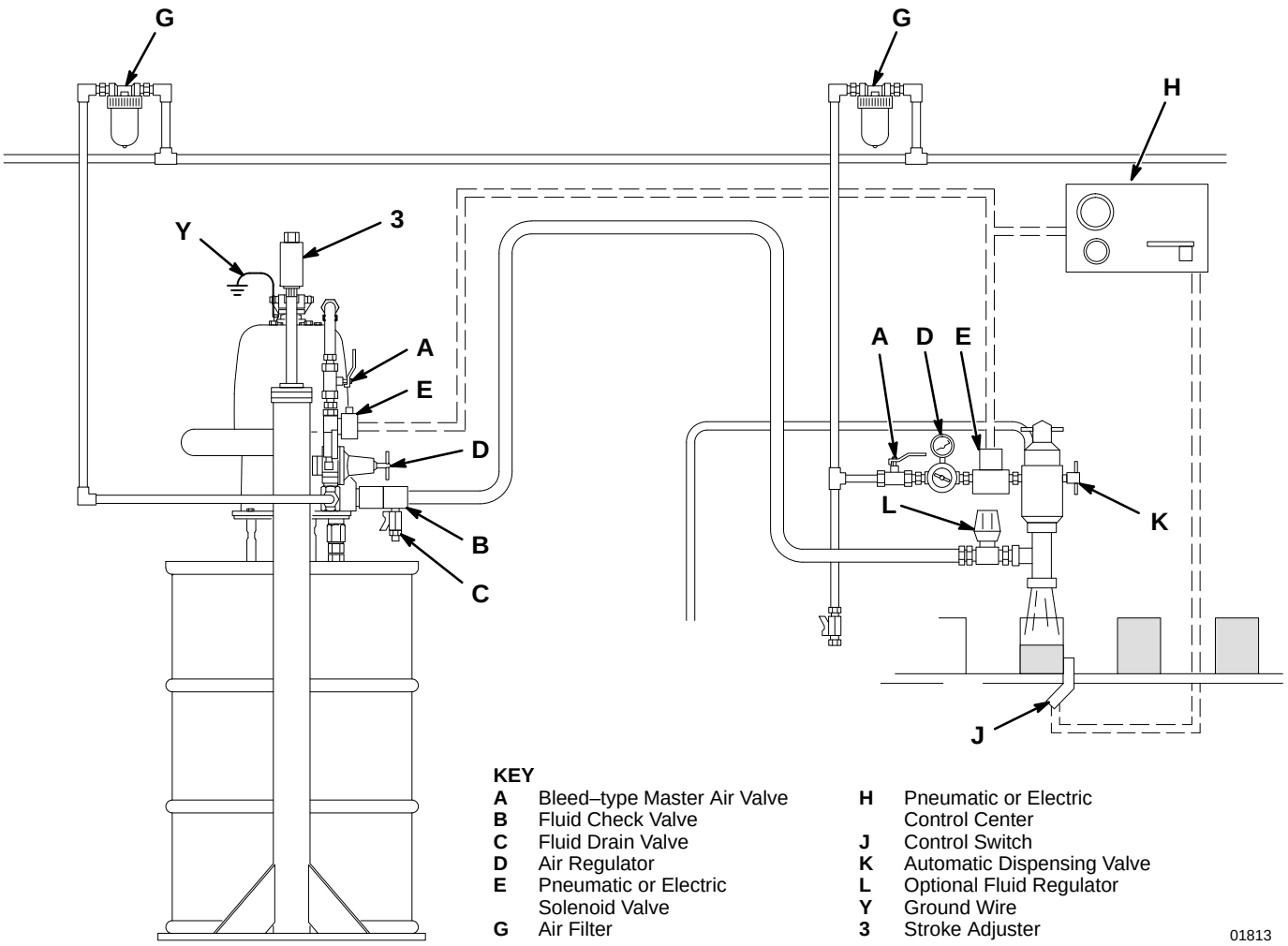


Fig 1

Installation



KEY

A	Bleed–type Master Air Valve	**H**	Pneumatic or Electric Control Center
B	Fluid Check Valve	**J**	Control Switch
C	Fluid Drain Valve	**K**	Automatic Dispensing Valve
D	Air Regulator	**L**	Optional Fluid Regulator
E	Pneumatic or Electric Solenoid Valve	**Y**	Ground Wire
G	Air Filter	**3**	Stroke Adjuster

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The Typical Metering System shown above is only a guide to selecting and installing required and optional accessories. Contact your Graco distributor or Graco Technical Assistance (see back page) for assistance in designing a system to suit your particular needs.

⚠ CAUTION

In order to prevent damage to the adjuster and motor, do not move the stroke adjuster (3) until the motor is completely installed and the system is fully primed. Always have the air motor operating when adjusting the stroke. See page 9 for adjusting instructions. Never force the adjusting knob; if it does not turn easily, service the adjusting mechanism (see page 11).

Grounding

Before operating the air motor or system, be sure the pump and all system components are thoroughly grounded. See page 5.

Accessories

Many accessories mentioned or shown in the Typical Installation are available from Graco. See **ACCESSORIES** on page 17 or contact your distributor.

⚠ WARNING

A bleed-type master air valve (A) and a fluid drain valve (C) are required in your system to help reduce the risk of serious injury, including fluid injection, splashing in the eyes, or injury from moving parts, if you are adjusting or repairing the pump or motor.

The bleed-type master air valve stops the air supply to the motor and relieves the air from the motor so that the pump cannot cycle unexpectedly.

The fluid drain valve relieves fluid pressure in the displacement pump, hose, and dispensing valve; triggering or actuating the dispensing valve may not be sufficient to relieve pressure.

Operation

Pressure Relief Procedure

⚠ WARNING

INJECTION HAZARD
To reduce the risk of serious injury, including fluid injection, splashing in the eyes or on the skin, or injury from moving parts or electric shock, always follow this procedure whenever you:

- are instructed to relieve the pressure,
- stop spraying,
- check or service any of the system equipment,
- install or clean the spray tips,
- or shut off the pump.

1. Engage the spray gun safety latch.
2. Turn off the air to the pump.
3. Close the bleed-type master air valve (required in your system).
4. Disengage the gun safety latch. Hold a metal part of the gun or valve firmly to a grounded metal waste container and trigger it to relieve the fluid pressure. Engage the safety latch.
5. Open the pump drain valve (required in your system), having a container ready to catch the drainage.
6. Leave the drain valve open until you are ready to spray again.

If you suspect that the spray tip or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, ***very slowly*** loosen the tip guard retaining nut or hose end coupling and relieve pressure gradually, then loosen completely. Now clear the tip or hose.

Operation

1. The piston must be at the bottom of its stroke. Apply low pressure air to move the piston down.

2. Fasten the restraining bracket (32) to two of the three tie rods (M), using the clamps (31), with the screws (30) and washers (29) loosely installed.

3. Turn the piston tube stud (73) to align it with the slot in the bracket (32). Raise the bracket to 1/2 to 3/4 in. (12–19 mm) from the top of the stud. Hold the bracket and tighten the tie rod clamps securely. See Fig 2.

⚠ CAUTION

Run the motor for a couple of cycles at low air pressure to see that the piston tube or pump coupling nut (N) do not hit the bracket (32)

4. Screw the electric control pressure switch or pneumatic count line tube from the control center (H) to the 1/4 npt(f) fitting on the side of the motor shield.

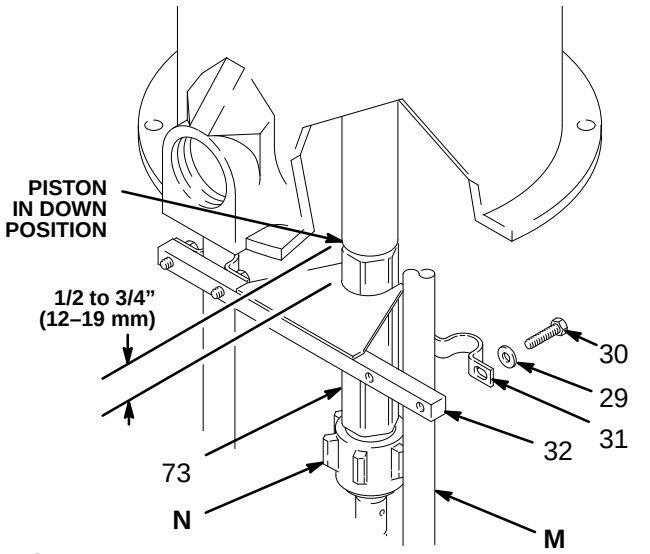


Fig 2 01814

5. **To change the stroke length**, first be sure the motor air regulator (D) is closed. Then open the master air valve (A). Slowly open the air regulator until the motor starts. Then loosen the locking knob (19) of the stroke adjustor (3), and turn the adjusting knob (20) counterclockwise to shorten the stroke. Now tighten the locking knob (19). See Fig 3.

NOTE: The air motor is factory set for the full stroke length of 4.25 in. (106 mm) or 480 on the adjuster indicator (12). The shortest possible stroke length is 1.5625 in. (39.5 mm).

6. Record the number shown on the indicator (12). If you change this setting, and at a later date want to repeat this setting, return the indicator to that setting. If the pressure and fluid temperature are the same as before, the amount of fluid dispensed will be the same within one percent.

1 Turn adjusting knob (20) counterclockwise to shorten stroke

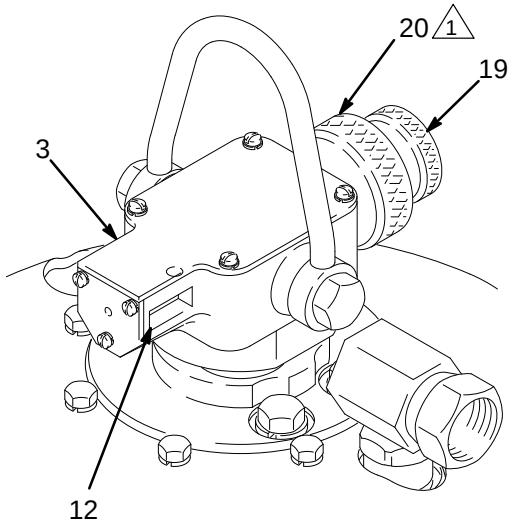


Fig 3 01815

Operation

How To Find The Stroke Setting

NOTE: Read this procedure, then study the example before determining the stroke setting.

1. Set the adjuster to 480 on the indicator (12). Operate the pump to measure the **Maximum Full Stroke Output** of the displacement pump, measure the output in *ounces.*

2. Multiply the **Maximum Full Stroke Output** by 0.375 (37 1/2% – a constant number) which gives the **Minimum Output Possible.**

3. The **Output Range** is all of the numbers between the Minimum Output Possible and Maximum Full Stroke Output.

4. Determine the **Lowest Number** in the Output Range which can be evenly divided into the Container Size, and then divide that number into the total ounces of the container to get the **Ounces Per Cycle.**

5. Subtract the **Minimum Output Possible** from the needed **Ounces Per Cycle** to determine the **Variable Number.**

6. Subtract the **Minimum Output Possible** from the **Maximum Full Stroke Output** to determine the **Output Range Number.**

7. Divide the **Variable Number** by the **Output Range Number** to determine the **Percent of Range.**

8. Multiply the **Percent of Range** by **4.83** (a constant number) to determine the **Trial Setting.**

EXAMPLE:

1. In this example, the **Maximum Full Stroke Output** is 8 oz. The Container Size is 20 oz.

2. **0.375** (37 1/2% – Constant Number)
   x **8** (Maximum Full Stroke Output)
   = **3** (Minimum Output Possible)

3. **3 oz. to 8 oz.** is the Output Range

4. **20** (Container Size)
   ÷ **4** (Lowest number in Output Range which divides evenly into Container Size)
   = **5** (Ounces Per Cycle)

5. **5** (Ounces Per Cycle)
   – **3** (Minimum Output Possible)
   = **2** (Variable Number)

6. **8** (Maximum Full Stroke Output)
   – **3** (Minimum Output Possible)
   = **5** (Output Range Number – *not related to ounces per cycle)*

7. **2** (Variable Number)
   ÷ **5** (Output Range Number)
   = **.40** (or 40% of the Range)

8. **4.83** (Constant Number)
   x **40** (Percent of Range)
   = **193** (YOUR TRIAL SETTING)

NOTE: Remember, the pump exhausts twice each cycle, so in this case, set the counter to 8 (2 x 4) rather than 4 which is the lowest number in the output range which divides evenly into the container size.

Troubleshooting

Motor Icing

As the motor exhausts air, the compressed air rapidly expands and lowers the temperature inside the motor to below freezing. If there is moisture in your air supply, it can cause icing on the outside of the motor.

To help prevent icing, be sure the compressed air supply is clean and dry. An air and water seperator with a 20 micron filter element can remove much of the moisture, oil and other contaminants. A dessicant air dryer, downstream from the seperator, will dry the air to –45°F (–42.8°C) dewpoint to provide very dry air to the motor.

Air Leaking

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 7.

Relieve the pressure, then disconnect the air supply hose from the motor.

Screw the inlet union (35) out of the air manifold. remove the adjuster (see page 11). Remove the air motor shield (37). Screw the union into the manifold. Connect the air hose. Open the bleed-type master air valve (A), and slowly open the air regulator (D). use the **Check Chart** to determine the source of the leak.

1 Hold paper strip over exhaust holes.

2 Push trip rod down to start stalled motor.

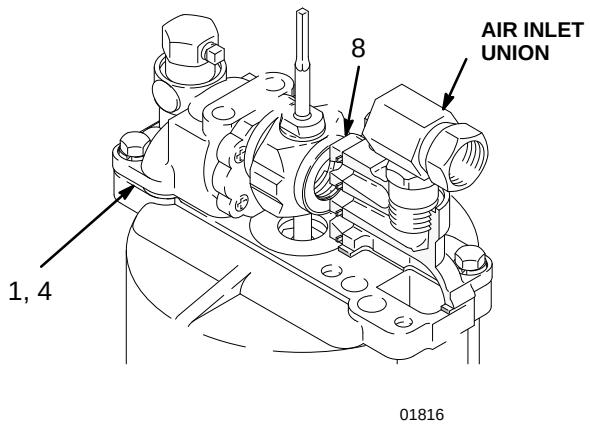
⚠ WARNING

To reduce the risk of pinching or amputating your fingers, keep them clear of all moving parts in the motor and keep them out of the exhaust openings.

Check Chart

NOTE: The reference numbers in the Check Chart refer only to Fig. 4.

Stroke Position	Ref. Points	Checking Method	Cause of Leakage
UP, only (air valve housing down)	1	By feel	Blown air manifold gaskets
	2	By feel	Blown air cylinder gasket
	3	Squirt oil around wiper	Worn throat packing
	4	By feel	Blown air manifold gaskets
DOWN, only (air valve housing up)	5	By feel	Damaged connecting tube gasket
	6	Squirt oil around bearing	Worn trip rod packing
	7	Squirt oil around air bearing	Damaged trip rod bearing gasket
BOTH	8	Squirt oil around air valves	Worn air valves or their packings
	9	Hold paper strip over exhaust holes	Worn air piston packing



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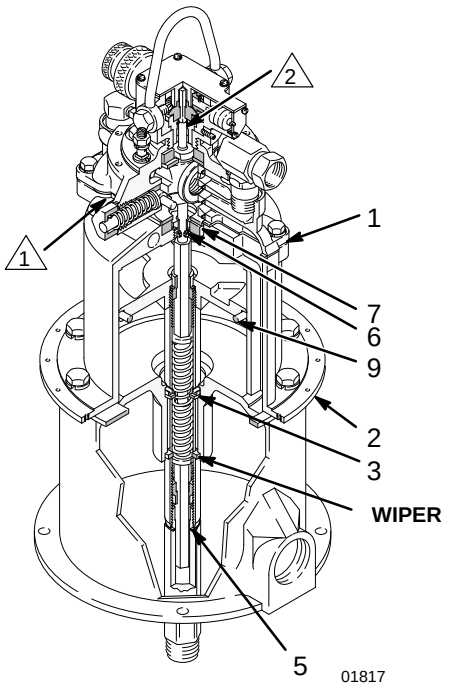

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Fig 4

Stroke Adjuster Repair (Fig 5)

⚠ CAUTION

If you do not remove the trip rod (33), record the indicator reading BEFORE removing the adjuster assembly (3) so that you can set it at the same number when reinstalling it. This will keep the adjuster setting in agreement with the stroke setting and prevent possible damage to the air motor.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 7.

1. **Relieve the Pressure**
2. Loosen the housing collar setscrew (9). Holding the adjuster assembly (3), screw the collar (24) out of the detent housing (82). Now lift the adjuster assembly up.
3. Remove the cover (15). Remove the setscrew (6) on the side which holds the gear adjusting shaft (21).
4. Pull out the shaft (21) and adjusting knob (20), and then remove the gear (14).
5. Remove the end plate (18). Remove the setscrew (6) from the gear (14). Pull out the shaft (22) and indicator (12), and then remove the gear (14).

⚠ CAUTION

Be careful not to drop or damage the indicator (12), which can be easily damaged.

6. If you need to replace the indicator (12), loosen the two setscrews (11) in the shaft (22) and pull the indicator off of the shaft. When installing a new indicator, tighten the setscrews (11) firmly into the shaft.
7. Remove the remaining gear (26) from the retainer (23).
8. Clean the gears and shafts thoroughly. Inspect all parts and replace any that are worn or damaged.
9. When reassembling the adjuster, align the holes in the shafts with the setscrews, and tighten the setscrews snugly.
10. If necessary, add more grease to the stroke adjuster housing (16) until it just covers the center gear (26). Do not lubricate the indicator (12).

REF NO. 3
STROKE ADJUSTER ASSEMBLY
INCLUDES ITEMS 4–27

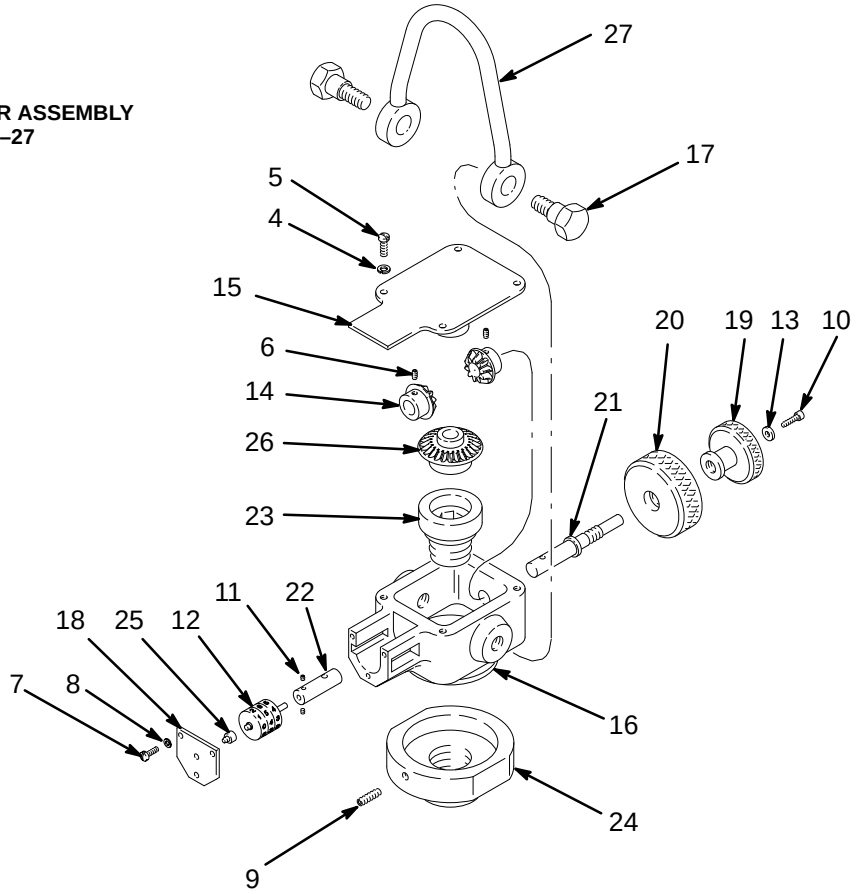

Fig 5 01818

Service

NOTE: Packing Repair Kit 206–734 is available. Use all the new parts in the kit, even if the old ones look good. Be sure you have all the repair parts available to reduce down time. Reference numbers with an asterisk, for example (52*), indicate parts included in the kit.

Air Valve Repair (See Fig 6)

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 7.

1. **Relieve the pressure**.
2. Remove the stroke adjuster as explained in Step 2 of **Stroke Adjuster Repair**.
3. Remove the air inlet fitting (35) and disconnect the ground wire. See the Parts Drawing.
4. Remove the screws (43), washers (38) and air motor shield (37). See the Parts Drawing.
5. Unscrew each spring retainer (66) and remove the spring (68), guide (67) and plunger (83) from each side of the detent housing (82).

⚠ CAUTION

Handle all springs carefully. Nicks and scratches cause extra stress on the weakened points of the springs and may cause them to break during use.

6. Remove the screws (46) and washers (40) from the detent housing (82). Carefully lift the housing so the rollers (85) and axles (86) are not dropped or damaged. Remove the washer (60) and pad (61).
7. While holding in the director valves (74), push the motor piston up from the bottom of the base (2). Turn the air valve housing (64) so it rests on the manifolds (78). Remove the spring (59), o–ring (52) and air director valve (74) from each side of the housing.
8. Pull the trip rod (33) up as far as possible and grasp it with the special locking pliers (order part no. 207-579). Hold the flats of the air valve housing with a wrench, screw off the trip rod nut (65) and remove the lockwasher (42). Remove the air valve housing (64). Screw off the hub (69). Release the pliers.

⚠ CAUTION

Be sure the trip rod (33) does not turn, which would change the stroke setting. Also, be careful not to damage the rod surface.

9. Remove the two screws (41) and lockwashers (42) from each air manifold (78). Remove the manifold gaskets (75) from the cylinder (81).

⚠ WARNING

The valve plate (84) openings are razor sharp! Be careful not to cut yourself when handling them.

10. Check the valve plates (84) and seals (76) and replace them if they are worn or damaged.
11. Clean the mating surfaces of the valve plates and manifolds, then reassemble using the screws (47).

NOTE: If no further service is needed, skip to **Reassembly** Step 11.

NOTE: To service the piston, continue as follows.

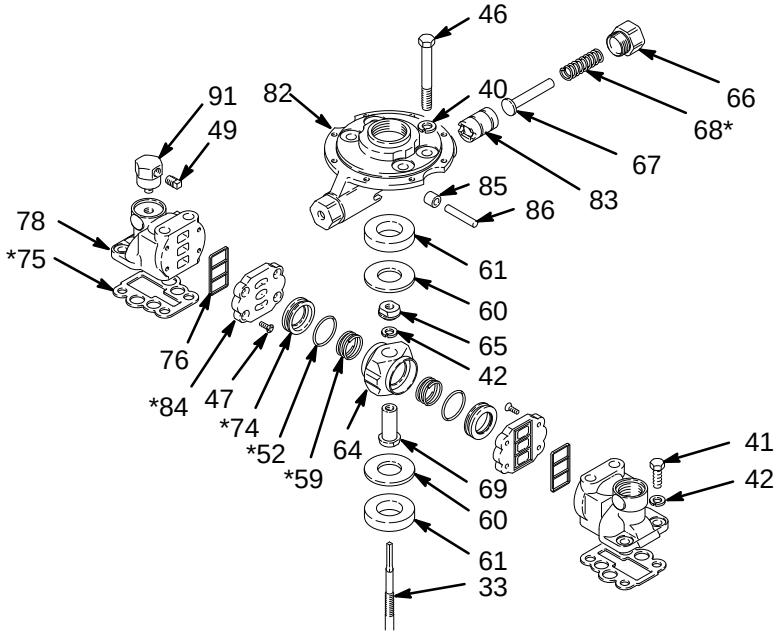

Fig 6 01819

Service

Piston Repair (See Fig. 9)

12. Remove the screws (44) and lockwashers (39) and pull the cylinder (81) straight up off the piston. Remove the dampener pad (61) and washer (60).

13. Remove the trip rod bearing (1), using a 1 in.socket wrench. Remove the gasket (51), washer (54) and packing (55) from the bearing.

14. Pull the piston (89), piston rod (90) and trip rod (33) up out of the base (2). Remove the o–ring (62).

15. Place a wrench on the turned down part of the piston rod (90) and screw out the stud (73).

16. Place a wrench on the top of the trip rod (33) and turn the rod clockwise until the top socket (72) is free. Then count the number of turns it takes to screw out the bottom socket (71). Write the number down: it is important when reassembling the motor.

NOTE: If the trip rod is broken, use a 9/16 in. hex key wrench to remove the bottom socket (71). A damaged trip rod cannot be repaired; use a new one.

17. Remove the trip rod (33) from the piston rod (90). See Fig 7.

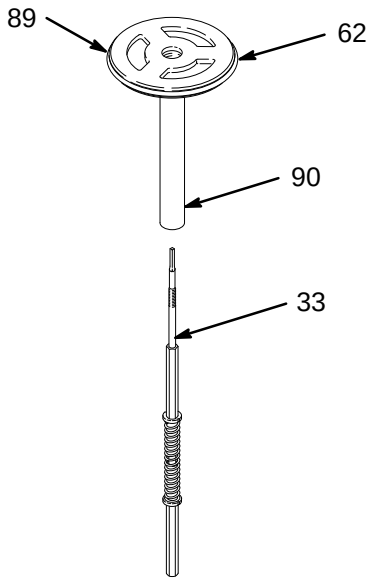

Fig 7

Reassembly (See Fig. 9)

1. Clean all parts thoroughly and inspect for wear or damage. Replace parts as necessary.

2. Screw the bottom socket (71) into the piston rod (90) the number of turns you counted in Step 16, above. The end of the socket should extend 1/8 in.(3 mm) from the piston (89). Slide the trip rod into the piston. Install the top socket (72), turning it clockwise until the socket is flush with the top of the piston; the bottom socket should be 1 in. (25 mm) into the piston rod. See Fig 8.

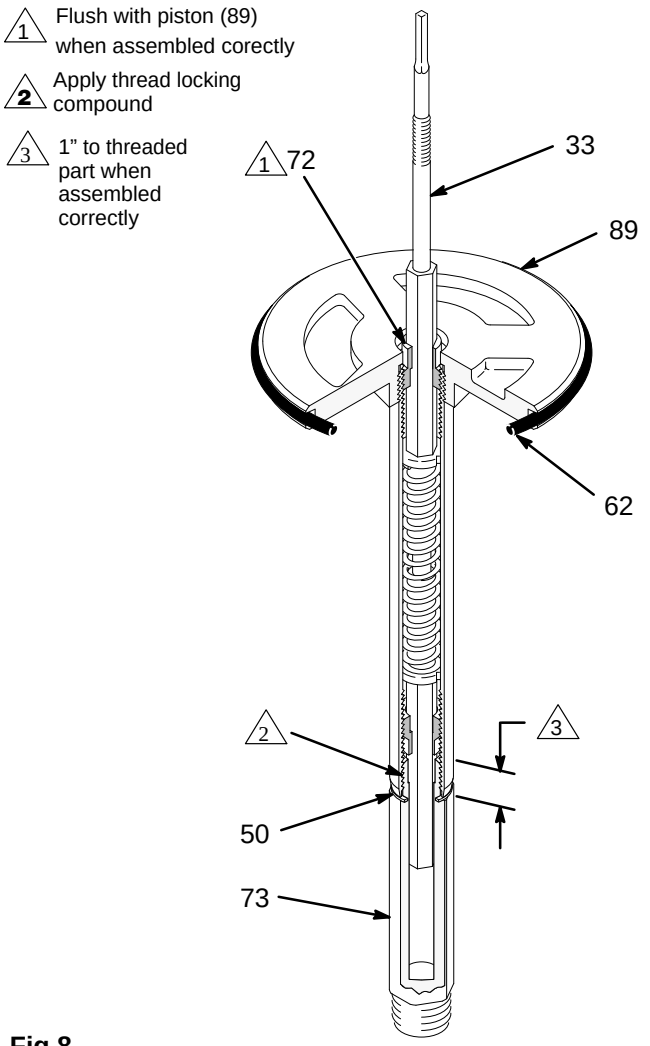

Fig 8

3. Place a copper gasket (50) on the piston stud (73). Apply thread sealant to the stud threads, and screw the stud firmly into the piston assembly.

4. Check the adjusting mechanism by turning the trip rod (33) clockwise until it stops. The top socket should extend about 1/16 in. (2 mm) above the piston. Now turn the rod counterclockwise until the socket is again flush with the piston.

5. Grease the cavity in the base (2) and install a washer (57*) and a v–packing (56*) so the lips of the v–packing face up in the base.

6. Grease the piston (89), o–ring (62*), and inside of the cylinder (81). Place the cylinder upside down on a flat surface. Place the o–ring around the piston; the o–ring is larger than the piston groove. Install the piston in the cylinder so the excess of the o–ring fits into the one of the notches on the flange of the cylinder. Use your fingers to push the o–ring out of the notch and seat it in the piston groove. Push the piston into the the cylinder to hold the o–ring in place.
7. Regrease the inside of the cylinder (81), the trip rod (33) and the piston stud (73). Be sure the gasket (53) is properly located on the base (2).
8. Guide the piston assembly and cylinder into the base, aligning the cylinder and base correctly. Install the lockwashers (39) and screws (44) snugly.
9. Install a washer (54*) and v–packing (55*) in the bearing (1) so the lips of the v–packing face down in the cylinder. Install the o–ring (51) on the bearing.
10. Install the bearing (1) in the cylinder throat.
11. Push the piston up and thread the trip rod nut (65) loosely onto the trip rod. Use a 1 in. socket wrench to tighten the bearing (1) into the cylinder.
12. Install the dampener pad (61) and washer (60) in cylinder throat.

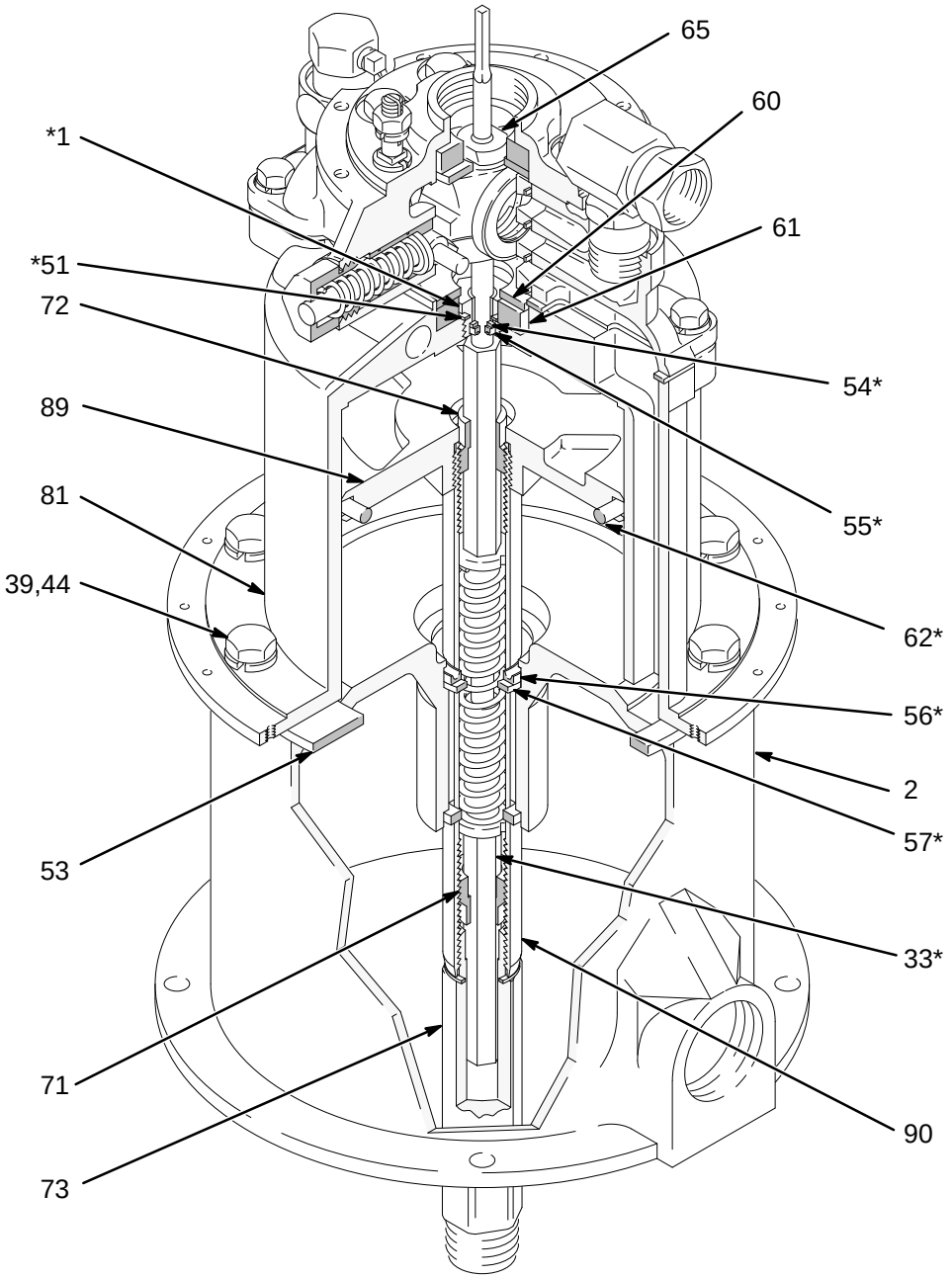

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Fig 9

13. Place the air valve spacer tool (168–513) on the cylinder. Position the gaskets (75*) and manifolds (78) on the cylinder. Install the screws (41) and washers (42). Remove the tool. See Fig 10.

14. Push the piston all the way up. Remove the trip rod nut (65). Slide the hub (69) onto the rod, then grasp the rod below the hub with the special locking pliers. Screw the hub down as far as possible.

15. Install the air valve housing (64), washer (42) and trip rod nut (65). Hold the flats of the valve housing with a wrench and with another wrench, tighten the trip rod nut so the top of the threads are flush with the top of the nut, or one screw thread is visible above the nut, and the nut is torqued to 21–25 ft–lb (28–35 N.m). See Fig 10. Turn the valve housing so it rests on the manifolds, then release the pliers.

16. Install the o–rings (52*) on the director valves (74). Grease the director valves and springs (59) and place in each side of the air valve housing. Hold the parts in at the top and carefully rotate the valve housing until it slides down between the manifolds. Be very careful not to pinch your fingers!

17. Recheck the clearance by holding the air valve spacer tool up close to the manifold.

18. Grease the plunger (83), and guide (67) and install them with the spring (68) into each side of the detent housing (82). Loosely screw a retainer (66) into each side of the housing.

19. Install the dampener pad (61) and washer (60) in the bottom of the detent housing. Grease and assemble the axles (85) and rollers (86) and install in housing.

20. Position the detent housing on the manifolds and install the washers (40) and screws (46). Now finish tightening the retainers (66). Finally, tighten the screws (46) firmly.

21. Install the air motor shield, washers, screws, and the air inlet fitting. Install the Stroke Adjuster as described on page 8. Reconnect the ground wire.

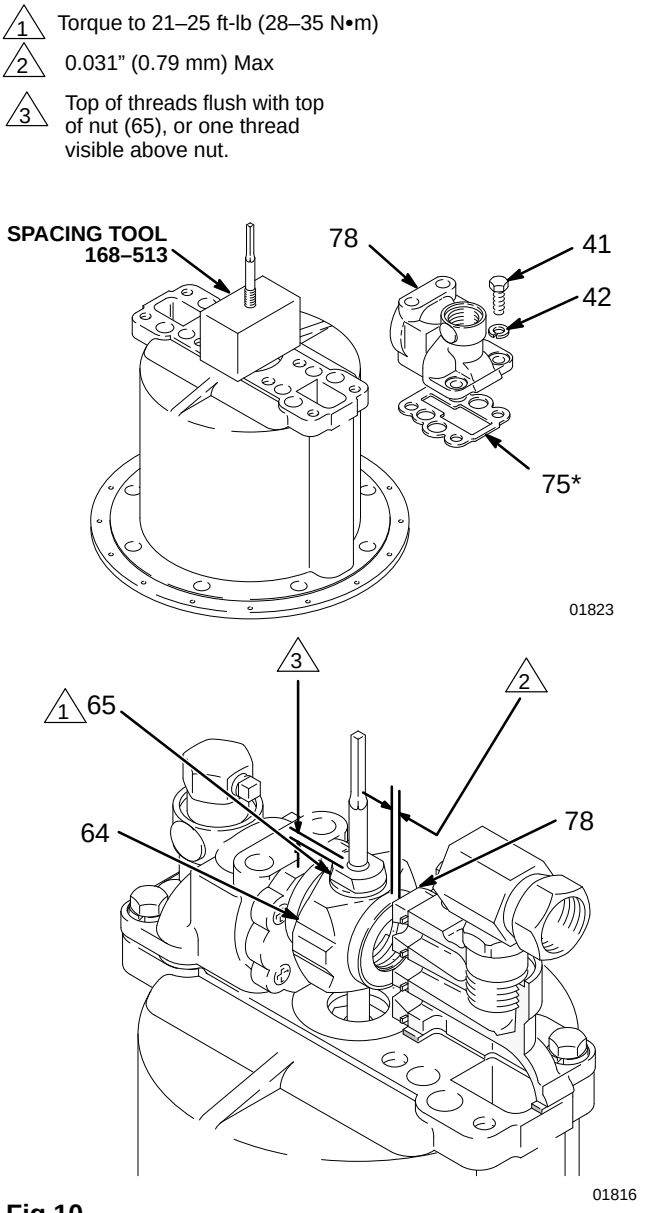
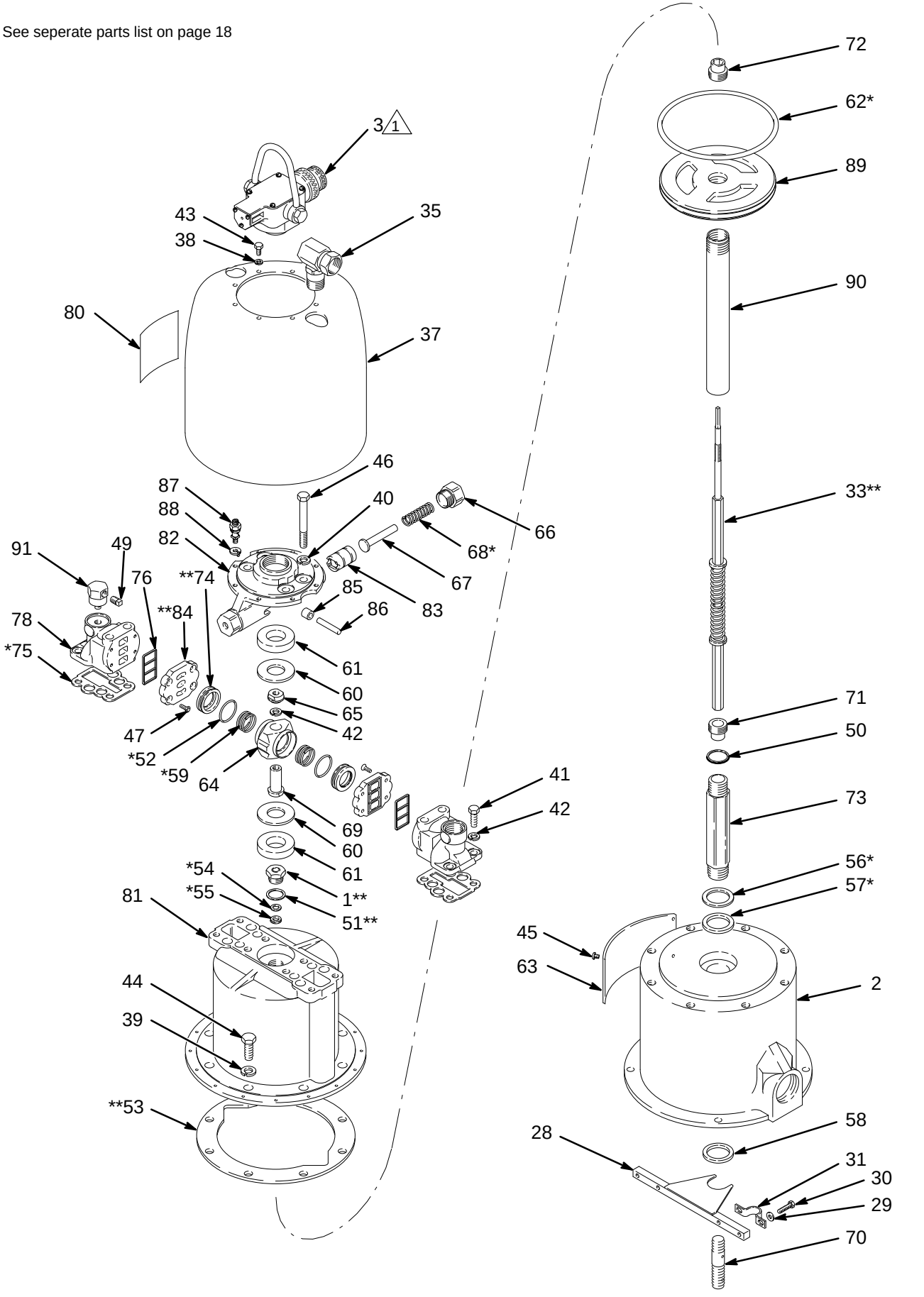


Fig 10

Parts Drawing

1 See seperate parts list on page 18



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Parts List

Model 210–302, Series E
Includes items 1–91

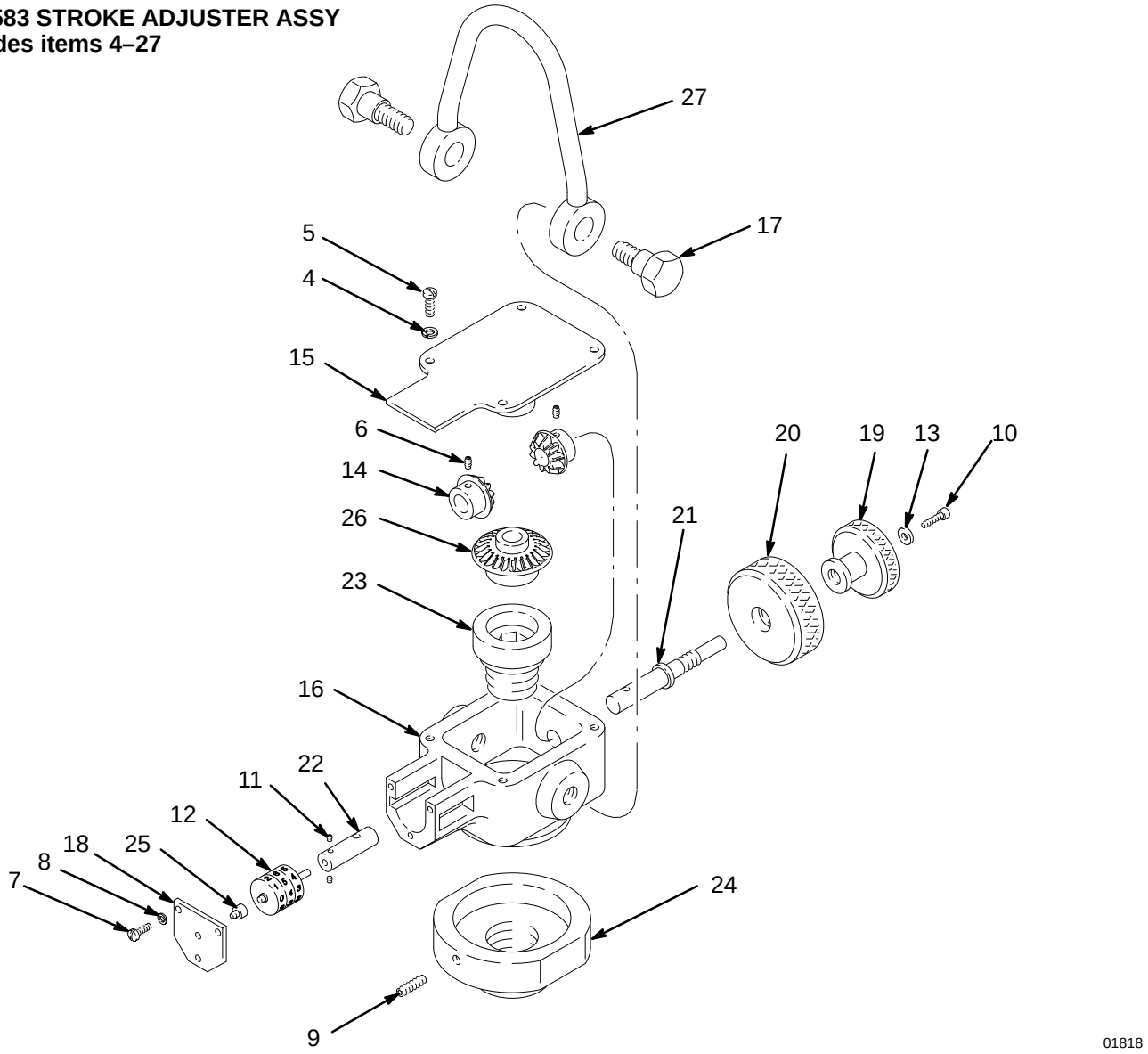
REF NO.	PART NO.	DESCRIPTION	QTY
1	204–649**	BEARING, trip rod	1
2	235–995	BASE, air motor	1
3	207–583	STROKE ADJUSTER ASSY	
		See separate parts list on page 16	1
28	207–590	RESTRAINING BRACKET	
		Includes items 29–32	1
29	100–086	.WASHER, plain; 3/16”	4
30	100–643	.CAPSCREW, soc hd; 1/4–20 x 1”	4
31	168–044	.CLAMP	2
32	207–589	.BRACKET, restraining	1
33	207–593**	TRIP ROD	1
35	207–648	UNION, 90_ adapter;	
		3/4 npsm(f) x 3/4 npsm(m) swivel	1
37	171–791	SHIELD, motor	1
38	100–016	LOCKWASHER, spring; 1/4”	8
39	100–018	LOCKWASHER, spring; 1/2”	8
40	100–052	LOCKWASHER, spring; 7/16”	4
41	100–101	CAPSCREW, hex hd; 3/8–16 x 1”	4
42	100–133	LOCKWASHER, spring; 3/8”	5
43	100–333	CAPSCREW, hex hd; 1/4–20 x 1/2”	8
44	100–424	CAPSCREW, hex hd;	
		1/2–13 x 1–1/4”	8
45	101–845	SCREW, self tap, type “F”;	
		6–32 x 1/4”	8
46	101–713	CAPSCREW, hex hd;	
		7/16–14 x 3–1/2”	8
47	101–716	SCREW, mach, flat hd; 10–24 x 1/2”	8
49	100–403	PLUG, pipe; 1/8 npt	1
50	150–429**	GASKET; copper	2
51	150–647**	GASKET; copper	1
52	156–698*	PACKING, o–ring; nitrile rubber	2
53	161–556**	GASKET, cylinder	1
54	161–559*	WASHER, flat; leather	1
55	161–560*	V–PACKING; leather	1
56	161–562*	V–PACKING; buna–N	1
57	161–563*	WASHER, flat; leather	1
58	161–569	SEAL, plain encased	1
59	161–575**	SPRING, compression	2
60	161–576	WASHER, flat; steel	2
61	161–577	PAD, dampener; rubber	2
62	161–578*	PACKING, o–ring; nitrile rubber	1
63	176–305	PLATE, name	1
64	161–585	HOUSING, air valve	1
65	161–586	NUT, trip rod	1
66	161–587	RETAINER, spring	2
67	161–588	GUIDE, spring	2
68	161–589**	SPRING, compression	2
69	161–590	HUB, valve housing	1
70	168–054	STUD, pump conn.	1
71	168–057	SOCKET, trip rod, right hand thd	1
72	168–058	SOCKET, trip rod, left hand thd	1
73	168–059	STUD, piston tube	1
74	168–182**	VALVE, air director	2
75	168–183*	GASKET, air manifold	2
76	168–184	SEAL, valve plate	2
77	168–185	GROMMET; nitrile rubber	1
78	168–187	MANIFOLD, air	1
	171–715	MANIFOLD, air	1
80	168–491	DECAL, “Graco”	1
81	169–372	CYLINDER	1
82	177–664	HOUSING, detent	1
83	169–583	PLUNGER, detent	2
84	169–584**	PLATE, valve	2
85	169–585	ROLLER	2
86	169–586	AXLE	2
87	104–029	GROUNDING LUG	1
88	104–582	WASHER	1
89	168–055	PISTON	1
90	168–056	ROD, piston	1
91	171–714	UNION, adapter; 1/8 npt(mxf)	1

*Included in Repair Kit 206–734.

**Recommended spare parts to keep on hand.

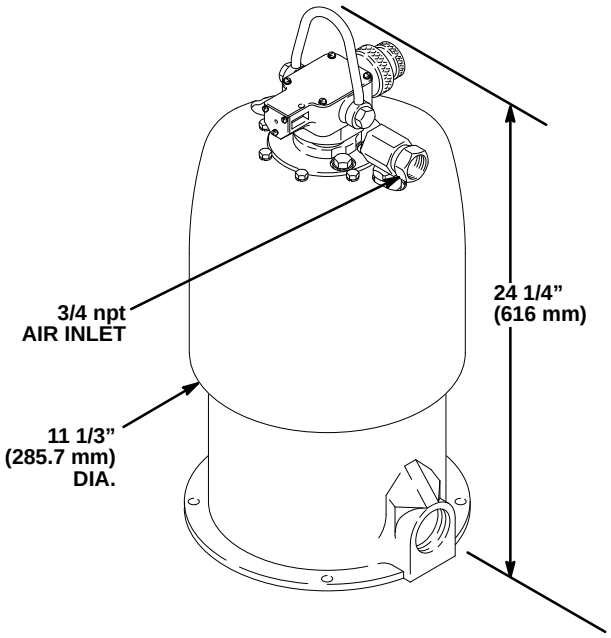
Parts

207–583 STROKE ADJUSTER ASSY
Includes items 4–27

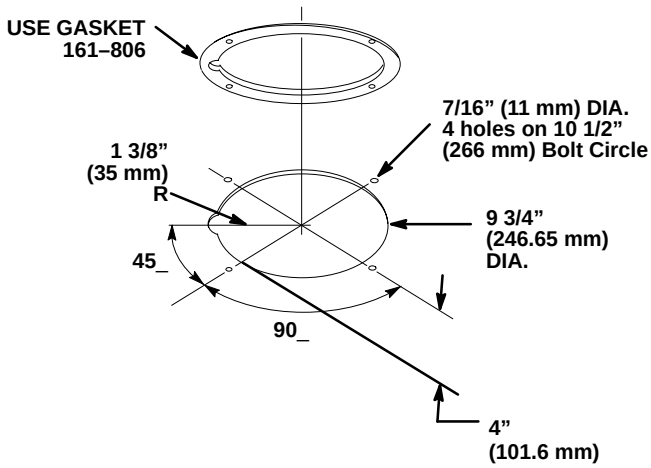


REF NO.	PART NO.	DESCRIPTION	QTY
4	100–079	.LOCKWASHER, spring; No. 8	4
5	100–649	.SCREW, mach, fil hd; 8–32 x 1/2”	4
6	101–702	.SETSCREW, soc hd, cup pt; 5–40 x 1/4”	2
7	101–791	.SCREW, mach, rd hd; 5–40 x 3/8”	3
8	101–792	.LOCKWASHER, ext shkprf; No. 5	3
9	101–949	.SETSCREW, soc hd, cup pt; 10–32 x 5/8”	1
10	102–296	.CAPSCREW, soc hd; 5–40 x 1/2”	1
11	102–679	.SETSCREW, soc hd, cup pt; 3–48 x 3/16”	2
12	102–682	.INDICATOR, odometer	1
13	151–395	.WASHER, flat; steel, No. 5	1
14	168–028	.GEAR, bevel	2
15	168–031	.COVER, housing	1
16	168–032	.HOUSING, stroke adjuster	1
17	168–033	.SCREW, shoulder, hex hd; 3/8–24 x 1–11/32”	2
18	168–034	.PLATE, instruction	1
19	168–035	.KNOB, locking	1
20	168–036	.KNOB, adjusting	1
21	168–037	.SHAFT, adjusting	1
22	168–038	.SHAFT, straight, gear	1
23	168–039	.RETAINER, housing	1
24	168–042	.COLLAR, housing	1
25	168–324	.BEARING, indicator; aluminum	1
26	207–582	.GEAR, bevel	1
27	207–587	.CLEVIS, lifting	1

Dimensions



Mounting Hole Layout



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Manual Change Summary

The following changes have been added to this manual:

- The entire manual was updated electronically.
- The air motor base for assembly 210–302 (Ref. 2) was changed from Part No. 206–782 to 235–995.

Technical Data

Effective piston area	38 sq. in. (2470 mm^2)
Piston diameter	7 in. (177.8 mm)
Stroke	1–9/16 to 4–1/4 in. (39.5–106 mm), continuously variable
Air valves	Nitralloy; dual, slide type
Valve housing	Balanced, opposing seals and detent rollers
Packings	Nitrile rubber, leather

ADJUST-A-STROKE Pump Variation Chart

Cylinder Material	Packing Material	Piston Type	Reference to Std. Pump No.	Displacement Pump Dimension	Air Motor	Displacement Pump	Connecting Rod	Tie Rods *Order 3*	Tube	Elbow
15:1 Senator										
SD	T & U	PP	222–518	32.75” (831.8 mm)	217–540	222–639	168–212	620–013	None	None
CST	T & U	PP	222–489	32.75” (831.8 mm)	217–540	222–639	168–212	620–013	None	None
25:1 Senator										
SD	T & U	PP	222–525	32.5” (826 mm)	217–540	222–640	168–054*	620–056	None	None
CST	T & U	PP	222–519	32.5” (826 mm)	217–540	222–640	168–054*	620–056	None	None
5:1 Bulldog										
CST	L	DB	221–104	32.50” (825.5 mm)	210–302	210–208	168–054*	620–054	161–612	None
SST	R	DP	206–418	19.25” (489 mm)	210–302	206–452	166–041	620–055	None	None
SST	T	DP	206–796	19.25” (489 mm)	210–302	206–453	166–041	620–055	None	None
SST	R	DP	207–321	32.25” (819.1 mm)	210–302	206–452	166–041	620–055	166–047	None
10:1 Bulldog										
CST	T & U	PP	204–287	32.25 (819.1 mm)	210–302	204–641	168–054*	620–056	None	None
SD	T	PP	207–172	31.375” (796.9 mm)	210–302	207–242	166–041	620–057	None	None
SST	R	DB	206–596	21.875” (555.6 mm)	210–302	206–613	166–041	620–058	None	None
SST	T	DB	206–797	21.875” (555.6 mm)	210–302	206–792	166–041	620–058	None	None
CST	T	DB	207–268	23.50” (596.9 mm)	210–302	208–577	168–212	620–059	None	None
SST	T	DB		32.25 (819.1 mm)	210–302	206–792	166–041	620–058	166–625	None
CST	L	DB	206–281	32.375” (822.3 mm)	210–302	207–655	168–212	620–013	165–950	None
SD	T & U	PP	222–526	31.375” (796.9 mm)	208–356	222–638	166–041	620–057	None	None
20:1 Bulldog										
CST	L & U	DB	218–985	20.906” (503 mm)	210–302	217–527	168–212	620–060	None	None
25:1 Bulldog										
CST	T & U	PP	217–565	32.75” (831.8 mm)	210–302	217–201	168–212	620–013	None	None
SD	T & U	PP	222–527	32.75” (831.8 mm)	210–302	217–201	168–212	620–013	None	None
CST	T & U	PP	217–564	25.875” (657.2 mm)	210–302	217–201	166–548	620–060	None	None
SD	T & U	PP	222–528	25.75” (654 mm)	208–356	222–639	166–548	620–060	None	None
30:1 Bulldog										
CST	L & U	DB	217–579	21.094” (535.7 mm)	210–302	217–530	168–212	620–060	None	166–634
CST	L & U	DB	221–064	32.656” (829.4 mm)	210–302	217–530	168–212	620–061	None	None
SST	T	DB	900–300	21.094” (535.7 mm)	210–302	950–162	600–233	620–062	None	600–152
40:1 Bulldog										
CST	T & U	PP	220–447	25.625” (650.8 mm)	210–302	220–449	166–548	620–060	None	None
CST	T & U	PP	220–448	32.50” (825.5 mm)	210–302	220–449	168–054*	620–056	None	None
SD	T & U	PP	222–535	32.50” (825.5 mm)	210–302	220–449	168–054*	620–056	None	None
SD	T & U	PP	222–536	25.75” (654 mm)	208–356	222–640	166–548	620–060	None	None

KEY:

Packing Material
- L Leather
- N Neoprene
- R Rubber
- T PTFE
- U UHMWPE

Piston Type
- DB Double Ball
- DP Double Poppet
- PP Priming Piston

Cylinder Material
- CST Nitrated Carbon Steel
- SST Stainless Steel
- SD Severe Duty

* Included with Air Motor 210–302.

ADJUST-A-STROKE Pump Variation Chart

Cylinder Material	Packing Material	Piston Type	Reference to Std. Pump No.	Displacement Pump Dimension	Air Motor	Displacement Pump	Connecting Rod	Tie Rods *Order 3*	Tube	Elbow
20:1 King										
CST	L & U	DB	207–567	23.50" (596.9 mm)	952–356	207–655	168–212	620–059	None	None
SST	R	DB	951–803	22.125" (561.9 mm)	952–356	902–169	620–065	620–064	None	None
CST	T & U	PP	222–248	32.50" (825.5 mm)	952–356	204–641	168–212	620–013	None	None
SD	T	PP	220–648	32.50" (825.5 mm)	952–356	207–242	620–065	620–063	None	None
SD	T & U	PP	222–539	32.50" (825.5 mm)	207–647	222–638	620–005	620–063	None	None
45:1 King										
CST	L & U	DB	218–335	21.0" (533.4 mm)	952–356	217–527	168–212	620–060	None	None
CST	L & U	DB	221–063	32.375" (822.3 mm)	952–356	217–527	168–212	620–061	170–094	None
45:1 King										
CST	L & U	DB	218–335	21.0" (533.4 mm)	952–356	217–527	168–212	620–060	None	None
CST	L & U	DB	221–063	32.375" (822.3 mm)	952–356	217–527	168–212	620–061	170–094	None
55:1 King										
CST	U	PP	217–566	32.75" (831.8 mm)	952–356	217–201	168–212	620–013	None	None
SD	T & U	PP	222–545	32.75" (831.8 mm)	207–647	222–639	168–212	620–013	None	None

KEY:

Packing Material
- L Leather
- N Neoprene
- R Rubber
- T PTFE
- U UHMWPE

Piston Type
- DB Double Ball
- DP Double Poppet
- PP Priming Piston

Cylinder Material
- CST Nitrated Carbon Steel
- SST Stainless Steel
- SD Severe Duty

ADJUST-A-STROKE Pump Specifications

Pump	**Air Motor Diameter** Inch (mm)	**Piston Stroke Range** Inch (mm)	**Pressure Ratio**	**Piston Type**	**Approximate Per Cycle Range** Fluid Oz (liter)
		37.5 to 100%			***37.5 to 100%***
Senator	5.5 (139.7)	1.6 – 4.25 (40.6 – 107.9)	15:1 **SD**	PP	2.4 – 6.4 (0.07 – 0.19)
			25:1 **SD**	PP	2.4 – 6.4 (0.07 – 0.19)
Bulldog	7 (177.8)	1.6 – 4.25 (40.6 – 107–9)	5:1	DB**	12.0 – 32.0 (0.36 – 0.95)
			5:1	DP**	12.0 – 32.0 (0.36 – 0.95)
			10:1 **SD**	DB**	6.8 – 18.0 (0.20 – 0.53)
			10:1 **SD**	PP**	6.8 – 18.0 (0.20 – 0.53)
			20:1 **SD**	DB	3.0 – 8.0 (0.09 – 0.24)
			25:1 **SD**	PP	3.0 – 8.0 (0.09 – 0.24)
			30:1 **SD**	DB	2.4 – 6.4 (0.07 – 0.19)
			40:1 **SD**	PP	1.7 – 4.6 (0.05 – 0.14)
King	10 (254)	1.6 – 4.25 (40.6 – 107.9)	20:1 **SD**	DB**	6.8 – 18.0 (0.20 – 0.53)
			20:1 **SD**	PP	6.8 – 18.0 (0.20 – 0.53)
			45:1 **SD**	DB	3.2 – 8.5 (0.10 – 0.25)
			55:1 **SD**	PP	2.4 – 6.4 (0.07 – 0.19)

KEY:
- DB Double Ball
- DP Double Poppet
- PP Priming Piston
- **SD** Severe Duty (standard)

** Available in Stainless Steel

NOTE: Only immersed, inductor or ram-mounted pumps are to be used for metering.

Notes

Notes

The Graco Warranty and Disclaimers

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Graco warrants all equipment listed in this manual which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

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PRINTED IN U.S.A. 307–050 September 1974, Revised June 1996