Plunger Pumps

Torque Specifications in/lbs:(ft/lbs)

Oil Capacity	Manifold (Head)	Piston Nut	Rear Cover	Side Cover	Valve Cap	Connecting Rods
12	92/(5)	N/A	71/(6)	N/A	442/(37)	N/A

Limited Warranty

Annovi Reverberi (A.R.) *Cam Shaft Plunger Pumps* are warranted for a period of five years and *Axial Radial Pumps* are warranted for a period of one year to the original purchaser. *Electric Pressure Washers* are warranted for a period of one year to the original purchaser. This is from the date shipped from factory or U.S. Warehouse. **AR, ArrowLine** and **GF** accessories are warranted for a period of 90 days.

Warranty covers manufacturing defects or workmanship that may develop under normal use and service in a manner up to the directions and usage recommended by the manufacturer.

Warranty does not apply to misuse or when pump or accessory is altered or used in excess of recommended speeds, pressures, temperatures or handling fluids not suitable for pump or accessory material construction. Warranty does not apply to normal wear, freight damage, freezing damage or damage caused by parts or accessories not supplied by AR North America, Inc.

Liability of manufacturer for warranty is limited to repair or replacement at the option of the manufacturer when such products are found to be of original defect or workmanship at the time it was shipped from factory. This warranty is in lieu of all other warranties, expressed or implied, including any warranty of merchantability and of any and all other obligations or liabilities on the part of the manufacturers or equipment.

Warranty Returns

Items returned for warranty consideration must have a ***Returned Merchandise Authorization (RMA)*** number. All unauthorized returns will be refused and shipped back to sender. Please fax requests to: 763-398-2009 or e-mail to shop@arnorthamerica.com.

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Operating Instructions and Parts Manual RSV Series Pumps

Plunger Pumps

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Description

Plunger Pumps are designed for a wide variety of high pressure washing applications. They are constructed with die-cast bodies and feature a brass head. Internal components include coated ceramic plungers for long life and durability. Precision cast cooling fins are anodized for maximum heat dissipation. Oversized needle bearings on the drive side, and ball on the non-drive side together with the precision supports assure positive alignment and centering in relation to the crankcase. Valve cages of special designed Ultra-Form provide positive seating and extended life. One-piece connecting rods are special alloy aluminum, bronze rods over 4,000 psi units, oversized for strength and load disbursement. These pumps are designed for gasoline driven systems.

Figure *1*
Hollow Shaft

Figure *2*
Hollow Shaft

RSV 3400 rpm D Version - 3/4"

Model	Max GPM	Max PSI
RSV2.5G25D-F25	2.5	2500
RSV3G25D-F25	3	2500

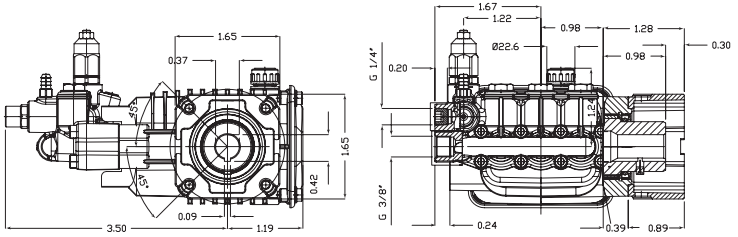
RSV 3400 rpm D Version - 1"

Model	Max GPM	Max PSI
RSV3G35D-F40	3	3500
RSV3.5G35D-F40	3.5	3500
RSV4G40D-F40	4	3000
RSV4G40D-F40	4	4000

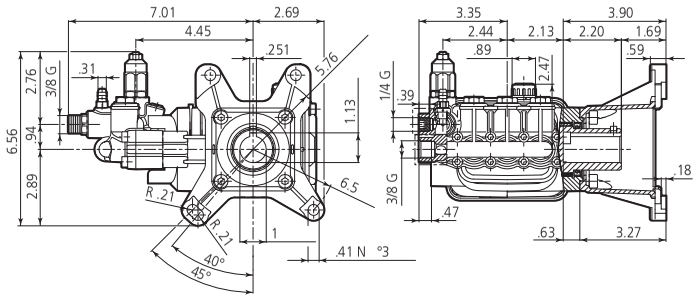
Form RSV-OM 0607

ANNOVI REVERBERI
High Performance Pumps

RSV D version + F25
Hollow shaft pump ø 3/4"



RSV D version + F40
Hollow shaft pump ø 1"



Operating Instructions and Parts Manual **RSV Series Pumps**

Plunger Pumps

Notes

NORTH AMERICA
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Plunger Pumps

Notes

Operating Instructions and Parts Manual **RSV Series Pumps**

Plunger Pumps

Formulas	Conversions
Nozzles:	Gallons x 3.785412 = Liters
Impact Force (lbs.) = .0526 x GPM x √PSI	Gallons x 128 = Oz.
Nozzle # = GPM x $\frac{4000}{\sqrt{PSI}}$	PSI x .06896 = Bar
	Bar x 14.5038 = PSI
GPM= Nozzle # x $\frac{PSI}{\sqrt{4000}}$	1 inches = 25.4 millimeters
	Liters x .2642 = Gallons (US)
PSI = $(GPM/Nozzle\ \#)^2$ x 4000	Ft. Lbs. x 1.356 = Newton Meters
Horse Power:	Inch Lbs. x .11298 = Newton Meters
$\frac{GPM \times PSI}{1714}$ = Hydraulic HP	Newton Meters x .737562 = Ft. Lbs. (force)
$\frac{GPM \times PSI}{1457}$ = EBHP	Newton Meters x 8.85 = In. Lbs. (force)
$\frac{EBHP \times 1457}{PSI}$ = GPM	Temperature = 1.8(C° + 17.78) = F°,.555(F° - 32) = C°
$\frac{EBHP \times 1457}{GPM}$ = PSI	1 U.S. Gallon of freshwater = 8.33 lbs.
HP loss due to altitude = 3% per 1000 FT above sea level	1 PSI = 2.31 feet of water
Pump Speed and Flow:	1 PSI = 2.04 inches of mercury
$\frac{Rated\ GPM}{Rated\ RPM} = \frac{Desired\ GPM}{Desired\ RPM}$	1 Foot of water = .433 PSI
$\frac{Motor\ Pulley\ Ø}{Pump\ RPM} = \frac{Pump\ Pulley\ Ø}{Motor\ RPM}$	1 Foot of water = .885 inches of mercury
	1 Meter of water = 3.28 feet of water
	Kilograms x 2.2 = Lbs.

General Safety Information

⚠ WARNINGS

Gasoline Drive Pumps

The pump is designed to pump non-flammable or non-explosive fluids. These pumps are intended to pump clean filtered water only.

Do not operate in or around an explosive environment.

Always wear safety glasses or goggles and appropriate clothing.

Do not alter the pump from the manufacturers design.

Do not allow children to operate the pump.

Never point the high-pressure discharge at a person, any part of the body or animals.

Do not operate gasoline engines in a confined area; always have adequate ventilation.

Do not exceed the pump specifications in speed or pressure.

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Plunger Pumps

General Safety Information (continued)

Maximum water temperature is 140°F.

All positive displacement plunger pumps must have a safety relief valve installed on the discharge side of the pump, this valve could be either an unloader or regulator and must be of adequate flow and pressure for the pump.

Adequate protective guards must cover all moving parts. Perform routine maintenance on the pump and components.

Use only components that are rated for the flow and pressure of the pump, this would include hose, fittings, safety valves, spray guns etc.

Electric Drive Pumps

Your power supply must conform to the system requirements.

The motor must be grounded. Use GFCI plugs and receivers.

Do not handle the pump/motor with wet hands.

Only use power cords that are in good condition.

Never pull the unit by the power cord.

Never spray or clean the unit with water

Failure to follow these warnings may result in personal injury or damage to property.

Installation

Direct Drive Gasoline Pumps

1. Install the shaft key into the keyway and apply a light coating of anti-seize on the engine shaft. (See Figure 3)

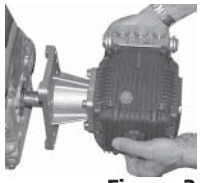


Figure 3

2. Align the two key ways and push the pump completely onto the engine.
3. Install all four (4) bolts and tighten evenly.
4. Remove the red shipping oil cap and install the black crankcase vent cap. (See Figure 4)

Figure 4

5. Install the appropriate unloader valve and other accessories.
6. Install the appropriate water inlet and discharge fittings.
7. Connect the water supply hose and high-pressure discharge hose/spray gun.
8. Turn on the water supply.
9. Open the spray gun to purge the system of any air.
10. Start the engine.
11. Adjust the engine speed and unloader valve.

Winter or Long Time Storage

1. Drain all of the water out of the pump.
2. Run a 50% solution of a RV or non-toxic/biodegradable antifreeze

Pos.	Code	Description	Qty.
1	1980300	Nut M6	1
2	2760420	Grub screw M6x12	1
3	1980540	Unloader knob	1
4	1980220	Spring plate	2
5	2760410	Spring	1
6	2760400	Valve piston	1
7	2260100	O-Ring ø6.02x2.62	1
8	660190	O-Ring ø6.07x1.78	1
9	2760210	Ring	1
10	2760050	Piston guide	1
11	1200690	O-Ring ø15.6x1.78	4
12	394280	O-Ring ø12.42x1.78	2
13	2260070	By-pass jet	1
14	2760090	Seat	1
15	770140	O-Ring ø11.11x1.78	1
16	1982520	Hose nipple	1
17	480480	O-Ring ø4.48x1.78	2
18	1250280	Ball	1
19	1560520	Spring	1
20	2760230	Detergent injector 3/8" G	1
21	2760270	O-Ring ø12x1	1
22	1470210	O-Ring ø9x1	1
23	2760120	Injector insert	1
24	2760200	Spring	1
25	2760130	Jet	1
26	1460430	O-Ring ø4x2.5	1
27	801080	Bolt M6x50 (92 in/lbs)	8
28	1381550	Lockwasher	8
29	2760020	Head	1
30	2760140	Ez-start plug	1
31	1982240	Ball	1
32	1981800	Spring	1
33	2760260	Plug 1/4" G	2
34	2760180	Plug (442 in/lbs)	3
35	2769050	Complete valve	6
36	2760220	Support ring	3
37	1342761	Gasket	3
38	1981580	Ring	1

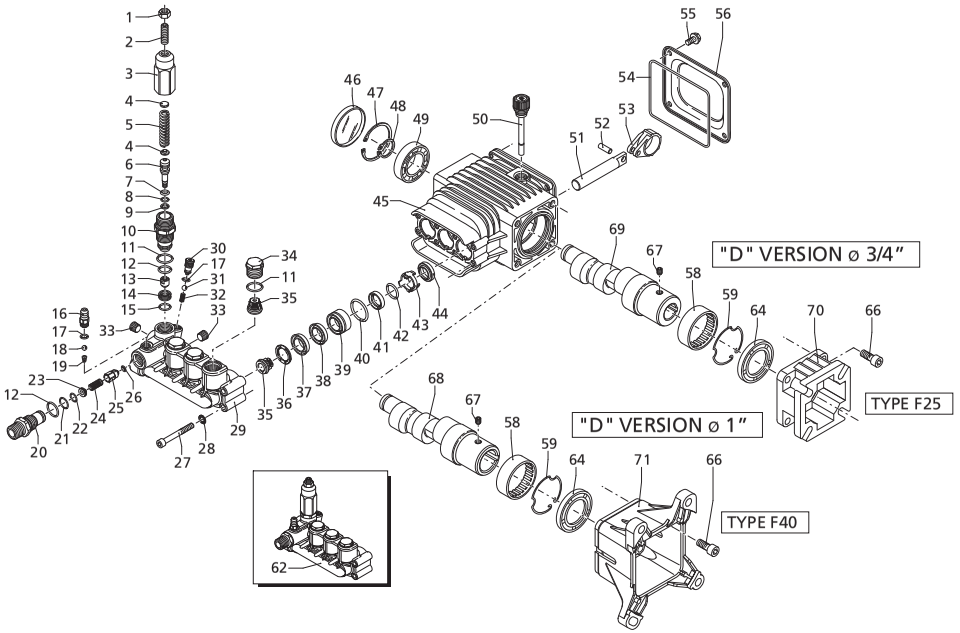
Pos.	Code	Description	Qty.
39	1981570	Piston guide	3
40	770260	O-Ring ø23.52x1.78	3
41	1260440	Gasket	3
42	640070	O-Ring ø13.95x2.62	3
43	2760310	Spacer	3
44	1260460	Oil seal	3
45	2760010	Pump body	1
46	1266740	Bearing cap	1
47	1260790	Circlip øi52	1
48	1780550	Snap ring	1
49	2760340	Bearing ❍❐⅄☒	1
	1780490	Bearing ●⅄■	1
50	880130	Oil cap	1
51	2760040	Piston	3
52	1780050	Piston pin	3
53	1780040	Con rod Aluminum ❍❐⅄☒	3
	1780710	Con rod Bronze ●⅄■	3
54	2760280	O-Ring ø101.27x2.62	1
55	802190	Bolt M6x12 (71 in/lbs)	4
56	2760110	Rear cover	1
58	2760350	Bearing ❍❐⅄☒	1
	1321190	Bearing ●⅄■	1
59	1321080	Snap ring	1
62	2769201	Complete pump head	1
64	480671	Oil seal	1
66	180030	Bolt M8x20	4
67	820440	Set screw M6	1
68	1780340	Hollow shaft ø1" ❍●	1
	1780920	Hollow shaft ø1" ⅄	1
	1780330	Hollow shaft ø1" ❐■	1
69	1780590	Hollow shaft ø3/4" ⅄	1
	1780600	Hollow shaft ø3/4" ☒	1
70	1780580	Flange F25 ⅄☒	1
71	2760290	Flange F40 ❍●⅄❐■	1
	AR64516	Oil	1

Oil Capacity - 12 oz

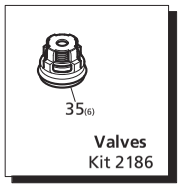
Legend

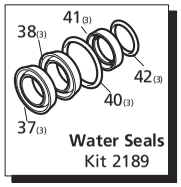
ø 15 For ⅄ RSV2.5G25	**ø 15** For ☒ RSV3G25	**ø 15** For ⅄ RSV3.5G35	**ø 15** For ❐ RSV4G30
	For ❍ RSV3G30		For ■ RSV4G35 RSV4G40
	For ● RSV3G35		

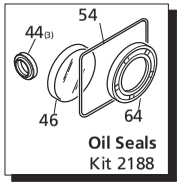
RSV 3400 RPM

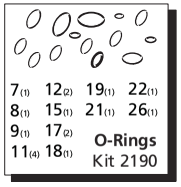


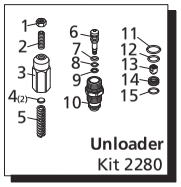
Repair Kits











Plunger Pumps

Installation (continued)

through the pump.

3. Flush the pump with fresh water before the next use.
4. In freezing conditions failure to do this may cause internal pump damage.
5. For long periods of storage in non-freezing areas the solution will keep the seals and O-rings lubricated.

Service Pumps

Servicing the Valves

The inlet and discharge valves in this series pumps are all the same. The valves are located under the six 19mm hex plugs. The inlet valves are located on the inside portion of the head under the seal assemblies and the discharge valves are located on the top row of the pump head.

Tools required: #8-32x" machine screw and diagonal pliers, screw driver, 19mm socket, ratchet, and torque wrench.

Discharge Valve Removal:


Figure 5

1. Remove the valve cap. (See Figure 5)
2. Inspect the valve cap O-ring for any damage, replace if necessary.
3. Screw the machine screw into the hole on top of the valve cage (approx 1/8"). Using the diagonal pliers grasp the screw at the lowest reachable point. Using the pump head as a base, push down on the pliers, the valve will lift out. (See Figure 6)


Figure 6

4. Use a small probe to move the poppet up and down to assure that the valve is functioning properly and that no debris is stuck in the valve. (See Figure 7)


Figure 7

5. Inspect the valve o-ring for any damage, replace if necessary.

Discharge Valve Assembly:

1. Insert the valve assembly squarely into the port pushing it into place with a deap well socket (you will feel the valve assembly seat). (See Figure 8)


Figure 8

3. Install the valve cap and torque to the proper specification. (See Figure 9)

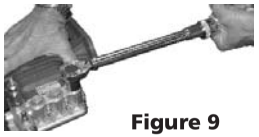


Figure 9

Servicing the Packings/Seals and Inlet Valves

To access the water seals and inlet valves for inspection or replacement, you will first need to remove the head of the pump.

Tools required: 5mm hex socket, ratchet, (2) long screwdrivers, channel lock pliers, mechanics pick and torque wrench.

Plunger Pumps

Service Pumps (continued)

Disassembly:

1. First remove the eight 5mm head bolts. (See Figure 10)


Figure 10

2. Place the screwdrivers as shown between the head and crankcase of the pump, lifting one up and the other down. The head should start to lift off of the plungers. (See Figure 11)


Figure 11

3. When you remove the head you may notice that some of the water seals have stayed on the plungers and some in the head. To remove the seals from the plungers simple turn the assemblies and pull off. (See Figure 12)


Figure 12

4. If the seal assemblies are in the head use the channel lock pliers to grab the seal retainer on the outside ring, twist the retainer in either direction (this is done to free the retainer O-ring which is stuck to the manifold) and lift out. (See Figure 13)

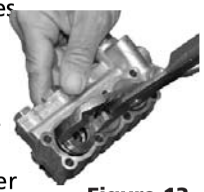


Figure 13

5. With your finger pull out the white restop ring. (See Figure 14)


Figure 14

6. With your finger pull the high-pressure seal and head ring out of the head. (See Figure 15)


Figure 15

7. The low-pressure seal is located in the brass seal retainer. Using the mechanics pick, go in between the seal and retainer and pull the seal toward the center and pull outwards. (See Figure 16)


Figure 16

8. Remove the seal retainer O-ring with the mechanics pick. (See Figure 17)


Figure 17

Assembly:

1. Install the plastic head ring into the head (the flat side is on the bottom). (See Figure 18)


Figure 18

2. Install the high-pressure seal. Place the seal so the open "V" portion is toward the head ring. You need to place the seal at an angle and pull and push to work the seal into position with your fingers (do not use any tools you may damage the seal). Make sure the seal is totally seated against the head ring. (See Figure 19 & 20)


Figure 19


Figure 20

3. Place the white restop ring so it mates to the top of the high pressure

Troubleshooting (cont.)

Symptom	Possible Cause(s)	Corrective Action
Low pressure (cont.)	3 Air leak in inlet plumbing	3 Disassemble, reseal and reassemble
	4 Relief valve stuck, partially plugged or improperly adjusted valve seat worn	4 Clean and adjust relief valve; check for worn or dirty valve seats
	5 Worn packing. Abrasive in pumped in cavitation. Inadequate water	5 Install proper filter suction at inlet manifold must be limited to lifting less than 20 feet of water or 8.5 psi vacuum
	6 Worn inlet, discharge valve blocked or dirty	6 Replace inlet and discharge valve
Pump runs extremely rough, pressure very low	1 Inlet restrictions and/or air leaks.	1 Clean out foreign material
	2 Stuck inlet or discharge valve	2 Replace worn valves
Water leakage from under manifold	Worn packing or cracked plunger	Install new packing or plunger
Slight leak, oil leaking in the area of crankshaft	1 Worn crankshaft seal or improperly installed oil seal o-ring	1 Remove oil seal retainer and replace damaged 0-ring and/or seals
	2 Bad bearing	2 Replace bearing
Excessive play in the end of the crankshaft pulley	Worn main bearing from excessive tension on drive belt	Replace crankcase bearing and/or tension drive belt
Water in crankcase	1 Humid air condensing into water inside the crankcase	1 Change oil intervals
	2 Worn packing and/or cracked plunger	2 Replace packing. Replace plunger
Loud knocking noise in pump	1 Cavitation or sucking air	1 Check water supply is turned on
	2 Pulley loose on crankshaft	2 Check key and tighten set screw
	3 Broken or worn bearing	3 Replace bearing

Troubleshooting

Symptom		Possible Cause(s)		Corrective Action
Oil leak between crankcase and pumping section		Worn rod oil seals		Replace crankcase piston rod seals
Frequent or premature failure of the packing	1	Cracked, damaged or worn plunger	1	Replace plungers
	2	Overpressure to inlet manifold	2	Reduce inlet pressure
	3	Material in the fluid being pumped	3	Install proper filtration on pump inlet plumbing
	4	Excessive pressure and/or temperature of fluid being pumped	4	Check pressures and fluid inlet temperature; be sure they are within specified range
	5	Running pump dry	5	Do not run pump without water
Pump runs but produces no flow		Pump is not primed		Flood suction then restart pump
Pump fails to prime		Air is trapped inside pump		Disconnect discharge hose from pump. Flood suction hose, restart pump and run pump until all air has been evacuated
Pump looses prime, chattering noise, pressure fluctuates	1	Air leak in suction hose or inlet	1	Remove suction line and inspect it for a loose liner or debris lodged in hose. Avoid all unnecessary bends. Do not kink hose
	2	Clogged suction strainer	2	Clean strainer
Low pressure at nozzle	1	Unloader valve is by-passing	1	Make sure unloader is adjusted property and by-pass seat is not leaking
	2	Incorrect or worn nozzle	2	Make sure nozzle is matched to the flow and pressure of the pump. If the nozzle is worn, replace
	3	Worn packing or valves	3	Replace packing or valves
Pressure gauge fluctuates	1	Valves worn or blocked by foreign bodies	1	Clean or replace valves
	2	Packing worn	2	Replace packing
Low pressure	1	Worn nozzle	1	Replace with nozzle of proper size
	2	Belt slippage	2	Tighten or replace with correct belt

Plunger Pumps

Service Pumps (continued)

seal (Make sure it is squarely seated). (See Figure 21)


Figure 21

4. Installing the low-pressure seal You want the open side of the seal to be pointed toward the water side of the head (toward the high-pressure seal) and the flat side toward the drive end of the pump.


Figure 22

Place the seal into the gland at an angle, with your finger push the exposed side of the seal towards the center and work the seal into position. After the seal is in the gland you can work it into it proper position.. (See Figure 22)


Figure 23

5. Install the retainer O-ring. (See Figure 23)
6. Squarely seat the retainer into the head and push with even pressure until it snaps into position. (See Figure 24)


Figure 24

Inlet Valve Removal:

1. Remove the valve cap.
2. Inspect the valve cap O-ring for any damage, replace if necessary.
3. Screw the machine screw into the hole on top of the valve cage (approx 1/8”). Using the diagonal pliers grasp the screw at the lowest reachable point. Using the pump head as a base, push down on the pliers, the valve will lift out.
4. Use a small probe to move the poppet up and down to assure that the valve is functioning properly and that no debris is stuck in the valve.
5. Inspect the valve o-ring for any damage, replace if necessary.

Inlet Valve Assembly:

1. Insert the valve assembly squarely into the port pushing it into place with a deap well socket (you will feel the valve assembly seat).
3. Install the valve cap and torque to the proper specification.


Figure 25

Pump Head to Drive End Installation

1. Turn the crankshaft to align the plungers as shown. (See Figure 25)
2. Place the head evenly onto the plungers and push it until it makes contact with the drive end of the pump. (See Figure 26)


Figure 26

3. Torque the head bolt as shown in the tightening sequence diagram. (See Figure 27 & 28)


Figure 27

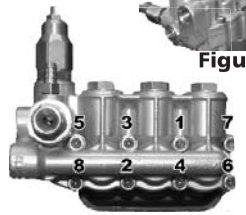


Figure 28

Plunger Pumps

Service Pumps (continued)

Oil Change

Change oil after first 50 hours of use. Then every 500 hours. Refer to parts breakdown for oil type.

Servicing the Built-in Unloader and Check Valve

These partw are serviced as assenbled kits.

Tools required: 3/8" drive ratchet, 19mm deepwell socket, medium strength thread locker, needle nose pliers.

Check Valve Removal:

1. Remove the chemical injector discharge nipple. Use the needle nose pliers to lift out the check valve. (See Figure 29)

Figure 29

Check Valve Assembly:

1. Place the check valve into the discharge outlet with the pointed side going in first (NOTE: older model pumps have springs that go into the hollow portion of the valve, newer models do not have springs.) (See Figure 30)

Figure 30

2. Inspect the o-rings on the injection nipple, if damaged replace. Place small amount of thread locker on the thread and tighten. (See Figure 31)

Figure 31

Unloader Removal:

Tools required: 3/8" rachet, 22mm deep well socket, crescent wrench, small hammer, 6mm x approximately 8mm or longer, medium strength thread locker.

Unloader assembly removal:

1. Using the 22mm socket rotate the pressure adjusting cap so both set of hexes are alligned. Use screw to remove the complete unloader assembly. (See Figure 32)

Figure 32

1. Screw the 6mm bolt into the unloader piston seat, grab the bolt with the crescent wrench just under the head. Using the hammer tap the bottom of the wrench. The seat will pop out. (See Figure 33)

Figure 33

Unloader assembly:

1. Piston seat installation screw the new seat onto the bolt (NOTE: the flat side is the bottom). Push squarly into the unloader base and tap into place with the hammer. (Remove the bolt) (See Figures 34 & 35)

Figure 34

Figure 35

2. Place a small amount of thread locker on the unloader cartride threads and screw into the base and tighten.

Operating Instructions and Parts Manual RSV Series Pumps

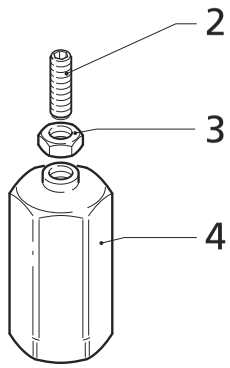
Plunger Pumps

Service Pumps (continued)

Unloader Adjusting Instructions

Follow these easy steps to adjust the pressure:

1. Loosen nut (pos. #3) with 10mm wrench.
2. Turn brass (pos. #4) clockwise until it stops.
3. Start pump, watch pressure gauge and turn (pos. #2) using 3mm hex clockwise until recommended/rated pressure is obtained. Line pressure will be approximately 200 psi less then actual head pressure. DO NOT set line pressure to rated.
4. Release trigger and make sure there is minimal spike (200-300 psi) (Repeat this step two or three times).
5. Tighten nut (pos. #3) down against (pos. #4).



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