

Service Manual

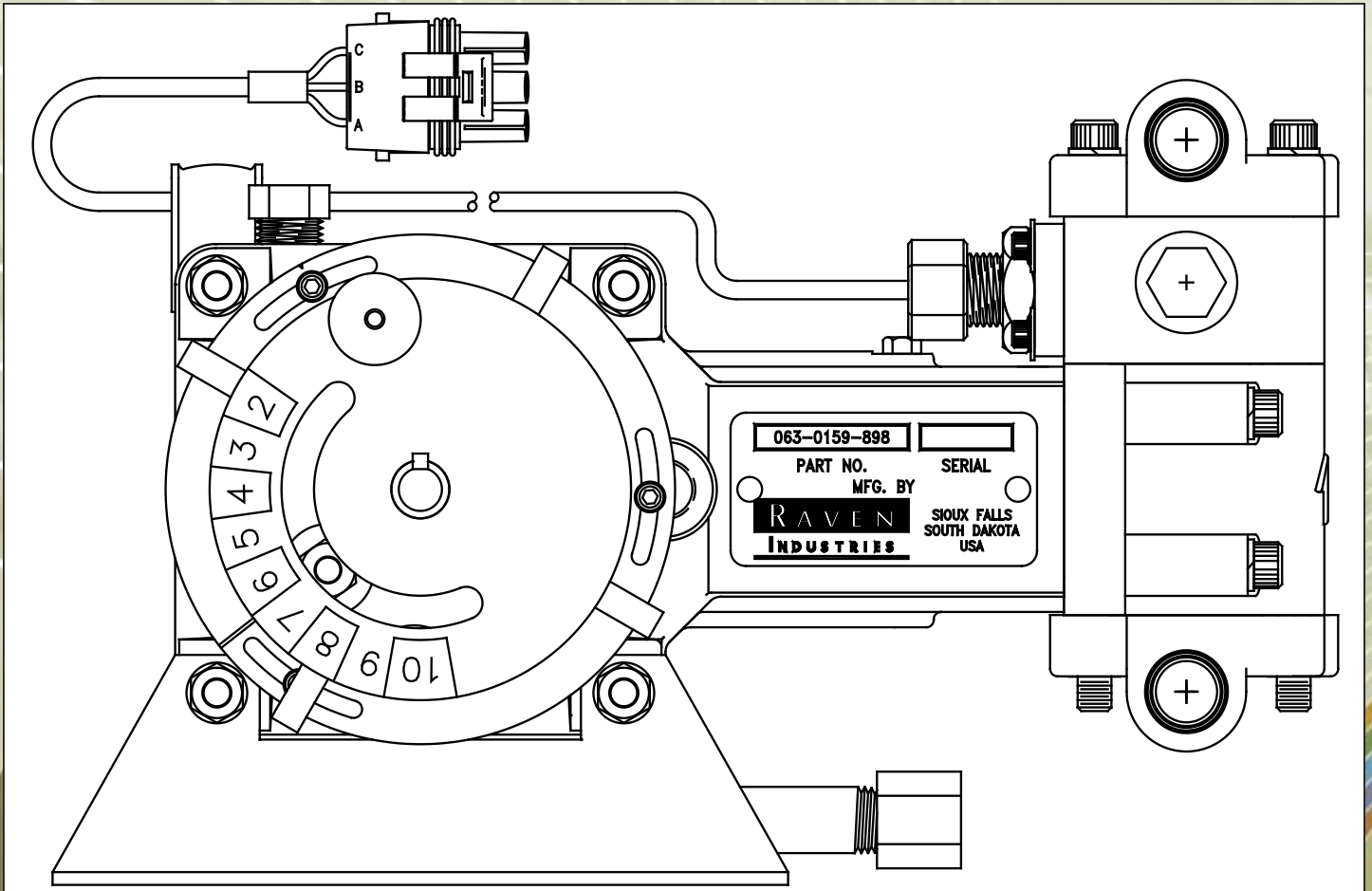


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GENERAL INFORMATION

The Raven Injection Pump is a positive displacement, variable stroke piston pump. See Pump Maintenance section for details.

SPECIFICATIONS

Dimensions	10"L x 5 3/4"H x 8 3/4"W
Pistons	two (2), 1/2" Diameter
Maximum Stroke Length	0.875" (10 Setting)
Minimum Stroke Length	0.175" (2 Setting)
Maximum RPM	1200
Maximum Operating Pressure	150 psi
Maximum Power Required	1/4 Hp
Maximum Recommended Suction Lift	2 ft.
Inlet & Outlet Plumbing	3/8" NPT-Right or Left Side
Crankcase Oil Capacity	4.5 oz.
Wetted Parts	303 Stainless Steel & Polypropylene
Body Material	Cast Iron
Wetted Seal O-Rings	V884-75/V965-80 Viton

INJECTION PUMP

1. PRIMING PROCEDURE

Injection Pump priming is required:

- 1) At initial start up.
- 2) If product tank has run empty.
- 3) When changing from one product to another.

To prime the Injection Pump, complete the following procedure. (See Figure 1).

- 1) Adjust the Pump Setting Index Line to the 10 setting.
- 2) Position the Injection Module hand valve for recirculation of product to Injection Module tank.
- 3) Run the Injection Pump at moderate speed for 3 minutes.
- 4) Return the Injection Module hand valve and Pump Setting to operating position.

2. ADJUSTING THE SETTING

- 1) Loosen Pump Setting Locknut, pull out on the Locking Pin and rotate the Printed Magnet Wheel until Pump Setting Index Line is at the proper number. (See Figure 1).
- 2) Tighten Pump Setting Locknut.

CAUTION: An error in positioning the Pump Setting Index Line will result in an error in product application.

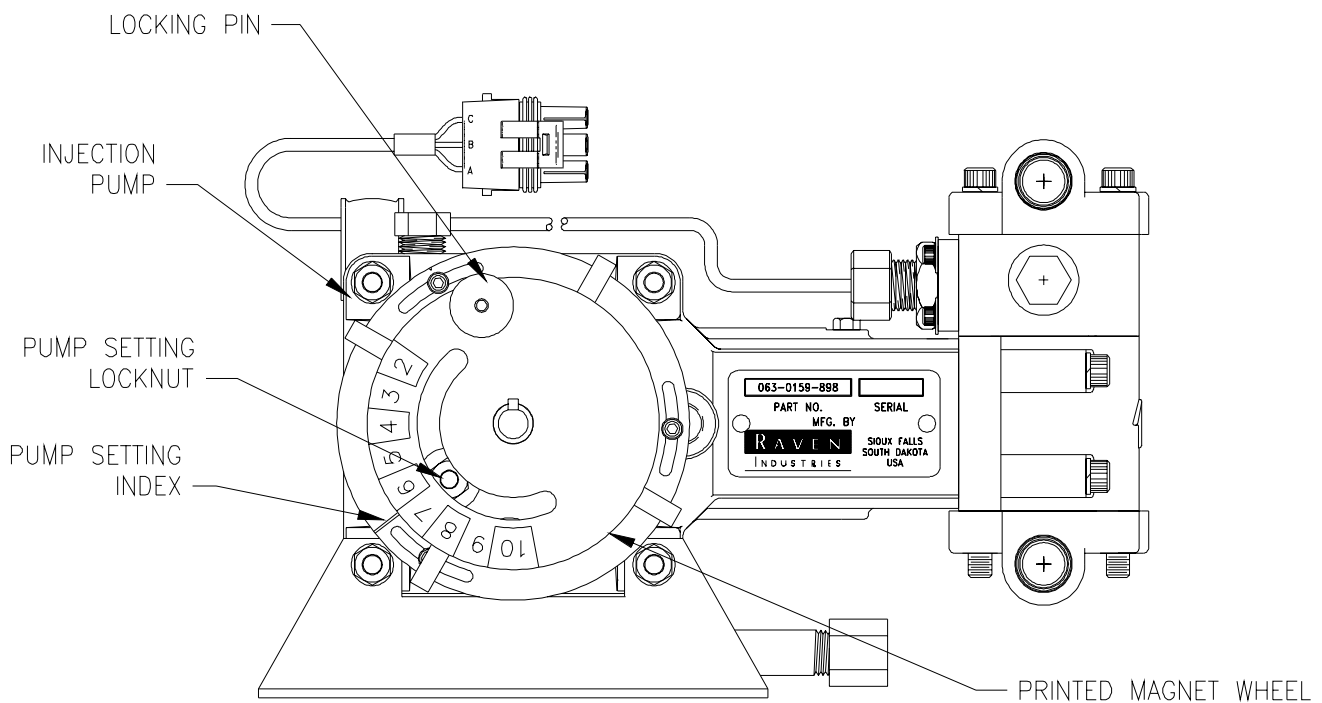


FIGURE 1

3. CALIBRATION VERIFICATION PROCEDURE

The Raven Injection Pump has been factory calibrated to constants listed on the calibration tag shown below in FIGURE 2. This should be verified periodically and every time a switch is made to different products. Calibration verification is detailed for PROD 1, pump setting 2. Repeat for PROD 2, etc., and other pump settings as necessary.

SETTING	ULTRA LOW VOLUME	LOW VOLUME	HIGH VOLUME
	3-48 g/min	1-166 g/min	2.5-288 g/min
2	2605 (9486)		550 (1850)
3	1867 (6304)		386 (1236)
4	1408 (4763)		276 (832)
5	1122 (3784)		220 (744)
6	938 (3172)		184 (622)
7	806 (2723)		158 (534)
8	704 (2377)		138 (466)
9	622 (2101)		122 (412)
10	561 (1807)		110 (372)

FIGURE 2

- 1) Prime the Injection Pump. See page 3, PRIMING PROCEDURE.
- 2) Program the Control Console as follows: (See Console Manual for details). Enter "990" in BOOM CAL 1, "1000" in SPEED CAL, "50" in METER CAL 1, and "6.0" in SELF TEST Speed. Place MASTER switch and BOOM 1 switch ON, and remaining BOOM switches OFF.
- 3) Position Pump Setting Index Line to 2.
- 4) With three-way valve set for recirculation, run Pump with PROD 1 OFF/MAN/AUTO switch in MAN and use INC/DEC switch until the PROD 1 rate display reads 150-160 for a Lo Volume Module or a High Volume Module, and 425-450 for an Ultra Low Volume Module.
- 5) Place OFF/MAN/AUTO switch in OFF position and enter "0" into PROD 1 VOLUME.
- 6) Place tank recirculation line into calibration flask (Raven P/N 106-0159-454).

- 7) Position OFF/MAN/AUTO switch to MAN until 50 oz. mark is reached on calibration flask, then position switch to OFF. Number displayed in PROD 1 VOLUME should fall within limits in table below. If number is not within calibration limits, check for debris caught on valve seat or damaged o-rings. If the Pump is not within these limits and the Pump valves are clean with no damaged parts, consult your Dealer.

ULTRA LOW VOLUME MODULE		
	CALIBRATION NUMBER	
PUMP SETTING	MIN	MAX
2	2705	2905
5	1072	1172
10	541	581

***NOTE:**

*These calibration numbers are representative when the injection pump is used with injection modules powered with Gear Motor Assembly 063-0159-831 with a capacity of .5 oz/min to 40 oz/min.

LOW VOLUME / HIGH VOLUME MODULE		
	CALIBRATION NUMBER	
PUMP SETTING	MIN	MAX
2	530	570
5	210	230
10	104	114

***NOTE:**

*These calibration numbers depend on the number of magnets located on the printed magnet wheel. This chart reflects 4 magnets. If only 2 magnets are present on the printed magnet wheel, the calibration number will be 1/2 of the number shown on this chart. Ref. Figure 1, page 3.

FIGURE 3

Normally, Re-Calibration of the Injection Pump is not necessary. It has been calibrated at the factory and this will not change unless the Index Ring has moved. Always use CALIBRATION VERIFICATION PROCEDURE on page 4. Check that Injection Pump valves are clean and undamaged.

4. RECOMMENDED INJECTION PUMP FLUSH SYSTEM

The recommended system is shown in FIGURE 4. Strainers are recommended for the product and flush system water. Strainers suitable for concentrated product are typically 20 mesh stainless steel. However, certain products may not flow through strainer without causing excessive vacuum or may clog strainer entirely. It is recommended that a flush system be incorporated with the injection system. This will enhance the performance of the injection pump. The basic components are shown below and are available through your local spraying equipment supplier. This system shall be installed as shown and operated per the following instructions. The required frequency of flushing may vary per the product being injected.

- 1) Drain or empty Product Injection Tank.
- 2) Place VALVE #3 in Recirculation position.
- 3) Place VALVE #2 in position to let clean water circulate thru Injection Pump from flush pump. **VENT CHEMICAL TANK.** Start flush System, pump approximately 1/2 gallon into Injection Tank.
- 4) Reposition VALVE #2 and VALVE #3 to allow rinse mixture to be injected. Spray rinse mixture at normal recommended rate.
- 5) Repeat this procedure until Pump and Tank are clean. (i.e. Triple rinse).

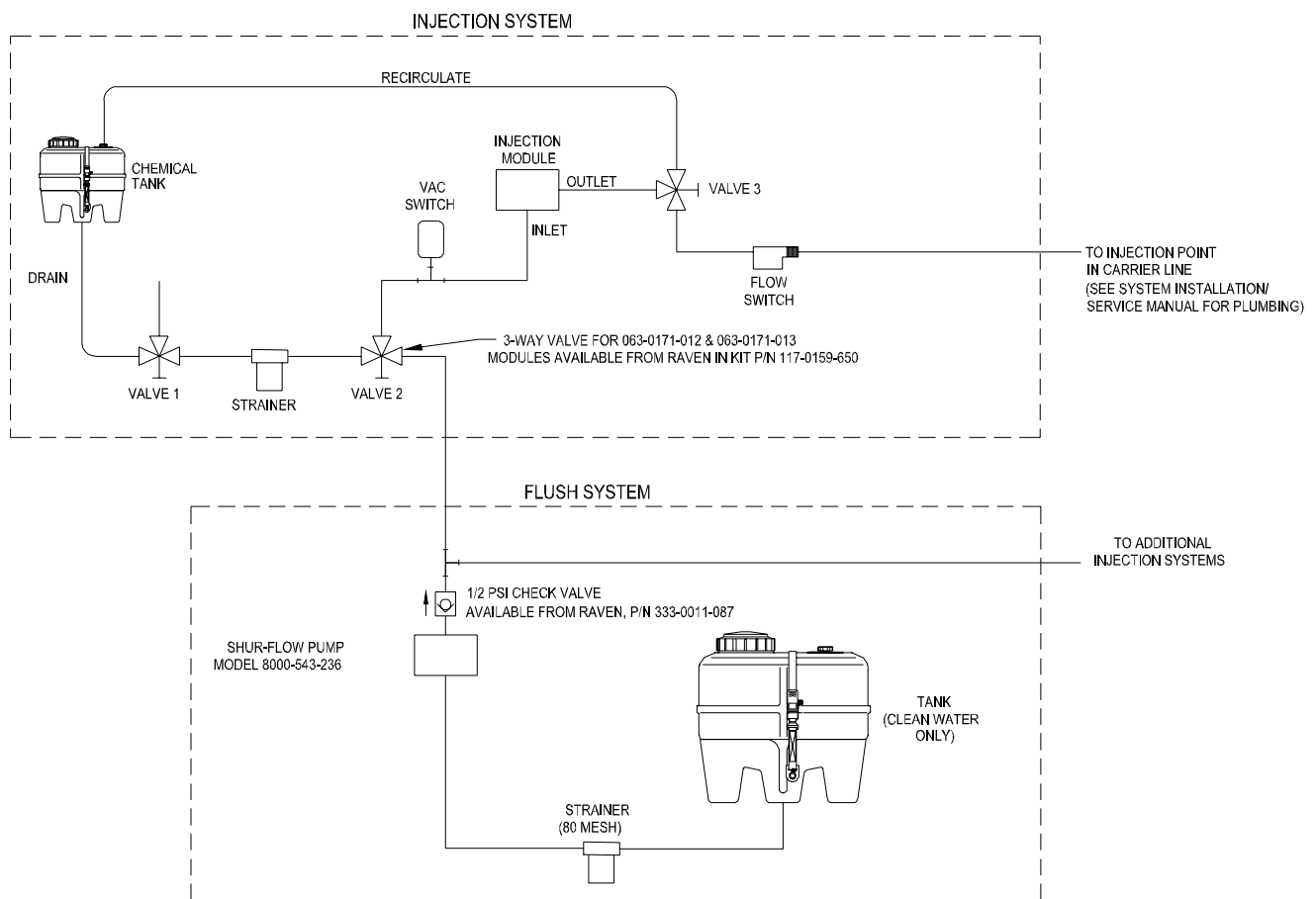


FIGURE 4

NOTE: SHUR FLOW Pump may be powered by unused agitator output from 750 Injection Cables. Select Agitator Control and set in the OFF mode until operation of flush system is desired.

MAINTENANCE

1. CLEANING OR REPLACING CHECK VALVE O-RINGS

Small particles of rust, sand, or grit may get trapped in the check valve seats. If this happens, the operator will notice a change in accuracy of application rate. It will be necessary to clean or replace the check valve o-rings. New o-rings are furnished in kit P/N 117-0159-824, which is available through your dealer. Complete the following procedure. Reference FIGURE 5 on page 8.

- 1) Empty any product from the Injection Module tank. Flush Pump with water.
- 2) Carefully remove the intake and discharge manifolds from the Pump. Ref. replacement parts list, items 8, 10 & 12.
- 3) Place a flat bladed screwdriver in the groove found on the check valve assembly where it protrudes out of the pump head and pry it out.
- 4) Examine o-ring around outside of valve assembly. Replace if cut or nicked. See note below.

NOTE: These o-rings are made of a chemical resistant compound.

- 5) Disassemble check valve assemblies per instructions on page 8. To prevent loss of parts place valve assembly inside clear plastic bag prior to doing this procedure. Examine the guide, spring, and poppet. Examine the poppet o-ring. Check for wear, pits, swelling, or foreign matter. Clean or replace if necessary. See note above.
- 6) Reassemble check valve assemblies per instructions on page 8. Do not interchange springs from the discharge and intake valves. The heavy spring is for the discharge valve (top), and the light spring is for the intake valve (bottom).
- 7) Apply petroleum jelly to valve body o-rings. Press check valve assemblies into the Pump head.
- 8) Inspect manifold o-rings. Clean and replace if necessary.

2. PUMP VALVE ORDER OF ASSEMBLY AND REPLACEMENT PARTS

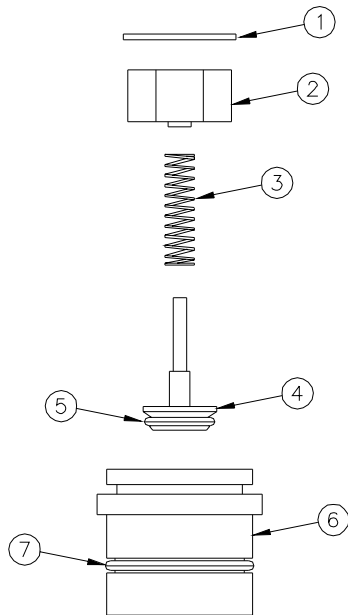
CAUTION: WEAR SAFETY GLASSES DURING ALL ASSEMBLY AND DISASSEMBLY OF VALVES.

Reference FIGURE 5.

ITEM	DESCRIPTION	RAVEN PART #	ITEM	DESCRIPTION	RAVEN PART #
1	Internal Snap Ring	335-0003-132	8	Spring, Retainer	107-0171-459
2	Poppet Guide	107-0159-934	9	Spring	314-0000-005
3	Spring	314-0000-006	10	Poppet Guide	107-0171-092
4	Poppet	107-0159-935	11	Valve Body	107-0171-090
5	O-Ring (Viton)	219-0007-011	12	Poppet	107-0171-447
6	Valve Body	107-0159-932			
7	O-Ring (Viton)	219-0002-018			

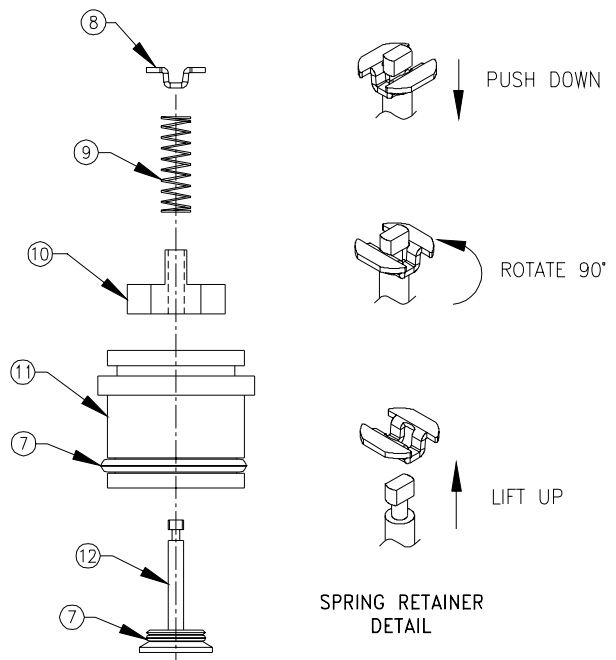
** Seals available in kit P/N 117-0159-824

DISCHARGE VALVE ASSY (063-0159-894)



NOTE: DEPRESS VALVE GUIDE (ITEM 2) ONTO SPRING (ITEM 3) TO REMOVE OR INSTALL SNAP RING (ITEM 1).

INTAKE VALVE ASSY (063-0159-893)



NOTE: TO REMOVE SPRING RETAINER (ITEM 8), HOLD POPPET (ITEM 12) SECURELY IN BODY (ITEM 11). THEN DEPRESS SPRING RETAINER AND TURN 90 DEGREES. CAREFULLY RAISE SPRING RETAINER FROM POPPET. SEE DETAIL ABOVE. TO INSTALL, REPEAT STEPS ABOVE IN REVERSE ORDER.

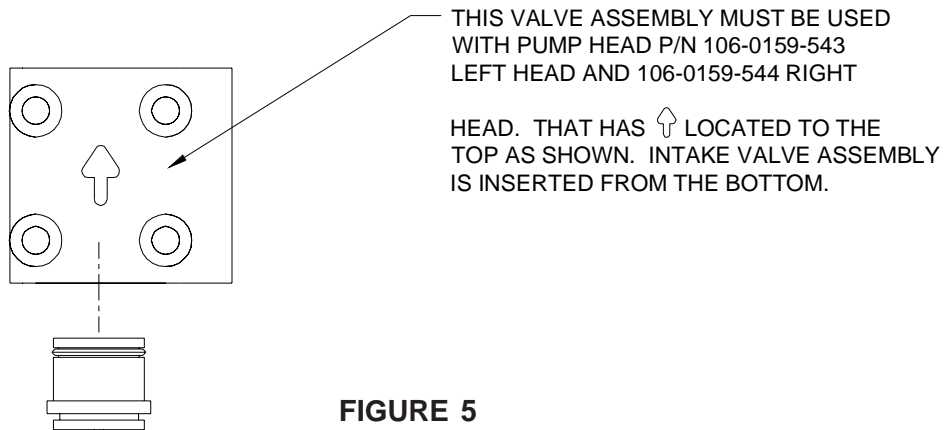


FIGURE 5



3. REPLACEMENT OF PISTON SEALS

Install new seals when Pump leaks excessive product or oil. Leakage will be through weep holes on the underside of the cylinder housing. New seals are furnished in kit 117-0159-824, which is available through your dealer. To install the seal kit, complete the following Steps.

For reference diagrams during this procedure see: Figures 5, 6, & 7.

- 1) Empty any product from the Injection Module tank. Flush the Pump with water.
- 2) Carefully remove the intake and discharge manifolds from the Injection Pump. For greatest convenience, remove the Pump from the Module. Ref. replacement parts list, items 8, 10, & 12.
- 3) Loosen and remove the four socket head cap screws that secure each Pump head to the crankcase. Remove the heads. Take care not to damage the finish on the exposed piston.
- 4) Locate the pry bar slots on the underside of the crankcase just behind the end of the poly-pak assembly (Item 1, Figure 6). Using a flat blade screwdriver in this slot, pry out poly-pak assembly.
- 5) Remove and inspect face and body seal sleeve o-ring (Item 4, Figure 8). Replace if necessary.

NOTE: These o-rings are made of a chemical resistant compound. Ref. Figure 6 & 7.
--

- 6) Remove oil and chemical poly paks. Use a needle nose pliers to pull seals from poly pak assembly. Be careful not to scratch sealing surfaces on plastic parts. (See Figure 7)
- 7) Install new seal kit. **NOTE:** The lip portion of both seals must face out. Care must be taken with the oil seal, so that its outside diameter is fully seated under the retaining lip of the sleeve (See Figure 7).
- 8) Carefully inspect the piston surface finish. Small nicks or scratches can reduce the life of the seals. Replace if necessary.
- 9) Apply a light coat of grease to the sleeve body o-ring and end of piston. Carefully push the seal sleeve assembly onto piston. Once piston end is past oil seal lip, rotate to see that it is not rolled under. The slot on seal sleeve must face down. Push the sleeve body all the way into housing (See Figure 7).
- 10) Verify that face o-ring and chemical seal are still seated in place. Now, reinstall heads. The heads have a  stamped on the outside face. Install the heads onto the pump with the  located to the top. Tighten the socket head cap screws finger tight (See Figure 5).
- 11) Reinstall manifolds and tighten securely. Torque bolts to 50 in. lbs.
- 12) Tighten socket head cap screws evenly (use a diagonal pattern) and securely.

4. SEALS

Reference Figures 6 & 7.

ITEM	DESCRIPTION	RAVEN PART #
1	Poly-Pak Sleeve	106-0159-538
2	Poly-Pak Chemical Seal	219-0000-058
3	Poly-Pak Oil Seal, Double Lip	219-0000-106
4	O-Ring, face/body	219-0002-121
5	O-Ring	219-0002-018
6	O-Ring	219-0007-011

** Seals available in kit P/N 117-0159-824

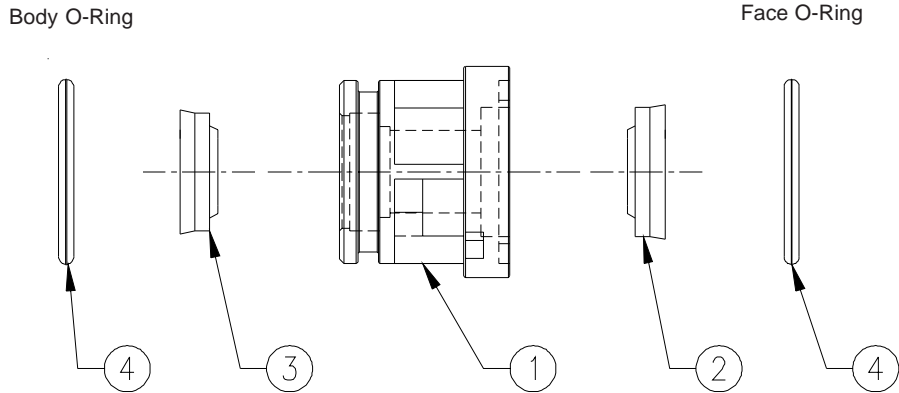


FIGURE 6

POLY-PAK ASSEMBLY (063-0172-082)

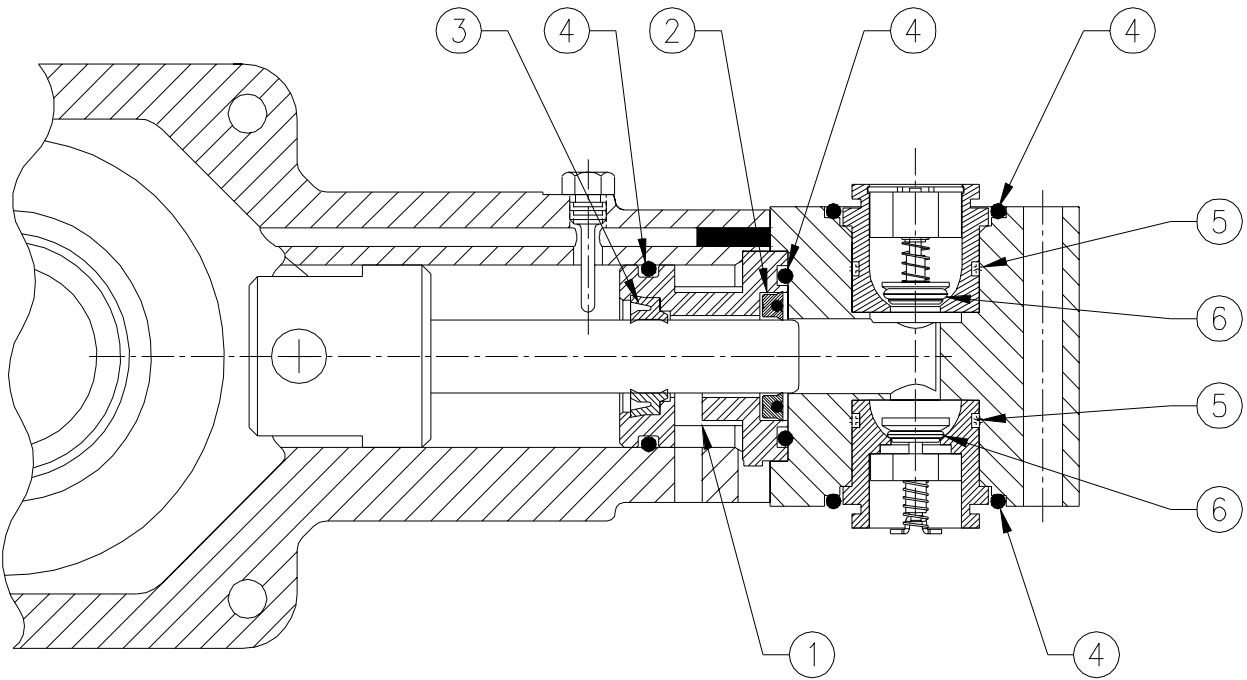


FIGURE 7

SEAL INSTALLATION

5. LUBRICATION

Check oil level in Injection Pump **daily**. If additional oil is required, add Mobile #1 (5W30) **ONLY**. Drain and refill the Pump after every 150 hours of operation.

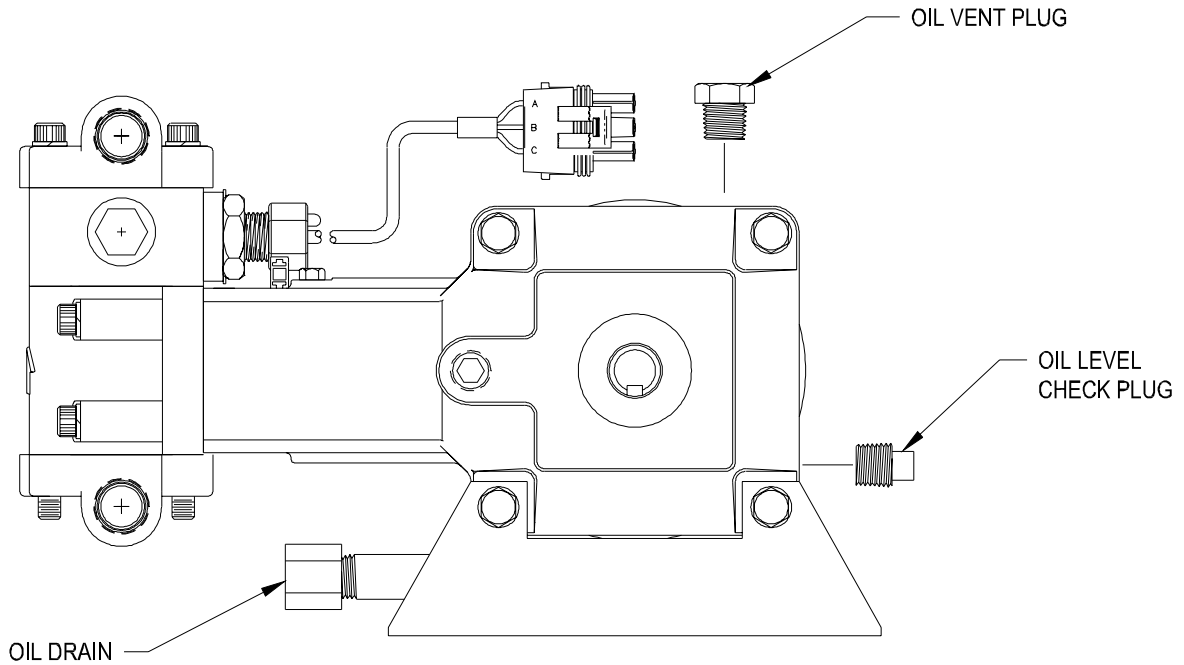


FIGURE 8

6. STORAGE

Prepare the Injection Pump for storage as follows:

- 1) Drain crankcase oil and refill to proper level (4.5 oz.) with Mobile #1 (5W30).
- 2) Flush any product remaining in the pump by recirculating water through the Injection Module. Incrustations of product may be removed by flushing with kerosene or fuel oil.
- 3) Recirculate a 50% water and 50% antifreeze mixture through the Injection Module.

7. SENSITIVITY ADJUSTMENT PROCEDURE, MANIFOLD FLOW MONITOR

1. Place pump on 10 setting. Position injection modules hand valve to recirculate. Run pump to prime system. Inspect for any leaks. Repair as necessary.
2. Change pump setting to 2. Adjust meter cal for setting 2. Monitor volume per minute. Manually adjust pump output to 5 oz. per minute.
3. Visually monitor LED on manifold sensor. Adjust manifold sensor left or right until LED flashes. Tighten screws on bracket. Ref. Figure 10.
4. Verify LED continues to flash. Adjust pump to pump setting 10. Adjust meter cal for setting 10.
5. Manually adjust pump output to 40 oz/min. Verify LED continues to flash.
6. During normal operation LED shall flash. If pump pumps on only one cylinder, LED will no longer flash. Flow error message will be displayed on console.
7. Return hand valve to injection position.

NOTE: To read vol/min on Console, press vol/min key or enter the following constants in console. Boom 1 - 990
All other Booms - 0
Meter Cal - Cal number for pump setting.
Self test - 6.0 mph
Re-enter normal constants when adjustment is completed.

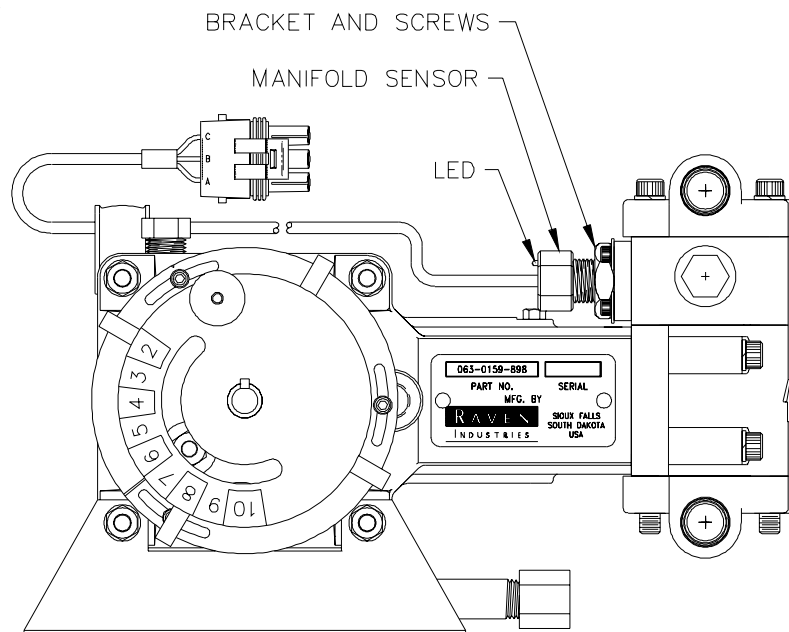
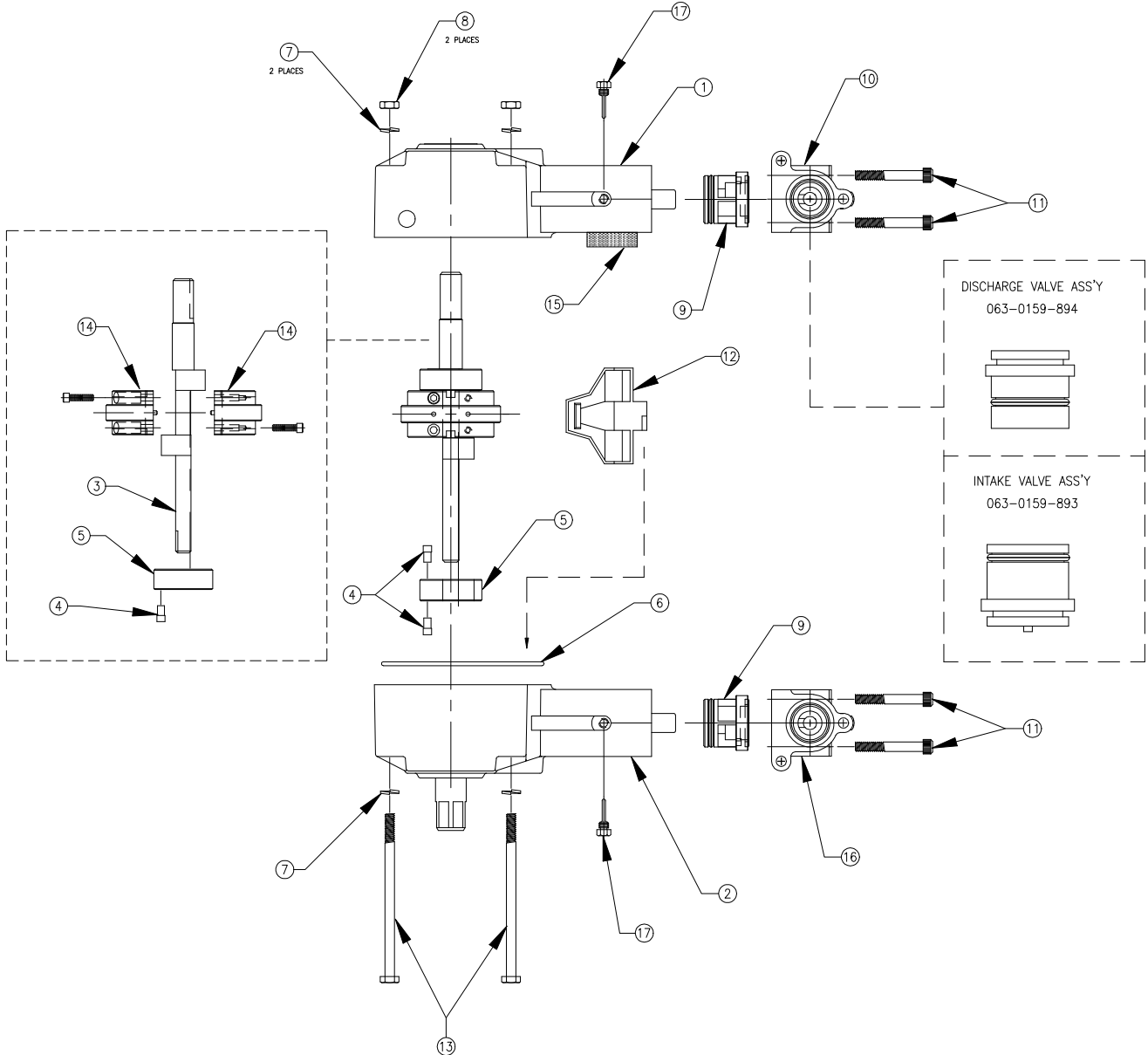


FIGURE 9

RAVEN INJECTION PUMP REPLACEMENT PARTS

INJECTION PUMP ASSEMBLIES:
063-0159-898

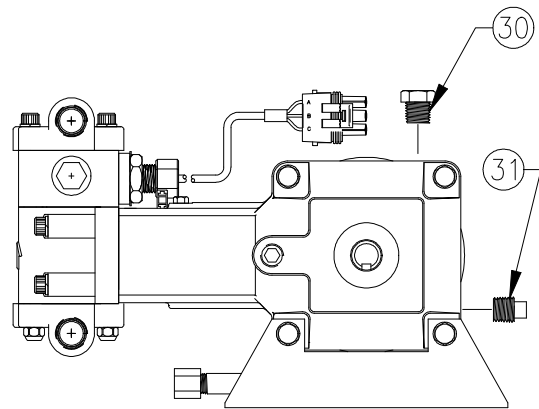
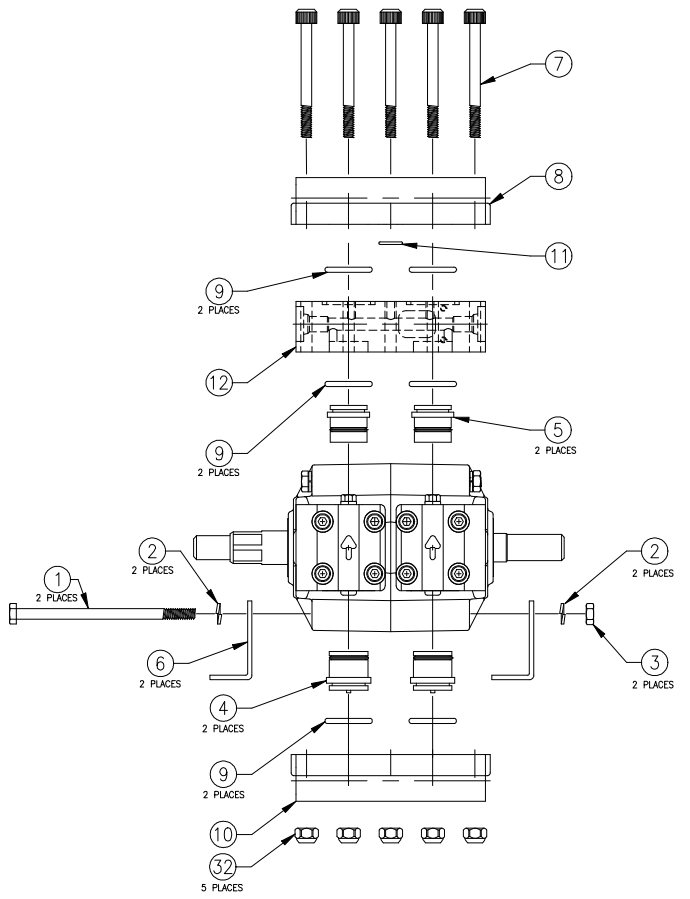
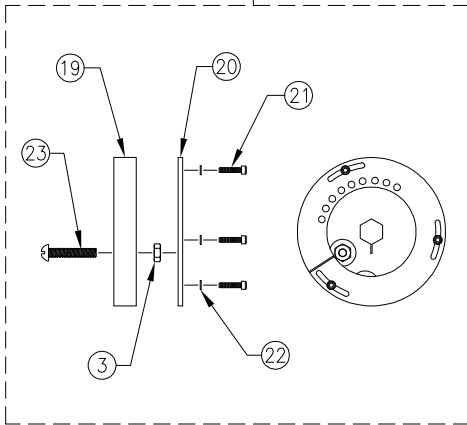
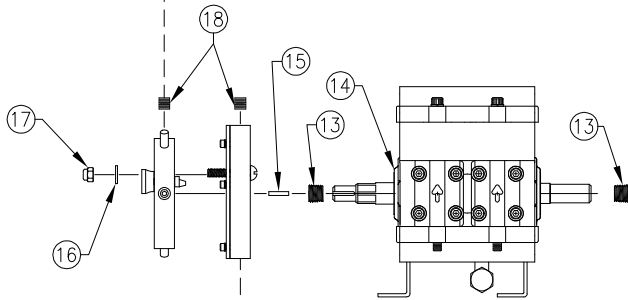
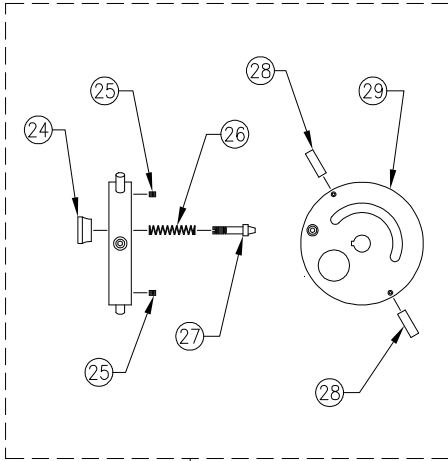
ITEM	DESCRIPTION	RAVEN PART #
1	Housing Assembly, Left	063-0159-889
2	Housing Assembly, Right	063-0159-890
3	Crankshaft	107-0159-925
4	Pin, Eccentric	107-0159-941
5	Eccentric	107-0159-930
6	O-Ring	219-0001-155
7	Lockwasher, Split, 1/4"	313-1000-017
8	Nut, Hex, 1/4-20 UNC	312-1001-033
9	Poly-Pak Assembly	063-0172-082
10	Head, Left	106-0159-543
11	Bolt, Hex Socket Head	311-0068-179
12	Oil Collector	106-0159-537
13	Bolt, Hex Head 1/4-20 UNC x 4 1/4"	019-0159-113
14	Wheel, Oiler, Halves	107-0171-384
15	Foam Tape	218-0159-444
16	Head, Right	106-0159-544
17	Pin, Oil Dripper	107-0171-369



RAVEN INJECTION PUMP REPLACEMENT PARTS

INJECTION PUMP MANIFOLD AND MAGNET WHEEL ASSEMBLIES FOR:
063-0159-898

ITEM	DESCRIPTION	RAVEN PART #
1	Bolt, Hex Head 1/4-20 x 4 1/2"	311-0050-243
2	Lockwasher, Split 1/4"	313-1000-017
3	Nut, Hex 1/4-20	312-1001-033
4	Intake Valve Assembly	063-0159-893
5	Discharge Valve Assembly	063-0159-894
6	Bracket, Pump Mounting	107-0159-945
7	Screw, Cap, Hex Socket Head 1/4-20 x 4 1/2"	311-0068-187
8	Manifold, Discharge	106-0159-541
9	O-Ring	219-0002-121
10	Manifold, Intake	106-0159-540
11	O-Ring	219-0002-110
12	Manifold, Monitor	063-0172-219
13	Plug, Pipe	333-0009-037
14	Pump Assembly	063-0159-897
15	Key, Square	107-0159-947
16	Flat Washer 1/4"ID	313-2300-010
17	Nylon Insert, Locknut	312-4000-057
18	Set Screw, Hex Socket Head	311-0015-729
19	Calibration Wheel	107-0159-943
20	Index Ring	107-0159-589
21	6-32 UNC x 5/8" Lg. Cap Screw	311-0068-026
22	Flat Washer	313-2300-111
23	1/4-20 x 1 3/4" Lg. Machine Screw	311-0050-253
24	Knob	107-0159-592
25	6-32 UNC x 3/16" Lg. Set Screw	311-0015-036
26	Stainless Steel Spring	314-0000-002
27	Pump Pin	107-0159-591
28	Magnet	418-0000-004
29	Printed Magnet Wheel	063-0159-885
30	Pipe Plug	333-0009-012
31	Pipe Plug, Square Head	333-0009-082
32	Nut, Lock, Nylon, 1/4"-20	312-4000-164



RAVEN

RAVEN INDUSTRIES

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Product under normal use, maintenance, and service.

How Long is the Coverage Period?

Raven Applied Technology Products are covered by this warranty for 12 months after the date of purchase. This warranty coverage applies only to the original owner and is nontransferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven Dealer. If your Dealer agrees with the warranty claim, the Dealer will send the part and proof of purchase to their distributor or to Raven Industries for final approval.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will, at our discretion, repair or replace the defective part and pay for return freight.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit or other special damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

R A V E N

Injection Pump
Service Manual
(P/N 016-0159-481 Rev G 2/09)

Simply improving your position.SM



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