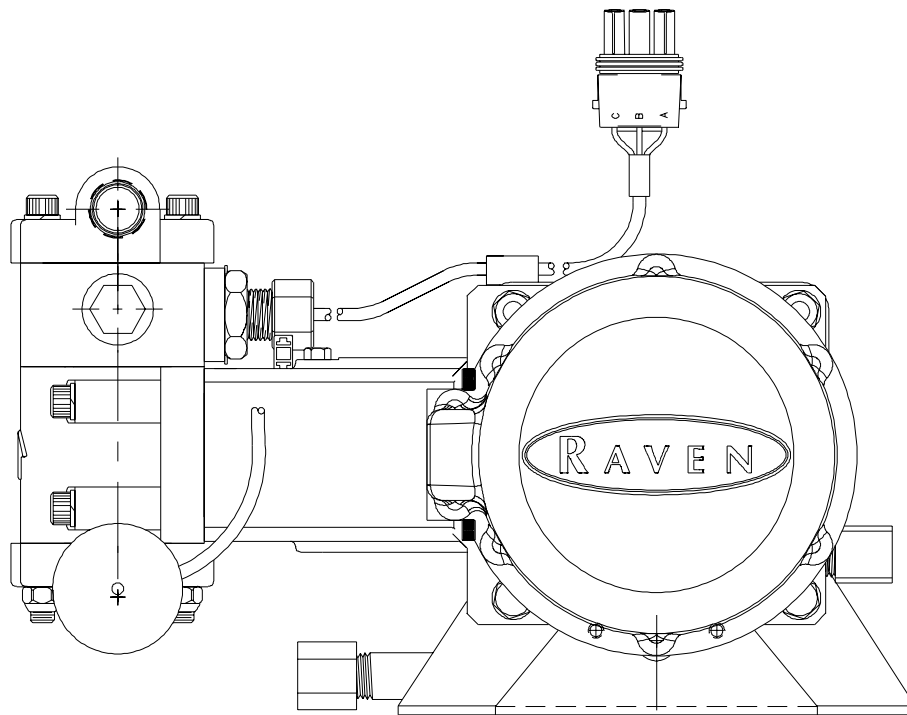


THE *Right* PRODUCTS
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INJECTION PUMP DIRECT DRIVE



SERVICE MANUAL

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GENERAL INFORMATION

The Raven Injection Pump is a positive displacement, 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"
Flow Output Range.....	5 to 200 oz/min. when used with Raven Sidekick Control Console
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/Left Side Inlet 1/2" NPT Outlet
Crankcase Oil Capacity	4.5 oz.
Wetted Parts	Polypropylene 303 Stainless Steel
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.

- 1) Position the Injection Module hand valve for recirculation of product to Injection Module tank.
- 2) Run the Injection Pump at moderate speed for 3 minutes.
- 3) Return the Injection Module hand valve to operating position.

2. CALIBRATION VERIFICATION PROCEDURE

The Raven Injection Pump has been factory calibrated to constant listed on the calibration tag shown below in FIGURE 2. This should be verified periodically. Calibration verification is detailed for below.

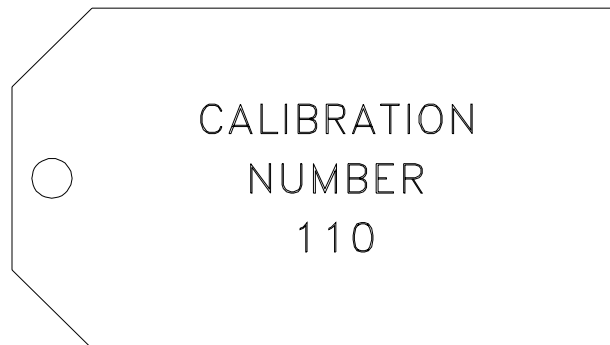


FIGURE 1

NOTE: The keys referenced in the steps below refer to using this pump with the Raven SIDEKICK system.

1. Enter 50 into the METER CAL key on the SCS SIDEKICK Console.
2. Place 3-way valve handle on Injection Pump to recirculate position.
3. Place BOOM and MASTER switches ON. Place the OFF/HOLD/RUN switch to RUN.
4. Run pump until liquid appears from tank return hose. Place OFF/HOLD/RUN switch to HOLD.
5. Enter "0" into TOTAL VOLUME key.
6. Place tank return hose into measuring container.
7. Place OFF/HOLD/RUN switch to RUN until 50 ounces of measured product is pumped. The number displayed in TOTAL VOLUME is the new METER CAL.
8. Enter this new METER CAL number in METER CAL key.
9. Enter "0" in TOTAL VOLUME key.
10. Place OFF/HOLD/RUN switch to RUN until 50 ounces of measured product is pumped.
11. The number in TOTAL VOLUME should be 49, 50, or 51. If not, repeat calibration procedures.

12. Empty tank return hose into measuring container.
13. Pour product caught in measuring container back into Injection Module Tank.

NOTE:	A.	Typical causes for Injection System to under apply are: <ol style="list-style-type: none">1. Fouled Pump Check Valves.2. Air leaks on Injection Pump inlet plumbing.3. Air entrained in chemical.4. Plugged inlet strainer.5. Chemical is too thick to flow thru inlet plumbing.
	B.	Typical cause for over application: Incorrect calibration data entered into Console.

CALIBRATION FLASK
106-0159-454

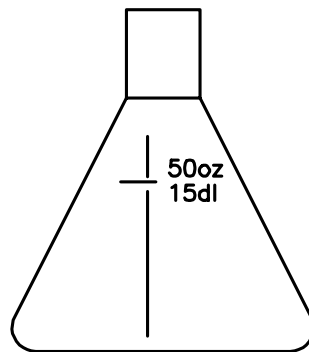


FIGURE 2

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 4 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.
- 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.

<p>NOTE: These o-rings are made of a chemical resistant compound and should only be replaced with o-rings supplied by your Dealer.</p>

- 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.

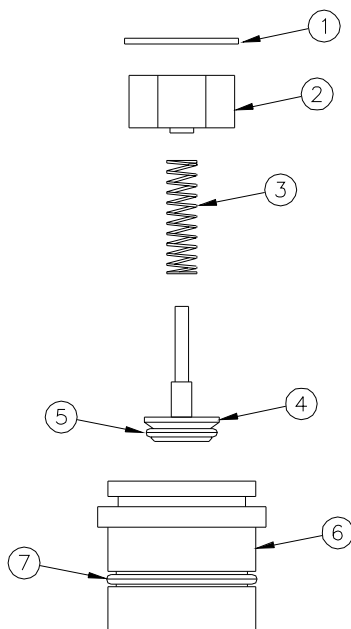
Reference FIGURE 4.

ITEM	DESCRIPTION	RAVEN PART #
1	Internal Snap Ring	335-0003-132
2	Poppet Guide	107-0159-934
3	Spring	314-0000-006
4	Poppet	107-0159-935
5	O-Ring (Viton)	219-0007-011
6	Valve Body	107-0159-932
7	O-Ring (Viton)	219-0002-018

ITEM	DESCRIPTION	RAVEN PART #
8	Spring Retainer	107-0171-459
9	Spring	314-0000-005
10	Poppet Guide	107-0171-092
11	Valve Body	107-0171-090
12	Poppet	107-0171-447

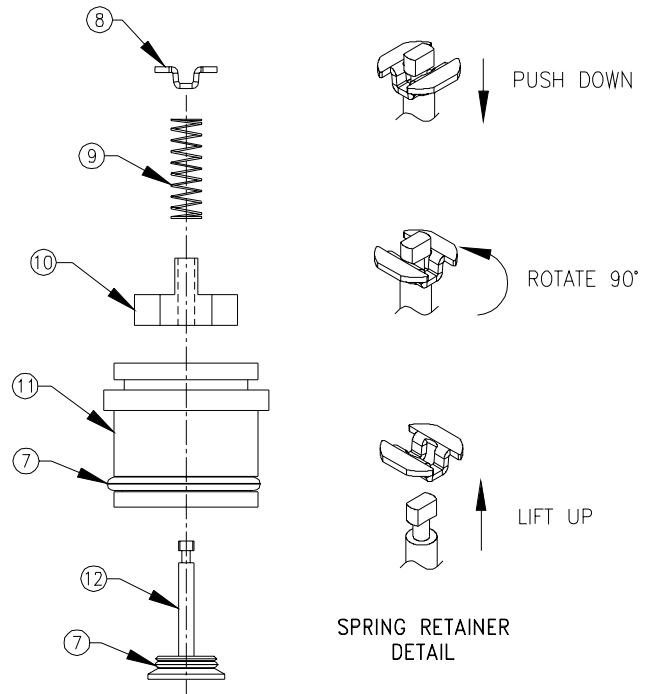
** Seals available in kit P/N 117-0159-824

DISCHARGE VALVE ASSY (063-0159-894)

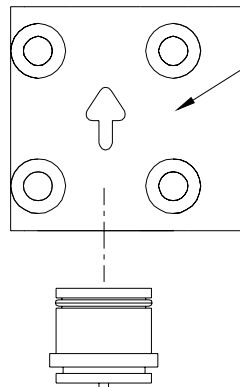


NOTE: DEPRESS VALVE GUIDE (ITEM 2) ONTO SPRING (ITEM 3) TO REMOVE OR INSTALL SNAP RING (ITEM 1).

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.



THIS VALVE ASSEMBLY MUST BE USED WITH PUMP HEAD P/N 106-0159-543 LEFT HEAD AND 106-0159-544 RIGHT

HEAD. THAT HAS ↑ LOCATED TO THE TOP AS SHOWN. INTAKE VALVE ASSEMBLY IS INSERTED FROM THE BOTTOM.

FIGURE 4



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 4, 5, AND 6

- 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.
- 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. 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 6). Replace if necessary.

NOTE: These o-rings are made of a chemical resistant compound and should only be replaced with o-rings supplied by your Dealer.

- 6) Remove oil and chemical seals. Use a needle nose pliers to pull seals out of the poly pak assembly. Be careful not to scratch sealing surfaces on plastic parts.
- 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 6).
- 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 6).
- 10) Verify that face o-ring and chemical seal are still seated in place. Now, reinstall heads. The heads have a  molded on the outside face. Install the heads onto the pump with the  located to the top. Tighten the socket head cap screws finger tight.
- 11) Reinstall manifolds and tighten securely. Torque to 50 in/lbs.
- 12) Tighten socket head cap screws evenly (use a diagonal pattern) and securely. Torque to 50 in/lbs.

4. SEALS

Reference Figures 5 & 6.

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 117-0159-512

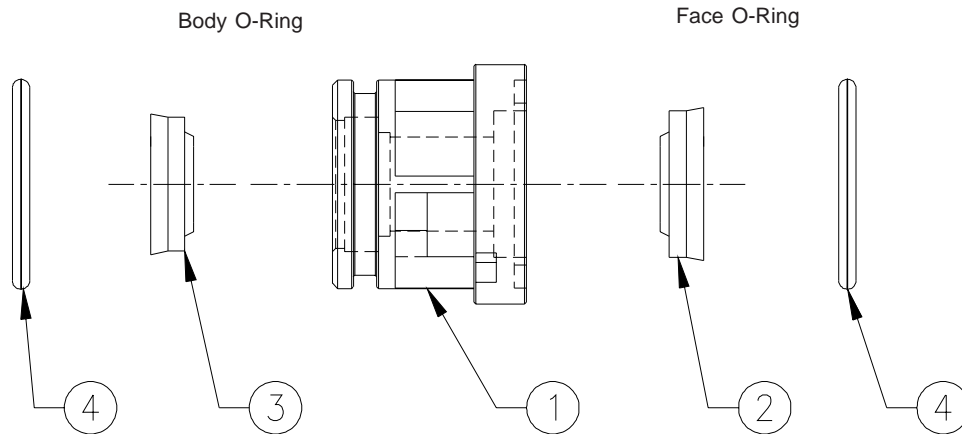


FIGURE 5

POLY-PAK ASSEMBLY (063-0172-082)

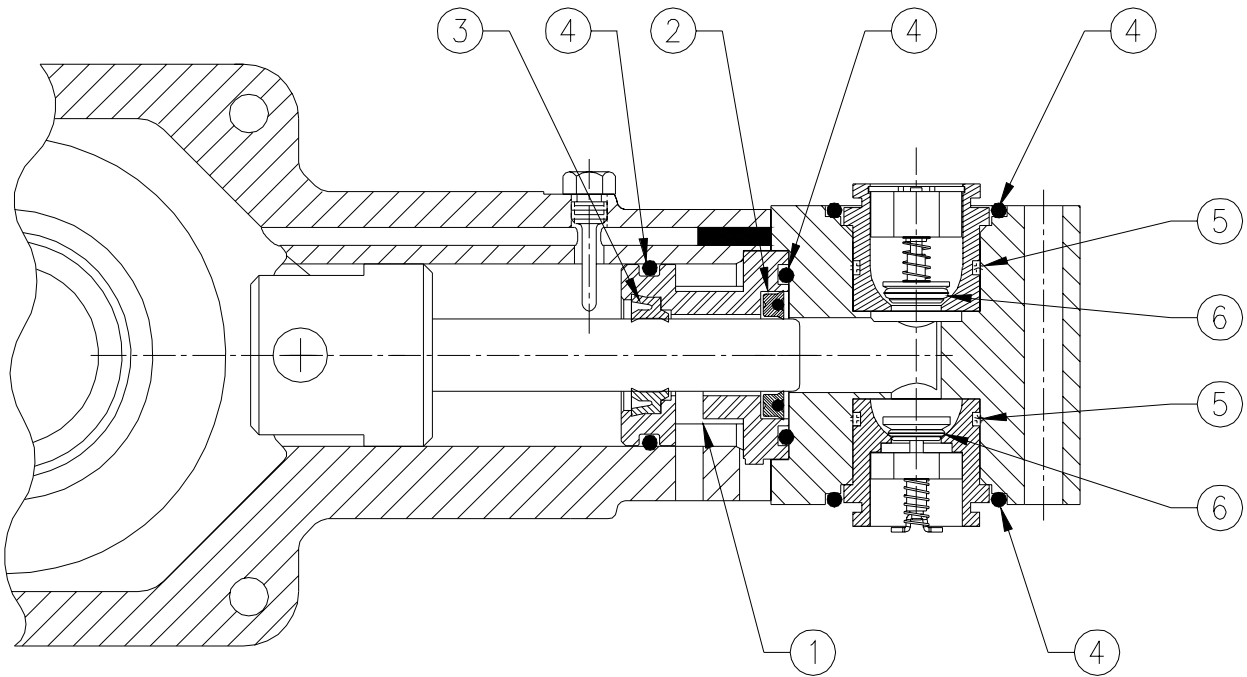


FIGURE 6

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.

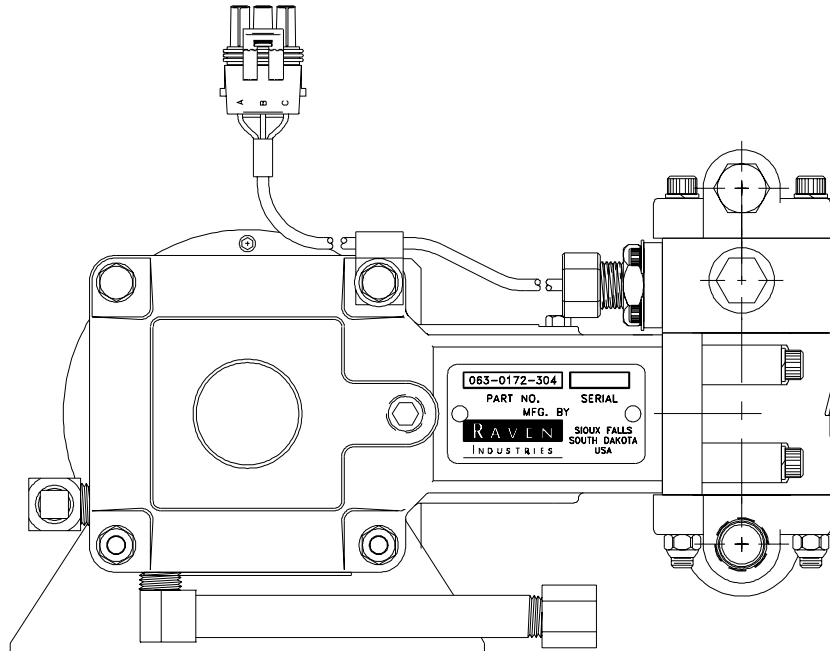


FIGURE 7

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. Position injection modules hand valve to recirculate. Run pump to prime system. Inspect for any leaks. Repair as necessary.
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 8.
4. Verify LED continues to flash.
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, refer to SIDEKICK CONSOLE Manual.

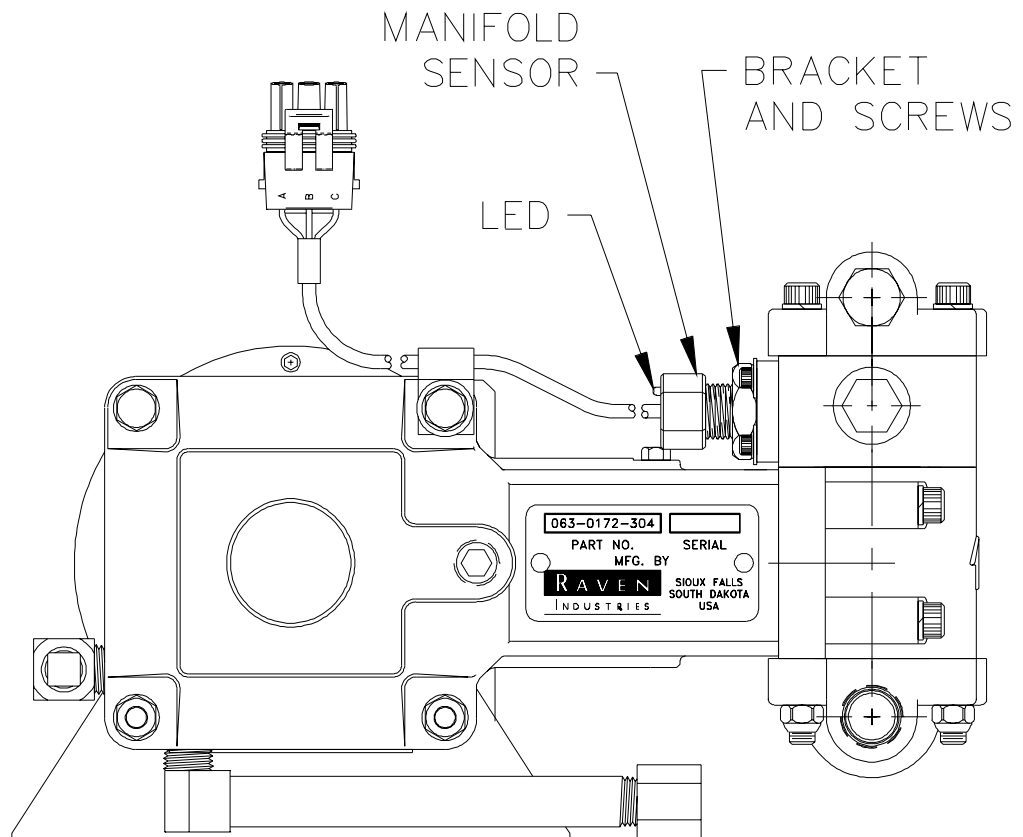
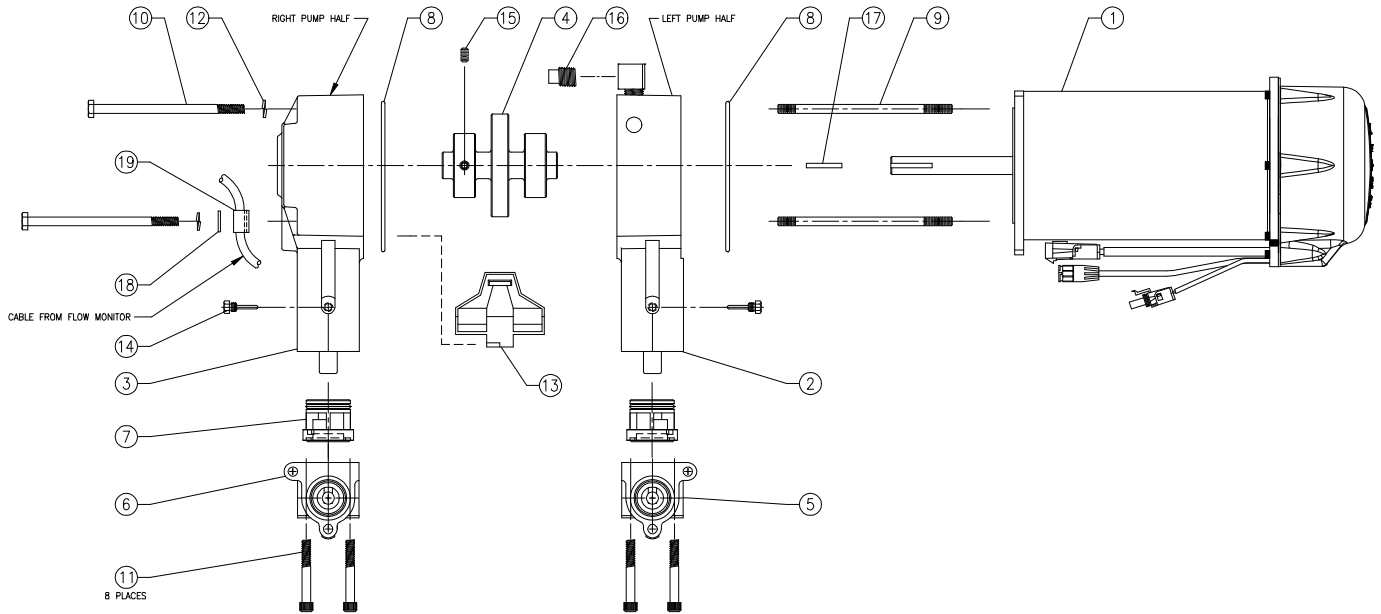


FIGURE 8

RAVEN INJECTION PUMP, DIRECT DRIVE REPLACEMENT PARTS

063-0172-304

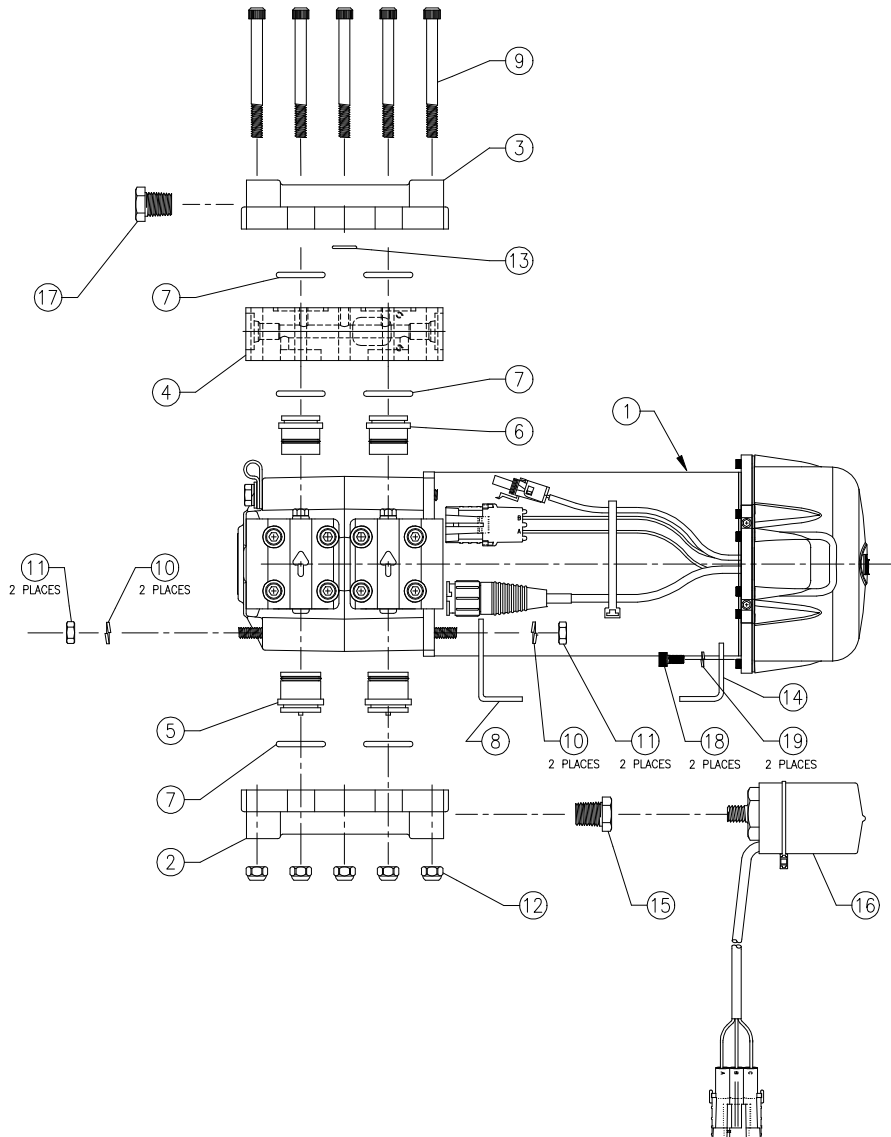
ITEM	DESCRIPTION	RAVEN PART #
1	Motor/Tach Assembly	063-0172-305
2	Housing Assembly, Left Hand	063-0172-311
3	Housing Assembly, Right Hand	063-0172-310
4	Crank, Direct Drive Pump	107-0171-435
5	Head, Pump, Left	106-0159-543
6	Head, Pump, Right	106-0159-544
7	Poly-Pak Assembly	063-0172-082
8	O-Ring	219-0001-155
9	Stud, Pump Halves	107-0171-434
10	Modified Bolt	019-0159-113
11	Screw, Cap, Hex Socket Head	311-0068-187
12	Lockwasher, Split	313-1000-017
13	Collector, Oil	106-0159-537
14	Pin, Oil Dripper, Plug	107-0171-369
15	Screw, Set, Hex Socket	311-0015-637
16	Plug, Pipe	333-0009-082
17	Key, Square	107-0171-443
18	Washer, Flat	313-2301-810
19	Clamp, Cable	435-3001-042



RAVEN INJECTION PUMP, DIRECT DRIVE REPLACEMENT PARTS

063-0172-304

ITEM	DESCRIPTION	RAVEN PART #
1	Motor/Tach Assembly	063-0172-305
2	Manifold, Intake	106-0159-540
3	Manifold, Discharge	106-0159-541
4	Manifold, Flow Monitor	063-0172-081
5	Valve, Intake	063-0159-893
6	Valve, Discharge	063-0159-894
7	O-Ring	219-0002-121
8	Bracket, Pump Mounting	107-0159-945
9	Screw, Cap, Hex Socket Head	311-0068-187
10	Lockwasher, Split	313-1000-017
11	Nut, Hex	312-1001-033
12	Nut, Nylon Locking	312-4000-164
13	O-Ring	219-0002-110
14	Bracket, Mounting	107-0171-471
15	Bushing, Reducing	333-0003-066
16	Switch, Vacuum	063-0171-035
17	Plug, Pipe	333-0009-062
18	Screw, Hex Socket Head	311-0068-177
19	Washer, Lock	313-1000-036





RAVEN INDUSTRIES

LIMITED WARRANTY

WHAT IS COVERED?

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

HOW LONG IS THE COVERAGE PERIOD?

This warranty coverage runs for 12 months from the purchase date of your Raven Flow Control Product. This warranty coverage applies only to the original owner and is not transferrable.

HOW CAN YOU GET SERVICE?

Bring the defective part, and proof of date of purchase, to your local dealer. If your dealer agrees with the warranty claim, he will send the part, and proof of purchase to his distributor or to Raven for final approval.

WHAT WILL RAVEN INDUSTRIES DO?

When our inspection proves the warranty claim, we will, at our option, repair or replace the defective part and pay for return freight.

WHAT DOES THIS WARRANTY NOT COVER?

Raven Industries will not assume any expense or liability for repairs made outside our plant without written consent. We are not responsible for damage to any associated equipment or product 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 is authorized to assume for us any liability. Damages caused by normal wear and tear, mis-use, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.

