



# INSTRUCTION MANUAL

**OASIS**  <sup>TM</sup>  
WetSeal Technology



## HYDRAULIC MOTOR DRIVEN CENTRIFUGAL PUMPS



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Note: Pump performance data, dimensions, and parts listings are on individual pump specification sheets and are not included in this manual. The specification sheets may be downloaded from the Product Literature page at [www.AcePumps.com](http://www.AcePumps.com) or call 800-843-2293 to request a copy.

## WARNINGS

### **AVOID HIGH PRESSURE FLUIDS**

Escaping fluid under pressure may penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure and inspect hoses regularly for wear or damage. If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

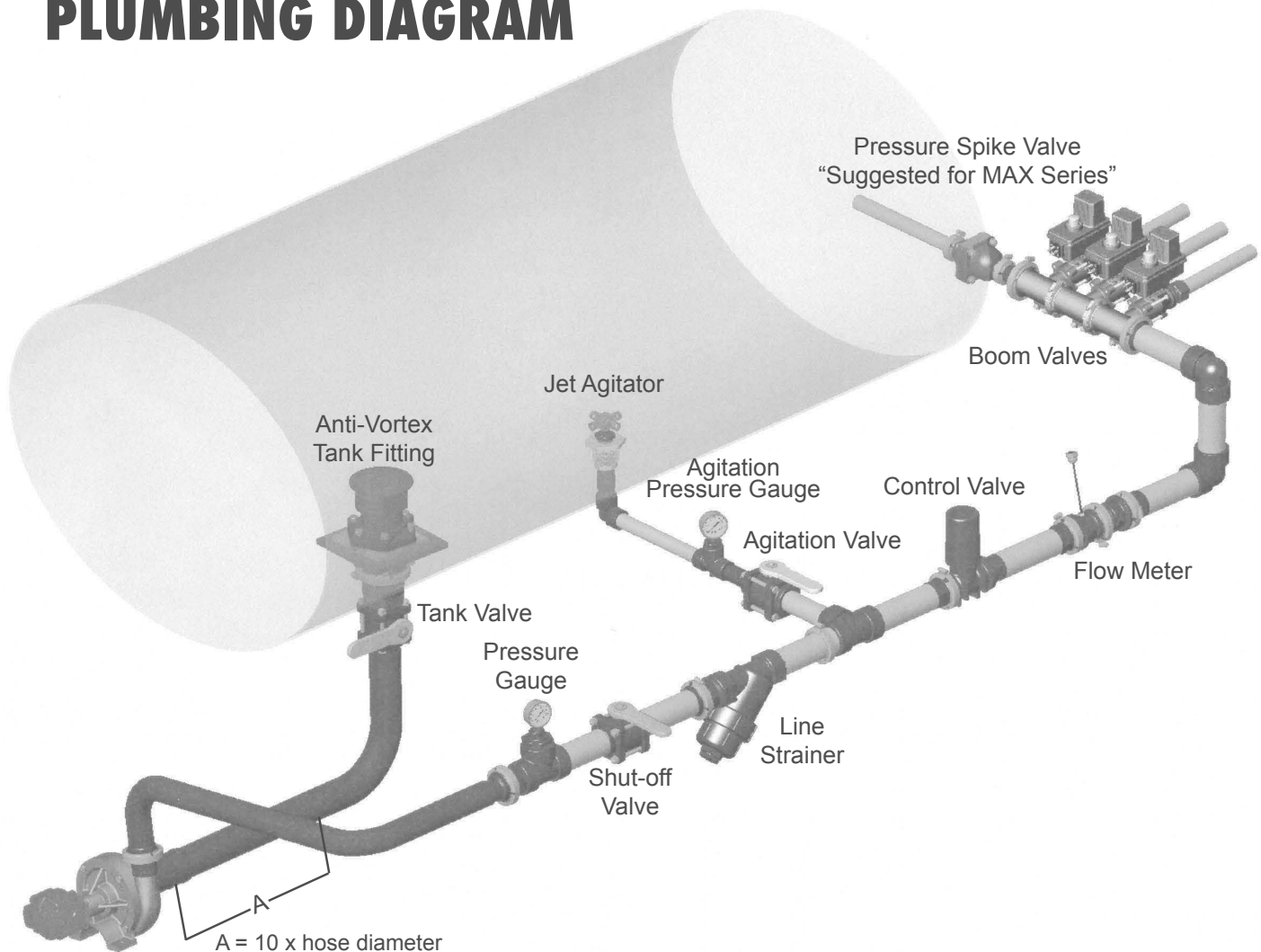
### **NEVER OPERATE MOTOR UNLESS ATTACHED TO PUMP**

The motor should never be operated separate from the pump. The four bolts which attach the motor to the pump also provide the strength necessary to hold the motor together during operation. Operating the motor separate from the pump may cause the motor to explode. The shaft seal may also be ejected when hydraulic pressure is applied. Motor damage and personal injury may result.

### **HANDLE CHEMICAL PRODUCTS SAFELY**

Direct exposure to hazardous chemicals may cause serious injury. Potentially hazardous chemicals used with Ace pumps are hydraulic fluid, fertilizer, and chemicals. A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques. Check the MSDS before starting any job using a hazardous chemical.

# PLUMBING DIAGRAM



## HYDRAULIC MOTOR FEATURES

**Coasting Check** - This internal feature is standard for all Ace hydraulic motors. It protects the motor seal from pressure spikes created by the flywheel effect of the impeller when the pump is turned off.

**Needle Valve** - The valve allows for bypass of excess hydraulic fluid on open center hydraulic systems. The valve has a threaded needle with a slotted end and lock nut. The needle on 300A motors is located under a hex cap with no lock nut.

**Reverse Flow Check** - The check valve prevents damage by not allowing the pump to run backwards. The valve is an external fitting on the 200N series motors and internal on 300 series models.

Consult these Ace Product Updates for more information:

- Update 1 - Hydraulic Seals
- Update 12 - Seal Support Spacer
- Update 14 - 200N Series Motors
- Update 15 - 300A Series Motors

### Hydraulic Hose Connections:

- 200 Series - 1/2" NPT
- 300 Series - 1/2" NPT

# SPRAYER PLUMBING SUGGESTIONS

The primary goal when plumbing a sprayer pump is to route liquid from the pump to the spray boom with minimum restriction. Minimizing restrictions is necessary for achieving the pump's maximum rated capacity. 1) Hoses should be the same size as the pump's suction and discharge port. A straight run of 10 times the suction hose diameter is recommended prior to the pump inlet. 2) Install a pressure gauge and ball valve on the discharge side of the pump for the purpose of measuring the SHUT-OFF pressure (refer to page 4). 3) A minimum number of elbows, fittings, and valves should be used to reduce pressure losses. 4) Use spray control valves and a flowmeter that are the same size as the discharge port to prevent flow restriction. Following these guidelines is necessary for delivering the highest pressures to the boom.

## PUMP MOUNTING

The following are basic guidelines for proper pump mounting: 1) The pump should be mounted below the tanks to allow gravity to naturally fill the pump with liquid. 2) The volute should be oriented with the discharge port pointing up or across the top of the pump which allows air to rise out of the pump. 3) A petcock valve can be installed in the top most pipe plug hole to allow air to be bled off each time the tanks are filled. 4) Another option would be to install a 1/8" air bleed line from the top most pipe plug hole to the sprayer tank. This will continually bleed air from the pump housing. 5) If the pump must be located above the liquid level, a foot valve should be installed to maintain the pump's prime.

The hydraulic driven centrifugal pumps are straight centrifugals and must be primed prior to operation. The word "primed" means the pump must be completely full of water and any trapped air vented before a centrifugal pump can operate. Following the pump mounting guidelines will insure proper priming of the pump and avoid premature seal failure.

## HYDRAULIC SYSTEM CONNECTIONS

The following hydraulic connection recommendations are important for optimum pump efficiency and extended motor seal life. 1) Hydraulic hoses should be sized to insure proper oil supply to the motor and minimize back pressure on the return side of the motor. Recommended hose sizes are 1/2" for 200 Series motors and 3/4" for 300 Series motors. The hoses should be sized larger if individual hose lengths exceed 15 feet. 2) Connect the hydraulic hoses to the tractor hydraulic couplers so the pump operates with the control lever in the "Lower/Retract" position. The pump can then be turned off in the forward "Float" position. Turning the pump off in "Float" instead of "Neutral" allows the hydraulic system pressure to equalize and reduces the occurrence of damaging pressure spikes. 3) The return line should be connected to a low pressure return port if available. The low pressure return port returns oil directly to the oil reservoir reducing pressure in the return line. Pressure reduction in the return line extends the motor seal life and increases the motors operating efficiency. Consult your tractor dealer for low pressure return options.

## HYDRAULIC MOTOR SEALS

Hydraulic seal failures are typically caused by high pressure or pressure spikes in the return line. The seal is rated for 250 PSI maximum pressure. Maintaining return line below 100 PSI continuous pressure will assure maximum seal life and efficient operation. Minimize back pressures in the return line by plumbing an unobstructed return back to the hydraulic reservoir or motor return port. Avoid returning the oil through remote valves, couplers, and long undersized hose lengths. Consult your tractor dealer for low pressure return options.

Do not install any hydraulic components in series downstream from the sprayer pump motor. Consult Ace Product Update 1 - Hydraulic Seals for additional information.

# REGULATING HYDRAULIC FLOW TO THE SPRAYER PUMP

## WARNING: FAILURE TO REGULATE OIL FLOW WILL CAUSE MOTOR FAILURE

There are three general types of hydraulic systems: 1) Load Sensing (LS), also known as Pressure-Flow Compensating Closed Center, 2) Pressure Compensating Closed Center (PC), and 3) Open Center (OPEN). The flow of hydraulic oil is regulated in a different manner for each type of hydraulic system. Consult the Tractor Hydraulic System Pump Selection Guide(HSG), Internet Hydraulic Selection Guide (IHSG) at [www.AcePumps.com](http://www.AcePumps.com), or your tractor dealer to determine the type hydraulic system on your tractor and the method of regulation.

### SHUT-OFF PRESSURE

Shut-off pressure is the sprayer system pressure with all flow turned off. This means closing the boom, agitation, and any by-pass valves. It is the highest pressure a centrifugal pump will achieve for a given RPM and relates directly to the flow of hydraulic oil. A pressure gauge must be located between the pump discharge and the shut off valves.

Maximum Shutoff Pressure:

FMC-75-HYD	100 PSI	FMC-150FS-HYD	120 PSI
FMC-HYD	100 PSI	FMC-150SP-HYD	120 PSI
FMC-150-HYD	120 PSI	FMC-200-HYD-210/310	80 PSI
FMC-150F-HYD	120 PSI	FMC-200-HYD-304	120 PSI

## LOAD SENSING CLOSED CENTER SYSTEM

Regulate oil flow with tractor's **FLOW CONTROL** and **FLOW LIMITER**.  
(Do not use restrictor orifice.)

Setup Instructions:

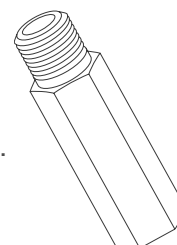
1. Suggested: Remove adapter and install flow limiter in motor inlet port (marked **I**).
2. Close motor needle valve: loosen jam nut, screw needle valve clockwise until seated, and lock jam nut. (factory setting)
3. Shut off sprayer boom and agitation valves.
4. Adjust tractor flow control to minimum flow setting (turtle).
5. Move hydraulic lever to "Lower/Retract" position to start pump.
6. Adjust tractor flow control until sprayer shut-off pressure is below maximum shown in **SHUT-OFF PRESSURE** section above.

Note: If the flow limiter stops oil flow to the motor: 6a) Move hydraulic lever to "Float" or "Neutral" to remove oil pressure from the flow limiter.

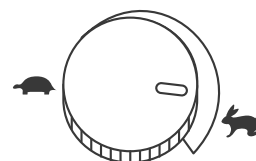
6b) Adjust tractor flow control to a lower flow position.

6c) Repeat steps 5 and 6.

7. Open the sprayer agitation valve to get desired spraying pressure.



**Flow Limiter**  
(Optional)



**Flow Control**

### FLOW LIMITER

The flow limiter is a hydraulic device designed to shut off the flow of hydraulic oil when a motor's rated flow is exceeded. On tractors with LOAD SENSING (LS) Closed Center hydraulic systems, it prevents failures due to excess flow. These tractors present a great potential to run the motors beyond their rated speeds. The flows out of the hydraulic valves can exceed 29 GPM while the motors are rated at 4 to 11 GPM. The flow limiter protects the Ace motor by shutting off when hydraulic flows exceed the motor's capacity.

The flow limiter should not be used on OPEN Center or PRESSURE COMPENSATING Closed Center hydraulic systems. The flow limiter should not be used with a restrictor orifice.

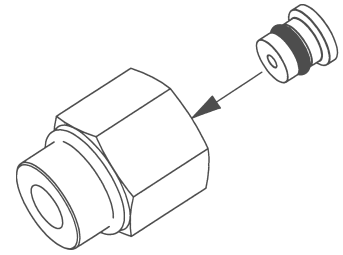
Consult Ace Form # FLOW LIMITER for additional information and specifications.

## PRESSURE COMPENSATING CLOSED CENTER SYSTEM

Regulate oil flow by using a **RESTRICTOR ORIFICE**. (Do not use flow limiter.)

Setup Instructions:

1. Install restrictor orifice insert inside the adapter/restrictor body in the motor inlet port (marked **I**).
2. Close motor needle valve: loosen jam nut, screw needle valve clockwise until seated, and lock jam nut. (factory setting)
3. Set "Rabbit/Turtle" flow control to "Turtle".
4. Move hydraulic lever to the "Lower/Retract" position to start pump.
5. Adjust "Rabbit /Turtle" flow control and sprayer agitation valve to get desired spraying pressure.



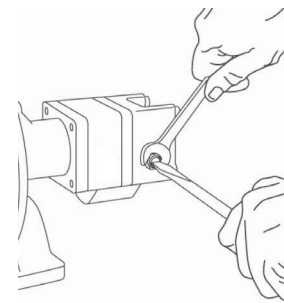
**Restrictor Orifice  
Insert**

## OPEN CENTER SYSTEM

Select motor size closest to tractor's hydraulic system capacity. Regulate oil flow with motor **NEEDLE VALVE**. (Do not use restrictor orifice or flow limiter.)

Setup Instructions:

1. Shut off sprayer boom and agitation valves.
2. **200N** - Loosen jam nut on motor and back out needle valve 3 or 4 turns counter clockwise.  
**300A** - Remove hex cap from side of motor and back out needle valve 3 or 4 turns counter clockwise.
3. Set tractor throttle to sprayer operating speed.
4. Move hydraulic lever to "Lower/Retract" position to start pump.
5. Screw needle valve clockwise until sprayer shut-off pressure is below maximum shown in **SHUT-OFF PRESSURE** section on previous page and lock jam nut or reinstall hex cap.
6. Open the sprayer agitation valve to get desired spraying pressure.



**Needle Valve  
Adjustment**

## MECHANICAL SHAFT SEALS

Mechanical seals have two polished faces which run against one another forming a barrier preventing solution from leaking. A small quantity of liquid crosses the faces and is necessary to lubricate and remove heat from the seal faces. The two most common causes of seal failure are:

**1) Abrasive Wear** - The carbon seal face is scratched by harder material crossing the face. Damage to the seal by harder materials can be caused by abrasive solution materials, rust or corrosion near the seal, precipitates which come out of solution when heated, and residue between the seal faces when a pump is shut off and not flushed out. This type of seal failure can be minimized by flushing the pump with water after use and storing the pump filled with antifreeze to prevent corrosion and freezing.

Note: In tough applications where the standard carbon seal face is scratched or quickly worn, the **BAC-7SC** seal with extra hard silicon carbide faces is recommended.

**2) Thermal Shock** - The seal face is cracked by cool liquid contacting a hot seal. There is no liquid to lubricate or remove heat from the seal faces when a pump runs dry. The seal heats up rapidly to a temperature that causes damage to the seal components. The resulting thermal shock creates radial cracks in the white ceramic face and the heat may melt rubber components.

Consult Ace Product Update 2- Mechanical Seals for additional information.

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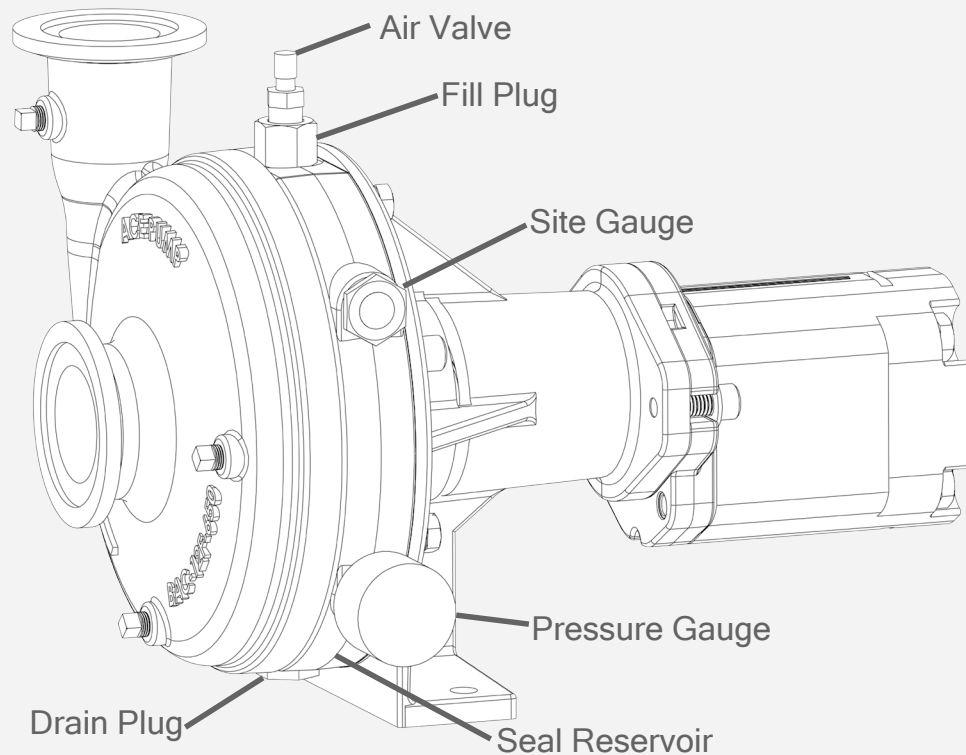
## WetSeal Technology

Ace Oasis<sup>TM</sup> Wet Seal Technology prevents the pumped liquid from contacting the shaft seals. The seals operate in a reservoir filled with a specially formulated barrier fluid for seal face lubrication and heat dissipation. Additionally, air pressure is introduced

to prevent pump fluid from contaminating the seal reservoir. This isolation of the seals prevents abrasive wear of the seal faces and run dry seal failures.

The Oasis WetSeal is standard on the FMCWS-650, FMC-750F, and FMC-855F pump models.

All pumps equipped with the Oasis<sup>TM</sup> WetSeal have a two year warranty.



## PUMP MAINTENANCE

1. MAX series pumps are equipped with lubricated and sealed bearings. No additional bearing lubrication or maintenance is required.
  2. Neutralize chemicals and flush pump after each use to prevent corrosion.
  3. If a danger of freezing exists, drain all water from the pump casing by removing the lowest volute pipe plug. This will prevent casting breakage due to frozen liquid inside the pump.
- Note: Do not drain the barrier fluid from the seal reservoir on Oasis<sup>TM</sup> WetSeal models.



# OASIS™ WETSEAL MAINTENANCE

The seal reservoir fluid level and pressure must be monitored and maintained to ensure proper operation of the WetSeal feature.

## How to check seal reservoir fluid level:

View the site gauge window on the side of the seal reservoir. A float is included to easily see fluid level.

If the fluid is not visible, add fluid by following these steps:

- Relieve reservoir air pressure by removing air valve cap and pressing stem.
- Remove fill plug on top of seal reservoir.
- Add barrier fluid (Ace Part #55032 - available in quarts) until level is at top edge of site window.

**Caution:** Do not overfill.

- Replace fill plug and recharge air pressure per instructions below.

## How to check seal reservoir pressure:

The reservoir pressure gauge gives a direct pressure reading. Pressure should remain within the green zone during operation. The recommended cold reservoir pressure is 25 to 30 psi.

**Note:** Pressure will increase during operation as the fluid is heated.

Steps to pressurize seal reservoir:

- Verify that fill and drain plugs are installed and tight.
- Remove air valve cap.
- Add air until gauge reads 25 to 30 psi. An air supply or tank regulated to 30 psi(2 bar) is best.

**Caution:** Do not over pressurize. Relieve excess air pressure if necessary.

- Replace air valve cap.

## Maintenance Intervals:

Initial Startup: Verify correct reservoir fluid level and pressure prior to startup.

Daily: Check reservoir pressure.  
If air must be added regularly, spray soapy water around plugs, seams, and fittings of seal plate to check for leakage. Reseal as needed. If no external leak is found, installation of a seal kit should be scheduled for next machine downtime.

Weekly: Check barrier fluid level. A small amount of barrier fluid will be consumed under normal operating conditions.  
If the barrier fluid appears cloudy or discolored in site gauge, drain until fluid runs clear, refill with clean fluid, and recharge pressure. Check again in one week. If fluid is cloudy or discolored again, this is an indication of inboard seal leakage. A seal kit installation should be scheduled for next machine downtime.

Season End: Remove drain plug and drain barrier fluid from the reservoir into a clean bucket.  
1) If the fluid is clear: reinstall plug, refill with barrier fluid, and recharge air pressure.  
2) If the fluid is cloudy, discolored, or contains water: This could be the indication that a seal leak is developing. Installation of a seal kit is recommended to ensure trouble free operation for the next season.

# WINTERIZING AND STORAGE

1. Flush pump thoroughly and neutralize chemicals to prevent corrosion.
2. Fill pump with recreational vehicle antifreeze to protect from corrosion and freezing.
3. If equipped with Oasis™ WetSeal, see Season End maintenance above.
4. If removing hydraulic hoses, insert plugs in motor ports to retain fluid and prevent contamination.

# HYDRAULIC MOTOR REPAIR KITS

Ace hydraulic motor repair kits include all O-rings and seals necessary to rebuild the motor. The motor model number and date code are stamped on the end plate below the ports. The 200 series kit will fit all motors including those with “L”, “N”, or “R” designation. The 300 series kit will fit all motors including those with “L” or “A” designations except 310 motors with G-5 or earlier date codes.

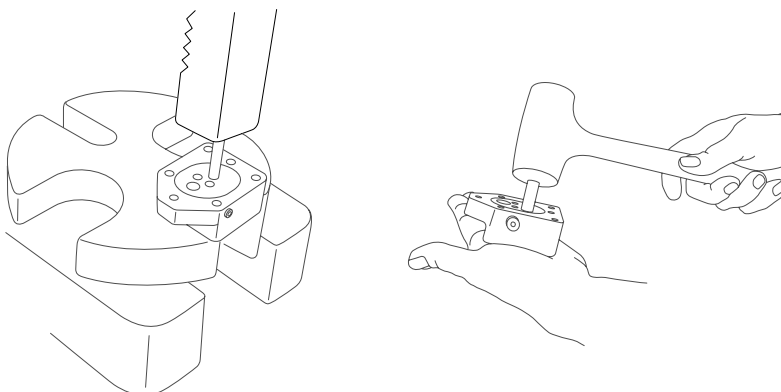
Motor Model	Repair Kit Part Number	Ace EDP#
200 Series Motors (202, 203, 204, 206, 210)	RK-BAC-75-HYD-L	41374
300 Series Motors (304, 305, 306, 307, 310)	RK-BAC-75-HYD-300-L	41362
310 Motor (G-5 or earlier)	RK-BAC-75-HYD-310	41379

## MOTOR REPAIR KIT INSTALLATION

NOTE: The seal cartridge comes on an installation bullet with a small diameter for storage and a larger diameter for installation. The seal lips curve towards the larger diameter when properly installed on the bullet. The seal should remain on the bullet until installation for best results.

### DISASSEMBLY:

1. Remove motor from pump by removing four cap screws.
2. Remove seal retaining ring from drive plate if installed and discard.
3. Remove two 1/4" cap screws (200 series) or four 3/8" cap screws (300 series).
4. Draw or scribe a line on motor casing (end plate, drive plate, housing), note orientation, and pull apart.
5. Remove idler gear/shaft assembly, drive gear, and drive shaft dowel pin.  
**Note:** Failure to remove dowel pin will result in bushing damage.
6. Press or tap (non-marring hammer) drive shaft/bearing assembly, and seal cartridge out of drive plate.

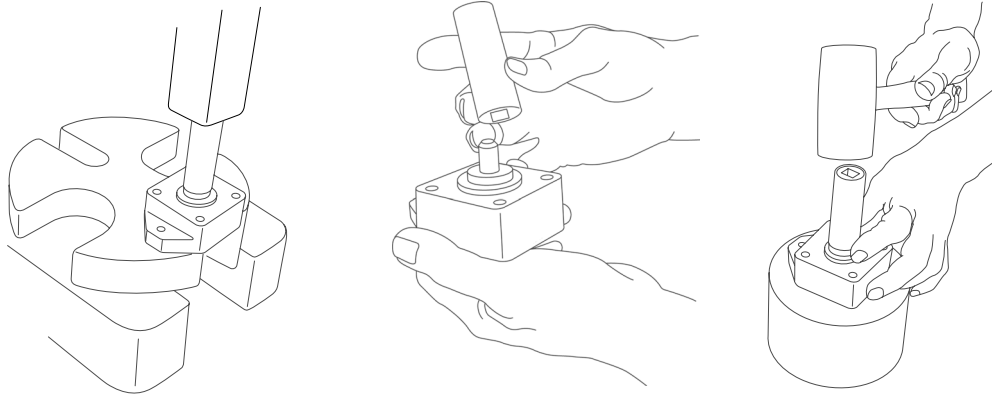


**Disassembly Step 6**

7. Remove and discard old “O” rings and seal cartridge. Check shaft for wear or grooving under seal and replace if damaged.

### ASSEMBLY:

1. Place drive shaft/bearing assembly in drive plate.
2. Apply a thin film of hydraulic oil to the seal bullet. Insert seal/bullet assembly over shaft tang. Press seal by hand over the installation bullet until the seal casing touches the drive plate.
3. Place a 3/4" (200 Series) or 15/16" (300 Series) deep socket over seal and press or tap into seal cavity until seated.



### Assembly Step 3

4. Remove the installation bullet.  
**Note:** Do not install the seal retaining ring with the seal support spacer.
5. Lightly grease large "O" rings and insert in plate grooves. (300 series grooves in gear housing)
6. Place dowel pin and drive gear on drive shaft.
7. Place idler gear/shaft assembly in drive plate bushing.
8. Assemble the drive, center, and end plates aligning scribe marks.
9. Install two 1/4" cap screws - torque 6-8 ft-lbs (200 series) or four cap screws - torque 24 ft-lbs (300 series).  
**Caution:** Do not over tighten.
10. Remove needle valve, replace thread seal (metal washer with rubber insert) by screwing it onto the needle, and reassemble.  
**Note:** Forcing the thread seal of the needle threads may damage the seal.
11. Remove seal check cap from drive plate with 5/32" allen wrench (200 series) or 7/8" wrench (300 series), replace seal check cap "O" ring, and reassemble.
12. Position seal support spacer in the cavity behind the pump bearing and snap ring. Fill the spacer hole halfway with coupling grease.  
**Note:** The smaller diameter of the 200 series spacer must face the hydraulic motor.
13. Install motor by aligning motor tang and pump shaft slot. Rotate motor to proper orientation.
14. Install four 5/16" socket head cap screws and tighten to 15 ft.lb. torque.

# TROUBLESHOOTING

## WILL NOT PUMP LIQUID

There are several operating conditions which must be met before a hydraulic motor driven centrifugal pump can pump liquid. If the shaft is not turning, check the first and second step. If the shaft is turning, go to the third step.

**First**, the impeller, shaft, and gears must turn freely. The hydraulic motor is a low torque motor and will not overcome a bound up shaft. Corrosion can form between the impeller and the volute or in the seal area. With the tractor off, reach inside the suction port of the volute with your fingers and see if the impeller can easily be turned by hand.

**Second**, hydraulic oil must flow across the gears in the motor. Check the needle valve to make sure it is set according the instructions on pages 4 and 5. If the needle valve is backed out, oil will by-pass the gears and fail to turn the shaft. Trapped pressure in the hydraulic couplers may also prevent flow across the hydraulic motor. Reverse the hydraulic control lever to momentarily pressurize the return hose. This action will open the quick coupler valve and relieve the trapped pressure.

**Third**, the pump must be primed. The pump will not operate unless the volute cavity is completely full of liquid when started. Remove the top pipe plug on the volute to verify that only liquid comes out. Refer to PUMP MOUNTING section on page three.

## WILL NOT DEVELOP PRESSURE

There are several factors which may contribute to a pump's inability to develop pressure. They are: 1) insufficient shaft speed; 2) restrictions in the plumbing; 3) internal leakage in the pump.

Check the SHUT-OFF PRESSURE according to the instructions on page 4. If the Shut-off Pressure is per the specifications, then the pressure drop is due to restrictions in the plumbing. If the shut-off pressure is below the specifications, it could be due to insufficient shaft speed or internal leakage in the pump.

**Restrictions in the plumbing:** For every length of hose, valve, strainer, and fitting between the pump and the boom, there is a loss of pressure. Check for clogged strainers, collapsed hoses, standard port valves, and undersized plumbing.

**Insufficient shaft speed:** The pressure created by a centrifugal pump is a function of the pump shaft speed. The shaft speed is determined by the flow rate of hydraulic oil going across the gears. A tractor dealership can use a hydraulic flow meter to verify the GPM of oil flow going to the hydraulic motor. For instructions on how to adjust the shaft speed, refer to the section on pages 4 and 5 titled: REGULATING HYDRAULIC FLOW TO THE SPRAYER PUMP.

**Internal leakage in pump:** In centrifugal pumps, there is a close fit where the eye of the impeller fits into the inlet port of the volute. This close fit seals the low pressure suction liquid from the high pressure liquid inside the pump. If either the impeller or volute are worn, then the pump will not develop pressure because liquid pressure leaks through this area. If there is significant play when the eye of the impeller fits into the inlet port of the volute, replace the impeller and/or volute.

## SEAL LEAKS

Refer to the sections titled MECHANICAL SHAFT SEALS on page 5 and HYDRAULIC MOTOR SEALS on page 3 for information on reducing the frequency of seal failures.

## LOSES PRESSURE GRADUALLY OVER SEVERAL HOURS

When a pump starts out at the correct pressure and then gradually loses pressure over a period of several hours, the likely cause is due to the hydraulic oil heating up. As hydraulic oil heats up from 90 degrees Fahrenheit to 150 degrees, the pump performance will decrease 30%. Typically, the heat added to the system is due to energy losses caused by large bypass flows and restriction. Improper regulation of hydraulic oil to the Ace motor can cause the oil to heat up (refer to pages 4 and 5 for setup instructions).

Ace Pump Corporation • P.O. Box 13187 - 1650 Channel Avenue • Memphis, TN 38113  
www.AcePumps.com • Phone: 901-948-8514 • Fax: 901-774-6147



## **STANDARD WARRANTY**

Ace pumps and valves are guaranteed against defects in material and workmanship for a period of one year from date of installation. The warranty period is two years for pumps equipped with Oasis™ WetSeal Technology which requires proper maintenance of the seal chamber by the user as directed in the Instruction Manual. Products or parts found to be defective upon inspection at the factory will be repaired or replaced at our discretion.

Ace Pump Corporation shall not be held liable for damages caused by abuse or misuse of the product or parts. No claim for labor in repairing or replacing such products will be allowed nor will loss of time or inconvenience be considered warranty obligations.

**IMPORTANT:** Pumps or valves returned for warranty consideration which are tested and found to perform within specifications are subject to an inspection charge.

### **PLEASE NOTE EXCEPTIONS**

All seals are covered against defects in materials or workmanship. Seal failures resulting from application related conditions are not covered. Most seal failures are due to application conditions such as: (1) abrasive solution scratching the polished seal faces; (2) chemical attack on elastomer or glue; (3) thermal shock from running pump dry or improper priming; (4) failure to flush chemical from pump after use.

Repair requests under the above category will not be considered warranty, and current repair and transportation charges will apply.

### **PROCEDURE**

To return a pump, valve, or part for warranty consideration, please call Ace Pump and request a Returned Goods Authorization (RGA) number (800-843-2293). Please request one RGA number for each pump or valve. Provide the part number of the item being returned along with the reason for return. Be specific when describing the nature of the defect. Include this information in the box along with a customer contact name, phone number, and return address. Ship pump prepaid freight. Package pump in original packaging or similar to prevent damage in shipment. Warranty determinations will be made after the product has been received and inspected.

This warranty is in lieu of all other warranties, express or implied, and Ace Pump Corporation does not authorize any other person to assume for it any obligation or liability in connection with the sale of said pumps, valves, or any parts thereof.

**WARNING:** Pumps returned to Ace must be free of chemical hazard. Chemicals must be neutralized and thoroughly rinsed. Pumps with indications of active chemical will not be considered for repair or warranty.