

# 200LR Self-Priming

## CENTRIFUGAL PUMP

FORM NO.: 95-03074 REVISION: 08/2015

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.





SPX Flow Technology  
611 Sugar Creek Road  
Delavan, WI 53115 USA

Tel: (800) 252-5200 or (262) 728-1900

Fax: (800) 252-5012 or (262) 728-4904

E-mail: [wcb@spx.com](mailto:wcb@spx.com)

Web site: [www.spx.com](http://www.spx.com)

Information contained in this manual is subject to change without notice and does not represent a commitment on the part of SPX Corporation. No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose, without the express written permission of SPX Corporation.

Copyright © 2015 SPX Corporation.  
All Rights Reserved.

Revision Date: 08/2015

Publication: 95-03074

<b>Warranty</b> .....	<b>5</b>
Shipping Damage or Loss .....	5
Warranty Claim .....	5
<b>Safety</b> .....	<b>6</b>
<b>Care of Stainless Steel</b> .....	<b>7</b>
Stainless Steel Corrosion .....	7
Elastomer Seal Replacement Following Passivation .....	7
<b>Introduction</b> .....	<b>8</b>
Receiving Your Pump .....	8
Pump Characteristics .....	9
Performance Characteristics .....	9
Standard Construction .....	9
Construction Options .....	10
Leg Kit .....	10
Motors .....	10
Enclosure Options .....	10
Operating Parameters .....	10
Dimensions .....	11
<b>Installation</b> .....	<b>12</b>
Special Requirements for Liquid Ring Self-Priming Pump .....	12
General Requirements .....	13
Installation Safety Procedures .....	13
Pump Leveling .....	14
Type 4 Seal Flush Supply Installation .....	14
Electrical Connections .....	14
Before First Startup .....	15
Cleaning Pump and Piping .....	15
Cleaning Safety Procedures .....	15
Preliminary Test Run .....	15
<b>Operation</b> .....	<b>16</b>
Starting Pump .....	16
Stopping Pump .....	16
<b>Maintenance</b> .....	<b>17</b>
Scheduled Routine Maintenance .....	17
Disassembly of Pump .....	17
Pump Disassembly Procedure .....	17
Type 1 Seal Disassembly .....	19
Type 4 Seal Disassembly .....	20
Inspecting Parts .....	21
Assembly of Pump .....	21
Setting Impeller Clearance .....	21
Type 1 Seal Assembly .....	22
Type 4 Seal Assembly .....	23
Backplate Assembly - 2065LR .....	24
Backplate Assembly - 2085LR .....	26
<b>Parts Lists</b> .....	<b>28</b>
Seal Components All Pumps .....	28
2065LR Self-Priming Pump Parts .....	30
2085LR Self-Priming Pump Parts .....	31
Motor Shaft Shims .....	32
Motor Mounts .....	32
<b>Troubleshooting</b> .....	<b>33</b>

## Warranty

Seller warrants its products to be free from defect in materials and workmanship for a period of one (1) year from the date of shipment. This warranty shall not apply to products which require repair or replacement due to normal wear and tear or to products which are subjected to accident, misuse or improper maintenance. This warranty extends only to the original Buyer. Products manufactured by others but furnished by Seller are exempted from this warranty and are limited to the original manufacturer's warranty.

Seller's sole obligation under this warranty shall be to repair or replace any products that Seller determines, in its discretion, to be defective. Seller reserves the right either to inspect the products in the field or to request their prepaid return to Seller. Seller shall not be responsible for any transportation charges, duty, taxes, freight, labor or other costs. The cost of removing and/or installing products which have been repaired or replaced shall be at Buyer's expense.

Seller expressly disclaims all other warranties, express or implied, including without limitation any warranty of merchantability of fitness for a particular purpose. The foregoing sets forth Seller's entire and exclusive liability, and Buyer's exclusive and sole remedy, for any claim of damages in connection with the sale of products. In no event shall Seller be liable for any special consequential incidental or indirect damages (including without limitation attorney's fees and expenses), nor shall Seller be liable for any loss of profit or material arising out of or relating to the sale or operation of the products based on contract, tort (including negligence), strict liability or otherwise.

## Shipping Damage or Loss

If equipment is damaged or lost in transit, file a claim at once with the delivering carrier. The carrier has signed the Bill of Lading acknowledging that the shipment has been received from SPX Flow Technology in good condition. SPX Flow Technology is not responsible for the collection of claims or replacement of materials due to transit shortages or damages.

## Warranty Claim

Warranty claims must have a **Returned Goods Authorization (RGA)** from the Seller before returns will be accepted.

Claims for shortages or other errors, exclusive of transit shortages or damages, must be made in writing to Seller within ten (10) days after delivery. Failure to give such notice shall constitute acceptance and waiver of all such claims by Buyer.

## Safety

### READ AND UNDERSTAND THIS MANUAL PRIOR TO INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT

Waukesha Cherry-Burrell recommends users of our equipment and designs follow the latest Industrial Safety Standards. At a minimum, these should include the industrial safety requirements established by:

1. Occupational Safety and Health Administration (OSHA), Title 29 of the CFR  
Section 1910.212- General Requirements for all Machines
2. National Fire Protection Association, ANSI/NFPA 79  
ANSI/NFPA 79- Electrical Standards for Industrial Machinery
3. National Electrical Code, ANSI/NFPA 70  
ANSI/NFPA 70- National Electrical Code  
ANSI/NFPA 70E- Electrical Safety Requirement for Employee Workplaces
4. American National Standards Institute, Section B11

**Attention:** Servicing energized industrial equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled equipment. Recommended practice is to disconnect and lockout industrial equipment from power sources, and release stored energy, if present. Refer to the National Fire Protection Association Standard No. NFPA70E, Part II and (as applicable) OSHA rules for Control of Hazardous Energy Sources (Lockout-Tagout) and OSHA Electrical Safety Related Work Practices, including procedural requirements for:

- Lockout-tagout
- Personnel qualifications and training requirements
- When it is not feasible to de-energize and lockout-tagout electrical circuits and equipment before working on or near exposed circuit parts

**Locking and Interlocking Devices:** These devices should be checked for proper working condition and capability of performing their intended functions. Make replacements only with the original manufacturer's renewal parts or kits. Adjust or repair in accordance with the manufacturer's instructions.

**Periodic Inspection:** Industrial equipment should be inspected periodically. Inspection intervals should be based on environmental and operating conditions and adjusted as indicated by experience. At a minimum, an initial inspection within 3 to 4 months after installation is recommended. Inspection of the electrical control systems should meet the recommendations as specified in the National Electrical Manufacturers Association (NEMA) Standard No. ICS 1.3, Preventative Maintenance of Industrial Control and Systems Equipment, for the general guidelines for setting-up a periodic maintenance program.

**Replacement Equipment:** Use only replacement parts and devices recommended by the manufacturer to maintain the integrity of the equipment. Make sure the parts are properly matched to the equipment series, model, serial number, and revision level of the equipment.

Warnings and cautions are provided in this manual to help avoid serious injury and/or possible damage to equipment:



**DANGER:** marked with a stop sign.  
Immediate hazards which *WILL* result in severe personal injury or death.



**WARNING:** marked with a warning triangle.  
Hazards or unsafe practices which *COULD* result in severe personal injury or death.



**CAUTION:** marked with a warning triangle.  
Hazards or unsafe practices which *COULD* result in minor personal injury or product or property damage.

---

## Care of Stainless Steel

### Stainless Steel Corrosion

Corrosion resistance is greatest when a layer of oxide film is formed on the surface of stainless steel. If film is disturbed or destroyed, stainless steel becomes much less resistant to corrosion and may rust, pit or crack.

Corrosion pitting, rusting and stress cracks may occur due to chemical attack. Use only cleaning chemicals specified by a reputable chemical manufacturer for use with 300 series stainless steel. Do not use excessive concentrations, temperatures or exposure times. Avoid contact with highly corrosive acids such as hydrofluoric, hydrochloric or sulfuric. Also avoid prolonged contact with chloride-containing chemicals, especially in presence of acid. If chlorine-based sanitizers are used, such as sodium hypochlorite (bleach), do not exceed concentrations of 150 ppm available chlorine, do not exceed contact time of 20 minutes, and do not exceed temperatures of 104°F (40°C).

Corrosion discoloration, deposits or pitting may occur under product deposits or under gaskets. Keep surfaces clean, including those under gaskets or in grooves or tight corners. Clean immediately after use. Do not allow equipment to set idle, exposed to air with accumulated foreign material on the surface.

Corrosion pitting may occur when stray electrical currents come in contact with moist stainless steel. Ensure all electrical devices connected to the equipment are correctly grounded.

### Elastomer Seal Replacement Following Passivation

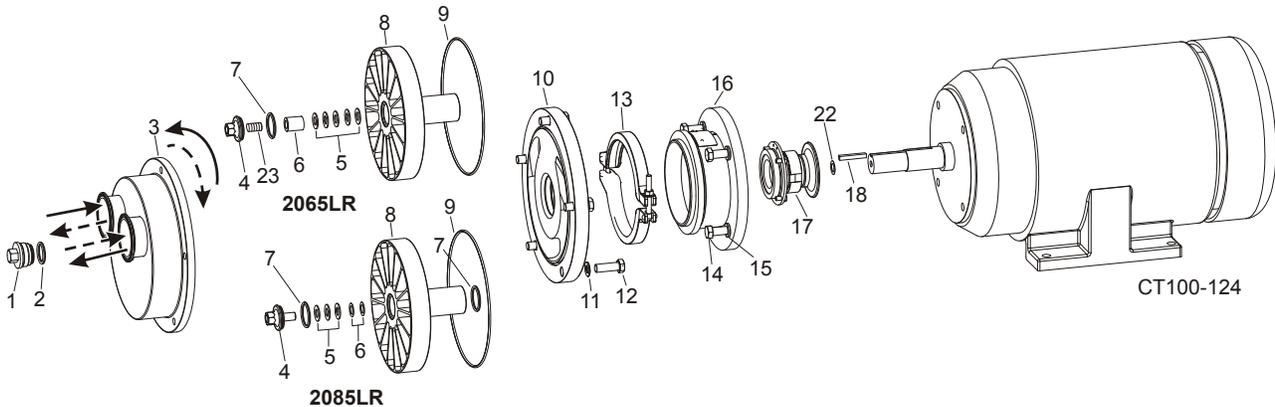
Passivation chemicals can damage product contact areas of WCB equipment. Elastomers (rubber components) are most likely to be affected. Always inspect all elastomer seals after passivation is completed. Replace any seals showing signs of chemical attack. Indications may include swelling, cracks, loss of elasticity or any other noticeable changes when compared with new components.

## Introduction

## Receiving Your Pump

All ports are covered at the factory to keep out foreign objects during transit. If covers are missing or damaged, remove the pump cover for a thorough inspection of fluid head. Be sure pumping head is clean and free of foreign material before rotating shaft.

Each Waukesha pump is shipped completely assembled, lubricated and ready for use. Review "Operation" on page 16 before operating your pump.



**Figure 1 - Common Part Identification**

- |  |                          |                                      |
|--|--------------------------|--------------------------------------|
| 1. Plug Inspection                             | 7. O-ring                | 14. Cap Screws                       |
| 2. O-Ring                                      | 8. Impeller              | 15. Lock Washers                     |
| 3. Casing                                      | 9. O-ring                | 16. Motor Adapter                    |
| 4. Impeller Retainer Nut                       | 10. Backplate            | 17. Seals (details shown on page 28) |
| 5. Spring (Belleville) Washer                  | 11. Flat Washers         | 18. Key                              |
| 6. Spacer Nut (2065LR) / Shim Washers (2085LR) | 12. Backplate Cap Screws | 22. Motor Shims                      |
|  | 13. Clamp                | 23. Stud (2065LR)                    |

The 200LR can rotate in either direction. When viewed from the front of the pump:

- Clockwise impeller rotation (*dashed arrows above*): inlet on the right, outlet on the left.
- Counter-clockwise impeller rotation (*solid arrows above*): inlet on the left; outlet on the right

Parts lists can be found starting on page 28.

## Pump Characteristics

The 200LR (Liquid Ring) Self-Priming Pump handles products with entrained air as well as maintaining its prime when other pumps become air bound. This feature makes the 200LR the best choice for complete emptying of tanks and lines during normal process or cleaning-in-place (CIP). In addition to being an excellent CIP return pump, the 200LR can run in either direction, making it possible to fill or empty tanks with the same pump.

The 200LR Self-Priming Pump is built for extremely durable service. The casing, backplate and impeller/stub shaft are 316L stainless steel for extra strength and resistance to line shock and corrosion. Large bearings and shaft provide positive alignment and minimize vibration.

The pump is available with two standard seal types:

- Type 1 - Single mechanical seal, external mounted and balanced.
- Type 4 - Double mechanical seal with flush housing.

All seal components are interchangeable between models. All seal assemblies use an externally-mounted balanced rotary seal for longer seal life and better sealing capability. The stationary seal face is reversible and replaceable.

## Performance Characteristics

### Standard Construction

- Casing: 316L Stainless Steel
- Port Connections: S-Line
- Backplate: 316L Stainless Steel
- Impeller with Integral Shaft: 316L Stainless Steel
- Impeller Retainer: 316L Stainless Steel
- Shaft Seal: Single Mechanical, External Balanced (Type 1)
- Rotary Seal Material: Carbon
- Stationary Seal: Siliconized Graphite
- Elastomers: FDA approved Viton®
- Finish: All product contact surfaces are 316L stainless steel with 32Ra finish.
- Motor adapter: Stainless steel
- Mounting: JM Motor

## Construction Options

### **Ports**

- 2065LV: 2" S-line fittings  
2085LV: 2.5" S-line fittings
- Optional casing 1/2" or 1" drain with S-clamp connection available.

### **Seal Type**

- Single mechanical seal, external mounted and balanced (Type 1 shaft seal)
- Double mechanical with flush (Type 4 shaft seal)
- WFI - special Type 4 shaft seal flush piping for water used in injection applications
- Commercially available seals (Contact your WCB representative for details.)

### **Rotary Seal Material**

Purebide  
Silicone Carbide  
Tungsten Carbide

### **Stationary Seal**

Silicone Carbide  
Tungsten Carbide

### **Elastomers**

EPDM (FDA approved)  
Silicone (FDA approved)  
FKM  
FFKM

### **Finishes/Product Contact Surfaces**

Electro-Polish (20Ra or 25Ra)

## Leg Kit

"Motor Mounts" on page 32.

## Motors

- NEMA JM (standard) totally enclosed fan cooled (TEFC) for close-coupled pumps.
- 1750 3-phase 230/460 volt.

## Enclosure Options

Washdown  
Explosion-proof  
Severe Duty/Chemical Duty

## Operating Parameters

### **Nominal Capacity**

Up to 180 U.S. GPM (40 Cubic Meters/Hr.)

### **Differential Pressure**

Up to 195 Feet (60 Meters)

### **Nominal Speeds**

1450 - 50HZ  
1750 - 60HZ

Dimensions

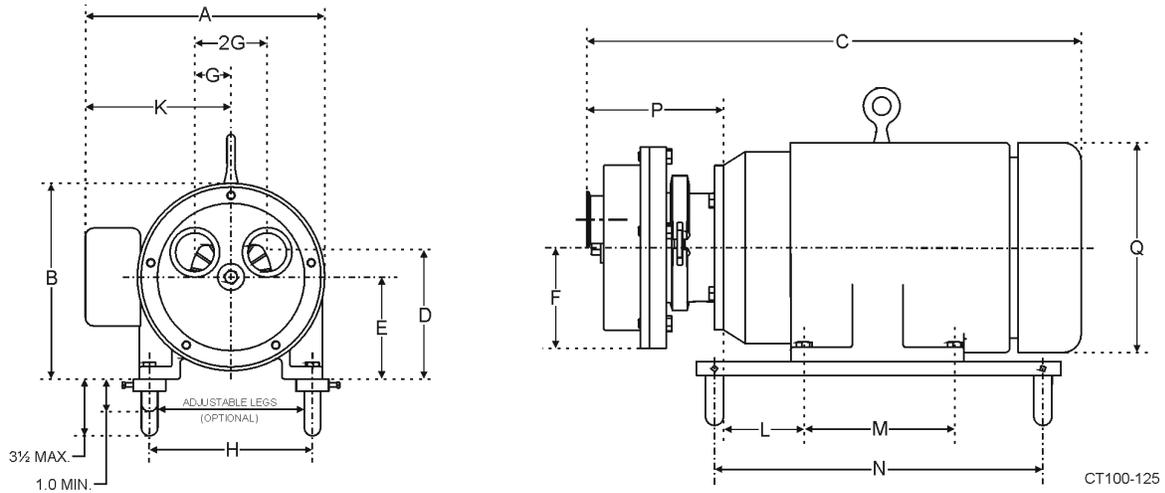


Figure 2 - Foot Print Dimensions

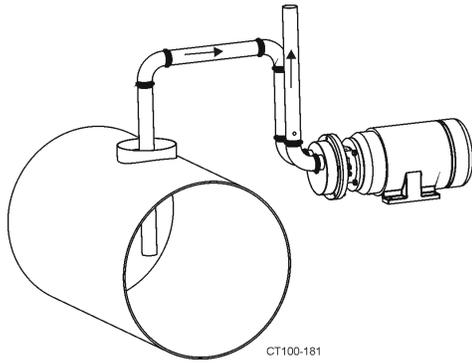
ITEM	DIMENSION FOR 2065LR 213JM AND 215JM MOTOR FRAME		DIMENSION FOR 2085LR 254JM AND 256JM MOTOR FRAME	
	IN	MM	IN	MM
A	13.44	341	14.9	379
B	10.34	263	12	305
C	23.51	597	27.4	697
D	6.51	165	7.75	197
E	5.25	133	6.25	159
F	4.56	116	5.50	140
G	1.88	48	2.25	57
2G	3.76	95	4.50	114
H	8.50	216	10.0	254
K	8.37	213	8.9	227
L	5.38	137	6.5	165
M	213JM = 5.5 215JM = 7.0	213JM = 140 215JM = 178	254JM = 8.25 256JM = 10.0	254JM = 209 256JM = 254
N	13.88	353	18.0	475
P	7.92	201	7.8	198
Q	10.18	259	11.5	292

Installation

**Special Requirements for Liquid Ring Self-Priming Pump**

Liquid ring self-priming pumps are designed for applications with large amounts of entrained air. CIP return pump applications involve intermittent flow from tank with air entering supply line. Suction lift applications evacuate air from supply line lifting liquid into pump to begin pumping. Suction lift up to 23 feet (7 meters) is possible.

For pump to work correctly, casing first must be full of liquid. If casing is completely dry or has too little liquid, it will not be able to self-prime and operate as intended. Correct installation piping helps ensure casing remains full of liquid and ensures trouble-free operation. Installation piping may include:



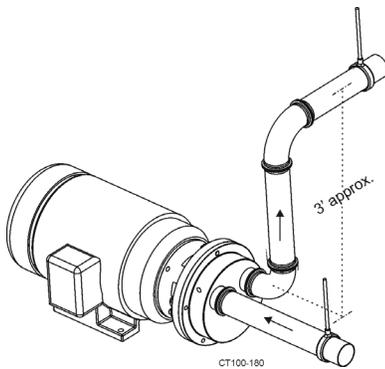
**Figure 3 - Vertical Suction and Discharge**

**Vertical Discharge Piping:** Ensures backflow into casing for CIP return or similar applications. Install vertical section of pipe no less than 3 feet (1 meter) long in discharge piping (Figure 4).

**Foot or Check Valve in Suction Piping:** For suction lift applications not allowing vertical suction piping (Figure 3), install foot or check valve to prevent backflow and siphon effect from evacuating liquid in casing.

**Vertical Suction Piping:** For suction lift applications, install vertical section of pipe no less than 3 feet (1 meter) long in suction and discharge piping. This will prevent backflow (due to siphon effect) from evacuating liquid in casing (Figure 3).

**Leak-Free Suction Piping:** Air leaks in suction piping will reduce pump performance and may allow air in faster than pump is able to pump it away. This is especially important for suction lift applications requiring long suction lift.



**Figure 4 - Vertical Discharge**

## General Requirements



**CAUTION:** Pump and piping may contain sharp edges. Wear gloves during installation and service of pump to help avoid injuries from these hazards.

- Install pump near as practical to liquid supply.
- Install shutoff valves to isolate pump from supply and discharge lines allowing pump service without draining system.
- Keep supply piping short and straight to keep pump supplied with liquid and prevent damaging cavitation.
- Use line size, particularly for inlet supply line, equal to or larger than connection size on pump.
- Ensure joints in suction line are well sealed preventing air leaks.
- Support supply and discharge piping near pump preventing strain on pump casing.
- Install pipe anchor between joint and pump if expansion joint is used.
- Allow easy access to pump for service and inspection during operation.
- Ensure mounting structures are properly sized supporting weight of pump.
- Consider local noise level regulations.
- Ensure pump motor type is suitable for environment where pump is to be operated.
- Protect motor from flooding.



**CAUTION:** Pumps intended for use in hazardous environments - eg., explosive, corrosive, etc. - must use a motor with appropriate enclosure characteristics. Failure to use an appropriate motor type may result in serious damage and/or injury.

### Installation Safety Procedures

- Any system throttling valves or similar devices controlling flow rate must be installed in discharge line. **Do not** install devices in supply line. Restriction in supply line may cause cavitation and pump damage.
- "Water hammer" in system can damage pump and other system components. Water hammer often occurs when valves in system are suddenly closed causing lines to move violently and with a loud noise. When this condition is present, find and eliminate source of water hammer. One way to eliminate water hammer is to slow down actuation speed of valve.
- Do not expose pump to freezing temperatures with liquid in casing. Frozen liquid in casing will damage pump. Drain casing before exposing to freezing temperatures.

**Pump Leveling**

Level pump by loosening set screws (Figure 5, item A) to adjust length of legs.

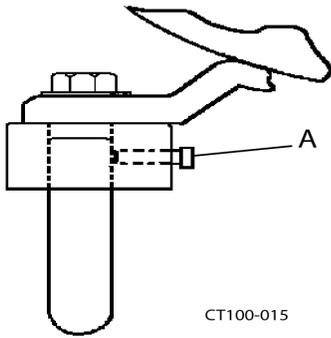


Figure 5 - Set Screw Location

**Type 4 Seal Flush Supply Installation**

Attach seal flush supply to bottom 1/4-inch pipe-threaded hole in flush housing. Drain tubing attached to top hole allowing continuous flooding and moderate pressure to be supplied to seals. (Figure 6).

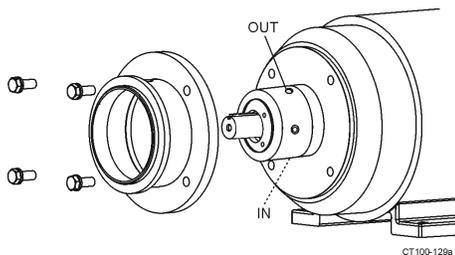


Figure 6 - Type 4 Flush Housing

**Electrical Connections**

**WARNING:** To avoid electrocution, all electrical installation should be done by a registered electrician following Industry Safety Standards. All power must be off and locked out during installation.

- Read motor manufacturer's instructions before making installation. Follow manufacturer's lubrication schedules.
- Check motor nameplate to confirm motor is compatible with all wiring, switches, starters and electrical supply. Ensure overload protections are correctly sized (Figure 7).

**CAUTION**  
To avoid possible injury, SHUT OFF and LOCK OUT all power; relieve system pressure before servicing.

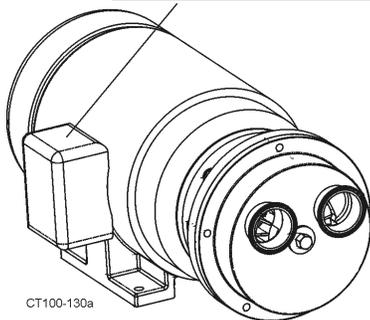


Figure 7 - Replaceable Label Location

## Before First Startup

 **DANGER:** Never attempt cleaning equipment while it is operating.

 **WARNING:** To prevent an accidental startup, power source should be locked out using lock and key.

 **WARNING:** To avoid electrocution, ammeter installation should be done by a registered electrician.

## Cleaning Pump and Piping

Disassemble pump and clean all product contact parts and seal parts prior to first operation. Follow instructions in “Cleaning Safety Procedures” on page 15 and “Scheduled Routine Maintenance” on page 17. The pump and piping system should be thoroughly cleaned of any materials accumulated during installation. Do not use pump to clean system. Check motor for proper rotation (looking at front of pump, motor should rotate counter-clockwise when discharge is on right side, clockwise when discharge is on left side).

- Pump housing should be filled with liquid before startup.
- Maximum inlet pressure to the pump should not exceed 150 PSI.
- Available NPSH should be greater than or equal to the NPSH required by the pump.

## Cleaning Safety Procedures

### Manual Cleaning

- Lock out electrical power and shut off all air prior to cleaning equipment.
- Keep electrical panel covers closed and power off when washing equipment.
- Do not use toxic and/or flammable solvents.
- Clean up spills as soon as possible.
- Wear proper protective clothing.

### Cleaning-In-Place (CIP)

- Ensure all connections in cleaning circuit are properly applied and tight to avoid contact with hot water or cleaning solutions.
- Establish safe procedures to avoid automatic startup while servicing equipment in circuit when cleaning cycle is controlled from remote or automated cleaning center.

## Preliminary Test Run

Test system using a preliminary run with materials to be pumped. During testing, **DO NOT** run pump to produce final product.

See “Starting Pump” on page 16.

### Ammeter Test

Temporarily install an ammeter in electrical service if uncertain about pump selection and application.

Operate pump under process conditions and check motor amp draw versus nameplate full load rating. If amp draw exceeds motor rating, a system change or pump change is required.

Recheck motor amp draw if liquid and/or process conditions change (higher specific gravity, higher viscosity).

---

**Operation**

Before proceeding, ensure that the pump has been correctly installed as described in "Installation" on page 12.

**Starting Pump**

1. Start flow of filtered flush water (recommended rate is approximately 5 US gallons per hour) before operating the pump if pump has flush seal option.
2. Start pump motor.
3. Check pump to verify liquid is flowing and all piping connections and seals are leak free.
4. Ensure pump is not operating against a closed discharge. Continued operation against a closed discharge will heat liquid in casing to boiling and lead to pump damage.

**Stopping Pump**

1. Shut off power to pump motor.

**NOTE:** *Liquid in system can flow freely through pump; pump does not act as a shutoff valve.*

2. Shut off supply and discharge lines.

## Maintenance

### Scheduled Routine Maintenance

A scheduled routine maintenance program can extend life of pump. Keep maintenance records to help pinpoint potential problems and causes.

- Check for unusual noise, vibration and bearing temperatures.
- Inspect pump and piping for leaks.
- Check mechanical seal area for leakage. No leakage is desired.
- Check backplate gasket for wear/damage.
- Lubricate bearings. (See motor manufacturer for correct specifications.)
- Analyze vibration.
- Check discharge pressure.
- Monitor temperature.

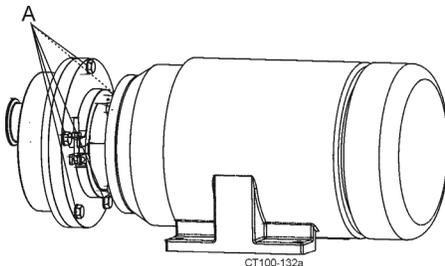
### Disassembly of Pump

#### Tools Required

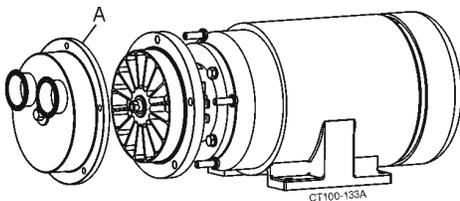
- Soft-face hammer
- 3/4" socket wrench
- 3/4" open end wrench
- 1/8" allen wrench
- 1/2" open end wrench
- 1/4" allen wrench
- 7/16" open end wrench

#### Pump Disassembly Procedure

1. Shut off product flow to pump and relieve any product pressure.
2. Shut off and lockout power to pump.
3. Disconnect suction and discharge pipe fittings.
4. Remove bolts and washers connecting front cover to backplate (Figure 8, item A).
5. Remove front cover (Figure 9, item A) from pump. Place front cover on a protected surface with ports up.



**Figure 8 - Remove Backplate Bolts**



**Figure 9 - Remove Cover**

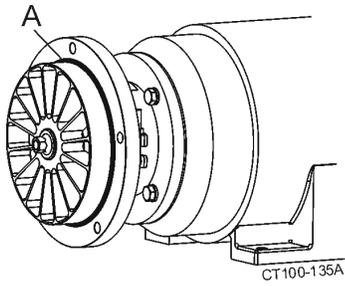


Figure 10 - Remove Cover O-ring

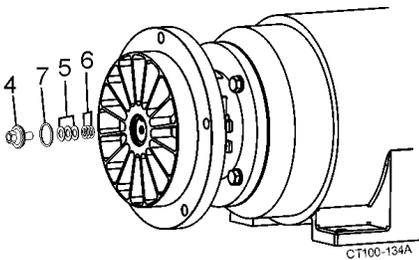


Figure 11 - Remove Shims, Spring Washers and Impeller Retainer (LR2085 Shown)

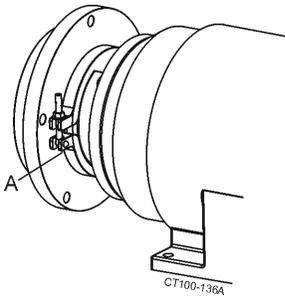


Figure 12 - Remove Clamp

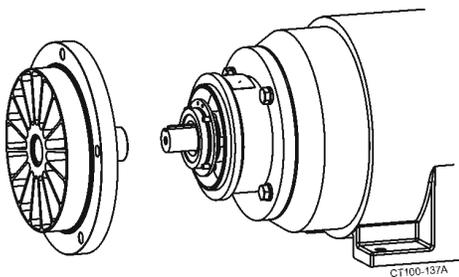


Figure 13 - Remove Impeller, Backplate and Seal Assembly

6. Remove backplate cover o-ring (Figure 10, item A).

7. Remove shims/spacer nut, spring washers and impeller retainer with o-ring (Figure 11, items 6, 5, 4 and 7).

**NOTE:** Tap the wrench handle with a soft-face hammer to loosen the impeller retainer. It may be necessary to block the impeller with a nylon dowel to assist in removing the impeller retainer.

8. Remove the clamp securing the backplate to the motor adapter (Figure 12, item A).

9. Pull the impeller, backplate, and seal assembly from the motor shaft (Figure 13). Place the assembly face down on impeller vanes on a protected surface.

**NOTE:** Use a wheel puller if assembly cannot be removed from motor shaft by hand.



**CAUTION:** Handle the impeller/backplate assembly with care to prevent damage to seal components.

For "Type 1 Seal Disassembly," turn to page 19.

For "Type 4 Seal Disassembly," turn to page 20.

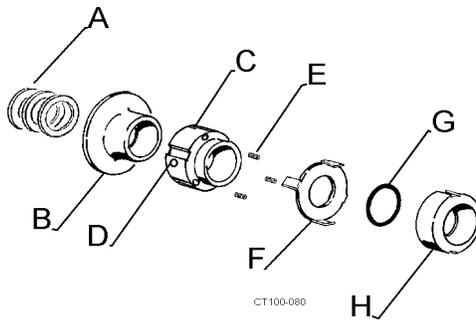


Figure 14 - Type 1 Seal Components



Figure 15 - Move Rotary Seal Up Shaft



Figure 16 - Push Rotary Seal Down, Releasing O-ring

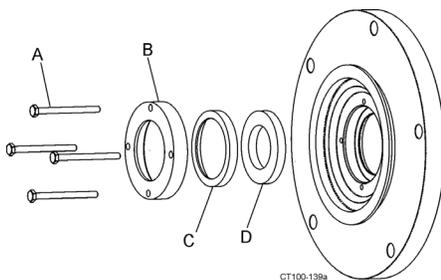


Figure 17 - Remove Stationary Seal

**Type 1 Seal Disassembly**

1. Remove deflector (Figure 14, item B).

**NOTE:** Drive key and shims (Figure 14, item A) remain on motor shaft. If impeller is replaced, add or remove shims as necessary.

2. Loosen (2) set screws (Figure 14, item D) in spring retainer (item C). Slide retainer and washer (item F) off shaft. Save (3) springs (item E).

3. Use backplate to slide rotary seal up impeller shaft approximately 1-1/2 inches (Figure 15).

4. With backplate resting on impeller, push rotary seal toward backplate until o-ring is free (Figure 16).

5. Remove o-ring and lift rotary seal off shaft (Figure 14, item G and H).



**CAUTION:** To avoid seal failure, DO NOT place fingers on seal face.

6. Lift backplate off impeller.

7. Remove four 1/4" hex bolts and stationary seal retainer ring (Figure 17, items A and B).

8. Pull stationary seal and L-gasket out of backplate (Figure 17, items C and D).

**NOTE:** The stationary seal is brittle. Prying or hammering on seal plate can shatter seal. If stationary seal cannot be removed by hand, place 2-1/4 inch diameter plastic or wood rod on impeller side of seal and apply even pressure to dislodge.

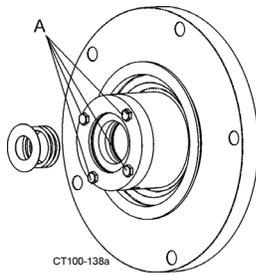


Figure 18 - Remove Screws from Housing

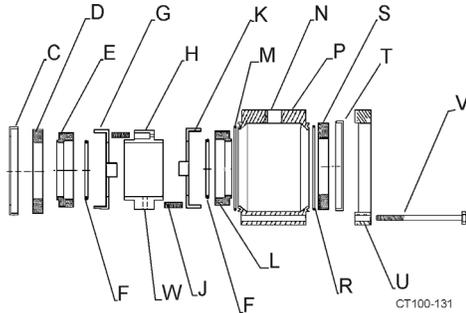


Figure 19 - Type 4 Seal Components



Figure 20 - Move Rotary Seal Up Shaft



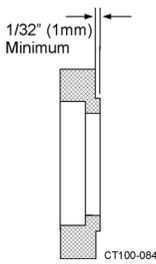
Figure 21 - Push Rotary Seal Down Releasing O-ring

### Type 4 Seal Disassembly

1. Remove cap screws from seal housing. (Figure 18, item A).
2. Carefully lift off seat retainer, o-ring, L-gasket, stationary seal and flush housing (Figure 19, items P, R, T, S and U).
3. Loosen set screws (2) in spring retainer. (Figure 19, items W and H).
4. Lift off rotating seal components:
  - Rotary Seal (Figure 19, item L)
  - O-ring (Figure 19, item F)
  - Washer (Figure 19, item K)
  - Spring Retainer (Figure 19, item H)
  - Springs (6 springs: 3 up, 3 down) (Figure 19, item J)
  - Washer (Figure 19, item G)
5. Use backplate to slide rotary seal up impeller shaft approximately 1-1/2 inches (Figure 20).
6. With backplate resting on impeller, push rotary seal toward backplate until o-ring is free (Figure 21).
7. Pull stationary seal and L-gasket out of backplate (Figure 19, items C and D).

**NOTE:** The stationary seal is brittle. Prying or hammering on the seal plate can shatter the seal. If the stationary seal cannot be removed by hand, place a 2-1/4 inch diameter plastic or wood rod on the impeller side of the seal and apply even pressure to dislodge it.

**Inspecting Parts**



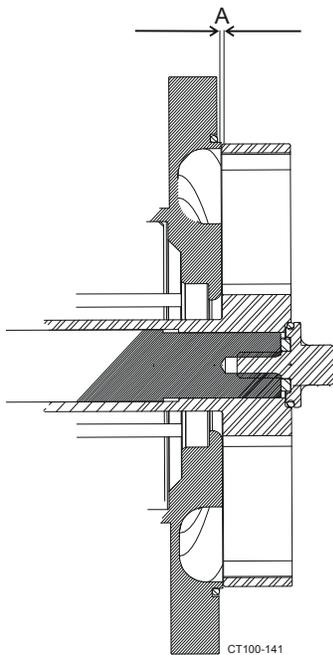
**Figure 22 - Replace Rotary Seal if Less than Minimum**

1. Examine all seal surfaces and replace scratched, cracked and/or braised seals.
2. Inspect all o-rings and o-ring seats for abrasions, cuts or other wear potentially causing leakage.
3. Clean all seal areas and alignment surfaces.

**NOTE:** Stationary seals are **reversible**. Use **both sides** before replacing.

**NOTE:** Replace rotary seal when seal face extends less than 1/32 inch (1 mm) from the body (Figure 22).

**Assembly of Pump**



**Figure 23 - Clearance Between Impeller and Backplate**

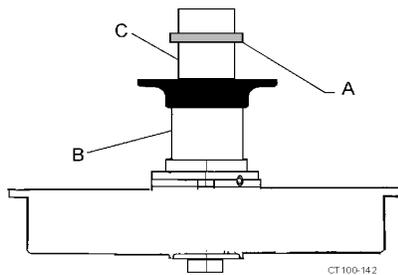
**Tools Required**

- Soft-face hammer
- 3/4" socket wrench
- .020" feeler gauge
- 3/4" open end wrench
- 1/8" allen wrench
- 1/2" open end wrench
- 1/4" allen wrench
- 7/16" open end wrench

**Setting Impeller Clearance**

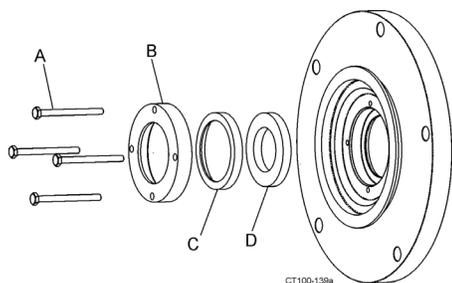
1. To determine the number of shims needed to space the impeller from the backplate while parts are in metal to metal contact, hold the impeller and backplate in place on the motor shaft and check the shimming of the impeller location (Figure 23). If necessary, add or remove shims from the motor shaft so the space between the backplate and impeller face is between 0.015-0.020 in (0.381-0.508 mm). See Figure 23, item A. When the proper clearance is achieved, clamp the backplate, assemble the impeller retainer bolt, and check the clearance again.
2. Remove the impeller and backplate, leaving the shims on the motor shaft.

**NOTE:** Any axial movement of the shaft should not be added to the impeller clearance set in step 1, above. See Figure 23, item A. If needed, change the clearance by adding or removing shims. Shims (Figure 24, item A) are added on the drive shaft (Figure 24, item C) behind the impeller shaft (Figure 24, item B).



**Figure 24 - Shims Locations**

3. Clean all parts and lubricate all elastomer (rubber-like) parts with sanitary lubricant.



**Figure 25 - Stationary Seal Assembly**

4. Insert L-gasket (Figure 25, item D) into backplate seal cavity.
5. Place stationary seal into L-gasket. (Figure 25, item C and D).
6. Place seat retainer over stationary seal and secure retainer with four 1/4-20 x 1/2 inch hex head cap screws. (Figure 25, item B and A).

**NOTE:** Avoid hitting the stationary seal against the impeller shaft to prevent the seal from breaking.

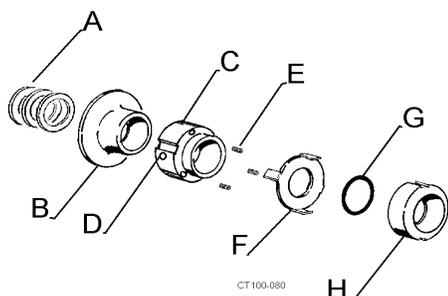
7. Tighten cap screws evenly.
8. Place impeller shaft end up on a clean flat surface and slide assembled backplate onto impeller shaft.

**CAUTION:** Handle impeller/backplate assembly with care to prevent damaging seal components.

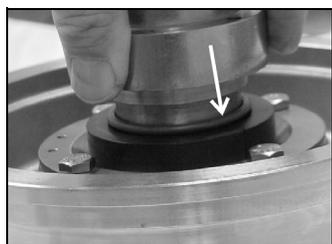
For "Type 1 Seal Assembly," continue.

For "Type 4 Seal Assembly," turn to page 23.

## Type 1 Seal Assembly



**Figure 26 - Type 1 Seal Components**



**Figure 27 - Install O-ring Using Spring Retainer.**

1. Carefully place rotary seal in position over impeller shaft and down against stationary seal.
2. Lubricate and slide seal assembly o-ring onto impeller shaft. (Use the spring retainer as a tool to push o-ring into rotary seal.) (Figure 27).
3. Slide tabbed washer (Figure 26, item F) over impeller shaft and engage tabs of washer into notches on outside of rotary seal. (Figure 26, item F and H).
4. Install three seal springs into holes in spring retainer (Figure 26, item C and E). Hold springs in place with RTV silicone sealant.
5. Slide spring retainer over impeller shaft until slots in spring retainer engage drive tabs on washer and springs rest against washer (Figure 26).
6. With backplate against impeller, push spring retainer down to compress springs until length of visible spring is approximately 1/8".
7. Lock spring retainer in place by tightening set screws (2) (Figure 26, item D).
8. Install deflector onto impeller shaft (Figure 26, item B).

To conclude assembly, turn to page 26, "Backplate Assembly - 2085LR."

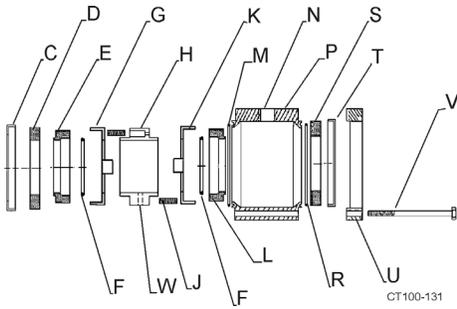


Figure 28 - Type 4 Seal Components

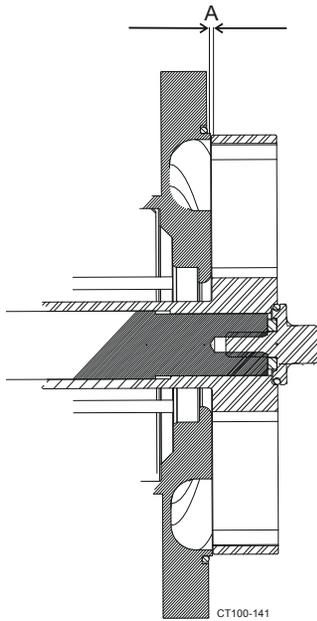


Figure 29 - Place Shims Between Impeller and Backplate

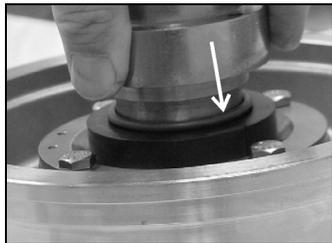


Figure 30 - Install O-ring Using Spring Retainer.

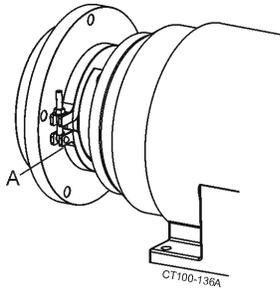
### Type 4 Seal Assembly

1. Install L-gasket in backplate (Figure 28, items B and C) and seat retainer. (Figure 28, item T).
  2. Install stationary seals (Figure 28, item S) in L-gaskets.
  3. Place backplate and rotary seal onto impeller shaft.
  4. Temporarily place .020" shims 180 degrees apart between impeller and backplate to preset clearance. **Remove shims before final assembly** (Figure 29).
  5. Slide o-ring (Figure 28, item F) onto shaft and use spring retainer to push o-ring into rotary seal (Figure 30).
  6. Place washer (Figure 28, item G) over rotary seal with tabs in outside diameter notches.
  7. Place three springs (Figure 28, item J) in one side of spring retainer holding them in place with silicone sealer. With springs down slide spring retainer onto impeller shaft against washer.
  8. Place remaining three springs in spring retainer.
  9. Slide washer and o-ring (Figure 28, items K and F) onto shaft against spring retainer. Use spring retainer to push o-ring into rotary seal.
  10. Remove 1/4 NPT plug from center port on flush housing (Figure 28, item N).
  11. Install o-rings (Figure 28, items R and M) in both ends of housing.
  12. Install L-gasket in seat retainer. (Figure 28, items T and U).
  13. Install stationary seal (Figure 28, item S) in L-gasket.
  14. Install housing over seal assembly.
  15. With flush ports facing away from the backplate place seat retainer (Figure 28, item T) on housing.
  16. Tighten seat retainer in place using four hex screws (Figure 28, item V).
- NOTE:** Tighten screws evenly until full metal to metal contact is made on backplate and seat retainer.
17. Tighten set screws in spring retainer through 1/4" NPT center port in flush housing (Figure 28, item N). Insert plug and tighten.

**Backplate Assembly - 2065LR**

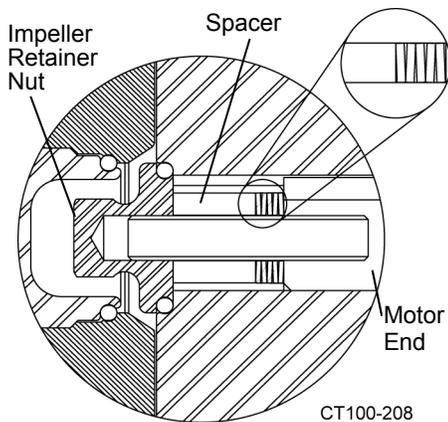
**NOTE:** For 2085LR Backplate Assembly, see "Backplate Assembly - 2085LR" on page 26.

For part numbers, see "2065LR Self-Priming Pump Parts" on page 30.

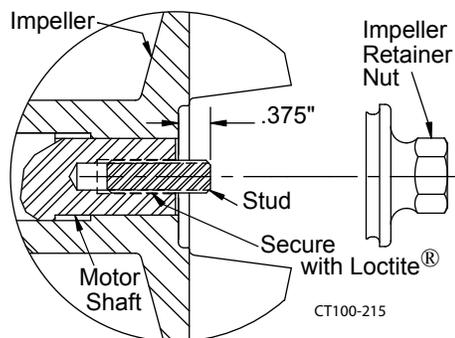


**Figure 31 - Clamp Impeller/Backplate to Motor Adapter**

1. Apply anti-seize or equal compound to the motor shaft and install the key.
2. Install the backplate with seal assembly and impeller on the motor shaft.
3. Position the backplate onto the adapter with the flat surface area above the groove. The top mounting screw will be at the 12 o'clock position.
4. Install the clamp and position the bolt/nut connection at 7 o'clock, allowing easy access to the front cover bolts. (Figure 31).
5. Assemble the spring washers in series, as shown in Figure 32.

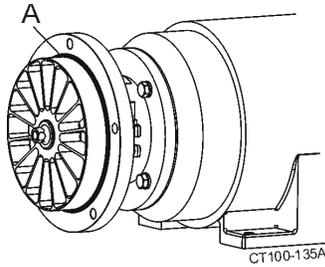


**Figure 32 - 2065LR Impeller Retainer Shimming**

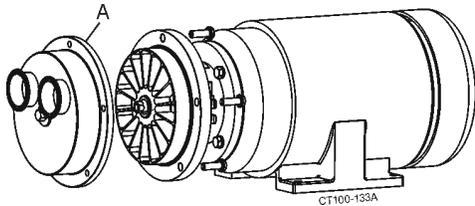


**Figure 33 - 2065LR Stud - Impeller Nut**

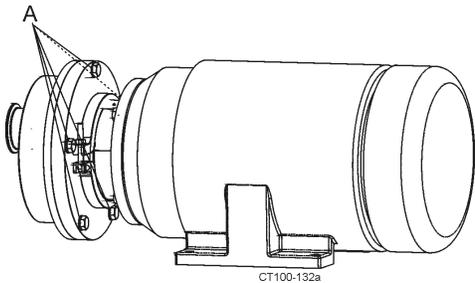
6. See Figure 33. Screw the stud into the motor shaft, finger-tight, until the stud protrudes .375" from the impeller.
7. Leaving the stud in place, remove the impeller and washers.
8. Measure the remaining length of stud that protrudes from the motor shaft.
9. Unscrew the stud, apply Loctite® R/C 680, and screw the stud back in to the measured length, adjust if necessary.
10. Re-install the spring washers and impeller.
11. Tighten the impeller nut to 15-20 ft-lb.



**Figure 34 - Install Backplate Cover O-ring**



**Figure 35 - Install Front Cover**



**Figure 36 - Install Backplate Bolts**

12. Install the backplate cover o-ring. (Figure 40, item A).

13. Install the front cover (Figure 41, item A) on the backplate with ports above the center of the pump.

14. Install bolts and washers connecting the front cover to the backplate (Figure 42).

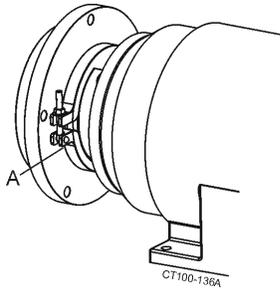
15. Remove the impeller inspection plug and confirm operating clearances by manually rotating the shaft/impeller, ensuring that the impeller does not touch the casing or backplate.

16. Reinstall the impeller inspection plug.

**Backplate Assembly - 2085LR**

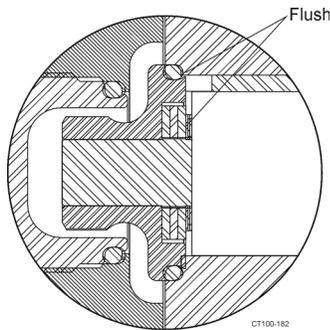
**NOTE:** For 2065LR Backplate Assembly, see "Backplate Assembly - 2065LR" on page 24.

For part numbers, see "2085LR Self-Priming Pump Parts" on page 31.

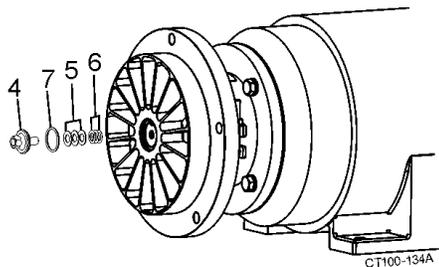


**Figure 37 - Clamp Impeller/Backplate to Motor Adapter**

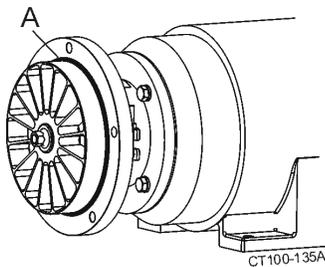
1. Install the o-ring in the front shims on the motor shaft.
2. Apply anti-seize or equal compound to the motor shaft and install the key.
3. Install the backplate with seal assembly and impeller on the motor shaft.
4. Position the backplate onto the adapter with the flat surface area above the groove. The top mounting screw will be at the 12 o'clock position.
5. Install the clamp and position the bolt/nut connection at 7 o'clock, allowing easy access to the front cover bolts. (Figure 37).
6. If the end of the shaft is not flush with the impeller counter bore, add .015 shim washers (Figure 39, item 6) to end of shaft (Figure 38).
7. See Figure 39. Assemble three belleville washers (item 5) to the impeller retainer (4) with the o-ring (7), making sure the curved surfaces are opposed to each other.
8. Tighten the impeller retainer nut to bottom out metal-to-metal. Torque to 30-40 ft-lb.



**Figure 38 - 2085LR Impeller Retainer Shimming**

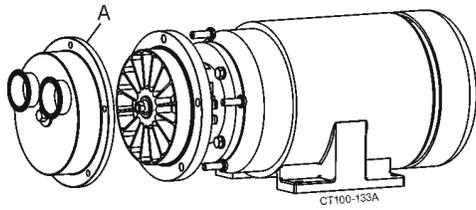


**Figure 39 - 2085 LR Install Shims, Washers, Impeller Retainer with O-Ring**



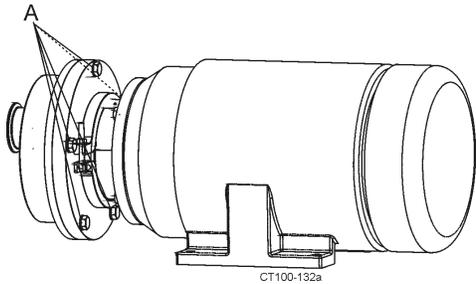
**Figure 40 - Install Backplate Cover O-ring**

9. Install the backplate cover o-ring. (Figure 40, item A).



**Figure 41 - Install Front Cover**

10. Install the front cover (Figure 41, item A) on the backplate with ports above the center of the pump.

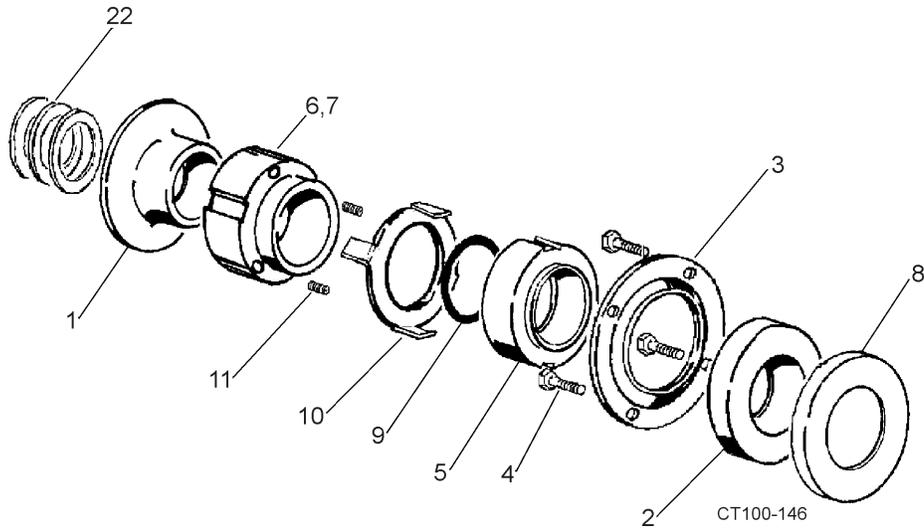


**Figure 42 - Install Backplate Bolts**

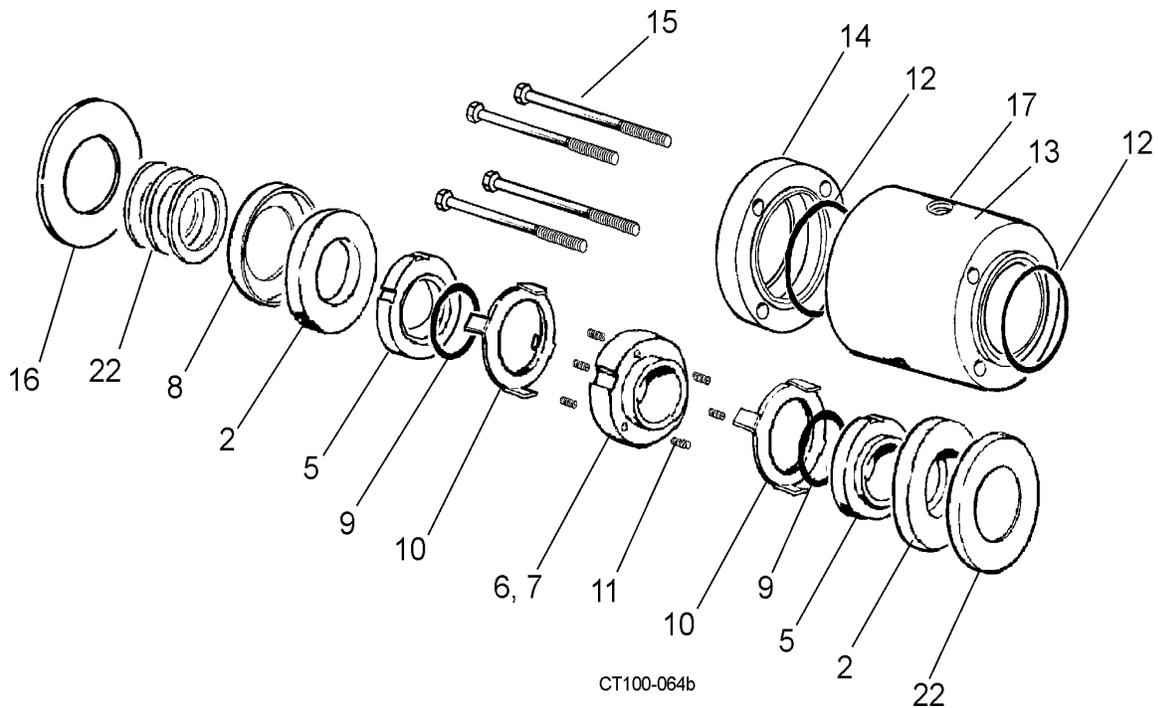
11. Install bolts and washers connecting the front cover to the backplate (Figure 42).
12. Remove the impeller inspection plug and confirm operating clearances by manually rotating the shaft/impeller, ensuring that the impeller does not touch the casing or backplate.
13. Reinstall the impeller inspection plug.

**Parts Lists**

**Seal Components All Pumps**



**Figure 43 - Type 1 Seal Assembly**



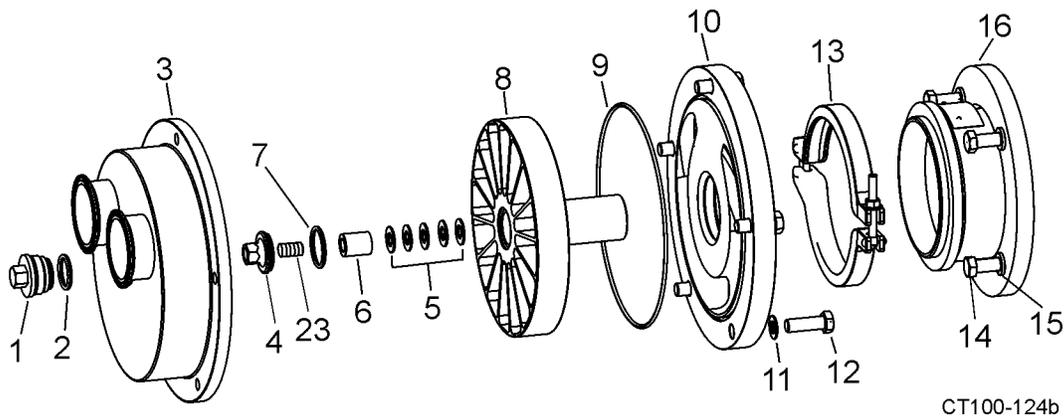
**Figure 44 - Type 4 Seal Assembly**

## Seal Components All Pumps

ITEM	DESCRIPTION	PART #	TYPE 1/1C SEAL QTY	TYPE 4 SEAL QTY
1	Deflector	69-1	1	-
2*	Stationary Seal Purbide (1.75")	23-17	1	2
	S/Carbide (1.75")	23-17A	1	2
	Ceramic (1.75")	23-17E	1	2
	T/Carbide (1.75")	23-17F	1	2
3	Seal Retainer	23-78	1	-
4	Bolt 1/4-20 x 1/2"	30-62	4	-
5*	Rotary Seal Carbon (1.75")	9-225A	1	2
	Purbide (1.75")	9-225B	1	2
	S/Carbide (1.75")	9-225C	1	2
	T/Carbide (1.75")	9-225F	1	2
6*	Capscrew 1/4-20 x 3/8" (not shown)	30-178	2	2
7*	Spring Retainer (1.75)	23-77	1	1
8*	L-gasket Viton®	9-37	1	2
	EPDM	9-37E	1	2
	Kalrez®	9-37K	1	2
	Silicone	9-37R	1	2
9*	O-ring FKM (1.75)	V70224	1	2
	EPDM (1.75)	E70224	1	2
	Chemrez (1.75)	C75224	1	2
	Kalrez® (1.75)	K75224	1	2
	Silicone (1.75)	S75224	1	2
10*	Washer, Tabbed	43-87	1	2
11*	Spring	24-65	3	6
12*	O-ring, Housing	V70039	-	2
13	Housing, Seal	23-80	-	1
14	Retainer, Seat	23-79	-	1
15	Capscrew 1/4-20 x 3"	30-175	-	4
16	Slinger, 142-215JM	69-4	-	1
17	Plug N.P.T. 1/4"	78-155	-	1
20	Plastic Hose 1/4" (not shown)	74-1	-	-
21	Hose Fitting 1/4" (not shown)	78-18	-	-
22	Motor Shaft Shim	See "Motor Shaft Shims" on page 32.		

\*Recommended spare parts.

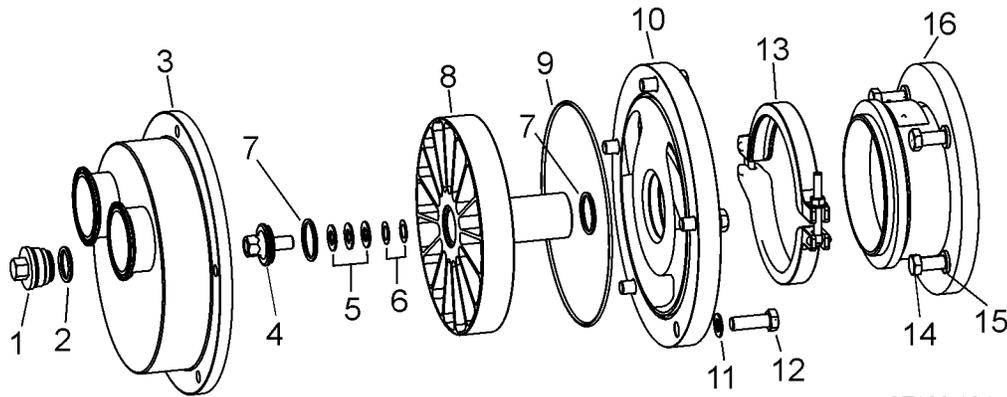
**2065LR Self-Priming Pump Parts**



ITEM #	DESCRIPTION	32RA	20RA	25RA
3	Cover Pump with S-Line Connections	CENTPT00855	CENTPT00859	CENTPT00873
4	Nut-Impeller Retainer	122456+	CENTPT00857	CENTPT00875
8	Impeller, Small Bore	120875+	CENTPT00861	CENTPT00874
10	Backplate	120874+	CENTPT00858	CENTPT00876

ITEM	DESCRIPTION	PART #	QTY
1	Plug Inspection	115162+	1
2	O-ring 215 FDA Viton®	V70215	1
5	Spring Washer	120897+	5
6	Spacer Nut	120896+	1
7	O-ring 214 FDA FKM Impeller Nut	V70214	1
9	O-ring 260 FDA FKM Cover Seal	V70263	1
11	Plain Washer 1/2" SS Type B Narrow	43-233	4
12	Bolt HHCS 1/2"-13 x 1.5"	30-103X	4
13	Clamp	119-87	1
14	Bolt HHCS 3/8"-16 x .75 18-8	30-50	4
15	Lock Washer 3/8" 18-8	43-28	4
16	Adapter LR85 254/256JM	120877+	1
23	Stud LR2065 Pump, 2"	120898+	1

2085LR Self-Priming Pump Parts



CT100-124a

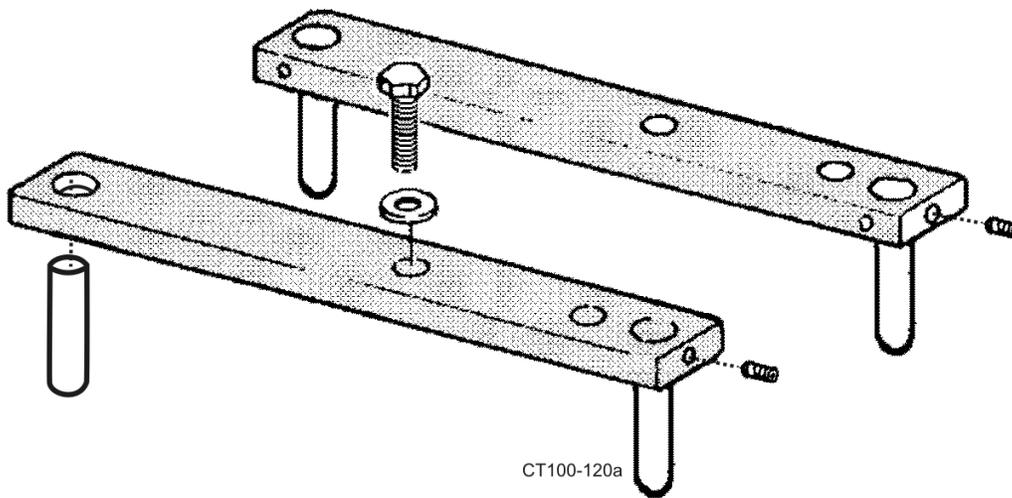
ITEM #	DESCRIPTION	32RA	20RA	25RA
3	Cover Pump with S-Line Connections	CENTPT00870	CENTPT00871	CENTPT00877
4	Nut-Impeller Retainer	115163+	CENTPT00231	CENTPT00879
8	Impeller, Large Bore	114911+	CENTPT00183	CENTPT00878
10	Backplate	115161+	CENTPT00210	CENTPT00880

ITEM	DESCRIPTION	PART #	QTY
1	Plug Inspection	115162+	1
2	O-ring 215 FDA Viton®	V70215	1
5	Belleville Washer 1/2" 17-7SS	43-243	3
6	Shim Washer .015" Thick	43-244	As required.
7	O-ring 220 FDA FKM Impeller Nut	V70220	2
9	O-ring 267 FDA FKM Cover Seal	V70267	1
11	Plain Washer 1/2" 18-8	43-31X	5
12	Bolt HHCS 1/2"-13 x 1.5"	30-103X	5
13	Clamp	119-71	1
14	Bolt HHCS 1/2"-13 x 1.25 316SS	30-36X	4
15	Lock Washer 1/2" 18-8	43-16	4
16	Adapter LR85 254/256JM	115169+	1

**Motor Shaft Shims**

MOTOR SHAFT SHIMS	MOTOR NEMA FRAME SIZE	PART #	QTY
.005" THK.	213JM-215JM	35-1	As required.
.010" THK.	213JM-215JM	35-2	As required.
.020" THK.	213JM-215JM	35-3	As required.
.005" THK.	254JM-326JM	35-4	As required.
.010" THK.	254JM-326JM	35-5	As required.
.020" THK.	254JM-326JM	35-6	As required.

**Motor Mounts**



PUMP MODEL	FRAME	LEG KIT
S2065LR	213/215	110254+
S2085LR	254/256	110253+

## Troubleshooting

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
<b>Not Enough Liquid Delivered</b>	Suction or discharge plugged or closed	Open suction. If plugged, shut down pump and remove blockage.
	Air leak in supply or at seal area	Check system for air leaks and repair as necessary. Replace seals if necessary.
	Discharge head too high	Lower discharge head until pump can move material without turning too freely causing overload.
	Suction lift too high	Lower pump in system until pump is easily supplied with product.
	Speed too slow (low voltage, wrong frequency, wrong motor)	Adjust voltage and frequency. Change motor if necessary.
	Excessive air in material	Adjust system to remove excess air from material before reaching the pump.
	Insufficient NPSH (Net Positive Suction Head) available	Adjust system to provide correct NPSH.
<b>Not Enough Pressure</b>	Air leak in supply or at seal area	Check system for air leaks and repair as necessary. Replace seals if necessary.
	Speed too slow (low voltage, wrong frequency, wrong motor)	Adjust voltage and frequency. Change motor if necessary.
	Excessive air in material	Adjust system to remove excess air from material before reaching the pump.
<b>Motor Overload</b>	Faulty electrical connections	Check wiring and repair or replace as necessary.
	Impeller interference	Disassemble pump and inspect for damage. Remove interference if still present. Replace worn or damaged parts.
	Seal binding	Disassemble pump and inspect for damage. Check for material crystallization on seals.
	Liquid heavier or more viscous than rating	Contact your Waukesha Cherry-Burrell Customer Service Representative for sizing information. WCB Customer Service Telephone: 1-800-252-5200 or 262-728-1900
	Overload heaters too small for motor	Inspect and replace as necessary.
	Electrical supply, voltage and frequency incorrect	Adjust voltage and frequency. Change motor if necessary.
	Defective motor	Replace motor.
	Discharge lead too low	Increase discharge pressure.

PROBLEM	POSSIBLE CAUSE	SUGGESTED ACTION
<b>Vibration/Noise</b>	Pump not level	Ensure legs are touching floor. Level pump.
	Piping not supported	Support all piping as described in installation section.
	Starved suction/supply line blocked	Shutdown pump and remove blockage
	Foreign material in pump	Disassemble pump, remove all foreign material and inspect for damage. Replace worn or damaged parts.
	Starved suction/insufficient NPSH (Net Positive Suction Head) available	Adjust system to provide correct NPSH.
	Impeller out of balance	Disassemble pump and inspect for damage. Replace impeller.
	Motor bearings worn	Disassemble motor and inspect for damage. Replace worn parts.
	Starved suction/supply line too long	Shorten system supply line.
	Starved suction/supply line too small	Install larger supply lines.
<b>Rapid Seal Wear</b>	Water Hammer	Adjust system to reduce air in system and sudden starts or stops in flow.
	Abrasive product	Contact your Waukesha Cherry-Burrell Customer Service Representative for alternate seal information. WCB Customer Service Telephone: 1-800-252-5200 or 262-728-1900
	Prolonged “dry” running	Adjust process to ensure pump has continual fresh supply of product during operation.
	Abrasive solids (unfiltered) in flush water supplied to seal	Use only filtered water in seal flush system.
<b>Seal Leaks</b>	Gasket damaged or worn	Replace gasket.
	Seal not installed correctly	Disassemble pump and inspect seal for damage (replace if necessary). Install seal correctly and reassemble pump.
	Carbon seal worn or damaged	Replace carbon seal.
	Inlet/outlet connection loose	Inspect inlet/outlet connection for gasket and tighten connection.



# 200LR Self-Priming

CENTRIFUGAL PUMP



## **SPX FLOW TECHNOLOGY**

611 Sugar Creek Road

Delavan, WI 53115

P: (262) 728-1900 or (800) 252-5200

F: (262) 728-4904 or (800) 252-5012

E: [wcb@spx.com](mailto:wcb@spx.com)

SPX reserves the right to incorporate our latest design and material changes without notice or obligation.

Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing.

Please contact your local sales representative for product availability in your region. For more information visit [www.spx.com](http://www.spx.com).

The green ">" is a trademark of SPX Corporation, Inc.

ISSUED: 07/2014

COPYRIGHT © 2014 SPX Corporation