



**CPE SYSTEMS
INCORPORATED**

CPE Portable Pump Quick Start Guide

How To Care For Your Portable Pump Assembly

PUMPS

-

HOSES

-

**HEAT
EXCHANGERS**

-

FLOW METERS

-

GASKETS

-

VALVES

-

FITTINGS

-

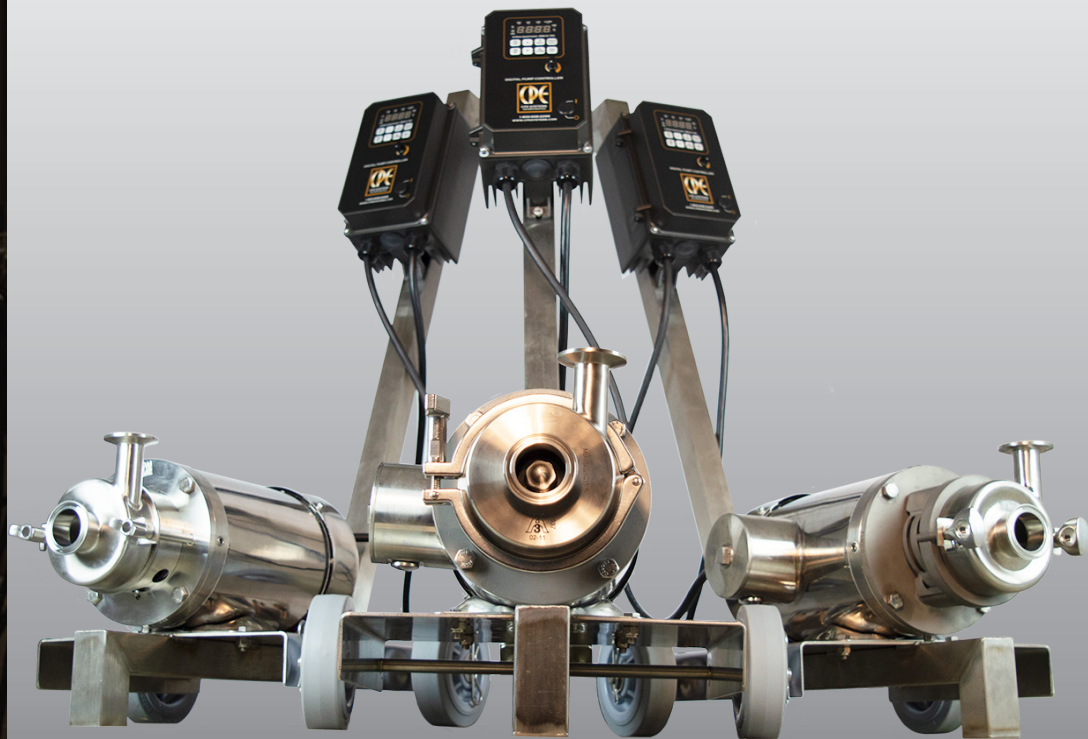
THERMOMETERS

-

**PORTABLE
SYSTEMS**

-

and more



CONTENTS

| | |
|--|----|
| 1. INTRODUCTION | 3 |
| 2. QUICK START GUIDE..... | 3 |
| 3. KEYPAD GUIDE..... | 4 |
| 3.1 Layout..... | 4 |
| 3.2 Drive Operation..... | 5 |
| 4. LINE INSTALLATION | 6 |
| 4.1 Inlet Line | 6 |
| 4.2 Outlet Line | 6 |
| 5. PUMP CLEANING..... | 7 |
| 5.1 Clean In Place | 7 |
| 5.2 Cleaning Stainless Steel..... | 7 |
| 5.3 Preventing Corrosion..... | 7 |
| 6. MAINTENANCE | 8 |
| 6.1 Disassembly | 8 |
| 6.2 Reassembly | 9 |
| 6.3 Setting The Seal Drive | 10 |
| 7. VFD DIGITAL SPEED CONTROL..... | 12 |
| 7.1 Standard Features..... | 12 |
| 7.2 Protection Features..... | 12 |
| 7.3 Programming | 12 |
| 7.4 Specifications..... | 13 |
| 8. PUMP PARTS | 14 |
| 8.1 C-100 Pump Parts..... | 14 |
| 8.2 C-114 through C328 Pump Parts..... | 14 |
| 9. TROUBLESHOOTING..... | 15 |
| 9.1 Pumping..... | 16 |
| 9.2 VFD Error Codes..... | 17 |

1. INTRODUCTION

Thank you for purchasing a CPE Centrifugal Pump. Your pump comes completely set up, wired, and pre-programmed. Please read this manual front to back, it includes care instructions for your pump.

2. QUICK START GUIDE

Your pump was assembled, wired, programmed, and tested before shipping. It should be ready for you to use without any modifications or changes required on your part.

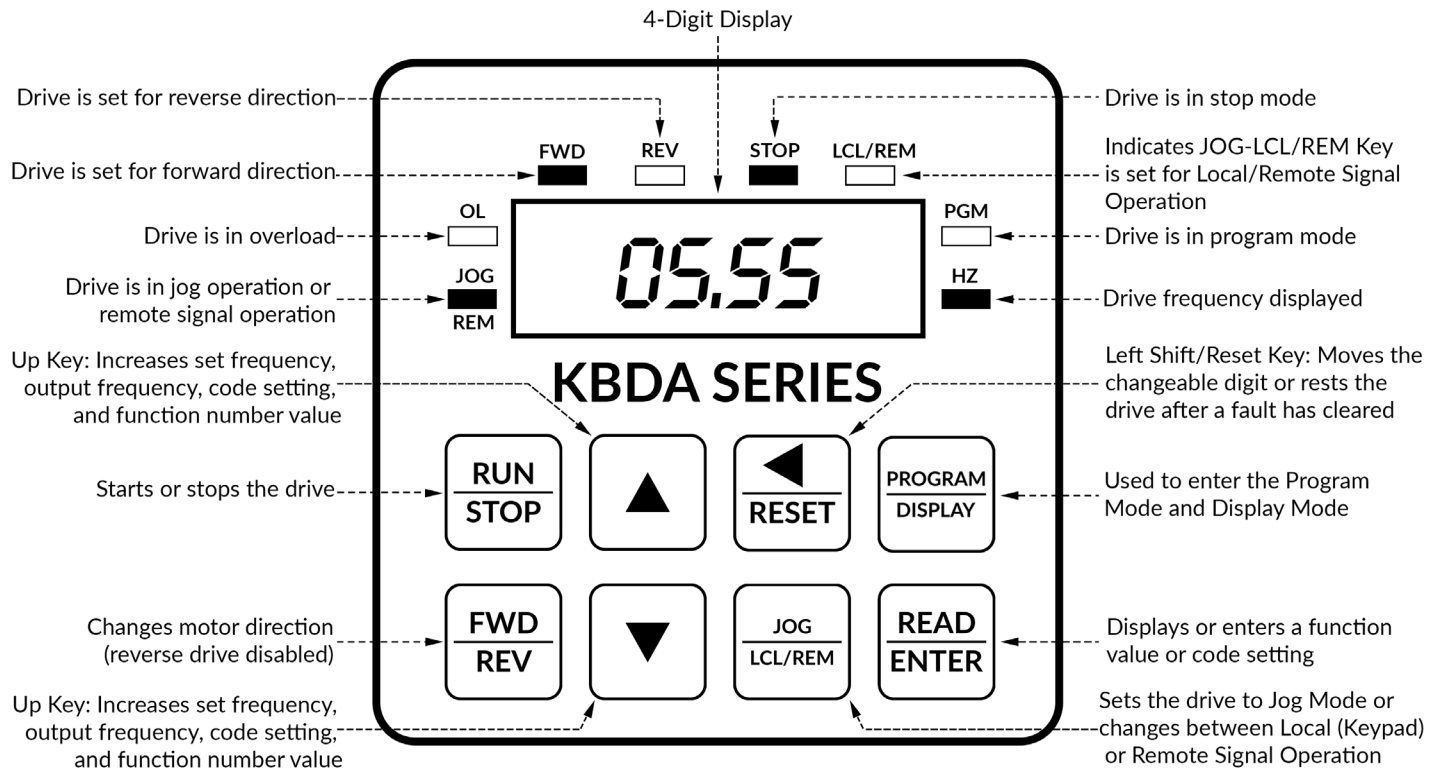
Do not make any changes without contacting CPE Systems first. Failure to do so will void the warranty.

1. Connect the inlet (suction) line to the Tri-Clamp fitting on the front of the pump using a new Tri-Clamp gasket and a heavy duty clamp. The inlet line should be at least the same diameter as the fitting on the pump. Take care to avoid putting a valve or a tee immediately before the pump.
2. Connect the discharger line to the Tri-Clamp fitting on the top of the pump using a new Tri-Clamp gasket and a heavy duty clamp.
3. Plug the power cord into an appropriate wall receptacle. The plug shipped on your pump matches the voltage setting on the controller. Do not change the plug or use an adapter; this will void the warranty.
4. Open the valve on the inlet line to the pump to allow liquid to flow to the pump.
5. Open the valve on the discharge line if you have one installed.
6. Adjust the potentiometer (speed control knob) on the front of the digital pump controller to the midpoint; the indicator dot on the knob should be at the top.
7. Press the RUN/STOP button briefly to start the pump.
8. Adjust the speed of the pump by using the potentiometer to obtain your desired flow.
9. If the OL LED (overload) is lit then slow the pump down or restrict the discharge flow until the OL LED goes off.
10. When you are finished pumping, stop the pump by pressing the RUN/STOP button. The STOP LED will illuminate. Turning down the potentiometer to zero will NOT turn off the pump. This will still allow voltage to the motor and can cause damage and electrical shock.
11. If equipped, close both the inlet and discharge valves.

Note: Do not try to run your centrifugal pump in reverse. It will not operate in reverse; the R/F switch has been disabled.

3. KEYPAD GUIDE

3.1 Layout











Caution:

Do not assume that your unit is in a power-off state because the LEDs or 4-digit display is off. This does not guarantee a power-off state. Be sure the pump is unplugged or that the main power switch or circuit breaker is in the "OFF" position before servicing the drive.

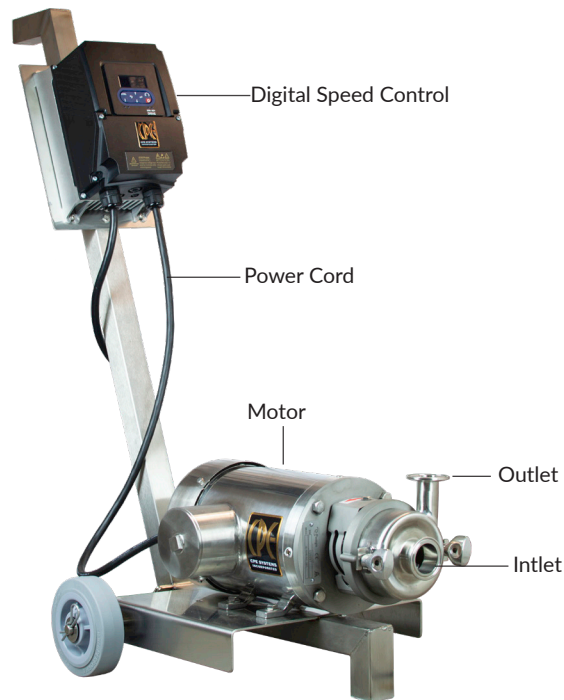


3.2 Drive Operation

Start-up procedure - Your variable frequency drive has been programmed and all the connections have been completed. To start the drive, set the speed control potentiometer midway and then press the RUN/STOP button. The motor will begin to accelerate to the set frequency. To adjust the speed turn the knob clockwise to speed up and counterclockwise to slow down the pump. To stop the pump press the RUN/STOP button again.

| Key | Description |
|---|--|
|  | Starts or stops the drive. |
|  | Changes motor direction. (Disabled on all centrifugal pumps) |
|  | Up Key: Increases Output Frequency, Set Frequency, Frequency Number Value, and Code Setting. (Does not function if potentiometer knob is active) |
|  | Down Key: Decreases Output Frequency, Set Frequency, Function Number Value, and Code Setting. (Does not function if potentiometer knob is active) |
|  | Factory programmed function as a Jog Key. When the key is pressed, it toggles between Run Mode and Jog Mode (the "JOG/REM" LED will illuminate and the display will show the Jog Frequency Setting (see Function No.3.13)). If the key is reprogrammed for Local/Remote Operation (see Function No.2.02), the key is used to toggle between Local (keypad) or Remote Signal Operation (the "LCL/REM" LED will illuminate). (Optional IODA board is required for Local/Remote Operation) |
|  | Used to enter Program Mode or Display Mode. If the key is pressed while Set Frequency is displayed, the previously entered Function Number will be shown. If the key is pressed while Function Number is displayed, the Set Frequency will be shown. When more than one display function is enabled, the key is used to toggle between displays. |
|  | Left Shift/ Reset Key: Moves the changeable digit or resets the drive to clear a fault. |
|  | Reads or enters a function number's value or code setting. The key is also used to read or enter the frequency setting. |

4. LINE INSTALLATION



4.1 Inlet Line

The suction line should be short and follow a direct route with a minimum number of elbows and fittings. Elbows should be located as far as possible from the suction inlet to prevent head loss due to increased friction. Excessive friction losses in the suction line could result in pump cavitation, which causes poor performance, noise, vibration, damage to equipment, and possible damage to the product. Whenever practical the diameter of the line at the suction inlet should be increased in size. An eccentric tapered reducer should be used in lieu of a concentric tapered reducer to prevent air pockets from forming and impairing pump efficiency. The eccentric reducer may be placed at the inlet of the pump and should be positioned so the straight side is up. A horizontal suction line must have a gradual rise to the pump. A high point in the suction line will form an air pocket and prevent proper pump operation. All joints in the suction line should be airtight to prevent air leakage, which can reduce pump capacity and efficiency.

4.2 Outlet Line

Position the pump outlet line either vertical or top horizontal. The discharge line should be short and direct with a minimum number of elbows and fittings. Elbows should not be used at the discharge outlet as the friction encountered would be increased, resulting in head loss. It is advisable to increase the line diameter at the discharge outlet to prevent head loss. However, the use of a larger discharge line than recommended may reduce the total pump head while increasing the pump volume, which can cause pump vibration due to overload. Use of a discharge pipe smaller than the pump discharge outlet increases the total pump head but decreases the volume. If a reducer is required on the outlet port of the pump and the discharge is vertical, a concentric reducer should be used. If the discharge is horizontal, an eccentric reducer should be used, which should be positioned with the straight side down.

5. PUMP CLEANING

5.1 Clean In Place

Our centrifugal pumps are designed to be cleaned in place (CIP). No disassembly should be required for cleaning if a proper CIP procedure is followed.

5.2 Cleaning Stainless Steel

Cleaning of stainless steel (AISI 300 Series), manually or chemically, is dependent on the process environment the equipment is operated in. Typically, the cleaning regimen should be developed and reviewed by a plant sanitarian or a formulation representative of a reputable chemical supply company.

The following chemicals may be utilized to clean, passivate, and disinfect equipment prior to operation:

Alkaline Detergent: A blended alkaline detergent may be used to clean equipment. The detergent should be a blended sodium hydroxide/water detergent, designed for use with stainless steel equipment and used at initial concentrations of 1-3% w/w solution at a temperature of 160° F (70° C) to 195° F (90° C) (depending on the chemical supplier). The detergent should be formulated with a metal chelating agent, such as sodium gluconate or gluconic acid, to remove metal ions in the water (hardness dependent) and a surfactant to increase the rinse ability of the solution.

Acid: To neutralize any residual alkali and render a passive surface on the stainless steel, a 160°F (70° C) solution of citric acid and water at a concentration of 0.5-3% w/w can be used. Phosphoric acid may be used at concentrations of 0.5-1.5% w/w at 115° F (45° C). If phosphoric acid is used, corrosion inhibitors should be blended in prior to use.

Disinfectant (Food Plants): Caution should be used with the application of chemical disinfectants. Most chemical disinfectants are halogen or quaternary ammonium-based compounds and, in high concentrations, are very corrosive to stainless steel. Typically, the most common disinfectant, iodophor, can be used with a maximum concentration of 25 mg/l at a maximum temperature of < 80°F (25° C). Other common disinfectants, such as sodium hypochlorite and chloramine, are not recommended.

5.3 Preventing Corrosion

The corrosion resistance of stainless steel is greatest when a layer of oxidation is formed on the surface of the metal. If the protective surface is disturbed or destroyed, the metal can easily be corroded by contact fluids.

1. Regularly inspect stainless steel equipment for surface deposition and/or localized pitting corrosion. If deposition or discoloration is detected, disassemble equipment, remove components and soak in a mild alkaline-based detergent. Rinse using warm water. Allow equipment to air dry thoroughly before assembly.
2. Regularly check all electrical devices and verify all equipment is grounded to avoid any electrolytic-concentration corrosion.
3. Regularly inspect joints and gaskets in the system for crevice corrosion.
4. Regularly inspect equipment for trapped air pockets to avoid pitting caused by oxygen concentration corrosion.
5. Regularly inspect any areas of equipment using dissimilar metals connected by a mechanical joint to avoid galvanic corrosion.
6. Regularly inspect system components not manufactured with stabilized low carbon stainless steel (intergranular corrosion).

6. MAINTENANCE

Caution:

Before servicing pump, disconnect electrical power source, carefully relieve all pressure and drain all fluids from pump and connected piping.



For C-Series pumps equipped with the “Groove-In-Shaft” design (types D, DG, or F seals only), it is not necessary to disassemble if used in a Clean-In-Place installation. In some applications, it may be necessary to disassemble parts of the pump for cleaning and sanitizing. The extent of disassembly will depend on the application and the type of seal used in your pump. It is recommended that periodic inspection of all parts of the pump be made to prevent malfunctions caused by worn or broken parts. Disassembly for repair is the same procedure as for cleaning.

6.1 Disassembly

Disassembly of the pump wet end

1. Disconnect the inlet and outlet lines.
2. Remove seal guard assembly with a wrench of appropriate size.
3. Turn the wing nut on the clamp assembly until tension on the clamp saddle is relieved. (On a C100 pump remove the two wing nuts.)
4. Open the clamp and remove the casing. (C114 and large pumps only)
5. Push back on the impeller and center the retainer pin in the stub shaft.
6. Slide the impeller forward and remove it. Do not try to remove the retainer before removing the impeller, as this will cause damage to the retainer, shaft, and impeller.
7. Rotate the backplate until the backplate pins clear the pins in the adapter and remove the backplate
8. Remove the casing gasket.
9. Remove the carbon seal, seal o-ring, seal cup, and spring.

Note: Protect the sealing surface of the backplate against nicks and scratches while removing, cleaning, and reassembling.

D & F Seal Service

1. For D and F seals, examine the backplate sealing surface carefully for any damage that will shorten seal life.
2. Remove the carbon seal, o-ring seal, cup, and spring. If your pump is equipped with a drive collar, remove it by loosening set screws and sliding the collar off the stub shaft.
3. Carefully inspect the seal o-ring and carbon seal for signs of abrasions, cuts or other wear that would cause leakage. When the extension of the carbon seal face extends less than 1/32” from the body, it is advisable that the carbon seal be replaced.
4. Remove the cascading water attachment, if included. Remove the rubber shaft deflector by prying it gently from the rear, while sliding it forward. Examine the deflector for tearing, loose fit, or other defects that would allow fluid leakage into the motor along the armature shaft.
5. Remove the bolts securing the adapter to the motor frame and remove the adapter. Loosen the 4 set screws securing the stub shaft to the motor armature. Remove the stub shaft by prying from the back with a flat bar. The stub shaft is a tight fit but can be removed by evenly applying pressure around the periphery of the shaft with a pry bar. (This step is not required for seal replacement)
6. Examine the stub shaft sealing surface for nicks or scratches which can cause excessive o-ring seal wear or leaking.
7. Inspect the casing clamp for damage or wear and replace as required.
8. Inspect the wheels, adapter, and casing; replace if necessary.

Note: The electric motor contains no field serviceable components; therefore, this manual does not cover the maintenance, repair, and wiring of the electric motor. For specific information contact CPE Systems.

DG Seal Service

1. Perform disassembly as above for the “D” seal
2. Remove the four bolts/screws from the backplate. Inspect DG seat insert, gland ring, and gaskets for damage or wear. Replace as required.

Note: 80P outboard and #80R inboard gaskets are not interchangeable. The #80R (thicker) gasket must be inboard between the backplate and seal seat. Care must be taken to protect the sealing face of the seal seat for DG seals from nicks and scratches.

3. Remove the carbon seal and seal o-ring. Examine and replace as necessary.

6.2 Reassembly

1. If it was removed, install the adapter to the motor with the drain holes at the bottom. Insert the four bolts securing the adapter to the motor; tighten the bolts securely.
2. Assemble the stub shaft to the motor armature shaft. Do not tighten set screws.
3. Install the backplate by rotating it until the pins in the backplate engage the pins in the adapter.
4. Rotate the shaft until the floating pinhole is in a horizontal position. Insert the floating retainer, center it in the shaft, and slide the impeller on the shaft. Hold the impeller tight against the shoulder of the shaft and rotate the shaft one-fourth turn until the floating retainer drops and engages the impeller.
5. Install the casing and secure it with the clamp or wing nuts.
6. Push the stub shaft onto the motor shaft until the impeller strikes the inside front face of the backplate. Locate the stub shaft on the motor shaft allowing 1/16th (1.5mm) maximum clearance between the rear face of the impeller and the inside face of the backplate. Tighten the set screws on the stub shaft. Remove casing, impeller, impeller pin, and backplate.
7. Slide the rubber deflector on the shaft until it seats in the groove in the shaft.
8. Slide drive collar onto stub shaft and locate per setting instructions in next section. Assemble the spring, seal cup, seal o-ring, and carbon seal, and install as a unit. Take care that the slot in the seal cup is aligned with the pin in the drive collar. Gentle finger pressure will overcome o-ring resistance on the shaft.
9. Install the backplate by rotating it until the pins in the backplate engage the pins in the adapter.
10. Rotate the shaft until the floating pin hole is in a horizontal position. Insert the floating retainer, center it in the shaft, and slide the impeller on the shaft. Hold the impeller tight against the shoulder on the shaft and rotate the shaft one-fourth turn until the floating retainer drops and engages the impeller.
11. Install gasket on backplate.
12. Place the casing in position and close and tighten the clamp or wing nuts while lightly tapping the clamp with a hammer to ensure even tightening. Assemble seal guard and tighten nuts.
13. Assemble the cascading water attachment, (F seal only) to the adapter.

14. Assemble the inlet and outlet lines to the pump. Check for strain on the casing. Adjust as necessary.

Note: Apply a small amount of food-grade lubricant to the o-ring prior to installation. Do not lubricate the carbon seal with any type of oil or grease. The seal faces are lubricated by the product being pumped.

6.3 Setting The Seal Drive

Setting The Seal Drive Collar By Position

1. Assemble the spring, seal cup, seal o-ring, and carbon seal onto the drive collar. Care must be taken so that the spring does not rest on the tab that is bent back. A portion of the spring is offset to provide clearance for this tab. Care must be taken to ensure that the pins on the drive collar are in line with the slot on the cup.
2. Install as a unit on the shaft.
3. Install the backplate and casing.
4. Install and tighten the casing clamp.
5. Slide the drive collar and seal assembly toward the backplate until the nose of the drive collar pushes the o-ring and carbon seal tight against the backplate.
6. Slide the drive collar away from the backplate 1/32" (.79mm) and secure the drive collar in this location with the set screws.
7. When the drive collar is properly positioned and seal components are properly installed, the pump shaft should rotate freely by hand. If excessive effort is required to rotate the shaft, check to be sure that all components are properly installed and the drive collar is properly positioned.

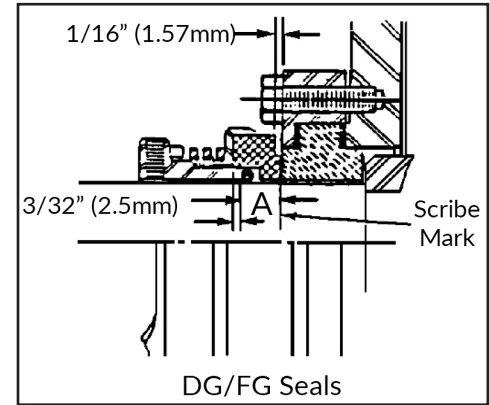
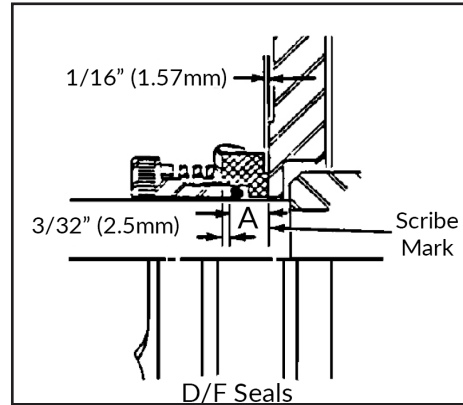
Note: Extra care should be taken when assembling C series pumps with type DG seal. Incorrect stub shaft settings will allow the impeller hub to contact the inboard face of the stationary seal seat. Interference of impeller hub and seal seat face will cause wear of impeller hub and damage the inboard or secondary seal face of the clamped-in-seat. Usual inspection is recommended after installation of the impeller and before installation of the casing, to ensure clearance between the impeller hub and seal face. If no clearance is visible, the pump should be disassembled and the stub shaft moved forward to provide at least 1/32 (.79) mm clearance between the impeller hub and seal seat face. Reset seal drive collar if necessary. Rotate freely by hand; if excessive effort is required to rotate the shaft, check to be sure that all components are properly installed and the drive collar is properly positioned.

Setting The Drive Collar By Measurement

Note: Not applicable to the C100 model

1. Install the backplate, gasket, and casing.
2. Install and tighten casing clamp

3. At a location behind the backplate, scribe a mark on the shaft. See figures below.



4. Remove casing clamp, casing, and backplate.
5. Slide the drive collar onto the shaft.
6. Locate drive collar in relation to the scribe mark as shown in dimension A and secure to the shaft with the set screws. Drive collar location is critical.

| Model | "A" Dimension |
|-------|-----------------------------|
| C114 | 1 $\frac{1}{32}$ " (2.3 mm) |
| C216 | 1 $\frac{1}{32}$ " (2.3 mm) |
| C218 | 1 $\frac{1}{32}$ " (2.3 mm) |
| C328 | 1 $\frac{1}{32}$ " (2.3 mm) |
| C4410 | 1 $\frac{1}{32}$ " (2.3 mm) |

7. Install the seal spring, seal cups, seal o-ring, and carbon onto the shaft.

7. VFD DIGITAL SPEED CONTROL

7.1 Standard Features

- Industrial duty die-cast aluminum enclosure with a hinged cover in a dark gray finish.
- Multi-Function Keypad - The keys are used to operate the drive, change operating parameters, reprogram functions, and change the display output (Run/Stop, Forward/Reverse, Up, Down, etc).
- 4-Digit LED Display - Provides readout of drive operating parameters and programming functions. Displays output frequency, motor rpm, output current, output voltage, bus voltage, function no. codes and values, and fault codes.
- LED Status Indicators - The LEDs provide indication of the drive's status and operating mode (Hz, PGM, LCL/REM, STOP, FWD, REV, OL, JOG/REM).
- Multi-function output relay contacts can be used to turn on or off equipment or to signal a warning if the drive is put into various modes of operation (The optional IODA input/output multi-function board adds 9 digital and analog outputs and 2 additional relay outputs).
- Motor Current Selection - Programmable motor current allows the drive to be used on a wide range of motor horsepower.
- Compatible with some GFCIs.
- Power Start - Provides more than 200% starting torque which ensures startup of high frictional loads. Programmable flux vector compensation with static auto-tune and boost provides excellent load regulation and dynamic response over a wide speed range.
- Speed Range - 60:1

Note: Your drive has been programmed with the correct settings for optimal performance. Do not change the parameter settings without contacting the factory. This will void the warranty.

7.2 Protection Features

- Motor Overload with RMS Current Limit - Provides motor overload protection, which prevents motor burn-out and eliminates nuisance trips. (UL approved as an electronic overload protector for motors.)
- Electronic Inrush Current Limit (EICL) - Eliminates harmful inrush AC line current during startup.
- Short Circuit -Shuts down the drive if a short circuit occurs at the motor (phase-to-phase).
- AC Line Phase Loss Detection (On 3 phase models only)
- Decel Extend - Eliminates tripping due to bus overvoltage caused by rapid deceleration of high inertial loads.
- Under-voltage and over-voltage - shuts down the drive is the AC line input voltage goes below or above the operating range.
- MOV Input Transient Suppression.
- Microcontroller Self Monitoring and Auto-Reboot.

7.3 Programming

The VFD is factory set for optimal operational efficiency. If you need to make changes please contact our service department for assistance.

7.4 Specifications

Table 1: Electrical Ratings

| Model | Part No. (Gray/White) | AC Line Input | | | Fuse or Circuit Breaker Rating (Amps AC) | Output | | | Net Wt. | |
|----------|--------------------------|------------------------|--------------|---------------------------------|--|--------------------------------|---|------------------------------------|---------|-----|
| | | Volts AC (50/60 Hz) | Phase (Φ) | Maximum Current (Amps AC) | | Voltage Range (Volts AC) | Maximum Continuous Load Current (RMS Amps/ Phase) | Maximum Horsepower (HP (kW)) | lbs | kg |
| KBDA-24D | 9536/9537 | 115 | 1 | 16 | 20 | 0 - 230 | 3.6 | 1 (.75) | 5.9 | 2.7 |
| | | 208/230 | | 10 | 15 | | | | | |
| KBDA-27D | 9543/9544 | 115 | 1 | 22 | 25 | 0 - 230 | 5.5 | 1 ½ (1.13) | 10.3 | 4.7 |
| | | 208/230 | | 15 | 20 | 0 - 230 | 6.7 | 2 (1.5) | | |
| KBDA-29 | 9545/9546 | 208/230 | 1 | 15 | 20 | 0 - 230 | 6.7 | 2 (1.5) | 10.3 | 4.7 |
| | | | | 10.8 | 15 | 0 - 230 | 9.0 | 3 (2.25) | | |
| KBDA-45 | 9659/9660 | 400/460 | 1 | 5.3 | 10 | 0 - 400/460 | 4.6 | 3 (2.25) | 10.3 | 4.7 |
| KBDA-48 | 9661/9662 | 400/460 | 1 | 9.6 | 15 | 0 - 400/460 | 8.3 | 5 (3.75) | 10.3 | 4.7 |

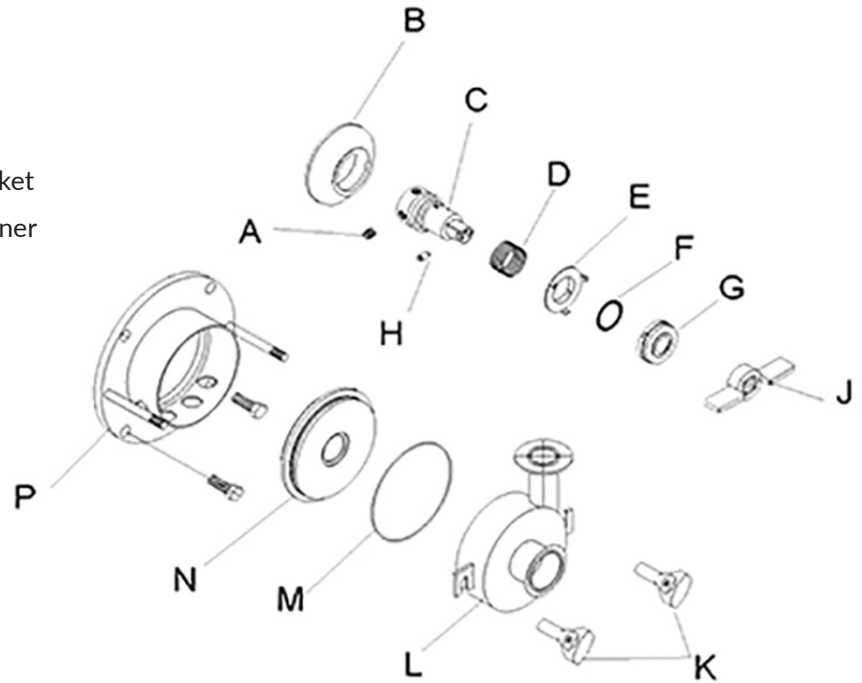
Table 2: General Performance Specifications

| Description | Specification | Factory Setting |
|--|-------------------------|-----------------|
| 115 Volt AC Line Input Voltage Operating Range (Volts AC) | 115 (±15%) | - |
| 208/230 Volt AC Line Input Voltage Operating Range (Volts AC) | 208 (-15%) / 230 (+15%) | - |
| 400/460 Volt AC Line Input Voltage Operating Range (Volts AC) | 380 (-15%) - 460 (+15%) | - |
| Maximum Load (% of Current Overload for 2 Minutes) | 150 | - |
| Switching Frequency (kHz) | 8, 10, 12 | 8 |
| Signal Following Input Voltage Range (Volts DC) | 0 - 5 | - |
| Output Frequency Resolution (Bits, Hz) | 10, .06 | - |
| Minimum Operating Frequency at Motor (Hz) | 0.3 | - |
| Acceleration Time (Seconds) | 0.1 - 180.0 | 1.5 |
| Deceleration Time (Seconds) | 0.3 - 180.0 | 1.5 |
| Speed Range (Ratio) | 60:1 | - |
| Speed Regulation (30:1 Speed Range, 0 - Full Load) (% Base Speed) | 2.5 | - |
| Overload Protector Trip Time for Stalled Motor (Seconds) | 6 | - |
| Undervoltage/Overvoltage Trip Points for 115 Volt AC Line Input (± 5%) (Volts AC) ³ | 76 / 141 | - |
| Undervoltage/Overvoltage Trip Points for 208/230 Volt AC Line Input (± 5%) (Volts AC) ³ | 151 / 282 | - |
| Undervoltage/Overvoltage Trip Points for 400/600 Volt AC Line Input (± 5%) (Volts AC) ³ | 302 / 567 | - |
| Run/Fault Output Relay Contact (Amps at 30 Volts DC, 125 Volts AC, 250 Volts AC) | 1, 0.5, 0.25 | - |
| Operating Temperature Range (°C/ °F) | 0 - 45 / 32 - 113 | - |

8. PUMP PARTS

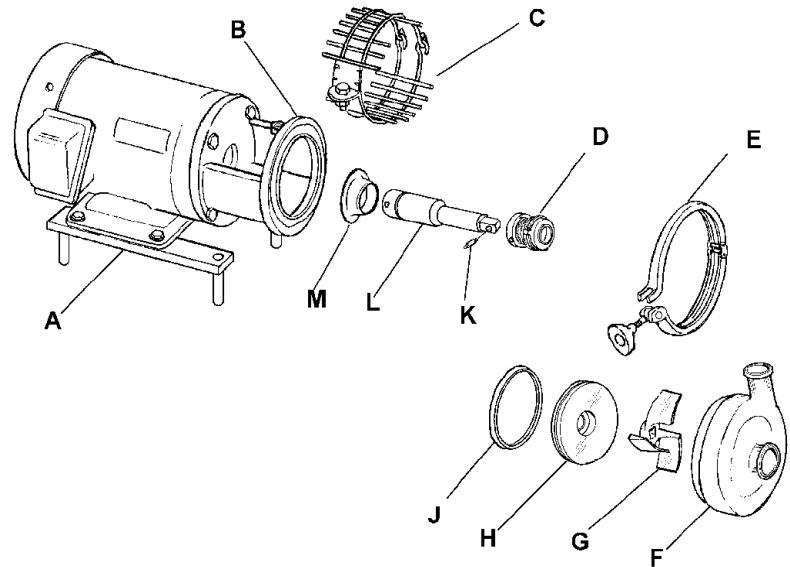
8.1 C-100 Pump Parts

- | | |
|---------------------------|----------------------|
| A. Motor Leg Kit Assembly | G. Impeller |
| B. Adaptor | H. Backplate |
| C. Guard | J. Backplate Gasket |
| D. Type "D" Seal Assembly | K. Impeller Retainer |
| E. Clamp | L. Stub Shaft |
| F. Casing | M. Deflector |



8.2 C-114 through C328 Pump Parts

- | | |
|--------------------|----------------------|
| A. Shaft Set Screw | H. Impeller Retainer |
| B. Deflector | J. Impeller |
| C. Stub Shaft | K. Wing Nut |
| D. Spring | L. Casing |
| E. Cup | M. Backplate Gasket |
| F. O-Ring | N. Backplate |
| G. Seat Seal | P. Adapter |



9. TROUBLESHOOTING

CPE pumps are relatively maintenance-free with the exception of sanitizing and seal replacement. However, like any piece of machinery occasional problems can arise. This section provides a means of determining and correcting most of your pump problems. The motor manufacturer should be contacted for specific repair instructions on the motor. Table 3 and Table 4 have been prepared on the basis that the pump is properly-suited to its application. Should problems arise where the remedies listed in the following tables do not resolve them, pump cavitation may be the problem. Symptoms of pump cavitation, such as noisy operation, insufficient discharge, and vibration, can result when a pump is not properly applied. If these conditions are present, check the system and re-evaluate the application. If assistance is required, contact CPE Systems.

9.1 Pumping

Table 3: Pump Troubleshooting

| Problem | Probable Cause | Remedy |
|--------------------------------|--|--|
| 1. No Discharge | a. Pump speed too low | a. Correct wrong or poor electrical connections |
| | b. Wrong direction of rotation | b. Reverse a three-phase motor by switching any two of the three power leads at the motor controller; reverse a single phase motor per motor manufacturer's instructions |
| | c. Closed valve; obstruction in discharge piping | c. Open gate valve; clear obstruction |
| 2. Insufficient Discharge | a. Pump speed too low | a. See 1.a |
| | b. Wrong direction of rotation | b. See 1.b |
| | c. Valve partially closed; obstruction in discharge piping | c. See 1.c |
| | d. Impeller damaged | d. Replace Impeller |
| 3. Excessive Power Consumption | a. Motor speed too high | a. Internal motor wiring is incorrect; replace motor |
| | b. Impeller is binding | b. Relieve strain on casing replace defective impeller |
| | c. Motor shaft is bent or worn | c. Replace shaft |
| 4. Pump Is Noisy | a. Magnetic hum in motor | a. Consult motor manufacturer |
| | b. Motor Bearings are worn | b. Replace bearings |
| | c. Foreign matter is rotating with impeller | c. Remove casing and remove foreign matter |
| | d. Impeller is binding | d. See 3.b |
| | e. Cavitation | e. Improper sizing or piping, ect |
| 5. Excessive Vibration | a. Pump is not leveled properly | a. Level pump |
| | b. Impeller is damaged | b. Replace impeller |
| | c. Piping is not supported | c. Support discharge and suction piping |
| | d. Cavitation | d. Improper sizing or piping, ect |
| 6. Pump Leaks | a. O-ring seal is worn or defective | a. Replace o-ring seal |
| | b. Carbon seal is worn | b. Replace carbon seal |
| | c. Insufficient compression on seal assembly | c. Replace spring |
| | d. Damaged inlet or outlet | d. Replace casing |
| | e. Backplate gasket is worn | e. Replace gasket |
| | f. Clamp is loose | f. Tighten clamp |

9.2 VFD Error Codes

Table 4: VFD Error Codes

| Display | Description |
|---------|---|
| STOP | Drive Stopped - Indicates that the drive is in the Stop Mode Function No.4.03 set to "0001" |
| END | Parameter Changed - Momentarily flashes. Indicates that a parameter has been successfully changed. |
| 8.01 | Function No. Example - A Function No. consists of a Group No. (digits on the left side of decimal point) and a Group Code No. (digits on the right side of the decimal point). |
| ---A | Motor Current Display - When the display is set to show Motor Current, the format will be "XX.XA". Function No.4.04 set to "00001". |
| ---U | Motor Voltage Display - When the display is set to show Motor Voltage, the format will be "XXXu". Function No. 4.05 Set to "0001". |
| ---U | Bus Voltage Display - When the display is set to show Bus Voltage, the format will be "XXXU". Function No.4.06 set to "0001". |
| -LU- | Low Voltage Trip - Indicates that the AC line input voltage is below the Undervoltage Trip Point specified in Table 2. |
| LU-R | Low Voltage Recovery - Indicates that a Low Voltage Trip occurred and the AC line input voltage has returned to within the operating range specified in Table 2. |
| -OU- | Overvoltage Trip - Indicates that the AC line input voltage is above the Overvoltage Trip Point specified in Table 2. |
| OU-R | Overvoltage Recovery - Indicates that an Overvoltage Trip occurred and the AC line input voltage has returned to within the operating range specified in Table 2. |
| OL-T | Overvoltage Trip (I²t Timeout) - Indicates that the motor has been overloaded for an extended period of time. |
| EF-T | External Fault Trip - Indicates that an external fault has occurred at one of the MFITs of the IODA Function Nos. 7.00 - 7.06 set to "0008". |
| CS-T | Current Source Trip - Indicates that the current signal output (from the IODA) has been opened. |
| -SC- | Short Circuit Fault - Indicates that the drive detected a short circuit at the motor (phase-to-phase). |

| Display | Description |
|---------|---|
| -PL- | AC Line Phase Loss Detection - Indicates that the drive has detected a loss of one of the phases in the 3-phase AC line input applied to Models KBDA-29, 45, 48. |
| ERR1 | Data Enter Error - Indicates that the drive is in the Program Mode and a non-valid parameter change has been attempted. |
| ERR2 | Keypad Communication Error - Indicates that the keypad failed to initialize when the drive powered up. This is an abnormal condition - contact our sales department. |
| ERR3 | Flash Memory Error - Indicates that a flash memory error on the drive has occurred. This is an abnormal condition - contact our sales department. |
| ERR4 | IODA Error - Indicates that the drive has lost communication with the IODA. |