Portable Pump Guide

CPE SYSTEMS INC

CPE SYSTEMS
INCORPORATED

QUICK START GUIDE

CPE C-SERIES PORTABLE CENTRIFUGAL PUMP WITH VFD DIGITAL SPEED CONTROL

Thank you for purchasing the CPE Centrifugal Portable Pump!

Your pump comes completely set-up, wired, and pre-programmed.

Please Read this Instruction Manual Front To Back.

Please Contact Us With Any
Questions www.cpesystems.com
1-800-668-2268

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 programming changes without contacting the factory first. Failure to do so will void the warranty.

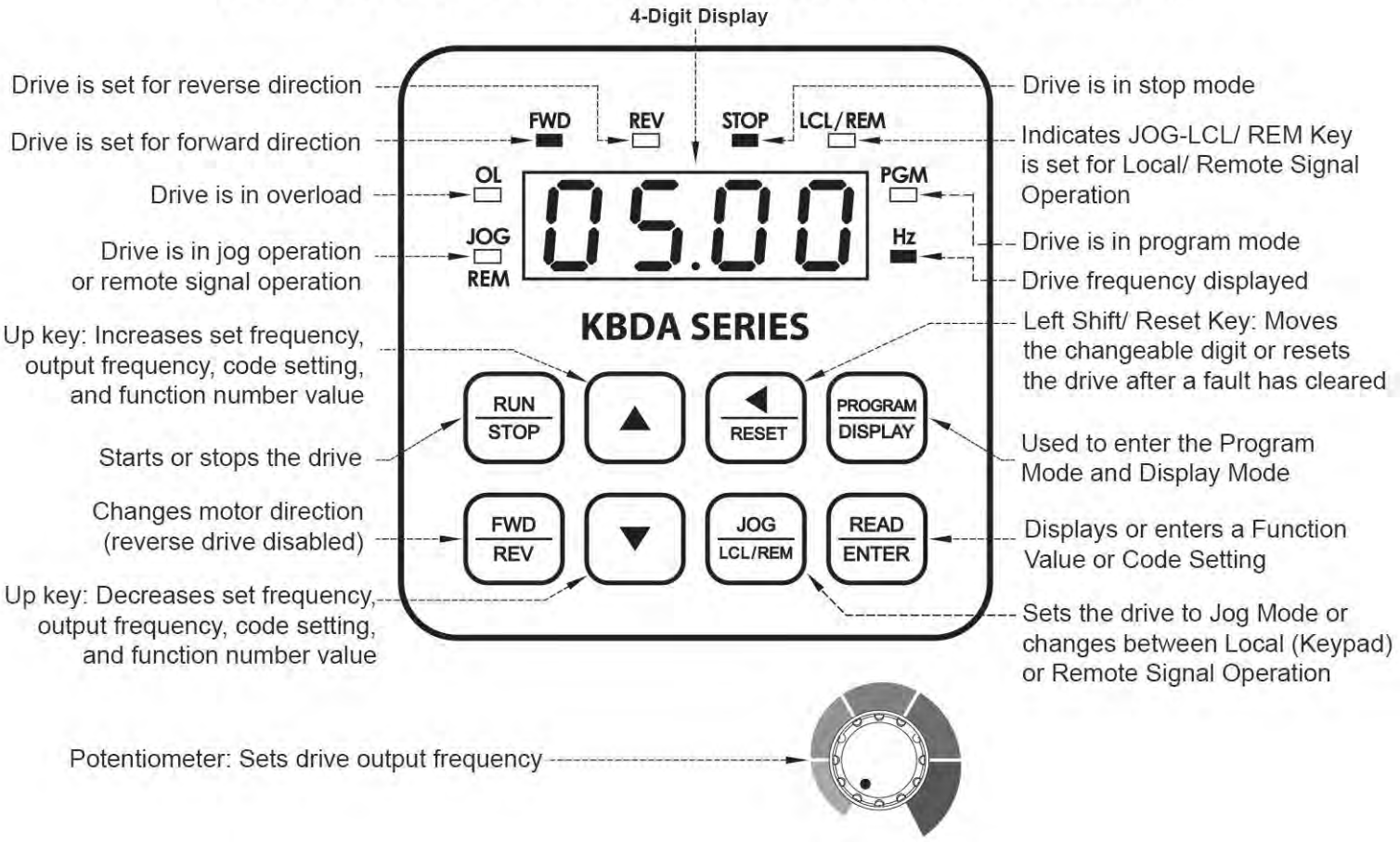
1. Connect the inlet (suction) line to the tri-clamp fitting on the front of the pump using a new tri-clamp gasket and a heavy duty clamp. The inlet line should be at least the same diameter as the fitting on the pump; take care to avoid putting a valve or a tee immediately before the pump.
2. Connect 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 FWD/REV switch has been disabled.

KEYPAD GUIDE

VFD DIGITAL SPEED CONTROL

FIGURE 2 - KEYPAD LAYOUT WITH MAIN SPEED POTENTIOMETER



Warning! Do not depend on the LEDs or the 4-Digit Display to no longer be illuminated as a guaranteed power off condition. Be sure the main power switch or circuit breaker is in the "OFF" position before servicing the drive.

KEYPAD GUIDE

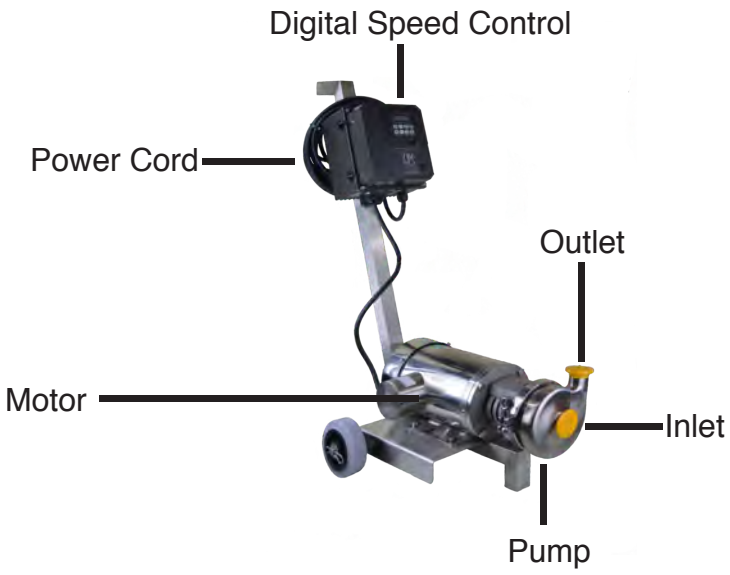
DRIVE OPERATION

Start Up Procedure - The drive has been fully set up 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 counter clockwise to slow down. To stop the pump press the same RUN/STOP button.

TABLE 6 - KEYPAD DESCRIPTION

Key	Description
RUN / STOP	Starts or stops the drive
FWD / REV	Changes motor direction **Disabled on all centrifugal pumps*
▲	Up Key:Increases Output Frequncy, Set Frequncy, Frequency Number Vaule, and Code Setting
▼	Down Key: Decreases Output Frequency, Set Frequency, Function Number Value, and Code Setting
JOG / LCL/REM	Factory programmed to 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 or Modbus is required for Local/Remote Operation*
PROGRAM / DISPLAY	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. See Figure 22
◀ / RESET	Left Shift/ Reset Key: Moves the changeable digit or Resets the drive to clear a fault
READ / ENTER	Reads or Enters a Function Number's Value or Code setting. The key is also used to read or enter the frequency setting

LINE INSTALLATION



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 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 air tight to prevent air leak-age, which can reduce pump capacity and efficiency.

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, 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.

PUMP

Figure 1 - Pump Components for C-114 Through C-328

Table 1: Callouts for Figure 1

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

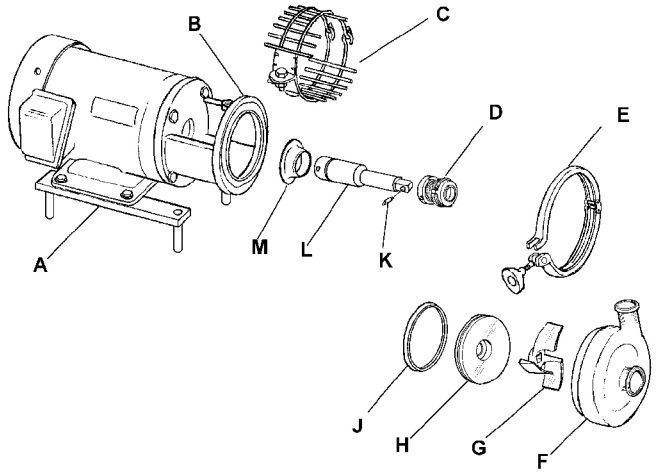
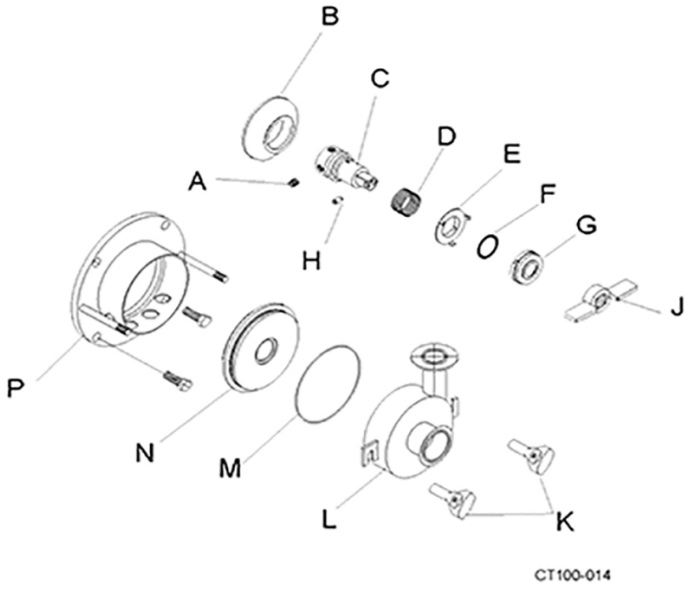


Figure 2 - Pump Components for TC-100

Table 2: Callouts for Figure 2

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. Adaptor



PUMP CLEANING

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) (dependent 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 application of chemical disinfectants. Most chemical disinfectants are halogen or quarternary 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 chloroamine, are not recommended.

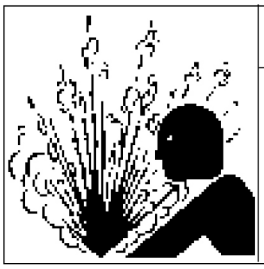
PUMP CLEANING

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).

MAINTENANCE

DISASSEMBLY, CLEANING (GENERAL)



⚠ WARNING

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

It's necessary to disassemble parts of the pump for cleaning and sanitizing. 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.

The extent of disassembly will depend on the application and the type of seal used in your pump. To disassemble, disconnect the inlet and outlet lines. Remove seal guard assembly with a wrench of appropriate size. Turn the wing nuts on the clamp assembly until tension on the clamp saddle is relieved. Open the saddle and remove the casing.

Push back on the impeller and center the retainer in the stub shaft. Slide the impeller forward and remove it. Do not try to remove retainer before removing impeller as this will cause damage to the retainer, shaft and impeller.

Rotate the backplate until the backplate pins clear the pins in the adapter and remove the backplate

Remove the casing gasket.

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

Remove the carbon seal, o-ring seal- seal cup,and spring

DG/FG CLAMPED IN SEAT

1. Remove four bolt/screws from backplate. Inspect DG seat insert, gland ring and gaskets for damage or wear, and replace as required.
   Note: #80P outboard and #80R inboard gaskets are not interchangeable #80R (thicker) gasket must be inboard between backplate and seal seat. Care must be taken to protect the sealing face of the backplate for D and F seals and the seal seat for DG seals from nicks and scratches.

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

MAINTENANCE

REPAIR

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.

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

1. For D and F seals, examine the backplate sealing surface carefully for any defects 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 collar off the stub shaft.
3. The balanced seal is designed for outside application. Sealing of the process fluid along the shaft is accomplished by action of the process pressure on an o-ring seal installed in a groove in the carbon seal. The same action pressurizes the o-ring groove and augments the spring tension in keeping a tight joint at the sealing faces. The location of width of the sealing face controls the balancing of the seal.
4. Carefully inspect the o-ring seal 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.
5. 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.
6. 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 pry bar.
7. Examine the stub shaft sealing surface for nicks or scratches which can cause excessive o-ring seal wear or leaking.
8. Attach a hoist to the motor if necessary, and remove the bolts securing the motor to the pump cart.
9. Inspect casing clamp for damage or wear and replace as required. Inspect the cart wheels, adapter, and casing; replace if necessary. 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.

MAINTENANCE

1. 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 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 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 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 seats the groove in the shaft.
   Note: If the deflector cannot be forced on with the fingers, a blunt instrument can be used to provide additional force at the I.D. of the deflector.

8. Slide drive collar onto stub shaft, and locate per setting instructions in next section. Assemble the spring, seal cup, o-ring seal and carbon seal, and install as a unit, taking care that slot in seal cup is aligned with pin in drive collar. Gentle finger pressure will overcome o-ring resistance on the shaft.
   Note: Apply a small amount of food grade lubricant to the o-ring prior to installation. But, do not lubricate the carbon seal with any type of oil or grease. The seal faces are lubricated by product being pumped.

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 nut.

13. Assemble the cascading water attachment, if so equipped, to the adapter. Close and tighten the clamp. Assemble the inlet and outlet lines to the pump. Check for strain on the casing. Adjust as necessary.

EXTERNAL BALANCED SEALS - SETTING SEAL DRIVE COLLAR LOCATION

The balanced seal is designed for outside applications, and is available with cascading water attachment. Sealing of the process fluid along the shaft is accomplished by action of the process pressure on an o-ring seal installed in a groove in the carbon seal. The same action pressurizes the o-ring groove and augments the spring tension in keeping a tight joint at the sealing faces. The width of the seal face controls balancing of the seal. This type of seal should be replaced when the clearance between the carbon seal face and the backplate is less the 1/32” (.79mm), or when leakage is noted.

To replace the seal:

1. Disconnect the inlet and outlet lines, and remove the casing, impeller, and backplate.

2. Remove the carbon seal, o-ring, seal cup, and spring.

3. Apply a small amount of food grade lubricant to the o-ring and assemble the new spring, seal cup, o-ring seal, and carbon seal and install as a unit; take care that slot in seal cup is aligned with pin on drive collar. Gentle finger pressure will overcome o-ring resistance on the shaft.

4. When the carbon seal is replaced, the location of the drive collar should be checked and relocated of necessary, by one of the two following methods.

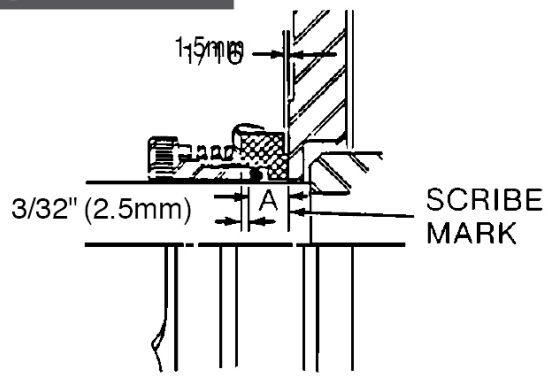
MAINTENANCE

SETTING THE DRIVE COLLAR BY MEASUREMENT
(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 Figure 2 or 3.
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.
7. Install the seal spring, seal cups, seal o-ring and carbon onto the shaft.

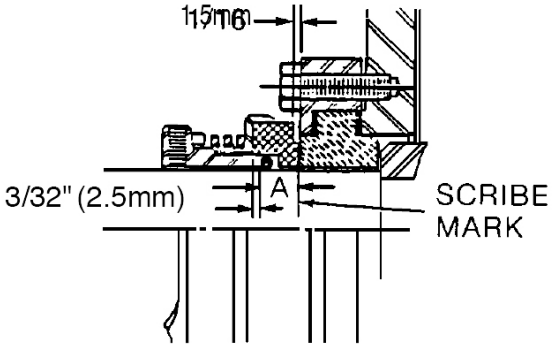
Model	"A" Dimension
C114	11/32" (2.3mm)
C216	11/32" (2.3mm)
C218	11/32" (2.3mm)
C328	11/32" (2.3mm)
C4410	11/32" (2.3mm)

Figure Two



D/F Seals

Figure Three



DG/FG Seals

MAINTENANCE

SETTING THE DRIVE COLLAR BY POSITION

1. Assemble the spring, seal cup, o-ring seal, 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 pins on drive collar is in line with slot on 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

   Note: Extra care should be taken when assembling "C" series pumps with type DG or FG seals. Incorrect stub shaft settings will allow the impeller hub to contact the inboard face of the stationar seal seat. Interference of impeller hub and seal seat face will cause wear of impeller hub and damage the inboard or secondar. seal face of the clamped-in-seat. isual inspection is recommended after installation of the impeller, and before installation of casing, to ensure clearance between the impeller hub and seal face. If no clearance is visible, the pump should be disassembled and stub shaft moved forward, to provide at least 1 32 .7 mm clearance between the impeller hub and seal seat face. Reset seal drive collar if necessar . 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.

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.

VFD DIGITAL SPEED CONTROL

STANDARD FEATURES

Industrial Duty Die-Cast Aluminum Enclosure with Hinged Cover in a dark gray finish.

Multi-Function Keypad - The keys are used to operate the drive, change operating parameters, reprogram func-tions, and change the display output (Run/Stop, Forward/Reverse, Up, Down, Shift/Reset, Jog-Local/Remote, Program/Display, Read/Enter).

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, Fault Codes, and Custom Units.

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-Fuction 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 contains 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 GFCIs.

PERFORMANCE FEATURES

Power Start - Provides more than 200% starting torque which ensure 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

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

PROTECTION FEATURES

Motor Overload with RMS Current Limit - Provides motor overload protection, which prevents motor burn-out and eliminates nuisance trips.*

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

Decel Extend- Eliminates tripping due to bus over-voltage 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

Micro-controller Self Monitoring and Auto-Reboot.

*UL approved as an electronic overload protector for motors

TABLE 3 – ELECTRICAL RATINGS

Model	Part No. (Gray / White[1])	AC Line Input			Fuse or Circuit Breaker Rating (Amps AC)	Output			Net Wt.	
		Volts AC[2] (50/60 Hz)	Phase (ϕ)	Maximum Current (Amps AC)		Voltage Range (Volts AC)	Maximum Continuous Load Current[3] (RMS Amps/Phase)	Maximum Horsepower (HP (kW))	lbs	kg
KBDA-24D[4]	9536/9537	115	1	16	20	0 – 230	**3.6**	1 (.75)	5.9	2.7
		208/230	1	10	15					
KBDA-27D[4,5]	9543/9544	115	1	22	25	0 – 230	5.5	1½ (1.13)	10.3	4.7
		208/230	1	15	20	0 – 230	**6.7[3]**	2 (1.5)		
KBDA-29[6,7]	9545/9546	208/230	1	15	20	0 – 230	6.7	2 (1.5)	10.3	4.7
			3	10.8	15	0 – 230	**9.0[3]**	3 (2.25)		
KBDA-45[7,8]	9659/9660	400/460	3	5.3	10	0 – 400/460	**4.6**	3 (2.25)	10.3	4.7
KBDA-48[7,8]	9661/9662	400/460	3	9.6	15	0 – 400/460	**8.3**	5 (3.75)	10.3	4.7

TROUBLESHOOTING

CPE pumps are relatively maintenance free with the exception of sanitizing. Like any piece of machinery, however, occasional problems can arise. This section provides a means of determining and correcting most of your pump problems. The motor manufacturer should be contracted for specific repair instructions on the motor.

The charts below has been prepared on the basis that the pump is properly suited to its application. Should problems arise where the remedies listed below chart do not cure the situation, 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.

 **Warning!** Do not depend on the LEDs or the 4-Digit Display to no longer be illuminated as a guaranteed power off condition. Be sure the main power switch or circuit breaker is in the "OFF" position position before servicing the drive.

TROUBLESHOOTING

TABLE 7 – DIGITAL READOUT CODES

Display	Description
StoP	**Drive Stopped** – Indicates that the drive is in the Stop Mode. Function No. 4.03 set to "0001".
8.01	**Function No. Example** – A Function No. consists of a Group No. (digits on the left side of the decimal point) and a Group Code No. (digits on the right side of the decimal point).
---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".
-LU-	**Low Voltage Trip** – Indicates that the AC line input voltage is below the Undervoltage Trip Point specified in Table 2, on page 9.
-OU-	**Overvoltage Trip** – Indicates that the AC line input voltage is above the Overvoltage Trip Point specified in Table 2, on page 9.
OL-t	**Overload Trip (I^2t Timeout)** – Indicates that the motor has been overloaded for an extended period of time.
CS-t	**Current Source Trip** – Indicates that the current signal output (from the IODA) has been opened.
-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.
Err2	**Keypad Communication Error** – Indicates that the keypad failed to initialize when the drive is powered up. This is an abnormal condition – contact our Sales Department.
Err4	**IODA Error** – Indicates that the drive has lost communication with the IODA.

Display	Description
End	**Parameter Changed** – Momentarily flashes. Indicates that a parameter has been successfully changed.
---.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 "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-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, on page 9.
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, on page 9.
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".
-SC-	**Short Circuit Fault** – Indicates that the drive detected a short circuit at the motor (phase-to-phase).
Err1	**Data Enter Error** – Indicates that the drive is in the Program Mode and a non-valid parameter change has been attempted.
Err3	**Flash Memory Error** – Indicates that a flash memory error on the drive has occurred. This is an abnormal condition – contact our Sales Department.

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 1a above.
		b. Wrong direction of rotation.	b. See 1b above.
		c. Valve partially closed; obstruction in discharge piping.	c. See 1c above.
		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 3b above.
		e. Cavitation	e. Improper sizing or piping, etc.
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, etc.
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.