



# **DE-1000 Centrifuge Full Hydraulic Drive**

**Issued 30 Sep 09**

**Revised 17 Sep 12**

## **Maintenance & Operation Manual**

### **Mineral Processing, Industrial, & Environmental Applications**

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## UNIT NUMBER IS KEY TO DERRICK SERVICE

All inquiries to Derrick must include the equipment unit number. The stainless steel unit number tag attached to each piece of Derrick equipment is your key to efficient service and support.



### Typical Derrick Unit Number

This unique number gives vital information to Service personnel who use it to identify the correct parts when filling orders, provide accurate responses to service questions, track documentation, and trace the equipment's history or configuration. In short, the **unit number provides the critical information needed to ensure that Derrick customers receive the best possible service.**

The unit number consists of a two-character alphabetic prefix that identifies the equipment type and a series of numeric characters that signify the sequence of the machine's manufacture. For example, unit number MA000001 would be the first screening machine manufactured by Derrick. Alphabetic prefixes currently in use are:

MA - Screening Machine	AD - Desilter and Desander
DG - Degasser	AG - Mud Agitator
CF - Centrifuge	SF - Screen Frame

To ensure that it will remain intact over many years of rigorous service, the heavy-gage tag is riveted to a structural member such as the shaker support structure. It is not to be confused with any other identifier on the machine such as a vibrator motor serial number.

For convenient availability, the unit number is also recorded in the Operation and Maintenance manual shipped with the equipment. When contacting Derrick for any equipment question or need, always have the unit number in your possession. It's the best way to get the most efficient service from our dedicated Service and Engineering personnel.



## **ABOUT THIS MANUAL**

**In this electronic manual, all sections and paragraphs listed in the CONTENTS are linked to the corresponding text.**

**Navigate the electronic manual as follows:**

- 1. To view any desired information, display the CONTENTS page and move the cursor to the desired paragraph or section title.**
- 2. To display the desired information, click on the listing when the pointing finger appears over the text.**
- 3. When finished viewing the text, press Alt + left arrow key to return to the CONTENTS page.**
- 4. If desired to return to the same information, press Alt + right arrow. To locate a different item, repeat steps 1 and 2.**
- 5. Blank pages are included to facilitate accurate two-sided printing on a standard copier. To print any individual section, simply enter the PDF page number range at the top of the screen (not the page number at the bottom of each page).**

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Continuous improvement is a policy of Derrick Corporation. All instructions and procedures are subject to change without notice.

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## SECTION 1 - INTRODUCTION

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### OVERVIEW

This manual provides instructions for installing, operating, and maintaining the DE-1000 Full Hydraulic Drive (FHD) centrifuge (Figure 1-1). The manual is divided into several sections to assist the user. Personnel responsible for transporting, installing, operating, or performing maintenance on this equipment are required to read and understand the information and instructions in this manual. One copy of this manual should be available and accessible at the equipment location.

For maximum safety and performance, no additions and/or changes may be made to the equipment without the explicit written permission of Derrick Corporation. Genuine Derrick repair/replacement parts are required.



**Figure 1-1 DE-1000 Full Hydraulic Drive (FHD) Centrifuge**

### SAFETY

Section 2 of this manual contains relevant safety information for both operation and maintenance of this equipment. Be sure this information is read and understood by all personnel.

**DO NOT** operate the equipment if defective or faulty mechanical or electrical components are detected.

## INTRODUCTION

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### SOUND EMISSION

Hearing protection is recommended when working on or near the centrifuge. Based on measurements taken for technically comparable machinery, the centrifuge emits the following airborne sound levels:

- A-Weighted Machine Surface-Averaged Sound Pressure Level at 1m – 84.8 dBA
- A-Weighted Machine Surface-Averaged Sound Power Level – 102.8 dBA
- C-Weighted Instantaneous Peak Sound Pressure Level - TBA

### EQUIPMENT USE

The DE-1000 FHD centrifuge is designed expressly for removing low specific gravity solids from slurries. In one type of processing, solids are removed and the liquid is returned for recirculation. Alternatively, solids are returned to the active system and the liquid is discarded.

Derrick Corporation does not authorize any other use of this equipment. Intended usage of the equipment includes compliance with the operating, maintenance, and safety procedures included in this manual.

### DESCRIPTION

Major components of the centrifuge (Figure 1-2) consist of the rotating assembly; hydraulic drive assembly; electrical control box; drive motor; vibration switch; and case, base, and skid. The following paragraphs describe these components.

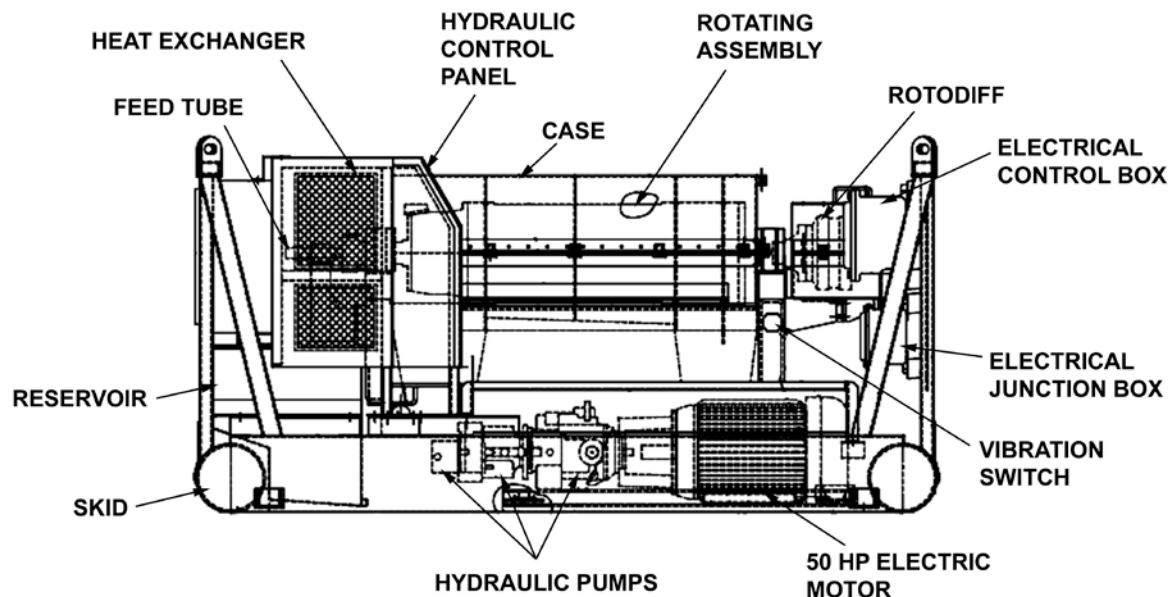


Figure 1-2 DE-1000 FHD Centrifuge Major Components



## **Rotating Assembly**

The rotating assembly consists of a cylindrical stainless steel bowl, conveyor assembly, and related components. The bowl has openings at both ends: A conical head at the solid discharge end and a flat liquid bowl head at the opposite end. The bowl ends are supported by greased ball bearings.

### ***Bowl Assembly***

The bowl assembly consists of a cylindrical bowl closed on one end by the liquid bowl head and at the other by the solid bowl head. Adjustable weirs on the liquid bowl head permit manual adjustment of the pond depth. Index marks are provided on the weirs to facilitate precise settings. The pond depth, along with other factors, helps determine the liquid content of the discharged solids. The tapered bowl extension at the solid end forms an upward sloping beach, where solids collect and are discharged continuously through the solid discharge outlet. Four openings are provided in the solid bowl head for solids discharge. Replaceable wear inserts in the solid bowl head protect the openings from wear.

### ***Conveyor***

The conveyor assembly is a hollow, cylindrical auger that receives the inlet slurry into its interior, disperses it through nozzles to the bowl assembly, and transports the solids to the solid discharge outlet. Rotated by a differential hydraulic motor, the conveyor turns in the same direction but at a slower rate than the bowl. A drive shaft extending through the bowl head transfers motion from the motor to the conveyor. The feed tube inserted into the solid end of the conveyor directs inlet slurry against a feed accelerator, which rapidly disperses the material through feed nozzles in the conveyor. Carbide inserts in the feed nozzles and carbide tiles on the edges of the conveyor flights provide wear resistance. Both ends of the conveyor are supported by greased ball bearings mounted in pillow blocks.

## **Hydraulic Drive Assembly**

Utilizing a 50HP electric motor to operate three separate hydraulic pumps on a common shaft, the hydraulic drive assembly is a complete, self-contained 3000PSI hydraulic system that operates major components of the centrifuge. The hydraulic drive's pumps pressurize hydraulic fluid, which is then supplied to the hydraulic motors that drive the bowl assembly and conveyor. Major components of the hydraulic drive assembly consist of a closed-loop pump, open-loop pump, boost pump, bowl assembly drive motor, conveyor drive motor (Rotodiff), overhung load adapter, control and drain manifolds, heat exchanger, fluid reservoir, and control panel. The hydraulic drive components are interconnected with high-pressure flexible hoses for vibration isolation.

### ***Closed-Loop Pump***

This closed-loop pump drives the bowl assembly. The pump is driven directly by the 50HP electric motor. The variable-speed pump is controlled by a rotary throttle control on the hydraulic control panel. Adjustment of pump speed permits varying the bowl assembly drive motor from 0 to 3400RPM.

## INTRODUCTION

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### ***Open-Loop Pump***

The open-loop pump supplies the Rotodiff, which operates the conveyor assembly at a differential speed independent of the bowl speed. The pump is driven by the common shaft that also operates the closed-loop pump. The variable-speed pump is manually adjusted by a rotary throttle control on the hydraulic control panel. Adjusting the pump speed varies the Rotodiff speed within a 4 to 6 RPM range in relation to the bowl speed.

### ***Boost Pump***

The boost pump assists the open-loop pump in driving the conveyor assembly. If the BOOST SYSTEM control is set to ON, the pump is automatically operated whenever conveyor resistance causes a rise in pressure needed to operate the conveyor. Boost system operation is initiated when a pressure of 1600PSI is shown on the CONVEYOR PRESSURE gage. The hydraulic boost cylinder connected to the control manifold then directs hydraulic fluid to the boost pump, which assists the open-loop pump to supply the additional pressure demanded by the Rotodiff to turn the conveyor. The boost system may be turned on and off by means of a two-position switch on the hydraulic control panel. During boost system operation, the pressure produced by the boost pump may rise to 450PSI, as shown on the CHARGE PRESSURE gage.

### ***Bowl Assembly Drive Motor***

The bowl assembly drive motor is driven by the closed-loop pump, with fluid continually re-circulated fluid back to the pump for re-pressurizing. Motor speed is adjusted by means of a rotary control valve on the control panel. A filter in the recirculation line removes particles from the re-circulating fluid. A pilot line samples the fluid for displaying the loop pressure on a gage mounted on the hydraulic control panel. The hydraulic motor drives the bowl assembly through a belt and pulley sheave; rotation is clockwise when viewed from the solids discharge end. Bowl speed is detected by a proximity switch located near the Rotodiff. This switch transmits pulses to a tachometer on the control panel to display bowl RPM.

### ***Conveyor Drive Motor (Rotodiff)***

The conveyor is driven by a special-purpose motor called a Rotodiff, which receives pressurized fluid from the open-loop pump installed on the common shaft that drives the closed-loop pump. The Rotodiff turns the conveyor in the same direction as the bowl assembly but at a proportionally lower rate. Since the rotational speed of the conveyor varies directly with the bowl speed, a consistent differential relationship is maintained for solids conveyance. The Rotodiff is cantilevered on the conveyor shaft; one end is supported by the liquid end conveyor bearing and the other end is unsupported. The Rotodiff shaft engages internal splines in the conveyor to transmit rotary motion. Conveyor pressure is displayed on the hydraulic control panel, and a rotary control is used to adjust conveyor RPM. The differential conveyor speed is translated into RPM from a flowmeter indication on the hydraulic control panel.

### ***Overhung Load Adapter***

The overhung load adapter (OLA) is directly coupled to the bowl assembly drive motor to absorb radial stress imposed by the drive and bowl assembly during high-speed rotation. Isolating this stress from the motor increases motor durability. The OLA shaft has an internal receptacle that matches the hydraulic motor output shaft and an external male connector that receives the bowl drive sheave. The shaft is fully supported by large bearings that are constantly lubricated in the oil-filled case.

### ***Control Manifold***

The control manifold has interconnecting passages, check valves, relief valves, and needle valves that control the flow of hydraulic fluid to various components including the Rotodiff, pressure gages, feed pump on and off switches, reservoir, and boost cylinder. Provisions for fine adjustment of the boost system, open loop pump pressure, bowl speed limit, and closed loop pump pressure limit are contained in the control manifold.

### ***Drain Manifold***

The drain manifold receives returning fluid from the closed-loop and open-loop pumps. A relief valve and needle valve are installed in the manifold block. The relief valve is set to limit hydraulic charge pressure to the boost cylinder to 425PSI. A needle valve in the drain manifold permits speed adjustment of the hydraulic cooling fan motor for the heat exchanger.

### ***Heat Exchanger***

The heat exchanger is a thermal transfer device that receives returning hydraulic fluid from the drain manifold and Rotodiff and allows heated fluid to release heat to the ambient environment. After heat is removed by the heat exchanger, the fluid returns to the reservoir. Heat dissipation is maximized by a series of finned tubes, which cool the returning fluid as it continuously flows back to the reservoir for recirculation. Heat transfer is further enhanced by a hydraulically driven cooling fan positioned close to the exchanger's cooling fins. To prevent fluid over-temperature, the heat exchanger fins must remain open during centrifuge operation.

### ***Reservoir***

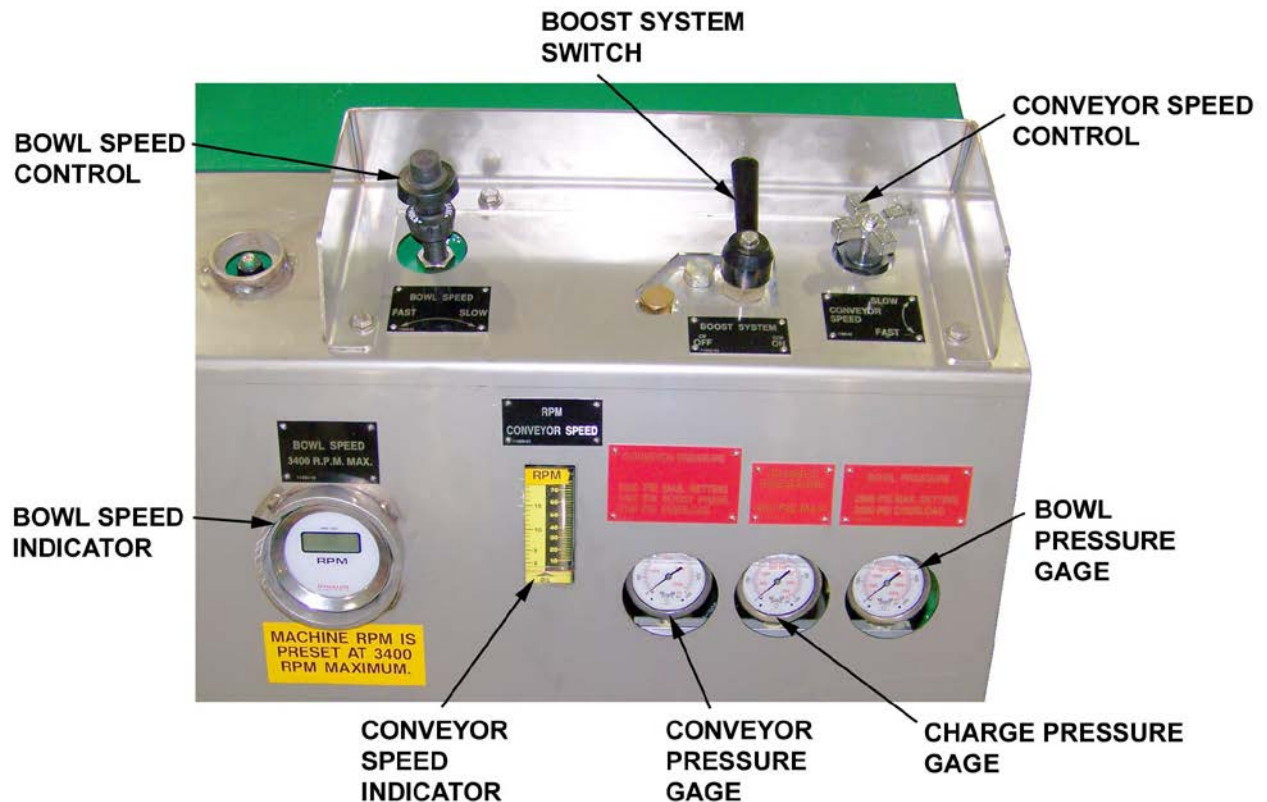
The 47.5-gallon hydraulic reservoir is a welded stainless steel tank, which retains an ample supply of hydraulic fluid for hydraulic drive operation. Its large capacity facilitates cooling of returning fluid due to the heat sink effect of the large volume. A screen is provided to capture residue from the circulating hydraulic fluid. The temperature and low fluid level switch installed at the top of the reservoir causes an immediate system shutdown in case of excessively high fluid temperature or low level in the reservoir. Fill and drain plugs are provided to facilitate servicing. Pressure and return pipes are installed at the top of the reservoir; returning fluid is discharged below the outlet pipe to maximize cooling of heated returning fluid.

### ***Control Panel***

Controls and indicators for operating and monitoring the hydraulic drive assembly show through cutouts on the control panel (Figure 1-3). Identification tags containing operating information are installed beside each cutout. The control panel components are described in the table below.

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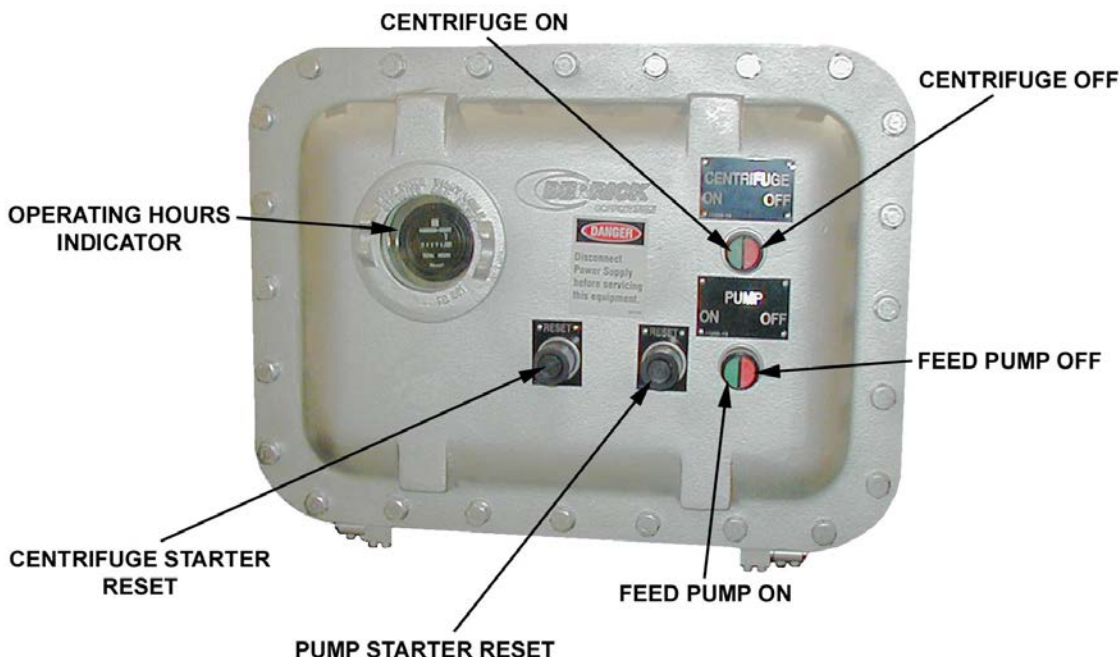
HYDRAULIC DRIVE CONTROLS AND INDICATORS	
CONTROL	DESCRIPTION
BOWL SPEED control	Rotary control used to manually adjust speed of the bowl assembly drive hydraulic motor. Rotating the adjusting knob counterclockwise increases bowl speed, and clockwise rotation reduces speed.
BOOST SYSTEM switch	ON/OFF hydraulic switch that permits operator to turn boost system on and off.
BOWL SPEED indicator	Displays current bowl rotational speed (3400RPM maximum).
CONVEYOR SPEED control	Rotary control used to manually adjust speed of the conveyor drive motor (Rotodiff) within permissible range determined by bowl speed.
CONVEYOR SPEED indicator	Displays current conveyor differential rotational speed in relation to bowl speed.
CONVEYOR PRESSURE gage	Displays current pressure used to drive conveyor. Pressure depends on resistance met by conveyor during rotation.
CHARGE PRESSURE gage	Displays current pressure developed by boost system to overcome resistance of conveyor to rotate.
BOWL PRESSURE gage	Displays current pressure required for motor to overcome resistance of bowl to rotate.

**Control Panel (Cont'd)****Figure 1-3 Hydraulic Control Panel****Electrical Control Box**

Centrifuge operation is controlled at the electrical control box (Figure 1-4), which contains components that control operation of the electric motor that drives the hydraulic pumps and slurry feed pump. The CENTRIFUGE ON/OFF and PUMP ON/OFF switches and an indicator of operating hours are installed on the front panel. Each ON/OFF switch is split vertically, with the ON position at the left and OFF to the right. RESET buttons are provided to permit manual resetting of the centrifuge and pump run relays following a trip. Thermal overloads are built into the relays to shut down the centrifuge or feed pump motor in case of excessive current draw. The button mechanically depresses a reset button on its corresponding relay. The PUMP ON indicator is turned on when the feed pump is operating. During normal operation, the light goes on and off as the conveyor pressure demand rises and falls. Pressure switches shut down the feed pump when conveyor pressure demand reaches 1500PSI and re-start the feed pump when pressure falls to 700PSI.

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**Figure 1-4 Electrical Control Box**

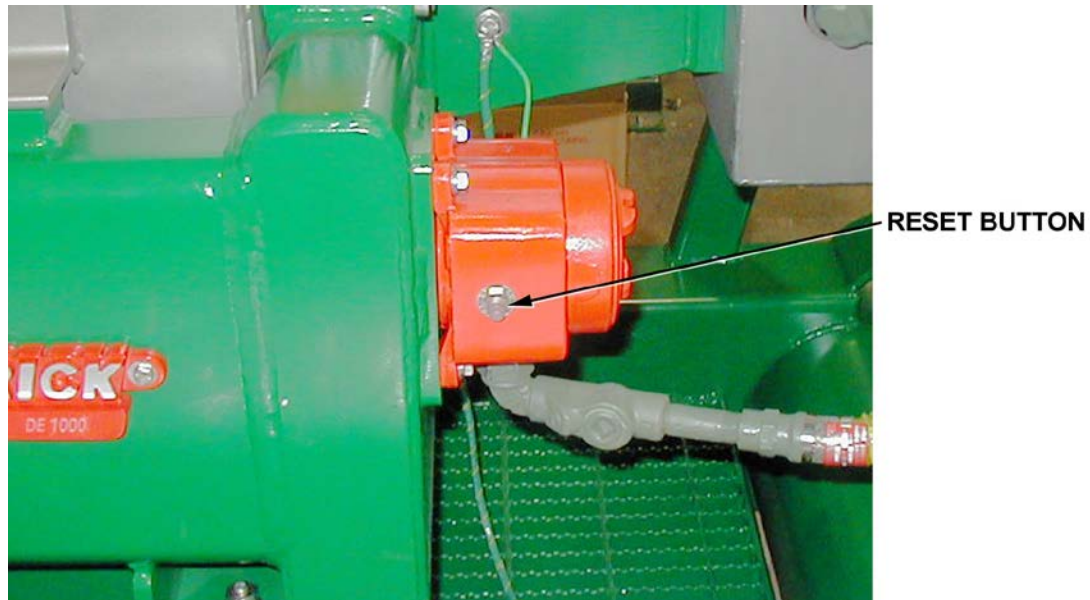
### Electric Motor

The 50HP, 460Vac / 60Hz or 380Vac / 50Hz, three-phase, explosion-proof electric motor is directly coupled to the closed-loop and open-loop hydraulic pumps. The 60Hz motor operates at 1760RPM, and the 50Hz unit operates at 1475RPM. A temperature sensing element in the motor's stator winding causes the motor to shut down if the motor reaches an excessively high temperature.

### Vibration Switch

The vibration switch (Figure 1-5) is a safety device designed to protect personnel and equipment by shutting down the centrifuge in case of excessive vibration. Normally, the switch contacts are held closed by a mechanical latch. However, strong vibration or a shock of 2 Gs will overcome the magnetic latch, causing the switch armature to break away from the normally closed position, interrupting power to centrifuge run relay CR1. A reset button on the side of the switch must then be manually pressed to close the contacts and re-engage the magnetic latch. The vibration trip level is adjustable by means of a set point control, which adjusts the air gap between the magnet and latch arm plate. Turning the screw counterclockwise reduces the vibration set point in terms of G force needed to trip the armature. When the control is turned fully clockwise, the switch will trip at the maximum rated vibration level.

The vibration switch is mounted on the centrifuge frame in an orientation that is most affected by out-of-balance vibration of the bowl assembly. Clogging of the conveyor or worn bearings may produce sufficiently high vibration to trip the switch.



**Figure 1-5 Vibration Switch**

### **Case, Base, and Skid**

The stainless steel upper and lower case halves provide a sealed, protective enclosure that fully surrounds the bowl assembly. The liquid discharge pipe and the solids discharge chute are installed at the bottom of the lower case half. Mating baffles installed inside the top and bottom case halves separate the solids and liquid. Bolts secure the top and bottom halves together, and a rubber gasket in the top case seals the two halves. A separate, two-piece enclosure is provided for the Rotodiff at the liquid end of the bowl assembly.

The case is bolted onto the welded steel base assembly, which contains mounting provisions for the bearing pillow blocks and feed tube support. The base assembly is bolted to the welded steel skid.

### **MECHANICAL OPERATION**

The centrifuge employs centrifugal force produced by the high-speed rotation of a cylindrical bowl to separate solids from a slurry. Centrifuge performance is based on three variable factors:

- Force exerted on the fluid - Centrifugal force pulling fluid against the outside wall of the centrifuge
- Retention time in the centrifuge - The longer the slurry remains in the centrifuge the smaller the particle that can be separated
- Differential speed of conveyor - The faster the conveyor rotates the wetter the solids

All three factors may be manipulated in the Derrick DE-1000 FHD centrifuge to alter the liquid and solids discharge. The centrifugal force is adjusted by varying the bowl RPM. Retention time is controlled by adjusting the liquid discharge ports on the liquid bowl head to vary the pond depth (depth of liquid remaining in the bowl), and the feed rate to the unit (the lower the feed rate, the higher the retention time). The conveyor operates at a slightly lower speed than the bowl. The conveying speed is the difference between the bowl and conveyor speeds. During centrifuge operation, the CONVEYOR SPEED indicator on the hydraulic control panel displays the number



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of conveyor RPM less than the current bowl RPM. For example, a displayed conveyor speed of 30 with a bowl speed of 2000RPM translates into a conveyor speed of 1970RPM.

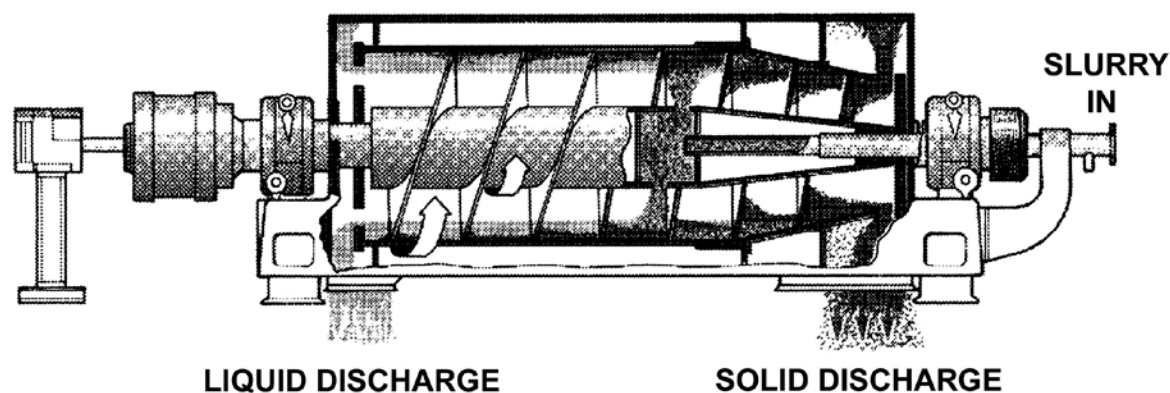
Other than pond depth, all other parameters may be changed quickly and easily to adjust the equipment for optimum efficiency in response to varying the feed conditions. For best performance, the slurry should be screened to 74 microns in vibrating screening machines before passing to the centrifuge for processing.

During centrifuge operation, slurry is pumped through the feed tube into the center of the rotating conveyor (Figure 1-6), where it splashes against the feed accelerator. The high velocity slurry is then dispersed out four feed nozzles mounted in the periphery of the conveyor cylinder. Rotating at a higher speed than the conveyor, the bowl creates an additional shearing effect, which further increases the slurry's acceleration. The depth of the slurry in the bowl (pond depth) is determined by the setting of weirs on the liquid bowl head (large end of the bowl).

As the slurry flows in the channels between the conveyor flights, the heavy particles settle at an accelerated rate due to the centrifugal force imposed by the rotating bowl. Sand particles settle almost instantly; then the finer, lighter particles settle. Particles that cannot be settled under the present centrifuge settings will be discharged with the liquid through the adjustable weirs on the liquid bowl head. Liquid exiting the liquid bowl head is directed through the liquid discharge outlet.

The settled solids form a cake on the inside of the bowl and are transported by the conveyor toward the narrow end of the bowl, or beach. As the solids travel across the beach, their free liquid film is lost due to centrifugal squeezing and drainage. When they are discharged at high velocity through the solids discharge ports on the bowl, they contain only the adsorbed moisture.

Since the discharge cake is very heavy and sticky due to the lack of free liquid, the centrifuge should be installed over the receptacle that is to receive the discharged solids. If this is not possible a slide or chute is needed to convey the solids. A steep angle is required to ensure self cleaning, or a wash system must be provided to prevent material buildup.



**Figure 1-6 Centrifuge Operation**



## **ELECTRICAL CONTROL AND HYDRAULIC SYSTEM OPERATION**

The following paragraphs describe operation of the electrical control system and hydraulic system. This information is provided as an aid to understanding the centrifuge operation, which will facilitate operating the equipment as well as troubleshooting. Since the machine requires electric power to operate the electric motor that drives the hydraulic pumps used to generate pressure in the hydraulic system, familiarity with the electrical control system is essential to equipment operators and technicians. Therefore, electrical control system operation is described first, followed by hydraulic system operation.

### **Electrical Control System**

#### ***Bowl Assembly***

With intrinsic relay No. 2 (refer to wiring diagram in Section 8) energized by direct application of electric power from the source, pressing the CENTRIFUGE ON button applies power through the switch's normally open (N/O) contacts, normally closed (N/C) thermal overload contacts, N/C vibration switch contacts, N/C motor over-temperature contacts, and closed N/O contacts of intrinsic relay No. 2, energizing centrifuge run relay CR1. With run relay CR1 closed, power is applied to the 50 HP electric motor that drives the hydraulic pumps to build pressure for operation of the hydraulic bowl motor. In addition, the feed pump circuit is enabled, permitting startup of the slurry feed pump, and the elapsed time meter is energized to begin recording operating time.

#### ***Feed Pump***

Pressing the PUMP ON button applies power through the switch's N/O contacts, PUMP OFF N/C contacts, N/C contacts of pump run relay CR2, and N/O contacts of centrifuge run relay CR1, energizing pump start relay CR3. With relay CR3 energized, and with conveyor pump pressure demand below 700 PSI, pump control relay CR4 is energized through N/C contacts of intrinsic relay No. 1 and N/O contacts of centrifuge run relay CR1. Run relay CR2 is then energized through the N/O contacts of CR3 and N/C contacts of pump control relay CR4. This circuit turns on the PUMP ON light, and initiates feed pump operation. In addition, the N/O contacts of CR3 are closed, providing a parallel path to maintain the relay energized after the PUMP START button is released.

Operation of the feed pump continues until hydraulic pressure demand of the conveyor reaches 1500PSI. The high pressure switch then opens, causing intrinsic relay No. 1 to change state. The relay's N/C contacts open, which de-energizes pump control relay CR4 and turns off the PUMP ON light. The feed pump remains shut down until conveyor pressure demand falls to 700PSI, which closes the N/C contacts of intrinsic relay No. 1, re-starting the pump, and turning on the PUMP ON light.

#### ***Safety***

The centrifuge is protected from an excessively high pressure demand of the conveyor, high temperature of hydraulic fluid, or low fluid level. If pressure demand of the conveyor rises to 2100PSI, the overload pressure switch opens, causing intrinsic relay No. 2 to change state. The relay's N/C contacts open, which de-energizes centrifuge run relay CR1, shutting down the 50 HP electric motor and disabling the centrifuge. Shutdown will also occur if the temperature of hydraulic fluid in the reservoir rises above 175°F, or if reservoir fluid level is low. In either case, the temperature/low level switch opens, causing intrinsic relay No. 2 to change state. The relay's N/C contacts open, which de-energizes centrifuge run relay CR1, shutting down the 50 HP electric motor and disabling the centrifuge. Once shut down by high pressure demand, high fluid temperature, or low fluid level, the centrifuge cannot be re-started until the anomaly is removed, allowing intrinsic relay 2 to revert to its operational state and re-energize centrifuge run relay CR1.

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If either thermal overload trips due to excessive current flow, the thermal overloads should be re-set and the centrifuge should be re-started only after removing the cause of the overload. Pressing the centrifuge and pump starter RESET buttons mechanically closes the thermal overloads.

Tripping the vibration switch due to excessive vibration of the centrifuge will also cause a shutdown, as the switch interrupts power flow to centrifuge run relay CR1. After removing the cause of unusual vibration, pressing the external button on the switch housing returns the switch contacts to the magnetically latched condition to restore power. The centrifuge is re-started by pressing the CENTRIFUGE ON button.

The motor over-temperature switch interrupts power to run relay CR1 if the drive motor becomes excessively heated. After allowing the motor to cool and removing the cause of heating, the centrifuge is re-started by pressing the CENTRIFUGE ON button.

## Hydraulic System

The hydraulic drive is supervised by the electrical control system. With the 50HP electric motor operating, hydraulic pressure is developed by the motor-driven, closed-loop and open-loop pumps (Figure 1-7). The following paragraphs describe operation of the bowl motor, conveyor motor (Rotodiff), and boost circuit that receive hydraulic pressure from these pumps.

### ***Closed-Loop Pump and Bowl Drive Motor***

Pressurized hydraulic fluid flowing from the electric motor-driven, closed-loop pump passes through filter elements before entering the bowl drive hydraulic motor and returns directly to the closed-loop pump. Fluid accelerates the bowl drive motor until the bowl speed reaches the speed setting at which the BOWL SPEED control remained when the centrifuge was shut down. Rotating the control counterclockwise increases the motor speed, which is transmitted to the bowl through a directly coupled overhung load adapter and sheave and belt arrangement. Bowl speed is limited to 3400RPM and is displayed on the BOWL SPEED indicator below the speed control. Magnetic pulses are supplied to the tachometer by a pickup mounted near the Rotodiff flange.

Hydraulic pressure currently driving the bowl motor is shown continuously on the BOWL PRESSURE indicator. Normally, this pressure will hover at about 2000PSI or less. However, during startup or during conditions of heavy slurry, hydraulic pressure naturally rises to overcome bowl resistance to meet the speed setting. To protect system components, bowl pressure automatically relieves at 3000PSI.

In addition to the closed-loop circulation to the pump drive motor, secondary circulation from the pump occurs through the drain manifold. The closed-loop pump has two connections to the drain manifold. One connection permits the pump to draw its hydraulic fluid supply, and the second provides a fluid return path from the pump.

***Open-Loop Pump and Conveyor Drive Motor (Rotodiff)***

As a special-purpose motor, the Rotodiff maintains a differential speed slightly lower than the bowl speed as it rises and falls. As the bowl accelerates, the Rotodiff also accelerates, while maintaining a lower rotational speed than the bowl. The Rotodiff is directly coupled to the conveyor.

The open-loop pump that supplies the conveyor drive motor (Rotodiff) draws hydraulic fluid from the reservoir and delivers the pressurized fluid through the flowmeter and control manifold to the Rotodiff. Fluid passing through the flowmeter displays the differential speed of the Rotodiff through an aperture on the hydraulic control panel. The RPM corresponds directly with the flow in liters per minute (LPM). The number of conveyor revolutions less than the current bowl speed is displayed on the flowmeter. For example, for a flowmeter indication of “40” and a bowl speed of 3000RPM, the conveyor speed is 2960RPM.

After passing through the flowmeter, the pressurized fluid enters the control manifold, where it passes through an adjustable needle valve. Fluid is then filtered by 10- and 16-micron filters before entering the Rotodiff. The pressurized fluid drives the Rotodiff at the speed setting where the CONVEYOR SPEED control remained when the centrifuge was shut down. By rotating the control counterclockwise, the operator can increase the differential speed within a 4 to 6RPM range in relation to the bowl speed. Two return paths are provided from the Rotodiff: One path returns fluid to the reservoir by way of the drain manifold, and the second drain returns fluid directly to the reservoir.

***Boost System***

With the BOOST SYSTEM switch set to ON, the boost system is automatically initiated when a pressure of 1600PSI is shown on the CONVEYOR PRESSURE gage. A hydraulic cylinder connected to the control manifold then slowly opens the three-way boost valve in the control manifold to increase the flow of fluid to the open-loop pump. This gradually raises the flow to the Rotodiff, correspondingly increasing the differential speed of the conveyor. This gradual increase in conveyor speed reduces the torque on the system if high-gravity solids are present. During this overload condition, if feed pump pressure rises to 1500PSI, the pump is temporarily turned off. If the boost process successfully clears the centrifuge, the conveyor returns to its original speed. The feed pump resumes operation when conveyor pressure falls to 700PSI.

If the clearing process is unsuccessful, the CONVEYOR PRESSURE gage may continue to rise above 1600PSI. At 2100PSI, the overload pressure switch is actuated to shut off electric power to the centrifuge. Although the hydraulic pumps are no longer being driven by the electric motor, the inertia of the rotating bowl continues to turn the hydraulic pumps. Consequently, the Rotodiff continues to turn the conveyor to clear the centrifuge while it coasts to a stop. A hydraulic pressure relief valve set to open at 2300PSI protects the hydraulic system as the centrifuge slows down.

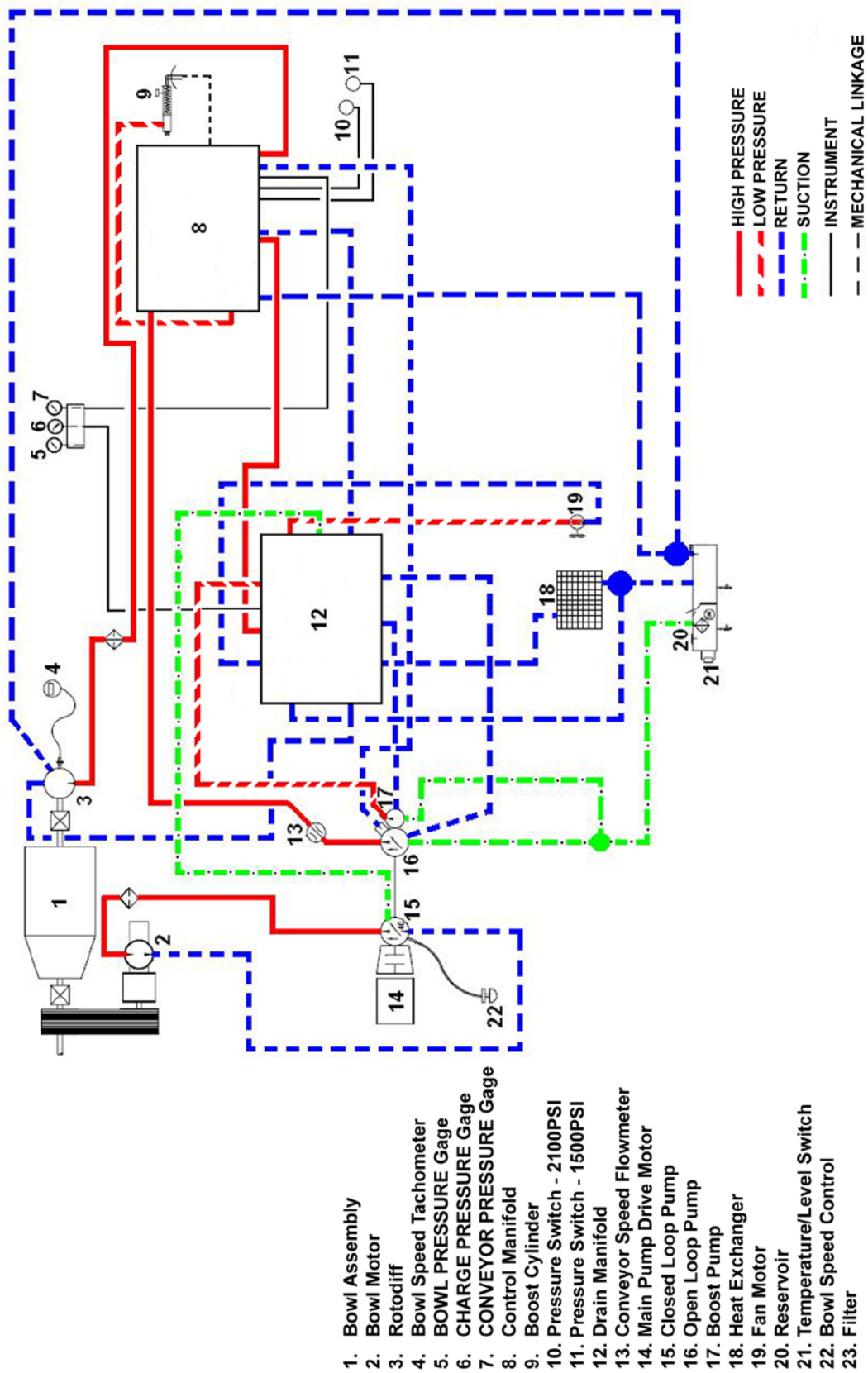


Figure 1-7 Hydraulic System Schematic Diagram

## PRODUCT SUPPORT

Derrick Corporation offers 24-hour per day, 7-day per week product support. Product support includes screen replacement / ordering information and repair / replacement parts and service for the entire product line. Refer to the following table for the parts / service center nearest you.

PARTS SALES & SERVICE LOCATIONS	
<b>Colorado</b>	
	Grand Junction - 970.241.2417
<b>Louisiana</b>	
	Broussard - 877.635.3354
<b>New York - Corporate Headquarters</b>	
	Buffalo - 716.683.9010
<b>Oklahoma</b>	
	Oklahoma City - 405.208.4070
<b>Texas</b>	
	Houston (Oilfield Headquarters) - 866.DERRICK (337.7425) • 281.590.3003
	North Texas (Bridgeport) - 405.208.4070
	South Texas (Corpus Christi) - 361.299.6080
	West Texas (Midland) - 405.397.4089
	East Texas, Arkansas, and Louisiana - 281.546.1166
<b>Wyoming</b>	
	Casper - 307.265.0445
<b>North Dakota</b>	
	Williston - 701.572.0722



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## SECTION 2 - SAFETY

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### GENERAL

This section contains a summary of WARNINGS used in this manual and a list of material safety data sheets (MSDSs) applicable to the equipment. The centrifuge has been designed to perform the stated functions safely.

### WARNINGS

All persons responsible for operation and maintenance of this equipment must read and understand all safety information in this manual prior to operating and/or maintaining the equipment. The safety warnings listed below are included in applicable procedures throughout this manual.

#### Sound



**WARNING! TO PROTECT AGAINST HEARING LOSS, HEARING PROTECTION SHOULD BE WORN AT ALL TIMES WHEN WORKING ON OR NEAR DERRICK MACHINES.**

#### Electrical Hazards



**WARNING! TO AVOID SERIOUS PERSONAL INJURY BE SURE EQUIPMENT IS LOCKED OUT, TAGGED OUT, DE-ENERGIZED, AND HAS STOPPED ROTATING BEFORE PERFORMING MAINTENANCE AND/OR ADJUSTMENTS.**



**WARNING! DRIVE MOTOR MUST BE OPERATED AT THE DESIGNATED SUPPLY VOLTAGE.**



**WARNING! HIGH VOLTAGE MAY BE PRESENT. BE SURE FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THIS EQUIPMENT IS OPEN. LOCK OUT AND TAG OUT POWER SUPPLY TO PREVENT ACCIDENTAL APPLICATION OF POWER WHILE MAINTENANCE AND/OR ADJUSTMENTS ARE IN PROGRESS.**







**WARNING! ELECTRICAL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL APPLICABLE LOCAL CODES. FAILURE TO COMPLY MAY RESULT IN AN UNSAFE CONDITION THAT COULD INJURE PERSONNEL OR DAMAGE EQUIPMENT. ENSURE THAT ALL ELECTRICAL AND CONDUIT CONNECTIONS ARE SECURE.**








## **SAFETY**

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### **Equipment Handling**

	<b>WARNING! USE SPREADER BARS TO PREVENT DAMAGE WHEN LIFTING THE EQUIPMENT.</b>
	<b>WARNING! TO ENSURE PROPER BALANCE AND ORIENTATION WHEN UNIT IS RAISED AND PREVENT DAMAGE TO COMPONENTS, ATTACH LIFTING SLING ONLY AT DESIGNATED LIFT POINTS. DO NOT ATTEMPT LIFTING BY ATTACHMENT TO MOTOR OR ANY OTHER LOCATION.</b>
	<b>WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT.</b>
	<b>WARNING! DO NOT REMOVE SHIPPING BRACKETS UNTIL EQUIPMENT HAS BEEN POSITIONED AT FINAL INSTALLATION SITE.</b>

### **Operation**

	<b>WARNING! BE SURE THAT BOWL SPEED AND CONVEYOR SPEED ARE TURNED DOWN FULLY BEFORE STARTING CENTRIFUGE.</b>
	<b>WARNING! ALL OPERATING AND MAINTENANCE PERSONNEL MUST READ AND UNDERSTAND ALL SAFETY INFORMATION IN THIS MANUAL BEFORE WORKING WITH THE EQUIPMENT.</b>
	<b>WARNING! BE SURE THAT ALL GUARDS ARE INSTALLED AND SECURED AND ALL PERSONNEL ARE CLEAR BEFORE STARTING MACHINE.</b>
	<b>WARNING! BEFORE STARTING CENTRIFUGE, BE SURE THAT ALL SHIPPING BRACKETS HAVE BEEN REMOVED AND BEARING PILLOW BLOCKS ARE PROPERLY TIGHTENED.</b>
	<b>WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING TOP COVER OR REMOVING GUARDS.</b>
	<b>WARNING! DO NOT OPERATE CENTRIFUGE IF EXCESSIVE NOISE OR VIBRATION DEVELOPS. ALWAYS CONFIRM THAT VIBRATION SWITCH AND OTHER SAFETY DEVICES ARE FUNCTIONAL.</b>
	<b>WARNING! DO NOT EXCEED MAXIMUM BOWL SPEED SHOWN ON HYDRAULIC CONTROL PANEL.</b>

### **Maintenance**

	<b>WARNING! HIGH VOLTAGE MAY BE PRESENT. ALWAYS OPEN FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THE EQUIPMENT, AND LOCK OUT AND TAG OUT POWER SUPPLY BEFORE PERFORMING ANY MAINTENANCE AND/OR ADJUSTMENTS OF EQUIPMENT.</b>
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## Storage



**WARNING! CENTRIFUGE MAY BE DAMAGED BY STORING IN A HIGH HUMIDITY ENVIRONMENT (GREATER THAN 50% RH). EQUIPMENT MUST BE STORED IN A LOW-HUMIDITY ENVIRONMENT.**

## MATERIAL SAFETY DATA SHEETS (MDDSs)

Material Safety Data Sheets (MSDSs) advise personnel of the properties and any possible hazards associated with these materials. Emergency first aid procedures, special precautions, emergency telephone number, and other relevant data are contained in the MSDSs. These documents are prepared by the product manufacturers, which have sole responsibility for accuracy of the information.

The MSDSs listed below apply to products used in the manufacture of the Derrick equipment. Where shown, dates are current as of the publication date of this manual. The latest MSDSs may be obtained from the product manufacturer.

MATERIAL DESCRIPTION – WHERE USED	MSDS No. / Date
<b>Paints</b>	
PPG Dimetecote 302H Green 302F0250 Resin - Top Coat	1302H-5A / 04-11-10
PPG Dimetecote 302H Clear 302G0910 Cure - Top Coat	1302H-B / 01-21-10
PPG PSX 700 Neutral Tint Resin - Undercoat	PX700T3 / 02-28-08
PPG PSX 700FD Cure - Undercoat	PX700FD-B / 01-11-07
<b>Lubricants</b>	
<b>Arctic Environment</b>	
Shell Aeroshell GR-14 - All Bearings	<u>56200E-9</u> / 10-23-03*
Texaco Rando 68 - Rotodiff & Overhung Load Adapter	<u>01659</u> / 03-21-00
<b>Standard Environment</b>	
Chevron SRI NLGI 2 - All Bearings	<u>6979</u> / 08-03-04*
Texaco Rando 68 - Rotodiff & Overhung Load Adapter	01659 / 03-21-00
<b>Food Grade</b>	
Chevron SRI NLGI 2 - Main Bearings	<u>6979</u> / 08-03-04*
Mobil FM 102 - Conveyor Bearings Only	<u>642363-00</u> / 01-17-02
Texaco Rando 68 - Rotodiff & Overhung Load Adapter	01659 / 03-21-00
<b>Sealant</b>	
Fasteners - Loctite Anti-Seize Lubricant	<u>76764</u> / 09-27-04

\* Refer to specification data sheet supplied with machine for correct product.



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## SECTION 3 - INSTALLATION

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### GENERAL

This section describes the recommended installation procedure for the Derrick DE-1000 FHD centrifuge. The centrifuge is shipped fully assembled. For safety during shipment, however, the rotating assembly is supported by shipping brackets. It must be lowered onto the base, and then the main bearing pillow blocks must be secured to the base.

### SAFETY

Read and understand **ALL** safety information presented in this manual **before** installing and operating this equipment. Refer to Section 2 for a summary of Warnings addressing installation, operation, and maintenance of this equipment.

Before beginning the installation, review the equipment handling information in this section. Note particularly the information concerning “lift points” and the use of spreader bars before lifting or moving the equipment.

Failure to observe proper equipment handling procedures may result in serious personal injury or death and/or damage to the equipment.



**WARNING! TO ENSURE PROPER BALANCE AND ORIENTATION WHEN UNIT IS RAISED AND PREVENT DAMAGE TO COMPONENTS, ATTACH LIFTING SLING ONLY AT DESIGNATED LIFT POINTS. DO NOT ATTEMPT LIFTING BY ATTACHMENT TO ANY OTHER LOCATION.**



**WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT. LOWER THE CENTRIFUGE GENTLY INTO PLACE, AS JARRING MAY CAUSE DAMAGE.**



**WARNING! DO NOT REMOVE SHIPPING BRACKETS UNTIL CENTRIFUGE HAS BEEN POSITIONED AT FINAL INSTALLATION SITE.**

## INSTALLATION

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### INSTALLATION SEQUENCE

Following is the sequence of steps for installing the centrifuge. The sequence presented may vary depending on the user's facilities and previous experience with this type of equipment.

1. Read and understand all safety information in Section 2 before installing and operating this equipment.
2. Position and level equipment at installation site.
3. Remove shipping components, and lower and secure the rotating assembly to the base.
4. Adjust drive belt.
5. Connect liquid discharge line.
6. If discharge duct is to be used, connect duct to solid discharge chute.
7. Install feed tube, and connect flexible feed line to feed tube.
8. Connect electric power supply to the equipment, and connect feed pump to centrifuge control circuit.
9. Refer to Section 4 - Operating Instructions for startup and operating procedures.

### SITE PREPARATION AND CLEARANCE REQUIREMENTS

Prior to placement of equipment, verify that electricity is available at the equipment site and that feed line and discharge chute (if any) are provided. Also ensure that clearances around the equipment are adequate. Prepare the installation site as follows:

1. Provide adequate clearances to perform the following activities:
  - a. Access the electrical control box and electrical junction box.
  - b. Open and close top cover.
  - c. Check and fill hydraulic reservoir.
  - d. Grease main and gearbox bearings.
  - e. Connect and disconnect feed and discharge lines.
2. Confirm that mounting structure is properly positioned and adequate to support the weight of the centrifuge.
3. Verify that electric power supply available at the site matches the centrifuge power requirements.
4. Check that liquid discharge line flange matches the liquid discharge connection on the machine.

### EQUIPMENT HANDLING



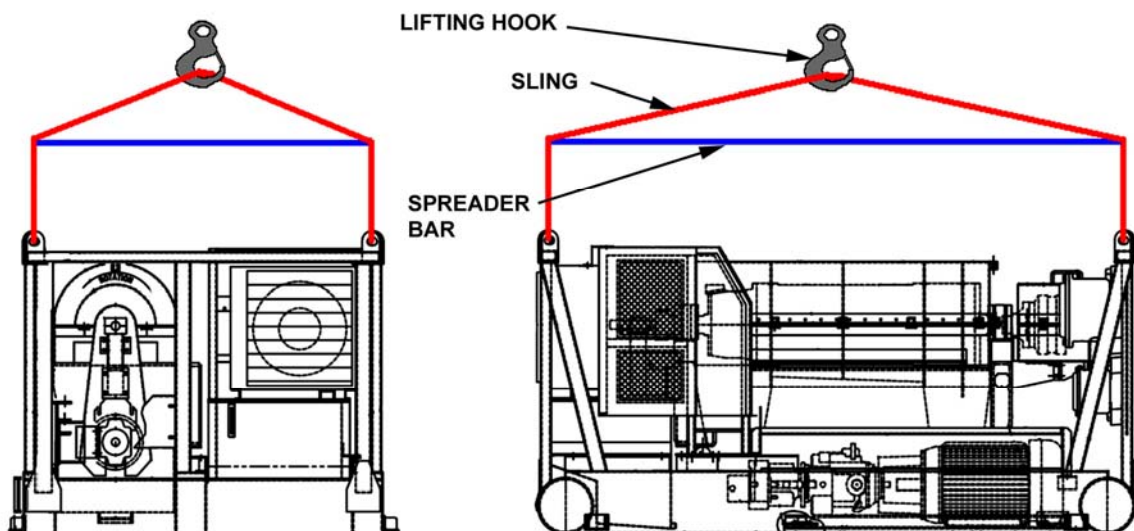
**WARNING! USE SPREADER BARS TO PREVENT DAMAGE WHEN LIFTING THE EQUIPMENT.**

	<b>WARNING! TO ENSURE PROPER BALANCE AND ORIENTATION WHEN UNIT IS RAISED AND PREVENT DAMAGE TO COMPONENTS, ATTACH LIFTING SLINGS ONLY TO LABELLED LIFTING POINTS. DO NOT ATTEMPT LIFTING BY ATTACHMENT TO ANY OTHER LOCATION.</b>
	<b>WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT.</b>
	<b>WARNING! DO NOT REMOVE SHIPPING BRACKETS UNTIL EQUIPMENT HAS BEEN POSITIONED AT FINAL INSTALLATION SITE.</b>
	<b>WARNING! WHEN USING AN OVERHEAD LIFTING DEVICE, USE ALL FOUR LIFTING POINTS PROVIDED.</b>

The centrifuge is shipped fully assembled and installed on a shipping skid. A label indicating the weight of the unit was affixed to the machine. Refer to the general arrangement drawing in Section 8 for equipment weight and other technical data.

While the centrifuge is still mounted on the shipping skid, it may be transported on the ground using a forklift. After the machine is removed from the shipping skid, an overhead lifting device is required.

Four reinforced lifting lugs are built into the equipment frame to allow attachment of an overhead-lifting device (Figure 3-1). Lifting points are labeled “**LIFT HERE ONLY**”. **DO NOT** attempt lifting equipment by attaching slings or similar lifting aids to the electric drive motor or other non-designated portions of the unit. Use of spreader bars is recommended.



**Figure 3-1 Lifting Arrangement**

## INSTALLATION

### EQUIPMENT POSITIONING AND LEVELING

The centrifuge must be properly leveled for satisfactory operation. The equipment must be leveled along the length and width of the unit (Figure 3-2). A 2-foot or torpedo level is recommended. Non-compressible shims should be used as required to level the machine.

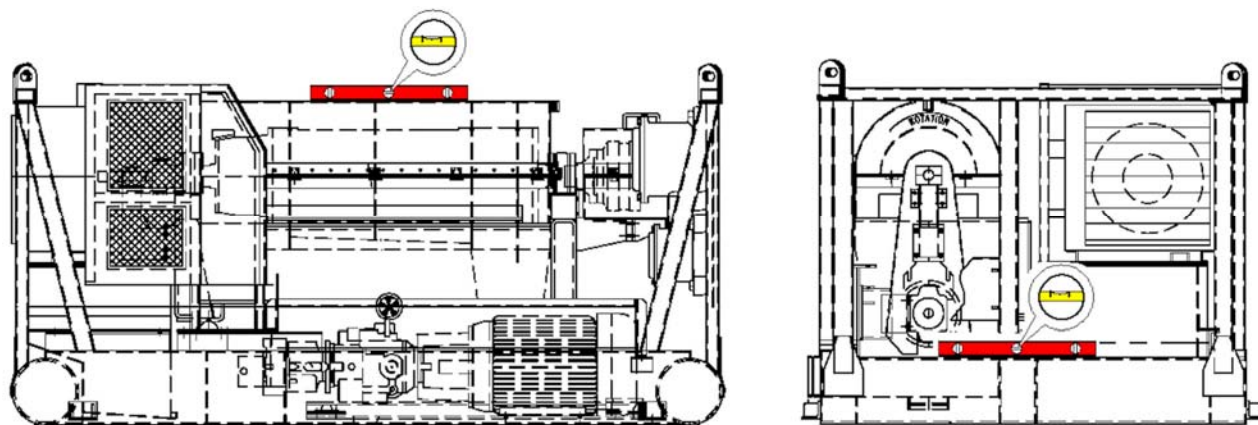


Figure 3-2 Centrifuge Leveling

### LOWER AND SECURE ROTATING ASSEMBLY



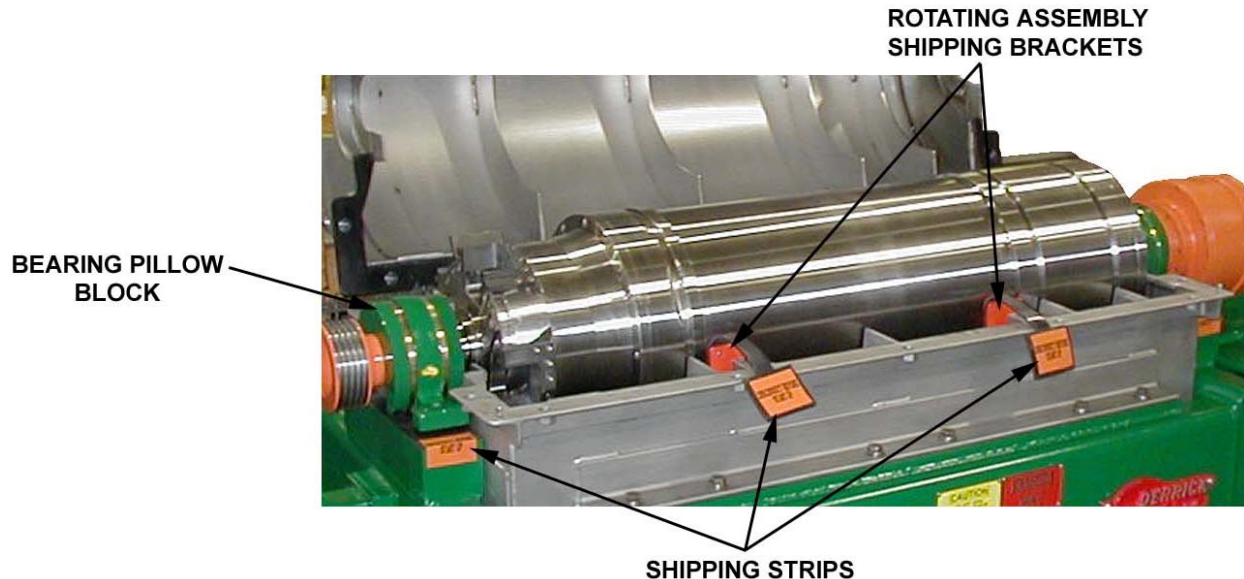
**Note! Retain shipping brackets that support rotating assembly after removal. The brackets must be re-installed whenever the machine is moved, as they prevent damage to the rotating assembly bearings during transit.**

Shipping brackets prevent bearing damage during transit, and rubber strips protect the pillow block mounting surfaces. After final positioning and leveling of the centrifuge, the shipping brackets and covers must be removed and the rotating assembly secured to the base.

Each shipping component is labeled **DISCONNECT BEFORE STARTUP**. To remove the shipping components, proceed as follows:

1. Remove belt guard and Rotodiff guard.
2. Using a 1-ton hoist, lift rotating assembly slowly and evenly about 5".
3. Remove shipping brackets under rotating assembly.
4. Remove rubber shipping strips under rotating assembly and bearing pillow blocks (Figure 3-3).
5. Using a suitable solvent, clean pillow block mounting surfaces and alignment pin holes. Check for, and remove, any nicks or burrs.
6. Slowly lower rotating assembly until pillow blocks contact base, but maintain support by hoist.
7. Apply anti-seize compound to pillow block bolts and tapered alignment pins, and insert through pillow blocks. Tap alignment pins into place.
8. Hand tighten pillow block bolts, and then release hoist. Tighten pillow block bolts in accordance with applicable torque specification in Section 5.
9. Adjust effluent ports, if necessary, from factory setting of 3.4.

10. Close case cover, and evenly tighten all cover bolts sequentially beginning at the center and moving toward ends.
11. Rotate bowl manually to confirm that no binding or rubbing is present.



**Figure 3-3 Shipping Components Locations**

12. Adjust drive belt tension in accordance with *Preventive Maintenance* in Section 5.
13. Install belt guard and gearbox guard.

## FEED AND DISCHARGE CONNECTIONS

For vibration isolation, a flexible line must be connected to the feed tube. A source of fresh water is required for flushing the centrifuge prior to shutdown. To connect the flush line, install a tee fitting in the feed line with shutoff valves to permit selection of either the feed line or the flush line (Figure 3-4). The shutoff valves are required to prevent flush water from flowing back into the centrifuge feed.

If a liquid discharge line (customer-supplied) is used, a flexible line is required for vibration isolation. Since the discharge cake is very heavy and sticky because of the lack of free liquid, the centrifuge should be installed over the receptacle that is to receive the discharged solids. If this is not possible a slide or chute is needed to convey the solids. At least a 45-degree angle is required to ensure self cleaning, or a wash system must be provided to prevent material buildup.

## FEED PUMP

The customer must supply a positive-displacement feed pump of up to 15HP for delivering slurry to the centrifuge. The pump must be connected to the centrifuge's electrical control system as described in this document so that its operation can be supervised by the centrifuge.



## INSTALLATION

### FEED PUMP (CONT'D)

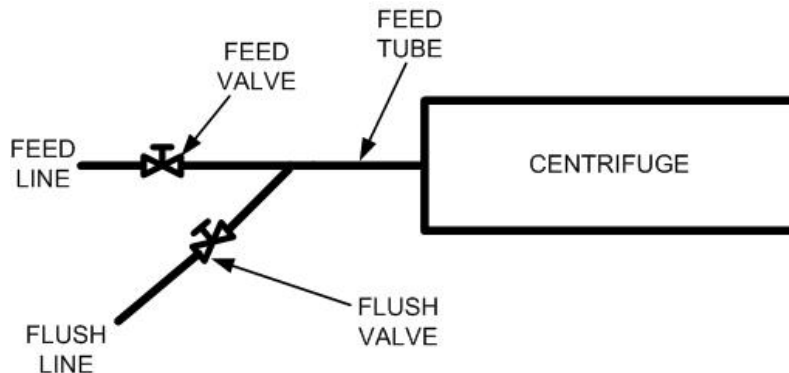


Figure 3-4 Feed and Flush Connections

### ELECTRIC POWER CONNECTIONS

Three-phase line power and ground connections are required. In addition, the customer's feed pump must be connected to the centrifuge control circuit. All other connections have been made at the factory. Connect the facility's three-phase electric power supply and customer's feed pump to the electrical junction box in accordance with Figure 3-5. Refer to the electrical diagrams in Section 6 for additional assistance and information on electrical connections.

Incoming power to the centrifuge is three-phase 50 or 60 Hz supplied at the customer-specified voltage. The **drive motor is not dual wound** and must be operated at the design voltage. For motor specifications, refer to Section 7.



**WARNING! DRIVE MOTOR MUST BE OPERATED AT THE DESIGNATED SUPPLY VOLTAGE.**

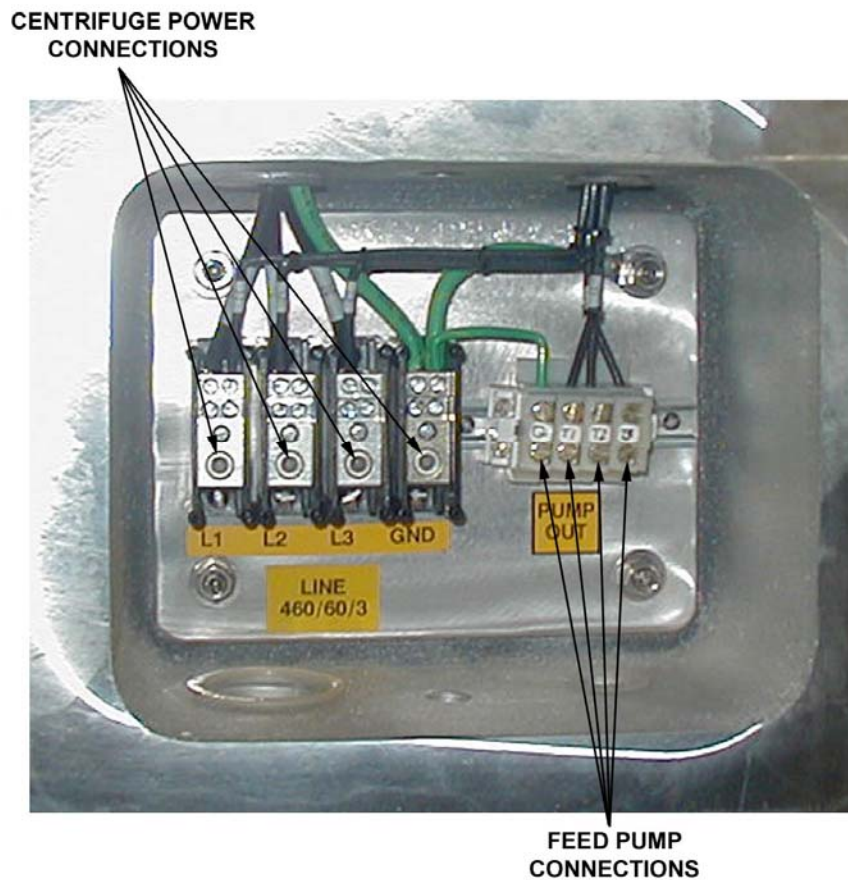


**WARNING! HIGH VOLTAGE MAY BE PRESENT. BE SURE FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THIS EQUIPMENT IS OPEN. LOCK OUT AND TAG OUT POWER SUPPLY TO PREVENT ACCIDENTAL APPLICATION OF POWER WHILE MAKING ELECTRICAL CONNECTIONS.**



**WARNING! ELECTRICAL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL APPLICABLE LOCAL CODES. FAILURE TO COMPLY MAY RESULT IN AN UNSAFE CONDITION THAT COULD INJURE PERSONNEL OR DAMAGE EQUIPMENT. ENSURE THAT ALL ELECTRICAL AND CONDUIT CONNECTIONS ARE SECURE.**





**Figure 3-5 Electric Power and Feed Pump Connections**

**A fused disconnect primary power supply is required for this equipment.** The fused disconnect and interconnecting wiring to the equipment must be suitably sized and in accordance with National Electrical Code (NEC) standards and all other applicable state and local codes.

Additional wiring requirements are as follows:

1. The fused disconnect device shall have sufficient interrupting capacity to clear the maximum fault current capability of the power supply system.
2. The GND connection in the power supply junction box must be connected to a known ground.
3. The feed pump connections are made to terminals in the electrical junction box as shown. The feed pump starter can operate a feed pump drive motor of up to 15 HP.

## MACHINE STARTUP

Refer to Section 4 for initial startup and operating procedures for the centrifuge.



**WARNING! DO NOT ATTEMPT TO OPERATE MACHINE WITH SHIPPING COMPONENTS INSTALLED.**



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## SECTION 4 - OPERATING INSTRUCTIONS

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### GENERAL

This section includes initial and normal startup, operation, shutdown, and emergency shutdown procedures for the centrifuge. These procedures are for use only by trained personnel who are qualified to operate high-speed rotating equipment.

### OPERATING SAFETY

	<b>WARNING! BE SURE THAT BOWL SPEED AND CONVEYOR SPEED ARE TURNED DOWN FULLY BEFORE STARTING CENTRIFUGE.</b>
	<b>WARNING! ALL OPERATING AND MAINTENANCE PERSONNEL MUST READ AND UNDERSTAND ALL SAFETY INFORMATION IN THIS MANUAL BEFORE WORKING WITH THE EQUIPMENT.</b>
	<b>WARNING! BE SURE THAT ALL GUARDS ARE INSTALLED AND SECURED AND ALL PERSONNEL ARE CLEAR BEFORE STARTING MACHINE.</b>
	<b>WARNING! BEFORE STARTING CENTRIFUGE, BE SURE THAT ALL SHIPPING BRACKETS HAVE BEEN REMOVED AND BEARING PILLOW BLOCKS ARE PROPERLY TIGHTENED.</b>
	<b>WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING COVER OR REMOVING GUARDS.</b>
	<b>WARNING! DO NOT OPERATE CENTRIFUGE IF EXCESSIVE NOISE OR VIBRATION DEVELOPS. ALWAYS CONFIRM THAT VIBRATION SWITCH AND OTHER SAFETY DEVICES ARE FUNCTIONAL.</b>
	<b>WARNING! DO NOT EXCEED MAXIMUM SPEED SHOWN ON THE HYDRAULIC CONTROL PANEL.</b>

## OPERATING INSTRUCTIONS

### COLD CLIMATE STARTUP

#### Main Bearing Re-Lubrication

In below-freezing ambient conditions where steam, portable heaters, or other means is used to raise the temperature of the centrifuge, re-lubrication of bearings may be necessary prior to startup. If bearing housings reach a temperature of 200°F (93°C), grease may liquefy and drain from bearings. This will result in dry running the bearings upon startup. To prevent this condition, proceed as follows:

1. After applying heat and prior to startup, pump 15 shots of grease into each main bearing.
2. Refill conveyor bearings until grease is observed exiting the appropriate drain hole.
3. After machine is started, pump an additional five shots of grease into each main bearing.
4. Monitor bearing temperatures for the first 2 hours of centrifuge operation.



**Note! It is Normal for Temperatures to Rise for 15 to 30 Minutes After Greasing and Then Return to Normal.**

#### Hydraulic System Warmup

In cold climates, warming up the hydraulic fluid is recommended to before starting the hydraulic motors. After completing the warmup, proceed with *Initial Startup* or *Normal Startup* procedure.

#### HYDRAULIC SYSTEM WARMUP PROCEDURE

Step	Procedure
1	Ensure that all tools, documents, and shipping components have been removed and there are no obstructions to operation.
2	Confirm that all operators and maintenance personnel have read and understand all operating and safety information in Section 2.
3	Verify that equipment has been installed properly, all shipping brackets have been removed, and bearing pillow blocks have been tightened to specified torque.
4	Check that cover is closed, all cover bolts are fully tightened, and all guards are secure.
5	Verify that all personnel are clear of equipment.
6	Turn CONVEYOR SPEED and BOWL SPEED controls fully clockwise.
7	Operate centrifuge motor until hydraulic fluid and pumps are fully warmed.
8	Start centrifuge in accordance with <i>Initial Startup</i> procedure.

## INITIAL STARTUP

Perform the Initial Startup procedure when the machine is being started for the first time or after the machine has been removed from service for an extended period.

INITIAL STARTUP PROCEDURE	
Step	Procedure
1	Ensure that all tools, documents, and shipping components have been removed and there are no obstructions to operation.
2	Confirm that all operators and maintenance personnel have read and understand all operating and safety information in Section 2.
3	Verify that equipment has been installed properly, all shipping brackets have been removed, and bearing pillow blocks have been tightened to specified torque.
4	Check that cover is closed, all cover bolts are fully tightened, and all guards are secure.
5	Verify that all personnel are clear of equipment.
6	Start centrifuge in accordance with <i>Normal Startup</i> procedure steps 3 through 9, below.

## NORMAL STARTUP

NORMAL STARTUP PROCEDURE	
Step	Procedure
1	Check that cover is closed, all cover bolts are fully tightened, and all guards are secure.
2	Rotate bowl manually to check that rotating assembly turns freely and no rubbing is felt.
3	Verify that all personnel are clear of centrifuge.
4	Turn CONVEYOR SPEED and BOWL SPEED controls fully clockwise. Unless known in advance that boost will not be required due to feed material conditions, set BOOST SYSTEM control to ON position.
5	Press CENTRIFUGE ON button to start the centrifuge drive motor. Check CONVEYOR SPEED flowmeter for indication that the conveyor is turning at about 5RPM. Confirm that conveyor is turning counterclockwise when looking toward liquid bowl head. If centrifuge is clear of solids, CONVEYOR PRESSURE gage should be at 500PSI or less, CHARGE PRESSURE should be about 400 to 500PSI, and BOWL SPEED should be at zero.
6	Turn CONVEYOR SPEED control counterclockwise until desired speed is reached, as shown on the CONVEYOR SPEED indicator. Note that CONVEYOR PRESSURE will rise slightly with increased speed.
7	Slowly turn BOWL SPEED control counterclockwise until desired speed (up to 3400RPM maximum) is shown on BOWL SPEED tachometer. Set speed in accordance with operating conditions. When BOWL PRESSURE gage reaches about 1000PSI, the CHARGE PRESSURE gage should drop below 400PSI indicating proper operation.

## OPERATING INSTRUCTIONS

NORMAL STARTUP PROCEDURE	
Step	Procedure
8	Press PUMP ON button to start feed pump, and slowly introduce feed to centrifuge. PUMP ON light should go on.
9	Check that BOWL PRESSURE is below 2800PSI, and CONVEYOR PRESSURE is below 1400PSI. Adjust feed rate, BOWL SPEED, and/or CONVEYOR SPEED as required to optimize centrifuge operation. If necessary due to feed material conditions, move BOOST SYSTEM control to ON. Refer to the paragraphs below for assistance in adjusting operating parameters and using the boost system.

## OPERATION

Monitor the liquid and solid discharges continually to determine operating status of the centrifuge. Rising conveyor pressure demand indicates that the conveyor is becoming overburdened in moving solids. Conversely, falling conveyor pressure shows that processing speed can be raised. Operating parameters should be adjusted, as required, to optimize centrifuge operation and prevent automatic shutdown due to excessive conveyor pressure demand.

The following parameters affect centrifuge operation:

- Feed rate
- Pond depth
- Bowl speed
- Conveyor speed

Adjustment of one parameter may produce the desired clarity of liquid effluent and solids dryness. Or the desired performance may be achieved by further adjustment. It is important to understand the interdependence of the operating parameters. Changing one characteristic results in other effects that may warrant additional adjustments.

Except for pond depth, these parameters can be adjusted while the centrifuge is operating. The operator may then view the results of one change before making additional adjustments. The following paragraphs describe the effect of changing each parameter.

## FEED RATE ADJUSTMENT

If slurry is thin, increasing the feed rate may permit a higher processing rate. However, as feed rate is increased, the operator must check for a rise in conveyor pressure indicating that the conveyor is becoming burdened by moving the increased solids volume at its present speed. The bowl and/or conveyor speed may then be lowered to reduce the pressure demand, or the feed rate may be reduced until the conveyor pressure falls.

## BOWL SPEED

Bowl speed is adjusted by means of a throttle control on the hydraulic control panel. Generally, a higher bowl speed increases dryness of the solids discharge and clarity of liquid effluent. However, the higher bowl speed will reduce bearing life, increase wear, and raise the torque load on the conveyor. The bowl should be operated at the lowest speed possible to achieve desired dryness and liquid clarity.

## **CONVEYOR SPEED**

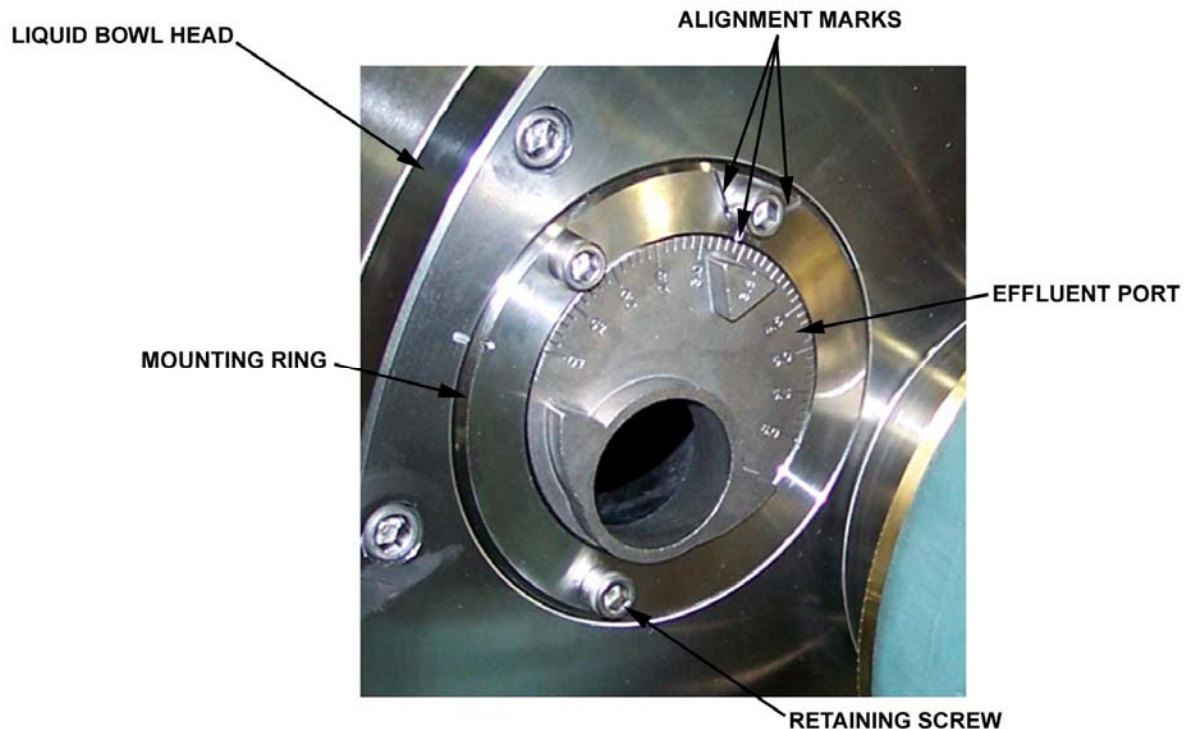
Changing the conveyor speed adjusts the solids discharge rate. Generally, a slower differential speed will produce drier solids but reduces the solids discharge rate. The conveyor speed indicator on the hydraulic control panel displays the differential speed of the conveyor. Adjusting the conveyor speed alters this differential speed.

Raising the conveyor speed reduces the differential gap between the bowl and conveyor, while reducing the speed increases the gap. The settling time is reduced by increasing the conveyor speed, which will increase the wetness of the solids. Reducing conveyor speed raises the settling time, which will produce dryer solids.

## **POND DEPTH ADJUSTMENT**

Four adjustable effluent ports (Figure 4-1) are provided on the liquid bowl head to facilitate setting the pond depth; all ports must be set identically. A higher pond depth increases settling time by permitting more liquid to remain in the bowl. However, a higher pond depth also reduces the beach area at the solids discharge end of the bowl, which will result in a wetter solids discharge.

Pond depth can only be adjusted with the centrifuge fully stopped and disabled. For this reason, pond depth is usually adjusted last. The factory pond depth setting is usually satisfactory when used in conjunction with feed rate, bowl speed, and conveyor speed adjustments. However, if desired results cannot be achieved by other means, the pond depth may require re-setting.



**Figure 4-1 Effluent Port Adjustment**



## OPERATING INSTRUCTIONS

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### POND DEPTH ADJUSTMENT (CONT'D)

To adjust pond depth, proceed as follows:



**WARNING! DO NOT OPEN COVER OR ATTEMPT ANY ADJUSTMENT OR MAINTENANCE ON THE CENTRIFUGE UNLESS THE BOWL IS AT A COMPLETE STANDSTILL.**

1. Shut down, lock out, and tag out the centrifuge using the Normal Shutdown procedure described later in this section.
2. Open case cover.
3. Loosen three screws securing mounting ring to liquid bowl head, rotate the effluent port until the desired setting is positioned at the alignment marks, and tighten screws. All four effluent ports must be set to the same position.
4. Close case cover after completing adjustments.

### BOOST SYSTEM OPERATION

If the BOOST SYSTEM control on the hydraulic control panel is set to ON, the system is initiated when the CONVEYOR PRESSURE gage shows a pressure of 1600PSI.

The boost system raises the conveyor speed, which reduces the torque on the system when high-gravity solids are present. For drilling mud, the system is generally set to ON. Following are guidelines for operating the boost system:

1. For heavy mud, set BOOST SYSTEM control to ON.
2. For light mud, set BOOST SYSTEM control to OFF.

To verify that the choice is correct for the current conditions, while processing mud perform the following test:

1. Note and record CONVEYOR PRESSURE gage reading.
2. Check CONVEYOR SPEED indication, and reduce conveyor speed by 50 percent.
3. If the CONVEYOR PRESSURE drops, set the BOOST SYSTEM control to OFF.
4. If the CONVEYOR PRESSURE rises or remains constant, set the BOOST SYSTEM control to ON.

### FEED PUMP CYCLING

If the centrifuge is being overfed with slurry, the feed pump will cycle on and off as conveyor operating pressure rises and falls. The PUMP ON indicator goes on when the feed pump is running and off when the pump is stopped.

Upon reaching a conveyor pressure demand of 1500PSI, the high pressure switch in the control manifold opens, de-energizing the pump control relay to shut down the feed pump. If conveyor pressure continues to rise, and the BOOST SYSTEM control is in the ON position, upon reaching 1600PSI the boost system is automatically activated to assist the conveyor in clearing the excess solids.

When the conveyor has cleared the solids, and pressure drops to 700PSI, the pump control relay is re-energized by the low pressure switch in the control manifold to turn the pump back on. In this way, the feed rate is managed automatically to prevent overwhelming the centrifuge with an excessive feed rate and causing blockage.



## CLEARING CONVEYOR BLOCKAGE

Conveyor overload is indicated by an unusual pressure rise, followed by a shutdown. During normal operation, the Rotodiff rotates clockwise (when viewed from the liquid discharge end). However, rotation may be reversed to help clear a blockage. Reversal should be performed after first attempting to clear the blockage by flushing with clear water. If Rotodiff reversal fails to clear the blockage, the bowl will require manual cleaning. Reverse the Rotodiff as follows:

1. Shut down, lock out, and tag out electric power to centrifuge if not already done, and depressurize the hydraulic system.
2. Remove six screws and washers (1, Figure 4-2) securing flange to housing.
3. Loosen but DO NOT REMOVE two screws (2) in the flange slots.
4. Insert locking bar (4) in hole in flange (5) marked U, pressing in fully to engage corresponding hole in cover plate (6).
5. Using locking bar (4), rotate flange until loosened screws are at opposite end of slots.
6. With locking bar in place, tighten two screws (2).
7. Install six screws (1) and washers.
8. Tighten all eight screws (1 and 2) to 90 ft-lbs (121 Nm).

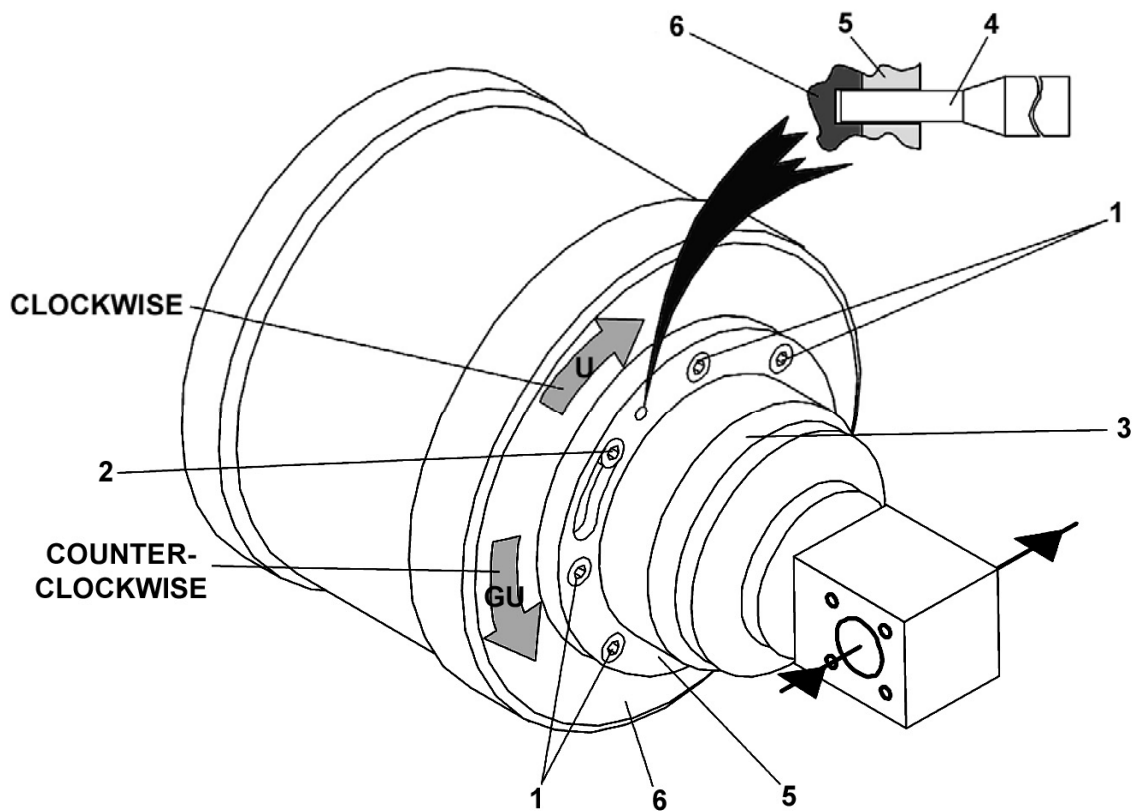


Figure 4-2 Reversing Rotodiff Direction

## OPERATING INSTRUCTIONS

### CLEARING CONVEYOR BLOCKAGE (CONT'D)

9. Connect feed pump to a fresh water source, and then attempt to re-start centrifuge. If centrifuge starts and then shuts down, the blockage must be cleared as follows:
  - a. With centrifuge fully stopped, open cover and inspect bowl interior and conveyor for accumulated solids on one side of bowl.
  - b. Water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, or if dislodged tiles are found, remove rotating assembly, remove conveyor, and manually clear all solids and dislodged tiles from the conveyor and bowl interior.
  - c. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly (refer to Section 5).
10. After clearing centrifuge, restore Rotodiff to original direction of rotation (clockwise) using steps 2 through 8 above, except insert locking bar (4) into hole marked GU and rotate flange back to original position.
11. Restore feed pump connection to original feed supply line, and re-start centrifuge using the *Normal Startup* procedure above. Monitor pressures, vibration, and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as high pressure and/or high fluid temperature and take indicated corrective action.
12. Reduce the feed rate to avoid another high pressure shutdown.

### NORMAL SHUTDOWN

The normal shutdown procedure is to be used for controlled stopping of operation. Normal shutdown is performed for routine activities such as cleaning, lubrication, inspection, or adjustment.



**WARNING! CENTRIFUGE MUST BE FLUSHED OUT THOROUGHLY AT THE END OF THE DAY. UNLESS WASHED OUT, PROCESS MATERIAL WILL SAG AND DRY OUT CAUSING SEVERE OUT OF BALANCE. WHEN RE-STARTED, THE CENTRIFUGE WILL PRODUCE SEVERE VIBRATION, RESULTING IN AUTOMATIC SHUTDOWN.**

#### NORMAL SHUTDOWN PROCEDURE

Step	Procedure
1	Press PUMP OFF pushbutton to discontinue feed to centrifuge.
2	Flush centrifuge until all solids are removed from conveyor and bowl.
3	Turn BOWL SPEED control fully clockwise to bring the bowl to a full stop, and then turn CONVEYOR SPEED control fully clockwise.
4	Press CENTRIFUGE OFF button to shut down electric power to centrifuge. Open fused disconnect supplying electric power to the machine.

### AUTOMATIC SHUTDOWN

The centrifuge has built-in safety features to protect the equipment. These features will result in automatic shutdown of the centrifuge before damage occurs. The following paragraphs describe these automatic shutdown events.

### Excessive Vibration

A vibration level of 2 Gs will cause the vibration switch to interrupt electric power to the centrifuge run relay, shutting down the machine. Such excessive vibration may occur during startup or normal operation due to slumping of the wall cake or other unbalanced condition of the bowl. The machine may be re-started by pressing the reset button on the vibration switch and then using the *Normal Startup* procedure.

If nuisance tripping occurs during normal startup, the reset button may be held depressed until full speed is reached.

### High Fluid Temperature Or Low Fluid

If the temperature of hydraulic fluid in the reservoir rises above 175°F or fluid level falls excessively, the temperature/low level switch in the reservoir shuts down electric power to the centrifuge run relay. To re-start the centrifuge, the cause of the high temperature or low level must be corrected and the machine re-started using the *Normal Startup* procedure.

### Motor Overload

Thermal overloads protect the circuits supplying electric power to the centrifuge drive motor and feed pump motor. In case of excessive current draw through the centrifuge motor starter circuit, the thermal overload trips to disable the centrifuge run relay and shut down the motor. Excessive current draw through the pump starter circuit trips the thermal overload, which de-energizes the pump start relay to disable the feed pump motor. To re-start the centrifuge following shutdown due to a thermal overload trip, clear the cause of excessive current draw, press both RESET buttons, and then re-start the machine using the *Normal Startup* procedure.

### Motor Over-Temperature

If high temperature is sensed by the thermocouple embedded in the drive motor winding, the motor over-temperature switch in the motor winding opens, disabling the centrifuge run relay and shutting down the motor. To re-start the centrifuge, allow the motor to cool, check for and remove the cause of over-temperature, and then re-start the machine using the *Normal Startup* procedure.

### High Conveyor Pressure

If the conveyor is unable to clear accumulated solids, the conveyor pressure will continue to rise even after the feed pump is shut down. To protect the centrifuge from damage, when system hydraulic pressure reaches 2100PSI electric power is automatically shut down by the overload pressure protection switch, ceasing centrifuge operation. If conveyor pressure still continues to rise as the bowl and conveyor coast downward, a pressure relief valve in the control manifold that is set to relieve at 2300PSI automatically reduces hydraulic system pressure to a safe level.

To re-start the centrifuge, proceed as follows:

1. Wait until bowl and conveyor have fully stopped.



**WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING CASE COVER.**

## OPERATING INSTRUCTIONS

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### High Conveyor Pressure (Cont'd)

2. Attempt to clear all solids from the conveyor and bowl by flushing with clear water. If solids are cleared, re-start the centrifuge using the Normal Startup procedure above. If unable to clear solids by flushing, reverse Rotodiff direction as described in *Clearing Conveyor Blockage*.

### EMERGENCY SHUTDOWN

To immediately stop the centrifuge in case of emergency, open the fused disconnect supplying electric power to the machine.

## SECTION 5 - MAINTENANCE

### GENERAL

This section describes preventive and corrective maintenance procedures for the DE-1000 FHD centrifuge. Obvious procedures are omitted. Before beginning any centrifuge maintenance, shut down, lock out, and tag out equipment.



**WARNING! HIGH VOLTAGE MAY BE PRESENT. ALWAYS OPEN FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THE EQUIPMENT, AND LOCK OUT AND TAG OUT POWER SUPPLY BEFORE PERFORMING ANY MAINTENANCE PROCEDURES.**



**WARNING! FAILURE TO WEAR SAFETY GLASSES MAY RESULT IN SERIOUS EYE INJURY OR PERMANENT LOSS OF VISION. SAFETY GLASSES MUST BE WORN AT ALL TIMES WHILE PERFORMING ANY MAINTENANCE PROCEDURE.**

### PREVENTIVE MAINTENANCE

Preventive maintenance consists of inspection, cleaning, and lubrication. These routine procedures will ensure maximum life and trouble-free operation. While the maintenance schedule presented in this section should remain flexible, modifications should be based on experience with operating the equipment at your facilities. A maintenance log should be kept to help establish a preventive maintenance schedule, as well as to monitor and adjust the schedule as necessary throughout the equipment's life.

When establishing a preventive maintenance schedule, consider duty cycle, ambient temperature, and operating environment. The recommended preventive maintenance schedule is presented in the table below. Refer to the lubrication chart on the following page for applicable lubricants and quantities.

PREVENTIVE MAINTENANCE SCHEDULE	
Action	Frequency
Inspect feed tube connection for leaks, and tighten connection clamp as required.	Each shift
Inspect liquid discharge connection for leaks. Tighten connection and/or add silicone sealant to prevent leakage.	Each shift
Grease main bearings (Figure 5-1).	One shot each shift
Grease conveyor bearings (Figure 5-1).	Every 2 weeks
Remove feed tube, clean interior of tube, and reinstall.	Weekly
Check reservoir fluid level.	Every week

## MAINTENANCE

### PREVENTIVE MAINTENANCE (CONT'D)

PREVENTIVE MAINTENANCE SCHEDULE	
Action	Frequency
Check interior and exterior of case for accumulated solids, and clean as required.	Weekly
Remove belt cover, inspect belt for damage, and check/adjust tension.	Monthly
Remove and clean flinger covers.	Monthly
Check overhung load adapter.	Every 6 months
Change filters.	Yearly

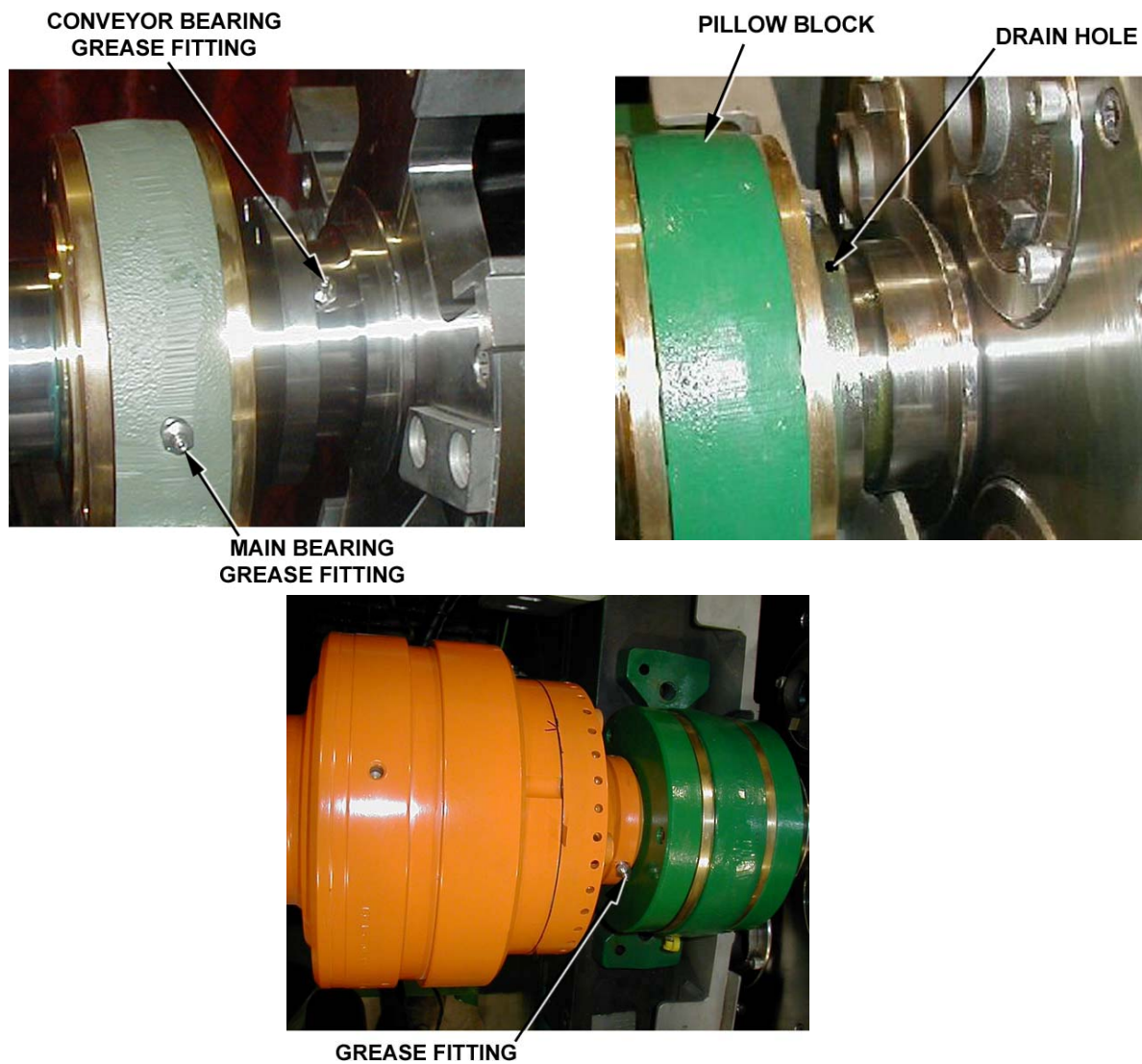


Figure 5-1 Rotating Assembly Lubrication Points




## LUBRICATION CHART

The following chart lists the Derrick-approved lubricants for the DE-1000 FHD centrifuge.

DERRICK APPROVED LUBRICANTS - DE-1000 FHD CENTRIFUGE				
Manufacturer	Product	Application	Quantity	Temp
OILS				
Texaco	Rando 68	Hydraulic System	45 Gal.	All
		Overhung Load Adapter	6.8 Oz.	All
GREASES				
Chevron	SRI NLGI 2 SRI-2	Main & Conveyor Bearings	A/R	Standard
Shell	Aeroshell 14	Main & Conveyor Bearings	A/R	Arctic
Mobil	FM 102 (Food Grade)	Conveyor Bearings Only	A/R	Standard

## DRIVE BELT REPLACEMENT

Before beginning any centrifuge maintenance, shut down, lock out, and tag out equipment. The drive belt should be replaced if inspection reveals damage or deterioration. To replace the belt, proceed as follows:

	<b>WARNING! HIGH VOLTAGE MAY BE PRESENT. ALWAYS OPEN FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THE EQUIPMENT, AND LOCK OUT AND TAG OUT POWER SUPPLY BEFORE PERFORMING ANY MAINTENANCE PROCEDURES.</b>
	<b>WARNING! REDUCE HYDRAULIC PRESSURE TO ZERO, AND LOCK OUT AND TAG OUT HYDRAULIC SYSTEM BEFORE BEGINNING ANY MAINTENANCE PROCEDURE.</b>
	<b>WARNING! FAILURE TO WEAR SAFETY GLASSES MAY RESULT IN SERIOUS EYE INJURY OR PERMANENT LOSS OF VISION. SAFETY GLASSES MUST BE WORN AT ALL TIMES WHILE PERFORMING ANY MAINTENANCE PROCEDURE.</b>

1. Loosen screws securing feed tube clamp, and slide out feed tube.
2. Remove belt guard.
3. Loosen bolts securing hydraulic motor base, slide motor base upward to loosen belt, and remove belt from sheave.
4. Check sheave parallel alignment using a straight edge. Adjust position of sheave to achieve parallel alignment within 0.0156" (0.4mm).
5. Install new belt onto hydraulic motor and overhung load adapter (OLA) sheaves.



## MAINTENANCE

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### DRIVE BELT REPLACEMENT (CONT'D)

6. Tighten motor mount adjustment bolts (Figure 5-2) to apply sufficient belt tension to permit a 5/8" (16mm) deflection when pressed at the midpoint of the belt. Correct tension will prevent slippage without overloading bearings. After correct tension is set, tighten castle nuts, insert cotter pins through adjustment bolts, and tighten motor mount bolts.
7. Install belt guard.
8. Insert feed tube into feed tube support until shoulder fully contacts support, and tighten screws to specification listed in *Hardware Torque Specifications*.

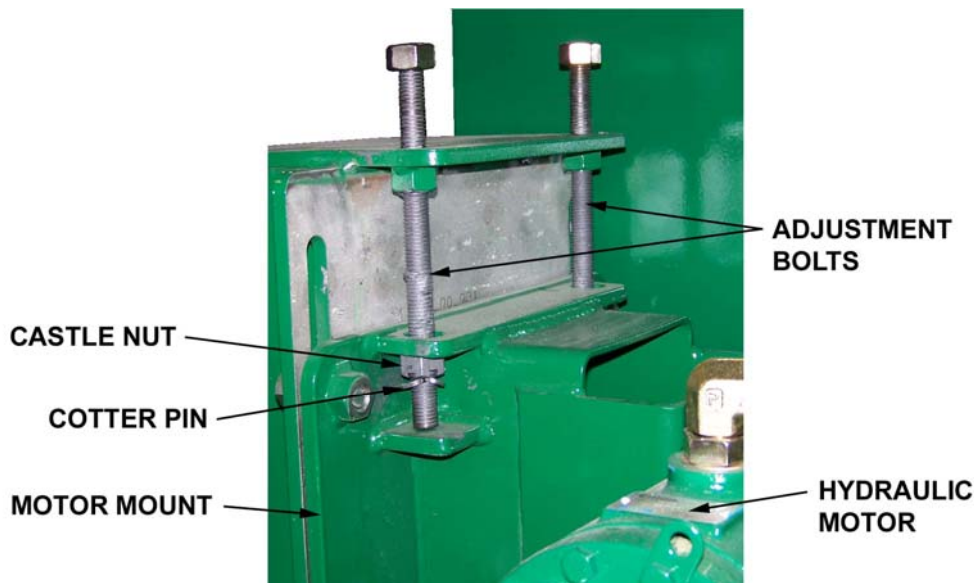


Figure 5-2 Drive Belt Tensioning

### ROTATING ASSEMBLY MAINTENANCE

Maintenance of the rotating assembly requires disassembly and can only be performed with the assembly removed from the case. After removal from the case, the rotating assembly is oriented with the solid end down and placed in the support stand to facilitate removal of the liquid bowl head and conveyor. The following paragraphs describe maintenance procedures for the rotating assembly.

#### Removal and Disassembly

1. Shut down, lock out, and tag out electric power to the centrifuge.



**WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING COVER OR REMOVING GUARDS.**

2. After bowl assembly has coasted to a full stop, loosen screws securing case cover until screws are disengaged from lower case, and raise cover.
3. Remove feed tube and drive belt.





**WARNING! DO NOT APPLY ANY LOAD TO PORT BLOCK, AS PORT BLOCK MAY BE DAMAGED BY APPLICATION OF A LOAD.**

4. Remove top cover from Rotodiff enclosure.
5. Disconnect hydraulic pressure and return hoses from Rotodiff port block and housing. Plug hose fittings and Rotodiff ports to prevent entry of contaminants.
6. Remove Rotodiff from liquid bowl head (Figure 5-3) as follows:
  - a. Scribe a line across Rotodiff and flange to ensure correct positioning upon installation. Using a 14mm hex wrench, remove six screws securing Rotodiff to flange.
  - b. To ensure correct placement of shim(s), mark location of shim(s) between flange and Rotodiff. Install two 3/8"-16 jack screws into flange clearance holes that are 180° apart. Using a 9/16" box wrench, alternately turn both jack screws a few revolutions at a time to begin separating Rotodiff from flange.
  - c. To support unit during remainder of removal procedure, place lifting strap around Rotodiff and attach strap to overhead lifting device. Fully separate unit from flange by alternately turning jack screws until unit is fully detached.
  - d. With Rotodiff supported by lifting strap and overhead lifting device, **CAREFULLY** slide unit outward until free of splined shaft. Place Rotodiff in a plastic bag to prevent contamination.
7. Tighten nuts on pillow block alignment pins to jack out pins, and remove pins.
8. Remove bolts securing pillow blocks to base mounting pads.
9. Attach lifting straps at two locations on rotating assembly and, using a hoist capable of supporting at least 2000 pounds (910kg), lift and remove rotating assembly from case.

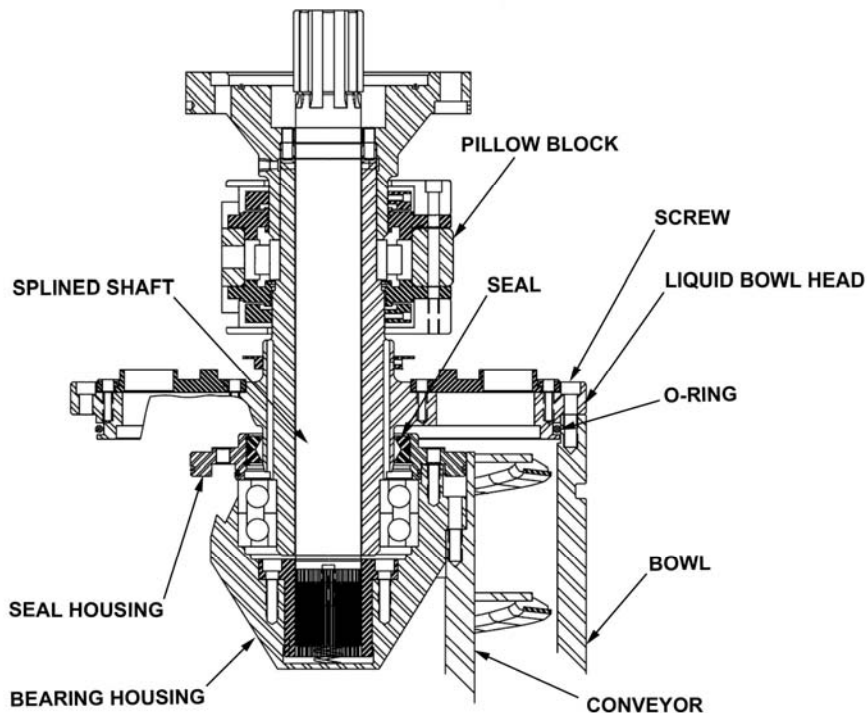


**Figure 5-3 Rotodiff Removal**

### Removal and Disassembly (Cont'd)

10. Remove liquid bowl head assembly as follows:

- a. Hoist and orient rotating assembly vertically with solid end down, and insert end into slot in vertical stand (Figure 5-4) while continuing to support weight with the hoist.
- b. Record locations of alignment marks on liquid bowl head to ensure proper orientation during reassembly.
- c. Remove 12 screws securing liquid bowl head to bowl assembly.
- d. Thread four 3/8"-16 jack screws into bowl head, and tighten evenly until head has separated from bowl.
- e. Attach a second hoist to Rotodiff flange, and lift bowl head off rotating assembly with pillow block and splined shaft attached.
- f. If bowl head does not separate from rotating assembly, lower head down until just enough space remains to insert a pry bar. Carefully pry bowl head evenly until it releases from rotating assembly. Lift and remove bowl head.

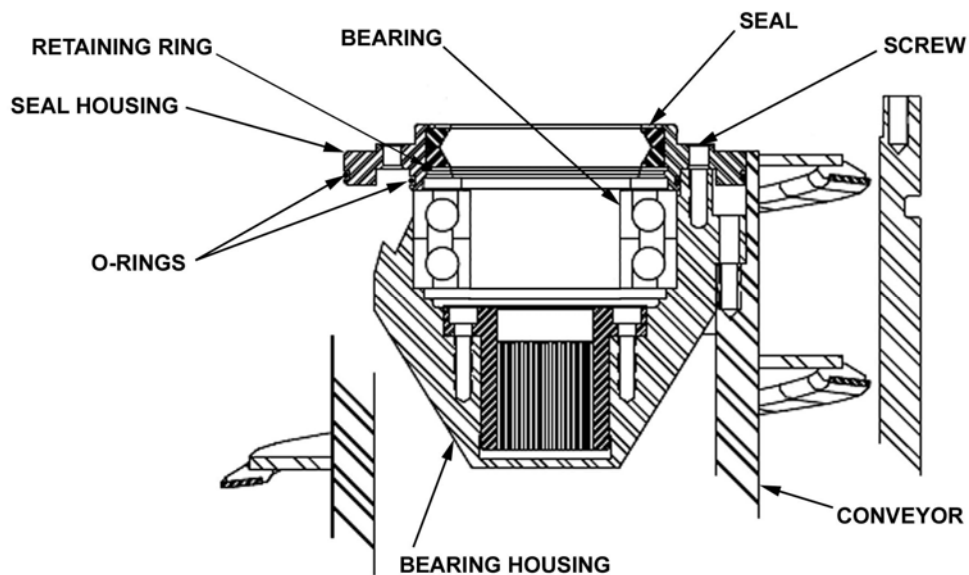


**Figure 5-4 Liquid Bowl Head Removal**

11. Remove conveyor assembly as follows:

- a. Remove four screws securing liquid end seal housing to conveyor (Figure 5-5), and separate seal housing from bearing housing using jack screws. Remove seal housing and discard seal.

- b. Position vertical lifting bracket on conveyor, and secure with four screws.



**Figure 5-5 Liquid End Seal Housing Removal**

- c. Attach a hoist capable of lifting at least 750 pounds (340kg) to vertical lifting bracket.
- d. Slowly lift conveyor from bowl assembly, using care to avoid allowing conveyor to contact interior of bowl.
- e. Orient conveyor horizontally, and place on a support that does not contact tiles.

### Cleaning, Inspection, and Repair

After removing and disassembling rotating assembly, clean, inspect, and repair as follows:

1. Wash off mud and debris from conveyor and interior and exterior of bowl assembly.
2. Inspect conveyor for missing tiles, distorted or gouged flights, burrs, or other obvious damage. Replace conveyor if serious defects are found.
3. Inspect conveyor feed nozzles for obvious wear. Rotate 180 degrees and reinstall if damage is apparent but not severe. Replace nozzles if found highly damaged. To help preserve dynamic balance, always replace nozzles in pairs that are opposite to each other.
4. Inspect feed accelerator inside conveyor for gouges, fractures, or distortion. If replacement is required, remove three set screws securing feed accelerator and tap from the solid end to remove accelerator.
5. Inspect solids discharge wear inserts on bowl assembly for cracks, fractures, or other damage, and replace if seriously damaged.
6. Inspect bowl interior and exterior for gouges, scratches, or other damage that may affect performance.
7. Check pillow block bearings and conveyor bearings for looseness, noise, or rubbing. Replace any defective bearings in accordance with bearing replacement procedures in this section.

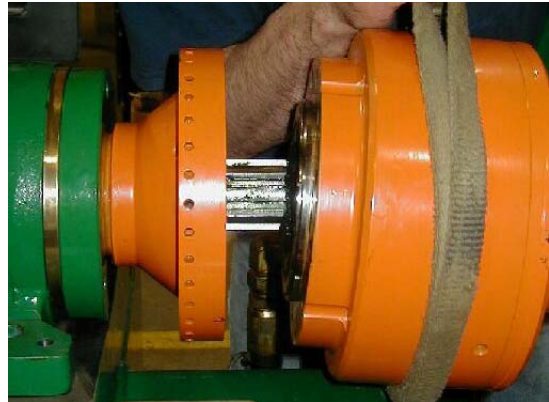
### Reassembly and Installation

Reassembly and installation of the rotating assembly are basically the reverse of removal.

1. Prepare and install conveyor into bowl assembly as follows:
  - a. Apply a light coat of grease to bearing seat and seal surfaces of conveyor to facilitate installation.
  - b. With bowl in vertical position on vertical stand, hoist conveyor above bowl and carefully lower into bowl.
  - c. Remove vertical lifting bracket from conveyor.
  - d. Install new seal in seal housing (Figure 5-5), apply light coat of grease to seal, and install seal housing onto bearing housing. Apply anti-seize compound to screws, insert screws through holes of seal housing, and tighten into bearing housing in accordance with *Hardware Torque Specifications*.
2. Install liquid bowl head assembly onto bowl.
3. Remove all nicks and/or burrs from pillow blocks and mating surfaces. Clean all surfaces of any protective coating applied after removal.
4. Reinstall shims in proper locations, as noted during removal.
5. Clean alignment pins before reinstalling, and apply anti-seize compound.
6. Orient rotating assembly to horizontal position, and carefully lower into case until about 1/2" (13mm) above base.
7. Insert bolts through pillow blocks, and start threads into base. Do not tighten bolts.
8. Lower rotating assembly fully onto base.
9. Insert alignment pins through pillow blocks, and lightly tap into holes to fully align pillow blocks with base mounting holes.
10. Tighten bolts in accordance with applicable specification in *Hardware Torque Specifications* to secure pillow blocks to base.

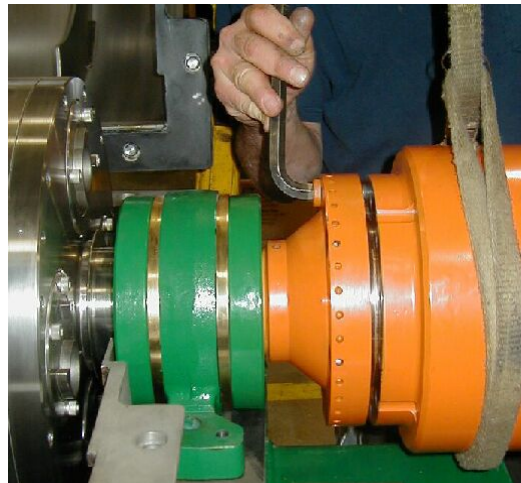
11. Install Rotodiff as follows:

- a. Insert new O-ring into groove in face of Rotodiff, and apply grease to shaft to facilitate installation. Place lifting strap on Rotodiff, and, using an overhead lifting device **CAREFULLY** lift and position Rotodiff to engage splined shaft with internal spline of Rotodiff.



- b. Insert six new hex head screws through Rotodiff flange and into threaded mounting holes of Rotodiff. Alternately turn each screw a few revolutions at a time to evenly draw the Rotodiff and flange together.

**Tighten the mounting screws using a star pattern typical for circular bolt patterns. Refer to *Hardware Torque Specifications* for torque values.**



12. Inject grease into conveyor bearing until grease escapes from drain hole located between pillow block and liquid bowl head. Wipe off surplus grease, and distribute grease by rotating liquid bowl head one revolution clockwise and then one revolution counterclockwise.
13. Unplug and connect hydraulic hoses to their respective ports on Rotodiff port block and housing.



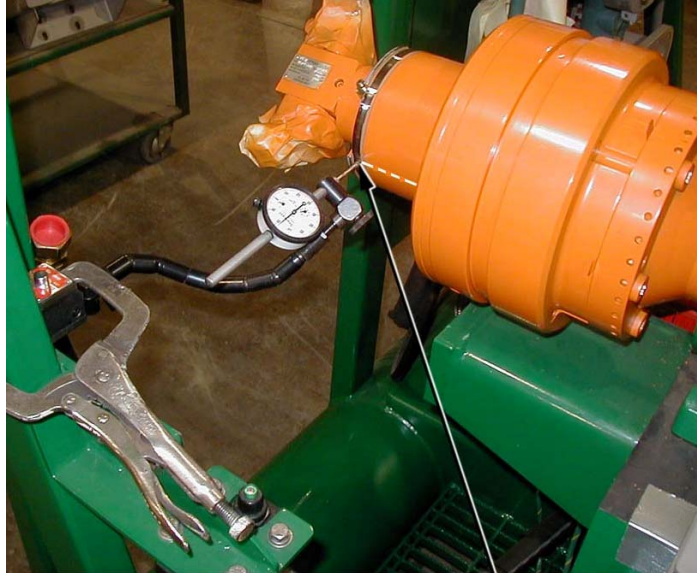
## MAINTENANCE

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### Reassembly and Installation (Cont'd)

14. Check and adjust runout of outside diameter of Rotodiff as described in the steps below. Axial runout may not exceed 0.002" (0.05mm) total indicator reading (TIR). To measure and adjust runout, proceed as follows:

- a. Clean surface of Rotodiff where dial indicator plunger will make contact.
- b. Install indicator holder with magnetic base in either position shown.
- c. Position plunger of dial indicator into contact with outside diameter at horizontal centerline of Rotodiff.
- d. Manually rotate the Rotodiff until dial indicator is at its lowest reading, and zero out dial indicator.

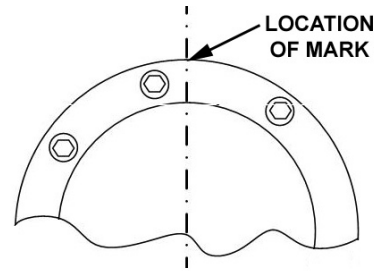


PLUNGER POSITIONED AT  
HORIZONTAL CENTERLINE  
OF ROTODIFF

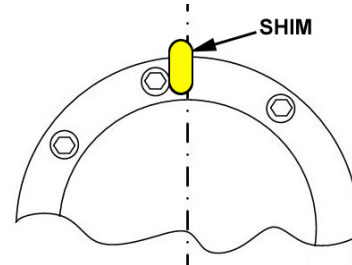
- e. Manually rotate the Rotodiff until reading on dial indicator is highest; mark across Rotodiff and flange along axial centerline where surfaces mate.



- f. Manually rotate Rotodiff until mark made in step e is at top.
- g. Loosen hex head screw closest to mark as well as both screws to each side of the mark.



- h. Insert shim having approximate thickness of dial indicator measurement between flange and Rotodiff. Shim should barely contact threads of screw hole closest to mark made in step e.



- i. Tighten screws loosened in step g.
- j. Repeat steps d through i, if required, until TIR does not exceed 0.002" (0.05mm).
- k. Trim projecting shim stock.

15. After completing Rotodiff installation, install top cover over Rotodiff.

16. Install drive belt, and apply adequate tension to prevent slippage.

17. Install feed tube and secure in its support.

18. Close cover, and secure by tightening screws.

## MAIN BEARING REPLACEMENT

This procedure describes replacement of the main bearings installed in the pillow blocks. Refer to *Tools and Equipment* for tools used in the removal and installation procedures.

Excessive noise or vibration during centrifuge operation may indicate defective bearings. If such conditions are evident, the bearings should be inspected for looseness and replaced if necessary.

Bearing replacement must be performed by properly trained and qualified personnel. To prevent contamination of the new bearings and internal components of the centrifuge, the replacement procedure must be performed in a clean environment.

The ends of the rotating assembly are supported by roller bearings fitted within pillow blocks. Components on each side of the pillow block form a labyrinth grease cavity, which prevents contaminants from entering. The roller bearing has a separate inner race, which must be removed from the bowl head shaft following removal of the bearing.

The pillow block bearings must be replaced as a set. Consequently, if one bearing is found defective, always replace both bearings.

## MAINTENANCE

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### Liquid End Bearing

#### Removal



**WARNING! TO AVOID SERIOUS PERSONAL INJURY BE SURE EQUIPMENT IS LOCKED OUT, TAGGED OUT, DE-ENERGIZED, AND HAS STOPPED ROTATING BEFORE PERFORMING MAINTENANCE AND/OR ADJUSTMENTS.**

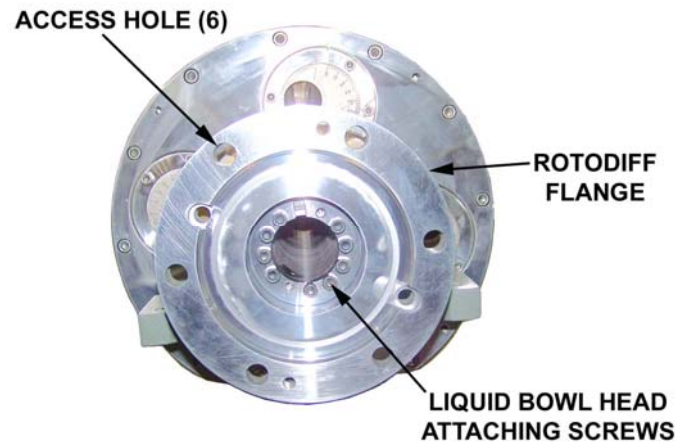
1. Shut down, lock out, and tag out electric power to the centrifuge. Allow rotating assembly to coast to a full stop.
2. Open case cover, and remove screws securing pillow blocks at liquid and solid ends to case.
3. Using a suitable hoist, lift rotating assembly to separate pillow blocks from bottom of case leaving sufficient clearance to permit removal of pillow blocks.
4. Remove Rotodiff from liquid bowl head (Figure 5-6) as follows:
  - a. Scribe a line across Rotodiff and flange to ensure correct positioning upon installation. Using a 14mm hex wrench, remove six screws securing Rotodiff to flange.
  - b. To ensure correct placement of shim(s), mark location of shim(s) between flange and Rotodiff. Install two 3/8"-16 jack screws into flange clearance holes that are 180° apart. Using a 9/16" box wrench, alternately turn both jack screws a few revolutions at a time to begin separating Rotodiff from flange.
  - c. To support unit during remainder of removal procedure, place lifting strap around Rotodiff and attach strap to overhead lifting device. Fully separate unit from flange by alternately turning jack screws until unit is fully detached.
  - d. With Rotodiff supported by lifting strap and overhead lifting device, **CAREFULLY** slide unit outward until free of splined shaft. Place Rotodiff in a plastic bag to prevent contamination.



**Figure 5-6 Rotodiff Removal**

5. Turn flange (Figure 5-7) until large access holes in flange align with retaining screws for outboard flinger cover. Remove screws securing outboard flinger cover to pillow block, and lift and remove flinger cover.
6. Remove screws securing flange to liquid bowl head, and loosen set screw securing flange to liquid bowl head.





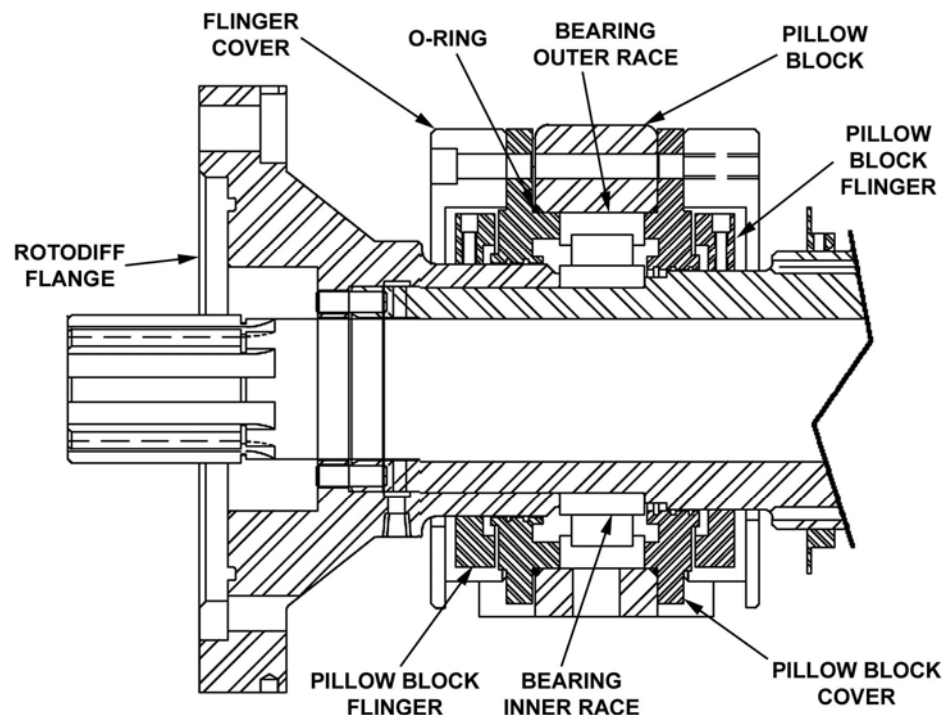
**Figure 5-7 Rotodiff Flange Attachment**

7. Thread two jack screws into flange, and alternately turn each screw a few turns at a time until flange is separated from liquid bowl head; then grasp flange, and pull from liquid bowl head.



**Note! Outboard flinger will remain attached to flange.**

8. Remove flathead screws securing outboard pillow block cover (Figure 5-8) to pillow block, and remove cover. Separate O-ring from pillow block cover and discard O-ring.



**Figure 5-8 Liquid End Main Bearing Installation**

## MAINTENANCE

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### **Removal (Cont'd)**

9. Remove flat head screws securing inboard pillow block cover to pillow block, and slide pillow block and bearing outer race and rollers off liquid bowl head.
10. Loosen set screw securing inboard flinger to liquid bowl head.
11. Using a suitable puller, and extreme care to avoid damaging bearing seat or shoulder on liquid bowl head, remove bearing inner race from bowl head. Discard inner race.
12. Slide inboard pillow block cover and flinger off bowl head. Separate O-ring from pillow block cover and discard O-ring.
13. Using a suitable puller, remove bearing outer race and rollers from pillow block. Discard outer race and rollers.

### **Cleaning, Inspection, and Repair**

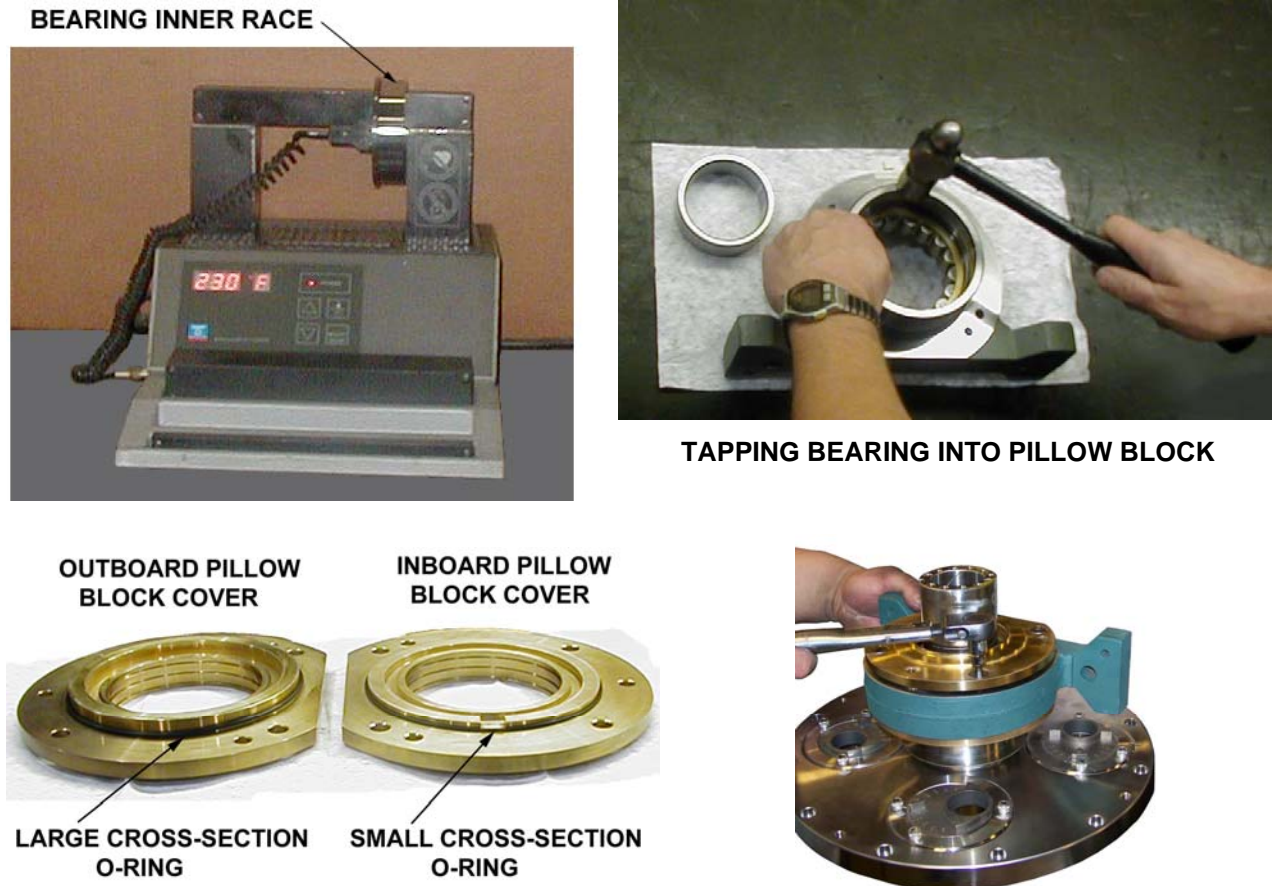
1. Clean all components with a suitable cleaner/degreasing agent, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. Inspect bowl heads for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace bowl head if shaft is obviously deformed or serious flaws are found that render the bowl head unserviceable.
3. Test fit a new bearing inner race on the main bearing journals of both bowl heads. If the journal is undersize, the inner race will slide easily onto the journal. Replace the bowl head if journal is undersize.
4. Inspect pillow block covers, flingers, and flinger covers for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects.
5. Replace any component that cannot be easily repaired. Replace all O-rings, seals, and bearings.
6. Place all cleaned components in clean plastic bags to prevent contamination.

### **Installation**



**WARNING! IN THE FOLLOWING STEP, USE EITHER A BEARING HEATER OR A CLEAN HEATED OIL BATH TO HEAT BEARING INNER RACE. DO NOT USE A TORCH, AS THIS WILL DAMAGE THE BEARING.**

1. Place inner race of liquid end bearing in a bearing heater (Figure 5-9) or clean heated oil bath, and heat to approximately 230°F (110°C). Do not use a torch to heat inner race, as this will damage the race.
2. Wearing insulated gloves, remove heated inner race from bearing heater, and immediately slide onto bearing journal until seated against bowl head shoulder. Allow inner race to cool until unmovable on liquid bowl head.
3. Slide inboard pillow block flinger onto shaft (Figure 5-8), followed by pillow block cover. Do not tighten flinger set screw at this time.
4. Position bearing outer race and rollers into chamfer of pillow block. Using a suitable tool that contacts only the outer bearing race, carefully tap outer race into pillow block until about 1/8" (3mm) below the surface of the pillow block.



**Figure 5-9 Main Bearing Installation Details**

5. Install new O-ring against shoulder of inboard pillow block cover, and slide pillow block cover onto shaft.
6. Apply sufficient quantity of the bearing grease listed in customer specification to completely cover bearing rollers.
7. Slide assembled pillow block and bearing outer race onto inner race previously installed on bearing journal.
8. Install new O-ring against shoulder of outboard pillow block cover, slide pillow block cover onto shaft, and rest against pillow block.
9. Orient inboard pillow block cover so that flat edge is aligned with bottom of pillow block.
10. Apply anti-seize compound to four flat head screws, and install screws to secure inboard pillow block cover to pillow block. Tighten screws in accordance with *Hardware Torque Specifications*.
11. Orient outboard pillow block cover so that flat edge is aligned with bottom of pillow block.
12. Apply anti-seize compound to four flat head screws, and install screws to secure outboard pillow block cover to pillow block and draw bearing into proper position within pillow block. Tighten screws in accordance with *Hardware Torque Specifications*.
13. Slide outboard bearing flinger onto Rotodiff flange, but do not tighten screw.

## MAINTENANCE

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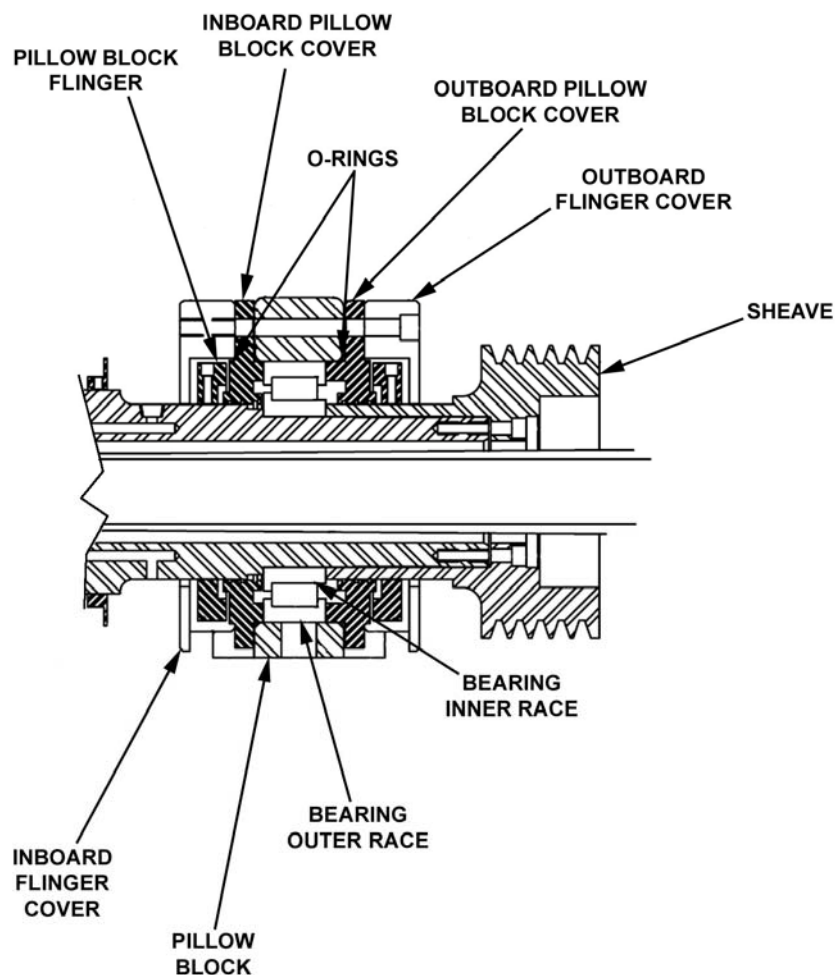
### ***Installation (Cont'd)***

14. Apply a light coat of grease to surface of bowl shaft where Rotodiff flange mounts.
15. Heat flange to 200°F (93°C). While handling with insulated gloves, orient notch in flange with key on liquid bowl head shaft and install flange on shaft. Tighten set screw to secure flange.
16. Slide inboard and outboard pillow block flingers close to pillow block covers, leaving about 1/16" (1.6mm) clearance, and tighten set screws on both flingers.
17. Install flinger covers, and secure with screws.
18. Using lifting strap and overhead lifting device, orient Rotodiff with lines scribed during removal aligned, and slide Rotodiff onto splined shaft. Insert screws through flange and into Rotodiff, insert shims at locations marked during removal, and tighten screws.

## **Solid End Bearing**

### ***Removal***

1. Remove screws securing inboard and outboard flinger covers (Figure 5-10) to pillow block, and lift and remove inboard flinger cover.



**Figure 5-10 Solid End Main Bearing Installation**

2. Record alignment marks on sheave, and then remove screws securing sheave to solid bowl head.
3. Thread two jack screws into sheave, and alternately turn each screw a few turns at a time until sheave is separated from solid bowl head; remove sheave and outboard flinger cover.
4. Grasp sheave, and pull from solid bowl head.



**Note! Outboard flinger will remain attached to sheave.**

5. Remove flathead screws securing outboard pillow block cover to pillow block, and remove cover. Separate O-ring from pillow block cover and discard O-ring.
6. Remove flat head screws securing inboard pillow block cover to pillow block, and slide pillow block and bearing outer race and rollers off solids bowl head.
7. Loosen set screw securing inboard flinger to solid bowl head.
8. Using a suitable puller and extreme care to avoid damaging bearing seat or shoulder on solid bowl head, remove bearing inner race from bowl head. Discard inner race.
9. Slide inboard pillow block cover and flinger off bowl head. Separate O-ring from pillow block cover and discard O-ring.
10. Using a suitable puller, remove bearing outer race and rollers from pillow block. Discard outer race and rollers.

### ***Cleaning, Inspection, and Repair***

1. Clean all components with a suitable cleaner/degreasing agent, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. Inspect bowl heads for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace bowl head if shaft is obviously deformed or serious flaws are found that render the bowl head unserviceable.
3. Test fit a new bearing inner race on the main bearing journals of both bowl heads. If the journal is undersize, the inner race will slide easily onto the journal. Replace the bowl head if journal is undersize.
4. Inspect pillow block covers, flingers, and flinger covers for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects.
5. Replace any component that cannot be easily repaired. Replace all O-rings, seals, and bearings.
6. Place all cleaned components in clean plastic bags to prevent contamination.

### ***Installation***



**WARNING! IN THE FOLLOWING STEP, USE EITHER A BEARING HEATER OR A CLEAN HEATED OIL BATH TO HEAT BEARING INNER RACE. DO NOT USE A TORCH, AS THIS WILL DAMAGE THE BEARING.**

## MAINTENANCE

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### ***Installation (Cont'd)***

1. Place bearing inner race in a bearing heater (Figure 5-9) or heated clean oil bath, and heat to approximately 230°F (110°C). Do not use a torch to heat the inner race, as this will damage the race.
2. Wearing insulated gloves, remove heated inner race from bearing heater, and immediately slide onto bearing journal until seated against bowl head shoulder. Allow inner race to cool until unmovable on solid bowl head.
3. Slide inboard pillow block flinger onto shaft, followed by pillow block cover. Do not tighten flinger set screw at this time.
4. Position bearing outer race and rollers into chamfer of pillow block. Using a suitable tool that contacts only the outer bearing race, carefully tap outer race into pillow block until about 1/8" (3mm) below the surface of the pillow block.
5. Install new small cross-section O-ring against shoulder of inboard pillow block cover, and slide pillow block cover onto shaft.
6. Apply sufficient quantity of bearing grease listed in customer specification to completely cover bearing rollers.
7. Slide assembled pillow block and bearing outer race onto inner race previously installed on bearing journal.
8. Install new large cross-section O-ring against shoulder of outboard pillow block cover, slide pillow block cover onto shaft, and rest against pillow block.
9. Orient inboard pillow block cover so that flat edge is aligned with bottom of pillow block.
10. Apply anti-seize compound to four flat head screws, and install screws to secure inboard pillow block cover to pillow block. Tighten screws in accordance with *Hardware Torque Specifications*.
11. Orient outboard pillow block cover so that flat edge is aligned with bottom of pillow block.
12. Apply anti-seize compound to four flat head screws, and install screws to secure outboard pillow block cover to pillow block and draw bearing into proper position within pillow block. Tighten screws in accordance with *Hardware Torque Specifications*.
13. Slide outboard bearing flinger onto sheave, but leave screw loose.
14. Apply a light coat of grease to surface of bowl shaft where sheave mounts.
15. Heat sheave to 200°F (93°C). While handling with insulated gloves, orient notch in sheave with key on solid bowl head shaft and install sheave on shaft. Secure sheave with screws.
16. Slide inboard and outboard pillow block flingers close to pillow block covers, leaving about 1/16" (2mm) clearance, and tighten set screws on both flingers.
17. Install flinger covers, and secure screws.
18. Operate hoist to lower rotating assembly into centrifuge until pillow blocks contact base.
19. Insert alignment pins into pillow block alignment holes, and insert bolts. Remove alignment pins, and tighten pillow block bolts in accordance with *Hardware Torque Specifications*.



## CONVEYOR BEARING REPLACEMENT

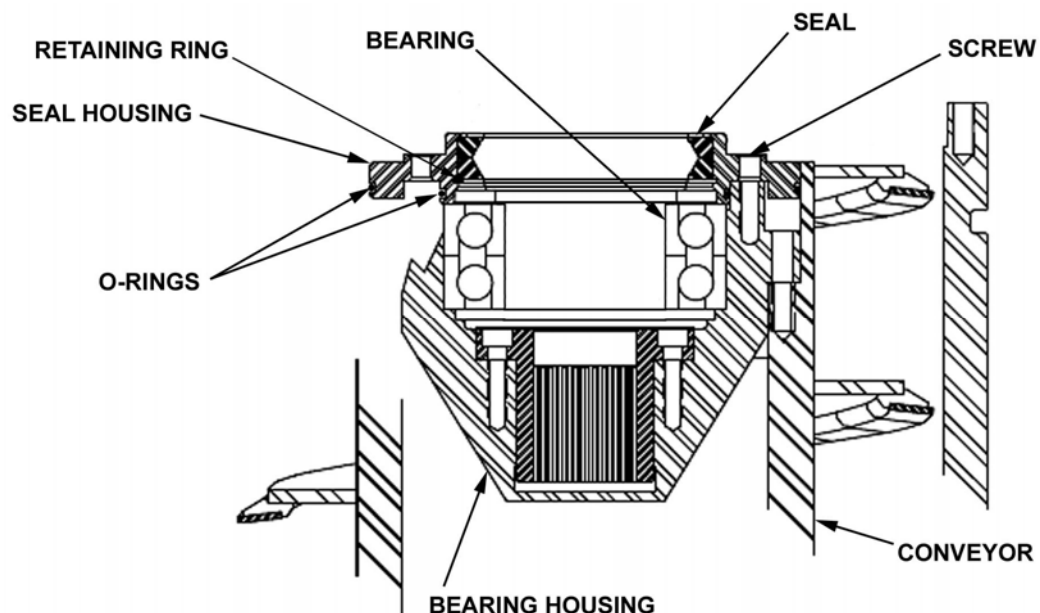
This procedure requires removal of the conveyor assembly from the bowl assembly. Conveyor bearing replacement must be performed in a clean environment by trained, qualified personnel.

If the conveyor bearings are found to be defective, it is likely that the conveyor will require complete overhaul. Consequently, all parts should be carefully inspected, and fits and clearances should be measured to determine the suitability of parts for re-use.

### Liquid End Thrust Bearings

The liquid end contains two thrust bearings; a single ball bearing is installed at the solid end. Replace all conveyor bearings as a set if excessive vibration, end play, or radial looseness is found.

1. Remove conveyor from rotating assembly in accordance with *Preventive Maintenance* if not already done.
2. With conveyor supported, remove screws securing lifting bracket to conveyor and remove lifting bracket.
3. Remove liquid end thrust bearings as follows:
  - a. Remove screws securing liquid end seal housing (Figure 5-11) to bearing housing, and remove seal housing. Remove and discard O-rings installed in external grooves of seal housing.
  - b. Using a suitable hammer-type puller, extract both thrust bearings from liquid end bearing housing. Discard bearings.
  - c. Remove retaining ring securing seal in seal housing, and remove and discard seal.



**Figure 5-11 Liquid End Conveyor Thrust Bearings Installation**

## MAINTENANCE

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### ***Cleaning, Inspection, and Repair***

1. Clean all components with a suitable cleaner/degreasing agent, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. Inspect bowl head shafts for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace bowl head if shaft is obviously deformed or serious flaws are found that render the bowl head unserviceable.
3. Inspect bearing and seal housings for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects.
4. Check that solid bowl head wave spring has retained its tension. Replace if damaged or tension is insufficient.
5. Replace any component found having damage that cannot be easily repaired. Replace all seals, O-rings, and bearings.
6. Test fit a new bearing inner race in the bearing housing of both bowl heads. If the bore is undersize, the outer race will slide easily into the bore. Replace the bearing housing(s) if bore is found loose.
7. Place all cleaned components in clean plastic bags to prevent contamination.

### ***Installation***

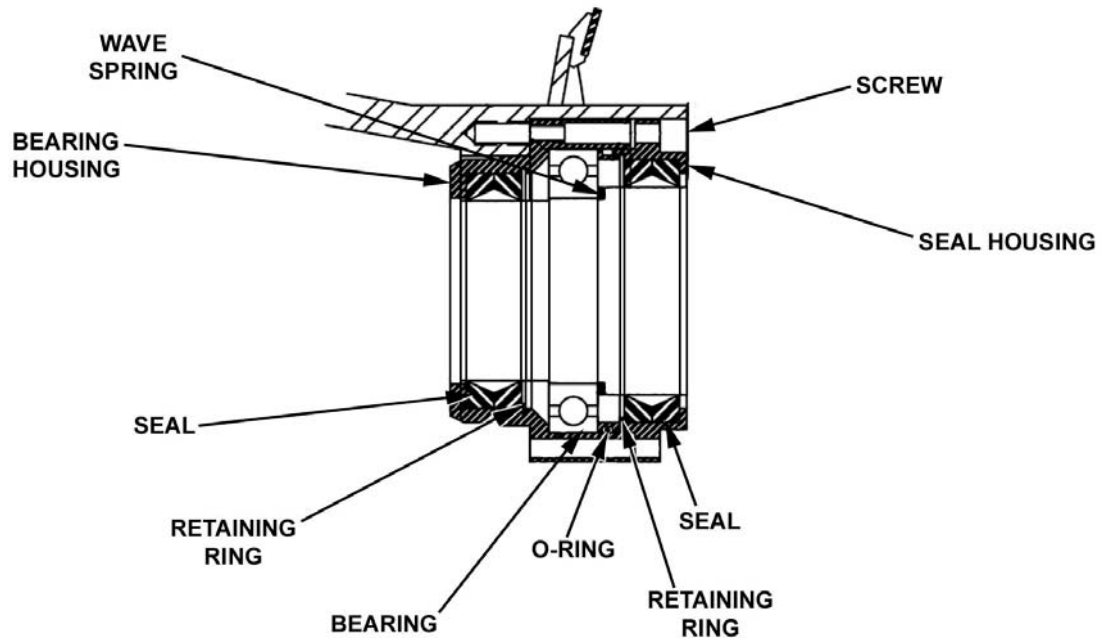
1. Insert new seal into liquid end seal housing (Figure 5-11), and secure with retaining ring. Install new O-rings in external grooves of seal housing.
2. Place one new thrust bearing on bore of bearing housing and, using a suitable tool, tap bearing evenly into place against shoulder of bearing housing. Orient second thrust bearing with part number up to facilitate identification, and install into housing on top of previous bearing.
3. Install new O-rings into external grooves of seal housing.
4. Position seal housing on bearing housing, and secure with screws. Tighten screws in accordance with *Hardware Torque Specifications*.
5. Replace solid end bearing in accordance with the following procedure. Re-install conveyor after completing replacement of both bearings and all conveyor repairs.

## **Solid End Bearing**

### ***Removal***

1. Remove conveyor from rotating assembly in accordance with *Rotating Assembly Maintenance* if not previously done.
2. Remove screws securing seal housing and bearing housing (Figure 5-12) to conveyor, and remove seal housing and bearing housing. Separate seal housing from bearing housing.
3. Remove retaining ring securing seal within seal housing. Remove and discard seal and O-ring from seal housing.
4. Extract bearing from bearing housing, and discard bearing.
5. Remove retaining ring securing seal within bearing housing, and remove and discard seal.
6. Remove wave spring from solid bowl head shaft.





**Figure 5-12 Solid End Conveyor Bearing Installation**

***Cleaning, Inspection, and Repair***

1. Clean all components with a suitable cleaner/degreasing agent, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. Inspect bowl head shafts for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace bowl head if shaft is obviously deformed or serious flaws are found that render the bowl head unserviceable.
3. Inspect bearing and seal housings for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects.
4. Check that solid bowl head wave spring has retained its tension. Replace if damaged or tension is insufficient.
5. Replace any component having damage that cannot be easily repaired. Replace all seals, O-rings, and bearings.
6. Test fit a new bearing inner race in the bearing housing of both bowl heads. If the bore is undersize, the outer race will slide easily into the bore. Replace the bearing housing(s) if bore is found loose.
7. Place all cleaned components in clean plastic bags to prevent contamination.

## MAINTENANCE

### Installation

1. Insert new seal into seal housing (Figure 5-12), and secure with retaining ring.
2. Install new O-ring into external groove of seal housing.
3. Insert new seal into bearing housing, and secure with retaining ring.
4. Insert new bearing into bearing housing, fully seat against shoulder, and place wave spring on top of bearing.
5. Insert bearing housing into conveyor opening, place seal housing over bearing housing, and secure both housings to conveyor with screws. Tighten screws in accordance with *Hardware Torque Specifications*.
6. Re-install conveyor in bowl assembly, and install bowl assembly on centrifuge in accordance with *Preventive Maintenance*.

## HYDRAULIC COMPONENT MAINTENANCE

Following is a list of hydraulic components installed on the centrifuge. If detailed maintenance and/or parts information is required for any of these components, consult the manufacturers and/or their websites for available documentation.

Component	Description
Hydraulic Pump	Eaton Hydrostatic Pump, Series 1, Models 33-64
Hydraulic Pump	Eaton Hydrostatic Variable Pump, Series 1, Models 33-64
Hydraulic Pump	Eaton Medium Duty Piston Pump, Model 70523 or 70553
Rotodiff	Viscotherm Rotodiff 1071 S-GVL/VO

## TOOL LIST

The following tool list includes all tools and equipment supplied to facilitate maintenance of the centrifuge. Each component is listed with its part number, quantity supplied, and use or application.

DE-1000 FHD CENTRIFUGE TOOL LIST		
Part No.	Description / Application	Qty
Allen-33212	Long-Arm Allen Wrenches, 3/32" to 1/2" <i>Various rotating assembly hardware</i>	1
Allen-14MM	Allen Wrench, 14MM <i>Various rotating assembly hardware</i>	1
OTC-1039	Bearing Puller, 2-Jaw, 10" Reach, 0" to 12" Spread <i>Remove main bearing inner race from liquid bowl head shaft</i>	1
G0008667	Socket, 15/16", 1/2" Drive <i>Remove and install pillow block bolts</i>	1
G0004178	Hex Head Jack Bolt, 3/8-16 x 2-1/2" Long <i>Separate Rotodiff from flange</i>	2

<b>DE-1000 FHD CENTRIFUGE TOOL LIST</b>		
<b>Part No.</b>	<b>Description / Application</b>	<b>Qty</b>
HXCBF31-18X400	Hex Head Jack Bolt, 5/16-18 x 4" Long <i>Separate conveyor bearing housing from liquid end bowl head shaft</i>	4
HXCBF38-16X400	Hex Head Jack Bolt, 3/8-16 x 4" Long <i>Separate conveyor bearing housing from solid end bowl head shaft</i>	4
10792-00	Vertical Lifting Bracket <i>Lift solid end bowl head and conveyor from bowl assembly</i>	1
10791-00	Vertical Stand <i>Support bowl assembly vertically during maintenance</i>	1
SKCS-38-16x175	Socket Hd Cap Screw, 3/8-16 x 1-3/4" <i>Attach vertical lifting bracket to Rotodiff flange</i>	4
RED-B150X125	Bushing, Hex, 1-1/4" x 1-1/2" <i>Reduce opening of feed tube</i>	1
CHE-SRI-2	Grease, Standard* <i>Lubricate main bearings and Rotodiff spline</i>	1
Aeroshell GR-14	Grease, Arctic* <i>Lubricate main bearings and Rotodiff spline</i>	1
EYE-S38-16X125Z	Eye Bolt, 5/16-18 x 1-1/8" <i>Lift rotating assembly by Rotodiff flange</i>	2
PP1122	Rotodiff Wrench <i>Reverse direction of rotation to free locked conveyor</i>	1
PP1127	Grease Gun, 1/2" Dia. Hose, 14.5 Oz. <i>Inject grease into Rotodiff and main bearing fittings</i>	2

\* Appropriate grease supplied per climate and customer requirements

## HARDWARE TORQUE SPECIFICATIONS

Use only hardware that is approved by Derrick Corporation. The use of potentially inferior, non-Derrick approved hardware may result in serious injury to personnel and/or damage to equipment. Additionally, any warranty in force, whether written or implied, may be voided by use of unapproved hardware. Contact Derrick Corporation with questions pertaining to hardware type and usage associated with Derrick centrifuges.



**WARNING! USE OF INFERIOR, NON-DERRICK APPROVED HARDWARE MAY RESULT IN SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.**

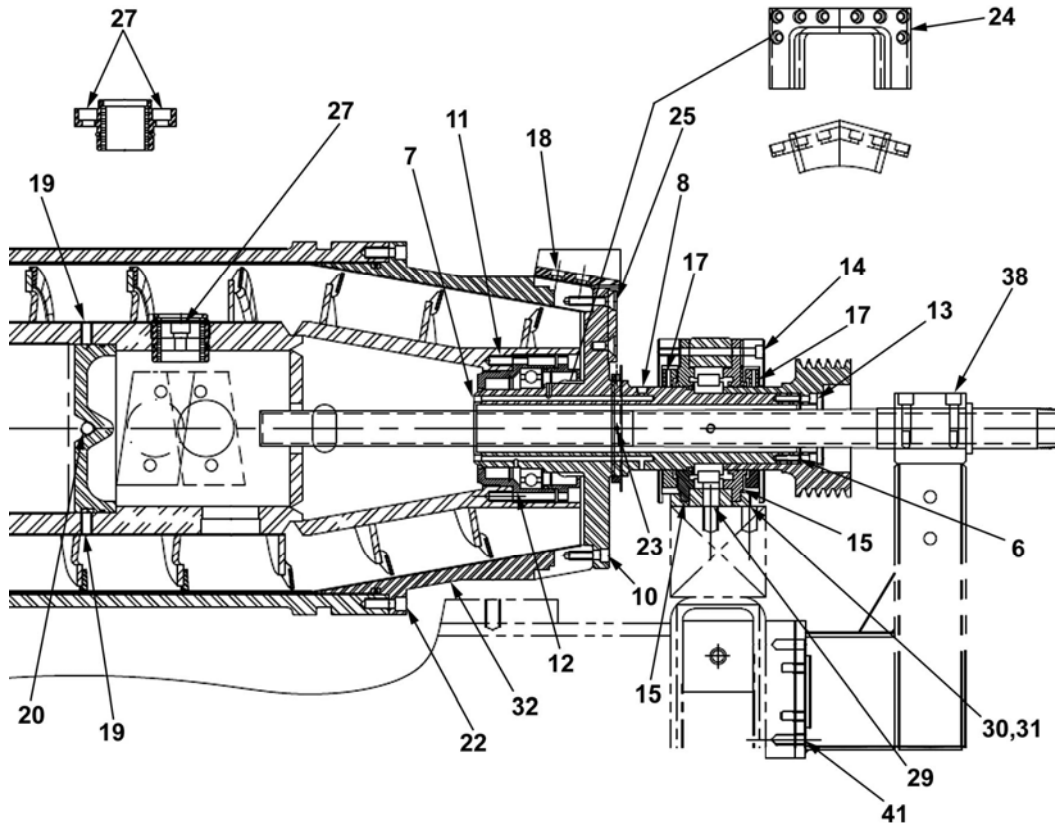
Recommended seating torque specifications, lubricants, and other hardware installation specifications for the various types and sizes of hardware used on the centrifuge are shown and described in the following tables.

## MAINTENANCE

### HARDWARE TORQUE SPECIFICATIONS (CONT'D)

Use the following procedure when tightening hardware:

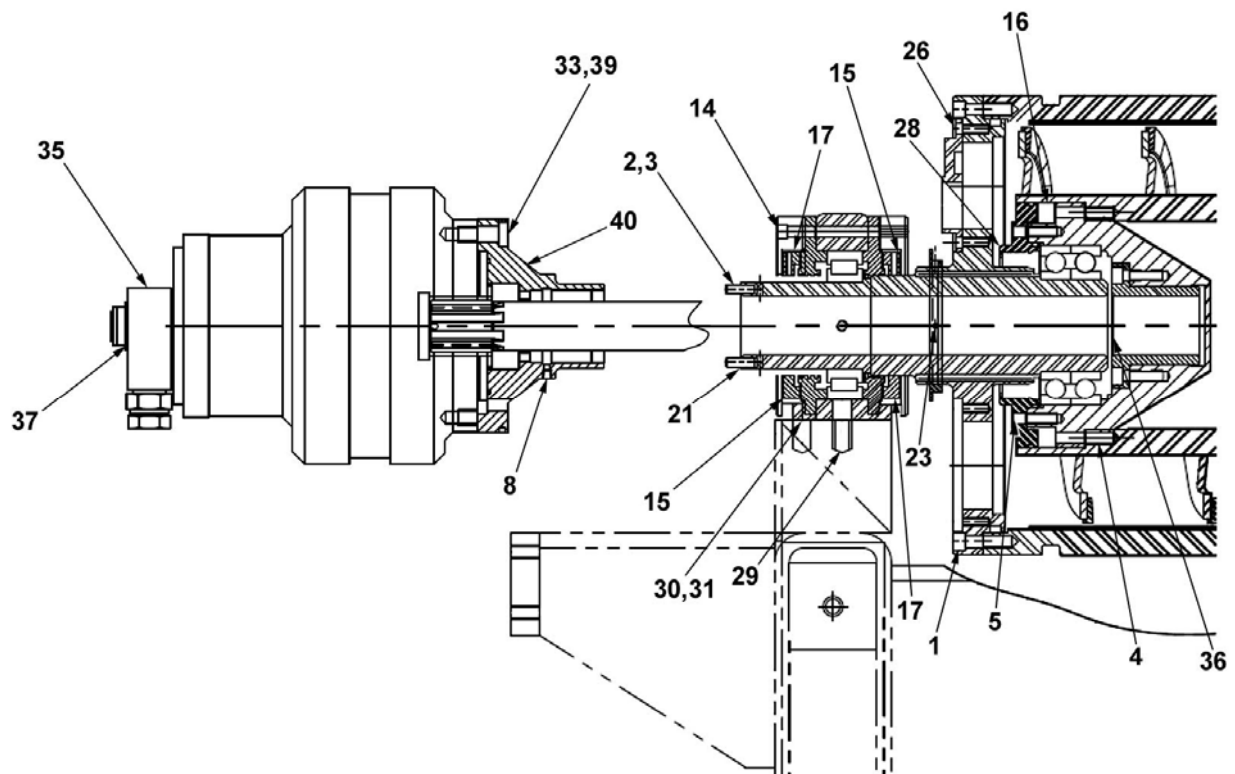
1. Use only a calibrated torque wrench.
2. Apply specified lubricant to hardware before installing.
3. When tightening more than one bolt, alternate tightening between bolts.
4. Always approach the final torque in several stages.



### SOLID END HARDWARE LOCATIONS

SOLID END HARDWARE TORQUE SPECIFICATIONS					
No.	Description	Qty	Lubricant	Torque	Location
6	1/4 x 1-1/4 Pin	4	Loctite 680	N/A	Solid End Bowl Head
7	5/16-18 x 1/2 Set Screw	2	Loctite 262	N/A	Solid End Bowl Head
8	1/8 NPT x 3/4 Grease Fitting	2	N/A	N/A	Solid End Bowl Head
10	3/8-16 x 1 Hx Skt Hd	8	Anti-Seize	252 in lb/28.5 Nm	Solid End Bowl Head
11	5/16-18 x 3 Hx Skt Hd	6	Anti-Seize	144 in lb/16.3 Nm	Solid End Seal Housing
12	1/4 x 1 Pin	1	Loctite 680	N/A	Solid End Bearing Housing
13	1-4-20 x 1 Hx Skt Hd	8	Anti-Seize	83 in lb/9.4 Nm	Pulley Sheave
14	5/16-18 x 4 Hx Hd	6	Anti-Seize	Unspecified	Flinger Cover
15	3/8-16 x 1 Flt Hd Hx Skt	16	Anti-Seize	183 in lb/20.7Nm	Pillow Block Cover
17	1/4-20 x 5/8 Hx Skt Hd	4	Anti-Seize	144 in lb/16.3Nm	Pillow Block Flinger

SOLID END HARDWARE TORQUE SPECIFICATIONS					
No.	Description	Qty	Lubricant	Torque	Location
18	3/8-16 x 3/4 Hx Skt Hd	8	Anti-Seize	252 in lb/28.5Nm	Case Plows
19	3/8-16 x 1 Set Screw	2	Anti-Seize	75 in lb/8.5Nm	Feed Accelerator Bump
20	1/2-13 x 1 Set Screw	1	Anti-Seize	265 in lb/30Nm	Feed Accelerator Bump
22	3/8-16 x 1 Hx Skt Hd	12	Anti-Seize	252 in lb/28.5Nm	Bowl Extension
23	10-24 x 1/4 Set Screw	2	Anti-Seize	N/A	Case Flinger
24	5/16-18 x 3/4 Hx Skt Hd	32	Anti-Seize	144 in lb/16.3Nm	Wear Inserts
25	3/8-16 x 3/4 Flt Hd Hx Skt	4	Anti-Seize	183 in lb/20.7Nm	Solid Head Plows
27	1/2-13 x 1 Hx Skt Hd	8	Anti-Seize	53 in lb/6Nm	Feed Nozzle
29	5/8-11 x 2-1/4 Hx Hd	4	Anti-Seize	197 ft lb/267Nm	Pillow Block
30	#8 Pin (7/16-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
31	#7 Pin (3/8-24 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
32	#8 Plug	1	Anti-Seize	35 ft lb/47.5Nm	Bowl Extension
38	3/8-16 x 2-1/2 Hx Hd	4	Anti-Seize	Unspecified	Feed Tube Mounting Block
41	3/8-16 x 1-1/2 Hx Hd	4	Anti-Seize	Unspecified	Feed Tube Support Flange



**LIQUID END HARDWARE LOCATIONS**

## MAINTENANCE

### HARDWARE TORQUE SPECIFICATIONS (CONT'D)

LIQUID END HARDWARE TORQUE SPECIFICATIONS					
No.	Description	Qty	Lubricant	Torque	Location
1	3/8-16 x 1-1/4 Hx Skt Hd	12	Anti-Seize	252 in lb/28.5Nm	Liquid End Bowl Head
2	5/16 x 1 Pin	*	Loctite 680	N/A	Liquid End Bowl Head
3	5/16 x 5/16 x 3 Key	1	N/A	N/A	Liquid End Bowl Head
4	3/8-16 x 1-1/2 Hx Skt Hd	8	Anti-Seize	252 in lb/28.5Nm	Liquid End Bearing Housing
5	3/8-16 x 1 Hx Skt Hd	4	Anti-Seize	252 in lb/28.5Nm	Liquid End Seal Housing
8	1/4 NPT x 3/4 Gr. Fitting	2	N/A	N/A	Liquid End Bowl Head
13	1/4-20 x 1 Hx Skt Hd	8	Anti-Seize	83 in lb/9.4Nm	Pulley Sheave
14	5/16-18 x 4 Hx Hd	6	Anti-Seize	Unspecified	Flinger Cover
15	3/8-16 x 1 Flt Hx Skt Hd	16	Anti-Seize	183 in lb/20.7Nm	Pillow Block Cover
16	3/8-16 x 1 Hx Skt Hd	8	Anti-Seize	252 in lb/28.5Nm	Spline Hub
17	1/4-20 x 5/8 Hx Skt Hd	4	Anti-Seize	144 in lb/16.3Nm	Pillow Block Flinger
21	5/16-18 x 1 Hx Skt Hd	*	Loctite 262	300 in lb/34Nm	Rotodiff Flange
23	10-24 x 1/4 Set Screw	2	Anti-Seize	N/A	Case Flinger
26	5/16-18 x 7/8 Hx Skt Hd	12	Anti-Seize	144 in lb/16.3Nm	Effluent Port
28	3/8-16 x 1/2 Set Screw	2	Anti-Seize	N/A	Seal Housing
29	5/8-11 x 2-1/4 Hx Hd	4	Anti-Seize	197 ft lb/267Nm	Pillow Block
30	#8 Pin (7/16-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
31	#7 Pin (3/24-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
33	M16 x 35 Hx Skt Hd	***	Anti-Seize	N/A	Rotodiff to Rotodiff Flange
35	3mm Set Screw	**	Anti-Seize	N/A	Port Block
36	3/8 x 1 Pin	2	Loctite 680	N/A	Spline Hub
37	30 x 1.5mm x 1.4 Snap Ring	**	N/A	N/A	Rotodiff Port Block
40	5/16-18 x 1/2 Set Screw	1	Anti-Seize	N/A	Flange to Key

\*2 - 4 on Serial numbers below CF000272  
 2 on serial numbers CF000272 thru CF000678  
 0 on serial numbers above CF000679

\*21 - 4 on serial numbers below CF000272  
 6 on serial numbers CF000272 thru CF000678  
 9 on serial numbers above CF000679

\*\*35 & 37 - Not used on serial numbers above CF000678

\*\*\*33 - Used with Rotodiff Assembly 107/D6V

\*\*\*39 - Used with Rotodiff Assembly 1071

### PARTS REPLACEMENT

Defective parts should be replaced as soon as possible to restore the equipment to full operational status. Refer to the engineering drawings in Section 8 for Derrick component locations and part numbers.

The following table lists the recommended spare parts required to support a single DE-1000 FHD Centrifuge for two years. However, since all potential part replacements cannot be predicted, the complete spare parts inventory should be based on the user's experience with similar equipment.

<b>TWO-YEAR RECOMMENDED SPARE PARTS - DE-1000 FHD CENTRIFUGE</b>			
<b>Part No.</b>	<b>Description</b>	<b>Consumable</b>	<b>Qty</b>
BELT-5/3V710	Drive Belt, 10.6" Dia. Sheave	Yes	1
BSSFNQ-R8/10*	Fuse, Time Delay, 8/10 A, Class CC, 380V	No	2
G0003996*	Fuse, Time Delay, 0.6 A, 460V	No	2
G0004195*	Fuse, Time Delay, 0.5 A, Class CC, 575V	No	2
BSS-LPCC30	Fuse, Low Peak, 30 A, Class CC	No	1
G0002926	Fuse, Time Delay, 1.25 A, 250 V, Style FNM	No	1
CA1595X1/2-6	Isolator Mount	No	4
CHE-SRI-2	Grease, Main Bearing/Conveyor, 14.5 Oz. Tube	Yes	12
CS10-EL-725-00	Fuse, Time Delay, 1 A, Class CC	No	4
CS10-RA-310-00	Support Bearing Inboard Seals	No	2
CS10-RA-311-00	Support Bearing Outboard Seals	No	2
CS10-RA-312-00	Thrust Bearing Seals	No	2
CS10-RA-316-00	O-Ring, Liquid Bowl Head	No	2
CS10-RA-321-00	O-Ring, Outer Liquid End	No	1
CS10-RA-322-00	O-Ring, Inner Liquid End	No	1
CS10-RA-323-00	O-Ring, Feed Accelerator	No	1
CS10-RA-324-00	Feed Nozzle O-Ring	No	4
CS10-RA-325-00	O-Ring, Solid End	No	1
CS10-RA-510-00	Conveyor Thrust Bearing	No	2
CS10-RA-511-00	Conveyor Support Bearing	No	1
CS10-RA-512-00	Solid End Main Bearing	No	1
CS10-RA-513-00	Liquid End Main Bearing	No	1
CS10-RA-629-TC	Tungsten Feed Nozzle	No	4
CS10-RA-630-IC	Solid Discharge Wear Inserts (8 Pieces)	Yes	2 Sets
CS10-RA-634-IC	Case Plow	Yes	2 Pair
CS10-RA-650-IC	Bowl Head Plow	Yes	4 Pair
9537-00	Feed Accelerator	No	1
9540-00	Feed Tube	No	1

\* Select per equipment operating voltage



## MAINTENANCE

### TROUBLESHOOTING

Malfunctions due to operating error or other problem can result in unnecessary machine down-time and should be corrected as soon as possible. The troubleshooting procedures presented in this section will assist technicians in isolating and correcting malfunctions.

Fault analysis should proceed logically from the simplest cause to the more complex. The most difficult problem is an unexpected shutdown or inability to start. Always eliminate obvious causes of malfunction before proceeding to more complex possibilities. Since more than one cause may be responsible for a malfunction, proceed methodically to eliminate all possible causes and take all corrective actions at each step of the troubleshooting process.

In general, an unexpected centrifuge shutdown is due to an interruption of electric power that has turned off the centrifuge motor. Safety components are installed in key areas of the centrifuge electrical control system to shut down the electric motor if safety parameters such as motor temperature, vibration, or conveyor torque are exceeded. The power interruption may be due to one or more factors, including a local power failure.

The troubleshooting chart consists of failure modes, possible cause(s), and recommended course(s) of action. These procedures should be used in conjunction with the schematic diagram in Section 8 to isolate and correct malfunctions.

During troubleshooting, before performing any electrical continuity checks, always shut down electric power to the centrifuge and lock out and tag out equipment.



**WARNING! CONTINUITY CHECKS MUST BE PERFORMED WITHOUT ELECTRIC POWER APPLIED TO CENTRIFUGE. LOCK OUT AND TAG OUT ELECTRIC POWER BEFORE ATTEMPTING CONTINUITY CHECKS.**

TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
<b>Failure Mode 1: Centrifuge Starts, Pressures Normal but Shuts Down Soon After Starting</b>	
Vibration switch tripped due to excessive vibration during startup.	Press and hold vibration switch reset button, and attempt to re-start centrifuge (refer to Section 4). If machine fails to start or shuts down soon after starting, continue troubleshooting.
Overload pressure switch tripped due to excessive hydraulic pressure (over 2100 PSI) demand of conveyor.	Reverse rotation of Rotodiff to attempt to clear solids (refer to Section 4). If unsuccessful, with centrifuge fully stopped open cover and inspect bowl interior and conveyor for accumulated solids obstructing rotation. If clogging is evident, water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, remove rotating assembly, remove conveyor, and manually clear all solids from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly. Re-start centrifuge (refer to Section 4), and monitor pressures, vibration, and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as high pressure and/or high fluid temperature, and continue troubleshooting.

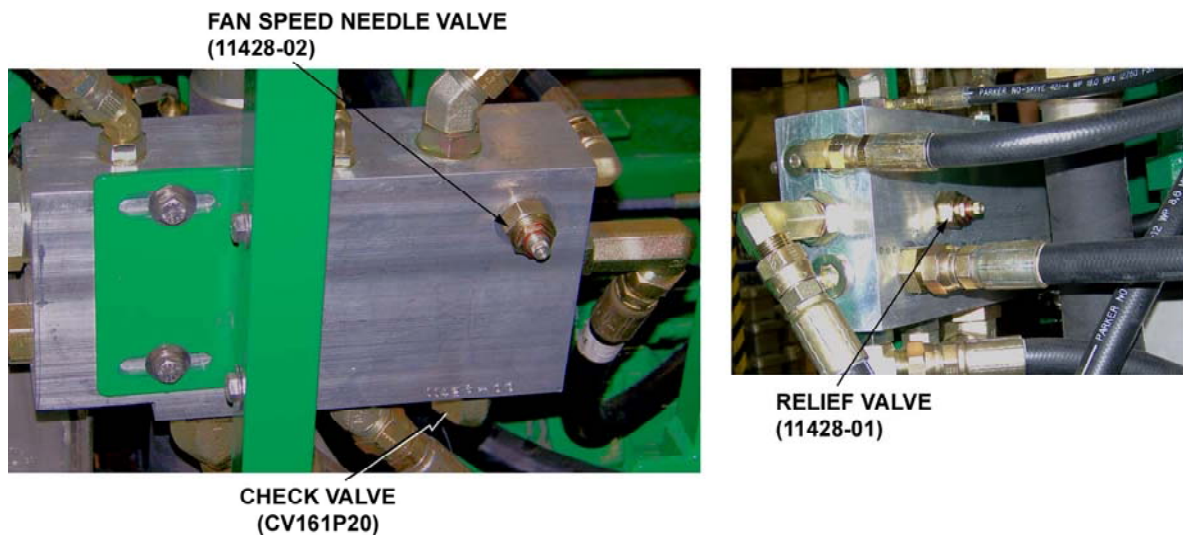


TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE			
Possible Cause		Isolation Procedure & Corrective Action	
Failure Mode 2: Centrifuge Has Automatically Shut Down; All Pressure Gages at 0 PSI			
No electric power.	Check that electric power is supplied to centrifuge, and check fuses. Correct power loss; replace any blown fuse(s).		
Vibration switch tripped.	Press and hold vibration switch reset button, and attempt to re-start centrifuge (refer to Section 4). If machine fails to start or shuts down soon after starting, continue troubleshooting.		
Hydraulic fluid temperature has risen above 175°F (79°C) or fluid level is low.	Confirm that hydraulic fluid temperature is not above 175°F (79°C), fluid level is correct, fan is operating, and heat exchanger louvers are open. Allow fluid to cool below 175°F (79°C), and replenish as necessary. Repeat attempt to re-start centrifuge (refer to Section 4).		
Bowl clogged with solids causing overload pressure switch to trip due to high hydraulic pressure needed to drive conveyor.	Reverse rotation of Rotodiff to attempt to clear solids (refer to Section 4). If unsuccessful, with centrifuge fully stopped open cover and inspect bowl interior and conveyor for accumulated solids obstructing rotation. If clogging is evident, water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, remove rotating assembly, remove conveyor, and manually clear all solids from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly (refer to <i>Rotating Assembly Maintenance</i> ).		
Pump drive motor overheated and/or starter thermal overloads tripped due to excessive current draw.	With power shut down and locked out and tagged out, and CENTRIFUGE ON switch pressed, check for electrical continuity from wire number X1 of CENTRIFUGE ON switch to ground. If an open circuit is found, check control system components for continuity to ground at the following wire numbers:		
	From	To	If No Continuity
	X1	2	Press CENTRIFUGE ON & repeat check
	2	4	Press RESET buttons & repeat check
	4	5	Press vibration switch reset button
	5	6	Allow motor to cool & repeat check
	If any test fails, replace component between affected test points.		
	If continuity is found at all above points, check for continuity from wire number 8 to ground. If continuity is not found, replace relay CR1.		
	Check for continuity from wire number 6 to 8. Replace safety devices intrinsic relay if continuity is not found.		
	Check for continuity from wire number 13 to ground. if continuity is not found, replace centrifuge run relay CR3.		

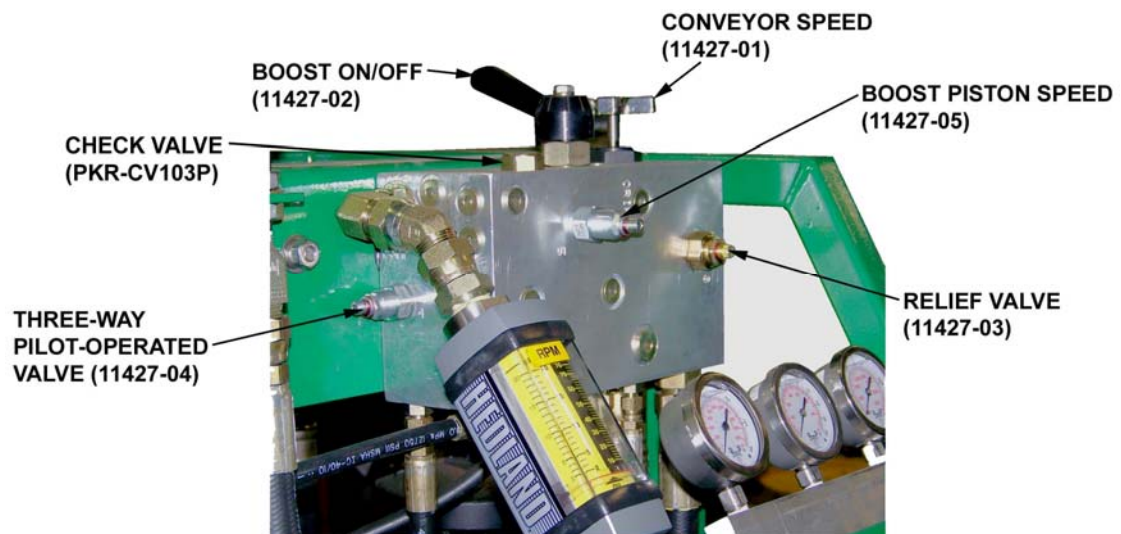
## MAINTENANCE

TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
Pump drive motor overheated and/or starter thermal overloads tripped due to excessive current draw (cont'd).	Check for continuity across motor winding terminals T1, T2, and T3 separately to ground. Replace motor if continuity is not found from any winding to ground. If continuity is found across all windings to ground, repeat all continuity checks to locate defective control system component(s). Replace defective component(s).
	Attempt to start centrifuge. If machine starts, monitor pressures, vibration, and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as high pressure and/or high fluid temperature. Determine cause of anomaly and correct before attempting to re-start centrifuge.
	If centrifuge does not start, check for continuity from wire number 20 to 19A. Replace overload pressure switch if continuity is not found.
Failure Mode 3: Centrifuge Starts But Pressure Gages Rise Quickly And Centrifuge Shuts Down Soon After Starting	
Overload pressure switch tripping due to excessive hydraulic pressure (over 2100 PSI) demand of conveyor.	Reverse rotation of Rotodiff to attempt to clear solids (refer to Section 4). If unsuccessful, with centrifuge fully stopped open cover and inspect bowl interior and conveyor for accumulated solids obstructing rotation. If clogging is evident, water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, remove rotating assembly, remove conveyor, and manually clear all solids from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly (refer to <i>Rotating Assembly Maintenance</i> ).
	Re-start centrifuge (refer to Section 4), and monitor pressures, vibration, and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as high pressure and/or high fluid temperature, and continue troubleshooting.
Failure Mode 4: Hydraulic Pressure Rises Above 2300 PSI Causing Centrifuge To Shut Down	
Control manifold relief valve (11427-03, Fig. 5-13) defective.	Adjust manifold relief valve 11427-03.
Failure Mode 5: CHARGE PRESSURE Gage Rises Above 450 PSI When Boost Operates	
Feed rate too high	Reduce feed rate.
Conveyor clogged.	Water wash bowl and conveyor until liquid discharge is clear of solids.

TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
<b>Failure Mode 6: Pump Fails to Run; PUMP ON Indicator Off</b>	
Defective pump run relay CR1.	Shut down, lock out, and tag out electric power to centrifuge. Disconnect lead 8 from centrifuge relay CR1, and check for continuity from terminal A to ground. If continuity is not found, replace relay.
Defective pump start relay CR3.	Disconnect lead 13 from relay CR3 terminal 14, and check for continuity from terminal 14 to ground. Replace relay if continuity is not found.



### Drain Manifold Valves



### Control Manifold Valves

Figure 5-13 Hydraulic Manifold Valves

## MAINTENANCE

TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
<b>Failure Mode 6: Pump Fails to Run; PUMP ON Indicator Off (Cont'd)</b>	
Defective pump run relay CR2.	Disconnect lead 10 from relay CR2, and check for continuity from terminal A to ground. If continuity is not found, replace relay. If continuity is found, continue troubleshooting.
Pump control relay CR4 contacts fail to open.	Check for an open circuit from line X1 to terminal 14 of pump control relay CR4. If an open circuit is found, replace relay.
<b>Failure Mode 7: Excessive Vibration Causes Vibration Switch to Trip</b>	
Drooping of wall cake or dislodged tiles causing bowl imbalance.	Reverse rotation of Rotodiff to attempt to clear solids (refer to Section 4). If unsuccessful, with centrifuge fully stopped, open cover and inspect bowl interior and conveyor for accumulated solids on one side of bowl. Water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, or if dislodged tiles are found, remove rotating assembly, remove conveyor, and manually clear all solids and dislodged tiles from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly.
Rotodiff misaligned.	Shim Rotodiff in accordance with <i>Rotating Assembly Maintenance</i> .
Loose components.	Inspect for loose components, and re-tighten as necessary.
Worn bearings	Inspect and replace bearings, if worn.
Flexible connections not installed	Install flexible connections where required.
Tiles have failed	Disassemble rotating assembly, and inspect conveyor flights. Replace conveyor if tiles are missing.
<b>Failure Mode 9: Feed Pump Fails to Start</b>	
Conveyor high pressure switch has tripped due to excessive hydraulic pressure (over 1500 PSI) demand of drive conveyor.	Allow conveyor pressure to drop below 700 PSI. If feed pump fails to go on, continue troubleshooting.
Feed control pressure switch defective.	Shut down, lockout, and tag out electric power to centrifuge. With pressure below 700 PSI, check for continuity from wire number 24 to ground. If continuity is not found, replace switch.
<b>Failure Mode 10: Feed Pump Cycles On and Off Frequently</b>	
Feed rate too high causing conveyor high pressure switch to trip due to excessive hydraulic pressure (over 1500 PSI) demand of conveyor.	Reduce feed rate, and allow conveyor pressure to drop below 700 PSI.

<b>TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE</b>	
<b>Possible Cause</b>	<b>Isolation Procedure &amp; Corrective Action</b>
<b>Failure Mode 11: Reservoir Fluid Temperature too High</b>	
Heat exchanger louvers not open sufficiently.	Open louvers.
Hydraulic fluid level too low.	Add hydraulic fluid to reservoir.
Fan speed too low.	Adjust needle valve (11428-02) to increase speed. Replace needle valve if problem persists.
<b>Failure Mode 12: Abnormal Rise of Hydraulic Fluid Temperature</b>	
Check valve (CV161P20) defective.	Replace check valve (CV161P20).
<b>Failure Mode 13: Boost Starts at Wrong Pressure or Fails to Operate</b>	
Three-way pilot-operated valve (11427-04) defective.	Replace pilot-operated valve (11427-04).
<b>Failure Mode 14: Boost Fails to Operate or Piston Strokes too Quickly</b>	
Needle valve (11427-05) defective.	Replace valve (11427-05).
<b>Failure Mode 15: Boost Piston Seals Blown</b>	
75PSI relief valve (11427-06) defective.	Replace valve (11427-06) and piston seals.
<b>Failure Mode 16: Boost Piston Does Not Retract or Strokes too Quickly</b>	
5PSI check valve (PKR-CV103P) defective.	Replace check valve (PKR-CV103P).
<b>Failure Mode 17: Boost Piston Fails to Extend, Extends Partially, or Fully Extends Below Boost Pressure</b>	
Pilot-to-open valve (11427-08) defective.	Replace valve (11427-08).
<b>Failure Mode 18: Boost Piston Does not Retract or Strokes too Quickly</b>	
5PSI check valve (PKR-CV103P) defective.	Replace check valve (PKR-CV103P).
<b>Failure Mode 19: Charge Pressure Exceeds 450PSI</b>	
Relief valve (11428-01) defective.	Check pressure with machine operating but without bowl rotating. Pressure should be 425-450PSI. Replace relief valve (11428-01) if pressure is excessive.

## MAINTENANCE

TROUBLESHOOTING DE-1000 CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
<b>Failure Mode 20: Incomplete Dryness</b>	
Pond depth too deep.	Adjust liquid effluent ports on bowl head.
Conveyor speed too high.	Reduce conveyor speed.
Feed rate too high.	Reduce feed rate.
Bowl speed too low.	Increase bowl speed.
<b>Failure Mode 21: Unacceptable Clarity of Discharge Liquid</b>	
Feed rate too high.	Reduce feed rate.
Pond depth too shallow	Adjust liquid effluent ports on bowl head.
Feed temperature too low.	Adjust temperature
Degradation of feed.	Check feed particle size. If too small, lower feed rate to increase retention time in bowl.
Conveyor speed too high.	Reduce conveyor speed.
Bowl speed too low.	Increase bowl speed.

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## SECTION 8 - REFERENCE DRAWINGS

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### GENERAL

This section contains Derrick engineering drawings for your equipment. These drawings are included to provide assistance in troubleshooting, repair, and parts ordering.

Number	Title
<a href="#"><u>13718-00 -</u></a>	General Arrangement - DE-1000 FHD Centrifuge
<a href="#"><u>9587-00-002 -</u></a>	Rotating Assembly - DE-1000 Centrifuge (Radial Flow)
<a href="#"><u>9587-00-004 -</u></a>	Rotating Assembly - DE-1000 Centrifuge (Axial Flow)
<a href="#"><u>15082-00 -</u></a>	Rotating Assembly - Bearing Fit
<a href="#"><u>11226-00-002 -</u></a>	Electrical Control Schematic - DE-1000 FHD Centrifuge
<a href="#"><u>11241-00-002 -</u></a>	Electrical Wiring Diagram - DE-1000 FHD Centrifuge
<a href="#"><u>10647-00-002 -</u></a>	Lubrication & Maintenance Schedule - DE-1000 Centrifuge
<a href="#"><u>11290-00-006 -</u></a>	Electrical Conduit/Cable Diagram
<a href="#"><u>11171-00 -</u></a>	High Voltage Schematic - DE-1000 Centrifuge (50/60 Hz)
<a href="#"><u>11196-00-005</u></a>	Hydraulic Parts List - DE-1000 FHD Centrifuge (New-Style Rotodiff)
<a href="#"><u>13275-00-003 -</u></a>	Control Box Assembly - DE-1000 FHD Centrifuge
<a href="#"><u>14894-00 -</u></a>	Rotating Assembly - Hardware Parts List





E

D

C

B

A

1	1	1	1	1	1	PP	BASE GAS SPRING MOUNT 2	18056-03	
1	1	1	1	1	1	OO	BASE GAS SPRING MOUNT 1	18056-02	
2	2	2	2	2	2	NN	GAS SPRING	G0012457	
8	8	8	8	8	8	MM	ELEC. BOX ISOLATOR MOUNT	LRD-J-5425-275	
1	1	1	1	1	1	LL	LIQUIDS HOPPER SEAL	12902-00	
1	1	1	1	1	1	KK	MOTOR-50HP 575/600/60/3/1750 RPM	G0009371	*SEE NOTE 3*
1	1	1	1	1	1	JJ	HEAT EXCHANGE BRACKET	12332-00	
1	1	1	1	1	1	II	THROTTLE CABLE BRACKET	11240-02	
4	4	4	4	4	4	HH	MOTOR PAN ISOLATOR MOUNTS	H+V VB MTS#R2	
1	1	1	1	1	1	GG	SOLIDS SAMPLE DOOR	13327-00	
1	1	1	1	1	1	FF	FEED TUBE SUPPORT	9539-01	
1	1	1	1	1	1	EE	PUMP GUARD	11240-04	
1	1	1	1	1	1	DD	FILTER BRACKET	13547-02	
1	1	1	1	1	1	CC	TOOL KIT	12016-00	
1	1	1	1	1	1	BB	Q.D. BUSHING	BUSHING-SK1.5	
1	1	1	1	1	1	AA	OIL RESERVOIR	11169-00	
1	1	1	1	1	1	Z	MOTOR PAN	11168-00	
1	1	1	1	1	1	Y	DRIVE BELT	BELT-5/3V710	
1	1	1	1	1	1	X	PULLEY SHEAVE	SHEAVE-3V-10.6	
1	1	1	1	1	1	W	GRATING, FRAME & NOISE DEFLECTOR	11238-00-002	
1	1	1	1	1	1	V	ROTODIFF	G0004102	
1	1	1	1	1	1	U	BOTTOM TERMINAL BOX	13276-00-001	
1	1	1	1	1	1	T	TOP CONTROL BOX ASSEMBLY	13275-00-003	
4	4	4	4	4	4	S	ISOLATOR MOUNTS	CA1595X1/2-6	
1	1	1	1	1	1	R	BASE	9589-00	
1	1	1	1	1	1	P	LOWER CASE	9590-01-001	
1	1	1	1	1	1	N	CASE COVER	9591-02	
1	1	1	1	1	1	M	ROTODIFF GUARD	13284-00-003	
1	1	1	1	1	1	L	BELT GUARD	11233-00	
1	1	1	1	1	1	K	CONTROL PANEL	11237-00-001	
1	1	1	1	1	1	J	O.H. LOAD ADAPTER MOUNT	11202-00-001	
						H	MOTOR-50HP 380/50/3/1475 RPM	BAL-CM7064T-I50	*SEE NOTE 3*
						G	MOTOR-50HP 460/60/3/1750 RPM	BAL-CM7064T-I	*SEE NOTE 3*
1	1	1	1	1	1	F	6" VICTAULIC COUPLING	VIC-6-75	
1	1	1	1	1	1	E	SKID	13100-01-007	
*	*	*				D	ROTATING ASSEMBLY (HARD SURFACED)	9587-59-004	*SEE MANUFACTURING SHEET*
*	*	*				C	ROTATING ASSEMBLY W/TILES	9587-00-004	*SEE MANUFACTURING SHEET*
*			*	*		B	ROTATING ASSEMBLY (HARD SURFACED)	9587-59-002	*SEE MANUFACTURING SHEET*
*			*	*		A	ROTATING ASSEMBLY W/TILES	9587-00-002	*SEE MANUFACTURING SHEET*
						05	RADIAL CENTRIFUGE ASSEMBLY (60 HZ)	13718-05	
						04	AXIAL CENTRIFUGE ASSEMBLY (60 HZ)	13718-04	
						03	AXIAL CENTRIFUGE ASSEMBLY (50 HZ)	13718-03	
						02	AXIAL CENTRIFUGE ASSEMBLY (60 HZ)	13718-02	
						01	RADIAL CENTRIFUGE ASSEMBLY (50 HZ)	13718-01	
						00	RADIAL CENTRIFUGE ASSEMBLY (60 HZ)	13718-00	
						QTY.	ITEM	PART NAME	DESCRIPTION

\* THIS SYMBOL SHOWS WHAT OPTIONS ARE AVAILABLE. THE MANUFACTURING SHEET LOCATED ON THE FIRST PAGE OF THE MANUAL SHOWS SPECIFICALLY WHAT OPTIONS WERE USED TO MANUFACTURE THE UNIT.

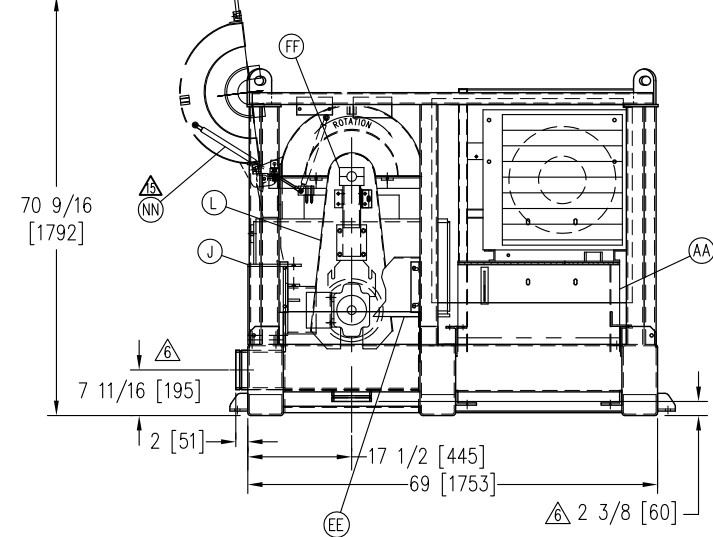
△<sub>16</sub> STATIC LOAD-- 8925 LBS [4049 KG]  
MAX TRANS DYNAMIC LOAD--162 LBS [74 KG]

REFERENCE DRAWINGS	
△ <sub>10</sub> ELECTRICAL CABLE DIAGRAM	11290-00-006 △ <sub>1</sub>
CONTROL SCHEMATIC	11226-00-002
ELECTRICAL SCHEMATIC (HIGH VOLTAGE)	11171-00
ELECTRICAL WIRING DIAGRAM	11241-00-002
LUBRICATION & MAINTENANCE	10647-00-004
HYDRAULIC PARTS LIST	11196-00-005 △ <sub>1</sub> △ <sub>2</sub>

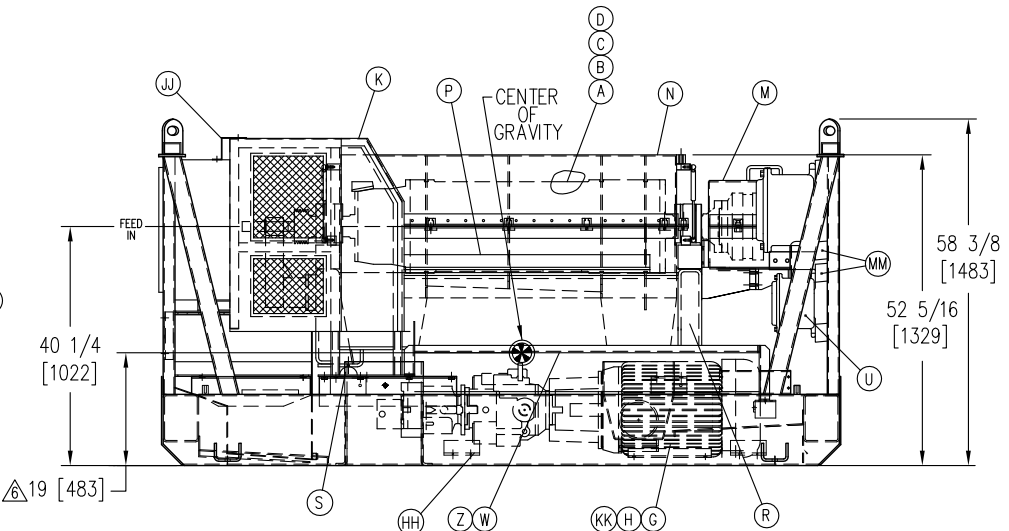
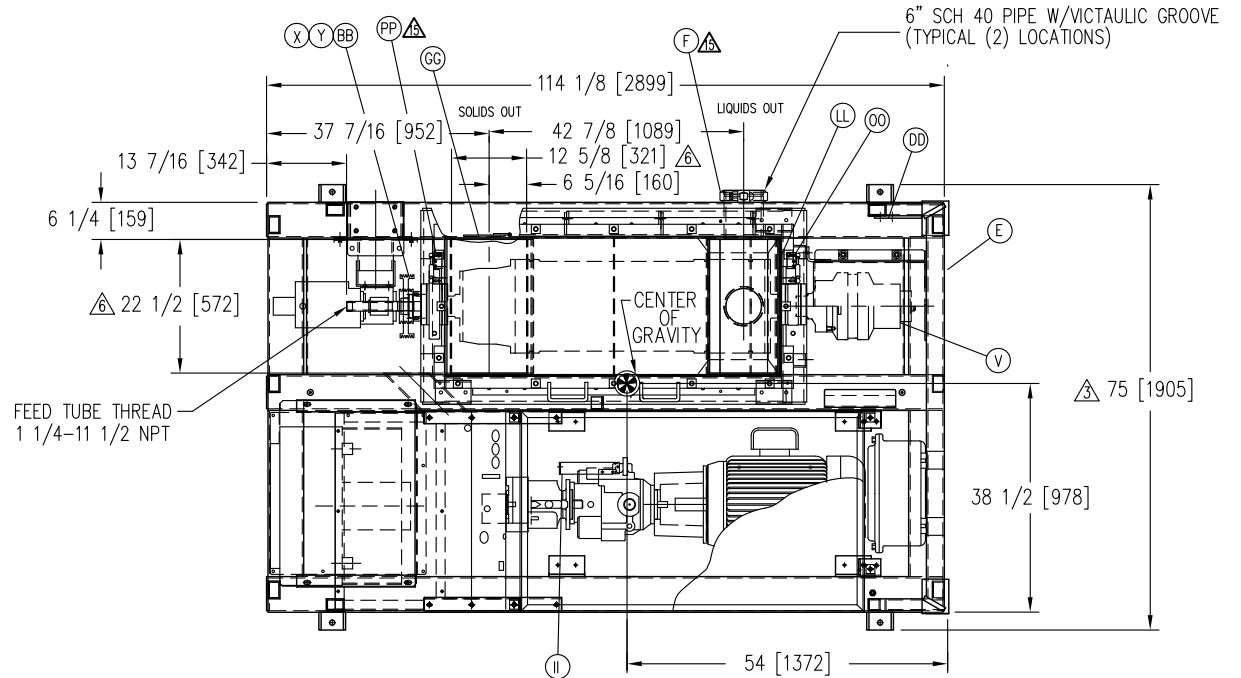
NOTES:

- 1) ONE (1) UNIT COMPLETE
- 2) COATING TYPE: SYSTEM ZRE/UE GREEN
- 3) MOTORS ARE EXPLOSION PROOF
- 4) LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
  - A) MAIN BEARINGS - PER APPLICATION
  - B) CONVEYOR BEARINGS - PER APPLICATION
  - C) HYDRAULIC OIL - PER APPLICATION
- 5) OPERATING SPEED(S) - SEE MANUFACTURING SHEET IN MANUAL

COVER HEIGHT IN OPEN POSITION



FEED TUBE THREAD  
1 1/4-11 1/2 NPT



APPROX WGT 8925 LBS

DIMENSIONS IN [ ] = MILLIMETERS

15	ADDED ITEMS NN-PP	WOS	6/25/12	TITLE	GENERAL ARRANGEMENT
14	ITEM KK WAS G0009473.	CCS	4/27/2010	DERRICK® DE-1000® FHD CENTRIFUGE	
13	ADDED ASSEMBLIES 04 & 05; ADDED ITEM KK; SEE RECORD COPY & MODEL SPACE FOR PREVIOUS REVISIONS.	CCS	4/6/2010	DWN TOC CKD	DATE 10/5/97 SCALE 1=20 REV 16
REV	CHANGE	CKD	DATE		
THE DESIGNS AND INFORMATION CONTAINED ON THIS DRAWING OR COPIES REMAIN THE EXCLUSIVE PROPERTY OF DERRICK CORPORATION. BUFFALO, NEW YORK U.S.A. AND ARE NOT TO BE REPRODUCED WITHOUT THE WRITTEN PERMISSION OF DERRICK CORPORATION. THE INFORMATION CONTAINED ON THIS DRAWING SHALL ONLY BE USED BY CUSTOMERS OR PROSPECTS OR THEIR AGENCIES IN THE ARRANGEMENT OR INSTALLATION OF DERRICK EQUIPMENT, OR BY VENDORS IN QUOTING ON OR IN THE SUPPLY OF PARTS OR ASSEMBLIES TO DERRICK, OR BY OTHERS FOR THE SPECIFIC REASON OUTLINED IN THE TRANSMITTAL WHETHER WRITTEN OR VERBAL.					
C20	Y	DWN			
SHEET SIZE	F C	CKD			
DRAWING NO.	13718-00				
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.					

**DERRICK**  
CORPORATION



WEAR ITEMS	ASSY. REF.	QTY	ITEM#	DESCRIPTION	DWG. NO.
---------------	---------------	-----	-------	-------------	--



**FIG: 1.1**



**DERRICK®**  
CORPORATION  
10 DUKE ROAD BUFFALO, NY 14225 U.S.A.

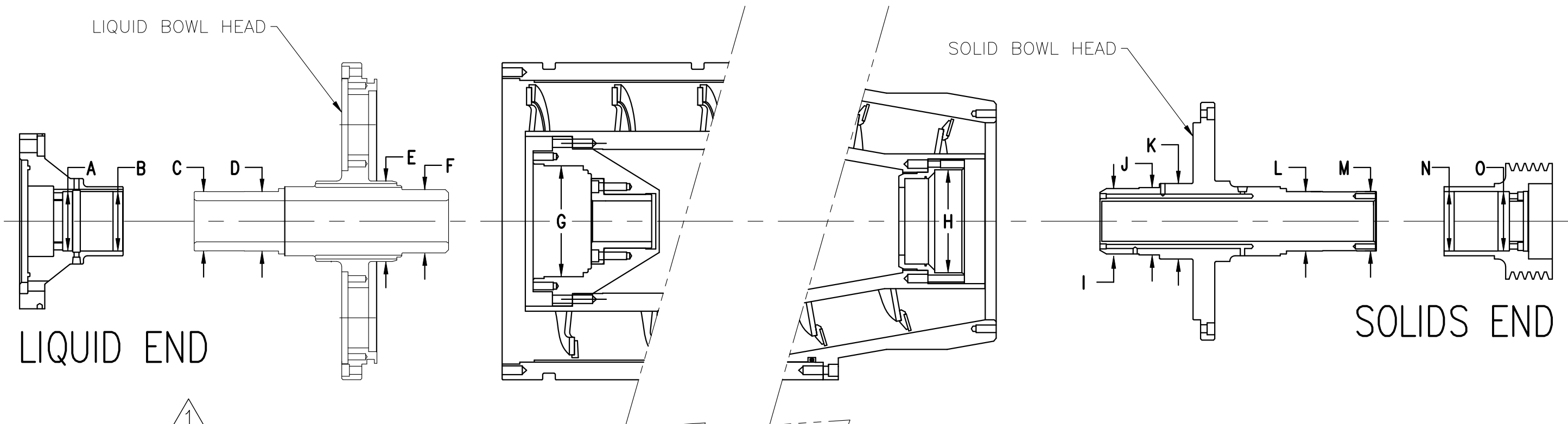









# ROTATING ASSEMBLY

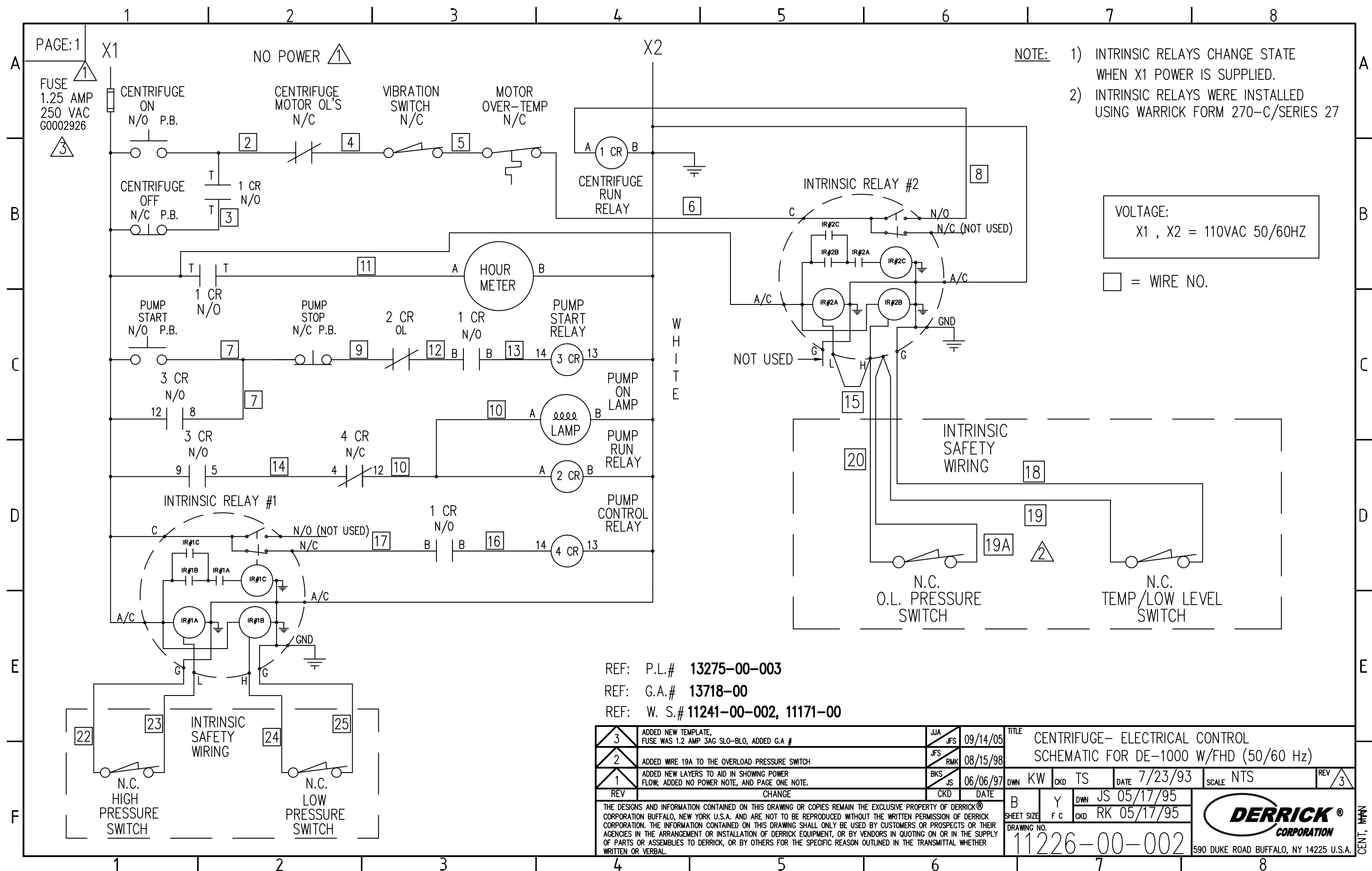


O	2.9491 ± .0004	S/BOWL HEAD & PULLEY SHEAVE FIT
N	2.9530 ± .0004	S/BOWL HEAD & PULLEY SHEAVE FIT
M	2.9497 ± .0003	S/BOWL HEAD & PULLEY SHEAVE FIT
L	2.9531 ± .0003	MAIN BEARING & PULLEY SHEAVE FIT
K	3.750 ± .001	SEAL TO S/E FIT
J	3.3453 ± .0005	S/E CONV SUPPORT BEARING FIT
I	3.250 ± .001	INBOARD SEAL FIT
H	5.1170 ± .0005	S/E BEARING FIT
G	5.5116 ± .0005	L/E BEARING FIT
F	3.1483 ± .0003	L/E CONV SUPPORT BEARING FIT
E	4.000 ± .001	SEAL FIT
D	2.9531 ± .0003	MAIN BEARING & ROTODIFF/GEAR FLANGE FIT
C	2.9497 ± .0003	L/BOWL HEAD & ROTODIFF/GEAR FLANGE FIT
B <sup>2</sup>	2.9528 ± .0004	ROTODIFF/GEAR FLANGE & L/BOWL HEAD FIT
A	2.9492 ± .0004	ROTODIFF/GEAR FLANGE & L/BOWL HEAD FIT
DIMENSION	BEARING/SEAL FIT	LOCATION

				TITLE		CENTRIFUGE ROTATING ASSEMBLY									
2		DIMENSION B, 2.9528 WAS 2.9531		NVB		11/15/02		BEARING & SEAL FITS							
1		MODIFIED BEARING/SEAL FIT TOLERANCES		NVB		2/21/02		DWN NVB CKD		DATE 9/26/01		SCALE 1=5		REV 2	
REV		CHANGE		CKD		DATE		B5		Y		DWN		 <b>DERRICK</b> CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.	
THE DESIGNS AND INFORMATION CONTAINED ON THIS DRAWING OR COPIES REMAIN THE EXCLUSIVE PROPERTY OF DERRICK® CORPORATION BUFFALO, NEW YORK U.S.A. AND ARE NOT TO BE REPRODUCED WITHOUT THE WRITTEN PERMISSION OF DERRICK CORPORATION. THE INFORMATION CONTAINED ON THIS DRAWING SHALL ONLY BE USED BY CUSTOMERS OR PROSPECTS OR THEIR AGENCIES IN THE ARRANGEMENT OR INSTALLATION OF DERRICK EQUIPMENT, OR BY VENDORS IN QUOTING ON OR IN THE SUPPLY OF PARTS OR ASSEMBLIES TO DERRICK, OR BY OTHERS FOR THE SPECIFIC REASON OUTLINED IN THE TRANSMITTAL WHETHER WRITTEN OR VERBAL.								SHEET SIZE		F C		CKD			
								DRAWING NO.		15082-00					

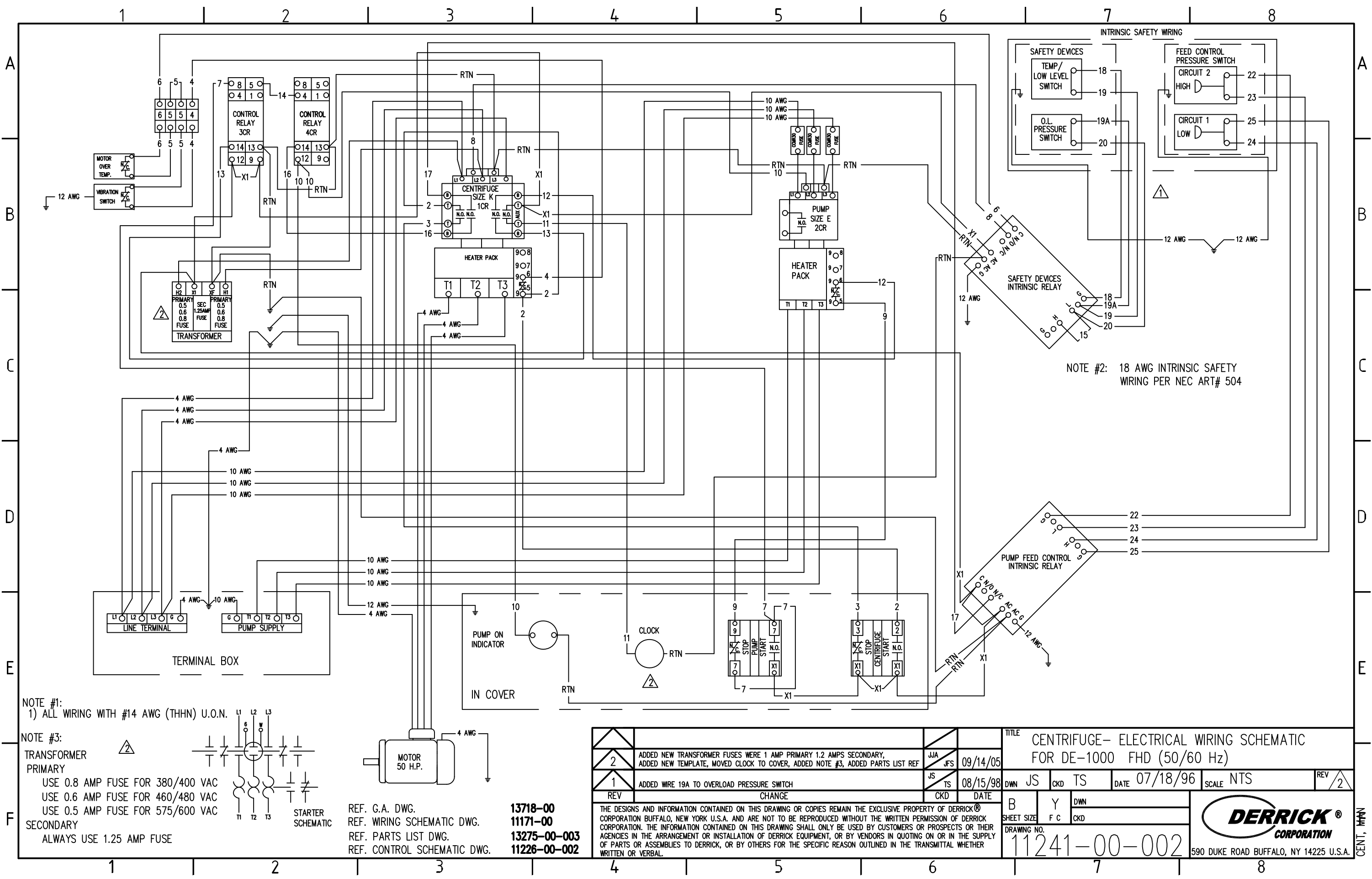
CENT.MANUAL





CENT. MAN.






NOTE #1:  
1) ALL WIRING WITH #14 AWG (THHN) U.O.N.

NOTE #3:  
TRANSFORMER  
PRIMARY  
USE 0.8 AMP FUSE FOR 380/400 VAC  
USE 0.6 AMP FUSE FOR 460/480 VAC  
USE 0.5 AMP FUSE FOR 575/600 VAC  
SECONDARY  
ALWAYS USE 1.25 AMP FUSE

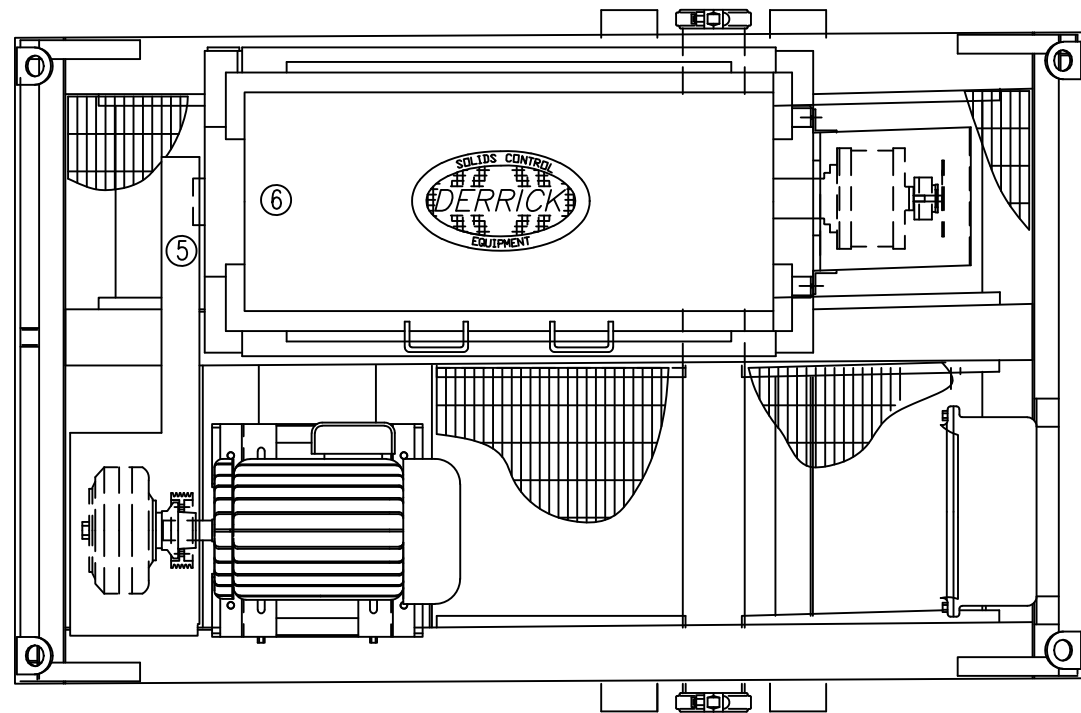
STARTER SCHEMATIC

REF. G.A. DWG.  
REF. WIRING SCHEMATIC DWG.  
REF. PARTS LIST DWG.  
REF. CONTROL SCHEMATIC DWG.

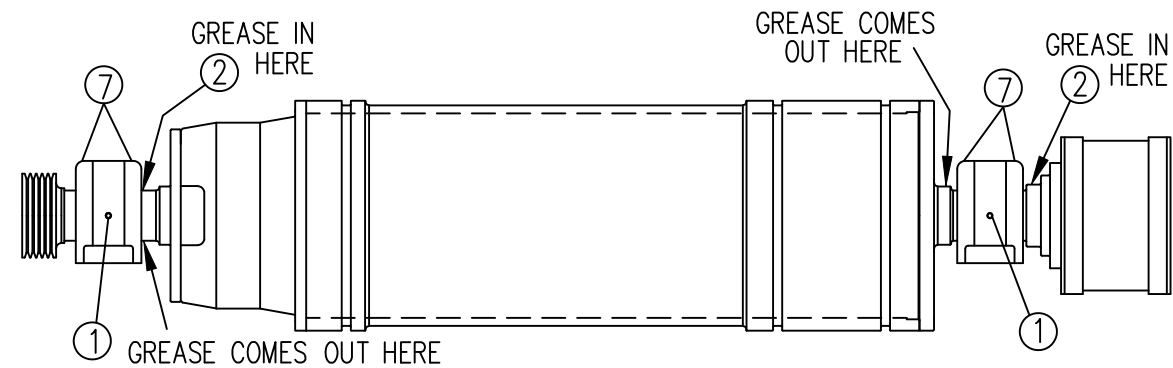
13718-00  
11171-00  
13275-00-003  
11226-00-002

						TITLE CENTRIFUGE- ELECTRICAL WIRING SCHEMATIC FOR DE-1000 FHD (50/60 Hz)									
2	ADDED NEW TRANSFORMER FUSES WERE 1 AMP PRIMARY 1.2 AMPS SECONDARY, ADDED NEW TEMPLATE, MOVED CLOCK TO COVER, ADDED NOTE #3, ADDED PARTS LIST REF	JJA	JFS	09/14/05											
1	ADDED WIRE 19A TO OVERLOAD PRESSURE SWITCH	JS	TS	08/15/98		DWN	JS	CKD	TS	DATE	07/18/96	SCALE	NTS	REV	2
REV	CHANGE			CKD	DATE										
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						SHEET SIZE		F C	CKD						
						DRAWING NO.		11241-00-002							



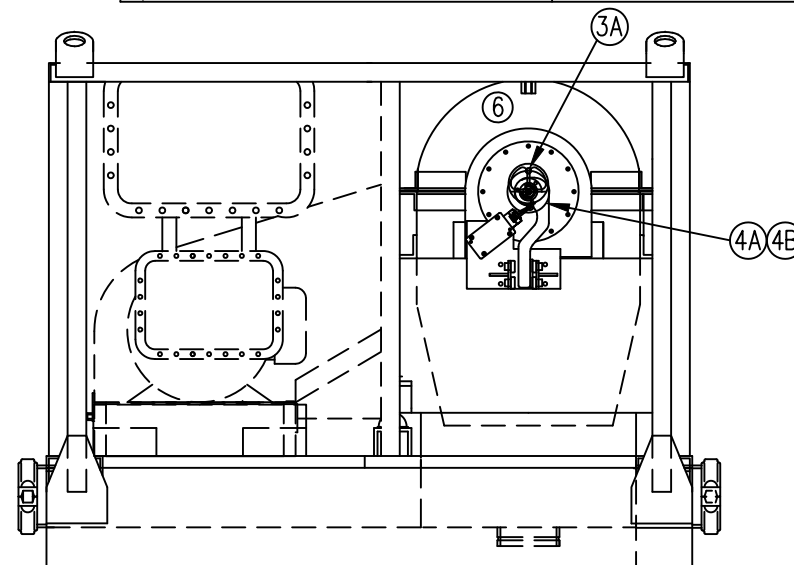
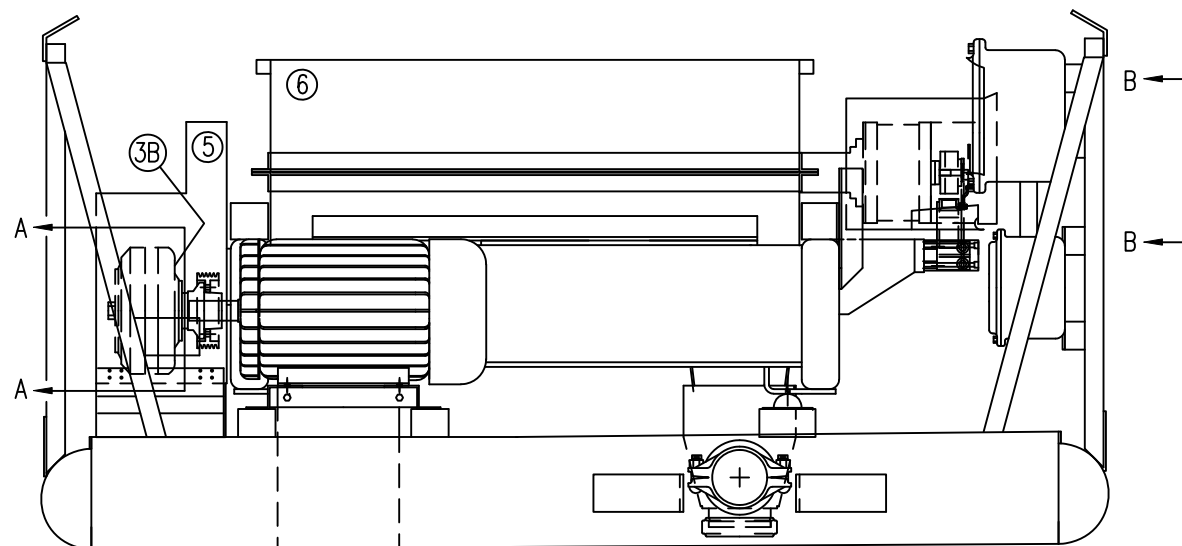


BELT DRIVE ONLY



LUBRICATION & MAINTENANCE SCHEDULE		
MAINTENANCE OPERATIONS	SERVICE INTERVAL	LUB. TYPE (OTHER)
1) GREASE MAIN BEARINGS	1 SHOT DAILY	REFER TO B 1.1
2) PURGE CONVEYOR BEARINGS	BI-WEEKLY	REFER TO B 1.1
3) CHECK FLUID LEVELS:		
A) GEAR BOX HOLE @ 12:00	BI-WEEKLY	REFER TO B 1.1
B) DRIVE CLUTCH HOLE	BI-WEEKLY	REFER TO B 1.1
4) TORQUE OUT ASSEMBLY		
A) CHECK TORQUE SETTING	250 HRS	REFER TO MANUAL
B) GREASE	1000 HRS	REFER TO MANUAL
5) CHECK BELT TENSION	BI-WEEKLY	20lbs. @ 1/2"
	INITIAL BREAK-IN	30lbs. @ 1/2"
6) CHECK CASE FOR SOLIDS	WEEKLY	VISUAL
7) CLEAN OUT UNDER FLINGER COVERS	MONTHLY	VISUAL
8) CHECK HYDRUALIC FLUID IN TANK	WEEKLY	REFER TO MANUAL

HYDRUALIC DRIVE ONLY

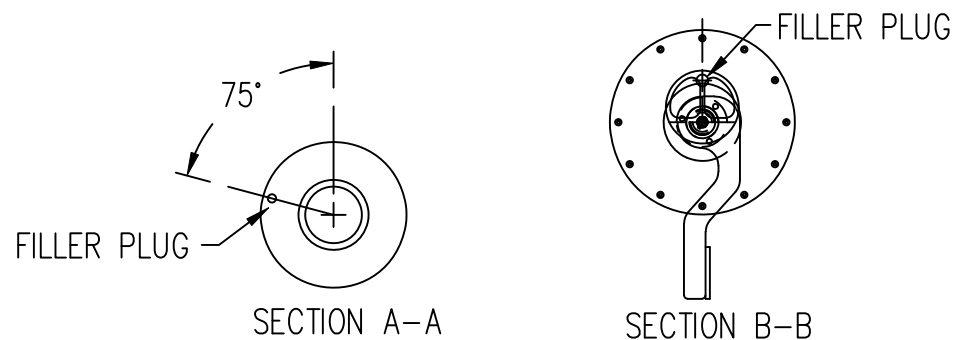


\*MIXING LUBRICANTS MAY CAUSE  
CATASTROPHIC FAILURE

\*DRAIN & REPLACE ALL FLUIDS EVERY  
120 DAYS OR 1800 HRS. OF USE\*

REF 10500-00

DWN: CK 06/27/97  
CKD:



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DERRICK® CORPORATION

590 DUKE ROAD

BUFFALO, NEW YORK 14225 U.S.A.

TITLE LUBRICATION & MAINTENANCE SCHEDULE  
DERRICK DE-1000™ CENTRIFUGE

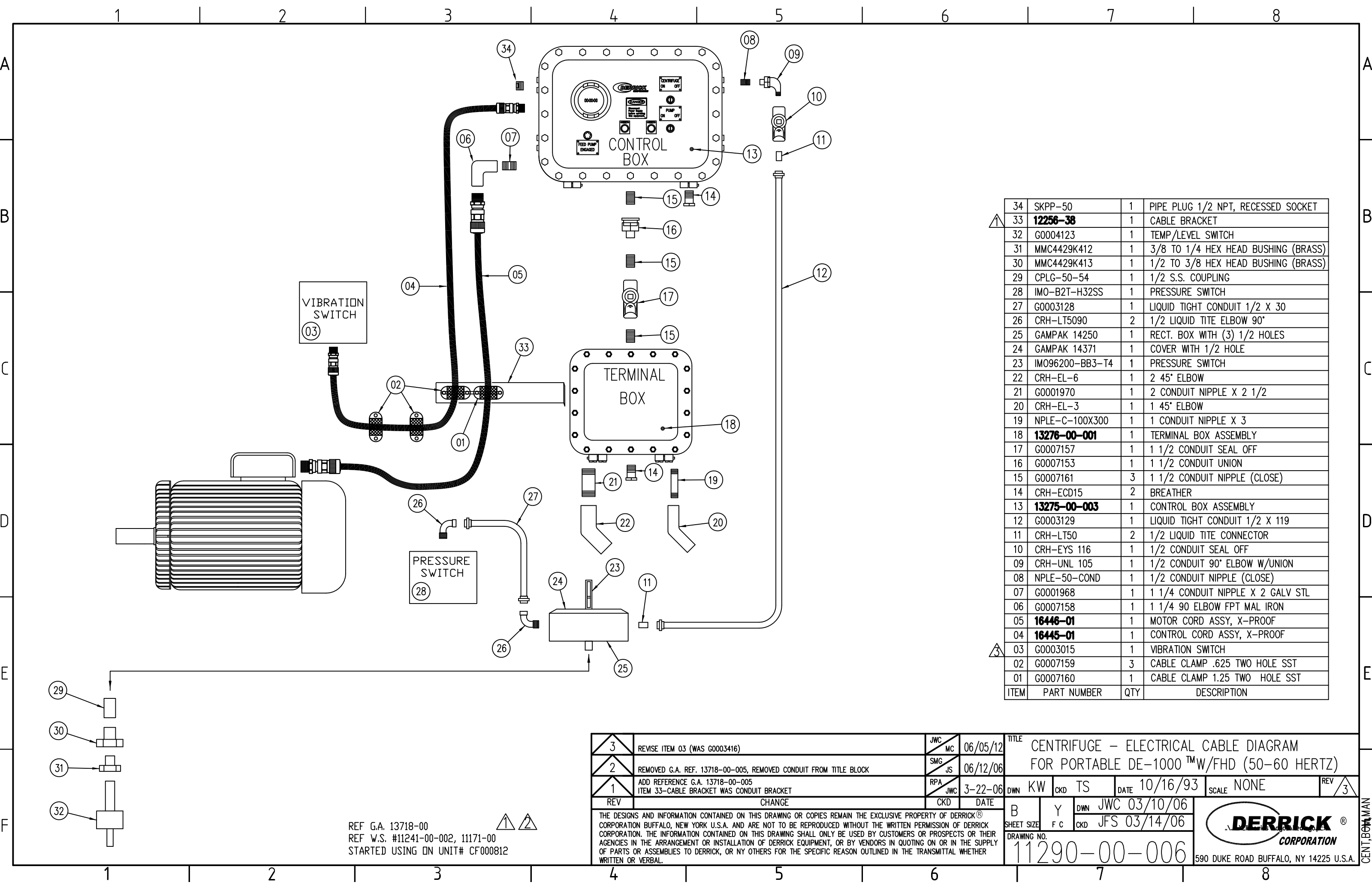
DWN KW CKD TS DATE 6-11-92 SCALE NTS

00C Y 10647-00-002 FIG B.1  
D B F C DRAWING NO. FIGURE NO. REV

REV CHANGE CKD DATE







34	SKPP-50	1	PIPE PLUG 1/2 NPT, RECESSED SOCKET
33	<b>12256-38</b>	1	CABLE BRACKET
32	G0004123	1	TEMP/LEVEL SWITCH
31	MMC4429K412	1	3/8 TO 1/4 HEX HEAD BUSHING (BRASS)
30	MMC4429K413	1	1/2 TO 3/8 HEX HEAD BUSHING (BRASS)
29	CPLG-50-54	1	1/2 S.S. COUPLING
28	IMO-B2T-H32SS	1	PRESSURE SWITCH
27	G0003128	1	LIQUID TIGHT CONDUIT 1/2 X 30
26	CRH-LT5090	2	1/2 LIQUID TITE ELBOW 90°
25	GAMPAK 14250	1	RECT. BOX WITH (3) 1/2 HOLES
24	GAMPAK 14371	1	COVER WITH 1/2 HOLE
23	IMO96200-BB3-T4	1	PRESSURE SWITCH
22	CRH-EL-6	1	2 45° ELBOW
21	G0001970	1	2 CONDUIT NIPPLE X 2 1/2
20	CRH-EL-3	1	1 45° ELBOW
19	NPLE-C-100X300	1	1 CONDUIT NIPPLE X 3
18	<b>13276-00-001</b>	1	TERMINAL BOX ASSEMBLY
17	G0007157	1	1 1/2 CONDUIT SEAL OFF
16	G0007153	1	1 1/2 CONDUIT UNION
15	G0007161	3	1 1/2 CONDUIT NIPPLE (CLOSE)
14	CRH-ECD15	2	BREATHER
13	<b>13275-00-003</b>	1	CONTROL BOX ASSEMBLY
12	G0003129	1	LIQUID TIGHT CONDUIT 1/2 X 119
11	CRH-LT50	2	1/2 LIQUID TITE CONNECTOR
10	CRH-EYS 116	1	1/2 CONDUIT SEAL OFF
09	CRH-UNL 105	1	1/2 CONDUIT 90° ELBOW W/UNION
08	NPLE-50-COND	1	1/2 CONDUIT NIPPLE (CLOSE)
07	G0001968	1	1 1/4 CONDUIT NIPPLE X 2 GALV STL
06	G0007158	1	1 1/4 90 ELBOW FPT MAL IRON
05	<b>16446-01</b>	1	MOTOR CORD ASSY, X-PROOF
04	<b>16445-01</b>	1	CONTROL CORD ASSY, X-PROOF
03	G0003015	1	VIBRATION SWITCH
02	G0007159	3	CABLE CLAMP .625 TWO HOLE SST
01	G0007160	1	CABLE CLAMP 1.25 TWO HOLE SST
ITEM	PART NUMBER	QTY	DESCRIPTION

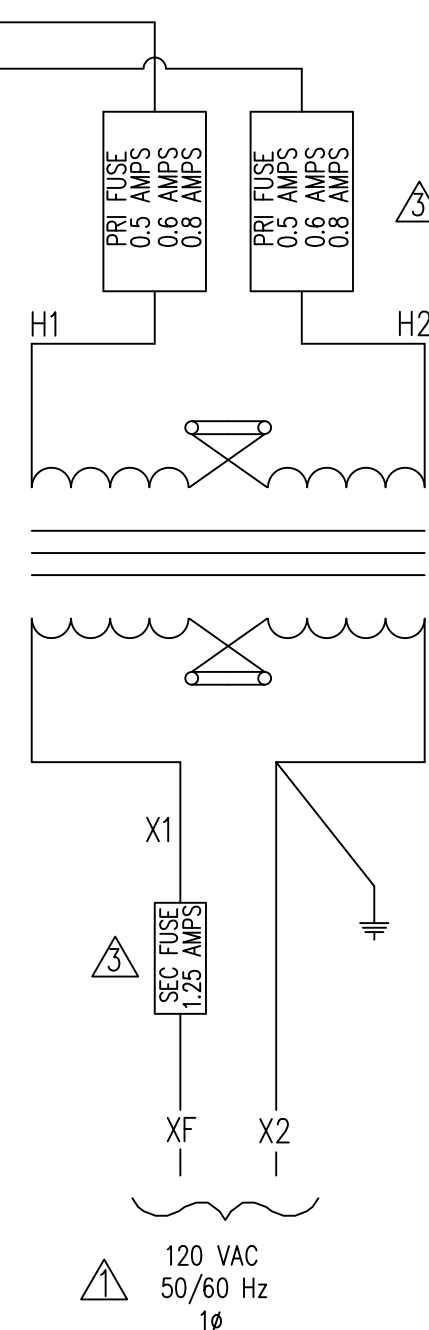
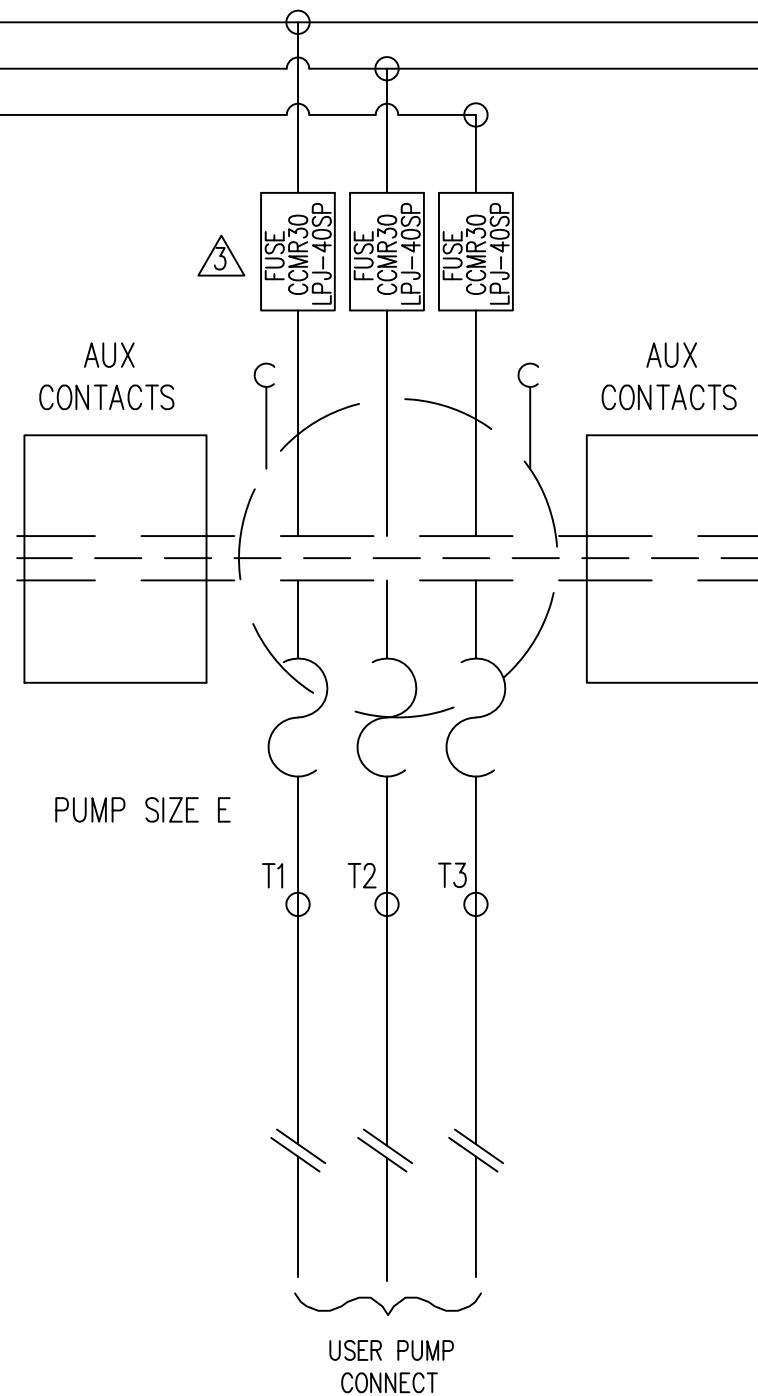
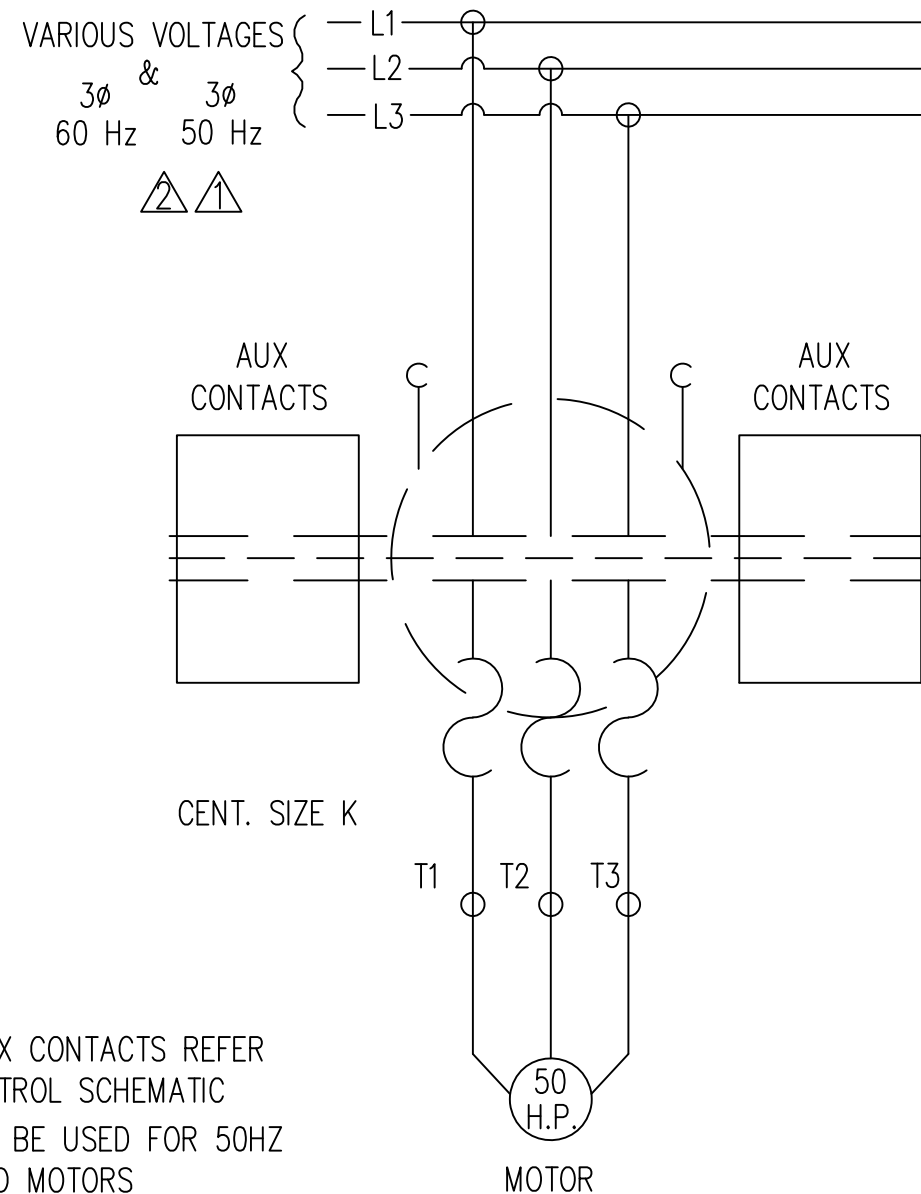
3	REVISE ITEM 03 (WAS G0003416)	JWC MC	06/05/12	TITLE CENTRIFUGE - ELECTRICAL CABLE DIAGRAM FOR PORTABLE DE-1000™W/FHD (50-60 HERTZ)			
2	REMOVED G.A. REF. 13718-00-005, REMOVED CONDUIT FROM TITLE BLOCK	SMG JS	06/12/06				
1	ADD REFERENCE G.A. 13718-00-005 ITEM 33-CABLE BRACKET WAS CONDUIT BRACKET	RPA JWC	3-22-06				
REV	CHANGE	CKD	DATE				
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				B Y DWN JWC 03/10/06 SHEET SIZE F C CKD JFS 03/14/06		DRAWING NO. 11290-00-006	
				DERRICK CORPORATION		590 DUKE ROAD BUFFALO, NY 14225 U.S.A.	

REF G.A. 13718-00  
REF W.S. #11241-00-002, 11171-00  
STARTED USING ON UNIT# CF000812



CENT. BOWMAN





- \* NOTES:
- 1) FOR AUX CONTACTS REFER TO CONTROL SCHEMATIC
  - 2) NOT TO BE USED FOR 50HZ DERATED MOTORS
  - 3) PRIMARY  
USE 0.8 AMP FUSE FOR 380/400 VAC  
USE 0.6 AMP FUSE FOR 460/480 VAC  
USE 0.5 AMP FUSE FOR 575/600 VAC
  - 3) SECONDARY  
ALWAYS USE 1.25 AMP FUSE
  - 4) USE FUSE LPJ-40SP  
WHEN SUPPLY VOLTAGE IS 380V, 50 Hz, 3 $\phi$

REF. P.L. 13275-00-003  
REF. P.L. 13275-00-004


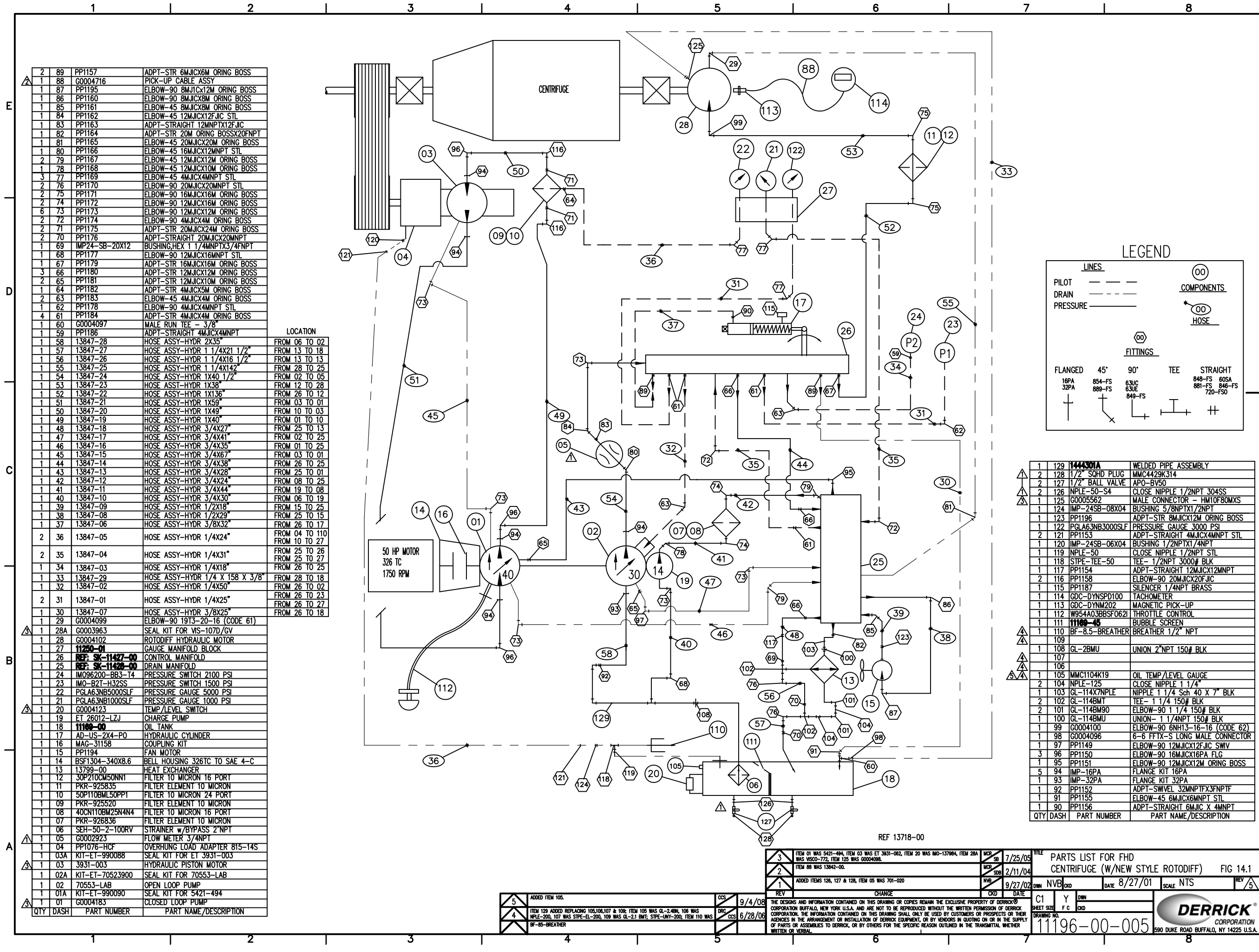
3	ADDED NOTE #3 & #4, ADDED PARTS LIST REF #, ADDED NEW TRANSFORMER, FUSES WERE 1 AMP PRIMARY 1.2 AMPS SECONDARY	JJA JFS	09/14/05	TITLE CENTRIFUGE – HIGH VOLTAGE SCHEMATIC FOR PORTABLE DE-1000™ (50/60 HERTZ)									
2	REMOVED VOLTAGES TO BE MORE GENERIC	JS PR	09/26/00										
1	ADDED 50/60, 380/50Hz & NOTE 2	TOC	03/02/94										
REV	CHANGE	CKD	DATE	DWN	KW	CKD	TS	DATE	06/21/93	SCALE	NONE	REV	3
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				SHEET SIZE	F C	CKD							
				DRAWING NO.									
							11171-00						

FIG 2.4

CENT. MAN





2	89	PP1157	ADPT-STR 6MJCX6M ORING BOSS
1	88	G0004716	PICK-UP CABLE ASSY
1	87	PP1195	ELBOW-90 8MJCX12M ORING BOSS
1	86	PP1160	ELBOW-90 8MJCX8M ORING BOSS
1	85	PP1161	ELBOW-45 8MJCX8M ORING BOSS
1	84	PP1162	ELBOW-45 12MJCX12FJC STL
1	83	PP1163	ADPT-STRAIGHT 12MNPTX12FJC
1	82	PP1164	ADPT-STR 20M ORING BOSSX20FNPT
1	81	PP1165	ELBOW-45 20MJCX20M ORING BOSS
1	80	PP1166	ELBOW-45 16MJCX12MNPT STL
2	79	PP1167	ELBOW-45 12MJCX12M ORING BOSS
1	78	PP1168	ELBOW-45 12MJCX10M ORING BOSS
3	77	PP1169	ELBOW-45 4MJCX4MNPT STL
2	76	PP1170	ELBOW-90 20MJCX20MNPT STL
2	75	PP1171	ELBOW-90 16MJCX16M ORING BOSS
2	74	PP1172	ELBOW-90 12MJCX16M ORING BOSS
6	73	PP1173	ELBOW-90 12MJCX12M ORING BOSS
2	72	PP1174	ELBOW-90 4MJCX4M ORING BOSS
2	71	PP1175	ADPT-STR 20MJCX24M ORING BOSS
2	70	PP1176	ADPT-STRAIGHT 20MJCX20MNPT
1	69	IMP24-SB-20X12	BUSHING,HEX 1 1/4MNPTX3/4FNPT
1	68	PP1177	ELBOW-90 12MJCX16MNPT STL
1	67	PP1179	ADPT-STR 16MJCX16M ORING BOSS
3	66	PP1180	ADPT-STR 12MJCX12M ORING BOSS
2	65	PP1181	ADPT-STR 12MJCX10M ORING BOSS
1	64	PP1182	ADPT-STR 4MJCX5M ORING BOSS
2	63	PP1183	ELBOW-45 4MJCX4M ORING BOSS
1	62	PP1178	ELBOW-90 4MJCX4MNPT STL
4	61	PP1184	ADPT-STR 4MJCX4M ORING BOSS
1	60	G0004097	MALE RUN TEE - 3/8"
1	59	PP1186	ADPT-STRAIGHT 4MJCX4MNPT
1	58	13847-28	HOSE ASSY-HYDR 2X35"
1	57	13847-27	HOSE ASSY-HYDR 1 1/4X21 1/2"
1	56	13847-26	HOSE ASSY-HYDR 1 1/4X16 1/2"
1	55	13847-25	HOSE ASSY-HYDR 1 1/4X142"
1	54	13847-24	HOSE ASSY-HYDR 1X40 1/2"
1	53	13847-23	HOSE ASSY-HYDR 1X38"
1	52	13847-22	HOSE ASSY-HYDR 1X136"
1	51	13847-21	HOSE ASSY-HYDR 1X59"
1	50	13847-20	HOSE ASSY-HYDR 1X49"
1	49	13847-19	HOSE ASSY-HYDR 1X40"
1	48	13847-18	HOSE ASSY-HYDR 3/4X27"
1	47	13847-17	HOSE ASSY-HYDR 3/4X41"
1	46	13847-16	HOSE ASSY-HYDR 3/4X35"
1	45	13847-15	HOSE ASSY-HYDR 3/4X67"
1	44	13847-14	HOSE ASSY-HYDR 3/4X38"
1	43	13847-13	HOSE ASSY-HYDR 3/4X28"
1	42	13847-12	HOSE ASSY-HYDR 3/4X24"
1	41	13847-11	HOSE ASSY-HYDR 3/4X44"
1	40	13847-10	HOSE ASSY-HYDR 3/4X30"
1	39	13847-09	HOSE ASSY-HYDR 1/2X18"
1	38	13847-08	HOSE ASSY-HYDR 1/2X29"
1	37	13847-06	HOSE ASSY-HYDR 3/8X32"
2	36	13847-05	HOSE ASSY-HYDR 1/4X24"
2	35	13847-04	HOSE ASSY-HYDR 1/4X31"
1	34	13847-03	HOSE ASSY-HYDR 1/4X18"
1	33	13847-29	HOSE ASSY-HYDR 1/4 X 158 X 3/8"
1	32	13847-02	HOSE ASSY-HYDR 1/4X50"
2	31	13847-01	HOSE ASSY-HYDR 1/4X25"
1	30	13847-07	HOSE ASSY-HYDR 3/8X25"
1	29	G0004099	ELBOW-90 1913-20-16 (CODE 61)
1	28A	G0003963	SEAL KIT FOR V5-107D/GV
1	28	G0004102	ROTODIFF HYDRAULIC MOTOR
1	27	11250-01	GAUGE MANIFOLD BLOCK
1	26	REF: SK-11427-00	CONTROL MANIFOLD
1	25	REF: SK-11428-00	DRAIN MANIFOLD
1	24	IMO96200-BB3-T4	PRESSURE SWITCH 2100 PSI
1	23	IMO-B2T-H32SS	PRESSURE SWITCH 1500 PSI
1	22	PGLA63NB5000SLF	PRESSURE GAUGE 5000 PSI
1	21	PGLA63NB1000SLF	PRESSURE GAUGE 1000 PSI
1	20	G0004123	TEMP/LEVEL SWITCH
1	19	ET 26012-LZJ	CHARGE PUMP
1	18	11169-00	OIL TANK
1	17	AD-US-2X4-P0	HYDRAULIC CYLINDER
1	16	MAG-31158	COUPLING KIT
1	15	PP1194	FAN MOTOR
1	14	BSF1304-340X8.6	BELL HOUSING 326TC TO SAE 4-C
1	13	13799-00	HEAT EXCHANGER
1	12	30P210CM50NN1	FILTER TO MICRON 16 PORT
1	11	PKR-925835	FILTER ELEMENT TO MICRON
1	10	50P110BML50PP1	FILTER TO MICRON 24 PORT
1	09	PKR-925520	FILTER ELEMENT TO MICRON
1	08	40CN110BM25N4N4	FILTER TO MICRON 16 PORT
1	07	PKR-926836	FILTER ELEMENT TO MICRON
1	06	SEH-50-2-100RV	STRAINER w/BYPASS 2"NPT
1	05	G0002923	FLOW METER 3/4NPT
1	04	PP1076-HCF	OVERHUNG LOAD ADAPTER 815-14S
1	03A	KIT-ET-990088	SEAL KIT FOR ET 3931-003
1	03	3931-003	HYDRAULIC PISTON MOTOR
1	02A	KIT-ET-70523900	SEAL KIT FOR 70553-LAB
1	02	70553-LAB	OPEN LOOP PUMP
1	01A	KIT-ET-990090	SEAL KIT FOR 5421-494
1	01	G0004183	CLOSED LOOP PUMP
QTY	DASH	PART NUMBER	PART NAME/DESCRIPTION

LOCATION
FROM 06 TO 02
FROM 13 TO 18
FROM 13 TO 13
FROM 28 TO 25
FROM 02 TO 05
FROM 12 TO 28
FROM 26 TO 12
FROM 03 TO 01
FROM 10 TO 03
FROM 01 TO 10
FROM 25 TO 13
FROM 02 TO 25
FROM 01 TO 25
FROM 03 TO 01
FROM 26 TO 25
FROM 25 TO 01
FROM 08 TO 25
FROM 19 TO 08
FROM 06 TO 19
FROM 15 TO 25
FROM 25 TO 15
FROM 26 TO 17
FROM 04 TO 110
FROM 10 TO 27
FROM 25 TO 26
FROM 25 TO 27
FROM 26 TO 25
FROM 28 TO 18
FROM 26 TO 02
FROM 26 TO 23
FROM 26 TO 27
FROM 26 TO 18

LEGEND

LINES

PILOT ---

DRAIN ---

PRESSURE ---

COMPONENTS

00

HOSE

FITTINGS

FLANGED 16PA 32PA

45° 854-FS 889-FS

90° 63UC 63UE 849-FS

TEE 848-FS 881-FS 846-FS 720-FS0

STRAIGHT 60SA 720-FS0

1	129	11196-01	WELDED PIPE ASSEMBLY
2	128	1/2" SQHD PLUG	MMC4429K314
2	127	1/2" BALL VALVE	AP0-BV50
2	126	NPLE-50-S4	CLOSE NIPPLE 1/2NPT 304SS
1	125	G0005562	MALE CONNECTOR - HM10F80MXS
1	124	IMP-24SB-08X04	BUSHING 5/8NPTX1/2NPT
1	123	PP1196	ADPT-STR 8MJCX12M ORING BOSS
1	122	PGLA63NB3000SLF	PRESSURE GAUGE 3000 PSI
2	121	PP1153	ADPT-STRAIGHT 4MJCX4MNPT STL
1	120	IMP-24SB-06X04	BUSHING 1/2NPTX1/4NPT
1	119	NPLE-50	CLOSE NIPPLE 1/2NPT STL
1	118	STPE-TEE-50	TEE- 1/2NPT 3000# BLK
1	117	PP1154	ADPT-STRAIGHT 12MJCX12MNPT
2	116	PP1158	ELBOW-90 20MJCX20FJC
1	115	PP1187	SILENCER 1/4NPT BRASS
1	114	GDC-DYNM202	TACHOMETER
1	113	GDC-DYNM202	MAGNETIC PICK-UP
1	112	W954A03BBSF0621	THROTTLE CONTROL
1	111	11169-05	BUBBLE SCREEN
1	110	BF-8.5-BREATH	BREATH 1/2" NPT
1	109		
1	108	GL-2BMU	UNION 2"NPT 150# BLK
1	107		
1	106		
1	105	MMC1104K19	OIL TEMP/LEVEL GAUGE
2	104	NPLE-125	CLOSE NIPPLE 1 1/4"
1	103	GL-114X7NPLE	NIPPLE 1 1/4 Sch 40 X 7" BLK
2	102	GL-114BM1	TEE- 1 1/4 150# BLK
2	101	GL-114BM90	ELBOW-90 1 1/4 150# BLK
1	100	GL-114BMU	UNION- 1 1/4NPT 150# BLK
1	99	G0004100	ELBOW-90 6NH13-16-16 (CODE 62)
1	98	G0004096	6-6 FFTX-S LONG MALE CONNECTOR
1	97	PP1149	ELBOW-90 12MJCX12FJC SWIV
3	96	PP1150	ELBOW-90 16MJCX16PA FLG
1	95	PP1151	ELBOW-90 12MJCX12M ORING BOSS
5	94	IMP-16PA	FLANGE KIT 16PA
1	93	IMP-32PA	FLANGE KIT 32PA
1	92	PP1152	ADPT-SWIVEL 32MNPTX3FNPTF
1	91	PP1155	ELBOW-45 6MJCX6MNPT STL
1	90	PP1156	ADPT-STRAIGHT 6MJCX 4 MNPT
QTY	DASH	PART NUMBER	PART NAME/DESCRIPTION

5	ADDED ITEM 105.	CCS	9/4/08
4	ITEM 120 ADDED REPLACING 105,106,107 & 108; ITEM 105 WAS GL-2.4BM, 106 WAS NPLE-200, 107 WAS STPE-EL-200, 108 WAS GL-2.1 BM; STPE-UNY-200; ITEM 110 WAS BF-8.5-BREATH	DRG	6/28/06

REF 13718-00

3

ITEM 01 WAS 5421-494, ITEM 03 WAS ET 3931-002, ITEM 20 WAS IMO-13789A, ITEM 28A WAS VSC0-772, ITEM 125 WAS G0004096.

7/25/05

MCB

SB

2

ITEM 88 WAS 13842-00.

2/11/04

MCB

SB

1

ADDED ITEMS 126, 127 & 128, ITEM 06 WAS 701-020

9/27/02

NVB

CRD

REV

CHANGE

DATE

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FILE

PARTS LIST FOR FHD CENTRIFUGE (W/NEW STYLE ROTODIFF)

FIG 14.1

C1

Y

OWN

SHEET SIZE

F C

CRD

11196-00-005

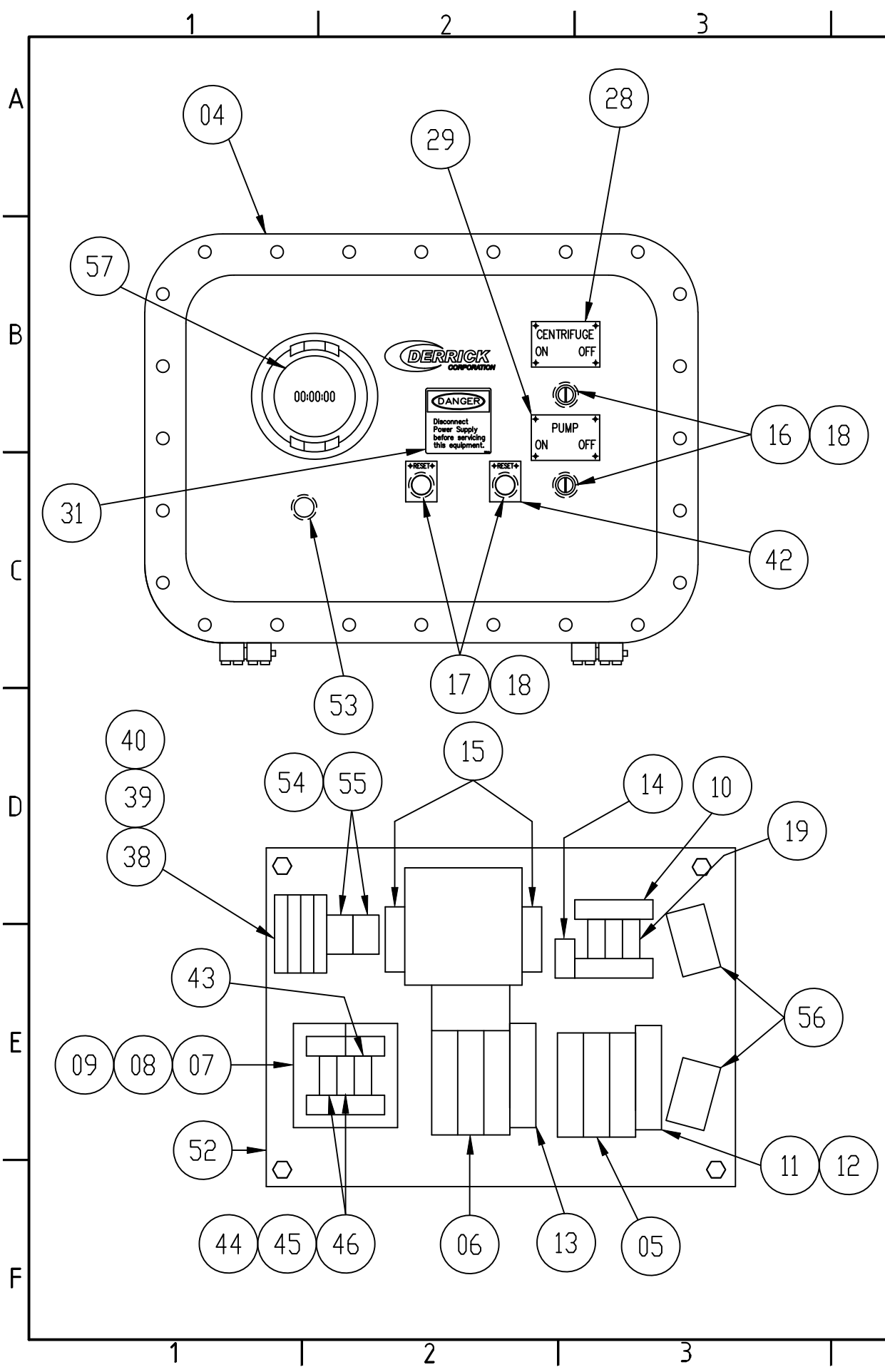
DERRICK CORPORATION

590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENT. MANUAL







REF W.S.#11241-00-002, 11171-00  
REF P.L.#11290-00-006, 11290-00-007  
REF G.A.#13718-00, 13718-00-005

6	ADDED G.A. REF # 13718-00-005 ADDED P.L. # 11290-00-007	JWC	JFS	06/13/06
5	CHANGED QUANTITY OF ITEM 20 (WAS 4) AND ITEM 21 (WAS 3), ADDED ITEM 58, CHANGED ITEM 22 (WAS CRH-LNR-1), CHANGED REF P.L. (WAS 11290-00-002)	JJA	JFS	10/11/05
4	ITEM 44 DESCRIPTION CHANGED WAS 1.5 AMPS	JJA	JFS	09/08/05
3	SEE RECORD COPY FOR REVISIONS 1 - 3	JJA	JFS	09/08/05
2	CHANGED QUANTITY OF ITEM 20 (WAS 4) AND ITEM 21 (WAS 3), ADDED ITEM 58, CHANGED ITEM 22 (WAS CRH-LNR-1), CHANGED REF P.L. (WAS 11290-00-002)	JWC	JFS	06/13/06
1	ITEM 44 DESCRIPTION CHANGED WAS 1.5 AMPS	JJA	JFS	10/11/05
0	SEE RECORD COPY FOR REVISIONS 1 - 3	JJA	JFS	09/08/05
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A	1	1	1	58	G0007421	CONDUIT BUSHING LINER .500 SM
	1	1	1	57	VDR-779516-201	METER, HOUR-AC VEEDER-ROOT
	2	2	2	56	WAR-27A1E0	INTRINSIC PUMP
	2	2	2	55	NEW 67F3890	PUMP CONTROL RELAY
	2	2	2	54	NWK-46F-3590	RELAY SOCKET
	1	1	1	53	G0003408	FEED PUMP ENGAGEMENT LIGHT
	1	1	1	52	13584-00	ELECTRICAL MOUNTING PLATE
	1	1	1	51	G0003190	TORQUE SPEC. STICKER
	1	1	1	50	G0003191	CAUTION STICKER
	1	1	1	49	G0003192	GROUNDING LUG STICKER
	1	1	1	48	G0002323	WARNING STICKER FOR GUARDS
	1	1	1	47	10777-08	DISCONNECT POWER TAG
			2	46	G0003996	FUSE, TIME DELAY-0.6 AMP 600V
		2		45	BSS-FNQ-R8/10	FUSE, TIME DELAY-8/10 AMP CLASS CC
	2			44	G0004195	FUSE, TIME DELAY-0.5 AMP CLASS CC
	1	1	1	43	G0002926	FUSE, TIME DELAY-1.25 AMP 250V STYLE FNM
	2	2	2	42	11255-12	RESET TAG, BLACK
	1	1	1	41	12195-00	SWITCH GUARD ASSY.
	B	1	1	1	40	CHMC381MC
1		1	1	39	CHMC381ES	TERMINAL BLOCK END
4		4	4	38	CHM-C381TP	TERMINAL BLOCK STRIP
1		1	1	37	THHN-14-STR-WHT	WIRE #14 WHITE X 12'
1		1	1	36	THHN-14-STR-BLK	WIRE #14 BLACK X 60'
1		1	1	35	THHN-10-STR-BLK	WIRE #10 BLACK X 12'
1		1	1	34	THHN-10-STR-G/Y	WIRE #10 GREEN/ YELLOW X 6"
1		1	1	33	THHN-4-STR-G/Y	WIRE #4 GREEN/ YELLOW X 3'
1		1	1	32	THHN-4-STR-BLK	WIRE #4 BLACK X 10'
1		1	1	31	10777-09	DANGER STICKER
1		1	1	30	G0003100	TAGS NUMBERED 6,5,5,4
1		1	1	29	11255-14	ON/ OFF PUMP TAG
1		1	1	28	11255-13	ON/ OFF CENTRIFUGE TAG
1		1	1	27	G0003112	CABLE ASSY.
2		2	2	26	PP1445	INSULATED CLAMPS 5/8"
1		1	1	25	NLGN-50X75	VINYL TUBE
3		3	3	24	T&B-54140	CRIMP LUG #4
15		15	15	23	PAN-TM3S10-C	WIRE MOUNTS
C		1	1	1	22	G0007415
	1	1	1	21	CRH-LNR-5	CONDUIT LINER 1.50
	1	1	1	20	CRH-LNR-4	CONDUIT LINER 1.25
	3	3	3	19	BSS-LPCC30	FUSE, 30 AMP CLASS "CC"
	4	4	4	18	CRH-SG2	GASKET
	2	2	2	17	CS10-EL-721-00	RESET SWITCH
	2	2	2	16	CS10-EL-702-00	START/ STOP SWITCH
	2	2	2	15	CHM-C320KGS4	AUX. CONTACT
	1	1	1	14	CHM-C320KGS1	AUX. CONTACT
	1	1	1	13	CS10-EL-708-0B	HEATER
	1			12	G0004199	RELAY, OVLD-14-22.8 AMPS CLASS 20
		1	1	11	CS10-EL-706-0B	HEATER
	1	1	1	10	CHM-C350KC63	FUSE BLOCK, 30A 600V CLASS "CC"
	1			09	G0002483	TRANSFORMER 575 V PRI/120V SEC
		1		08	G0002482	TRANSFORMER 380 V PRI/120V SEC
			1	07	G0002481	TRANSFORMER 460 V PRI/120V SEC
	1	1	1	06	CS10-EL-714-0B	STARTER SIZE K
	1	1	1	05	CS10-EL-712-0B	STARTER SIZE E
	1	1	1	04	G0005399	CONTROL BOX
D				03	13275-03-003	575V PRI/ 120 SEC CONTROL BOX ASSEMBLY
				02	13275-02-003	380V PRI/ 120 SEC CONTROL BOX ASSEMBLY
				01	13275-01-003	460V PRI/ 120 SEC CONTROL BOX ASSEMBLY
/06		QTY	ITEM	PART NUMBER	DESCRIPTION	

CONTROL BOX ASSEMBLY FOR  
PORTABLE DE-1000 W/FHD (50-60 HERTZ)

DWN TOC CKD

DATE 01/20/97

SCALE NONE

REV 6

B Y DWN BA 9/06/01

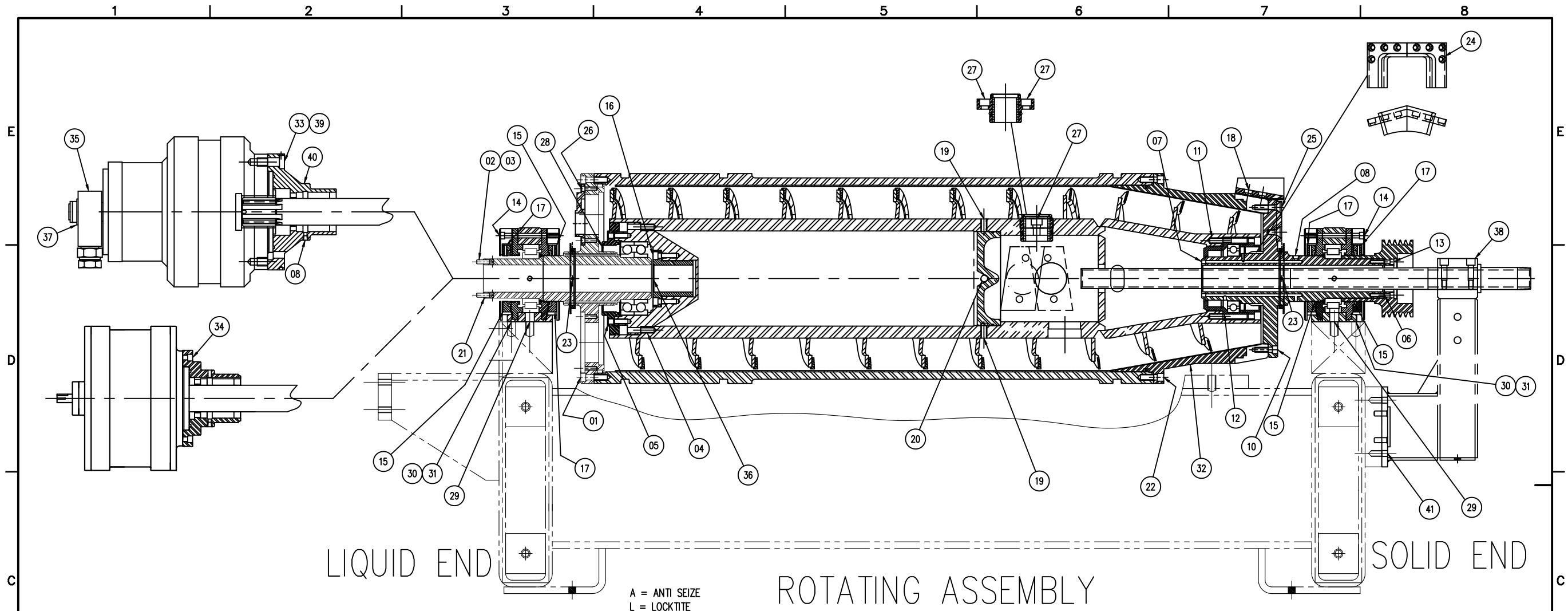
SHEET SIZE F C CKD JFS 9/11/01

DRAWING NO. 13275-00-003

**DERRICK**  
CORPORATION

590 DUKE ROAD BUFFALO, NY 14225 U.S.A.





## ROTATING ASSEMBLY

QTY	ITEM	HARDWARE REQUIRED	PART NO# (PER PC)	TORQUE SETTING	LUBRICANT	REFERENCE PART
4	41	3/8-16 X 1 1/2 (HEX HEAD BOLT)	G0008180	N/A	A	FEED TUBE SUPPORT FLANGE
1	40	5/16-18 X 1/2 ALY (SET SCREW CUP PT)	G0004184	N/A	A	FLANGE TO KEY
6	39	M16 X 40 (HEX SOCKET ALY)	13635-38	N/A	A	ROTODIFF TO ROTODIFF FLANGE
4	38	3/8-16 X 2 1/2 (HEX HEAD BOLT)	G0008178	NO TORQUE	A	FEED TUBE MOUNTING BLOCK
1	37	30 x 1.5MM X 1.4W EXTERNAL SNAP RING	G0003966	N/A	N/A	ROTODIFF PORT BLOCK
2	36	3/8 X 1 PIN (STEEL)	PP1354	N/A	680L	SPLINE HUB
1	35	3MM SET (SET SCREW)	PP1134-714	N/A	A	PORT BLOCK
6	34	5/16-18 X 3/4 (HEX SOCKET)	SKCS-31-18X075	N/A	A	GEARBOX TO GEARBOX FLANGE
6	33	M16 X 35 (HEX SOCKET ALY/PLD)	13635-37	N/A	A	ROTODIFF TO ROTODIFF FLANGE
1	32	#8 PLUG SS	PKR-8-HP50N-SS	35 FT-LBS	A	BOWL EXTENSION
4	31	#7 PIN (3/8-24 X 2 1/2 STEEL)	13775-00	N/A	A	PILLOW BLOCK
4	30	#8 PIN (7/16-20 X 2 1/2 STEEL)	G0003955	N/A	A	PILLOW BLOCK
4	29	5/8-11 X 2 1/4 (HEX HEAD BOLT)	G0008202	197 FT-LBS	A	PILLOW BLOCK
2	28	3/8-16 X 1/2 SS (SET SCREW CUP POINT)	G0003950	N/A	A	SEAL HOUSING
8	27	1/2-13 X 1 SS (HEX SOCKET)	G0002156	53 FT-LBS	A	FEED NOZZLE
12	26	5/16-18 X 7/8 SS (HEX SOCKET)	G0001578	144 IN-LBS	A	EFFLUENT PORT
4	25	3/8-16 X 3/4 SS (FLAT HEAD HEX SOCKET)	FHSK-38-16X75-S	183 IN-LBS	A	SOLID HEAD PLOWS
32	24	5/16-18 X 3/4 SS (HEX SOCKET)	G0003059	144 IN-LBS	A	WEAR INSERTS
4	23	10-24 X 1/4 SS (SET SCREW CUP POINT)	G0003874	N/A	A	CASE FLINGER
12	22	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	BOWL EXTENSION
9	21	5/16-18 X 1 (HEX SOCKET ALY)	SKCS-31-18X100	300 IN-LBS	262L	ROTODIFF/GEARBOX FLANGE
1	20	1/2-13 X 1 SS (SET SCREW FULL DOG)	G0003877	265 IN-LBS	A	FEED ACCEL BUMP
2	19	3/8-16 X 1 SS (SET SCREW CONE POINT)	G0003876	75 IN-LBS	A	FEED ACCEL BUMP
8	18	3/8-16 X 3/4 SS (HEX SOCKET)	G0003063	252 IN-LBS	A	CASE PLOWS
4	17	1/4-20 X 5/8 (HEX SOCKET SST)	G0008201	144 IN-LBS	A	PILLOW BLOCK FLINGER
8	16	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	SPLINE HUB
16	15	3/8-16 X 1 SS (FLAT HEAD HEX SOCKET)	G0001868	183 IN-LBS	A	PILLOW BLOCK COVER
6	14	5/16-18 X 4 (HEX SOCKET SST)	G0008200	NO TORQUE	A	FLINGER COVER
8	13	1/4-20 X 1 SS (HEX SOCKET)	G0003056	83 IN-LBS	A	PULLEY SHEAVE
1	12	1/4 X 1 PIN (STEEL)	PP1361	N/A	680L	S/E BEARING HOUSING
6	11	5/16-18 X 3 SS (HEX SOCKET)	G0003062	144 IN-LBS	A	S/E SEAL HOUSING
8	10	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	S/E BOWL HEAD
2	09	PLASTIC CAP	G0003467	N/A	N/A	S/E BOWL HEAD
4	08	1/8 NPT X 3/4 SS (GREASE FITTING)	G0003513	N/A	N/A	S/E BOWL HEAD
2	07	5/16-18 X 1/2 SS (SET SCREW CUP POINT)	G0005508	N/A	262L	S/E BOWL HEAD
4	06	1/4 X 1 1/4 PIN (STEEL)	G0001744	N/A	680L	S/E BOWL HEAD
4	05	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	L/E SEAL HOUSING
8	04	3/8-16 X 1 1/2 SS (HEX SOCKET)	G0003066	252 IN-LBS	A	L/E BEARING HOUSING
1	03	5/16 X 5/16 X 3 KEY	G0003872	N/A	N/A	L/E BOWL HEAD
4	02	5/16 X 1 PIN (STEEL)	PP1362	N/A	680L	L/E BOWL HEAD
12	01	3/8-16 X 1 1/4 SS (HEX SOCKET)	G0003065	252 IN-LBS	A	L/E BOWL HEAD

△  
NOTES:

- 1) MATERIAL: (HEX SOCKET BOLTS)  
ALLOY STEEL - TENSILE STRENGTH 190,000 PSI MINIMUM (HEAT TREATED)  
STAINLESS STEEL - TENSILE STRENGTH 80,000 PSI MINIMUM
- 2) QUANTITY LISTED IS PER ROTATING ASSEMBLY
- 3) \* A) ITEMS 02 & 21 QTY'S ARE (4) FOUR FOR UNITS PRIOR TO SERIAL NUMBER CF000272  
\* B) ITEM 02 QTY IS (2) TWO & ITEM 21 QTY IS (6) SIX FOR UNITS WITH SERIAL NUMBERS  
IN THE RANGE OF CF000272 TO CF000678  
△ \* C) ITEM 02 QTY IS (0) ZERO & ITEM 21 QTY IS (9) NINE FOR UNITS WITH SERIAL NUMBERS  
ABOVE CF000679  
\*\* D) ITEMS 35 & 37 ARE NOT REQUIRED AFTER UNIT CF000678  
△ \*\*\* E) ITEM 33 TO BE USED WITH ROTODIFF ASSY 107/D6V  
ITEM 39 TO BE USED WITH ROTODIFF ASSY 1071

CENTRIFUGE ROTATING ASSEMBLY HARDWARE PARTS LIST		DATE 3/21/01		SCALE 1:5		REV 8	
8		ADDED GEARBOX VIEW MOVED BALLOON 34 TO GEARBOX VIEW; SEE MODEL SPACE & RECORD COPY FOR REVISIONS 1 THRU 7.		CDS		5/12/08	
REV		CHANGE		CRD		DATE	
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SHEET SIZE		F C		CRD		DWN	
DRAWING NO.		14894-00		590 DUKE ROAD BUFFALO, NY 14225 U.S.A.		CENT. MAN. BOM	





This section should be used by operating and maintenance personnel to record historical information gathered during the installation and operation of the Derrick equipment. If properly kept, the log will be useful for altering maintenance intervals and intercepting trends that may indicate the need for changing operating procedures. Each entry in the log should be dated for future reference and tracking. If required, additional pages may be added to the log by copying a blank page or simply inserting ruled paper at the rear of the section.

[illegible]

[illegible]

[illegible]

[illegible]



[illegible]

[illegible]



## CERTIFICATE OF ORIGIN

Equipment:

Centrifuge

Model:

DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD

Characteristics:

0-600VAC, 50/60Hz, 3PH

Derrick Corporation acknowledges that the above set-forth product is manufactured in the United States of America as of the data of this certificate. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

A handwritten signature in blue ink, reading "Jennifer J. Polanowski".

Date: 29-December-2011

Signature: Jennifer J. Polanowski  
Derrick Corporation



## CERTIFICATE OF QUALITY

Equipment:	Centrifuges
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD, DE-7200 VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

Derrick Corporation acknowledges that the above set-forth product conformed to the requirements for the applicable purchase order at the time of its original shipment by Derrick Corporation in that all construction materials and components were new and unused, were manufactured for this product, and that it was free of any known defects as to their design, material and workmanship. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

A handwritten signature in blue ink that reads "Jennifer J. Polanowski".

Date: 29-December-2011

Signature: Jennifer J. Polanowski  
Derrick Corporation



## SHIPPING FINAL INSPECTION AND RUN TEST CERTIFICATE

Equipment:	Centrifuges
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD, DE-7200 VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

The product listed above was inspected and found to be in conformance with Derrick Corporation's internal coating, run test, and assembly inspection documents that were required for the type of equipment manufactured in accordance with the Derrick quality system. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

A handwritten signature in blue ink that reads "Jennifer J. Polanowski".

Date: 29-December-2011

Signature: Jennifer J. Polanowski  
Derrick Corporation



Doc # PE-S-036-02-06  
Date: 20-January-2011

## CERTIFICATE OF CONFORMANCE

Equipment: Mining & Oilfield equipment manufactured specifically for Hazardous Location Areas including but not limited to: Flo-Line® Cleaners, Flo-Line® Primers, Agitators, Vacu-Flo™ Degassers, DE-1000™ Centrifuges, Centrifugal Pumps, Flo-Line Scalpers™ etc.

Name and Address of Manufacturer: Derrick Corporation  
590 Duke Road  
Buffalo, NY 14225

Rating and Principle Characteristics: 0-600 VAC, 50/60Hz, 3PH

Model / Type Ref: Various

Additional Information: None

This product was found to be in conformance with:

**U.L. listed for hazardous locations Class I, Division 1, Groups C & D, which is similar to equipment marked as II 2G Ex d IIB T3 for Zone 1 areas. Assembled in accordance with National Electrical Code (NEC) – articles 500 thru 506 (hazardous locations) where applicable.**

Additionally:

Derrick Corporation certifies that the above-listed equipment for the referenced order conformed to the requirements of the specified order at the time of its original shipment by Derrick Corporation in that: all construction materials and components were new and unused, manufactured for this equipment, and that the goods were free of any known defects as to their design, material and workmanship. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the above-listed equipment.



Signature: For Thomas Silvestrini