



DE-1000 Centrifuge Gearbox Drive

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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).**

This document contains proprietary information of Derrick Corporation. It is intended solely for the information and use of parties operating and maintaining the equipment described herein. Such proprietary information may not be used, reproduced, or disclosed to any other parties for any other purpose without the expressed written permission of Derrick Corporation.

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

CONTENTS

Section	Page	Date
1 - Introduction	1-1	01 Jan 12
Overview	1-1	
Safety	1-1	
Equipment Use	1-2	
Description	1-2	
Mechanical Operation	1-6	
Electrical Control System Operation	1-8	
Product Support	1-9	
2 - Safety	2-1	01 Apr 11
General	2-1	
Warnings	2-1	
Material Safety Data Sheets (MSDSs)	2-3	
3 - Installation	3-1	31 Oct 11
General	3-1	
Safety	3-1	
Installation Sequence	3-2	
Site Preparation and Clearance Requirements	3-2	
Equipment Handling	3-2	
Equipment Positioning and Leveling	3-4	
Lower and Secure Rotating Assembly	3-4	
Feed and Discharge Connections	3-5	
Feed Pump	3-6	
Electric Power Connections	3-6	
Machine Startup	3-7	
4 - Operating Instructions	4-1	01 Jan 12
General	4-1	
Operating Safety	4-1	
Initial Startup	4-1	
Normal Startup	4-2	
Cold Climate Startup	4-2	
Operation	4-3	
Feed Rate Adjustment	4-3	

CONTENTS

Section	Page	Date
4 - Operating Instructions (Cont'd)		
Pond Depth Adjustment	4-3	
Bowl and Conveyor Speed Adjustment	4-4	
Overload Release Clutch Torque Adjustment	4-6	
Normal Shutdown	4-8	
Automatic Shutdown	4-9	
Emergency Shutdown	4-10	
5 - Maintenance.....	5-1	01 Jan 12
General.....	5-1	
Preventive Maintenance	5-1	
Approved Lubricants	5-2	
Fluid Coupling Oil Level	5-3	
Drive Belt Replacement	5-4	
Rotating Assembly Maintenance.....	5-5	
Main Bearing Replacement.....	5-12	
Conveyor Bearing Replacement	5-20	
Tool List	5-23	
Hardware Torque Specifications	5-24	
Parts Replacement	5-27	
Recommended Spare Parts	5-27	
Troubleshooting	5-29	
6-7 - Not Used		
8 - Reference Drawings.....	8-1	15 Aug 10
9 - Installation and Maintenance Log.....	9-1	04 May 09

SECTION 1 - INTRODUCTION

OVERVIEW

This manual provides instructions for installing, operating, and maintaining the DE-1000 Gearbox Drive (GBD) 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 Gearbox Drive (GBD) 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

EQUIPMENT USE

The DE-1000 GBD 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

The centrifuge is available in either 380Vac 50Hz or 460Vac 60Hz 3 phase power configuration. A 50HP drive motor operates the rotating assembly through a fluid coupling used to soften the starting torque applied to the bowl. The rotating assembly is housed in a stainless steel case having a hinged cover, which permits maintenance access while preventing liquid escape during centrifuge operation. The conveyor differential speed is set by the gearbox mounted at the liquid end of the bowl; available gearbox ratios are 52:1 and 125:1. Several drive motor sheaves are available to permit speed adjustment from 2450 to 4000RPM at 60Hz or 2000 to 3250RPM at 50Hz. The conveyor is protected by an automatic overload release clutch that shuts down the centrifuge in case of an over-torque condition.

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

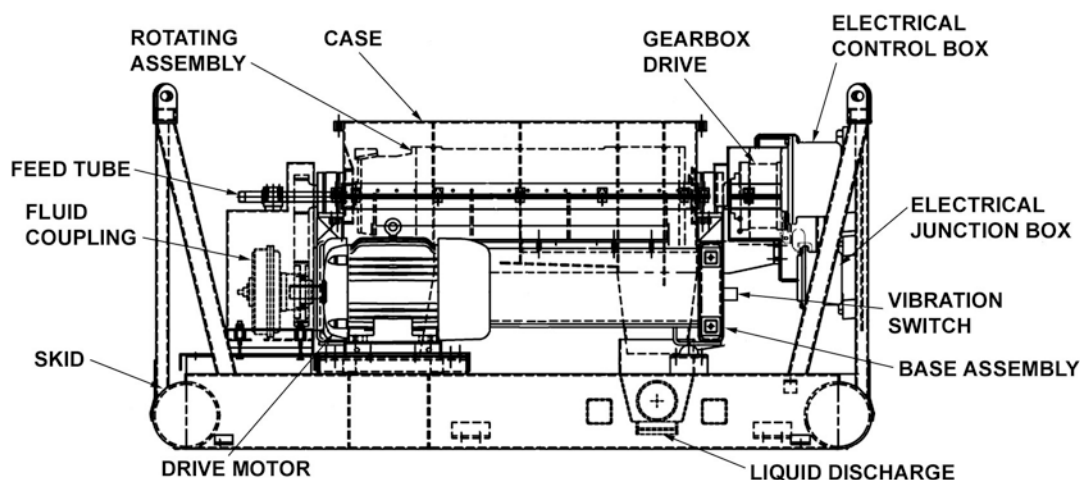


Figure 1-2 DE-1000 GBD Centrifuge Major Components

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-resistant 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 gearbox, 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 gearbox 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.

Gearbox Drive

The gearbox drive is a differential reduction gearbox that rotates the conveyor at a proportionally slower speed than the bowl assembly; available ratios are 52:1 and 125:1. The drive is bolted to the liquid end gear flange. Its shaft engages internal splines in the liquid end bearing housing to rotate the conveyor.

A two-stage planetary gear system transfers motion from a ring gear to a second-stage pinion gear that rotates the conveyor shaft. The conveyor's rotational speed varies directly with bowl speed, maintaining a consistent differential relationship for solids conveyance. If excessive solids cause high conveyor torque, the overload release assembly causes the centrifuge to automatically shut down.

Overload Release Clutch

The overload release clutch (Figure 1-3) protects the centrifuge by shutting down electric power to the drive motor and feed pump motor if excessive torque is required to rotate the conveyor (335 in lbs - 52:1 gearbox; 200 in lbs - 125:1 gearbox). The torque arm, which is suspended between two stops, is attached to the clutch to prevent it from rotating with the gearbox ring gear. The eccentric torque cam is keyed to the gearbox first-stage sun gear. If conveyor torque rises excessively, the first-stage sun gear rotates with the conveyor, causing the torque cam to rotate. When the torque cam rotates sufficiently to deflect the roller arm, the normally closed over-torque limit switch is opened, interrupting power to the drive motor and feed pump motor, and shutting down the centrifuge. Following an overload release, the clutch must be manually reset (refer to Section 5) before the centrifuge can be returned to operation.

INTRODUCTION

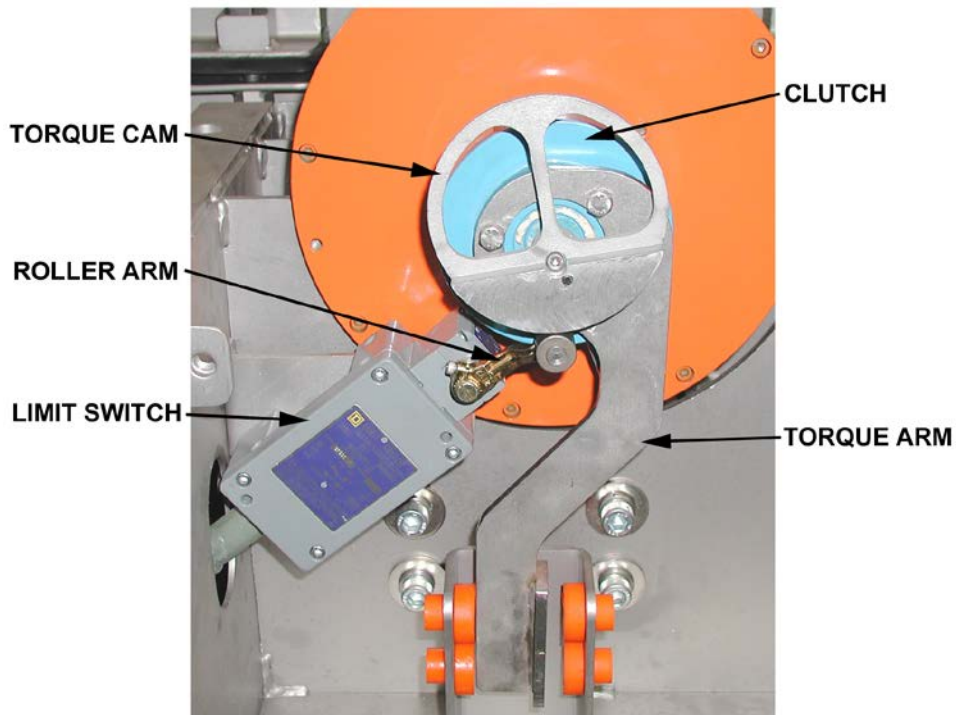


Figure 1-3 Overload Release Clutch

Fluid Coupling

Starting torque of the drive motor is cushioned by the fluid coupling mounted on the motor shaft. Rotary motion of the motor shaft is transmitted to the inner hub of the fluid coupling, while the outer hub of the coupling is connected to the sheave. Fluid pressure in the coupling causes the sheave to rotate, thereby overcoming the inertia of the rotating assembly slowly and allowing gradual, smooth bowl acceleration.

Electrical Control Box

Centrifuge operation is controlled at the electrical control box (Figure 1-4), which contains components that control operation of the drive motor 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. Pressure switches shut down the feed pump when conveyor pressure demand reaches 1500 PSI and re-start the feed pump when pressure falls to 700 PSI.

Electrical Control Box (Cont'd)

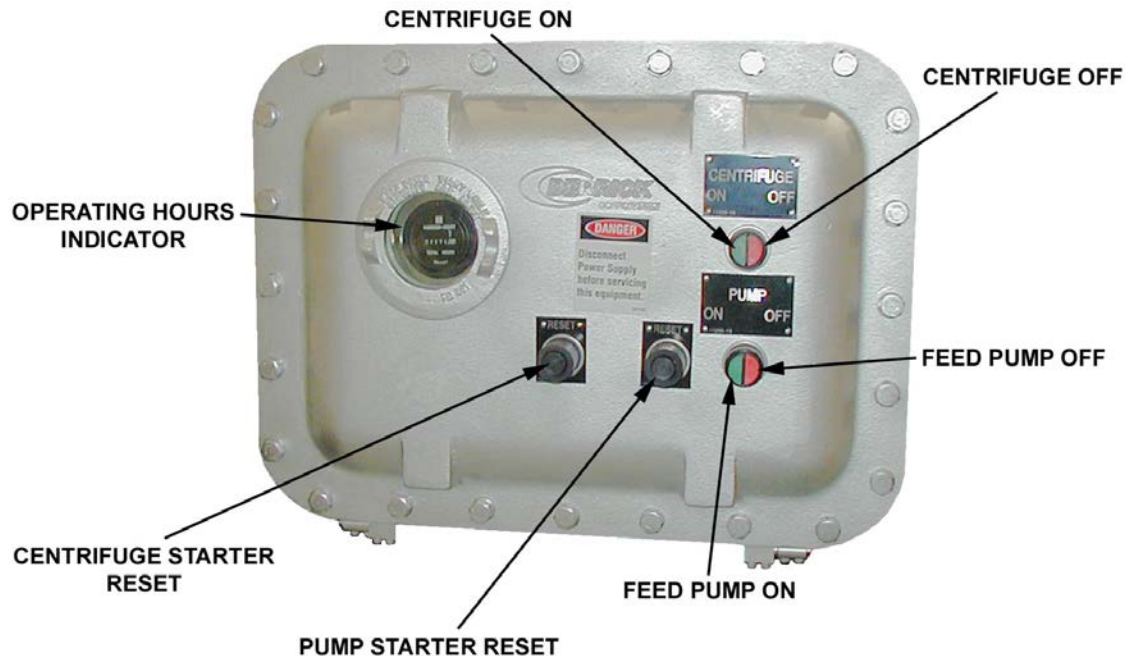


Figure 1-4 Electrical Control Box

Drive Motor

The 50HP, 460Vac 60Hz or 380Vac 50Hz, three-phase, explosion-proof electric drive motor is connected to the liquid bowl assembly by a sheave and drive belt. Motion is transmitted to the sheave by a fluid coupling, which is attached directly to the motor shaft. Protective guards cover the sheaves and drive belt for personnel protection.

The 60Hz motor operates at 1760 RPM, and the 50Hz unit operates at 1475 RPM. 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 magnetic 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.

INTRODUCTION

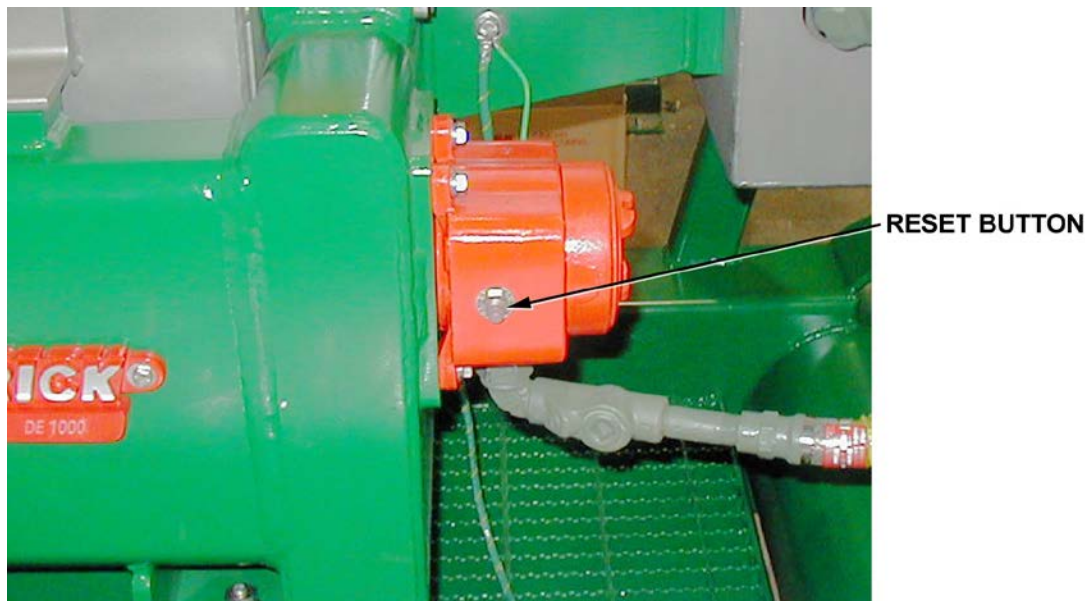


Figure 1-5 Vibration Switch

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 gearbox at the liquids 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 receives slurry at the sheave end (solid discharge end) of the machine. For best performance, the slurry should be screened to 74 microns in vibrating screening machines before being fed to the centrifuge.

The slurry flows through a feed tube into the rotating bowl, where centrifugal force separates liquid from the solids. Liquid flows out the liquid discharge connection at the gearbox end of the centrifuge, while solids are conveyed to the solid discharge where they fall into a chute at the bottom of the machine.

The centrifuge is configured at the factory to operate on a specific AC voltage supplied in three-phase, 50Hz or 60Hz. Electrical controls are mounted on the electrical control box located at the machine's liquid discharge end. Safety devices built into the centrifuge protect personnel and equipment by shutting down the drive motor in case of excessive conveyor pressure, high motor temperature, vibration, or other malfunction.

G forces produced by the high-speed rotation of a cylindrical bowl separate solids from the feed slurry. Centrifuge performance is based on three variable factors:

- G force exerted on the fluid - Gravitational 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 - Faster conveyor rotation results in wetter solids and greater volume of discharged solids

All three factors may be manipulated to alter the liquid and solids discharge. By changing the motor sheave diameter, the bowl RPM is varied. Retention time is controlled by adjusting the liquid discharge ports on the liquid bowl head to change the pond depth (liquid level), and the conveyor differential speed may be altered by changing gearbox ratio. The conveyor operates at a lower speed than the bowl; its speed is derived from the gearbox ratio. The conveying speed is the difference between the bowl and conveyor speeds.

Adjusting any parameter—pond depth, bowl speed, and conveyor differential speed—requires shutdown of the equipment. Another method of altering the discharge results is to change the feed rate.

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 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.

As the slurry flows in the channels between the conveyor flights, the heavy particles settle at an accelerated rate due to the G 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 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 inside the bowl and are transported by the conveyor toward the narrow end of the bowl (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 solid discharge ports on the bowl, they contain only the adsorbed moisture.

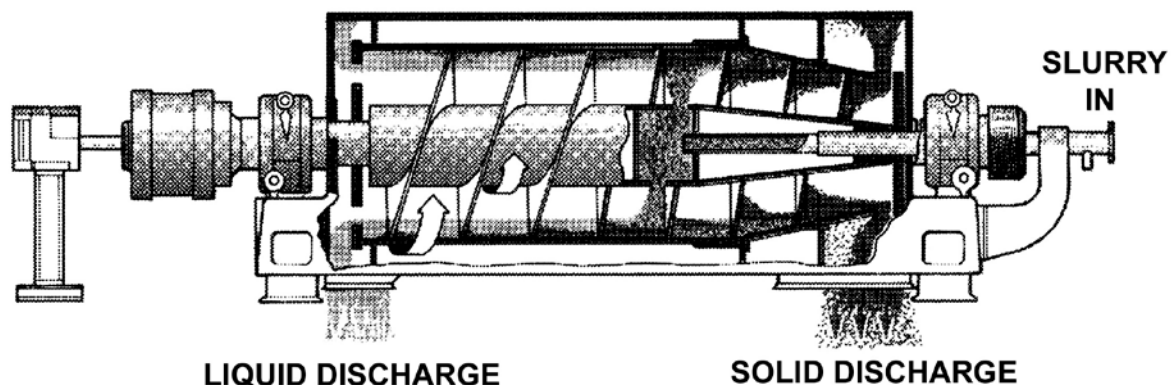


Figure 1-6 Centrifuge Operation

INTRODUCTION

ELECTRICAL CONTROL SYSTEM OPERATION

The following paragraphs describe operation of the electrical control system. This information is provided as an aid to understanding the centrifuge operation, as well as for assistance in troubleshooting. The following paragraphs describe operation of the drive motor and feed pump control circuits.

Drive Motor

With electric power supplied to the centrifuge, 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 over-torque switch contacts, N/C vibration switch contacts, and N/C motor over-temperature contacts, energizing centrifuge run relay CR1. With run relay CR1 energized, power is applied to the 50 HP electric drive motor. In addition, the feed pump circuit is enabled, permitting startup of the slurry feed pump, and the elapsed time meter is energized.

Feed Pump

Pressing the PUMP ON button applies power through the switch's N/O contacts and normally closed (N/C) thermal overload contacts, energizing pump start relay CR2. After the button is released, power is maintained to CR1 through the button's NC contacts and the parallel circuit formed by the N/O contacts of relays CR1 and CR2. Pressing the PUMP OFF button de-energizes relay CR2, shutting down the feed pump motor and centrifuge drive motor.

Safety

The centrifuge control system protects the centrifuge in case of any of the following conditions:

- Excessive drive motor current demand
- Excessively high conveyor torque
- Excessive vibration
- Drive motor over-temperature

Any of the above conditions de-energizes relay CR1. The relay's N/O contacts open, which de-energizes centrifuge run relay CR1 and shuts down the drive motor and feed pump motor. Once shut down by any of these conditions, the centrifuge may be re-started after removing the cause of the shutdown and pressing the CENTRIFUGE ON button.

Thermal Overload

If the drive motor or pump feed motor draws excessive current, the corresponding thermal overload in the electrical control panel will trip. The centrifuge may then be re-started only after removing the cause of the overload and pressing the centrifuge and pump starter RESET buttons.

Vibration

The vibration switch interrupts power to centrifuge run relay CR1 in case of excessive vibration. After removing the cause of unusual vibration, power is restored by pressing the external button on the vibration switch housing to magnetically latch the switch contacts. The centrifuge may then be re-started by pressing the CENTRIFUGE ON button.

Motor Over-Temperature

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.

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	
Colorado	
	Grand Junction - 970.241.2417
Louisiana	
	Broussard - 877.635.3354
New York - Corporate Headquarters	
	Buffalo - 716.683.9010
Oklahoma	
	Oklahoma City - 405.208.4070
Texas	
	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
Wyoming	
	Casper - 307.265.0445
North Dakota	
	Williston - 701.572.0722

SECTION 2 - SAFETY

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

Equipment Handling



WARNING! USE SPREADER BARS TO PREVENT DAMAGE WHEN LIFTING 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 MOTOR OR ANY OTHER LOCATION.



WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT.



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

Operation



WARNING! ALL OPERATING AND MAINTENANCE PERSONNEL MUST READ AND UNDERSTAND ALL SAFETY INFORMATION IN THIS MANUAL BEFORE WORKING WITH THE EQUIPMENT.



WARNING! BE SURE THAT TOP COVER IS CLOSED AND SECURED AND ALL PERSONNEL ARE CLEAR BEFORE STARTING MACHINE.



WARNING! BEFORE STARTING CENTRIFUGE, BE SURE THAT ALL SHIPPING BRACKETS HAVE BEEN REMOVED AND BEARING PILLOW BLOCKS ARE PROPERLY TIGHTENED.



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



WARNING! DO NOT OPERATE CENTRIFUGE IF EXCESSIVE NOISE OR VIBRATION DEVELOPS. ALWAYS CONFIRM THAT VIBRATION SWITCH AND OTHER SAFETY DEVICES ARE FUNCTIONAL.

Maintenance



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.

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.

APPLICATION - DESCRIPTION	MSDS No. / Date
Paints	
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
Lubricants	
<i>Arctic Environment</i>	
All Bearings - Shell Aeroshell GR-14*	56200E-9 / 10-23-03
All Bearings - Nye Lubricants NyoGel 760D*	760D / 03-26-03
Gearbox - Mobil SH 220	SH 220
Fluid Coupling - Mobil SCH 626	SCH 626
Overload Release Clutch - Shell Aeroshell GR 14	56200E-9 / 10-23-03
<i>Standard Environment</i>	
All Bearings - Chevron SRI NLGI 2*	6979 / 08-03-04
All Bearings - Nye Lubricants NyoGel 760D*	760D / 03-26-03
Gearbox - Shell Omala 320	Omala 320
Fluid Coupling - Chevron GST ISO-32	GST ISO-32
Overload Release Clutch - Shell Aeroshell GR 14	56200E-9 / 10-23-03
<i>Food Grade</i>	
Main Bearings Only - Chevron SRI NLGI 2*	6979 / 08-03-04
Conveyor Bearings Only - Mobil FM 102*	642363-00 / 01-17-02
Sealant	
Loctite Anti-Seize Lubricant - Fasteners	76764 / 09-27-04

* NyoGel 760D required only for 4000RPM operation per customer specification. Refer to specification data sheet supplied with machine to identify grease type.

SECTION 3 - INSTALLATION

GENERAL

This section describes the recommended installation procedure for the Derrick DE-1000 GBD 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

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. Operate controls on electrical panel
 - b. Open and close top cover.
 - c. Grease main and gearbox bearings.
 - d. Check gearbox and drive clutch oil levels.
 - 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.



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.



WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT.



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



WARNING! WHEN USING AN OVERHEAD LIFTING DEVICE, USE ALL FOUR LIFTING POINTS PROVIDED.

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.

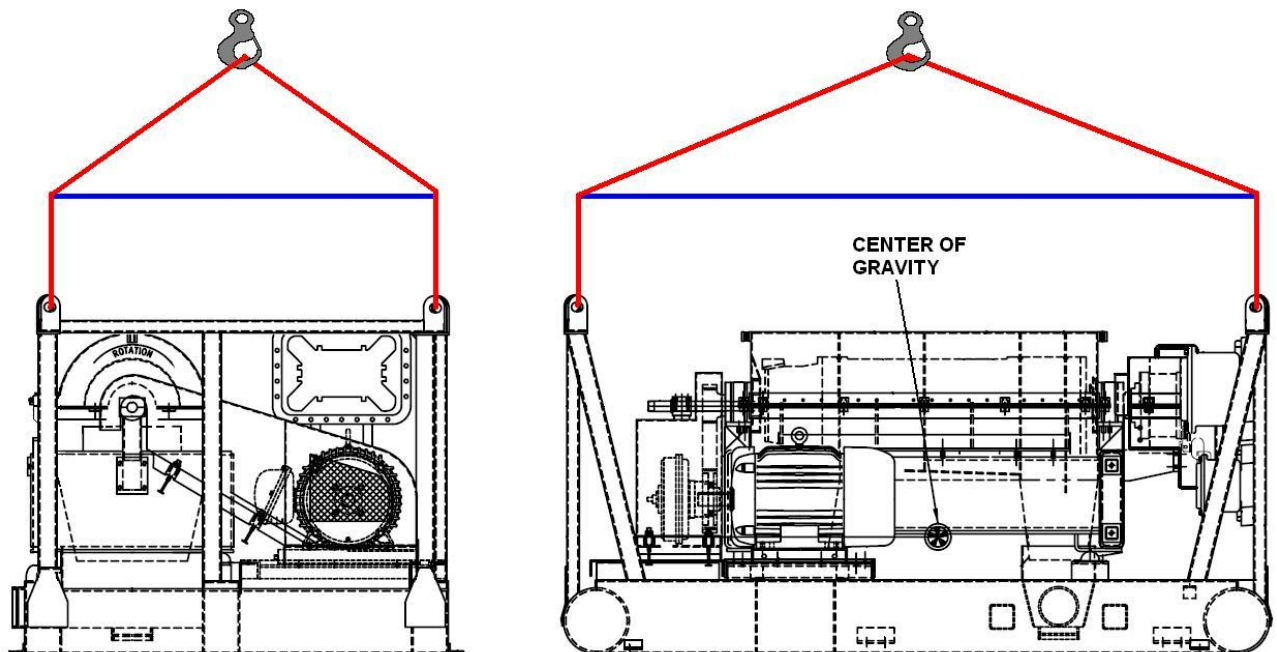


Figure 3-1 Lifting Arrangement

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.

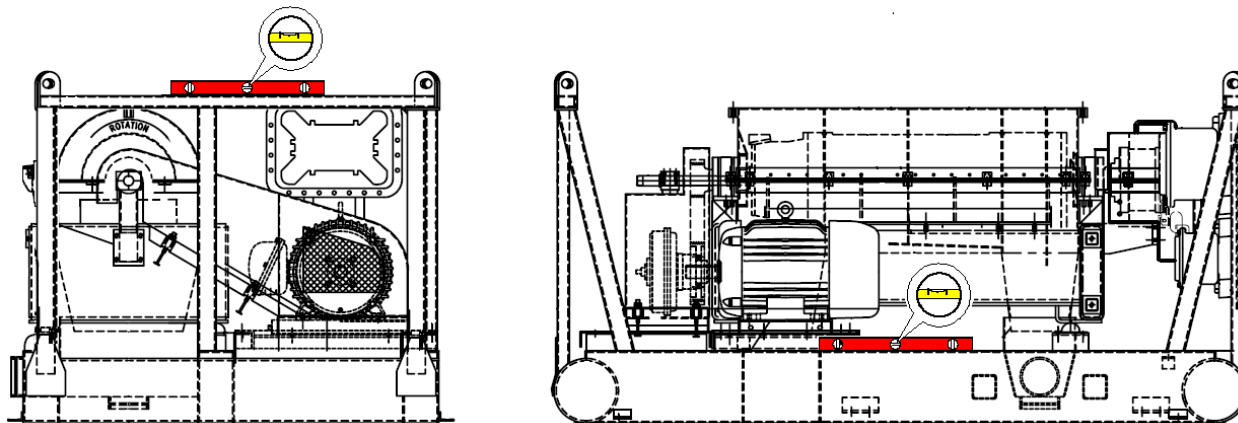


Figure 3-2 Centrifuge Leveling

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 gearbox 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.

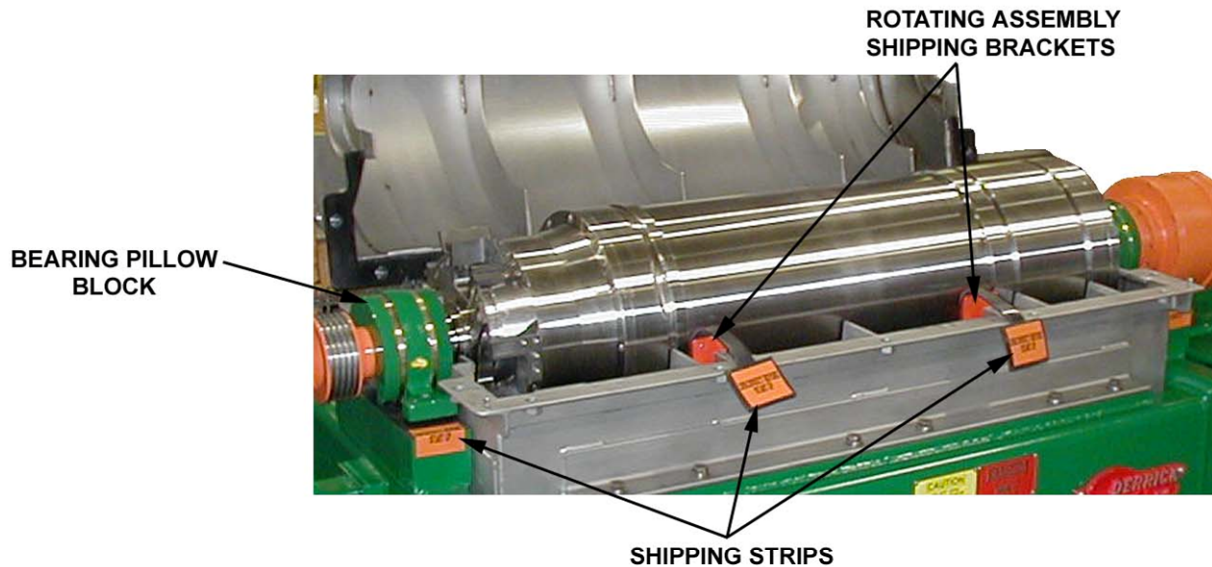


Figure 3-3 Shipping Components Locations

11. Rotate bowl manually to confirm that no binding or rubbing is present.
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.

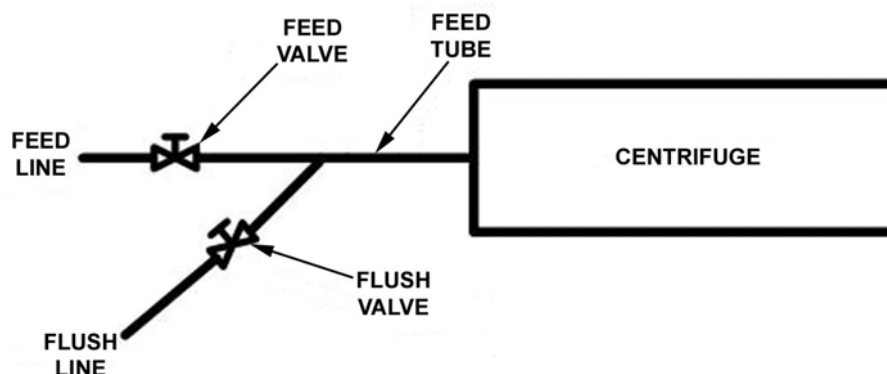


Figure 3-4 Feed and Flush Connections

INSTALLATION




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 section so that its operation can be supervised by the centrifuge.

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 8 for additional assistance and information on electrical connections.

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

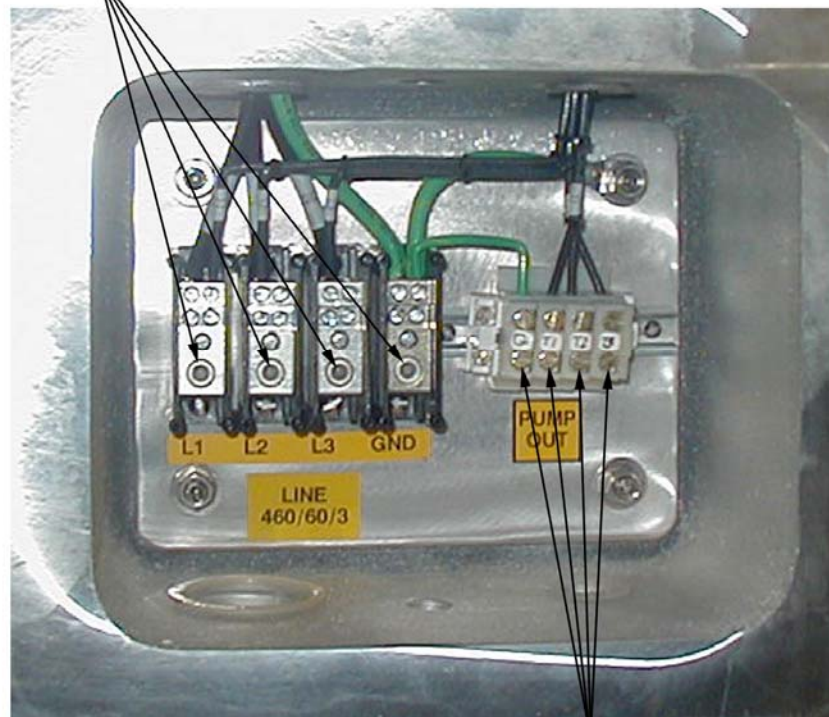
	WARNING! DRIVE MOTOR MUST BE OPERATED AT THE DESIGNATED SUPPLY VOLTAGE.
	WARNING! HIGH VOLTAGE MAY BE PRESENT. BE SURE FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THIS EQUIPMENT IS OPEN. LOCK OUT AND TAG OUT POWER SUPPLY TO PREVENT ACCIDENTAL APPLICATION OF POWER WHILE MAKING ELECTRICAL CONNECTIONS.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

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 15HP.

CENTRIFUGE POWER
CONNECTIONS



FEED PUMP
CONNECTIONS

Figure 3-5 Electric Power and Feed Pump Connections

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.

SECTION 4 - OPERATING INSTRUCTIONS

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

	WARNING! ALL OPERATING AND MAINTENANCE PERSONNEL MUST READ AND UNDERSTAND ALL SAFETY INFORMATION IN THIS MANUAL BEFORE WORKING WITH THE EQUIPMENT.
	WARNING! BE SURE THAT COVER IS CLOSED AND SECURED AND ALL PERSONNEL ARE CLEAR BEFORE STARTING MACHINE.
	WARNING! BE SURE THAT ALL SHIPPING BRACKETS HAVE BEEN REMOVED AND BEARING PILLOW BLOCKS ARE PROPERLY TIGHTENED.
	WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING COVER OR REMOVING GUARDS.
	WARNING! DO NOT OPERATE CENTRIFUGE IF EXCESSIVE NOISE OR VIBRATION DEVELOPS. ALWAYS CONFIRM THAT VIBRATION SWITCH AND OTHER SAFETY DEVICES ARE FUNCTIONAL.

INITIAL STARTUP

	Note! If centrifuge is heated, before starting centrifuge follow COLD CLIMATE STARTUP instructions later in this section to ensure proper bearing lubrication.
---	---

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.

Before beginning the procedure, verify the following:

1. All tools, documents, and shipping components have been removed and there are no obstructions to operation.
2. All personnel are clear of equipment.

OPERATING INSTRUCTIONS

INITIAL STARTUP PROCEDURE

Step	Procedure
1	Confirm that all operators and maintenance personnel have read and understand all operating and safety information in Section 2.
2	Verify that equipment has been installed properly, all shipping brackets have been removed, and bearing pillow blocks have been tightened to specified torque.
3	Check that services and utilities are available at the installation site.
4	Check that cover is closed, all cover bolts are fully tightened, and all guards are in place.
5	Start centrifuge in accordance with Normal Startup procedure below.

NORMAL STARTUP

The following procedure shall be performed at each machine startup:

NORMAL STARTUP PROCEDURE

Step	Procedure
1	Check that cover is closed, all cover bolts are fully tightened, and all guards are in place.
2	Rotate bowl assembly manually to check that the rotating assembly turns freely and no rubbing is felt.
3	Verify that all personnel are clear of centrifuge and all guards are in place before applying electric power to equipment.
4	Press CENTRIFUGE ON button to start the centrifuge drive motor. Confirm that conveyor is turning counterclockwise when looking toward liquid bowl head.
5	Press PUMP ON button to start feed pump, and slowly introduce feed to centrifuge.

COLD CLIMATE STARTUP

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.

OPERATION

Monitor the liquid and solid discharges continually to determine operating status of the centrifuge. Take corrective action if any anomaly is detected such as insufficient solids discharge and/or repetitive tripping of the overload release clutch. Note that any change in feed rate or adjustment of pond depth will not produce an immediate response from the centrifuge. It may take one or more hours of continuous operation before a change appears in the liquid and/or solid discharges. Continuously monitor the feed condition and liquid and solid discharges to detect any trend toward conveyor overloading, which may cause tripping of the overload release clutch.

The following parameters affect centrifuge operation:

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

The feed rate and pond depth should be adjusted, as required, to optimize centrifuge operation and prevent tripping of the overload release assembly. Tripping indicates that the conveyor is becoming overburdened in moving solids. The conveyor speed is fixed by the gearbox reduction ratio and varies directly with bowl speed. Consequently, changing the motor sheave diameter alters both the bowl speed and corresponding conveyor speed; a larger diameter increases bowl speed, while a smaller diameter reduces speed. The motor sheave should be changed only after feed rate and pond depth adjustments have been unsuccessful in achieving satisfactory performance of the centrifuge.

Changing the feed rate and/or pond depth should produce the desired clarity of liquid effluent and solids dryness. Feed rate may be changed while the centrifuge is operating, but pond depth can be adjusted only with the centrifuge shut down and locked out and tagged out.

The differential speed between the liquid bowl and conveyor can be changed only by replacing the gearbox. Two gearbox ratios are available: 52:1 and 125:1. Changing the gearbox to the alternate ratio should be done **only** after all other options have been unsuccessful in achieving satisfactory centrifuge operation and after consulting with the Derrick Service department.

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 that the conveyor is moving the increased solids volume. The feed rate should be reduced if the overload release clutch trips repetitively.

POND DEPTH ADJUSTMENT

Pond depth can only be adjusted with the centrifuge fully stopped and locked out and tagged out. For this reason, pond depth is usually adjusted after the feed rate is adjusted. The factory pond depth setting of 3.4 is usually satisfactory when used in conjunction with feed rate adjustment. However, if desired results cannot be achieved by adjusting the feed rate, changing the pond depth may be helpful.

Four adjustable effluent ports (Figure 4-1) on the liquid bowl head are used to set 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 solid discharge end of the bowl, which will result in wetter discharge solids.

OPERATING INSTRUCTIONS

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.

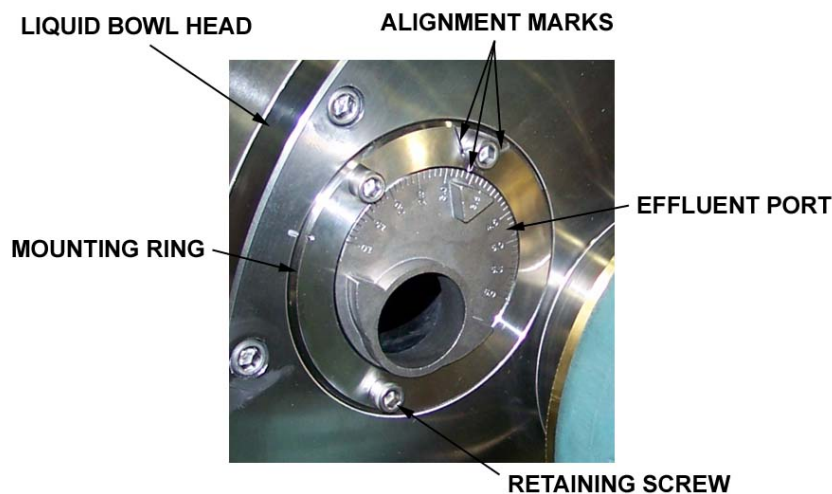


Figure 4-1 Effluent Port Adjustment

BOWL AND CONVEYOR SPEED ADJUSTMENT

Bowl speed is altered by changing the motor sheave. Since the conveyor speed is directly proportional to the bowl speed, increasing the bowl speed also increases conveyor speed. The accompanying table lists the available motor sheaves, corresponding bowl speeds, and proper size drive belts. The faster the bowl speed, the faster solids are conveyed out of the centrifuge, but faster processing results in wetter solids discharge. To reduce wetness, the slurry must remain in the bowl longer, subjecting it to the settling process for a longer duration before being conveyed out the solid discharge. Conversely, reducing bowl speed may be desirable for thick, heavy slurry to maximize liquid extraction.

Changing the bowl speed requires partial disassembly of the centrifuge. It should be done only after feed rate and pond depth adjustments do not produce desired results.

Motor Sheaves and Drive Belts

A larger motor sheave diameter increases the bowl speed but reduces the torque. Therefore, to provide adequate torque, the feed rate may have to be reduced or the gearbox changed to a higher ratio. For example, if a 125:1 gearbox is replaced with a 52:1 ratio gearbox, the feed rate must be reduced by 10 percent to avoid overloading the centrifuge. Since gearbox replacement is a major alteration, it should be considered only after all other options have been unable to produce satisfactory performance and following consultation with the Derrick Service department.

Available sheaves and corresponding belts are listed in the table below.

MOTOR SHEAVES AND DRIVE BELTS			
Sheave Diameter	Bowl Speed (RPM)	Sheave Part No.	Belt Part No.
60 Hz Motor			
8"	2450	10603-00	5G3V1000
9"	2750	10603-05	5G3V1000
9.9"	3000	10603-01	5G3V1000
10.6"	3225	10603-02	5G3V1000
11.1"	3400	10603-06	5G3V1060
11.5"	3500	10603-03	5G3V1060
13.1"	4000	10603-04	5G3V1060
50 Hz Motor			
8"	2000	10603-00	5G3V1000
9"	2250	10603-05	5G3V1000
9.9"	2450	10603-01	5G3V1000
10.6"	2600	10603-02	5G3V1000
11.1"	2750	10603-06	5G3V1060
11.5"	2850	10603-03	5G3V1060
13.1"	3250	10603-04	5G3V1060



WARNING! THIS PROCEDURE IS TO BE PERFORMED ONLY BY TRAINED, QUALIFIED PERSONNEL. DO NOT PERMIT UNQUALIFIED PERSONNEL TO ATTEMPT THIS PROCEDURE.

Sheave Replacement

1. Shut down, lock out, and tag out centrifuge.
2. Disconnect feed line from feed tube.
3. Loosen screws securing feed tube clamp, and slide out feed tube.
4. Release latches, and remove belt guard covering motor sheave and fluid coupling.
5. Loosen four locking nuts securing motor feet to mounting base (Figure 4-2).
6. Turn adjusting bolts equally counterclockwise until move motor moves sufficiently inward to release belt tension.
7. Slip drive belt off motor sheave.

OPERATING INSTRUCTIONS

Sheave Replacement (Cont'd)



Figure 4-2 Drive Belt Tension Adjustment

8. Remove screws securing motor sheave to fluid coupling, and remove sheave.
9. Install new motor sheave on fluid coupling, and secure with hex head screws. Tighten screws to 83 in lbs (9.4Nm).
10. Re-install belt on motor sheave.
11. Check sheave alignment by placing a straight edge across the bowl and motor sheaves. Sheaves must be aligned within 0.0156" (0.4mm). If not aligned, tighten or loosen one motor mount adjusting bolt, as required.
12. Turn motor mount adjusting bolts counterclockwise equally to apply sufficient belt tension to permit a 5/8" (16mm) deflection with 30 lbs (13.6kg) pressure exerted at the midpoint of the belt. Correct tension will prevent slippage without overloading bearings. After correct tension is set, tighten all four motor bolts to secure motor in place.
13. Re-install belt guard, and engage latches to secure guard in place.
14. Insert feed tube into feed tube support until shoulder fully contacts support, and tighten screws to secure tube.

OVERLOAD RELEASE CLUTCH ADJUSTMENT



WARNING! THESE PROCEDURES ARE TO BE PERFORMED ONLY BY TRAINED, QUALIFIED PERSONNEL. DO NOT PERMIT UNQUALIFIED PERSONNEL TO ATTEMPT THESE PROCEDURES.

Frequent overload tripping that cannot be corrected by feed rate and/or pond depth adjustments may be due to an incorrect torque setting of the overload release assembly. The release assembly torque should be checked and adjusted, if necessary, as follows:

1. Remove gearbox drive cover.
2. Remove torque cam from overload release clutch.

3. Insert socket key of torque wrench, 13147-00 (included in tool kit 14795-00), into keyway of overload release clutch. Exert sufficient force on torque wrench in a clockwise direction (when facing clutch) to release the clutch. Release should occur at 335 in lbs (2.4Nm) for 52:1 gearbox or 200 in lbs (1.4Nm) for a 125:1 gearbox.
4. Reset clutch as follows:
 - a. Rotate clutch hub until cam roll pin hole and hub keyway are aligned with set screw hole (stamped 22 on overload clutch housing).
 - b. Turn T-handle reset screw (Figure 4-3) clockwise (inward) approximately 2-1/2 turns until a click is heard, indicating that the clutch is reset.



CAUTION! When Turning Reset Screw Clockwise, Do Not Exceed Three Turns After Slight Resistance Is Felt, As Excessive Tightening May Damage The Clutch's Internal Components.

- c. Check that clutch has reset by attempting to rotate the cam/hub assembly. If rotation is possible, repeat steps a and b, above.



CAUTION! In the following step, T-Handle Reset Screw Must Be Backed Out Fully To Its Original Position Before Returning Centrifuge To Service.

- d. After confirming that the clutch is reset, return the T-handle set screw to its original position by turning counterclockwise (outward).
- e. Return over-torque limit switch roller into contact with torque cam.

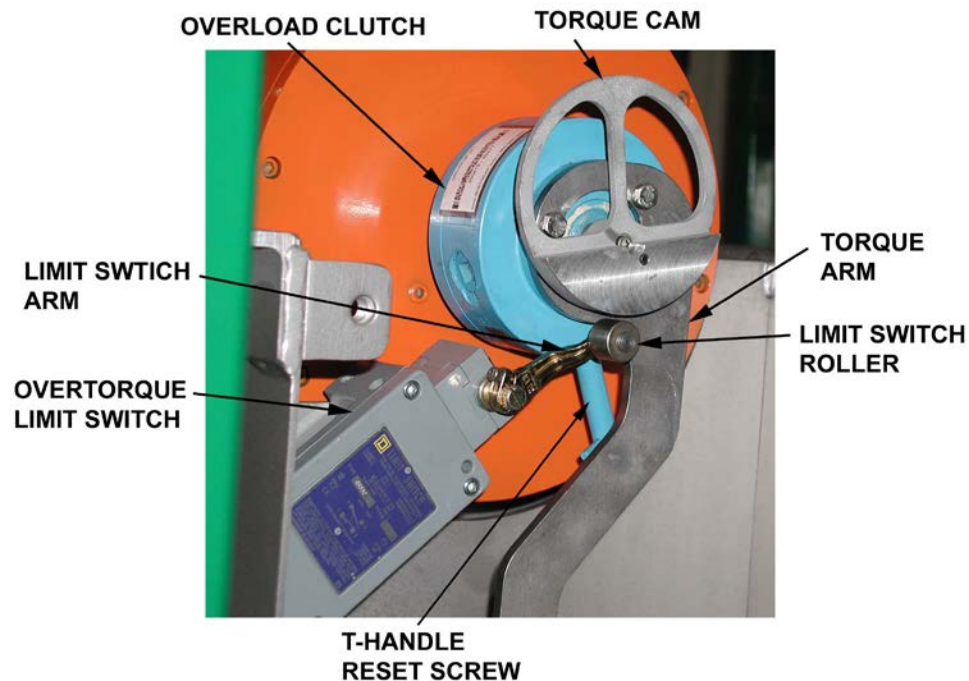


Figure 4-3 Overload Release Clutch Components

OPERATING INSTRUCTIONS

OVERLOAD RELEASE CLUTCH ADJUSTMENT (CONT'D)

5. If required torque is less than the value specified in step 3, above, increase torque by turning adjustment screw (Figure 4-4) clockwise until flush with the next milled depth on the clutch housing and scribed lines are aligned; then re-check torque. Do not increase torque setting beyond 335 in lbs (37.9Nm) for a 52:1 gearbox or 200 in lbs (22.6Nm) for a 125:1 gearbox.



WARNING! AN EXCESSIVE TORQUE SETTING CAN RESULT IN DAMAGE TO CENTRIFUGE. DO NOT SET CLUTCH TO RELEASE AT A HIGHER SETTING THAN 335 IN LBS FOR 52:1 GEARBOX OR 200 IN LBS FOR 125:1 GEARBOX.

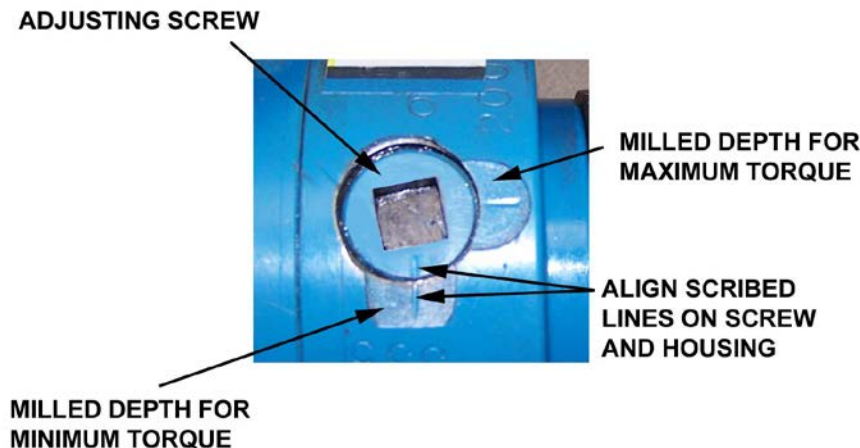


Figure 4-4 Setting Overload Release Torque

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	If the shutdown will extend for several hours (such as at the end of the day), flush out the centrifuge with clean liquid for 2 to 3 minutes. Unless flushed out, process material will sag and dry out, causing a severe out-of-balance condition.
3	Press CENTRIFUGE OFF button to shut down electric power to centrifuge. Open fused disconnect supplying electric power to the machine.
4	Lock out and tag out 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 shutdowns.

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.

Thermal Overloads

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.

OPERATING INSTRUCTIONS

Conveyor Over-Torque

If excessive conveyor torque develops, the centrifuge is shut down by the over-torque limit switch installed on the overload release clutch. The normally closed contacts of the over-torque limit switch are opened by the overload release roller arm, interrupting power to the drive motor and feed pump motor. After release, the clutch must be manually reset as described earlier in this section before the centrifuge can be returned to operation.

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 GBD 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 rotating assembly bearings (Figure 5-1).	One shot each shift
Remove feed tube, clean interior of tube, and reinstall.	Weekly
Check gearbox fluid level with fill plug at 12 o'clock position.	Every 2 weeks
Check fluid coupling level (Figure 5-2).	Every 2 weeks

MAINTENANCE

PREVENTIVE MAINTENANCE (CONT'D)

PREVENTIVE MAINTENANCE SCHEDULE	
Action	Frequency
Check interior and exterior of case for accumulated solids, and clean as required.	Weekly
Purge conveyor bearings.	Every 2 weeks
Remove belt cover, inspect belt for damage, and check/adjust tension.	Monthly
Remove and clean flinger covers.	Monthly
Check overload release clutch torque setting.	Every 250 hours
Grease overload release clutch.	Every 1000 hours

APPROVED LUBRICANTS

APPROVED LUBRICANTS - DE-1000 GBD CENTRIFUGE				
Manufacturer	Product	Application	Quantity	Temp
OILS				
Chevron	GST ISO 32	Fluid Coupling	112 Oz. (3.3L)	Standard
Mobil	Synthetic SHC 626	Fluid Coupling	112 Oz. (3.3L)	Arctic
Texaco	Meropa 320	Gearbox	80 Oz. (2.4L)	Standard
Mobil	SHC 220	Gearbox	80 Oz. (2.4L)	Arctic
GREASES				
Chevron	SRI NLGI 2 SRI-2	Main & Conveyor Bearings	A/R	Standard
Shell	Aeroshell 14	Main & Conveyor Bearings	A/R	Arctic
Centrilube	1000 (Nyogel 760D)	Main Bearings Only	A/R	4000 RPM
Mobil	FM 102 (Food Grade)	Conveyor Bearings Only	A/R	Standard
Shell	Aeroshell 14	Overload Release Clutch	A/R	Arctic

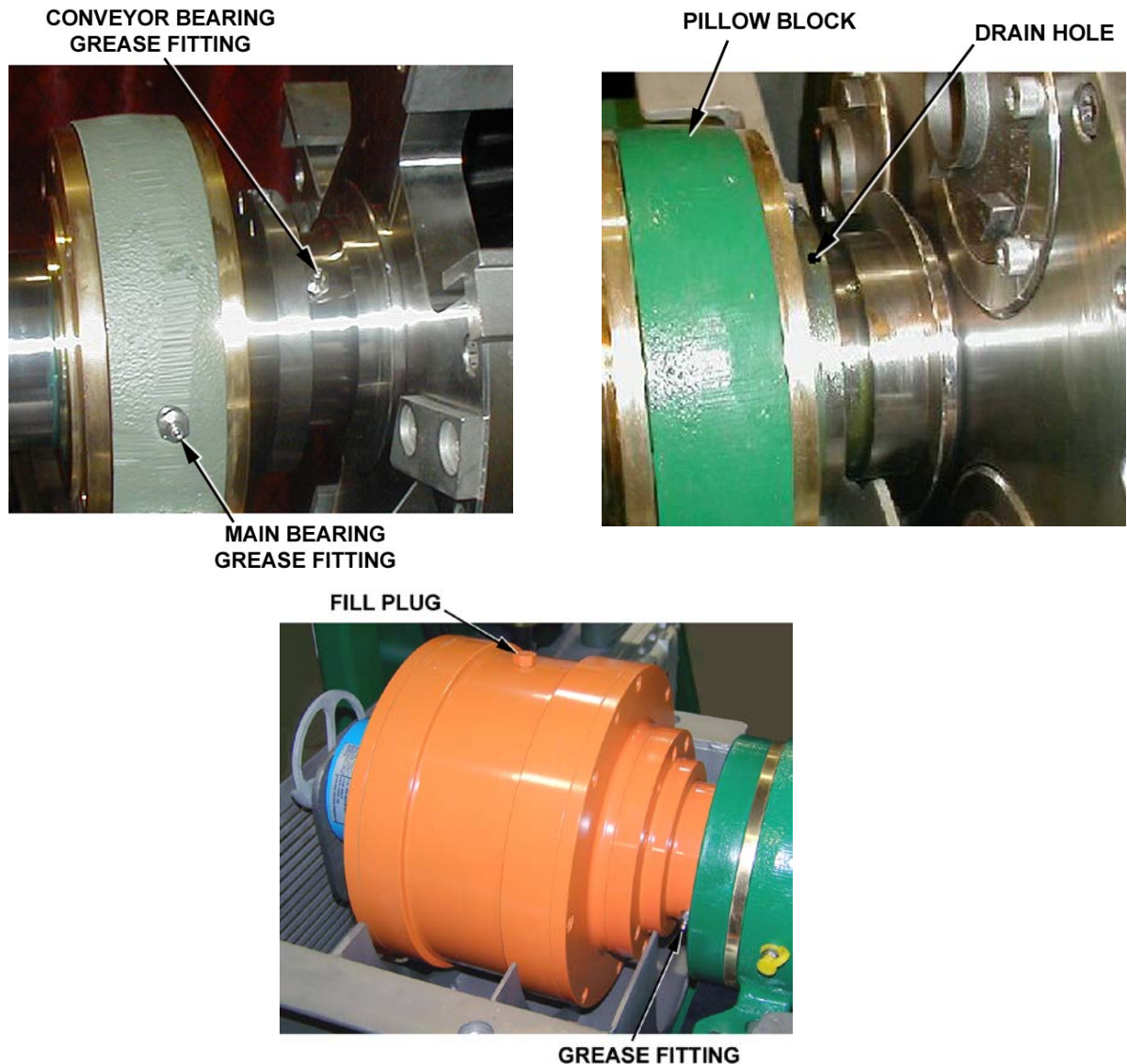


Figure 5-1 Rotating Assembly Lubrication Points

FLUID COUPLING OIL LEVEL

Replenishment of the fluid coupling oil is not normally required. If the oil level is found to be low, inspect the unit for evidence of leakage at the fusible plug and around the fill plug. If fill plug is leaking, re-seal and tighten plug. If leakage is detected at the fusible plug or in another area, contact the Derrick Service department for assistance.

To check the oil level in the fluid coupling, proceed as follows:

1. Rotate coupling until the number "2" on the housing is at the 12 o'clock position (Figure 5-2).
2. Unscrew and remove fill plug. If level is low, contact the Derrick Service department for assistance in determining and correcting source of leakage before re-filling.

MAINTENANCE

FLUID COUPLING OIL LEVEL (CONT'D)

3. After correcting cause of leakage, rotate coupling until number "2" is at the 12 o'clock position and add a sufficient quantity of the appropriate oil (refer to Approved Lubricants chart) to raise level to fill opening.
4. After confirming that level is up to fill opening, install and tighten fill plug.

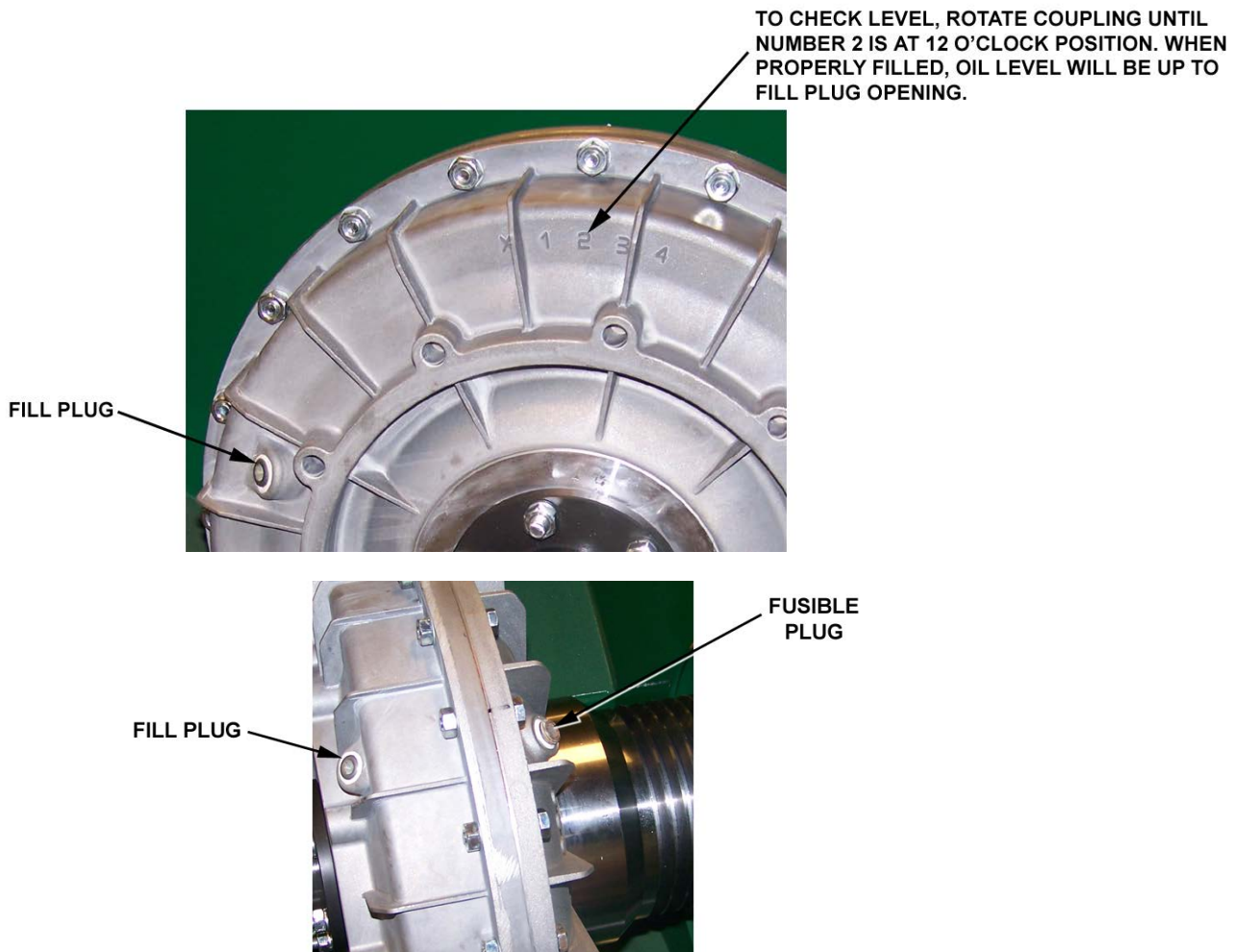


Figure 5-2 Checking and Filling Fluid Coupling

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:

1. Loosen screws securing feed tube clamp, and slide out feed tube.
2. Release latches, and remove belt guard covering sheaves and fluid coupling.
3. Loosen locking nuts securing drive motor feet to base (Figure 5-3), turn adjustment bolts counterclockwise to loosen belts, and slip belts off sheaves.

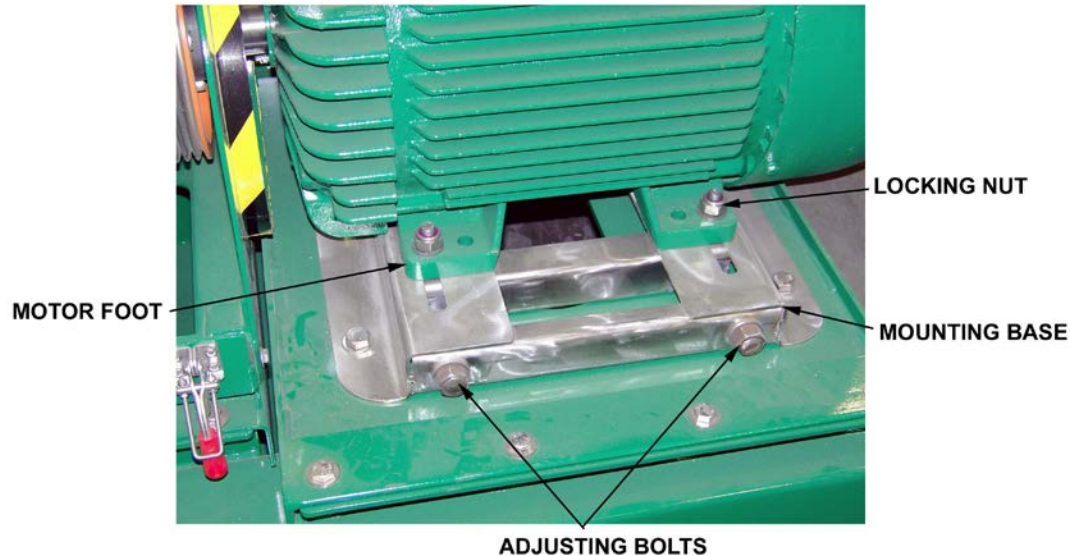


Figure 5-3 Drive Belt Tensioning Adjustment

4. Check sheave parallel alignment using a straight edge. Adjust position(s) of sheave(s) to achieve parallel alignment within 0.0156" (4mm).
5. Install new belt on drive motor and bowl assembly sheaves.
6. Tighten motor mount adjustment bolts to apply sufficient belt tension to permit deflection of 5/8" (16mm) with 30 lbs (13.6kg) of pressure exerted at the midpoint of the belt. After correct tension is set, tighten motor mount bolts.
7. Install belt guard, and latch in place.
8. Insert feed tube into feed tube support until shoulder fully contacts support, and tighten screws to secure tube.

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.
4. Remove top cover from gearbox enclosure.

Removal and Disassembly (Cont'd)

5. Remove the gearbox as follows:
 - a. Remove six screws securing gearbox (Figure 5-4) to flange.
 - b. Install two 3/8"-16 jack screws into gearbox flange clearance holes, and alternately turn both jack screws a few revolutions at a time to begin separating gearbox from flange.
 - c. Support gearbox during remainder of procedure using a lifting strap and suitable hoist.
 - d. Fully separate gearbox from flange by alternately turning jack screws until unit is fully detached.
 - e. With gearbox supported by lifting strap and overhead lifting device, **CAREFULLY** slide gearbox outward until splined shaft is free of conveyor. Place gearbox in plastic bag to prevent contamination.



Figure 5-4 Gearbox Removal

6. Tighten nuts on pillow block alignment pins to jack out pins, and remove pins.
7. Remove bolts securing pillow blocks to base mounting pads.
8. Attach lifting straps at two locations on rotating assembly and, using a hoist capable of supporting approximately 2000 lbs (910kg), lift and remove rotating assembly from case.
9. Note locations of all shims found between pillow blocks and base mounting pads, and remove and retain shims.
10. Apply protective coating to mating surfaces of pillow blocks and base.
11. 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 5-5) while continuing to support weight with the hoist.
 - b. Note 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 jack screws into four threaded jack screw holes in bowl head, and tighten evenly until head has separated from bowl.

- e. Attach a second hoist to liquid bowl head flange, and begin to lift bowl head off bowl with pillow block and splined shaft attached. If bowl head does not fully separate from bowl, lower head down until just enough space remains to insert a pry bar. Carefully pry bowl head evenly until it releases from bowl, and lift and remove bowl head. Remove and discard O-ring from bowl head.

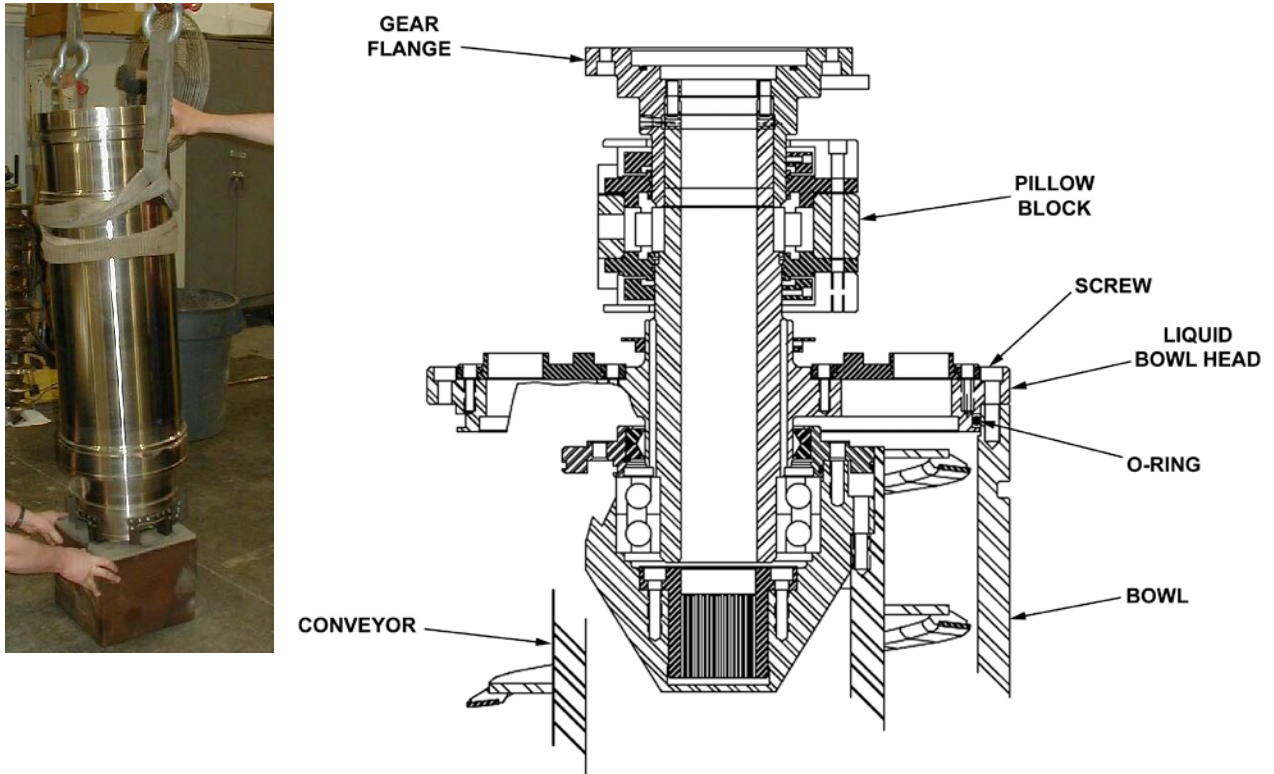


Figure 5-5 Liquid Bowl Head Removal

12. Remove conveyor assembly as follows:

- a. Remove four screws securing liquid end seal housing to conveyor (Figure 5-6), and using jack screws to separate seal housing from bearing housing, remove seal housing. Discard seal.
- b. Position vertical lifting bracket on conveyor, and secure with four screws.



Removal and Disassembly (Cont'd)

- c. Attach a hoist capable of lifting at least 750 lbs (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.

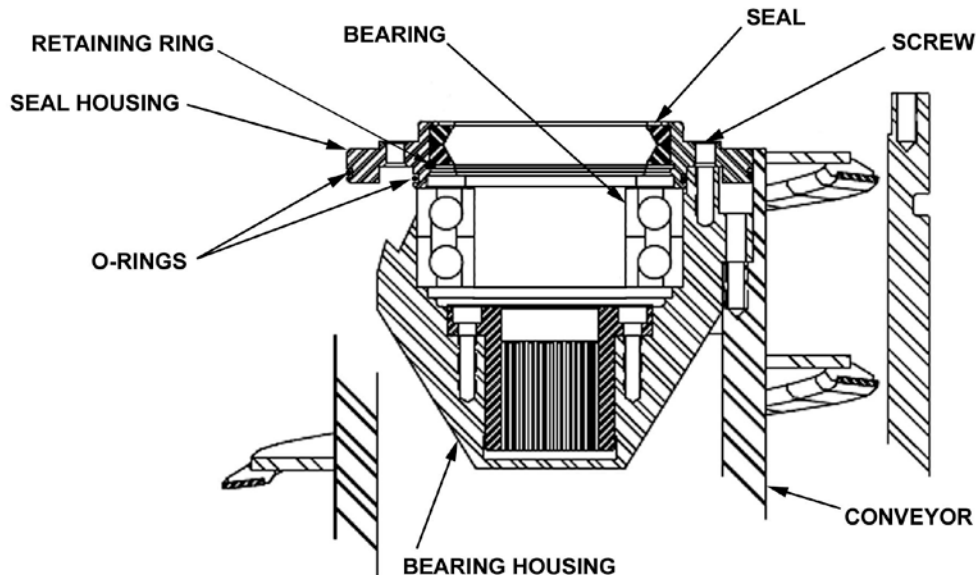


Figure 5-6 Liquid End Seal Housing Removal

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* in this section.

Reassembly and Installation

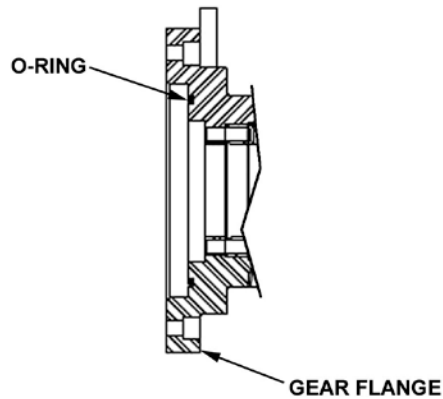
Reassembly and installation of the rotating assembly are basically the reverse of removal. Proceed as follows to reassemble and install rotating assembly:

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 5-6), 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 new O-ring in groove of liquid bowl head, apply a light coat of grease to O-ring, and install liquid bowl head onto bowl. Orient bowl head so that alignment marks correspond, and secure liquid bowl head to bowl with screws. Tighten screws in accordance with *Hardware Torque Specifications*.
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.

Reassembly and Installation (Cont'd)

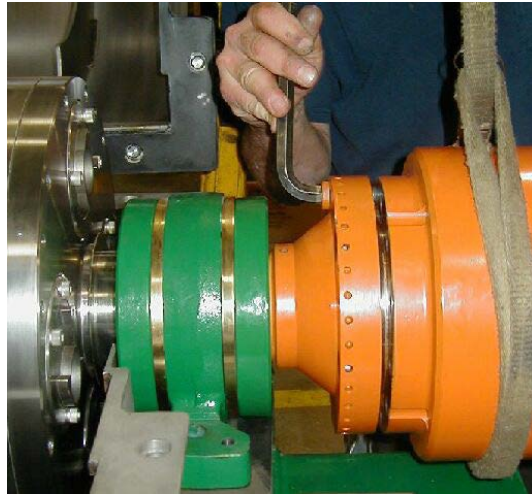
11. Install gearbox as follows:

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



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

Tighten the mounting screws using a star pattern typical for circular bolt patterns. Refer to *Hardware Torque Specifications* in this section 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. Check and adjust runout of outside diameter of gearbox as described in the steps below. Axial runout may not exceed 0.002" (0.05mm) total indicator reading (TIR).

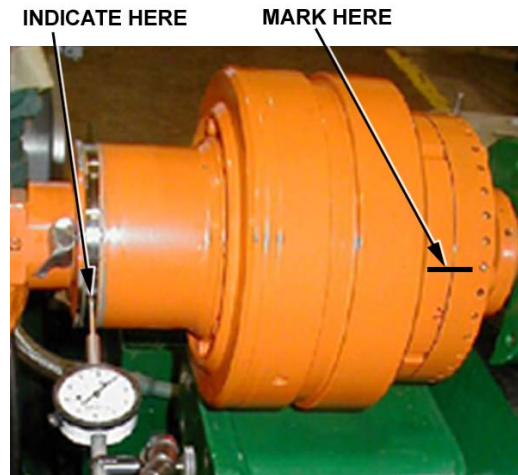
14. To measure and adjust runout, proceed as follows:

- a. Clean surface of gearbox 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 gearbox.
- d. Manually rotate the gearbox until dial indicator is at its lowest reading, and zero out dial indicator.



PLUNGER POSITIONED AT
HORIZONTAL CENTERLINE
OF GEARBOX

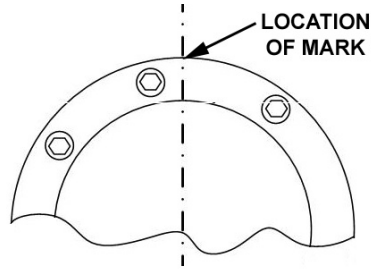
- e. Manually rotate the gearbox until reading on dial indicator is highest; mark across gearbox and flange along axial centerline where surfaces mate.



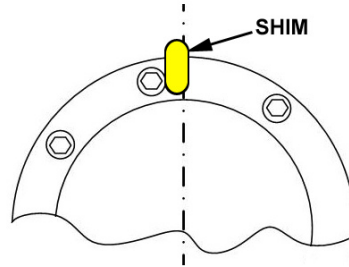
MAINTENANCE

Reassembly and Installation (Cont'd)

- f. Manually rotate gearbox 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 gearbox. 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 gearbox installation, install top cover over gearbox.
 - 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.

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 gearbox from liquid bowl head (Figure 5-7) as follows:
 - f. Scribe a line across gearbox and flange to ensure correct positioning upon installation. Using a 14mm hex wrench, remove six screws securing gearbox to flange.
 - g. To ensure correct placement of shim(s), mark location of shim(s) between gear flange and gearbox. 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 gearbox from flange.
 - h. To support unit during remainder of removal procedure, place lifting strap around gearbox and attach strap to overhead lifting device. Fully separate unit from flange by alternately turning jack screws until unit is fully detached.
 - i. With gearbox supported by lifting strap and overhead lifting device, **CAREFULLY** slide unit outward until splined shaft is free of conveyor. Place gearbox in a plastic bag to prevent contamination.



Figure 5-7 Gearbox Removal

5. Turn flange (Figure 5-8) 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 gear flange to liquid bowl head, and loosen set screw securing flange to liquid bowl head.

MAINTENANCE

Liquid End Bearing (Cont'd)

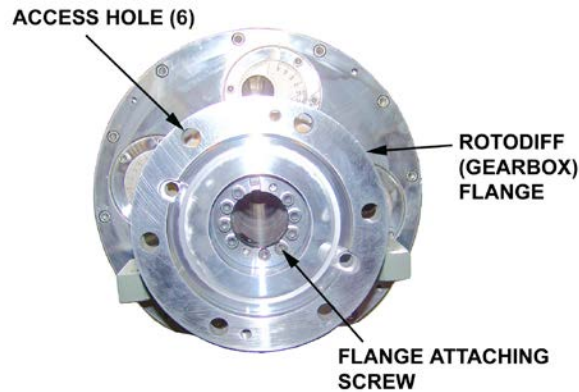


Figure 5-8 Gearbox Flange Attachment

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 5-9) to pillow block, and remove cover. Separate O-ring from pillow block cover and discard O-ring.

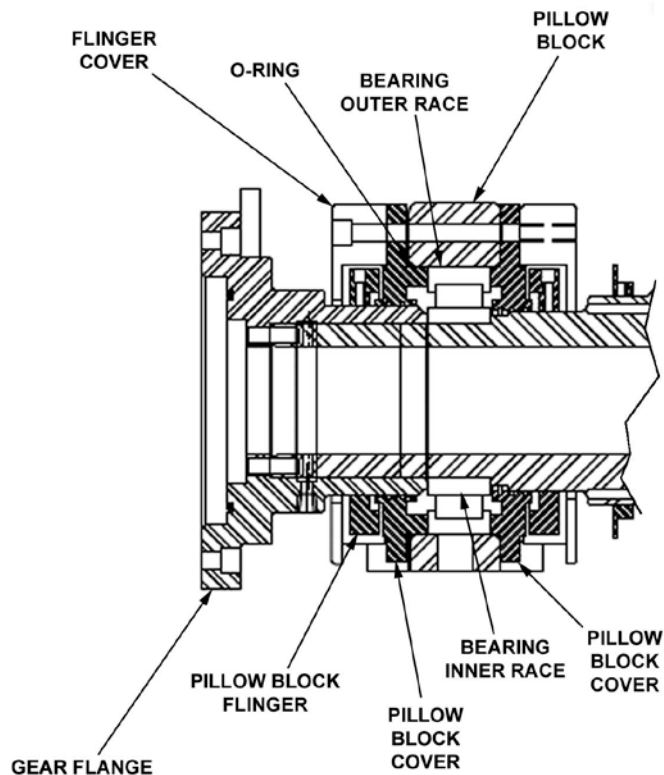


Figure 5-9 Liquid End Main Bearing Installation

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 5-10) 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 5-9), 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 O-ring against shoulder of inboard pillow block cover, and slide pillow block cover onto shaft.

MAINTENANCE

Installation (Cont'd)



TAPPING BEARING INTO PILLOW BLOCK

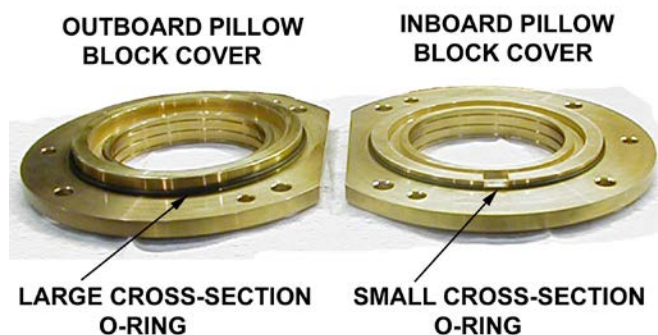


Figure 5-10 Main Bearing Installation Details

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 gearbox flange, but leave screw loose.
14. Apply a light coat of grease to surface of bowl shaft where gearbox 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 gearbox with lines scribed during removal aligned, and slide gearbox splined shaft into conveyor. Insert screws through flange and into gearbox, insert shims at locations marked during removal, and tighten screws.

Solid End Bearing

Removal

1. Remove screws securing inboard and outboard flinger covers to pillow block (Figure 5-11), and lift and remove inboard flinger cover.

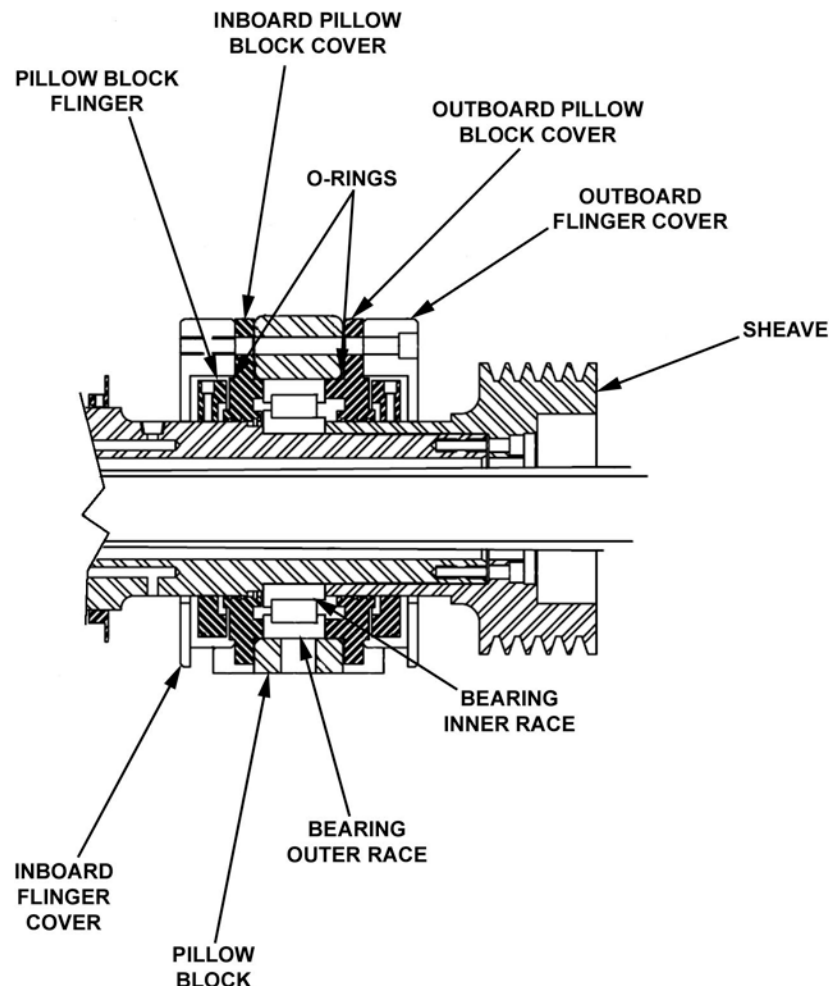


Figure 5-11 Solid End Main Bearing Installation

MAINTENANCE

Removal (Cont'd)

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 liquid 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.

1. Place bearing inner race in a bearing heater (Figure 5-10) 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.

Removal

1. Remove conveyor from rotating assembly in accordance with *Rotating Assembly Maintenance* in this section.
2. With conveyor supported, remove screws securing lifting bracket to conveyor and remove lifting bracket.
3. Remove screws securing liquid end seal housing (Figure 5-12) to bearing housing, and remove seal housing. Remove and discard O-rings installed in external grooves of seal housing.
4. Using a suitable hammer-type puller, extract both thrust bearings from liquid end bearing housing. Discard bearings.
5. Remove retaining ring securing seal in seal housing, and remove and discard seal.

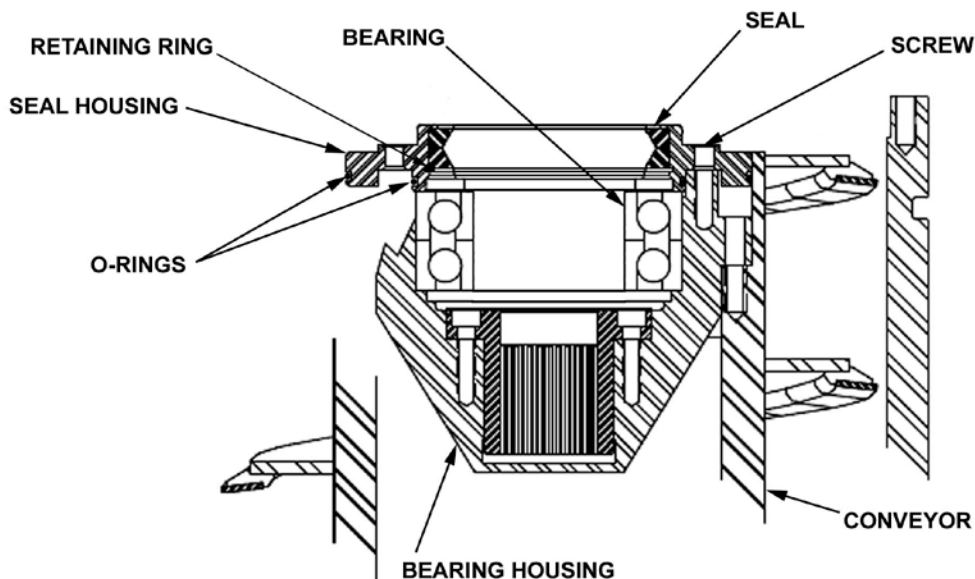


Figure 5-12 Liquid End Thrust Bearings Installation

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 tension is insufficient.
5. Replace any component found having damage that cannot be easily repaired. Replace all seals, O-rings, and bearings.
6. Place all cleaned components in clean plastic bags to prevent contamination.

Installation

1. Insert new seal into liquid end seal housing (Figure 5-12), 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 conveyor 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 5-13) 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 shaft.

Removal (Cont'd)

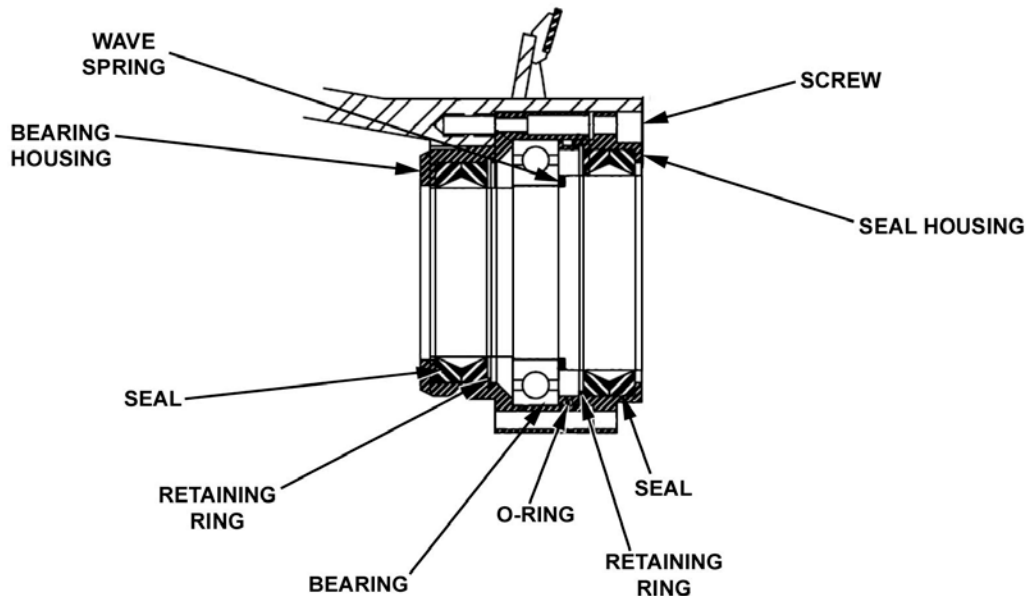


Figure 5-13 Solid End Conveyor Bearing Installation

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. Place all cleaned components in clean plastic bags to prevent contamination.

Installation

1. Insert new seal into seal housing (Figure 5-13), 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*.
3. Re-install conveyor in bowl assembly, and install bowl assembly on centrifuge in accordance with *Rotating Assembly Maintenance* in this section.

TOOL LIST

The following tool list includes all tools and equipment supplied to facilitate maintenance of the DE-1000 GBD centrifuge. Each component is listed with its part number, quantity supplied, and use or application.

DE-1000 GBD 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
PP1219	Fluid Coupling Removal Tool, TF13KSD <i>Remove fluid coupling on 380Vac centrifuge</i>	1
10790-00	Fluid Coupling Removal Tool, TF12KSD <i>Remove fluid coupling on 460Vac centrifuge</i>	1
13147-00	Torque Wrench, 1/2" Drive <i>Precision tightening of various rotating assembly hardware</i>	1
G0003150	Jack Bolt, Hex Hd, 5/16-18 x 1-1/2" <i>Separate gearbox from flange</i>	2
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>Removal and install pillow block bolts</i>	1
HXCBF031-18X400	Hex Head Jack Bolt, 5/16-18 x 4" Long <i>Separate conveyor bearing housing from liquid end bowl head shaft</i>	4
HXCBF038-16X400	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 liquid bowl assembly vertically during maintenance</i>	1
WFSS-31	5/16" Flat Washers <i>Attach vertical lifting bracket to gearbox flange</i>	6
NHHS-31-18	Hex Nut, heavy, 5/16-18 <i>Attach vertical lifting bracket to gearbox flange</i>	6
SKCS-38-16x175	Socket Hd Cap Screw, 3/8-16 x 1-3/4" <i>Attach vertical lifting bracket to gearbox flange</i>	6

MAINTENANCE

DE-1000 GBD CENTRIFUGE TOOL LIST		
PART NO.	DESCRIPTION / APPLICATION	QTY
G0004114	Socket Hd Cap Screw, 5/16-18 x 1-1/4" <i>Attach vertical lifting bracket to solid end bowl head</i>	6
RED-B150X125	Bushing, Hex, 1-1/4" x 1-1/2" <i>Reduce opening of feed tube</i>	1
PP1127	Grease Gun, 1/2" Dia. Hose, 14.5 Oz. <i>Inject grease into gearbox and main bearing fittings</i>	2
CHE-SRI-2	Grease, Standard* <i>Lubricate main bearings and gearbox spline</i>	1
Aeroshell GR-14	Grease, Arctic* <i>Lubricate main bearings, gearbox spline, and overload release clutch</i>	1
C000-RA-110-00	4000RPM Grease* <i>Lubricate main bearings and gearbox spline</i>	1
EYE-S31-18X113	Eye Bolt, 5/16-18 x 1-1/8" <i>Lift rotating assembly by gearbox flange</i>	2
G0004085	Socket, 1-1/8", 1/2" Drive <i>Adjust Drive Belt</i>	1

* Appropriate grease included 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.



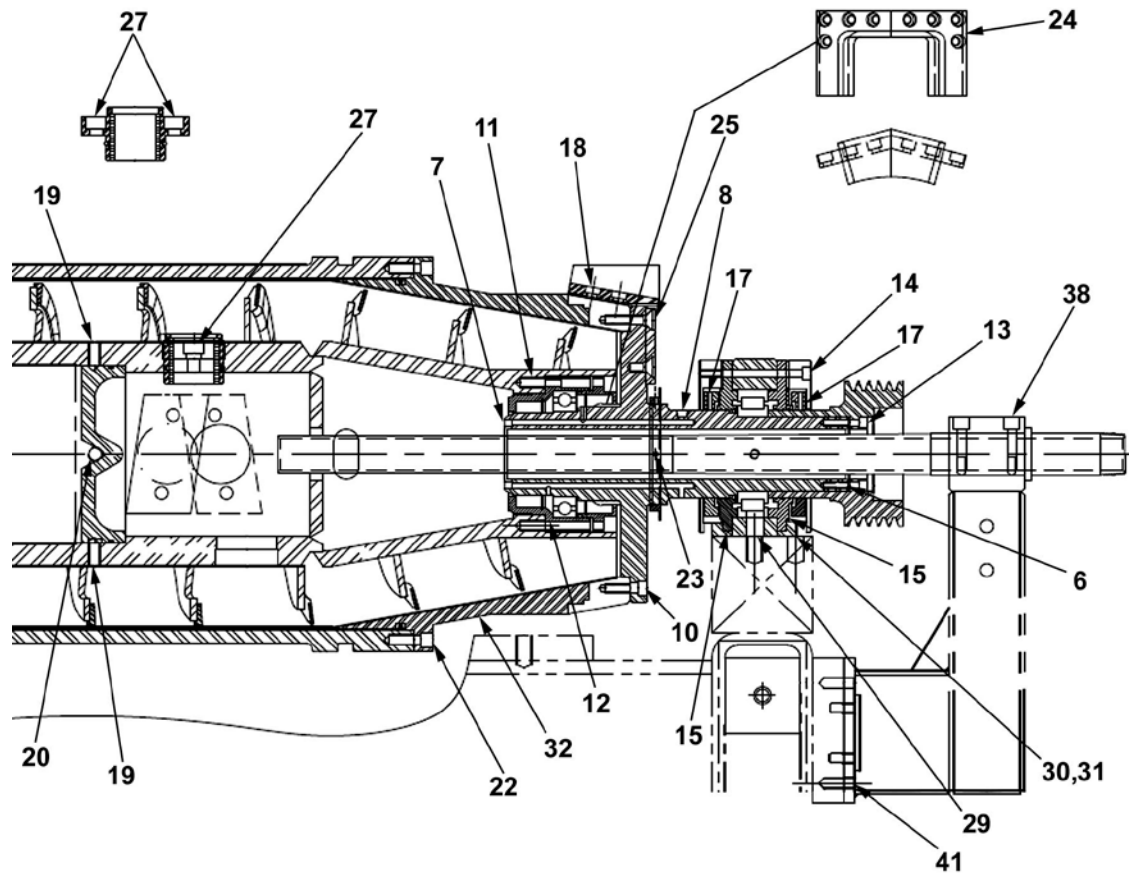
WARNING! USE OF INFERIOR, NON-DERRICK APPROVED HARDWARE MAY RESULT IN SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

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 on the following pages.

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.

HARDWARE TORQUE SPECIFICATIONS (CONT'D)

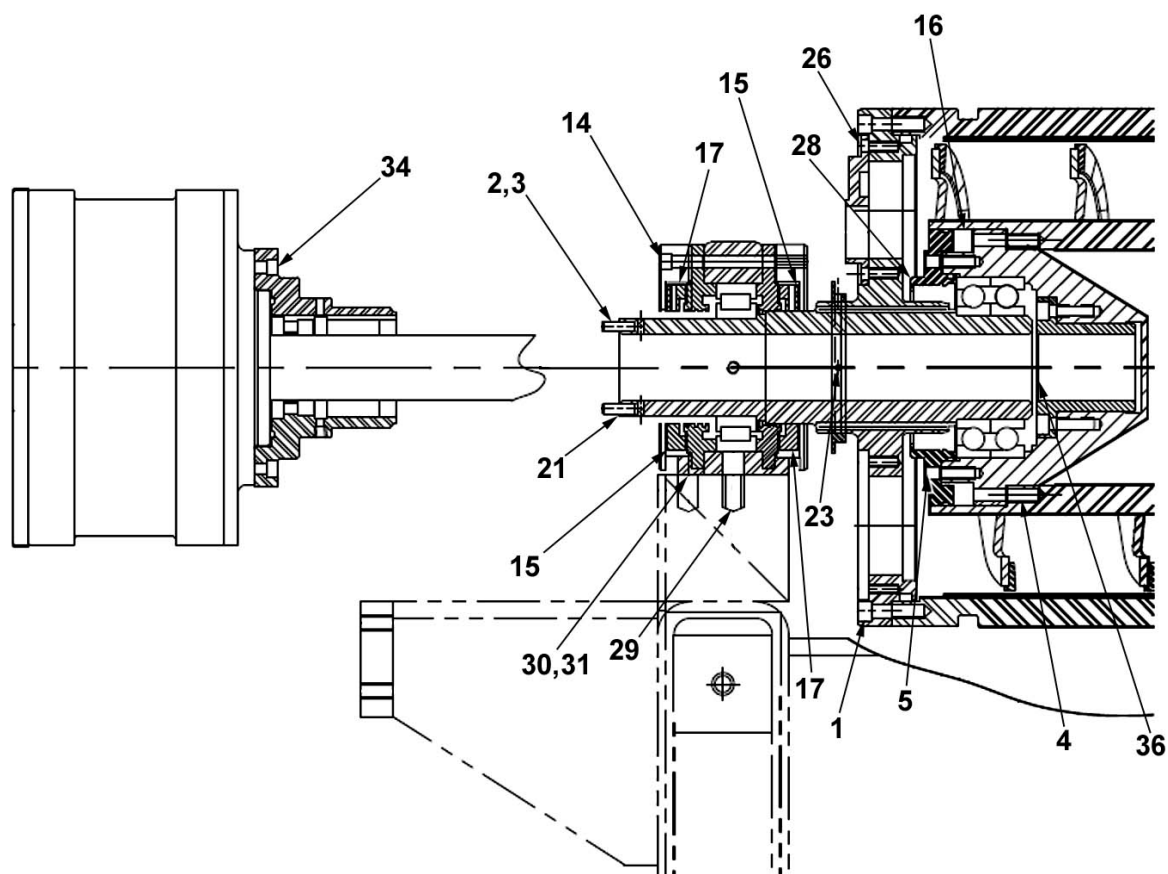


SOLID END HARDWARE LOCATIONS

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/28.5Nm	Solid End Bowl Head
11	5/16-18 x 3 Hx Skt Hd	6	Anti-Seize	144 in lb/16.3Nm	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/9.4Nm	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
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

MAINTENANCE

SOLID END HARDWARE TORQUE SPECIFICATIONS					
No.	Description	Qty	Lubricant	Torque	Location
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

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
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/Gearbox 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
34	5/16-18 x 3/4 Hx Skt Hd	6	Anti-Seize	N/A	Gearbox to Gearbox Flange
36	3/8 x 1 Pin	2	Loctite 680	N/A	Spline Hub

*2 - 4 on Serial numbers below CF000272
 2 on serial numbers CF000272 thru CF000678
 0 on serial numbers above CF000979

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

PARTS REPLACEMENT

Defective parts should be replaced as soon as possible to prevent further damage to equipment. Refer to the general arrangement drawing, rotating assembly drawing, and electrical drawings in Section 8 for Derrick component locations and part numbers.

RECOMMENDED SPARE PARTS

The following table lists the recommended spare parts required to support a single DE-1000 GBD 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.

MAINTENANCE

TWO-YEAR RECOMMENDED SPARE PARTS - DE-1000 GBD CENTRIFUGE			
Part No.	Description	Consumable	Qty
BELT-5G3V-1000	Drive Belt, 8" - 10.6" Dia. Sheaves	Yes	1
BELT-5G3V-1060	Drive Belt, 11.1" - 13.1" Dia. Sheaves	Yes	1
BSS-FNQ2	Fuse, Secondary, CPT	No	4
BSS-LPCC30	Fuse, Low Peak, 30 A, Class CC	No	1
C000-RA-110-00	Grease, High Speed, Main Bearing, 16 Oz.	Yes	4
CA1595X1/2-6	Isolator Mount	No	4
CHE-SRI-2	Grease, Std, Main Bearing/Conveyor, 14.5 Oz. Tube	Yes	12
CHE-GST-ISO-32	Oil, Fluid Coupling	Yes	1
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
SHELL-OMALA320G	Oil, Gearbox	Yes	1
9537-00	Feed Accelerator	Yes	1
9540-00	Feed Tube	No	1

TROUBLESHOOTING

Malfunctions due to operating error or other problem can result in unnecessary machine downtime and should be corrected as soon as possible. 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.

In general, an unexpected centrifuge shutdown is due to an interruption of electric power that has turned off the 50HP drive 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. All electrical continuity checks in this procedure are performed without electric power supplied to the centrifuge. Lock out and tag out equipment before attempting to perform any continuity check.



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

In addition to the troubleshooting chart, the technician should refer to the appropriate schematic and wiring diagrams in Section 8 and description and theory of operation in Section 1 for additional assistance in troubleshooting.

TROUBLESHOOTING DE-1000 GBD CENTRIFUGE	
Possible Cause	Isolation Procedure & Corrective Action
Failure Mode 1: Overload Release Trips Repeatedly	
Clogged conveyor.	Remove overload release assembly from gearbox, and attempt to turn gearbox pinion shaft while restraining bowl from rotating. If pinion cannot be turned independently of bowl, conveyor is clogged. Clear conveyor clogging by flushing with water or steam. If conveyor is not clogged, continue troubleshooting.
Failure Mode 2: Centrifuge Does Not Start	
No electric power.	Confirm that correct power is supplied to centrifuge and that main contactor is closed. Correct any defects.
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.
Over-torque switch not reset after tripping.	Reset overload release and over-torque switch. Attempt to re-start centrifuge (refer to Section 4), and monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal conditions such as no solids discharge.

MAINTENANCE

TROUBLESHOOTING DE-1000 GBD CENTRIFUGE	
Possible Cause	Isolation Procedure & Corrective Action
Failure Mode 3: Centrifuge Starts, But Shuts Down Soon After Starting	
Vibration switch tripped due to excessive vibration during startup.	Press and hold vibration switch reset button, and attempt re-start of centrifuge (refer to Section 4). If machine fails to start or shuts down soon after starting, continue troubleshooting.
Over-torque switch tripped due to excessive conveyor torque.	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 ambient temperature water fails to clear clogging, attempt to clear with hot water or steam. If flushing fails 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 vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal conditions such as no solids discharge, and continue troubleshooting.
Failure Mode 4: Centrifuge Has Automatically Shut Down	
No electric power.	Check that electric power is supplied to centrifuge, and check fuses. Correct power loss; replace any blown fuse(s).
Electrical connections incorrect.	Re-check electrical connections (refer to Section 3), and correct any defects.
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.
Bowl clogged with solids causing over-torque switch to trip due to excessive conveyor torque.	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. Reset overload release and over-torque limit switch.
Drive motor overheated and/or starter thermal overloads tripped due to excessive current draw.	Allow sufficient time for overload to reset, and then press centrifuge starter RESET button. Press CENTRIFUGE ON button to attempt re-start of centrifuge. If machine starts, monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as no solids discharge. Determine cause of anomaly and correct before attempting to re-start centrifuge.

TROUBLESHOOTING DE-1000 GBD CENTRIFUGE		
Possible Cause	Isolation Procedure & Corrective Action	
Failure Mode 4: Centrifuge Has Automatically Shut Down (Cont'd)		
Drive motor overheated and/or starter thermal overloads tripped due to excessive current draw (cont'd).	With power shut down, and CENTRIFUGE ON button 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
	X1	2
	2	4
	4	5
	5A	6
	If No Continuity	
	Press CENTRIFUGE ON & repeat check	
	Press RESET buttons & repeat check	
	Press vibration switch reset button	
	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 6 to ground. If continuity is not found, replace centrifuge relay CR1.	
	Check for continuity from each motor winding terminal 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).	
	Press centrifuge starter RESET button, and then attempt re-start of centrifuge. If machine starts, monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as no solids discharge. Determine cause of anomaly and correct before attempting to re-start centrifuge.	
Failure Mode 5: Feed Pump Fails to Start		
Feed pump motor overheated due to excessive current draw.	Allow sufficient time for motor to cool, and then press PUMP ON button to attempt re-start of feed pump. If pump starts, adjust feed rate to avoid overloading pump and monitor operation until confident of no recurrence.	
Feed pump motor overheated and/or starter thermal overloads tripped due to excessive current draw.	Allow sufficient time for starter overload to cool, and then press pump starter RESET button. Press PUMP ON button to attempt to re-start feed pump. If pump starts, adjust feed rate to avoid overloading pump and monitor operation until confident of no recurrence.	
Defective pump run relay CR2.	Shut down, lock out, and tag out electric power to centrifuge. Disconnect lead 10 from centrifuge relay CR1, and check for continuity from terminal 10 to ground. If continuity is not found, replace relay.	

MAINTENANCE

TROUBLESHOOTING DE-1000 GBD CENTRIFUGE	
Possible Cause	Isolation Procedure & Corrective Action
Failure Mode 6: Excessive Vibration Causes Vibration Switch To Trip	
Drooping of wall cake or dislodged tiles causing bowl imbalance.	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.
Gearbox misaligned	Shim gearbox in accordance with <i>Preventive 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.
Failure Mode 7: Incomplete Dryness	
Pond depth too deep.	Adjust liquid discharge 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.
Failure Mode 8: Unacceptable Clarity Of Discharge Liquid	
Pond depth too shallow	Adjust liquid discharge ports on bowl head.
Feed temperature too high.	Adjust temperature
Degradation of feed.	Check feed particle size. If too large, discontinue feed to centrifuge until feed is satisfactory.

SECTION 8 - REFERENCE DRAWINGS

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
<u>13744-00 -</u>	General Arrangement - DE-1000 GBD Centrifuge
<u>9587-00-001 -</u>	Rotating Assembly - DE-1000 Centrifuge (Radial Flow)
<u>9587-00-003 -</u>	Rotating Assembly - DE-1000 Centrifuge (Axial Flow)
<u>11372-01 -</u>	Gear Unit - DE-1000 GBD Centrifuge - 52:1
<u>11372-02 -</u>	Gear Unit - DE-1000 GBD Centrifuge - 125:1
<u>13223-00 -</u>	Overload Release Assembly - DE-1000 GBD Centrifuge - 125:1 & 52:1
<u>10147-00 -</u>	Electrical Control Schematic - DE-1000 GBD Centrifuge
<u>10141-00-001 -</u>	Electrical Wiring Diagram - DE-1000 GBD Centrifuge
<u>10647-00-002 -</u>	Lubrication & Maintenance Schedule - DE-1000 Centrifuge
<u>10785-00-006 -</u>	Electrical Conduit/Cable Diagram
<u>11171-00 -</u>	High Voltage Schematic - DE-1000 Centrifuge (50/60 Hz)
<u>13275-00-004 -</u>	Control Box Assembly - DE-1000 GBD Centrifuge
<u>14894-00 -</u>	Rotating Assembly - Hardware Parts List

E
D
C
B
A

E
D
C
B
A

1	1	1	1	E2	BELT GUARD SUPPORT ANGLE	10831-01	
1	1	1	1	D2	BASE GAS SPRING MOUNT 2	10058-03	
1	1	1	1	C2	BASE GAS SPRING MOUNT 1	10058-02	
2	2	2	2	B2	GAS SPRING	G0012457	
8	8	8	8	A2	ELEC. BOX ISOLATOR MOUNT	LRD-J-5425-275	
1	1	1	1	ZZ	UPPER BELT GUARD	13985-01-003	
1	1	1	1	YY	GRATING FRAME	11239-01-004	
1	1	1	1	XX	ADJUSTING ANGLE FOR CBL MOUNTING BKT	12258-39	
1	1	1	1	WW	CABLE BRACKET (Ø ELECTRICAL BOX)	12258-38	
1	1	1	1	VV	LIQUIDS HOPPER SEAL	12802-00	
1	1	1	1	UU	FLUID COUPLING	TF13KSD	
1	1	1	1	TT	BELT GUARD MOUNTING PAN	13887-01-001	
1	1	1	1	SS			
1	1	1	1	RR	MOTOR MOUNT	13129-00	
1	1	1	1	QQ	FEED TUBE SUPPORT	9539-01	
1	1	1	1	PP	ELECTRICAL CABLE SUPPORT	12258-37	
1	1	1	1	OO	SOLIDS SAMPLE DOOR	13327-00	
1	1	1	1	NN	6" VICTAULIC COUPLING	VIC-6-75	
1	1	1	1	MM	TOP CONTROL BOX ASSEMBLY	13275-01-004	
1	1	1	1	LL	BOTTOM CONTROL BOX ASSEMBLY	13276-00-001	
*	*	*	*	KK	HUB SHEAVE - 11.1" (2750 R.P.M.)	10803-08	*SEE MANUFACTURING SHEET*
*	*	*	*	JJ	HUB SHEAVE - 9.0" (2250 R.P.M.)	10803-05	
*	*	*	*	HH	HUB SHEAVE - 8.0" (2000 R.P.M.)	10803-00	
*	*	*	*	GG	HUB SHEAVE - 13.1" (3250 R.P.M.)	10803-04	
*	*	*	*	FF	HUB SHEAVE - 11.5" (2850 R.P.M.)	10803-03	
*	*	*	*	EE	HUB SHEAVE - 10.6" (2600 R.P.M.)	10803-02	
*	*	*	*	DD	HUB SHEAVE - 9.9" (2450 R.P.M.)	10803-01	*SEE MANUFACTURING SHEET*
*	*	*	*	CC	DRIVE BELT	BELT-5G3V-1060	*SEE NOTE 5,B*
*	*	*	*	BB	DRIVE BELT	BELT-5G3V-1000	*SEE NOTE 5,A*
*	*	*	*	AA	HUB SHEAVE - 13.1" (4000 R.P.M.)	10803-04	*SEE MANUFACTURING SHEET*
*	*	*	*	Z	HUB SHEAVE - 11.5" (3500 R.P.M.)	10803-03	
*	*	*	*	Y	HUB SHEAVE - 11.1" (3400 R.P.M.)	10803-08	
*	*	*	*	X	HUB SHEAVE - 10.6" (3225 R.P.M.)	10803-02	
*	*	*	*	W	HUB SHEAVE - 9.9" (3000 R.P.M.)	10803-01	
*	*	*	*	V	HUB SHEAVE - 9.0" (2750 R.P.M.)	10803-05	
*	*	*	*	U	HUB SHEAVE - 8.0" (2450 R.P.M.)	10803-00	*SEE MANUFACTURING SHEET*
				T			
4	4	4	4	S	ISOLATOR MOUNTS	CA1595X1/2-6	
1	1	1	1	R	FLUID COUPLING	TF12KSD	
1	1	1	1	Q	SLIDING MOTOR BASE	15968-01-001	
*	*	*	*	P	GEAR UNIT 52:1	13223-01	
*	*	*	*	O	GEAR UNIT 125:1	13223-00	
1	1	1	1	N	TOOL KIT	10785-00	
1	1	1	1	M	LOWER BELT GUARD	9847-01-005	
1	1	1	1	L	SKID	13100-01-007	
1	1	1	1	K	MOTOR-50HP 380/50/3; 1475 RPM	BAL-M7064T-150	*SEE NOTE 6*
1	1	1	1	J	MOTOR-50HP 460/60/3; 1750 RPM	BAL-M7064T-I	*SEE NOTE 6*
1	1	1	1	H	BASE	9589-00	
1	1	1	1	G	LOWER CASE	9589-01-001	
1	1	1	1	F	CASE COVER	9581-02	
1	1	1	1	E	GEAR UNIT GUARD	9585-01-008	
*	*	*	*	D	ROTATING ASSEMBLY (HARD SURFACED)	9587-00-003	*SEE MANUFACTURING SHEET*
*	*	*	*	C	ROTATING ASSEMBLY W/TILES	9587-00-003	*SEE MANUFACTURING SHEET*
				B	ROTATING ASSEMBLY (HARD SURFACED)	9587-00-001	*SEE MANUFACTURING SHEET*
				A	ROTATING ASSEMBLY W/TILES	9587-00-001	*SEE MANUFACTURING SHEET*
				03	AXIAL CENTRIFUGE ASSEMBLY (50HZ)	13744-03	
				02	AXIAL CENTRIFUGE ASSEMBLY (60HZ)	13744-02	
				01	RADIAL CENTRIFUGE ASSEMBLY (50HZ)	13744-01	
				00	RADIAL CENTRIFUGE ASSEMBLY (60HZ)	13744-00	
QTY.	No.	PART NAME			DESCRIPTION		

* DESIGNATES AVAILABLE OPTIONS. FOR SPECIFIC INFORMATION PERTAINING TO EQUIPMENT PURCHASED, REFERENCE CENTRIFUGE ORDER INFORMATION SHEET SUPPLIED IN CUSTOMER MAINTENANCE AND OPERATIONS MANUAL.

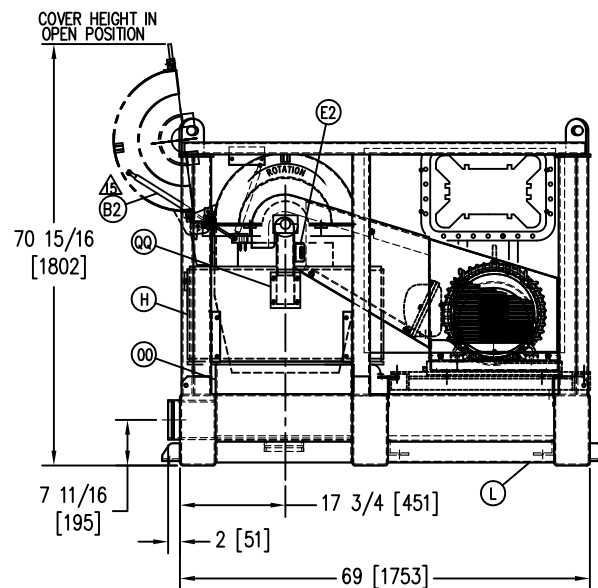
REFERENCE DRAWINGS	
ELECTRICAL CONDUIT/CABLE	10785-00-008
ELECTRICAL SCHEMATIC (LOW VOLTAGE)	10147-00
ELECTRICAL SCHEMATIC (HIGH VOLTAGE)	11171-00
ELECTRICAL WIRING DIAGRAM	10141-00-001
LUBRICATION & MAINTENANCE	10847-00-002

△

STATIC LOAD- 6860 LBS [3112 KG]
MAX TRANS DYNAMIC LOAD-124 LBS [57 KG]

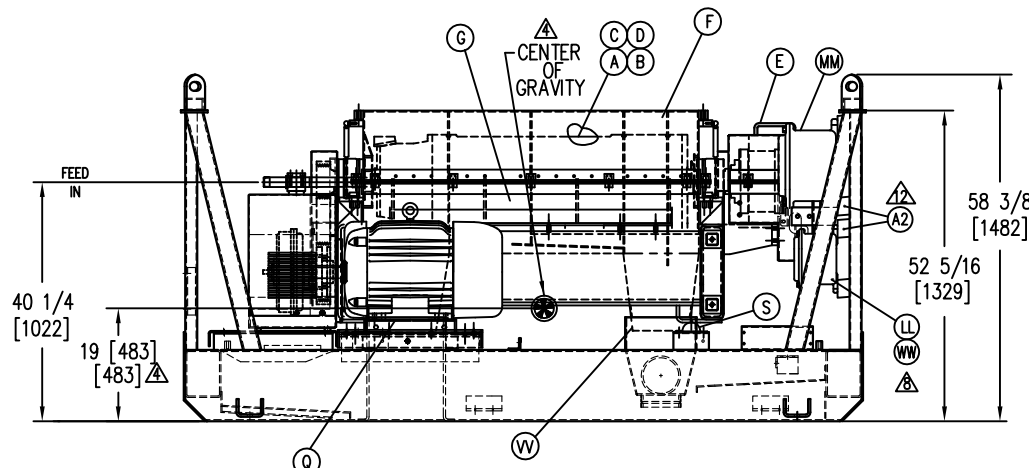
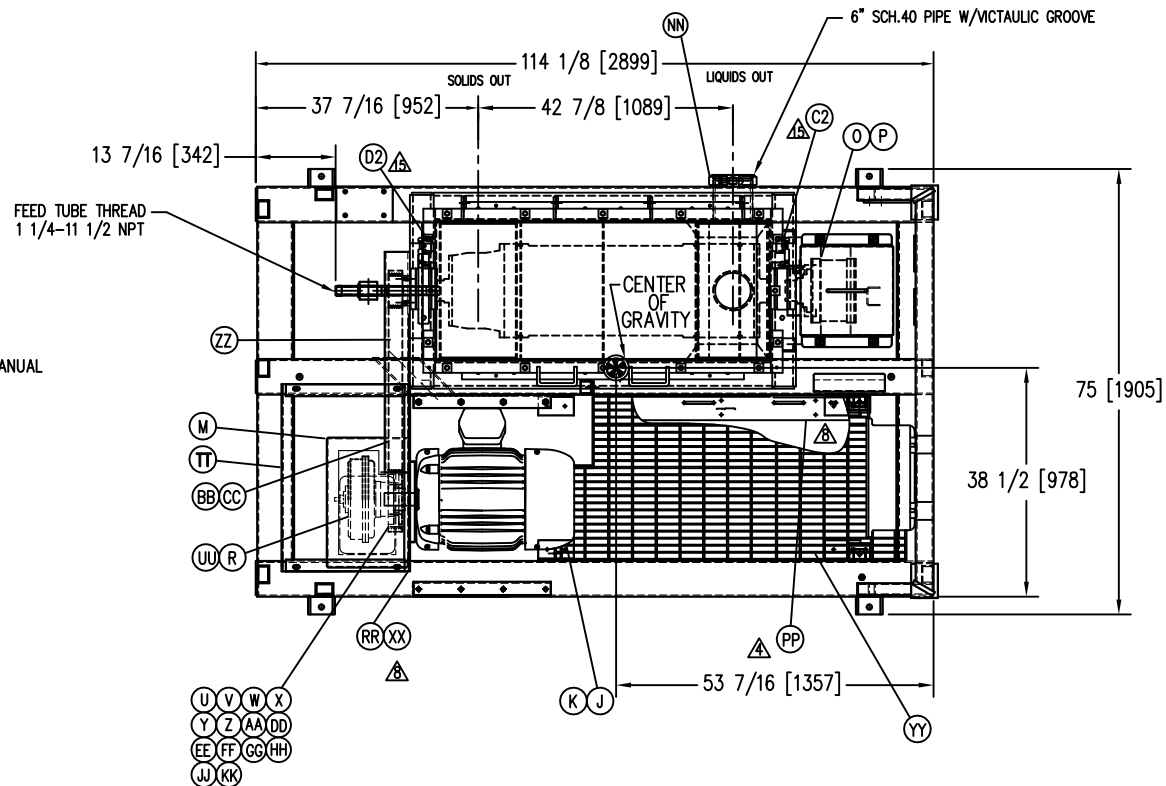
NOTES:

- ONE (1) UNIT COMPLETE
- COATING TYPE: SYSTEM ZRE/UE
- LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
 - MAIN BEARINGS - PER APPLICATION
 - CONVEYOR BEARINGS - PER APPLICATION
 - GEAR BOX - PER APPLICATION
 - DRIVE CLUTCH - PER APPLICATION
 - TORQUE OUT ASSEMBLY - PER APPLICATION
- OPERATING SPEED(S) - SEE MANUFACTURING SHEET IN MANUAL
- DRIVE BELT SELECTION -
 - BELT-5G3V-1000 TO BE USED WITH SHEAVES * 10603-00, 10603-01, 10603-02, & 10603-05
 - BELT-5G3V-1060 TO BE USED WITH SHEAVES * 10603-03, 10603-04, & 10603-06
- MOTORS ARE EXPLOSION PROOF



APPROX WT 6860 LBS

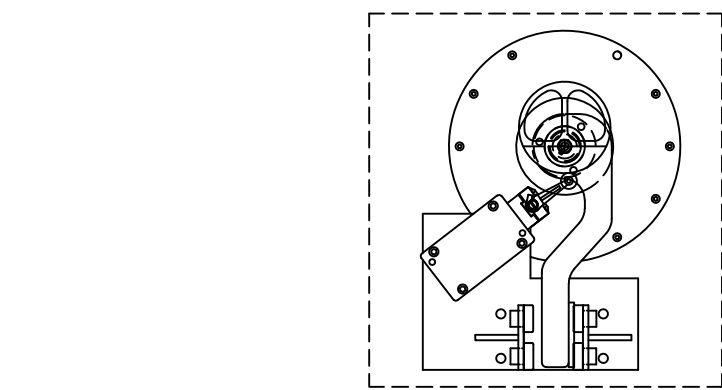
DIMENSIONS IN [] = MILLIMETERS



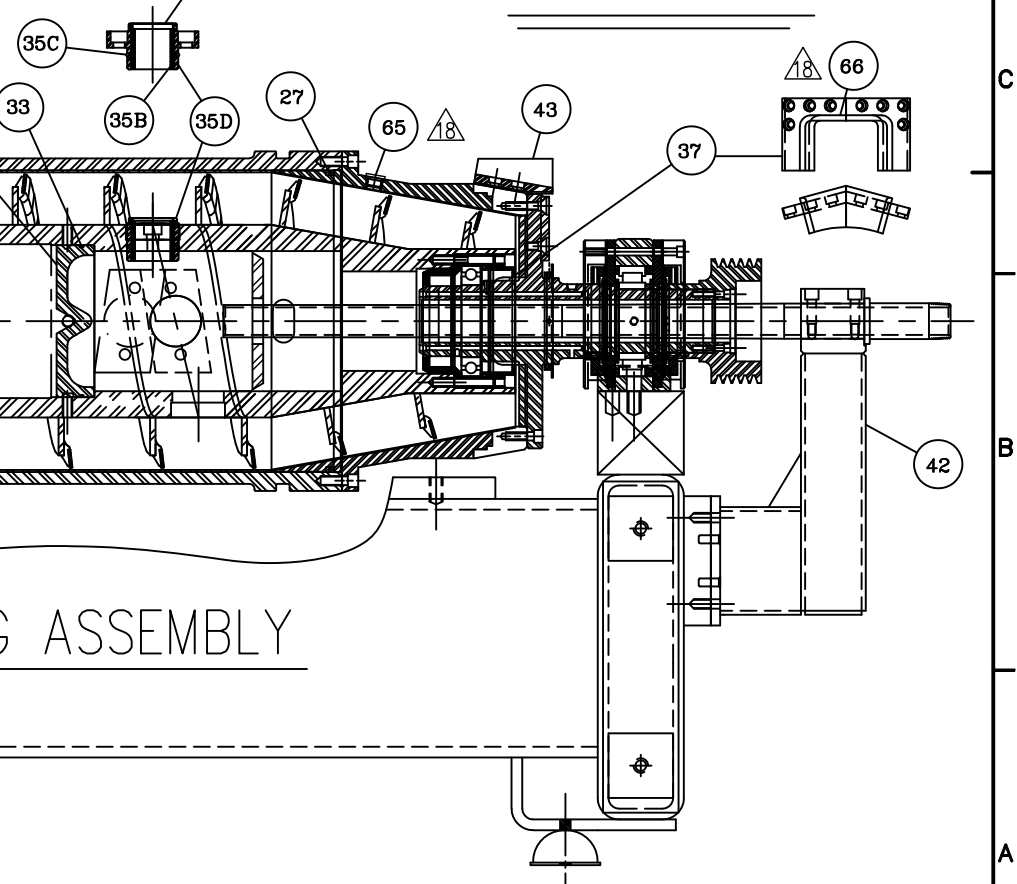
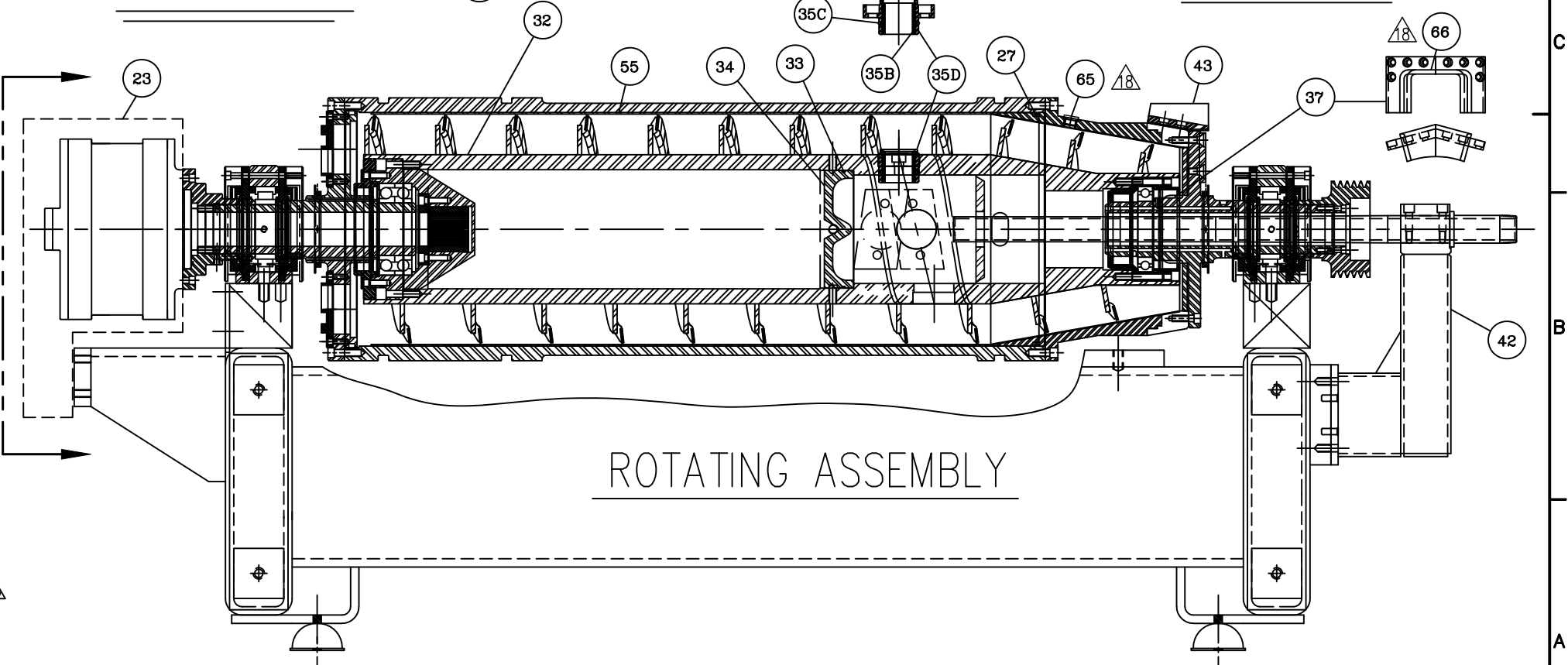
13	ITEM SS (GEAR UNIT 22:1 (ASSEMBLY 13224-00)) REMOVED PER DRR 2248	JDN	SB	8/9/10	TITLE	GENERAL ARRANGEMENT	FIG 1.2
12	ADDED ITEM A2 TO BOM	EJR		6/24/09	DE-1000™ GBD CENTRIFUGE		
11	ITEM Q WAS "PER MOTOR"; REMOVED BALLOONS X, Y & BB FROM PLAN VIEW. REFER TO RECORD COPY FOR REVISIONS 1-10.	CCS	DWN	12/15/08	DATE	10/16/97	SCALE 1=20
REV	CHANGE	CKD	DATE				
16	ADDED STATIC AND MAX TRANS DYNAMIC LOAD; ADDED ITEM E2	DMM	EJR	8/13/12			
15	ADDED ITEMS B2-02	WJR	EJR	6/26/12			
14	ITEM T WAS FEED TUBE (9540-00) REMOVED PER DRR 2250	JDN	EJR	10/19/10			
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.					C	Y	DWN
					SHEET SIZE	F C	CKD
					DRAWING NO.	13744-00	
					590 DUKE ROAD, BUFFALO, NY 14225 U.S.A.		

DERRICK
CORPORATION

VIEW A-A



* - COMPLETE SET



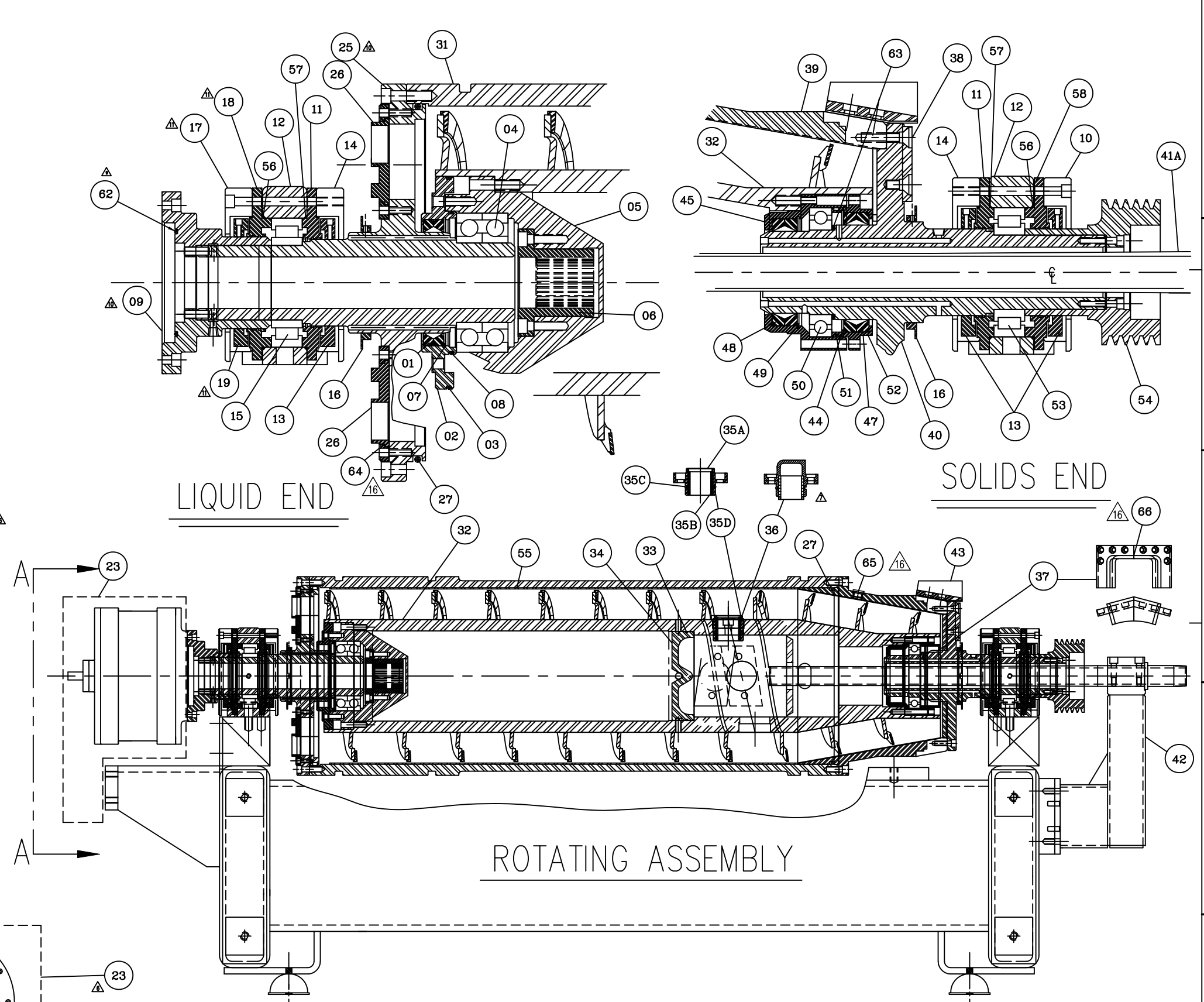
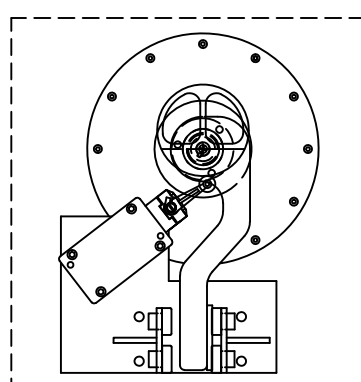
REF 13744-00

14	ITEM 18 WAS CSD-40-42-42, ADDED ITEM 41.	CS	12/15/04	FILE CENTRIFUGE - ROTATING ASSEMBLY FOR DESK-DE-1000" (RADIAL FLOW)
13	ITEMS 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 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2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212,			

WEAR ITEMS	ASSY. REF.	QTY	ITEM#	DESCRIPTION	DWG. NO.
			66	O-RING STOCK	700-NIT-CORD-21
			65	HEX PLUG	PKR-8-HP50N-SS
W	C		4	64 MOUNTING RING	10088-02
			63	WAVE SPRING	G0004365
C			62	O-RING (4.000 ID X .125)	ORVI-ARP-242
			61	CONVEYOR ASSY W/ HARD SURFACING	
			60	CONVEYOR ASSY W/ TILES	
			59	COMPLETE ROTATING ASSY W/ H.S.	
E	D,C		58	PILLOW BLOCK COVER (OUTBOARD)	9588-00
D,C			57	O-RING (4.989 ID X .070)	G0003212
D,C			56	O-RING (4.987 ID X .103)	G0003211
W	A		55	BOWL LINER	9582-00
D			54	PULLEY SHEAVE 5.75" PD	9546-00
D			53	BEARING NUP-2215	CS10-RA-512-00
B			52	SEAL HOUSING S/E	9553-00
B			51	O-RING 249	CS10-RA-325-00
B			50	BALL BEARING 6017	CS10-RA-511-00
B			49	RETAINER RING RR425	CS10-RA-327-00
B			48	SEAL (GARLOCK 24600-7374)	CS10-RA-310-00
B			47	SEAL (GARLOCK 24600-2462)	CS10-RA-311-00
			46		
B			45	BEARING HOUSING S/E	9553-00
B			44	RETAINER RING RR475	CS10-RA-328-00
W	A		43	BOWL EXTENSION PLOW	9552-00
E			42	FEED TUBE SUPPORT	9536-01
E			41A	FEED PIPE	9540-00
D			40	SOLID BOWL HEAD	9463-00
A			39	BOWL EXTENSION	9462-00
W	D		38	BOWL HEAD PLOW	(10570-00) CS10-RA-650-IC *
W	A		37	SOLIDS DISCH. WEAR INSERTS	(9547-00) CS10-RA-630-IC *
B			36	AXIAL FEED NOZZLE ASSY.	9524-00-001
B			35D	FEED NOZZLE - CASTING	9524-03
B			35C	O-RING 227	(9524-02) CS10-RA-324-00
W	B		35B	CARBIDE INSERT	(9524-01) CS10-RA-629-TC
W	B		35A	FEED NOZZLE ASSY.	9524-00
W	B		34	FEED ACCELERATOR BUMP	9537-00
B			33	O-RING 261	CS10-RA-323-00
B			32	4 1/4" SINGLE LEAD CONVEYOR	9582-01-008
A			31	BOWL	9523-00
B			30	4 1/4" SINGLE LEAD CONVEYOR	9582-01-008
			29		
			28		
A			27	O-RING 456	CS10-RA-316-00
W	C		26	EFFLUENT PORTS	10088-01
C			25	LIQUID BOWL HEAD	9505-00-001
			24		
			23	GEAR UNIT W/OVERLOAD RELEASE ASSY	REFER TO GA
			22		
			21		
			20		
D,C			19	PILLOW BLOCK FLINGER (OUTBOARD FLANGE SIDE)	9514-00-001
D,C			18B		
D,C			18	PILLOW BLOCK COVER (OUTBOARD FLANGE SIDE)	9588-00-002
			17B		
D,C			17	FLINGER COVER (OUTBOARD FLANGE SIDE)	9570-00-001
D,C			16	CASE FLINGER	9515-00
C			15	BEARING NU 2215	CS10-RA-513-00
D,C			14	FLINGER COVER (INBOARD)	9517-00
D,C			13	PILLOW BLOCK FLINGER	9514-00
D,C			12	PILLOW BLOCK	9545-00
D,C			11	PILLOW BLOCK COVER (INBOARD)	9512-00
D,C			10	FLINGER COVER (OUTBOARD)	9570-00
C			09	GEAR FLANGE	9522-00-001
B			08	O-RING 252	CS10-RA-322-00
B			07	RETAINING RING RR500	CS10-RA-326-00
B			06	SPLINE HUB	9519-00
B			05	BEARING HOUSING L/E	9521-00
B			04	THRUST BEARING 7216	CS10-RA-510-00
B			03	O-RING 266	CS10-RA-321-00
B			02	SEAL HOUSING L/E	9511-00
B			01	SEAL (GARLOCK 24600-0978)	CS10-RA-312-00
B			00	COMPLETE ROTATING ASSY W/ TILES	

NOTE:
 ▲ ITEMS 35 & 36 ARE CHOSEN PER APPLICATION
 QUANTITIES ARE 4 PER ASSEMBLY
 ▲* - COMPLETE SET

VIEW A-A



REF 13744-00

12	ITEM 28 WAS CS10-60-021-02, ADDED ITEM 43.	CS	12/15/04
11	ADDED ITEMS 17, 18 & 19. ITEM 58 QTY WAS 2, ITEM 13 QTY WAS 4, ITEM 10 QTY WAS 2, CHANGE TO REFLECT NEW SEAL FLANGE, SEE SECOND COPY OR GLASSY LAYER FOR PREVIOUS REVISIONS.	CS	10/5/02
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ADDED ITEMS 34, 35 & 36. REMOVED ITEM 37 TO ADD 34, CHANGES PER DRR 2484, ADDED NOTE, ITEM 38 WAS 10000-00

2/9/12

15

REMOVED BALLCON 38 FROM ITEM.

5/12/08

14

ITEM 32 WAS 9582-00-001, ITEM 30 WAS 9582-00-001, UPDATED ITEMS

8/25/08

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ITEM 42 DREL. NO. WAS 9528-00

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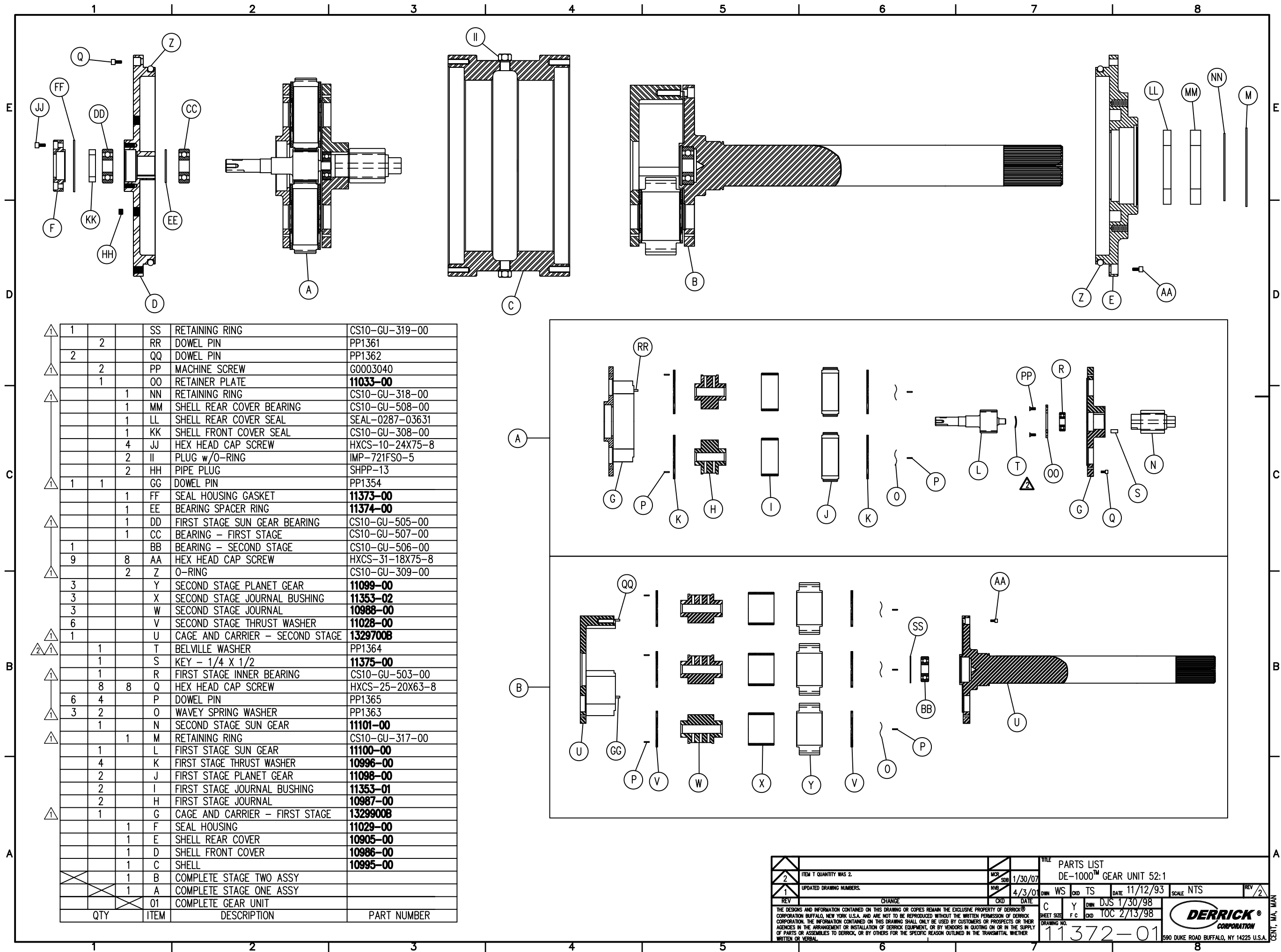
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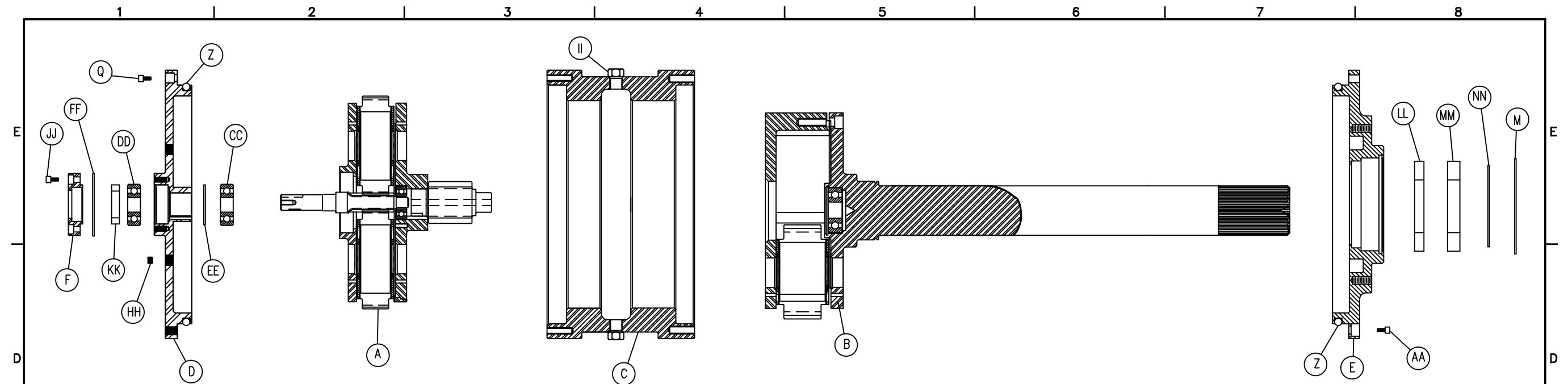
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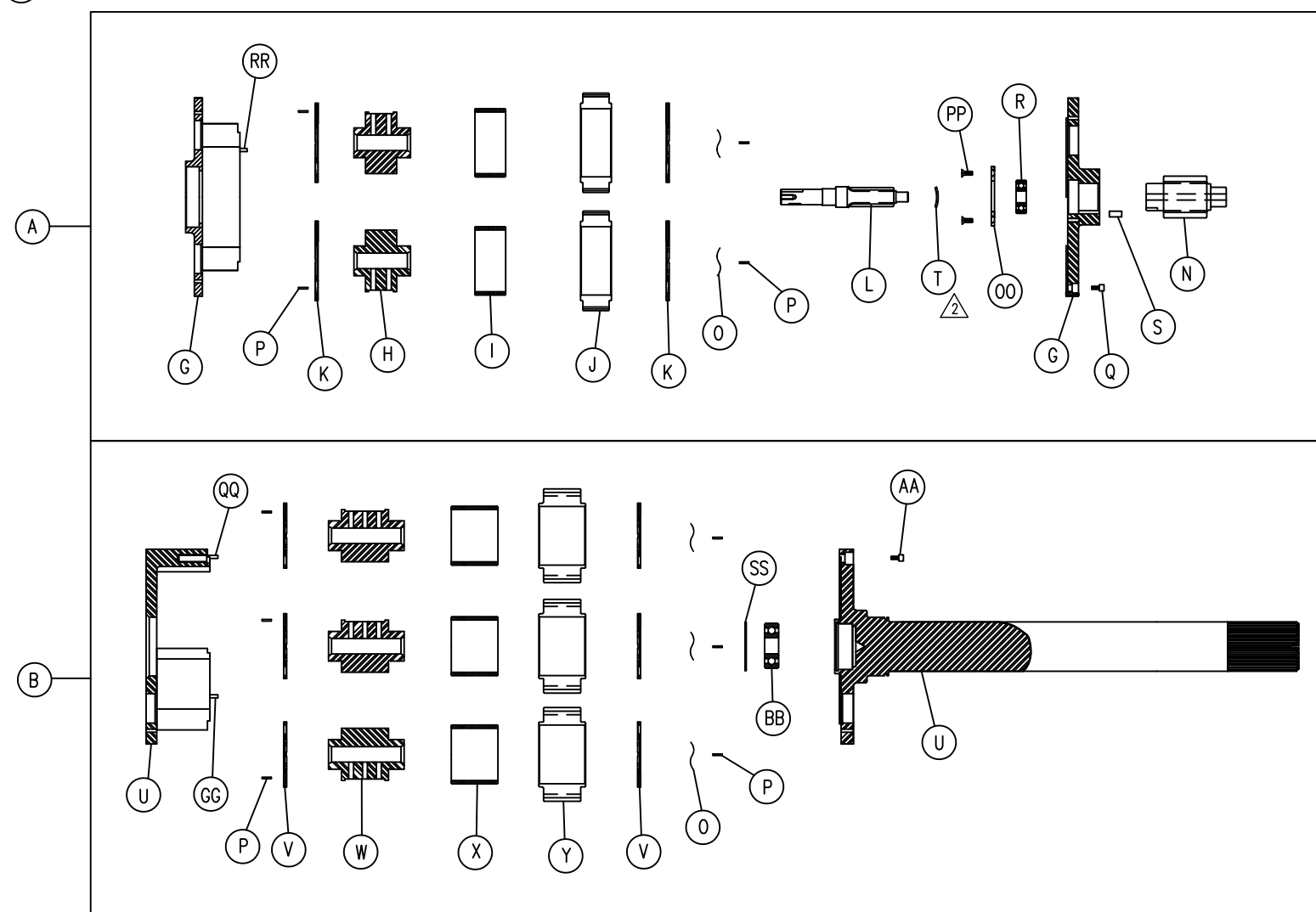


1		SS	RETAINING RING	CS10-GU-319-00
	2	RR	DOWEL PIN	PP1361
2		QQ	DOWEL PIN	PP1362
	2	PP	MACHINE SCREW	G0003040
	1	OO	RETAINER PLATE	11033-00
	1	NN	RETAINING RING	CS10-GU-318-00
	1	MM	SHELL REAR COVER BEARING	CS10-GU-508-00
	1	LL	SHELL REAR COVER SEAL	SEAL-0287-03631
	1	KK	SHELL FRONT COVER SEAL	CS10-GU-308-00
	4	JJ	HEX HEAD CAP SCREW	HXCS-10-24X75-8
	2	II	PLUG w/O-RING	IMP-721FSO-5
	2	HH	PIPE PLUG	SHPP-13
1	1	GG	DOWEL PIN	PP1354
	1	FF	SEAL HOUSING GASKET	11373-00
	1	EE	BEARING SPACER RING	11374-00
	1	DD	FIRST STAGE SUN GEAR BEARING	CS10-GU-505-00
	1	CC	BEARING - FIRST STAGE	CS10-GU-507-00
1		BB	BEARING - SECOND STAGE	CS10-GU-506-00
9	8	AA	HEX HEAD CAP SCREW	HXCS-31-18X75-8
	2	Z	O-RING	CS10-GU-309-00
3		Y	SECOND STAGE PLANET GEAR	11099-00
3		X	SECOND STAGE JOURNAL BUSHING	11353-02
3		W	SECOND STAGE JOURNAL	10988-00
6		V	SECOND STAGE THRUST WASHER	11028-00
1		U	CAGE AND CARRIER - SECOND STAGE	1329700B
	1	T	BELVILLE WASHER	PP1364
	1	S	KEY - 1/4 X 1/2	11375-00
	1	R	FIRST STAGE INNER BEARING	CS10-GU-503-00
	8	Q	HEX HEAD CAP SCREW	HXCS-25-20X63-8
6	4	P	DOWEL PIN	PP1365
3	2	O	WAVEY SPRING WASHER	PP1363
	1	N	SECOND STAGE SUN GEAR	11101-00
	1	M	RETAINING RING	CS10-GU-317-00
	1	L	FIRST STAGE SUN GEAR	11100-00
	4	K	FIRST STAGE THRUST WASHER	10996-00
	2	J	FIRST STAGE PLANET GEAR	11098-00
	2	I	FIRST STAGE JOURNAL BUSHING	11353-01
	2	H	FIRST STAGE JOURNAL	10987-00
	1	G	CAGE AND CARRIER - FIRST STAGE	1329900B
	1	F	SEAL HOUSING	11029-00
	1	E	SHELL REAR COVER	10905-00
	1	D	SHELL FRONT COVER	10986-00
	1	C	SHELL	10995-00
	1	B	COMPLETE STAGE TWO ASSY	
	1	A	COMPLETE STAGE ONE ASSY	
	01		COMPLETE GEAR UNIT	
QTY	ITEM		DESCRIPTION	PART NUMBER

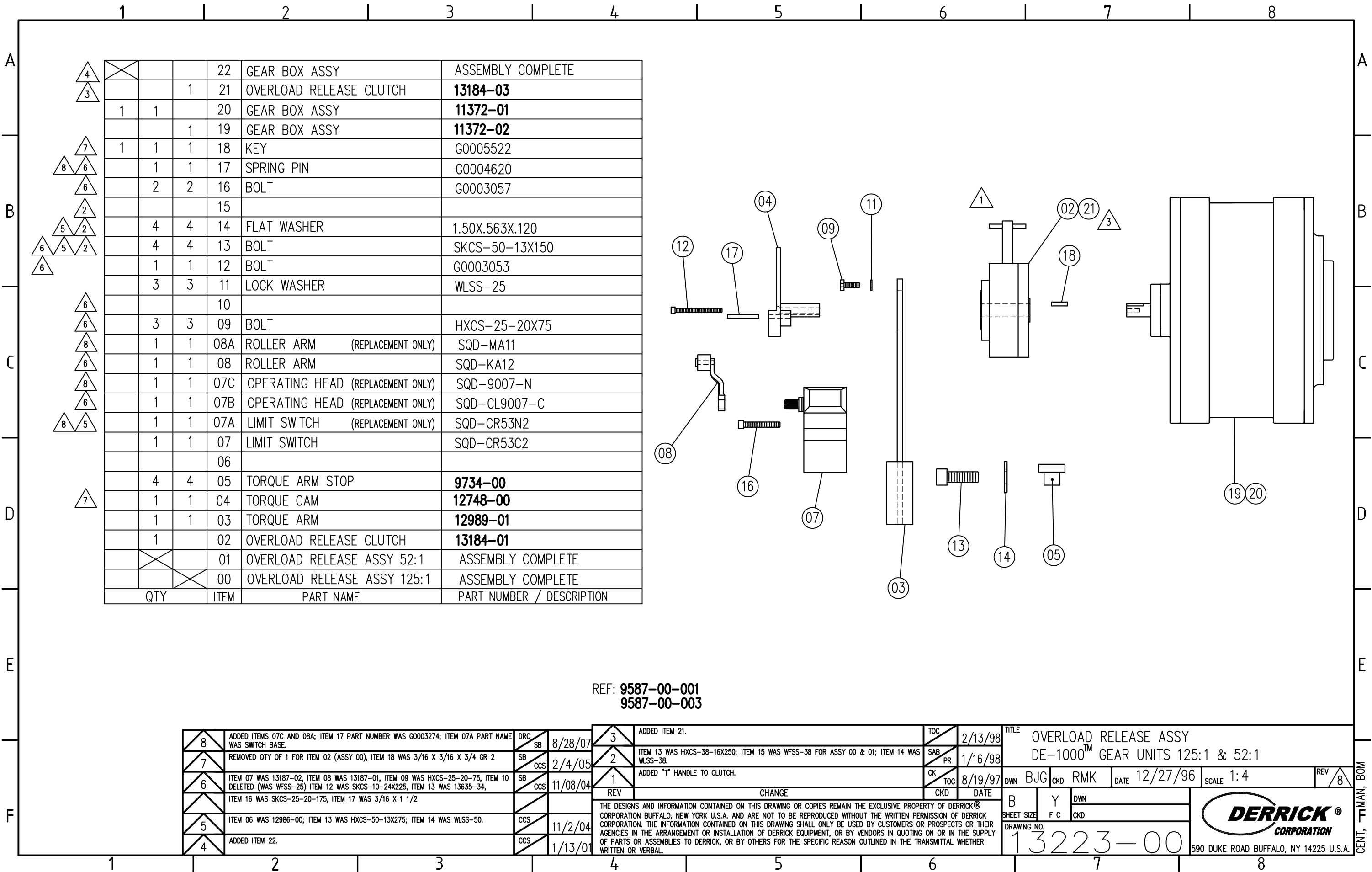
2	ITEM 1 QUANTITY WAS 2.	MOD	1/30/07	PARTS LIST														
1	UPDATED DRAWING NUMBERS.	WVB	4/3/07	DE-1000™ GEAR UNIT 52:1														
REV	CHANGE	CRD	DATE	DWN	WS	CRD	TS	DATE	11/12/93	SCALE	NTS	REV	2					
THE DESIGNS AND INFORMATION CONTAINED ON THIS DRAWING OR COPIES REMAIN THE EXCLUSIVE PROPERTY 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 AGENTS 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.													C	Y	DWN	DJS	1/30/98	
DRAWING NO. 11372-01													F	C	CRD	TOC	2/13/98	
													590 DUKE ROAD BUFFALO, NY 14225 U.S.A.			CENT, MA, MAN		

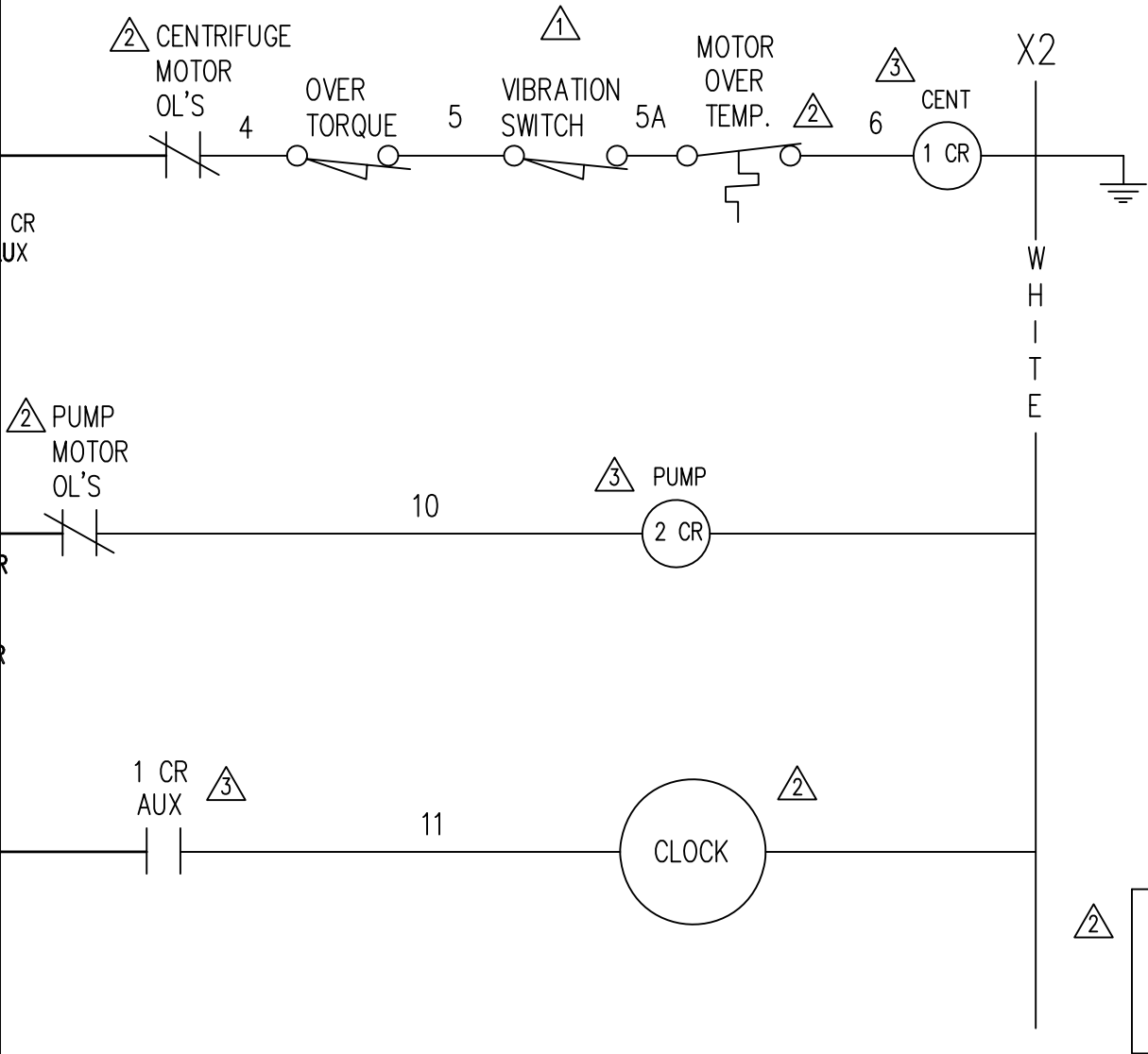


1	1		SS	RETAINING RING	CS10-GU-319-00
	2		RR	DOWEL PIN	PP1361
1	2		QQ	DOWEL PIN	PP1362
	2		PP	MACHINE SCREW	G0003040
1	1		OO	RETAINER PLATE	11033-00
	1		NN	RETAINING RING	CS10-GU-318-00
1	1		MM	SHELL REAR COVER BEARING	CS10-GU-508-00
	1		LL	SHELL REAR COVER SEAL	SEAL-0287-03631
1	1		KK	SHELL FRONT COVER SEAL	CS10-GU-308-00
	4		JJ	HEX HEAD CAP SCREW	HXCS-10-24X75-8
1	2		II	PLUG w/O-RING	IMP-721FS0-5
	2		HH	PIPE PLUG	SHPP-13
1	1		GG	DOWEL PIN	PP1354
	1		FF	SEAL HOUSING GASKET	11373-00
1	1		EE	BEARING SPACER RING	11374-00
	1		DD	FIRST STAGE SUN GEAR BEARING	CS10-GU-505-00
1	1		CC	BEARING - FIRST STAGE	CS10-GU-507-00
	1		BB	BEARING - SECOND STAGE	CS10-GU-506-00
1	9		AA	HEX HEAD CAP SCREW	HXCS-31-18X75-8
	2		Z	O-RING	CS10-GU-309-00
1	3		Y	SECOND STAGE PLANET GEAR	11099-00
	3		X	SECOND STAGE JOURNAL BUSHING	11353-02
1	3		W	SECOND STAGE JOURNAL	10988-00
	6		V	SECOND STAGE THRUST WASHER	11028-00
1	1		U	CAGE AND CARRIER - SECOND STAGE	13297008
	1		T	BELVILLE WASHER	PP1364
1	1		S	KEY	11375-00
	1		R	FIRST STAGE INNER BEARING	CS10-GU-503-00
1	8		Q	HEX HEAD CAP SCREW	HXCS-25-20X63-8
	6		P	DOWEL PIN	PP1365
1	3		O	WAVEY SPRING WASHER	PP1363
	1		N	SECOND STAGE SUN GEAR	11101-00
1	1		M	RETAINING RING	CS10-GU-317-00
	1		L	FIRST STAGE SUN GEAR	11102-00
1	4		K	FIRST STAGE THRUST WASHER	10996-00
	2		J	FIRST STAGE PLANET GEAR	11097-00
1	2		I	FIRST STAGE JOURNAL BUSHING	11353-01
	2		H	FIRST STAGE JOURNAL	10987-00
1	1		G	CAGE AND CARRIER - FIRST STAGE	1329900C
	1		F	SEAL HOUSING	11029-00
1	1		E	SHELL REAR COVER	10905-00
	1		D	SHELL FRONT COVER	10986-00
1	1		C	SHELL	10995-00
	1		B	COMPLETE STAGE TWO ASSY	
1	1		A	COMPLETE STAGE ONE ASSY	
	01			COMPLETE GEAR UNIT	
	QTY		ITEM	DESCRIPTION	PART NUMBER



2	ITEM T QUANTITY WAS 2.	MCR	SUB	2/20/07	TITLE	PARTS LIST DE-1000™ GEAR UNIT 125:1							
1	UNITED PART NUMBERS.	HMB	4/2/07	DWN	WS	CXD	TS	DATE	2/3/97	SCALE	NTS	REV	2
REV	CHANGE	CND	DATE	C	Y	DWN	DJS	1/30/98					
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				DRAWING NO.	11372-02			590 DUKE ROAD BUFFALO, NY 14225 U.S.A.					





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3	ADDED CONTACT RELAY; ADDED PUMP & CENT DESCRIPTION	KW	9/24/93	
2	ADDED 50 H.P. PORTABLE DE-1000 (460/60/3) TO TITLE; CLOCK WAS SELF POWERED W/BATTERIES & IS OBSOLETE; ADDED NEW CLOCK WIRING			
	CORRECTED OVER TEMP DIAGRAM; SPECIFIED MOTOR OVER LOADS; ADDED VOLTAGE INFORMATION	WS KW	1/6/93	
1	ADDED VIBRATION SWITCH,	TS RS	6/17/92	
REV	CHANGE	CKD	DATE	

DERRICK® CORPORATION

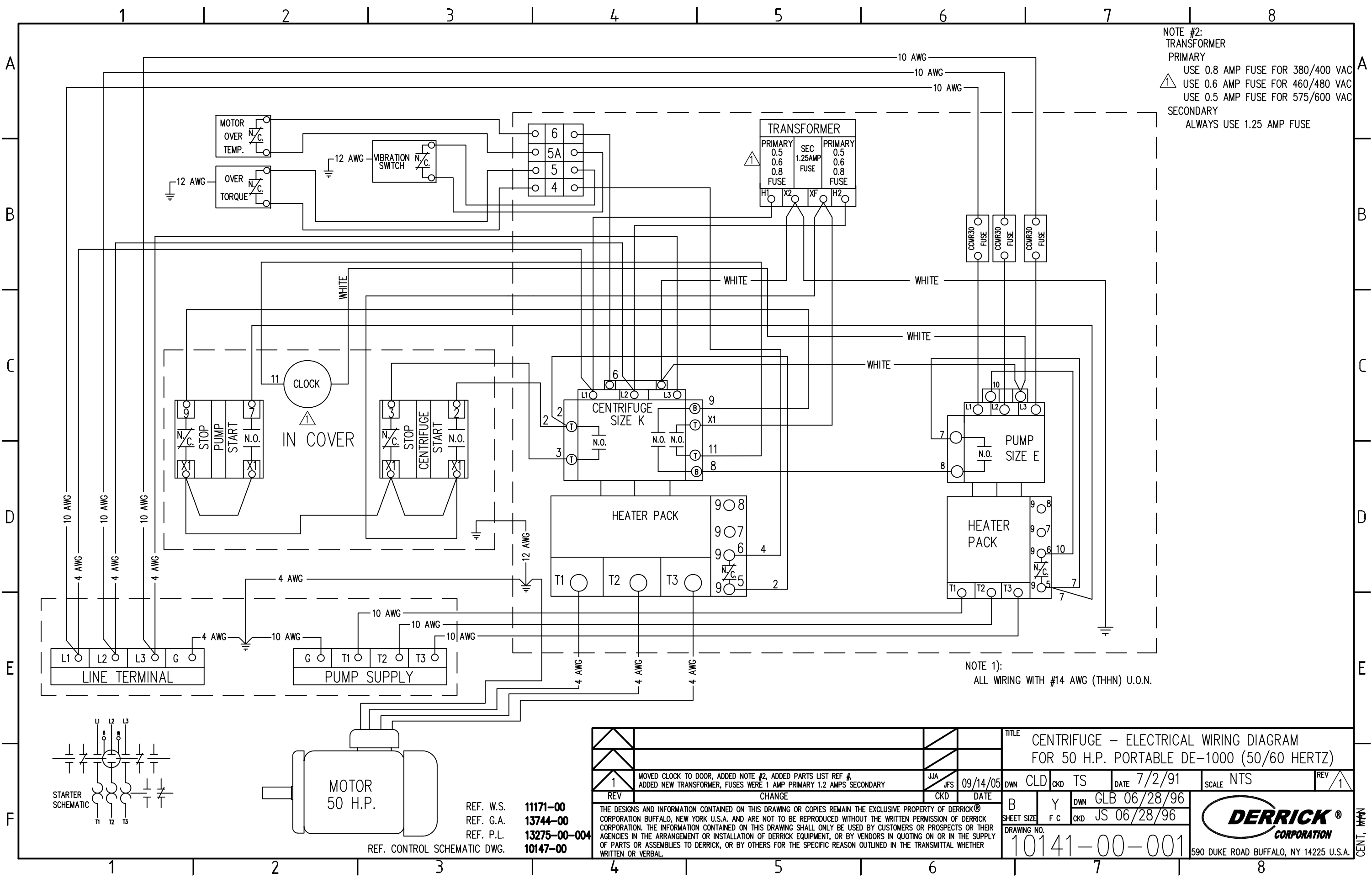
590 DUKE ROAD

BUFFALO, NEW YORK 14225 U.S.A.

TITLE


CENTRIFUGE- ELECTRICAL CONTROL SCHEMATIC
FOR 50 H.P. PORTABLE DE-1000 (50 HERTZ & 60 HERTZ)

DWN	CLD	CKD	TS	DATE	7/8/91	SCALE	NTS
00A D B	Y F C	DRAWING NO. 10147-00				FIG: 2.1 FIGURE NO	3 REV



NOTE #2:
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

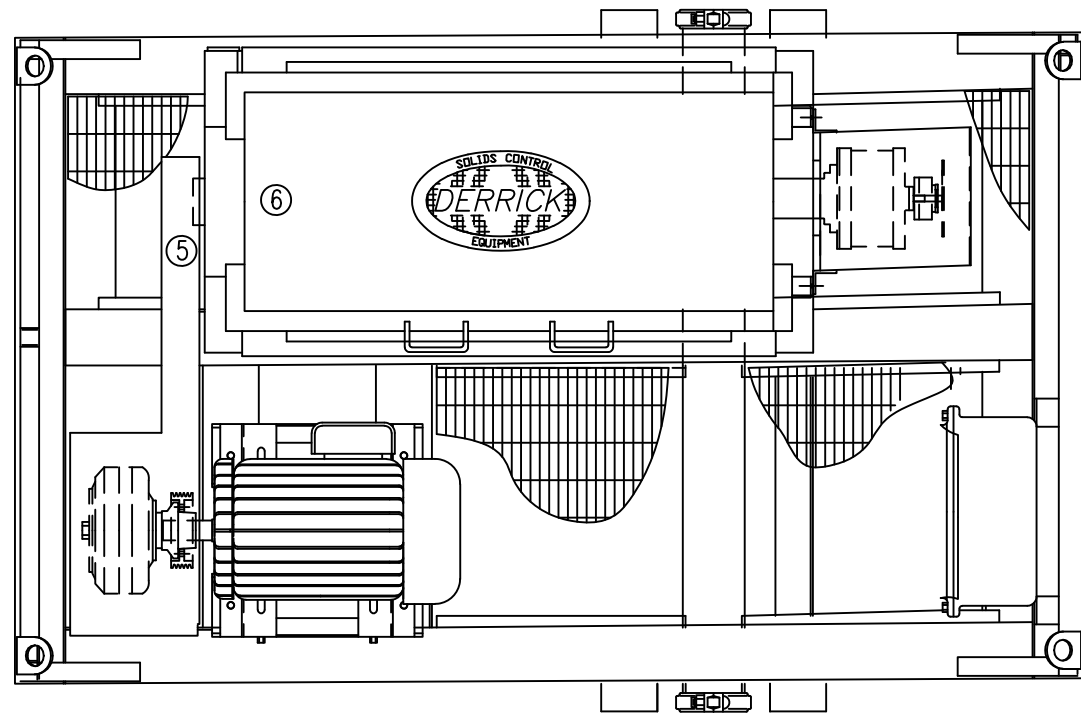
NOTE 1):
ALL WIRING WITH #14 AWG (THHN) U.O.N.

TITLE										CENTRIFUGE – ELECTRICAL WIRING DIAGRAM FOR 50 H.P. PORTABLE DE-1000 (50/60 HERTZ)																	
DWN		CLD		CKD		TS		DATE				7/2/91				SCALE				NTS				REV		1	
B		Y		DWN		GLB 06/28/96																					
SHEET SIZE		F C		CKD		JS 06/28/96																					
DRAWING NO.						10141-00-001																					
														590 DUKE ROAD BUFFALO, NY 14225 U.S.A.													

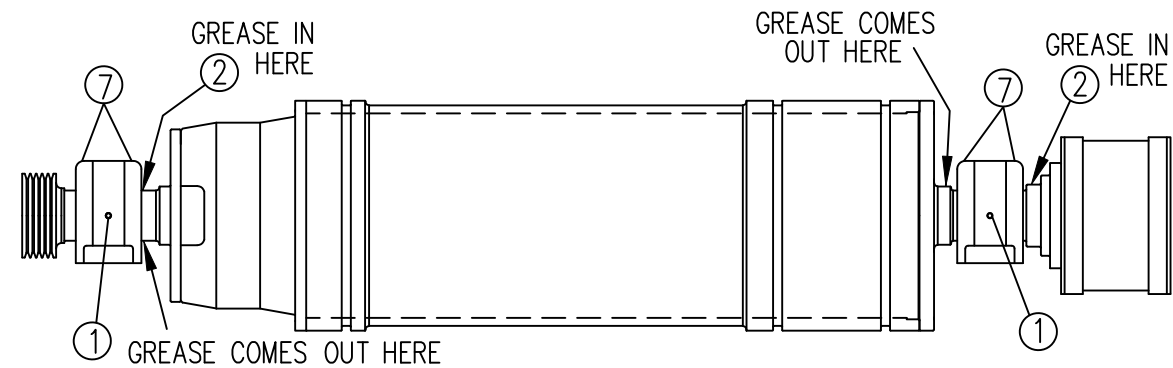


REF. W.S. 11171-00
REF. G.A. 13744-00
REF. P.L. 13275-00-004
10147-00

REF. CONTROL SCHEMATIC DWG.

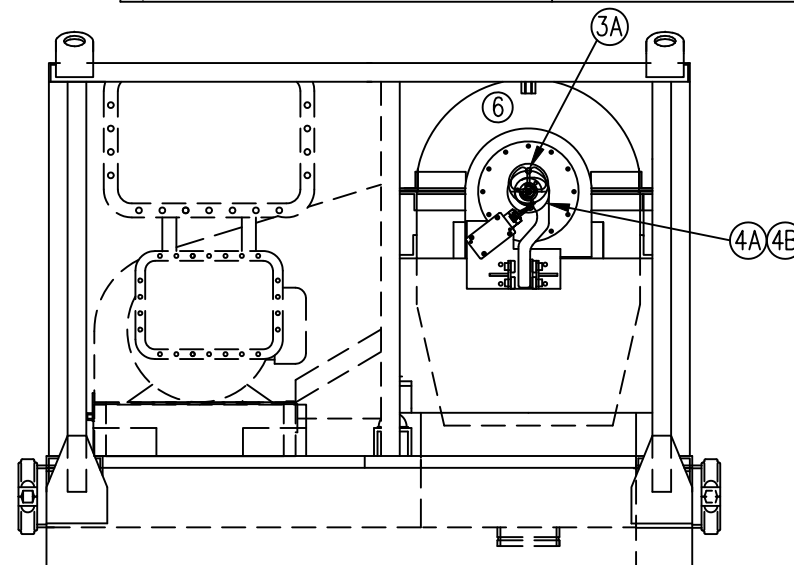
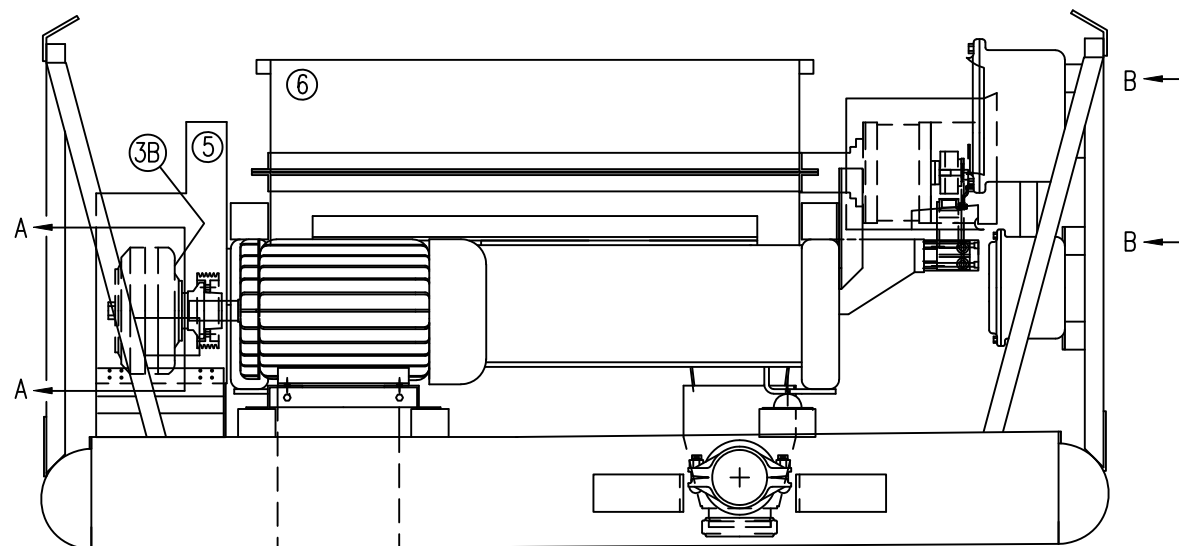


BELT DRIVE ONLY



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

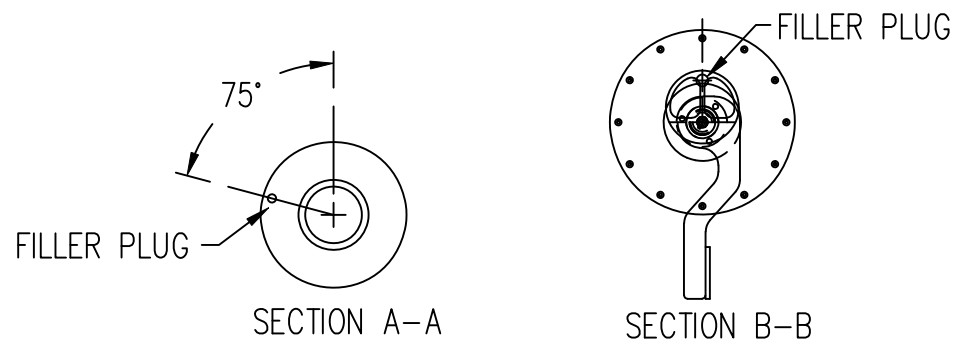


*MIXING LUBRICANTS MAY CAUSE
CATASTROPHIC FAILURE

*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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590 DUKE ROAD

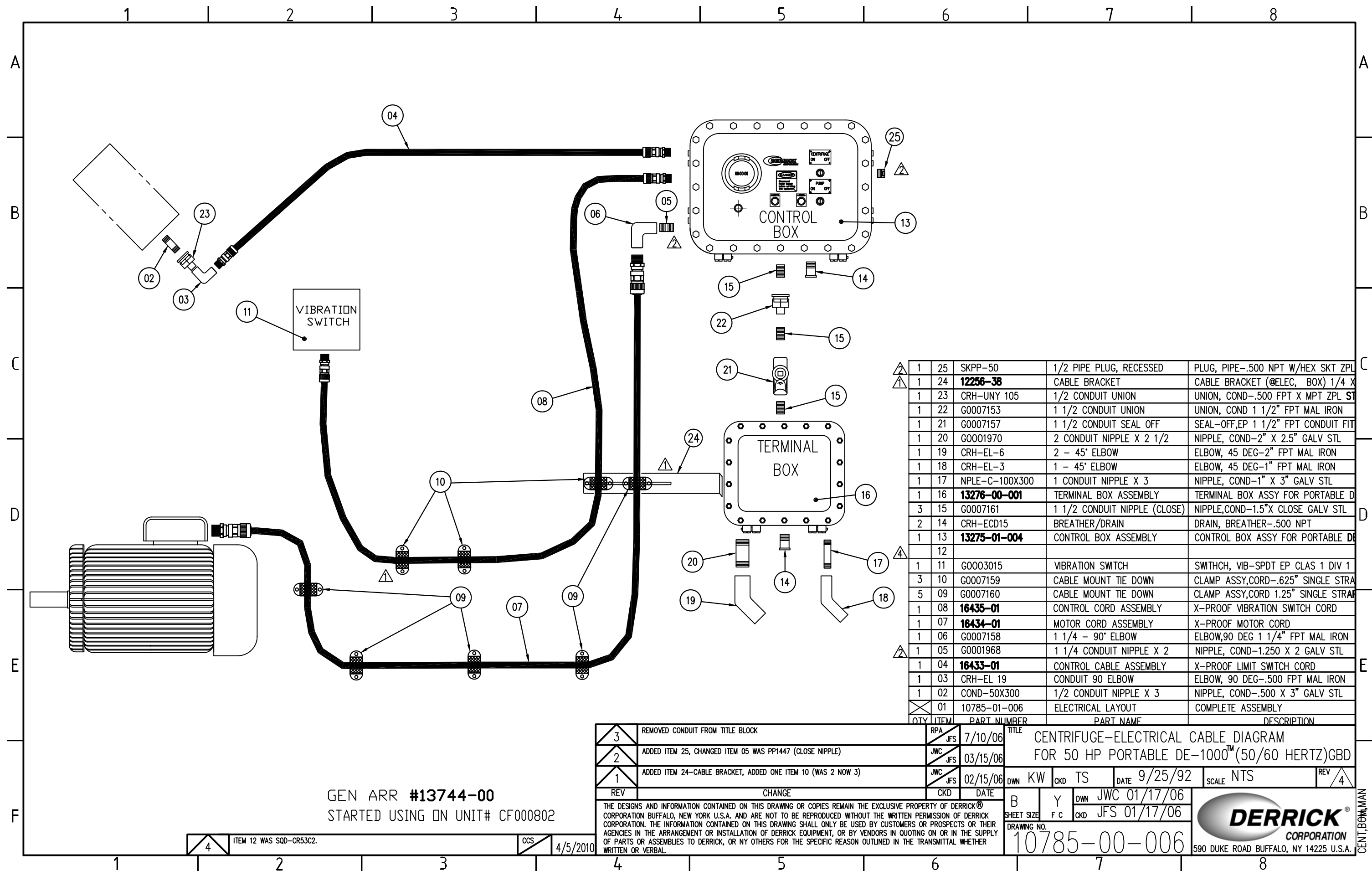
BUFFALO, NEW YORK 14225 U.S.A.

TITLE LUBRICATION & MAINTENANCE SCHEDULE
DERRICK DE-1000™ CENTRIFUGE

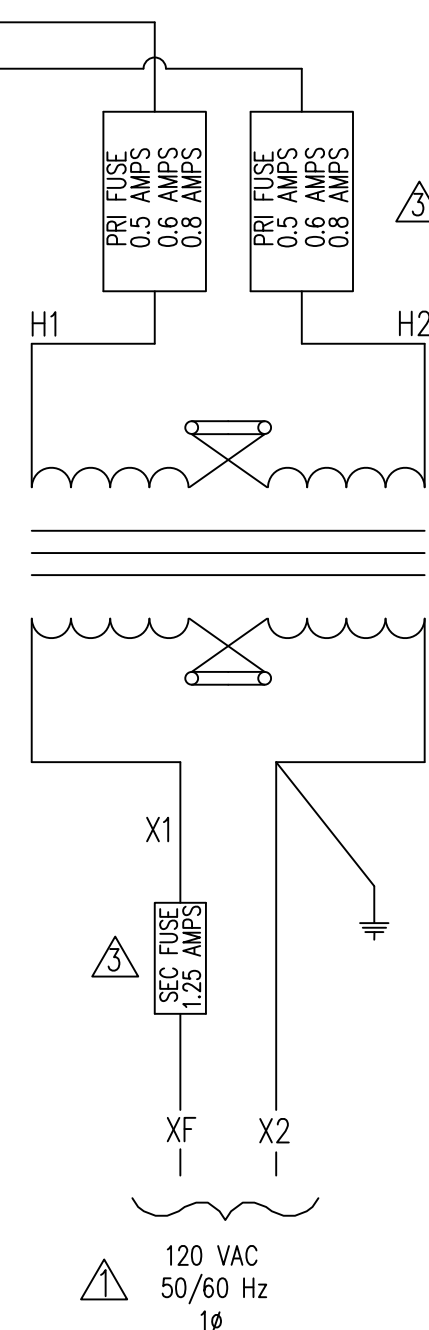
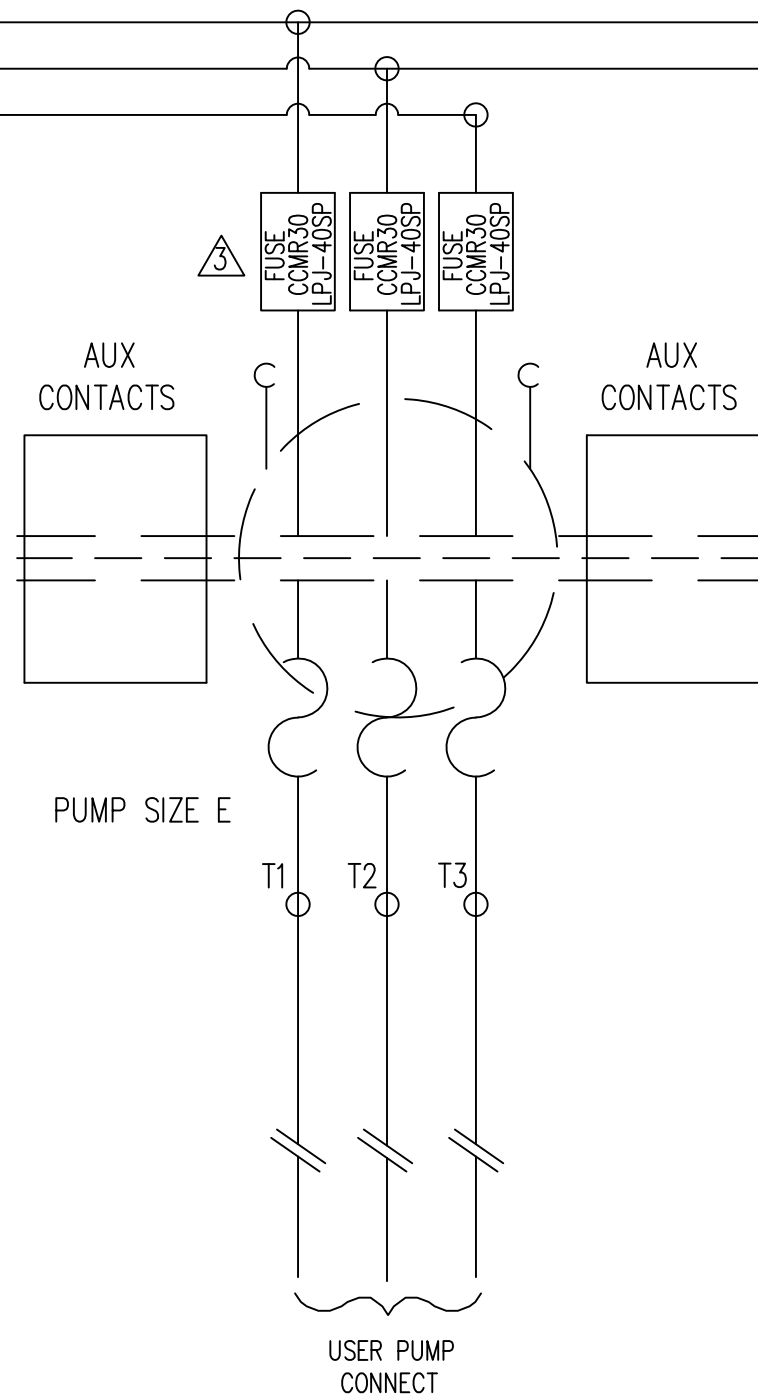
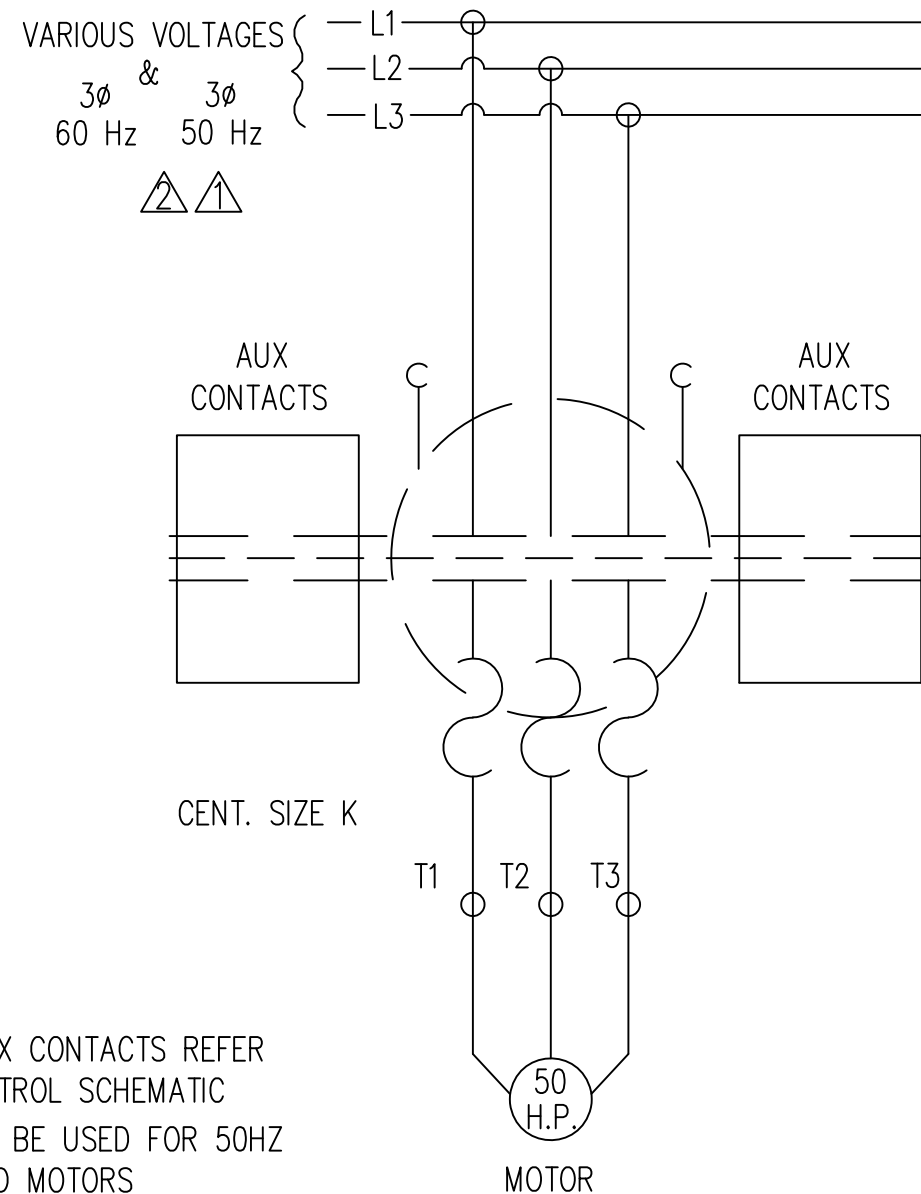
DWN KW CKD TS DATE 6-11-92 SCALE NTS

00C Y 10647-00-002 FIG B.1
DB FC DRAWING NO. FIGURE NO. REV

REV CHANGE CKD DATE



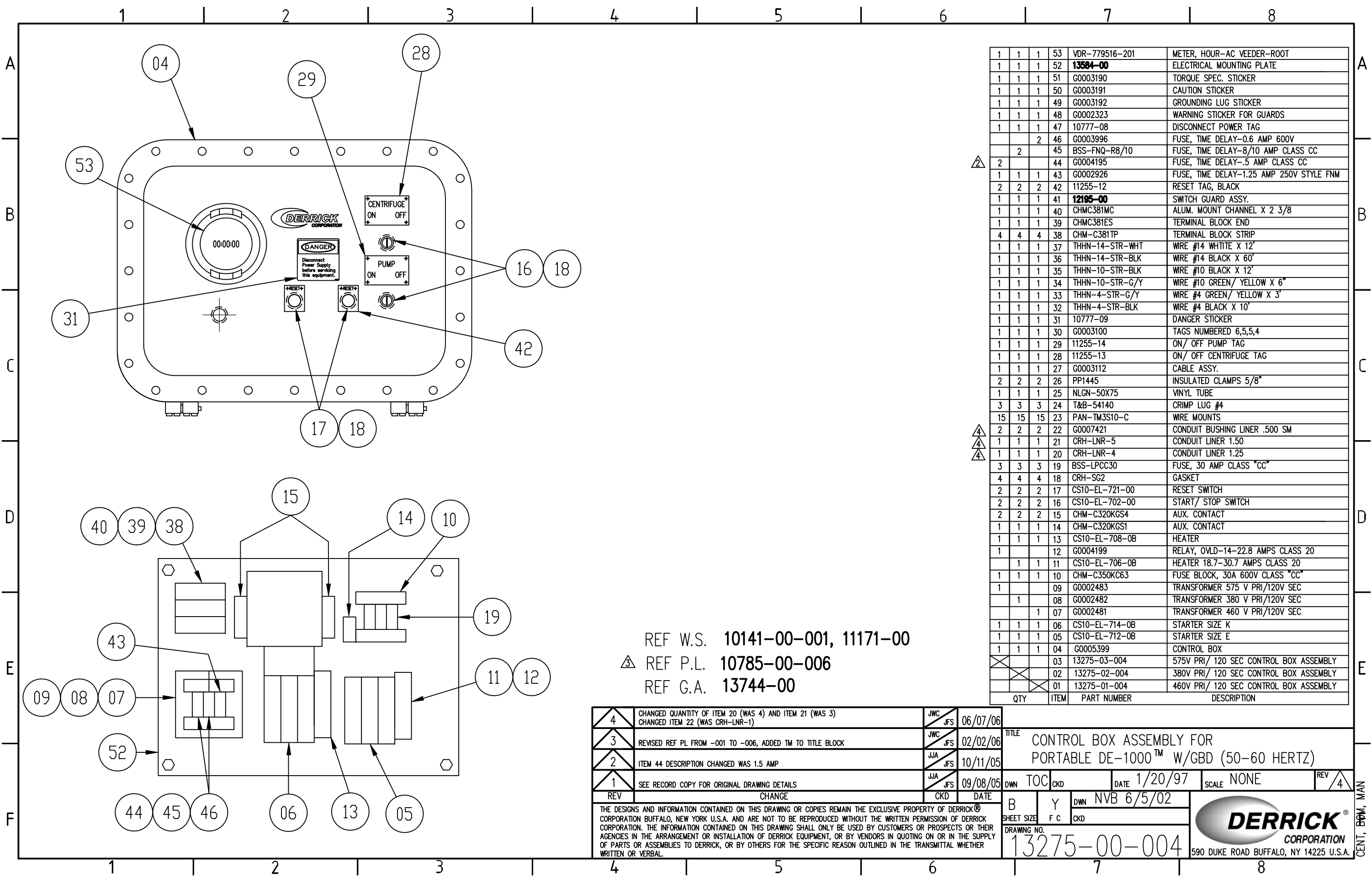
CENT. BOM. MAN.




- * 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 ϕ

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)				REV 3	
2	REMOVED VOLTAGES TO BE MORE GENERIC	JS	PR	09/26/00	DWN KW CKD TS DATE 06/21/93 SCALE NONE					
1	ADDED 50/60, 380/50Hz & NOTE 2	TOC		03/02/94	B1 Y DWN					
REV	CHANGE	CKD	DATE		SHEET SIZE F C CKD					
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REF. P.L. 13275-00-003 REF. P.L. 13275-00-004					DERRICK CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.				CENT. MAN	

FIG 2.4

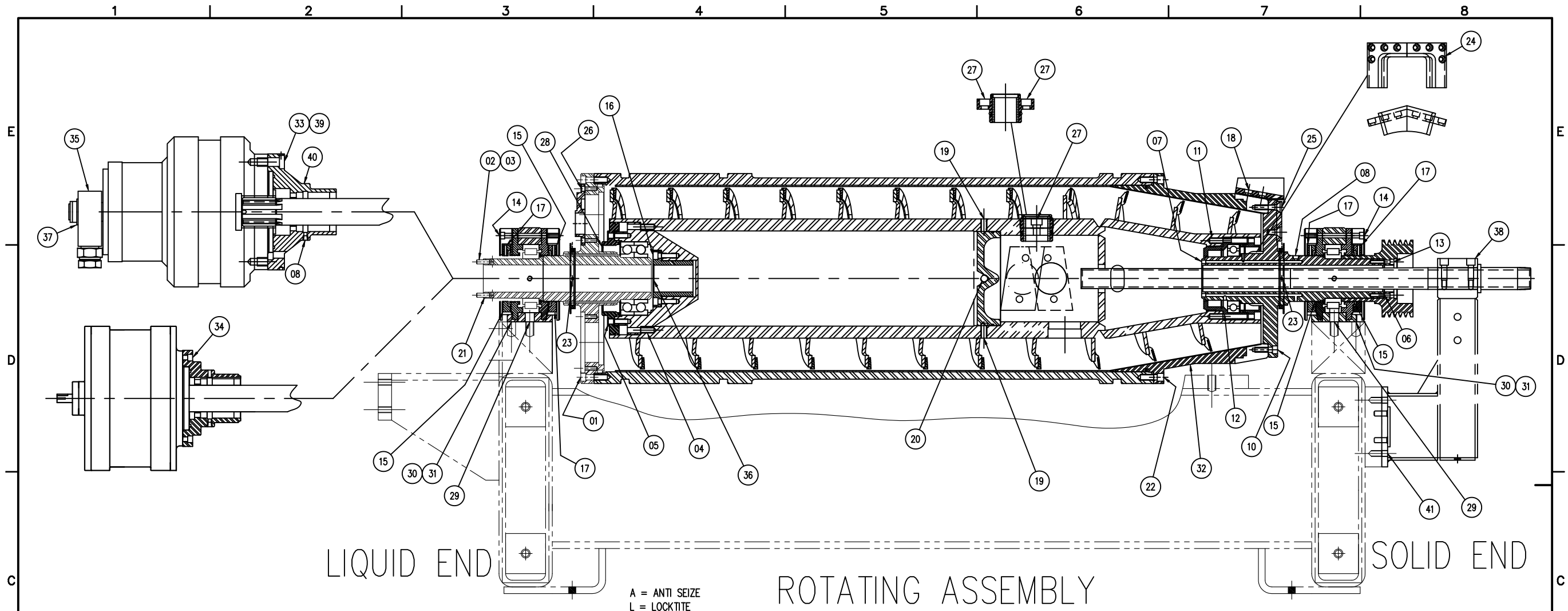


REF W.S. 10141-00-001, 11171-00
REF P.L. 10785-00-006
REF G.A. 13744-00

4	CHANGED QUANTITY OF ITEM 20 (WAS 4) AND ITEM 21 (WAS 3) CHANGED ITEM 22 (WAS CRH-LNR-1)	JWC	JFS	06/07/06	TITLE CONTROL BOX ASSEMBLY FOR PORTABLE DE-1000™ W/GBD (50-60 HERTZ)							
3	REVISED REF PL FROM -001 TO -006, ADDED TM TO TITLE BLOCK	JWC	JFS	02/02/06								
2	ITEM 44 DESCRIPTION CHANGED WAS 1.5 AMP	JJA	JFS	10/11/05								
1	SEE RECORD COPY FOR ORIGINAL DRAWING DETAILS	JJA	JFS	09/08/05								
REV	CHANGE	CKD	DATE	DWN	TOC	CKD	DATE	1/20/97	SCALE	NONE	REV	4
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					SHEET SIZE		F C	CKD				
					DRAWING NO.		13275-00-004					

	1	1	1	53	VDR-779516-201	METER, HOUR-AC VEEDER-ROOT
	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-.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.
	1	1	1	40	CHMC381MC	ALUM. MOUNT CHANNEL X 2 3/8
	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
	2	2	2	22	G0007421	CONDUIT BUSHING LINER .500 SM
	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 18.7-30.7 AMPS CLASS 20
	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
				03	13275-03-004	575V PRI/ 120 SEC CONTROL BOX ASSEMBLY
				02	13275-02-004	380V PRI/ 120 SEC CONTROL BOX ASSEMBLY
				01	13275-01-004	460V PRI/ 120 SEC CONTROL BOX ASSEMBLY
	QTY		ITEM		PART NUMBER	DESCRIPTION





A = ANTI SEIZE
L = LOCKTITE

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	
REV 8	DATE 3/21/01
ADDN GEARBOX VIEW MOVED BALLOON 34 TO GEARBOX VIEW; SEE MODEL SPACE 2; RECORD COPY FOR REVISIONS 1 THRU 7.	SCALE 1:5
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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.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

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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