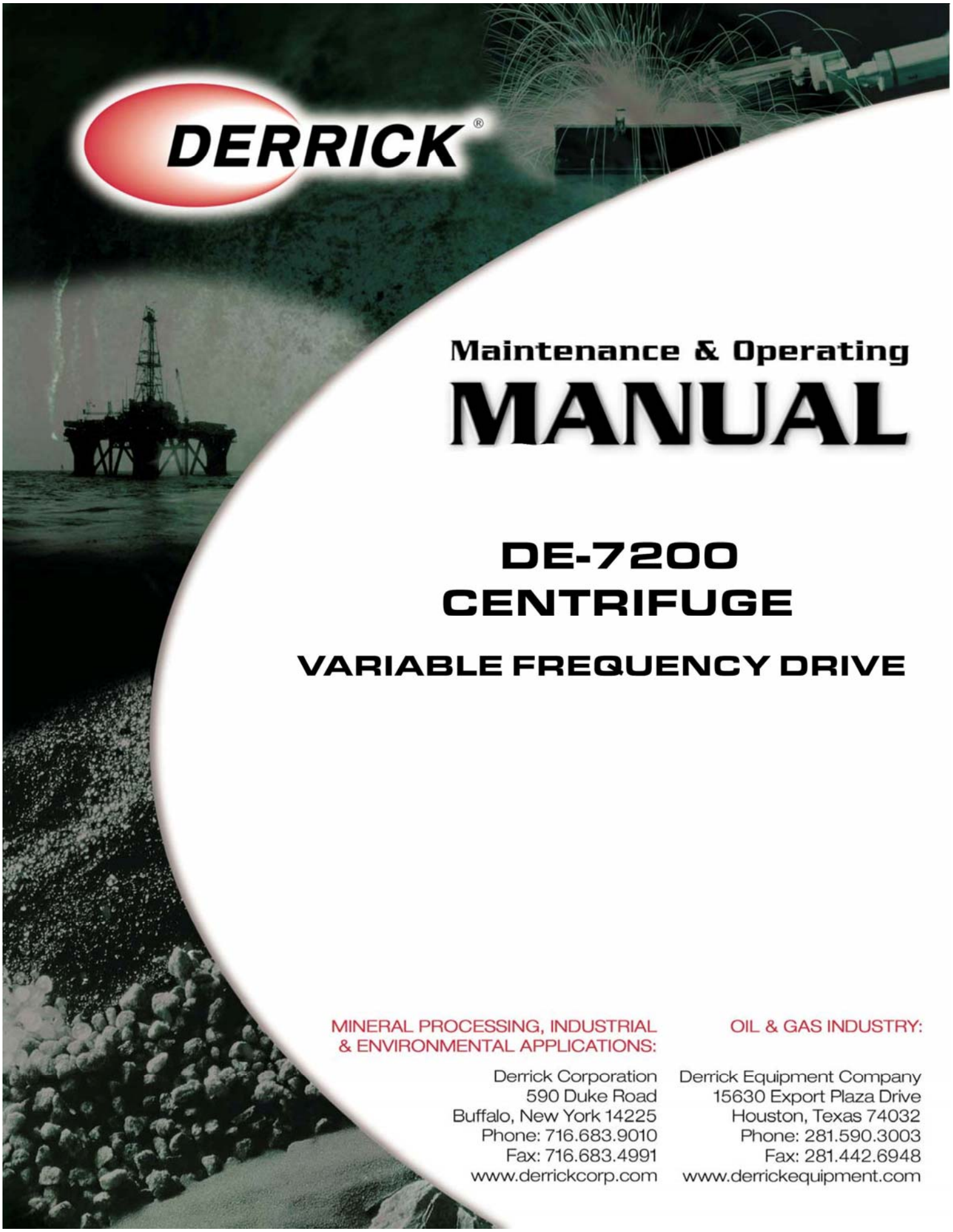

DERRICK®

Maintenance & Operating

MANUAL

DE-7200 CENTRIFUGE

VARIABLE FREQUENCY DRIVE

MINERAL PROCESSING, INDUSTRIAL & ENVIRONMENTAL APPLICATIONS:

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590 Duke Road
Buffalo, New York 14225
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Derrick Equipment Company
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HOW TO USE THIS “e-MANUAL”

This electronic version of a Derrick Operating and Maintenance Manual has been prepared in Adobe® Acrobat® pdf format. This format allows rapid access to information by clicking on the underlined italic document numbers.

NAVIGATIONAL TOOLS

A portion of the menu bar and associated navigation tools for Adobe Acrobat is shown below. A brief description of these tools is presented below. Additional information concerning other features and navigational tools is available by selecting “Acrobat Help” or “Adobe on line …..” from the “Help” drop-down menu provided at the top of the screen.

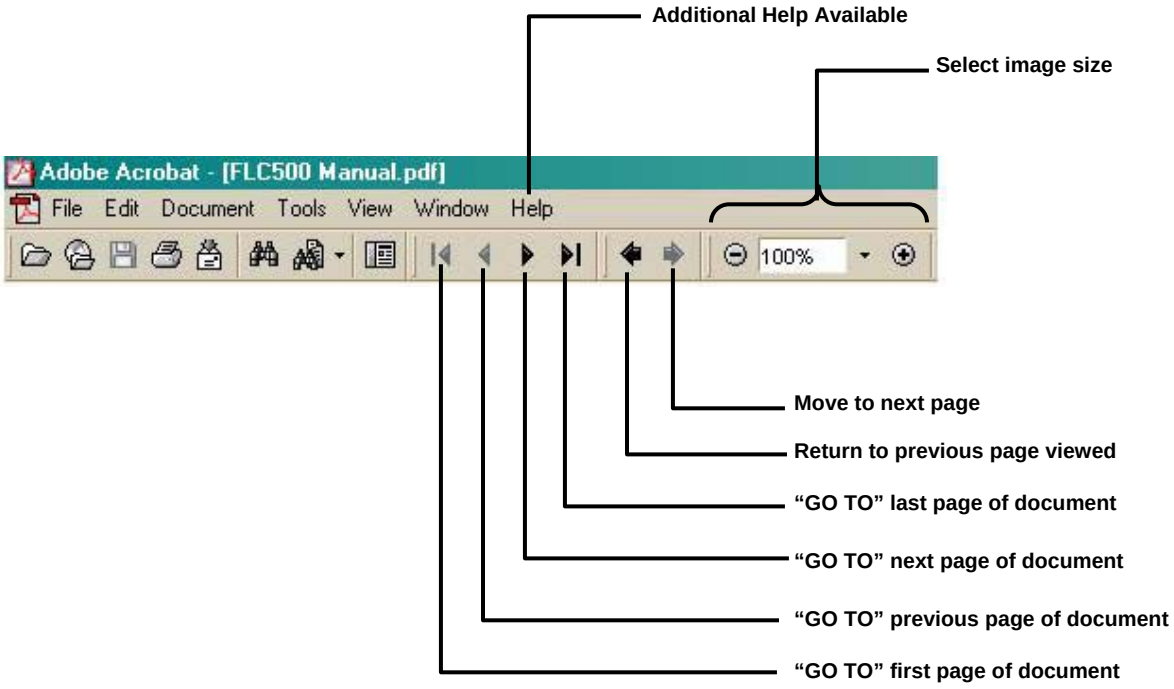


TABLE OF CONTENTS

DE-7200 CENTRIFUGE

TABLE OF CONTENTS

INTRODUCTION

DE-7200 CENTRIFUGE

OVERVIEW

This manual provides instructions for installing and operating the DE-7200 centrifuge (Figure 1021-1). The manual is divided into several sections to assist the user in readily accessing the information. Instructions include description, theory of operation, safety, installation, and maintenance. Reference drawings are provided to facilitate parts location and ordering, as well as for understanding of equipment operation and assist in troubleshooting. The manual also contains technical documentation provided by outside suppliers. These documents cover components used in the centrifuge but not manufactured by Derrick.

Figure 1021-1 DE-7200 Centrifuge

EQUIPMENT USE

The DE-7200 centrifuge is designed expressly to remove solids from slurries. In one type of processing, solids are removed and the liquid is returned for recirculation. In the other type of processing, 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.

Personnel responsible for transporting, installing, commissioning, operating, adjusting, or maintaining this equipment should be required to read and understand the 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.

CONTACT INFORMATION

CONTACT INFORMATION			
Location	**Telephone**	**Facsimile (FAX)**	**E-Mail / Website**
Derrick Corporation 590 Duke Road Buffalo, New York 14225 ***USA***	716.683.9010	716.683.4991	Technical Service *techservice@derrickcorp.com*
Derrick Equipment Company 15630 Export Plaza Drive Houston, Texas 77032 ***USA***	281.590.3003	281.442.6948	General Manager *abishop@derrickequipment.com*
Derrick GmbH & Co. KG Bockhorner Weg 6 29683 Fallingbostel ***GERMANY***	+49 5162 98580	+49 5162 985821	Info@derrickinternational.com www.derrickinternational.com

HIGHLIGHTED INFORMATION

Information considered important to safe and effective operation of the equipment is highlighted as shown below.

Safety Issues

WARNING! PRESENTS INFORMATION CRITICAL TO SAFE OPERATION AND/OR MAINTENANCE OF THE EQUIPMENT. FAILURE TO COMPLY WITH THIS INFORMATION MAY RESULT IN SERIOUS INJURY TO PERSONNEL AND/OR DEATH, OR MAJOR DAMAGE TO THE EQUIPMENT.

THIS STYLE OF HIGHLIGHTED INFORMATION WILL PRECEED THE TASK AND/OR PROCEDURE THAT IS DANGEROUS TO PERSONNEL AND/OR DETRIMENTAL TO THE EQUIPMENT.

General Information

Note! Identifies information that will assist operating and maintenance personnel in simplifying tasks and/or procedures and provides suggestions for maximizing equipment performance.

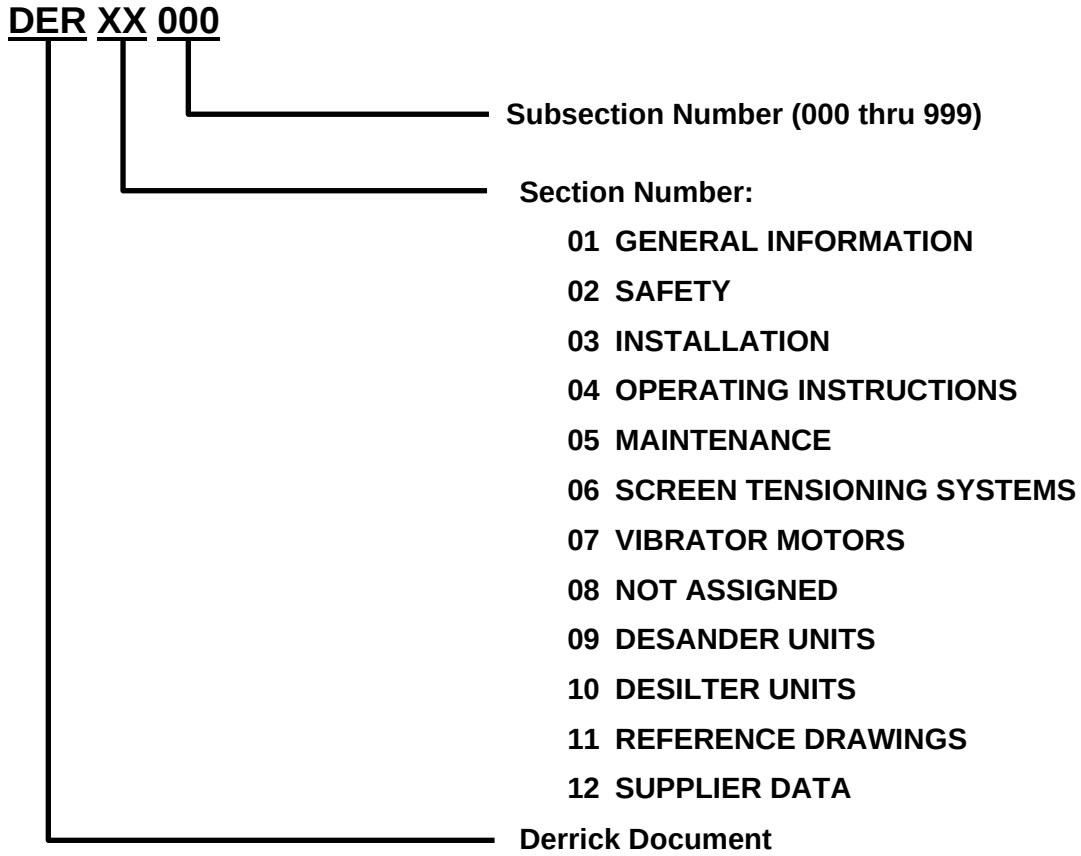
SAFETY INFORMATION

The equipment has been designed to safely perform the stated functions of the equipment. All persons responsible for operation and maintenance of this equipment must have read and understand all information presented in this manual prior to operating/maintaining the equipment.

Section 2 of this manual contains relevant safety information relating to both operation and maintenance of this equipment. Be sure this information is read and understood.

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

HOW TO USE THIS MANUAL



DESCRIPTION AND OPERATION

DE-7200 CENTRIFUGE

GENERAL

The centrifuge is a high-speed electro-mechanical machine using electronically controlled electric motors to drive the bowl assembly and conveyor. The centrifuge receives slurry through a feed component at the liquid discharge end of the machine. The slurry is dispersed into the rotating bowl, where centrifugal force is employed to separate liquid from the solids. Liquid flows out the liquid discharge chute, while solids are conveyed to the solids discharge chute at the gearbox end of the machine.

The centrifuge is configured at the factory to operate on a specific three-phase, 50Hz or 60Hz AC voltage. The specified power configuration must be supplied to the machine. The electronic control panel is mounted on the separate control cabinet, which can be placed locally or remotely from the centrifuge. Safety devices built into the centrifuge protect personnel and equipment by shutting down the bowl and conveyor motors in case of excessive bowl or conveyor torque, high main bearing temperature, vibration, overspeed, or other malfunction.

OPERATING PRINCIPALS

The centrifuge employs G forces produced by the high-speed rotation of a cylindrical bowl to separate solids from a 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 - The faster the conveyor rotates, the wetter the solids and the more solids that are discharged

All three factors may be manipulated in the Derrick DE-7200 centrifuge to alter the liquid and solids discharge. The centrifugal force is adjusted by varying the bowl RPM. Retention time is controlled by adjusting the liquid discharge ports on the liquid bowl head to vary the pond depth (depth of liquid remaining in the bowl), and the feed rate to the unit (the lower the feed rate, the higher the retention time). The conveyor operates at a slightly faster speed than the bowl. The conveying speed is the difference between the bowl and conveyor speeds. During centrifuge operation, the bowl and conveyor speeds are shown on the Operation screen.

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

OPERATING PRINCIPALS (CONT'D)

During centrifuge operation, slurry is pumped through the feed component assembly into the center of the rotating conveyor (Figure 1122-1). The high velocity slurry is then dispersed out feed nozzles in the periphery of the conveyor cylinder. Both the feed zone and feed nozzles accelerate and change direction of the slurry to minimize pond disturbance at the bowl wall. The depth of the slurry in the bowl (pond depth) is determined by the setting of weirs on the bowl head (large end of the bowl).

As the slurry flows in the channels between the conveyor flights, the heavy particles settle at an accelerated rate due to the 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 centrifuge settings will be discharged with the liquid through the adjustable weirs on the bowl head. Liquid exiting the bowl head is directed through the liquid discharge hopper.

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

Since the discharge cake is very heavy and sticky 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.

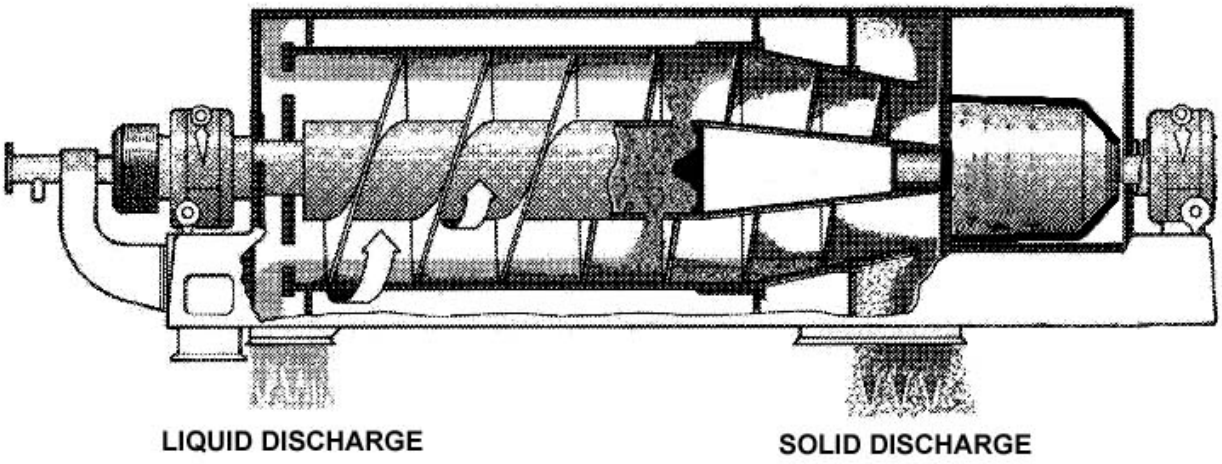


Figure 1122-1 Centrifuge Operation Schematic Diagram

MAJOR COMPONENTS

Major components of the centrifuge (Figure 1122-2) consist of the rotating assembly, bowl and conveyor drive motors, control system, purge system, vibration switch, and case and base. The following paragraphs describe these components.

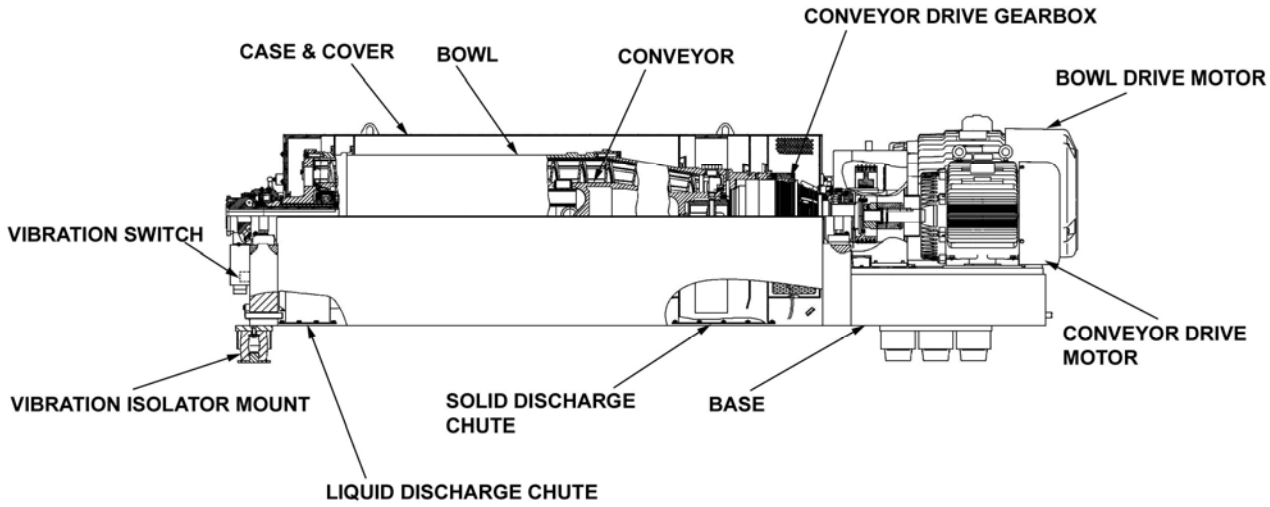


Figure 1122-2 Major Components

Rotating Assembly

The rotating assembly consists of a cylindrically shaped, high-strength carbon steel bowl, conveyor assembly, gearbox, and related components. The bowl consists of a straight steel cylinder with a conical section at the solid discharge end and a flat liquid bowl head at the opposite end. Openings are provided at both ends to permit liquid and solid discharges. The bowl ends are supported by roller bearings having grease fittings to facilitate periodic lubrication.

Bowl Assembly

The liquid bowl head at the liquid discharge end contains movable weir plates that permit manual adjustment of the liquid level remaining in the bowl during rotation. Notched locking plates adjacent to the weir plates facilitate precise adjustment. The liquid level or pond depth, along with other factors, helps determine the liquid content of the discharged solids. The conical bowl at the solid discharge end forms an upward sloping beach, where solids collect and are continuously discharged through the solid discharge ports. Replaceable inserts line the solid discharge ports to minimize the rate of wear due to abrasive action.

Conveyor

The conveyor assembly is a hollow, cylindrical auger that receives the inlet slurry into its interior, disperses it through feed nozzles to the bowl assembly, and transports the solids to the solids discharge outlet. Rotated by an electric motor through a three-stage planetary gearbox, the conveyor turns in the same direction as the bowl but at a higher rate of speed. The outer housing of the gearbox is secured to the bowl, while the shaft is directly connected to the conveyor.

The differential speed setting on the control panel determines the conveyor speed in relation to the bowl speed. This relationship remains consistent; as bowl speed is varied, the conveyor speed varies commensurately but maintains the differential relationship. For example, a bowl speed of 2000 RPM and a conveyor differential speed of 10 results in the conveyor rotating at a rate of 2010 RPM.

The feed component at the liquid discharge end directs inlet slurry into the interior of the conveyor, which rapidly disperses the material through feed nozzles into the bowl. Replaceable inserts line each of the eight feed nozzles to minimize wear due to abrasive action. A roller bearing supports the conveyor at the liquid bowl head, while at the solid end the conveyor is supported by the conveyor drive gearbox.

Conveyor Drive Gearbox

The conveyor drive gearbox is a three-stage planetary gearbox that rotates the conveyor at a faster speed than the bowl assembly. The gearbox is mounted on, and consequently driven by, the bowl assembly, Input and output shafts of the gearbox are supported by internal bearings. The conveyor drive motor is coupled to the gearbox input shaft by a flexible coupling, which permits compliance with slight alignment variations. The gearbox contains a gear system that transfers rotation from the motor and bowl to the conveyor's output shaft.

The input shaft end of the gearbox is supported by the solid end main bearing, while the output end is secured to the bowl. The gearbox ratio of 49:1 turns the conveyor at a proportionally faster rate than the bowl assembly. The control system ensures that the conveyor's rotational speed varies directly with bowl speed, maintaining a consistent differential relationship for solids conveyance.

During an overload condition, excessive solids in the conveyor may overburden the motor, causing motor torque to increase and resulting in an overload alarm. If the conveyor's pre-set torque limit is reached, the control system automatically reduces the feed rate to enable the conveyor to clear the excess solids. When the centrifuge is operating at the reduced feed rate, the Operation screen displays a message to inform the operator of the modified status. Unless the over-torque condition is removed, the centrifuge will be shut down automatically.

CONTROL SYSTEM

Centrifuge operation is supervised by a programmable logic controller (PLC) that interfaces with the variable frequency drives (VFDs) supplying power to the bowl, conveyor, and feed pump drive motors. Monitoring and control of the centrifuge may be performed locally or remotely. The environmentally hardened PLC also offers short-term data storage and a high degree of operating flexibility. The graphical interface mounted on the control cabinet facilitates communication with the VFDs and provides real-time access to system operating characteristics. Through the control panel, the operator may start up the centrifuge, enter and adjust bowl and conveyor speeds, set feed rate, and shut down the machine.

Various inputs including main bearing temperatures, bowl speed, bowl and conveyor torques, cabinet interior temperature, and vibration are transmitted to the PLC, which then responds with corresponding outputs to govern centrifuge operation. Critical status information is displayed on the control panel, as well as alarm and fault messages that signal the operator of any potential or imminent malfunctions. Any excessive variation from a pre-set limit causes the PLC to automatically shut down the centrifuge and display an explanatory message for the cause of the shutdown. In addition, emergency shutdown may be performed by the operator at any time from the front panel.

The feed pump is fully controlled by the PLC in either manual or automatic operation. Automatic operation provides maximum throughput, as the optimum feed rate is assured by the PLC under varying operating conditions. Feed is automatically increased until the pre-set torque limit is reached by either the bowl or conveyor drive motor. If feed slurry properties change, the feed rate is automatically adjusted to remain within the torque limit.

DRIVE MOTORS

The centrifuge is powered by two inverter-duty, three-phase, explosion-proof electric motors. The 150 HP bowl drive motor is connected to the bowl assembly by a sheave and series of drive belts, while a 60 HP electric motor is directly coupled to the gearbox input shaft by a flexible coupling. A protective guard covers the sheaves, drive belts, and conveyor drive flexible coupling for personnel protection.

PURGE SYSTEM

A continuous flow of air from the purge system prevents the cabinet interior from accumulating explosive vapors. When power is applied to the centrifuge, the cabinet purge system initiates a 14-minute rapid purge cycle at 16 CFM. This cycle consists of five complete air exchanges. When the rapid purge cycle is completed, the purge system automatically closes a switch that supplies power to the cabinet.

During centrifuge operation, the purge system maintains a continuous flow of air to provide positive pressure within the control cabinet to prevent entry of flammable gases. Minimum pressure and purge flow sensors provide an output signal to the PLC if the purge system is not maintaining satisfactory pressure within the cabinet. For further details of purge system operation, refer to the Expo Technologies documentation in Section 12 - Supplier Data.

VIBRATION SWITCH

The vibration switch (Figure 1122-5) 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, providing an input to the PLC. 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.

VIBRATION SWITCH (CONT'D)

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

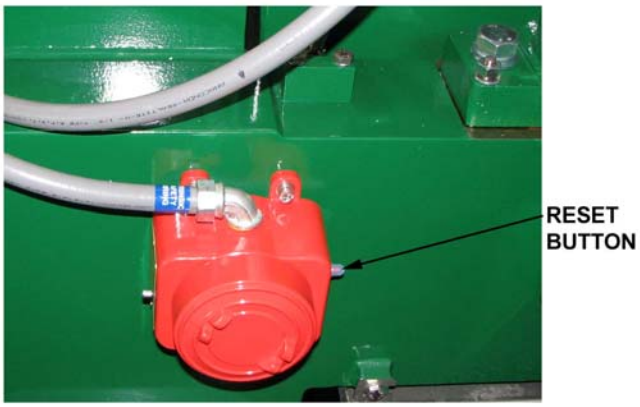


Figure 1122-5 Vibration Switch

CASE AND BASE

When the top cover is closed, the case provides a sealed, protective enclosure that fully surrounds the bowl assembly. The liquid discharge chute and solid discharge chute are installed at the bottom of the lower case half. Mating baffles installed inside the top and bottom case halves separate the solid and liquid. Bolts secure the top and bottom halves together; a gasket in the bottom case half seals the two halves.

The case is bolted onto the welded steel base assembly, which contains mounting provisions for the bearing pillow blocks. The base assembly supports the centrifuge components and contains hollow rubber vibration isolators that engage with centering pins embedded in the mounting platform.

EQUIPMENT SPECIFICATIONS

DE-7200 CENTRIFUGE

Equipment specifications are presented below for the DE-7200 centrifuge. Refer to Section 11 - Reference Drawings for additional information and specifications.

Dimensions (Approx.)	156” L x 45” H x 81-1/2” W (3962mm x 1143mm x 2070mm)
Weight (Approx.)	TBD lbs (TBD kg)
Drive System	Three separate pulse width modulated (PWM) variable frequency drives (VFDs) having insulated gate bipolar transistor (IGBT) outputs provide operating AC power to bowl, conveyor, and feed pump drive motors
Control System	Environmentally hardened PLC and operator control panel providing short-term data storage and display of critical parameters; optional remote monitoring and control of bowl, conveyor, and feed pump motors is available
Bowl Drive Motor	150 HP, explosion-proof, 3-phase inverter duty electric motor operating bowl through a sheave and belt; for additional information, refer to the data plate on the motor housing.
Conveyor Drive Motor	60 HP, explosion-proof, 3-phase inverter duty electric motor operating a 49:1 three-stage planetary gearbox which is directly coupled to conveyor; for additional information, refer to the data plate on the motor housing.
Bowl Speed	0 - 3000 RPM
Differential Conveyor Speed	0 - 90 RPM
Safety Devices	Sensing and automatic shutdown due to excessive bowl speed, high main bearing temperatures, and excessive vibration

SERVICES & UTILITIES REQUIRED

DE-7200 CENTRIFUGE

GENERAL

To achieve optimum performance and reliability from your Derrick equipment, the services and utilities described below must be available at the installation site.

ELECTRIC POWER

For electrical service requirements, refer to the voltage label on the electrical control cabinet. Also refer to the wiring schematic in Section 11 - Reference Drawings for input cable sizes and power requirements.

Electrical grounding is required for the control cabinet. A grounding lug is provided on the control cabinet for connection of the ground cable. Refer to *DER03022* for details on the ground connection.

WARNING! THE EQUIPMENT WILL BE DAMAGED BY INCORRECT ELECTRIC POWER. BE CERTAIN THAT POWER SUPPLIED TO THE EQUIPMENT IS THE CORRECT VOLTAGE AND FREQUENCY.

FRESH WATER

A 0.75” diameter minimum fresh water line with ball-type shutoff valve is required to facilitate dilution of slurry when required and for performing cleanout prior to shutdown. The line is to be connected to the feed component tee.

COMPRESSED AIR

For control cabinets operating in a hazardous environment, a source of filtered, dry compressed air at 120 PSI is required for purge system operation. Refer to Section 12 - Supplier Data for supply line size and flow rate requirements.

FEED PUMP

The customer is required to supply a positive-displacement feed pump for delivering slurry to the centrifuge. A progressing cavity pump having a fixed ratio gearbox and 30 HP maximum inverter-duty pump drive motor is recommended. The motor must be capable of operating in the 180 to 2700 RPM, 6 to 90 Hz speed range and also meet all other application requirements including voltage, frequency, and area of classification. The pump size, motor, and gearbox ratio must be chosen to deliver the maximum desired flow at a pump rotor speed (determined by the manufacturer) to be low enough to prevent accelerated wear of the rotor and/or stator.

The pump must be connected to the centrifuge's control system as described in *DER03022*, so that its operation can be supervised by the centrifuge.

EQUIPMENT HANDLING PROCEDURES

DE-7200 CENTRIFUGE

RECEIVING THE EQUIPMENT

Immediately upon receipt of the Derrick equipment, examine contents for damaged and/or missing components. The transportation company signed a bill of lading at the time of shipment to indicate that all items were present and accounted for, and all items were in good condition at the time of shipment. The transportation company assumes responsibility for the equipment from that point forward. For proper handling of your claim, immediately report any loss or damage to the transportation company.

For material shortages not appearing on the bill of lading or for discrepancies between material ordered and material received, immediately notify Derrick Corporation.

MOVING/POSITIONING THE EQUIPMENT

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. The control cabinet is mounted on a shipping skid. A label indicating the weight of the unit was affixed to the machine. Refer to Equipment Specifications *DER01222* for equipment weight and other technical data.

The centrifuge may be transported on the ground using a forklift. After the control cabinet is removed from the shipping skid, an overhead lifting device is required.

MOVING/POSITIONING THE EQUIPMENT (CONT'D)

Four reinforced lifting lugs are built into the equipment frame to allow attachment of an overhead-lifting device (Figure 1422-1). Lifting points are labeled **"LIFT HERE ONLY"**. **DO NOT** attempt lifting equipment by attaching slings or similar lifting aids to either drive motor or other non-designated portions of the unit. Use of spreader bars is recommended.

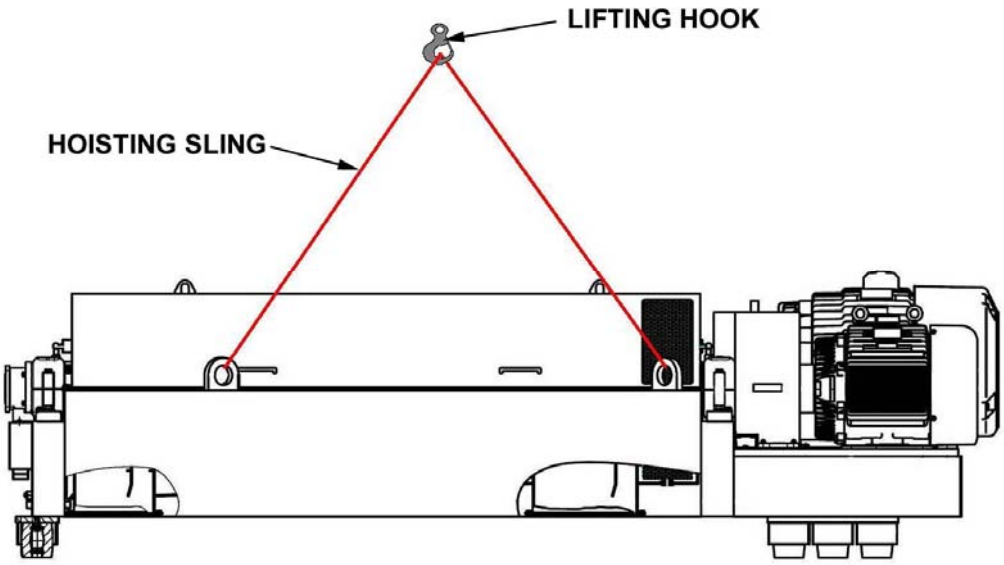


Figure 1422-1 Lifting Arrangement

EQUIPMENT STORAGE

General

If equipment is not being installed immediately, it should be stored in a dry environment (50 percent relative humidity or less). A dry environment will ensure that the machine remains in the same condition as when it was received.

If unit is stored outdoors, cover with a UV-resistant tarpaulin (tarp) or UV-resistant shrink-wrap. Install vents when using shrink-wrap. Cap exposed solid and liquid discharge chutes and feed component to prevent entry of moisture or foreign matter. Seal the Operating and Maintenance manual in plastic and attach to unit.

WARNING! MOTOR MAY BE DAMAGED BY STORING MACHINE IN A HIGH HUMIDITY ENVIRONMENT (GREATER THAN 50% RH). OUT-OF-SERVICE MOTOR(S) MUST BE STORED IN A LOW-HUMIDITY ENVIRONMENT.

Bearings

The main bearings that support the bowl assembly and the conveyor bearings should be lubricated before the centrifuge is placed in storage using the grease specified *DER05023*. Locations of lubrication points are shown in Figure 5023-1 in Section 5.

WARNINGS SUMMARY

DE-7200 CENTRIFUGE

GENERAL

This section contains a summary of WARNINGS presented throughout the manual. The WARNINGS are grouped according to the following categories:

- Electrical Hazards
- Equipment Handling
- Operation
- Maintenance
- Storage

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! ELECTRIC POWER MUST BE THE REQUIRED SUPPLY VOLTAGE, FREQUENCY, AND CURRENT.

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 CONNECTIONS AND GLANDS ARE SECURE.

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 MOTORS 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. PERIODICALLY 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 70% RH). EQUIPMENT MUST BE STORED IN A LOW-HUMIDITY ENVIRONMENT.

MATERIAL SAFETY DATA SHEETS (MSDSs)
DE-7200 CENTRIFUGE

Material Safety Data Sheets (MSDSs) for exterior finish products are included in this section to 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 were prepared by the product manufacturers, which have sole responsibility for accuracy of the information.

The MSDSs in this section are current as of the publication date of this manual and are supplied only for reference. Checking with the product manufacturer for updates is recommended and is the responsibility of the customer.

In addition to the MSDSs, manufacturer's specifications are listed for the lubricants and sealant used in the equipment. To ensure that current information is available, the MSDS for each product should be obtained at the time of purchase. Where more than one lubricant is listed for an application, all are equivalent and approved for lubrication requirements.

MATERIAL DESCRIPTION – WHERE USED	MSDS No. / Date
Paints	
Devoe Devthane 359 - Top Coat	*359* / 05-06-08
Devoe Epoxy Primer - Undercoat	*313K* / 08-02-04
Lubricants	
Main & Conveyor Bearings - Shell Albida EP2	*
Conveyor Drive Gearbox - Mobil SCH629	*
Bowl & Conveyor Drive Motors - Chevron SRI #2	*
Sealant	
Loctite 243 Anti-Seize Lubricant - Fasteners	*76764* / 09-27-04*

* MSDS not included; contact manufacturer for latest revision.

MATERIAL SAFETY DATA SHEET

prepared 05/06/08

ICI Paints North America 15885 Sprague Road Strongsville, Ohio 44136 EMERGENCY TELEPHONE NO. (800) 545-2643

HAZARDS IDENTIFICATION (ANSI Section 3)

Primary route(s) of exposure : Inhalation, skin contact, eye contact, ingestion.

Effects of overexposure :

Inhalation : Irritation of respiratory tract. Prolonged inhalation may lead to. Inhalation of spray mist may cause irritation of respiratory tract. Mucous membrane irritation, fatigue, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, abdominal pain, chest pain, coughing, apathy, central nervous system depression, intoxication, anesthetic effect or narcosis, difficulty of breathing, allergic response, tremors, severe lung irritation or damage, pulmonary edema, pneumoconiosis, loss of consciousness, respiratory failure, death. Possible sensitization to respiratory tract.

Skin contact : Irritation of skin. Prolonged or repeated contact can cause dermatitis, defatting, severe skin irritation. Possible sensitization to skin.

Eye contact : Irritation of eyes. Prolonged or repeated contact can cause conjunctivitis, blurred vision, tearing of eyes, redness of eyes, severe eye irritation, corneal injury.

Ingestion : Ingestion may cause lung inflammation and damage due to aspiration of material into lungs, mouth and throat irritation, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, gastro-intestinal disturbances, abdominal pain, visual disturbances, apathy, central nervous system depression, intoxication, anesthetic effect or narcosis, burns of the mouth, throat, stomach, pulmonary edema, loss of consciousness, respiratory failure, death.

Medical conditions aggravated by exposure : Eye, skin, respiratory disorders, kidney disorders, liver disorders, nervous system disorders, respiratory disorders.

FIRST-AID MEASURES (ANSI Section 4)

Inhalation : Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty. Remove to fresh air if inhalation causes eye watering, headaches, dizziness, or other discomfort.

Skin contact : Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral/baby oil onto skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. Dispose of contaminated leather items, such as shoes and belts. If irritation occurs, consult a physician.

Eye contact : Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion : If swallowed, obtain medical treatment immediately.

FIRE-FIGHTING MEASURES (ANSI Section 5)

Fire extinguishing media : Dry chemical or foam water fog. Carbon dioxide. Closed containers may explode when exposed to extreme heat or fire. Vapors may ignite explosively at ambient temperatures. Vapors are heavier than air and may travel long distances to a source of ignition and flash back. Vapors can form explosive mixtures in air at elevated temperatures. Closed containers may burst if exposed to extreme heat or fire. Dust explosion hazard. May decompose under fire conditions emitting irritant and/or toxic gases.

Fire fighting procedures : Water may be used to cool and protect exposed containers. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. Self-contained breathing apparatus recommended.

Hazardous decomposition or combustion products : Carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, ammonia, hydrogen chloride, toxic gases, barium compounds. Cyanides.

ACCIDENTAL RELEASE MEASURES (ANSI Section 6)

Steps to be taken in case material is released or spilled : Comply with all applicable health and environmental regulations. Eliminate all sources of ignition. Ventilate area. Ventilate area with explosion-proof equipment. Spills may be collected with absorbent materials. Use non-sparking tools. Evacuate all unnecessary personnel. Place collected material in proper container. Complete personal protective equipment must be used during cleanup. Large spills - shut off leak if safe to do so. Dike and contain spill. Pump to storage or salvage vessels. Use absorbent to pick up excess residue. Keep salvageable material and rinse water out of sewers and water courses. Small spills - use absorbent to pick up residue and dispose of properly.

HANDLING AND STORAGE (ANSI Section 7)

Handling and storage : Store below 80f. Store below 100f (38c). Keep away from heat, sparks and open flame. Store in original container. Keep away from direct sunlight, heat and all sources of ignition. Keep container tightly closed in a well-ventilated area.

Other precautions : Use only with adequate ventilation. Do not take internally. Keep out of reach of children. Avoid contact with skin and eyes, and breathing of vapors. Wash hands thoroughly after handling, especially before eating or smoking. Keep containers tightly closed and upright when not in use. Empty containers may contain hazardous residues. Ground equipment when transferring to prevent accumulation of static charge.

EXPOSURE CONTROLS/PERSONAL PROTECTION (ANSI Section 8)

Respiratory protection : Respiratory protection is required for use in isocyanate containing environments. Consider type of application and environmental concentrations when selecting respiratory protection. Observe governmental regulations for respirator use. (29 CFR 1910.134(OSHA))(Canadian z94.4) The use of positive pressure supplied air respirator is mandatory when the airborne isocyanate concentrations are not known. Note: isocyanate based materials have been determined to cause allergic sensitization in humans. Avoid inhalation and dermal (skin) contact with the uncured material.

Ventilation : Provide dilution ventilation or local exhaust to prevent build-up of vapors. Use explosion-proof equipment. Use non-sparking equipment.

Personal protective equipment : Eye wash, safety shower, safety glasses or goggles. Impervious gloves, impervious clothing, face shield, apron, boots.

STABILITY AND REACTIVITY (ANSI Section 10)

Under normal conditions : Stable see section 5 fire fighting measures

Materials to avoid : Oxidizers, acids, reducing agents, bases, aldehydes, halogens, amines, alkalis, water, peroxides, nitric acid, alcohols, combustible materials, caustics, mineral acids. Nitrates.

Conditions to avoid : Sunlight, elevated temperatures, moisture, contact with oxidizing agent, storage near acids, sparks, open flame, ignition sources.

Hazardous polymerization : Will not occur

TOXICOLOGICAL INFORMATION (ANSI Section 11)

Supplemental health information : Contains a chemical that is moderately toxic by ingestion. Contains a chemical that is toxic by inhalation. Contains a chemical that may be absorbed through skin. Free diisocyanate may cause allergic reaction in susceptible persons. Notice - reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. Contains iron oxide, repeated or prolonged exposure to iron oxide dust may cause siderosis, a benign pneumoconiosis. Other effects of overexposure may include toxicity to liver, kidney, central nervous system, blood.

Carcinogenicity : Contains formaldehyde, a potential cancer hazard. Rats exposed to formaldehyde via inhalation developed cancer of the nasal cavity. Evidence in humans is limited (nasal and nasopharyngeal cancer). Formaldehyde is listed as a carcinogen by OSHA, probable human carcinogen (group 2a) by IARC, and anticipated human carcinogen by NTP. Overexposure can cause eye, skin, and respiratory tract irritation, and skin and respiratory sensitization. In a lifetime inhalation study, exposure to 250 mg/m3 titanium dioxide resulted in the development of lung tumors in rats. These tumors occurred only at dust levels that overwhelmed the animals' lung clearance mechanisms and were different from common human lung tumors in both type and location. The relevance of these findings to humans is unknown but questionable. The international agency for research on cancer (IARC) has classified titanium dioxide as possibly carcinogenic to humans (group 2b) based on inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals.

Reproductive effects : High exposures to xylene in some animal studies, often at maternally toxic levels, have affected embryo/fetal development. The significance of this finding to humans is not known.

Mutagenicity : No mutagenic effects are anticipated

Teratogenicity : No teratogenic effects are anticipated

ECOLOGICAL INFORMATION (ANSI Section 12)

No ecological testing has been done by ICI paints on this product as a whole.

DISPOSAL CONSIDERATIONS (ANSI Section 13)

Waste disposal : Dispose in accordance with all applicable regulations. Avoid discharge to natural waters.

REGULATORY INFORMATION (ANSI Section 15)

As of the date of this MSDS, all of the components in this product are listed (or are otherwise exempt from listing) on the TSCA inventory. This product has been classified in accordance with the hazard criteria of the CPR (controlled products regulations) and the MSDS contains all the information required by the CPR.

Physical Data (ANSI Sections 1, 9, and 14)

Product Code	Description	Wt. / Gal.	VOC gr. / ltr.	% Volatile by Volume	Flash Point	Boiling Range	HMIS	DOT, proper shipping name
359F65DGF	devthane 359h (no organic haps) derrick green	9.02	291.43	34.96	80 f	208-595	*330	UN1263, paint, 3, PGIII
379C0910	devthane 379 hs converter	9.40	112.85	13.00	135 f	293-293	*321	UN1866, resin solution, combustible liquid, PGIII

Ingredients Product Codes with % by Weight (ANSI Section 2)

Chemical Name	Common Name	CAS. No.	359F65DGF	379C0910
4-heptanone, 2,6-dimethyl-	diisobutyl ketone	108-83-8	1-5	
ethane, 1,1',1''-methylidenetris(oxy)-tris-	ethyl orthoformate	122-51-0	1-5	
acetic acid, butyl ester	butyl acetate	123-86-4	5-10	5-10
c.i. pigment green 7	phthalo green pigment	1328-53-6	1-5	
benzene, dimethyl-	xylene	1330-20-7	.1-1.0	.1-1.0
titanium oxide	titanium dioxide	13463-67-7	1-5	
2-propenoic acid, 2-methyl-, 2-hydroxyethyl ester, polymer with ethenylbenzene, 2-ethylhexyl 2-propeno and methyl 2-methyl-2-propenoate	acrylic polymer	26916-05-2	40-50	
hexane, 1,6-diisocyanato-, homopolymer	aliphatic polyisocyanate	28182-81-2		90-95
formaldehyde	formaldehyde	50-00-0	LT .01	
c.i. pigment yellow 42	yellow iron oxide	51274-00-1	1-5	
acetic acid, 1,1-dimethylethyl ester	tert-butyl acetate	540-88-5	1-5	
butanamide, 2-((2-methoxy-4-nitrophenyl)azo) -n-(2-methoxyphenyl)-3-oxo-	pigment yellow 74	6358-31-2	1-5	
solvent naphtha (petroleum), light aromatic	light aromatic solvent naphtha	64742-95-6		1-5
1-butanol	n-butanol	71-36-3	1-5	
propanoic acid, 3-ethoxy-, ethyl ester	ethyl 3-ethoxypropionate	763-69-9	5-10	
sulfuric acid, barium salt	barium sulfate	7727-43-7	1-5	
castor oil	castor oil, raw	8001-79-4	10-20	
hexane, 1,6-diisocyanato-	hexamethylene diisocyanate	822-06-0		.1-1.0
acetic acid, c6-8-branched alkyl esters	oxo-heptyl acetate	90438-79-2	1-5	
benzene,1,2,4-trimethyl-	pseudocumene	95-63-6	.1-1.0	1-5
anti-settling agent	anti-settling agent	Sup. Conf.	1-5	
polyamide	rheological additive	Sup. Conf.	1-5	

Chemical Hazard Data (ANSI Sections 2, 8, 11, and 15)

		ACGIH-TLV				OSHA-PEL				S.R. Std.	S2	S3	CC					
Common Name	CAS. No.	8-Hour TWA	STEL	C	S	8-Hour TWA	STEL	C	S					H	M	N	I	O
diisobutyl ketone	108-83-8	25 ppm	not est.	not est.	not est.	50 ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
ethyl orthoformate	122-51-0	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
butyl acetate	123-86-4	150 ppm	200 ppm	not est.	not est.	150 ppm	not est.	not est.	not est.	not est.	n	n	y	n	n	n	n	n
phthalo green pigment	1328-53-6	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
xylene	1330-20-7	100 ppm	150 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
titanium dioxide	13463-67-7	10 mg/m3	not est.	not est.	not est.	10 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	y	y	n
acrylic polymer	26916-05-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
aliphatic polyisocyanate	28182-81-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
formaldehyde	50-00-0	not est.	not est.	0.3 ppm	not est.	0.75 ppm	2 ppm	not est.	not est.	not est.	y	y	y	y	n	y	y	y
yellow iron oxide	51274-00-1	5 mg/m3	not est.	not est.	not est.	10 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
tert-butyl acetate	540-88-5	200 ppm	not est.	not est.	not est.	200 ppm	not est.	not est.	not est.	not est.	n	n	y	n	n	n	n	n
pigment yellow 74	6358-31-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
light aromatic solvent naphtha	64742-95-6	not est.	not est.	not est.	not est.	500x ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
n-butanol	71-36-3	20 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
ethyl 3-ethoxypropionate	763-69-9	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
barium sulfate	7727-43-7	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
castor oil, raw	8001-79-4	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
hexamethylene diisocyanate	822-06-0	0.005 ppm	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
oxo-heptyl acetate	90438-79-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
pseudocumene	95-63-6	25 ppm	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	n	n	n	n	n	n
anti-settling agent	Sup. Conf.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
rheological additive	Sup. Conf.	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n

Footnotes:

C=Ceiling - Concentration that should not be exceeded, even instantaneously.

S=Skin - Additional exposure, over and above airborn exposure, may result from skin absorption.

n/a=not applicable
not est=not established
CC=CERCLA Chemical

ppm=parts per million
mg/m3=milligrams per cubic meter
Sup Conf=Supplier Confidential

S2=Sara Section 302 EHS
S3=Sara Section 313 Chemical
S.R.Std.=Supplier Recommended Standard

H=Hazardous Air Pollutant, M=Marine Pollutant
P=Pollutant, S=Severe Pollutant
Carcinogenicity Listed By:
N=NTP, I=IARC, O=OSHA, y=yes, n=no

MATERIAL SAFETY DATA SHEET

prepared 08/02/04

HAZARDS IDENTIFICATION (ANSI Section 3)

Primary route(s) of exposure : Inhalation, skin contact, eye contact, ingestion.

Effects of overexposure :

Inhalation : Irritation of respiratory tract. Prolonged inhalation may lead to mucous membrane irritation, fatigue, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, abdominal pain, chest pain, blurred vision, flu-like symptoms, coughing, sneezing, difficulty with speech, apathy, central nervous system depression, anesthetic effect or narcosis, difficulty of breathing, allergic response, fever and chills, tremors, abnormal blood pressure, severe lung irritation or damage, liver damage, kidney damage, pulmonary edema, pneumoconiosis, loss of consciousness, respiratory failure, asphyxiation, death. Possible sensitization to respiratory tract.

Skin contact : Irritation of skin. Prolonged or repeated contact can cause dermatitis, defatting, blistering, allergic response, severe skin irritation, severe skin irritation or burns. Possible sensitization to skin.

Eye contact : Irritation of eyes. Prolonged or repeated contact can cause conjunctivitis, blurred vision, tearing of eyes, redness of eyes, severe eye irritation, severe eye irritation or burns, corneal injury.

Ingestion : Ingestion may cause lung inflammation and damage due to aspiration of material into lungs, mouth and throat irritation, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, gastro-intestinal disturbances, abdominal pain, visual disturbances, apathy, central nervous system depression, anesthetic effect or narcosis, burns of the mouth, throat, stomach, liver damage, kidney damage, pulmonary edema, loss of consciousness, respiratory failure, death.

Medical conditions aggravated by exposure : Eye, skin, respiratory disorders, lung disorders, asthma-like conditions, respiratory disorders.

FIRST-AID MEASURES (ANSI Section 4)

Inhalation : Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty.

Skin contact : Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral/baby oil onto skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. Dispose of contaminated leather items, such as shoes and belts. If irritation occurs, consult a physician.

Eye contact : Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion : If swallowed, obtain medical treatment immediately.

FIRE-FIGHTING MEASURES (ANSI Section 5)

Fire extinguishing media : Dry chemical or foam water fog. Carbon dioxide. Closed containers may explode when exposed to extreme heat or fire. Vapors may ignite explosively at ambient temperatures. Vapors are heavier than air and may travel long distances to a source of ignition and flash back. Vapors can form explosive mixtures in air at elevated temperatures. Closed containers may burst if exposed to extreme heat or fire. May decompose under fire conditions emitting irritant and/or toxic gases.

Fire fighting procedures : Water may be used to cool and protect exposed containers. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. Self-contained breathing apparatus recommended.

Hazardous decomposition or combustion products : Carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, ammonia, aldehydes, toxic gases, barium compounds. Cyanides.

ACCIDENTAL RELEASE MEASURES (ANSI Section 6)

Steps to be taken in case material is released or spilled : Comply with all applicable health and environmental regulations. Eliminate all sources of ignition. Ventilate area. Ventilate area with explosion-proof equipment. Spills may be collected with absorbent materials. Use non-sparking tools. Evacuate all unnecessary personnel. Place collected material in proper container. Complete personal protective equipment must be used during cleanup. Large spills - shut off leak if safe to do so. Dike and contain spill. Pump to storage or salvage vessels. Use absorbent to pick up excess residue. Keep salvageable material and rinse water out of sewers and water courses. Small spills - use absorbent to pick up residue and dispose of properly.

HANDLING AND STORAGE (ANSI Section 7)

Handling and storage : Store below 80f. Store below 100f (38c). Keep away from heat, sparks and open flame. Keep away from direct sunlight, heat and all sources of ignition.

Other precautions : Use only with adequate ventilation. Do not take internally. Keep out of reach of children. Avoid contact with skin and eyes, and breathing of vapors. Wash hands thoroughly after handling, especially before eating or smoking. Keep containers tightly closed and upright when not in use. Empty containers may contain hazardous residues. Ground equipment when transferring to prevent accumulation of static charge.

EXPOSURE CONTROLS/PERSONAL PROTECTION (ANSI Section 8)

Respiratory protection : Control environmental concentrations below applicable exposure standards when using this material. When respiratory protection is determined to be necessary, use a NIOSH/MSHA (Canadian z94.4) Approved elastomeric sealing- surface facepiece respirator outfitted with organic vapor cartridges and paint spray (dust/mist) prefilters. Determine the proper level of protection by conducting appropriate air monitoring. Consult 29CFR1910.134 For selection of respirators (Canadian z94.4).

Ventilation : Provide dilution ventilation or local exhaust to prevent build-up of vapors. Use explosion-proof equipment. Use non-sparking equipment.

Personal protective equipment : Eye wash, safety shower, safety glasses or goggles. Impervious gloves, impervious clothing, face shield, apron.

STABILITY AND REACTIVITY (ANSI Section 10)

Under normal conditions : Stable see section 5 fire fighting measures

Materials to avoid : Oxidizers, acids, reducing agents, bases, aldehydes, ketones, halogens, amines, carbon tetrachloride (at elevated temperatures), aluminum, nitric acid, metal compounds, lewis acids, mineral acids.

Conditions to avoid : Elevated temperatures, moisture, contact with oxidizing agent, storage near acids, sparks, open flame, ignition sources.

Hazardous polymerization : Will not occur may polymerize in presence of aliphatic amines.

TOXICOLOGICAL INFORMATION (ANSI Section 11)

Supplemental health information : Contains a chemical that is moderately toxic by ingestion. Contains a chemical that may be absorbed through skin. Excessive inhalation of fumes may lead to metal fume fever characterized by a metallic taste in mouth, excessive thirst, coughing, weakness, fatigue, muscular pain, nausea, chills and fever. Notice - reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. Other effects of overexposure may include toxicity to liver, kidney, central nervous system, blood.

ICI Paints North America
925 Euclid Avenue Cleveland, Ohio 44115
EMERGENCY TELEPHONE NO. (800) 545-2643

Carcinogenicity : The international agency for research on cancer (IARC) has evaluated ethylbenzene and classified it as a possible human carcinogen (group 2b) based on sufficient evidence for carcinogenicity in experimental animals, but inadequate evidence for cancer in exposed humans. In a 2 year inhalation study conducted by the national toxicology program (NTP), ethylbenzene vapor at 750 ppm produced kidney and testicular tumors in rats and lung and liver tumors in mice. Genetic toxicity studies showed no genotoxic effects. The relevance of these results to humans is not known.

Reproductive effects : High exposures to xylene in some animal studies, often at maternally toxic levels, have affected embryo/fetal development. The significance of this finding to humans is not known.

Mutagenicity : Triethylenetetramine has demonstrated weak mutagenic activity in standard in vitro tests, and has caused embryo- fetal toxicity and fetal malformations when fed to rats. Triethylenetetramine did not exhibit carcinogenic potential in life-time mouse skin painting studies.

Teratogenicity : No teratogenic effects are anticipated

ECOLOGICAL INFORMATION (ANSI Section 12)

No ecological testing has been done by ICI paints on this product as a whole.

DISPOSAL CONSIDERATIONS (ANSI Section 13)

Waste disposal : Dispose in accordance with all applicable regulations. Avoid discharge to natural waters.

REGULATORY INFORMATION (ANSI Section 15)

As of the date of this MSDS, all of the components in this product are listed (or are otherwise exempt from listing) on the TSCA inventory. This product has been classified in accordance with the hazard criteria of the CPR (controlled products regulations) and the MSDS contains all the information required by the CPR.

Physical Data (ANSI Sections 1, 9, and 14)

Product Code	Description	Wt. / Gal.	VOC gr. / ltr.	% Volatile by Volume	Flash Point	Boiling Range	HMIS	DOT, proper shipping name
313B0250	do not use, use dc313b0250d instead	24.77	334.95	41.44	90 f	244-304	*231	paint, 3, UN1263, PGIII
313C0910	catha coat 313 organic zinc-rich epoxy primer clear converter	7.54	338.66	41.11	110 f	243-304	*320	paint, combustible liquid, UN 1263, PGIII

Ingredients Product Codes with % by Weight (ANSI Section 2)

Chemical Name	Common Name	CAS. No.	313B0250	313C0910
benzene, ethyl-	ethylbenzene	100-41-4	.1-1.0	
2-heptanone	methyl amyl ketone	110-43-0	5-10	20-30
1,2,-ethanediamine, n,n'-bis(2-aminoethyl)-	triethylenetetramine	112-24-3		1-5
zinc oxide	zinc oxide	1314-13-2	1-5	
benzene, dimethyl-	xylene	1330-20-7	1-5	
oxirane,2,2'-(((1-methylethylidene) bis (4,1-phenyleneoxymethylene))) bis-	diglycidyl ether of bisphenol a	1675-54-3	1-5	
phenol, 4,4'-(1-methylethylidene)bis-, polymer with 2,2'-((1-methylethylidene)bis (4,1-phenyleneoxymethylene))bis(oxirane)	epoxy resin	25036-25-3	1-5	
fatty acids, c18-unsatd., dimers, reaction products with polyethylenepolyamines	polyamide resin	68410-23-1		40-50
1-butanol	n-butanol	71-36-3		10-20
zinc	zinc	7440-66-6	70-80	
sulfuric acid, barium salt	barium sulfate	7727-43-7	1-5	
amine adduct	amine adduct	Sup. Conf.		10-20

Chemical Hazard Data (ANSI Sections 2, 8, 11, and 15)

		ACGIH-TLV				OSHA-PEL				S.R.	S2	S3	CC					
Common Name	CAS. No.	8-Hour TWA	STEL	C	S	8-Hour TWA	STEL	C	S	Std.				H	M	N	I	O
ethylbenzene	100-41-4	100 ppm	125 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	y	n
methyl amyl ketone	110-43-0	50 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
triethylenetetramine	112-24-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
zinc oxide	1314-13-2	2 mg/m3	10 mg/m3	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	y	n	n	n	n	n	n
xylene	1330-20-7	100 ppm	150 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
diglycidyl ether of bisphenol a	1675-54-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
epoxy resin	25036-25-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
polyamide resin	68410-23-1	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
n-butanol	71-36-3	20 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
zinc	7440-66-6	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
barium sulfate	7727-43-7	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
amine adduct	Sup. Conf.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n

Footnotes:

C=Ceiling - Concentration that should not be exceeded, even instantaneously.

S=Skin - Additional exposure, over and above airborn exposure, may result from skin absorption.

n/a=not applicable
not est=not established
CC=CERCLA Chemical

ppm=parts per million
mg/m3=milligrams per cubic meter
Sup Conf=Supplier Confidential

S2=Sara Section 302 EHS
S3=Sara Section 313 Chemical
S.R.Std.=Supplier Recommended Standard

H=Hazardous Air Pollutant, M=Marine Pollutant
P=Pollutant, S=Severe Pollutant
Carcinogenicity Listed By:
N=NTP, I=IARC, O=OSHA, y=yes, n=no

INSTALLATION INSTRUCTIONS

DE-7200 CENTRIFUGE

GENERAL

This section describes the recommended installation procedure for the Derrick equipment defined by the model number and drawing number associated with your equipment. The centrifuge is shipped fully assembled, except for the rotating assembly. For safety during shipment, this assembly is supported by rubber strips. It must be lowered onto the base and then its main bearing pillow blocks 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 information presented in *DER01422* in Equipment Handling Procedures in Section 1. Pay particular attention to 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 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 Warnings Summary *DER02021* in Section 2 before installing and operating this equipment.
2. Read and understand the Equipment Handling Procedures *DER01422* in Section 1 before lifting and moving the equipment.
3. Position and level equipment at installation site.
4. Remove shipping components, and lower and secure the rotating assembly bearing pillow blocks to the base.
5. Adjust drive belt (refer to Adjustments, *DER05023*).
6. Connect liquid discharge line.
7. If discharge duct is to be used, connect duct to solids discharge chute.
8. Install feed component, and connect flexible feed lines to inlet feed and flushing liquid flanges.
9. Select and install feed pump.
10. Connect electric power supply to the equipment, and connect bowl motor, conveyor motor, and feed pump motor to terminal blocks inside control cabinet.
11. Connect sensor cable to sensor junction box and plug.
12. For explosion-proof cabinet, connect compressed air supply source to purge unit.
13. Start up and confirm proper operation in accordance with *DER04098*.

REQUIRED CLEARANCES AND POSITIONING

Sufficient space should be provided around the equipment to facilitate access for maintenance, inspection, and adjustment.

Typical operation and maintenance functions include the following activities:

1. Access and operate the system control panel.
2. Open and close the control cabinet door (Figure 3022-1).
3. Open and close top cover of case.
4. Grease rotating assembly bearings.
5. Check and fill gearbox.
6. Connect and disconnect feed and liquid discharge lines.

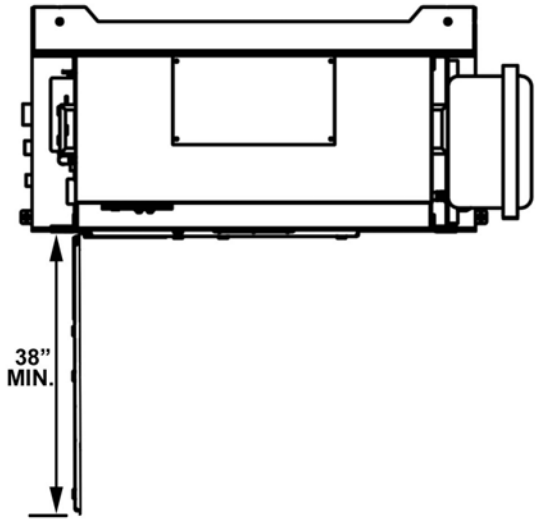


Figure 3022-1 Required Door Opening Clearance

EQUIPMENT POSITIONING AND MOUNTING

Base plates having 1-9/16" x 1-9/16" (40 mm x 40 mm) centering posts (Figure 3022-2) are required when mounting the centrifuge. The base plates may be either bolted or welded to the mounting platform to properly position and prevent movement of the centrifuge. (Refer to drawing 16590-00 in Section 11 for locations of centering posts.) When lowering the centrifuge onto the base plates, ensure that the centering posts engage with the opening at the bottom of each vibration isolator.

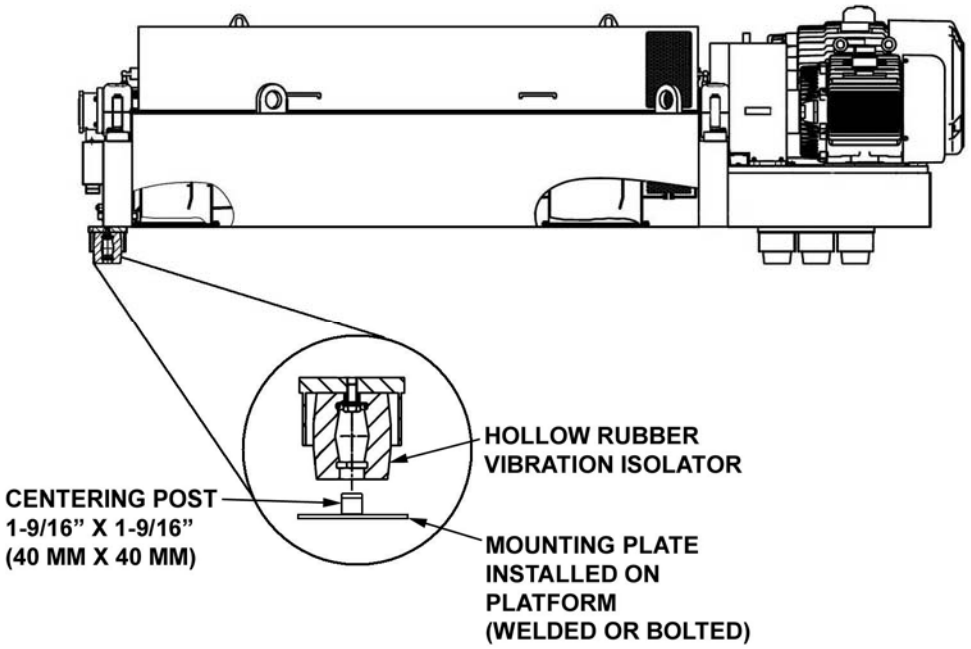


Figure 3022-2 Centrifuge Mounting

LIQUID AND SOLID DISCHARGE CHUTES

Observe the following design considerations when fabricating the liquid and solid discharge chutes. To determine dimensions and mounting hole arrangements, refer to drawing 16590-00 in Section 11.

Liquid Discharge Chute

When fabricating the chute, be certain to make the chute as straight as possible. Minimal curves are acceptable, but that will restrict flow away from the centrifuge should be eliminated from the chute design.

Solid Discharge Chute

The solid end chute should be designed at a sufficiently steep angle to facilitate self cleaning. If this is not possible, a means should be included to periodically remove accumulated solids from the chute.

EQUIPMENT LEVELING

The centrifuge must be properly leveled for satisfactory operation. The equipment must be leveled along the length and width of the unit (Figure 3022-3). A 2-foot or torpedo level is recommended. Non-compressible shims should be used as required to level the machine.

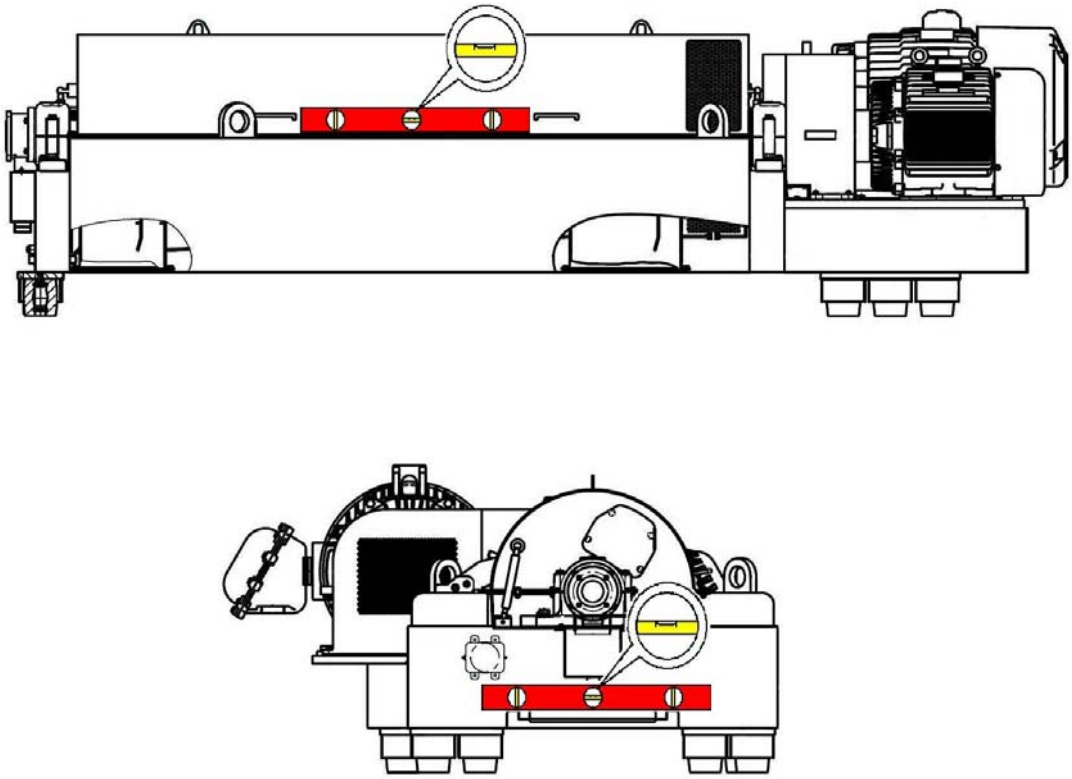


Figure 3022-3 Centrifuge Leveling

SHIPPING COMPONENTS

Note! Do not discard the rubber strips between bearing pillow blocks, cover, and base after removal. These strips must be re-installed whenever the machine is moved to prevent damage to the base and rotating assembly bearings during transit.

Following final positioning and leveling of the centrifuge, soft rubber strips inserted between the bearing pillow blocks and the base and hard rubber strips between the case cover and base must be removed. The strips prevent damage to the rotating assembly bearings during transit.

To remove the rubber strips, proceed as follows:

1. Remove all bolts securing top cover along both sides, but do not remove bolts on both ends of cover.
2. Remove bolts securing bearing pillow blocks to base and bolts securing upper halves of pillow blocks to lower halves (Figure 3022-4).
3. Install two jack bolts (Figure 3022-5) in top half of each pillow block, and thread bolts through lower halves.

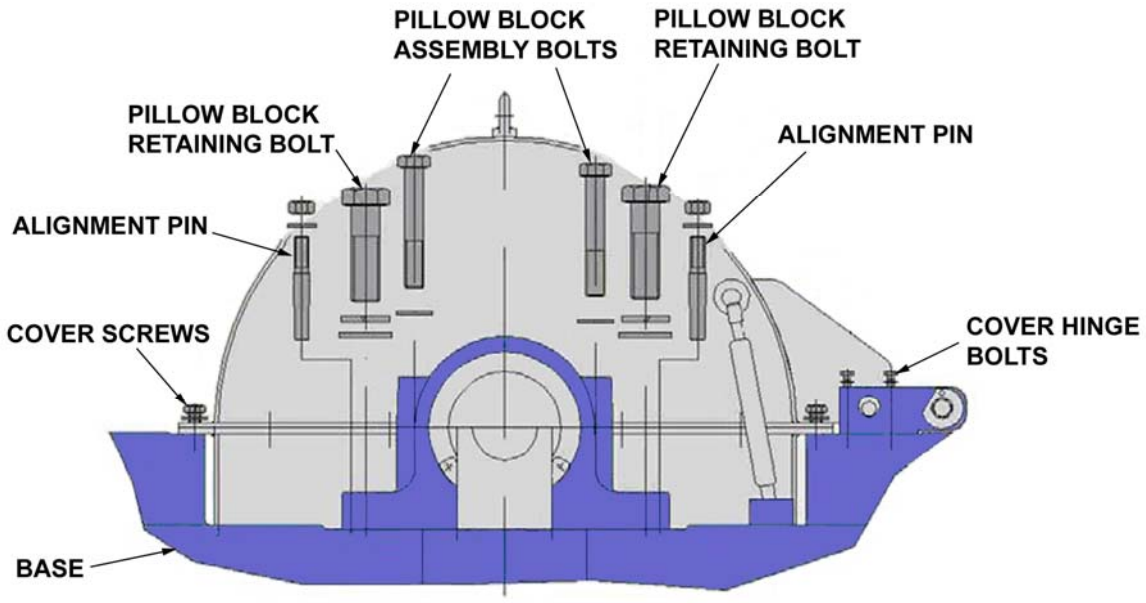


Figure 3022-4 Pillow Block and Case Cover Attachment

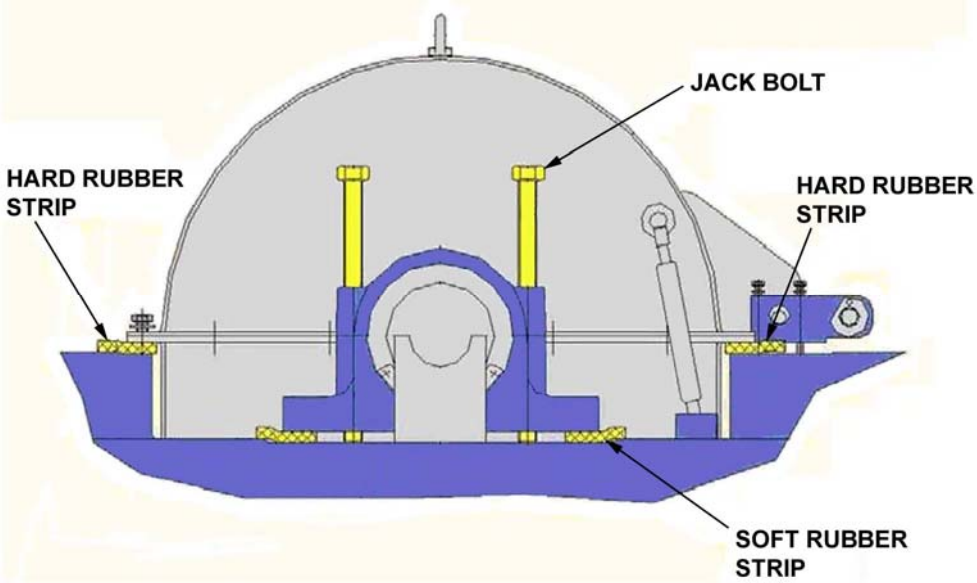


Figure 3022-5 Shipping Components Locations

4. Turn jack bolts clockwise to lift pillow blocks sufficiently to permit removal of all soft and hard rubber strips, and remove strips.
5. Clean mounting surfaces of lower pillow block halves and base, and then apply a light coating of grease or corrosion inhibitor to both surfaces.
6. Ensure that alignment pin holes in base are clean and unobstructed by inserting a tapered reamer through holes.
7. Insert four alignment pins into corresponding holes.
8. While turning jack bolts equally in a counterclockwise direction to slowly lower pillow blocks onto base, use alignment pins to properly position pillow blocks before they contact base. Remove jack bolts after pillow blocks are in full contact with base and mounting holes are aligned.
9. Insert two pillow block retaining bolts (Figure 3022-4) through top half of each pillow block, and tighten bolts evenly in accordance with *DER05028* to secure pillow block halves.
10. Use a brass hammer to fully seat alignment pins in bearing pillow blocks and base; then insert mounting bolts with washers and spring washers through holes. Tighten bolts incrementally to torque specified in *DER05028*. Do not tighten nuts on alignment pins.
11. Install and tighten all bolts along both sides of case cover.
12. Adjust drive belt tension in accordance with *DER05023*.

FEED AND DISCHARGE CONNECTIONS

To prevent damage to the centrifuge and piping system in case of centrifuge imbalance, vibration isolation is required. Consequently, flexible connections must be used for all feed and discharge connections. A source of fresh water or oil is to be connected to the flush fitting on the feed component for flushing the centrifuge prior to shutdown. A shutoff valve must be installed in the flush piping.

The feed component (Figure 3022-6) supplied with the centrifuge has female connections to accept the customer's feed and flush piping and an integral flex joint for vibration isolation. The liquid discharge chute, which is customer supplied, also requires a vibration isolator. If a solid discharge chute is used, it must be connected to the solids discharge chute through a flex connection. Refer to drawing 16590-00 in Section 11 for liquid and solid discharge chute connection flange dimensions and bolt patterns.

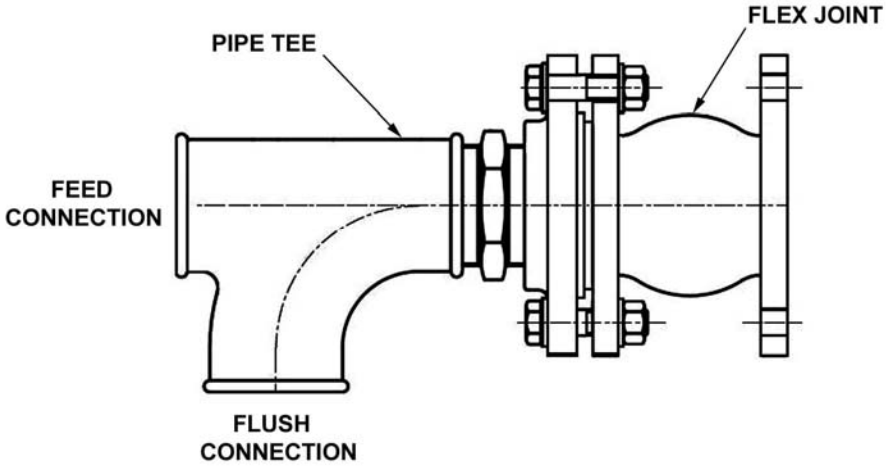


Figure 3022-6 Feed Component

FEED PUMP

A positive-displacement feed pump is required to supply the centrifuge. Refer to *DER01321* for feed pump specifications.

LIQUID DISCHARGE PUMP

If a centrifugal liquid discharge pump is used, sizing must take into account the aeration properties of the centrifuge. Be sure to size the centrifugal pump adequately to avoid cavitation due to the natural aeration properties of the centrifuge.

PLC CONNECTOR INSPECTION

General

Occasionally, vibration during transport may cause connections to the PLC to become disengaged. The unsatisfactory wiring condition that results may cause a centrifuge malfunction.

Before applying power to the centrifuge, confirm that all PLC connectors are securely mated as described in the procedure below. In addition, rotational direction of motors should be checked before the initial startup.

Connector Checkout

This procedure should be used upon delivery of equipment to the site and before connecting and applying power to the equipment. Its purpose is to ensure that all PLC connectors are fully engaged.

This procedure should also be used as an initial troubleshooting step in case of centrifuge control system malfunction. Always check for an improper connection before concluding that the equipment malfunction is due to a defective PLC or other component.

To perform the PLC inspection, proceed as follows:

WARNING! TO AVOID SERIOUS PERSONAL INJURY BE SURE EQUIPMENT IS LOCKED OUT, TAGGED OUT, DE-ENERGIZED BEFORE OPENING THE CONTROL CABINET TO PERFORM THIS PROCEDURE.

1. With electric power shut down, disconnected, and locked out and tagged out, open cabinet door.
2. Check position of connector insertion tabs on each section of the PLC as shown in the photos below. To ensure that the connectors are fully engaged, both tabs should be inserted fully into their respective slots (Figure 3022-7).
3. If the inspection reveals that either tab has moved, slide the tab(s) fully into the slot(s).
4. After completing the inspection and corrective action, if necessary, close and secure the control cabinet door.
5. Proceed with the Initial Startup procedure.

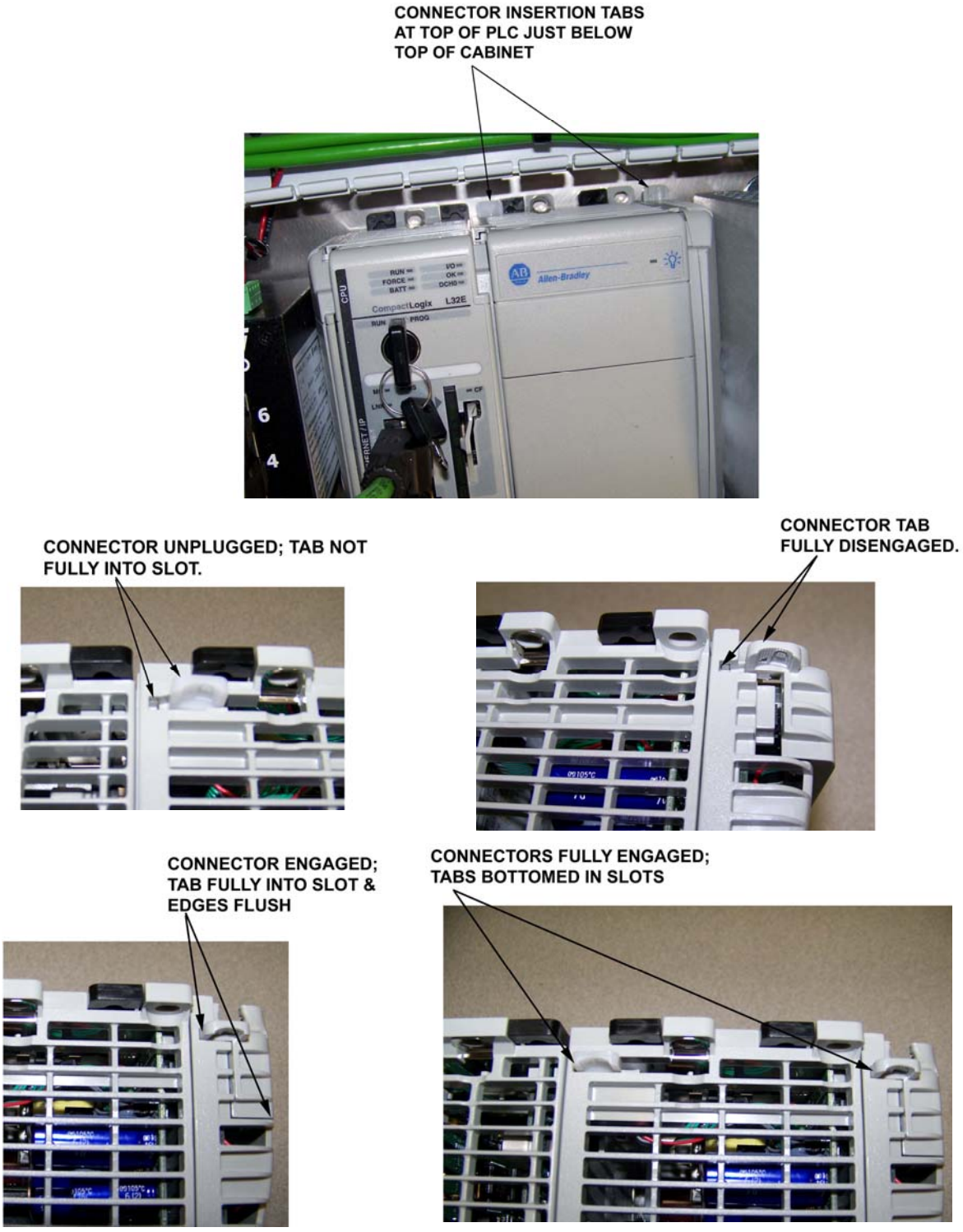


Figure 3022-7 Checking PLC Connector Tab Engagement

ELECTRIC POWER CONNECTIONS

WARNING! DANGEROUS VOLTAGE IS PRESENT. IF THE INPUT POWER IS SPLIT, BE SURE THAT PHASING IS CORRECT BEFORE APPLYING POWER TO CENTRIFUGE.

Connection Options

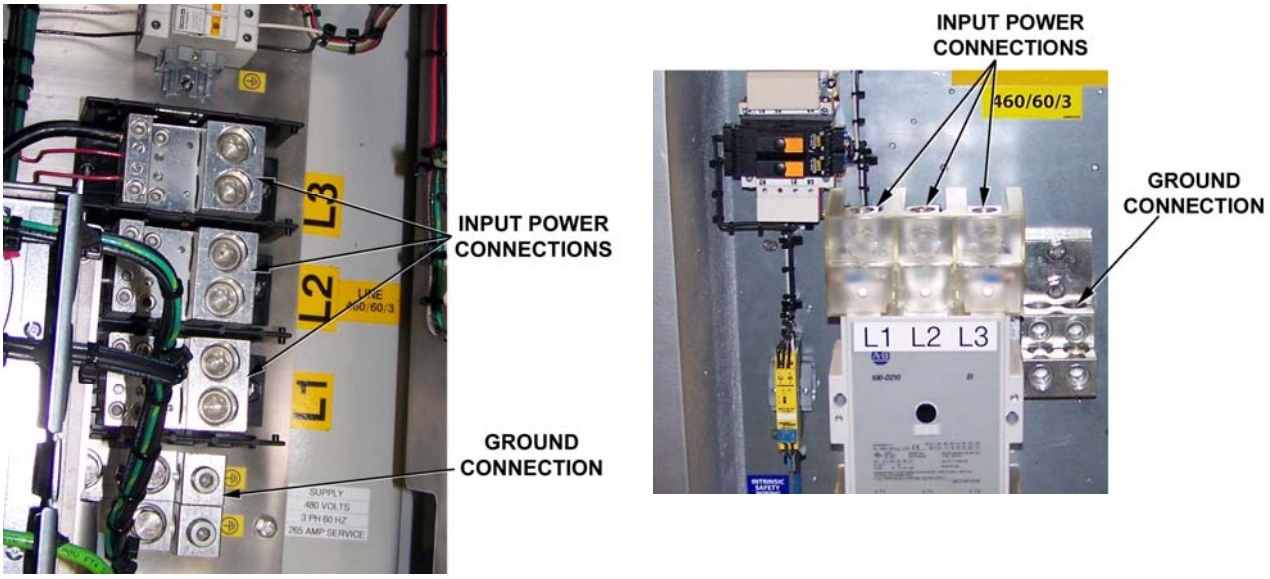
Connect the facility's three-phase electric power supply to the control cabinet in accordance with the appropriate view in Figure 3022-8. Non-hazardous area control cabinet connections are made inside the control cabinet; hazardous area connections are made in the electrical panel attached to the right side of the cabinet.

Note that power may be connected with either a single heavy-gage cable or split between two smaller, lighter cables. The smaller-gage cables used for the split-input connections are generally easier to handle. The input cabling components required for the two options are as follows:

Option 1 - One 4/0 AWG cable per phase and one 3" NPT gland

Option 2 - Two 2 AWG cables per phase and two 2" NPT glands

If the input is split (Figure 3022-9) as described in Option 2, be sure to group conductors of the same phase/color. Refer to the electrical schematic diagram in Section 11 - Reference Drawings for additional information on electrical connections and ratings.



Non-Hazardous Area Control Cabinet **Hazardous Area Control Cabinet**

Figure 3022-8 Electric Power Connections

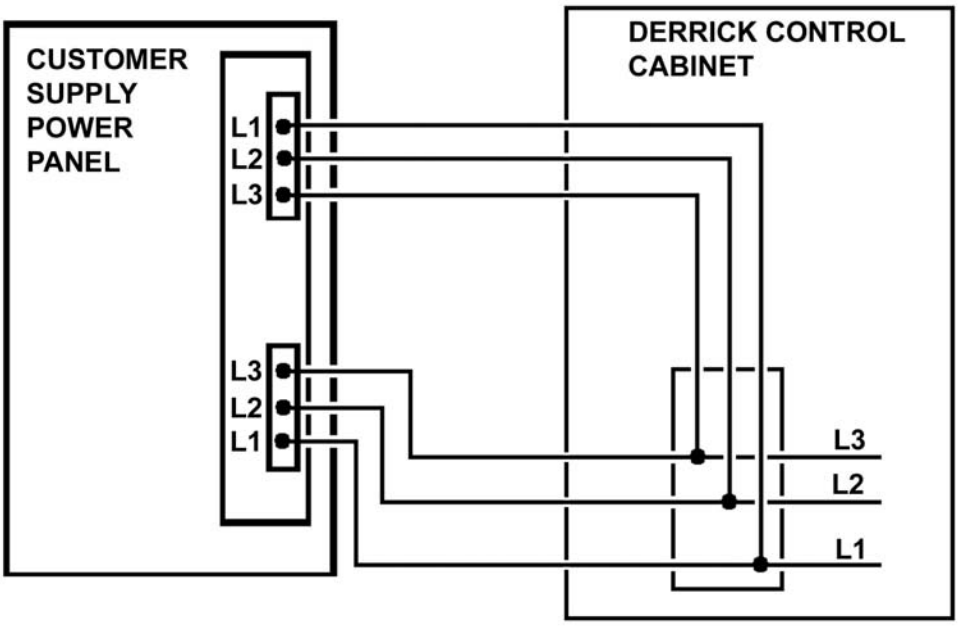


Figure 3022-9 Split Input Power Connections

Polarity Test

WARNING! BE CERTAIN THAT MOTORS ROTATE IN CORRECT DIRECTION. INCORRECT POLARITY OF CONVEYOR MOTOR WILL CAUSE CONVEYOR TO ROTATE AT AN INCORRECT SPEED, WHICH WILL RESULT IN PROCESSING PROBLEMS.

In the following procedure, polarity is critical. Be certain that all motors rotate in the correct directions. Simply checking to see if solids are discharged out the solid end **DOES NOT** ensure correct polarity!

If conveyor motor is wired incorrectly, the conveyor may become plugged or flooded depending on the speed settings of the bowl and conveyor. Test for correct polarity of all connections as follows:

1. Apply power to centrifuge.
2. Run bowl at 20 RPM with a conveyor differential speed of 5 RPM.
3. Confirm direction of rotation for bowl, conveyor, feed pump, and air conditioner condenser motors as follows:
   a. Bowl - Counterclockwise viewed from fan end
   b. Conveyor - Clockwise viewed from fan end
   c. Feed pump - Per manufacturer's data
   d. Air conditioner condenser - Clockwise viewed from fan end
4. Correct reverse rotation by shutting down power and switching any two of the three power leads at the terminal block(s) inside the cabinet (refer to Figure 3022-8 and electrical schematic diagram in Section 11.

ELECTRIC POWER CONNECTIONS (CONT'D)

	**WARNING! CENTRIFUGE 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 connections in the control cabinet and sensor system junction box must be connected to a known ground.

BOWL, CONVEYOR, AND FEED PUMP MOTOR CONNECTIONS

The bowl and conveyor drive motors require three-phase line power and ground connections. Power is derived through connections to terminal blocks inside the control cabinet. Similarly, the customer's feed pump motor must be connected to the centrifuge control system for control of its operation.

Connect the bowl, conveyor, and feed pump motors to terminal blocks in the bottom left side of the control cabinet as shown in Figure 3022-10. The control system can operate a feed pump drive motor of up to 30 HP.

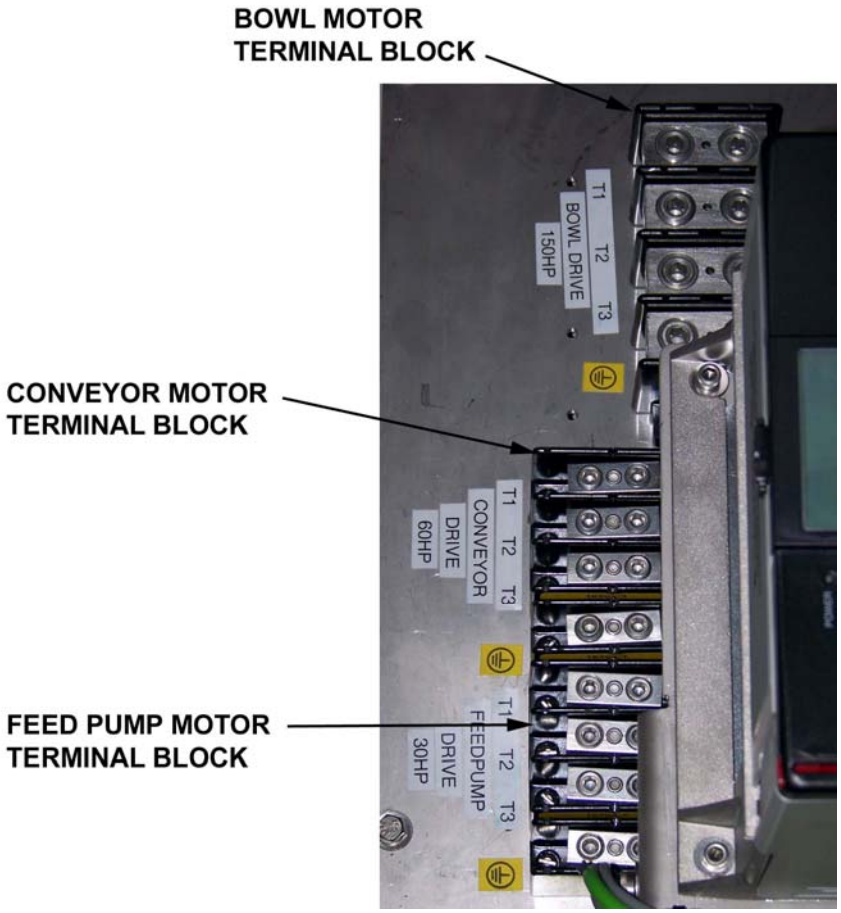


Figure 3022-10 Electric Power Connections to Bowl, Conveyor, and Pump Motors

SENSOR CONNECTIONS

A customer-supplied cable is used for sensor connections. One end of the cable is connected to terminals in the sensor junction box as shown in Figure 3022-11, and the opposite end is connected to the plug supplied with the centrifuge (Figure 3022-12). Connect leads to the corresponding numbered terminals (1 through 16) in the plug. After completing the wiring, plug the cable into the receptacle on the upper left side of the control cabinet.

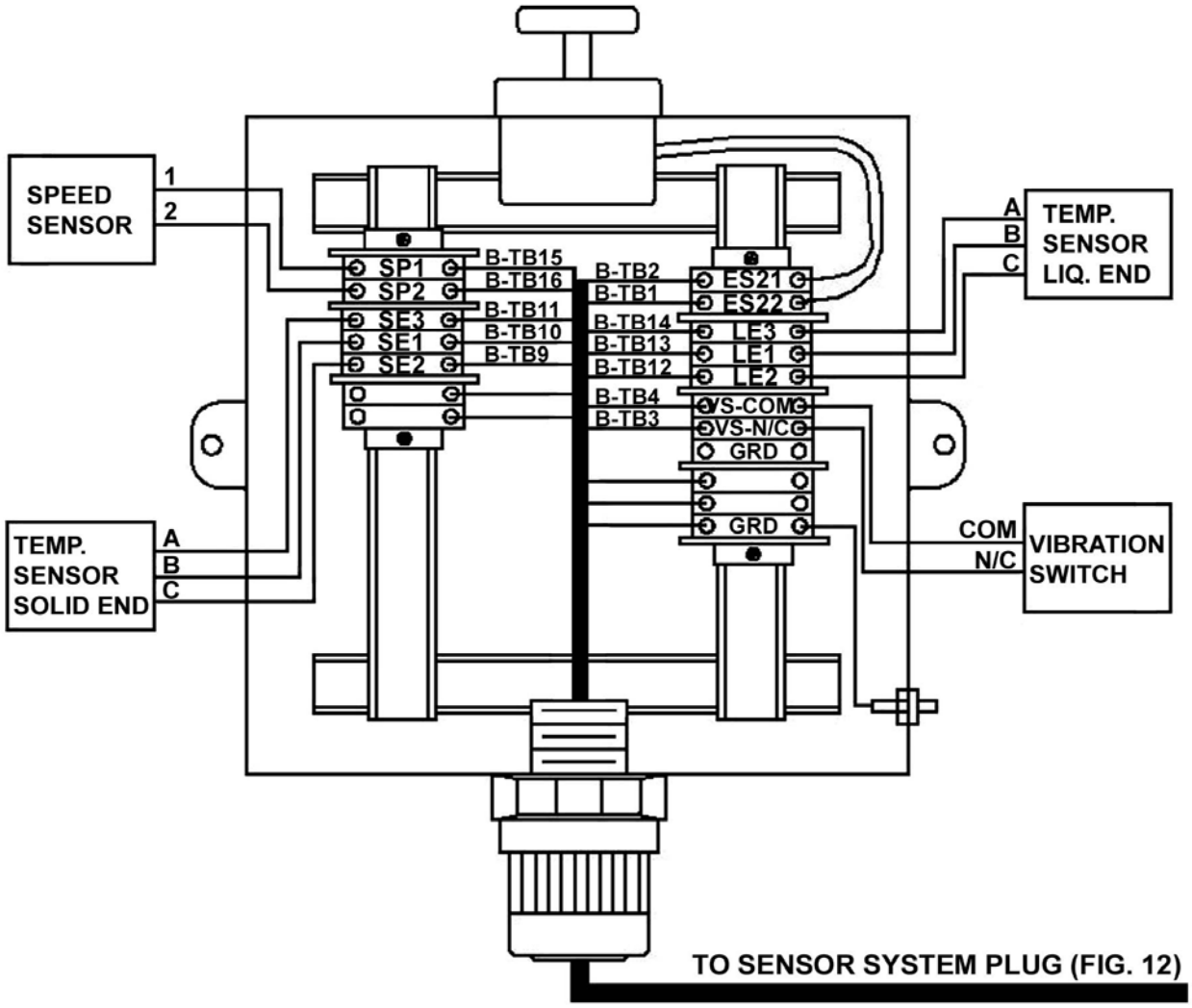


Figure 3022-11 Sensor System Junction Box Connections

SENSOR CONNECTIONS (CONT'D)

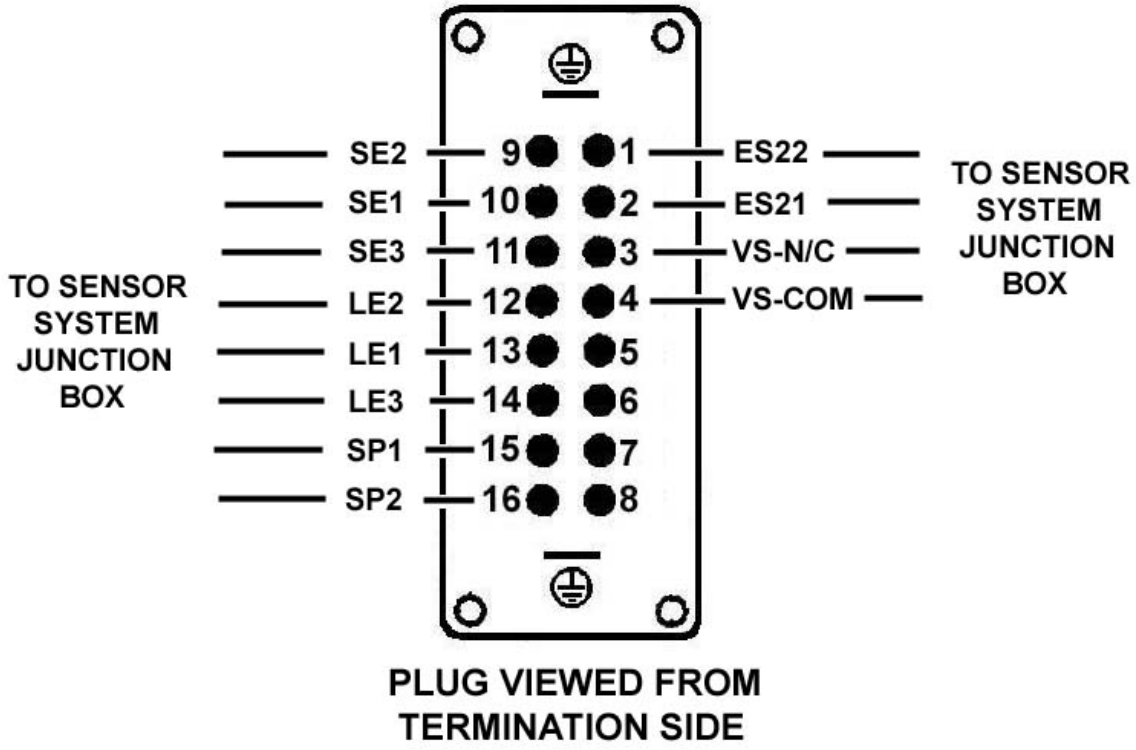


Figure 3022-12 Sensor System Plug Connections

COMPRESSED AIR CONNECTION TO PURGE SYSTEM

For explosion-proof Control Cabinet, supply compressed air at the required pressure and flow rate to the purge control unit. Connect compressed air supply in accordance with the Expo Technologies MiniPurge documentation in Section 12.

MACHINE STARTUP

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

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

OPERATING INSTRUCTIONS

DE-7200 CENTRIFUGE

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.

The centrifuge is designed to be operated only for the purpose specified at the time of purchase. Operation in any other application requires consultation with Derrick sales or technical service.

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 COMPONENTS 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.**

PURGE SYSTEM (HAZARDOUS ENVIRONMENT ONLY)

Only the centrifuge operating in a hazardous environment is equipped with the purge system. During startup, the purge system drives out all gases from the cabinet interior and then maintains positive pressure within the control cabinet to prevent potentially explosive gases from entering. Operation of the purge system is initiated when sufficient air pressure is sensed inside the cabinet. A 14-minute rapid purge cycle at 16 CFM then occurs, while the purge system prevents power from being applied to the cabinet interior. At the end of the rapid purge cycle, the purge system closes the main contactor that permits power to flow to the cabinet interior. A continuous 2 CFM purge then begins and continues both during and after centrifuge operation. It is preferable to keep the cabinet pressurized. If at any time a loss of cabinet pressure is detected, the main contactor will immediately open, disconnecting power. The 14-minute rapid purge is then repeated before power is re-established.

CONTROL SCREENS

The screens that appear on the control panel provide the operator interface to the centrifuge for operation of the control system for startup, monitoring, and shutdown. The paragraphs below describe the functions of the principal screens used in centrifuge operation.

Home

Following the purge cycle, power is applied to the cabinet. The Home screen (Figure 4098-1) then appears on the control panel, permitting selection of any of the following options:

Option	Screen or Function Displayed
Operation -	Operation screen (Figure 4098-2) used to start the centrifuge and monitor performance.
Clean Out -	Clean Out screen (Figure 4098-3) permits selection of automatic or manual clean out cycles, which facilitate removal of excess solids that are impeding conveyor rotation. If MANUAL is selected, the conveyor may be jogged between forward and reverse to assist in clean out process. All clean out cycles are timed to prevent damage to equipment.
Cent. Status -	Status screen (Figure 4098-4) presents all current operational information such as bearing temperatures, vibration switch condition, centrifuge operating hours, and status of air conditioner.
Alarms -	Alarms screen (Figure 4098-5) permits the operator to view current alarm messages of bowl, conveyor, and pump variable frequency drives.
Brg Temps -	Bearing temperature screen (Figure 4098-6) graphically displays liquid and solid end bearing temperatures over the selected time period.
Setup -	Setup screen (Figure 4098-7) allows the operator to set display panel brightness, select temperature unit, and view feed pump characteristics.
Login -	Login screen (Fig. 4098-8) permits password entry to display supervisor’s Home screen used to limit operator access to Monitor Operation screen only.
Motor Torqs -	Bowl and conveyor motor torque (Figure 4098-9) presented graphically over the selected time period.

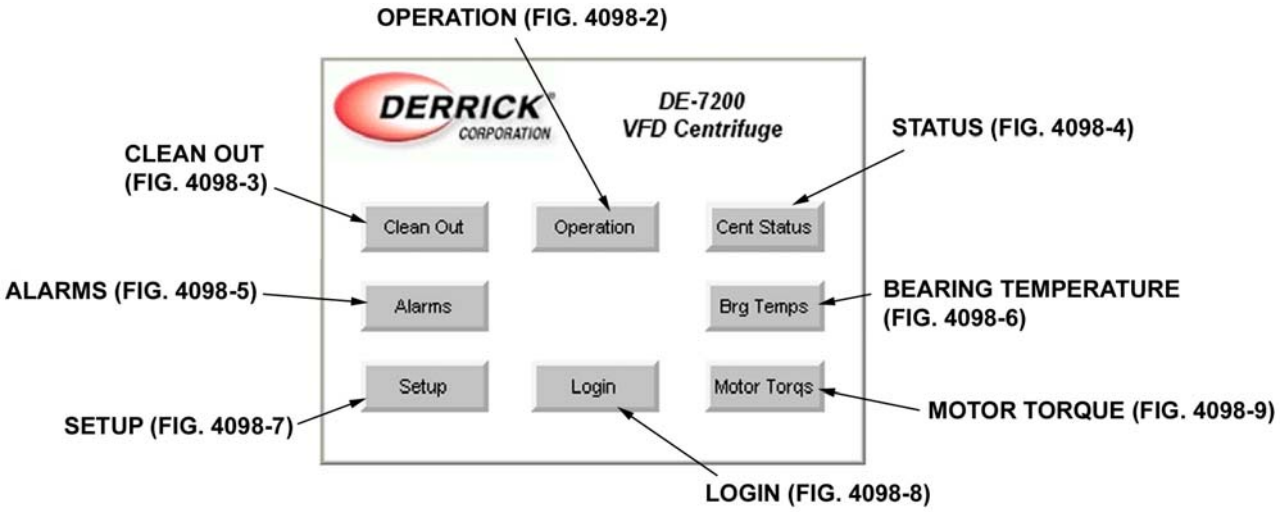
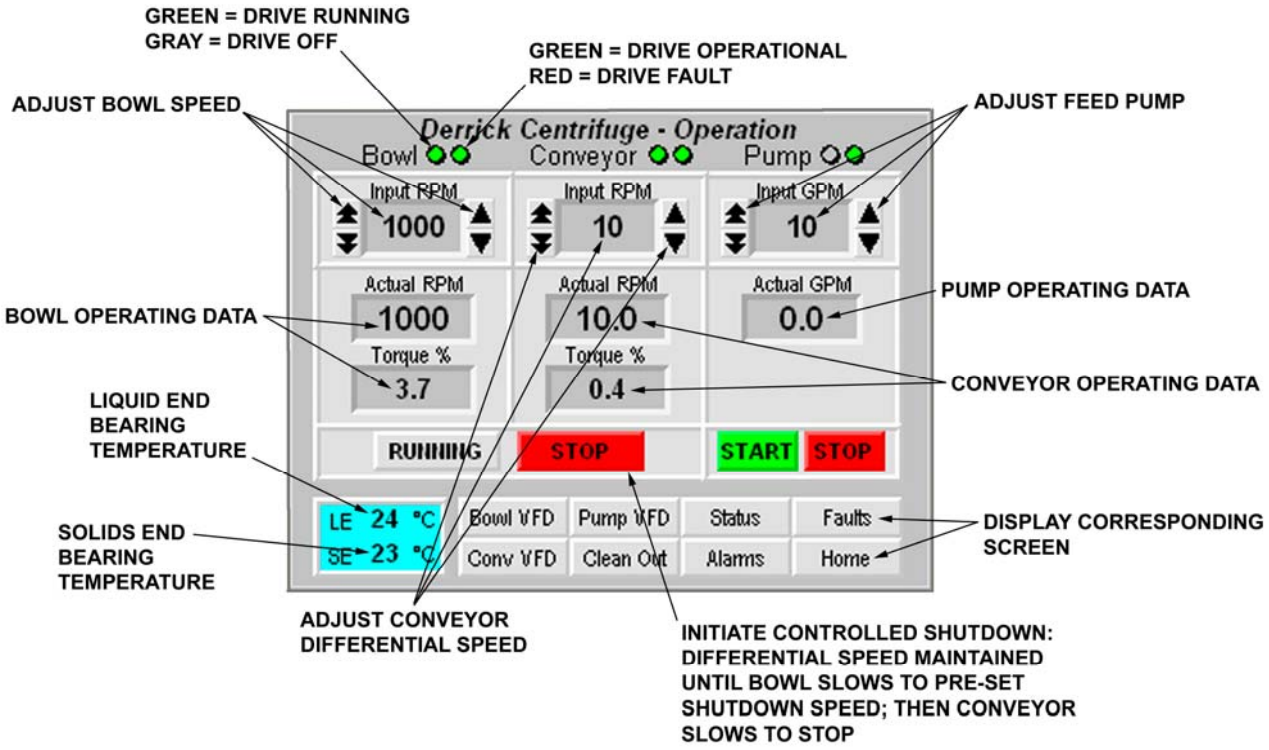


Figure 4098-1 Home Screen

Operation

The Operation screen (Figure 4098-2) is shown when Operation is selected on the Home screen. It permits the operator to view and adjust current operating information for the bowl, conveyor, and pump. These include set and actual bowl and conveyor RPMs and torque percentages, set and actual feed pump flow rate, and bearing temperatures. Adjustments of the conveyor and bowl speeds may be performed on this screen using up and down arrows or by entering actual numbers on the numeric keypad. In addition, the screen provides options for stopping the centrifuge, displaying VFD operation screens, and selecting Status, Clean Out, Faults, Alarms, and Home screens. The Bowl, Conveyor, or Pump VFD screens display the current operating status of the selected VFD. These screens are described later in this section.



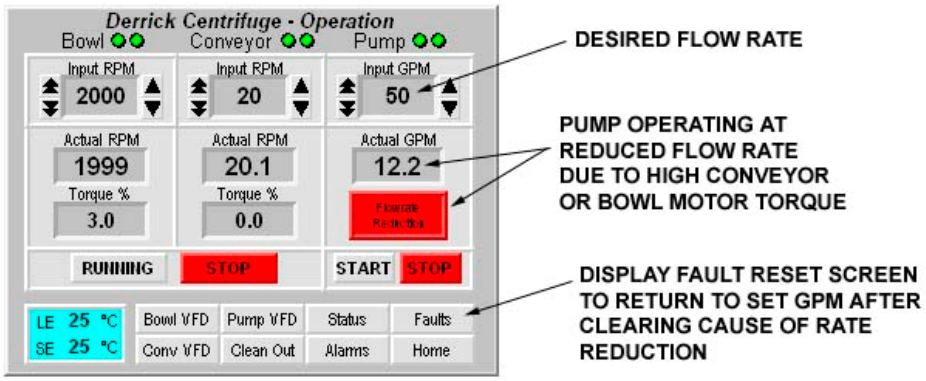


Figure 4098-2 Operation Screens

Clean Out

The Clean Out screen (Figure 4098-3) is used to set parameters for operating the bowl and/or conveyor to remove accumulated process material that is impeding rotation. With this screen displayed, the operator selects the desired bowl and conveyor RPMs for the cleanout process. During cleanout, the actual RPMs and torque percentages are displayed below the setpoints. Provision is included for selecting the automatic or manual cleanout options.

When the cleanout process has timed out or at any other time the operator chooses, the Operation screen or the Faults screen may be displayed.

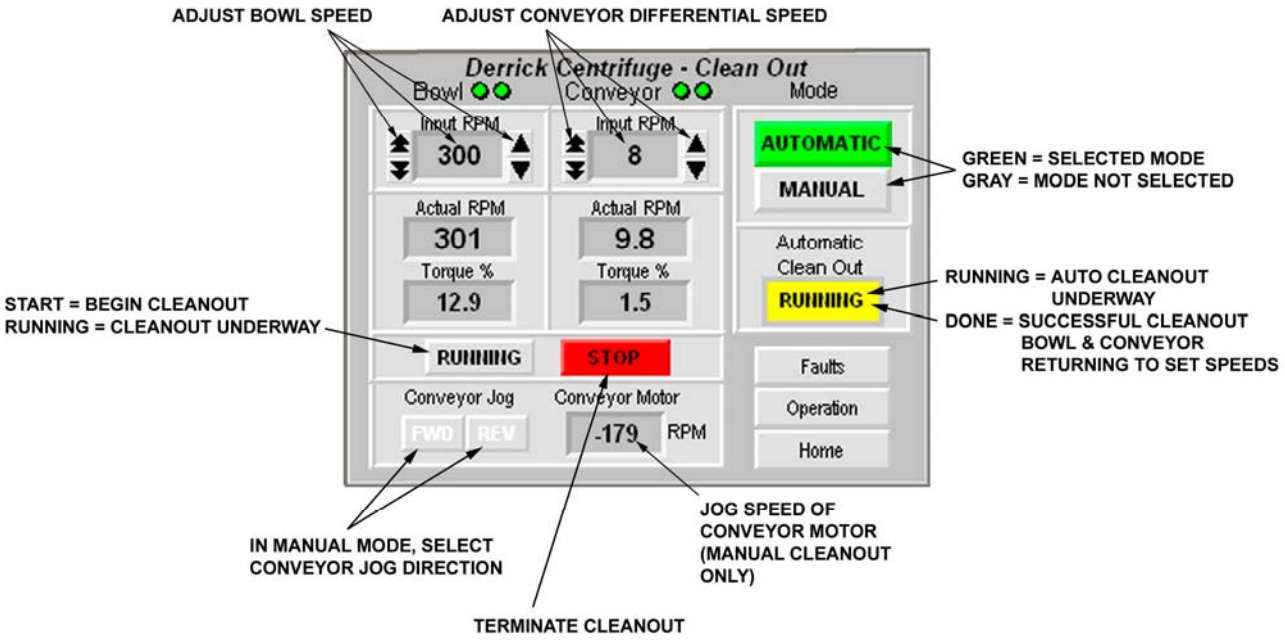


Figure 4098-3 Clean Out Screen

Centrifuge Status

Current performance information is shown on the Centrifuge Status screen (Figure 4098-4). Parameters displayed include bearing temperatures, open or closed status of vibration switch, air conditioner operation, and operating hours. Operating status of the air conditioner compressor motor, evaporator blower motor, and refrigerant pressure are shown. Exiting this screen returns to the previous screen.

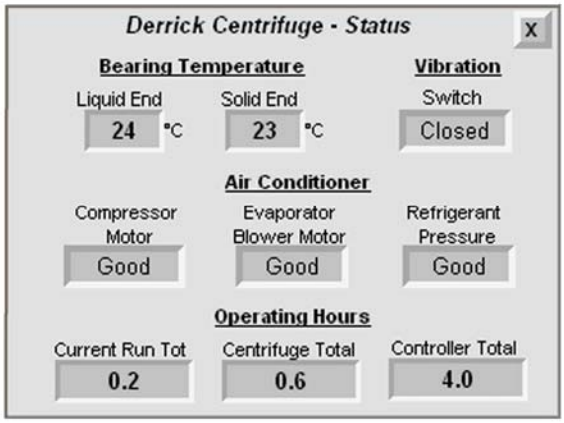


Figure 4098-4 Centrifuge Status Screen

Alarms

The Alarms screen (Figure 4098-5) permits the operator to review and acknowledge active alarm messages. Each alarm is listed with its status, date and time received, and description. Buttons are provided at the bottom of the screen to facilitate scrolling through the alarms. Messages may be acknowledged individually, or all alarms may be acknowledged simultaneously. Provisions are included for sorting alarms in the order of occurrence, and buttons are included for returning to the Operation or Home screen.

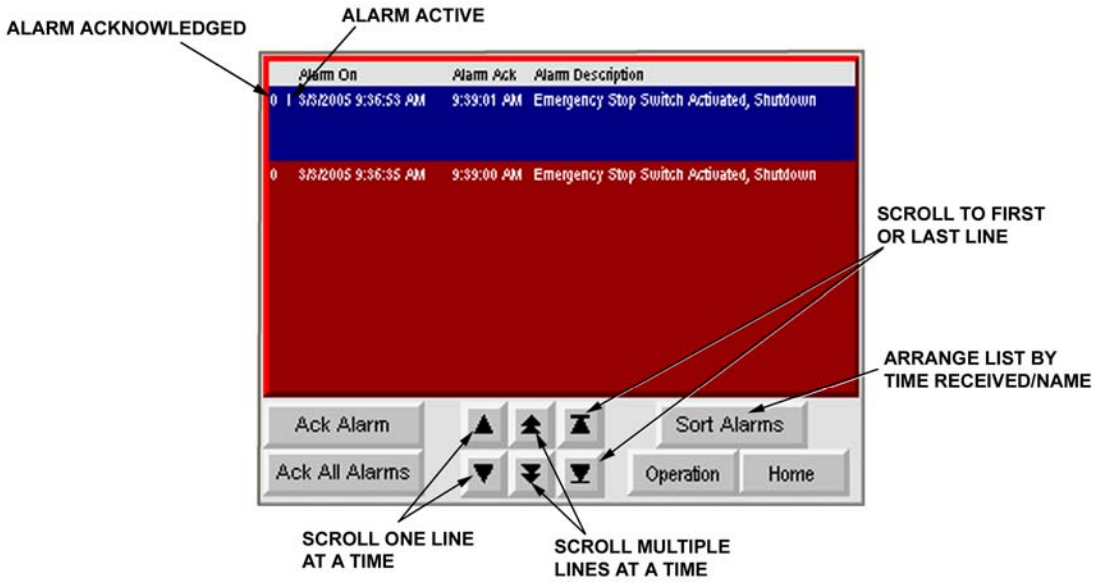


Figure 4098-5 Alarms Screen

Bearing Temperatures

Bearing temperature trends may be viewed in graphical form on the Bearing Temperature screen (Figure 4098-6). Temperatures are updated in accordance with a pre-set interval, and scroll buttons are provided to facilitate examination of trends over time. Solid and liquid end temperatures are displayed at the right side of the screen. The Motor Torque screen is also accessible from the Bearing Temperature screen. The operator may return to the Operation or Home screen using the buttons at the lower right of the screen.

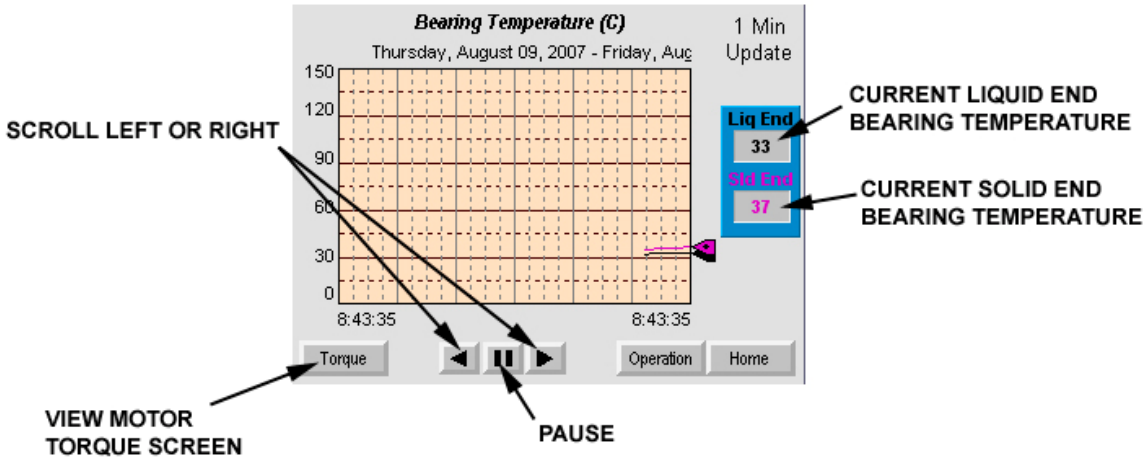


Figure 4098-6 Bearing Temperature Screen

Setup

The Setup screen (Figure 4098-7) permits the operator to view feed pump characteristics and set personal preferences. The feed pump output flow rate and gearbox ratio displayed on the left side of the Setup screen may not be changed by the operator. However, the operator may adjust the brightness of the control panel screen and select the temperature units (°C or °F) that will be shown on other screens.

Options are provided at the bottom of the screen to select the Login, Alarms, Operation, or Home screens. If Login is selected, prompting will appear to enter a user name and password, which is available only to authorized personnel. Once entered, the screen permits authorized personnel to set or change bowl, conveyor, and pump VFD parameters.

The manufacturer's data plate should include the feed pump gearbox ratio and Output / Rev. (GPR). This information should be entered by authorized personnel in the fields provided on the Setup screen.

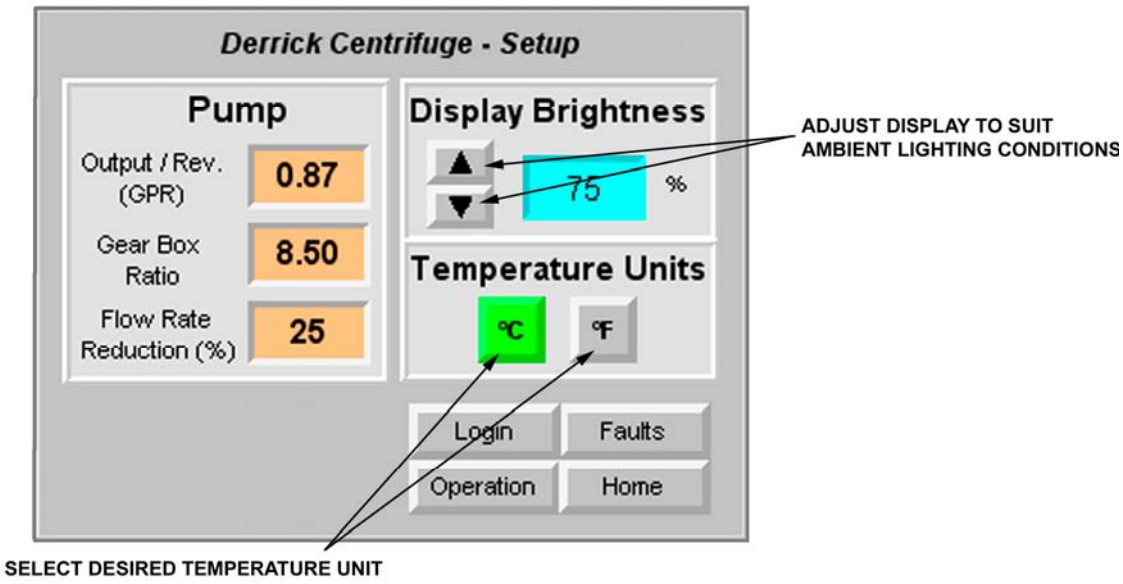


Figure 4098-7 Setup Screen

Login

The Login screen (Figure 4098-8) permits authorized personnel to enter a password required to display restricted screens. These screens permit supervisory personnel to re-set operating characteristics and thresholds that govern centrifuge operation.

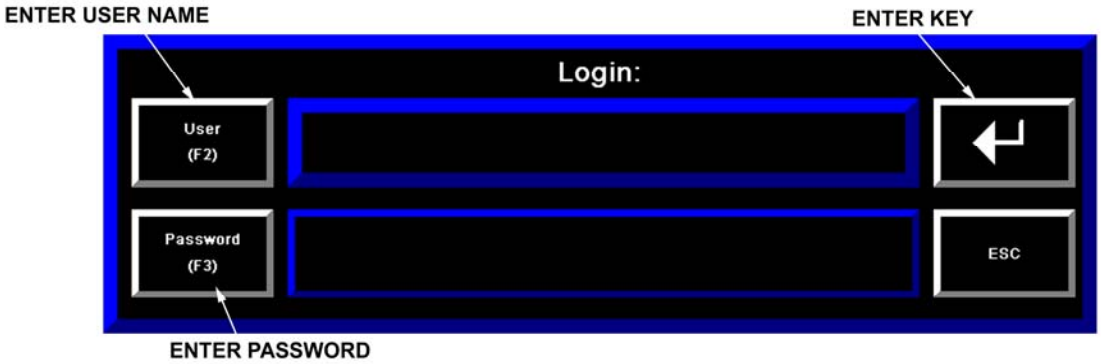


Figure 4098-8 Login Screen

Motor Torques

Bowl and conveyor torque trends may be viewed in graphical form on the Motor Torque trend screen (Figure 4098-9). Torques are updated in accordance with a pre-set interval (one minute), and scroll buttons are provided to facilitate examination of trends over time. Bowl and conveyor torques are displayed at the right side of the screen. The Bearing Temperature screen is also accessible from the Motor Torque screen. The operator may return to the Operation or Home screen using the buttons at the lower right of the screen.

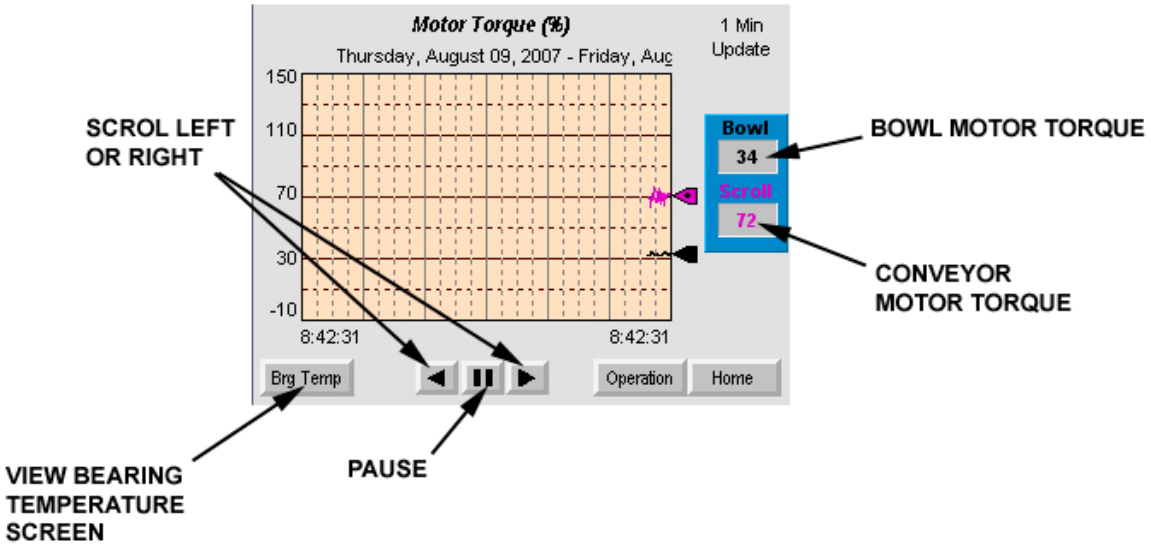


Figure 4098-9 Motor Torque Trend Screen

VFD STATUS SCREENS

A status screen is provided for each VFD (Figure 4098-10 through 4098-13) to permit review of current VFD status information. When selected on the Operation screen, the status screen permits the operator to view such operational factors as any alarm present, power output, motor direction (forward or stopped), VFD internal temperature, motor and bowl speeds, and motor torque. Clicking on the temperature field displays the VFD temperature trend screen.

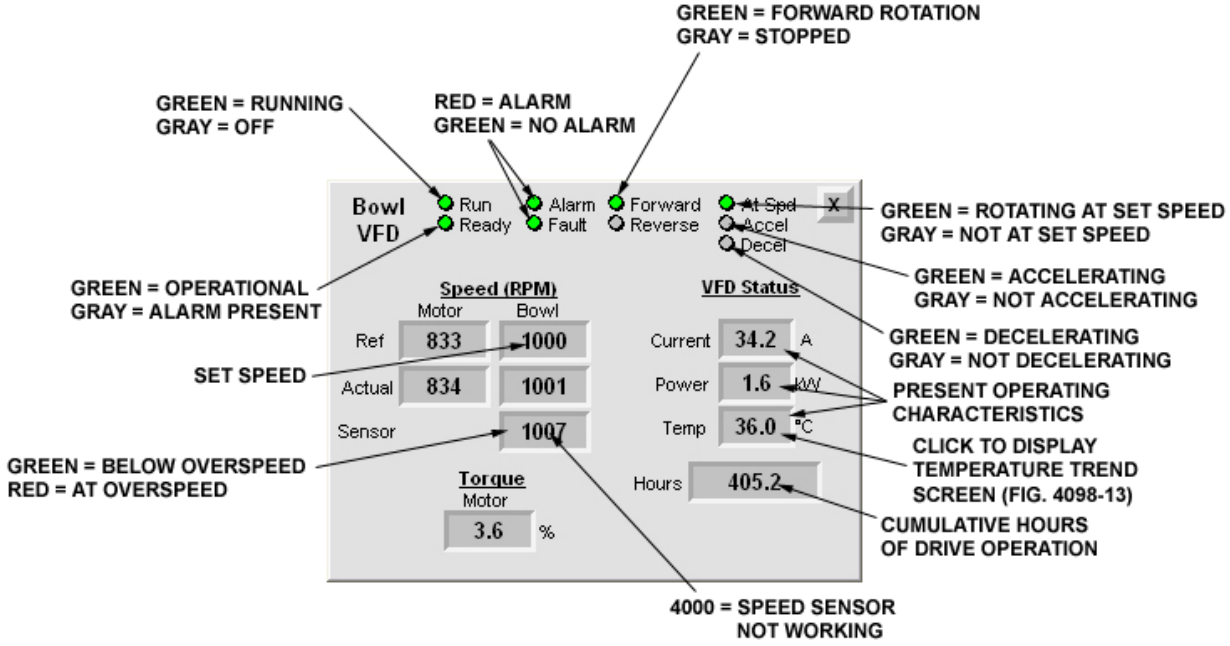


Figure 4098-10 Bowl VFD Screen

VFD STATUS SCREENS (CONT'D)

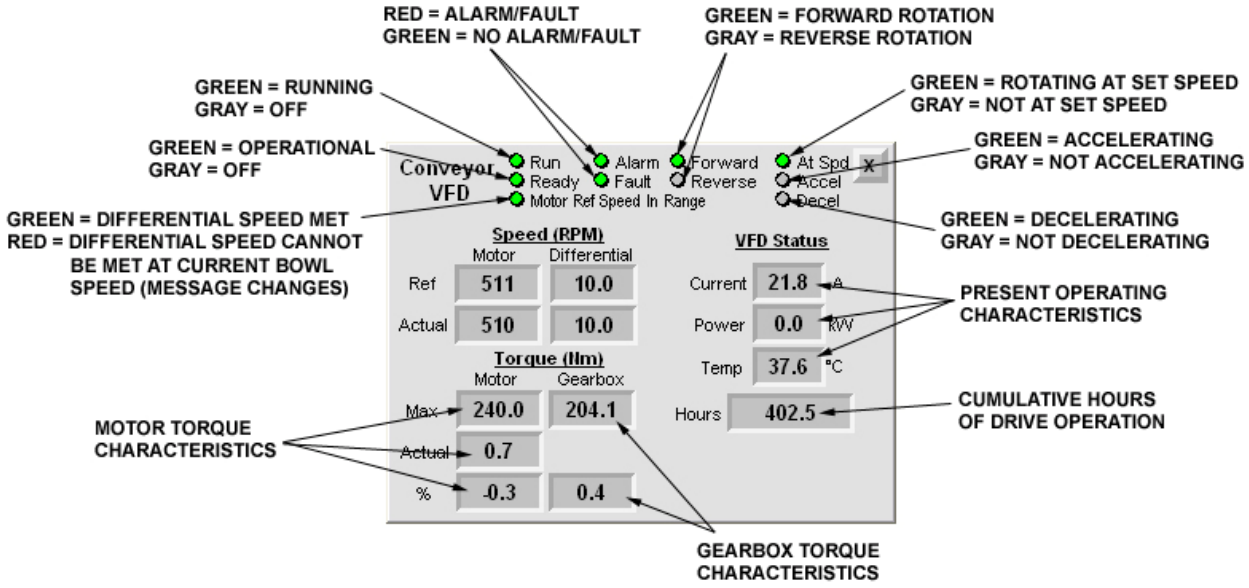


Figure 4098-11 Conveyor VFD Screen

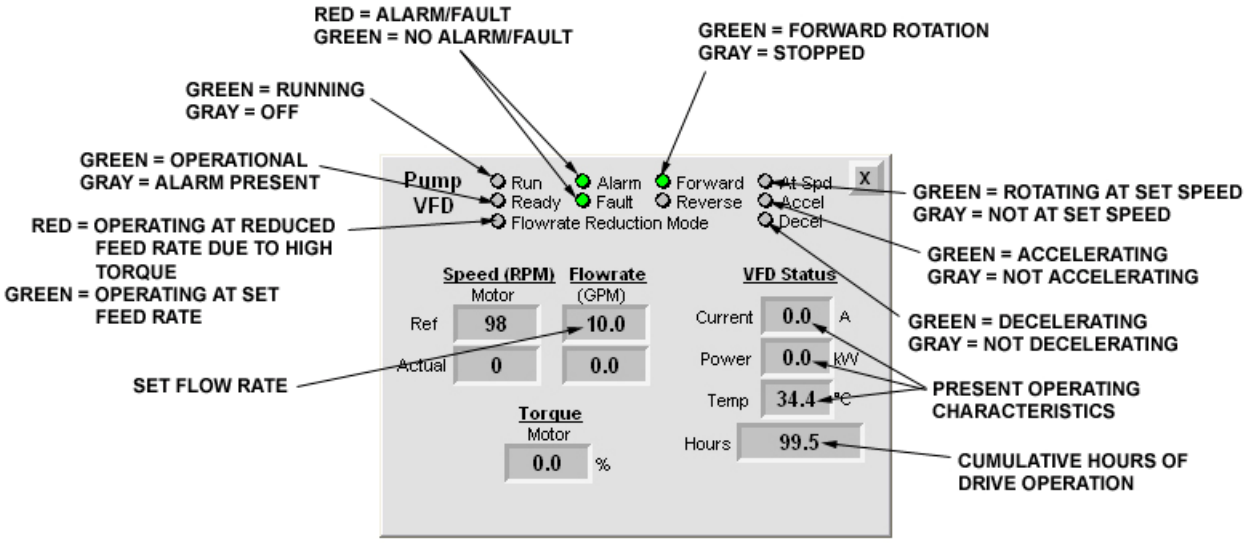


Figure 4098-12 Pump VFD Screen

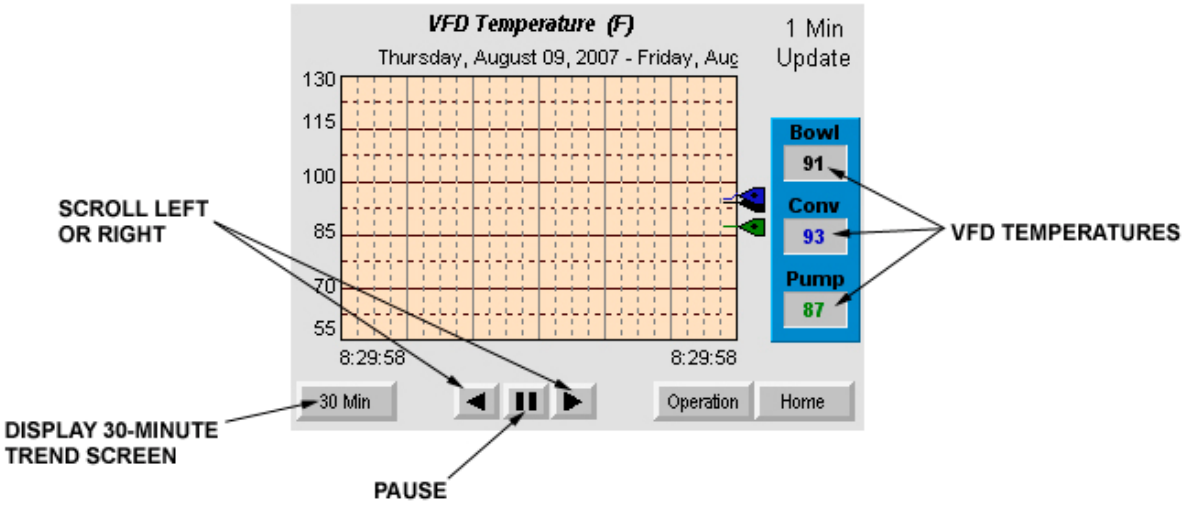


Figure 4098-13 VFD Temperature Trend Screen

FAULT RESET SCREEN

The Fault Reset screen (Figure 4098-14) displays the operational condition of all three VFDs. It may be selected from either the Clean Out or Operation screen. If high conveyor torque causes a reduction in the pump flow rate, the message “Flowrate Reduction” is displayed on the Operation or Clean Out screen to inform the operator that the pump is operating at a reduced flow rate. This message also appears on the Fault Reset screen. After removing the cause of the reduced flow rate, RESET is selected on the Fault Reset screen to return the pump to the normal flow rate. After any fault, be sure that centrifuge has come to a complete stop before attempting to re-start.

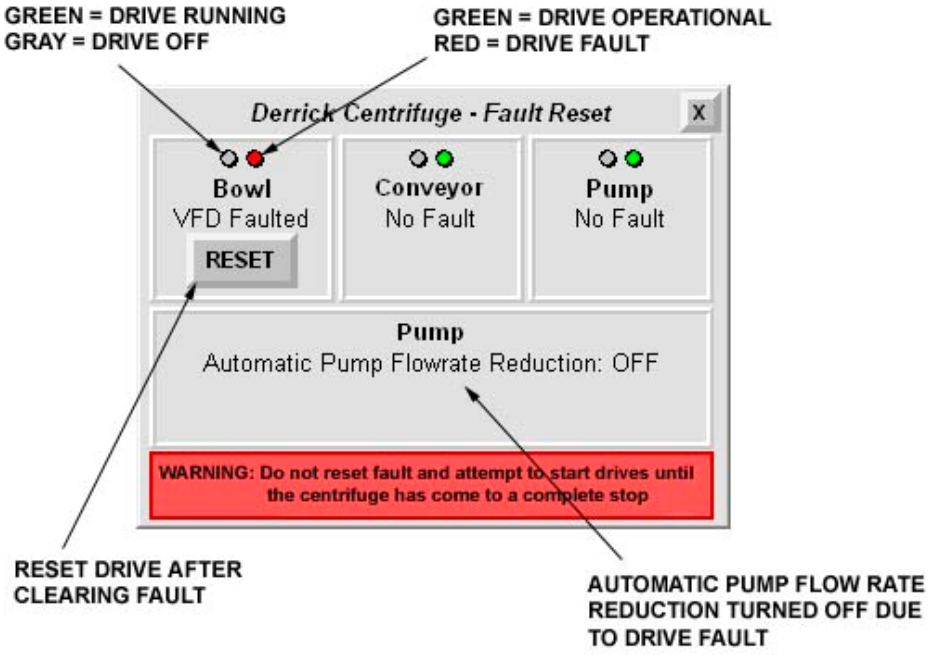


Figure 4098-14 Fault Reset Screen

INITIAL STARTUP

Perform the initial startup procedure when the centrifuge is being started for the first time following installation or after the machine has been relocated. 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.

INITIAL STARTUP	
Step	**Procedure**
1	Confirm that all operators and maintenance personnel have read and understand all operating and safety information in Section 2 - Safety.
2	Check that services and utilities are available at the installation site per *DER01321*.
3	Verify that equipment has been installed properly, all shipping brackets have been removed, and bearing pillow blocks have been tightened to specified torque per *DER03022*.
4	Apply power to centrifuge, and run bowl at 20 RPM with a conveyor differential speed of 5 RPM. Confirm direction of rotation for bowl, conveyor, feed pump, and air conditioner condenser motors as follows: • Bowl - Counterclockwise viewed from fan end • Conveyor - Clockwise viewed from fan end • Feed pump - Per manufacturer's data • Air conditioner condenser - Clockwise viewed from fan end Correct reverse rotation by shutting down power and switching any two of the three power leads at the terminal block(s) inside the cabinet (refer to *DER03022* and electrical schematic diagram in Section 11.
5	With electric power applied, but without centrifuge running, perform the following safety checks: • Operate emergency stop buttons on junction box and control cabinet, and confirm that Emergency Stop alarm message appears on control panel. • Tap vibration switch housing horizontally with a rubber or rawhide mallet, and confirm that High Vibration Fault message appears on control panel. These tests confirm that connections have been correctly made between control cabinet and centrifuge.
6	Start centrifuge in accordance with Normal Startup procedure below.

NORMAL STARTUP

Perform the following procedure at each centrifuge startup:

NORMAL STARTUP	
Step	**Procedure**
1	Without electric power applied, open cover and rotate bowl assembly manually to check that the bowl turns freely and no rubbing is felt.
2	Close cover, tighten all cover bolts to required torque (refer to *DER05029*), and ensure that all guards are in place.
3	Verify that all personnel are clear of centrifuge and all guards are in place before applying electric power to equipment.
4	Turn on compressed air (explosion-proof cabinet only) to purge system. Apply electric power to centrifuge. The 14-minute cabinet purge cycle (explosion-proof cabinet only) should begin, followed by display of the Main screen.
5	With Main screen displayed, select Operation screen.
6	Set Bowl and Conveyor RPMs at desired speeds, unless already set. Set Pump GPM at desired flow, unless already set.
7	Select START to turn on centrifuge. Note that Bowl and Conveyor speeds will gradually rise until they reach their settings, and Torque % for bowl and conveyor will rise.
8	When bowl speed has reached speed setting, select Pump START to start feed pump, and slowly introduce feed to centrifuge. **Note:** Pump will not start until actual bowl speed is within 120 RPM of setting.
9	Adjust feed rate, Bowl speed, and/or Conveyor speed as required to optimize centrifuge operation. Select Data screens at any time to review and monitor centrifuge operating characteristics, including air conditioner status, elapsed operating time, and VFD data. **Note:** Depending on conveyor differential speed setting, at bowl speeds above 300 RPM conveyor motor may rotate in opposite direction.

OPERATION

The properties of the inlet slurry and desired separation should be known in advance. This information can be used to set and change bowl speed, differential speed, and feed rate as required during centrifuge operation. Continual monitoring of the centrifuge control panel indications, as well as the condition of the inlet slurry, are essential to achieving desired effluent clarity and solids dryness. Rising conveyor torque indicates that one or more operating parameters should be lowered to reduce torque. Conversely, falling conveyor torque shows that speed can be raised and/or feed rate increased. Operating parameters should be adjusted, as required, to optimize centrifuge operation and prevent automatic shutdown due to excessive bowl or conveyor torque.

OPERATION (CONT'D)

The following parameters affect centrifuge operation:

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

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

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

Feed Rate

If slurry is low in viscosity and density, increasing the feed rate may permit a higher processing rate. However, as feed rate is increased, residence time in the bowl is decreased, resulting in more solids in the liquid discharge. Also, conveyor torque may rise indicating that the conveyor is becoming burdened by moving the increased solids volume at its present speed. To reduce the conveyor torque, the bowl speed may be lowered, the feed rate may be reduced, or the conveyor speed may be increased to move the solids out faster. The feed rate setting and actual feed rate are shown on the control panel to assist the operator in making adjustments.

Bowl Speed

The faster the bowl speed, the faster solids are settled through the pond to the outer wall of the bowl and 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 solids discharge. Conversely, reducing bowl speed may be desirable for thick, heavy slurry to extract only high-density materials or larger particles.

Both the bowl speed setting and actual bowl speed are shown on the control panel. The torque percentage of the bowl is also displayed. This information is useful in optimizing bowl speed to produce the desired solids dryness and processing speed.

Conveyor Differential Speed

With correct wiring polarity, the conveyor responds correctly to control system commands. Changing the conveyor differential speed adjusts the solids discharge rate. Generally, a slower differential speed will produce drier solids but reduces the solids discharge rate. Increasing conveyor speed reduces drying time, leading to wetter discharged solids. Reducing conveyor speed results in drier solids discharge. However, excessively slow conveyor speed permits solids to accumulate in the bowl, possibly causing an overload condition.

The drying time is reduced by increasing the conveyor differential speed, which will increase the wetness of the solids. Reducing the conveyor differential speed raises the settling time, which will produce drier solids.

Both the conveyor speed setting and actual conveyor speed are shown on the control panel. In addition, the conveyor torque percentage is shown to assist in optimizing conveyor speed to produce the desired solids dryness and processing speed.

Since the conveyor differential speed is controlled by the PLC relative to the bowl speed setting, wiring polarity of electrical components is critical. The effects of electrical polarity on differential speed can be learned from the Conveyor Motor Speed chart in Section 11, which can be used to determine actual speed and direction of conveyor motor for any bowl speed setting. For example, with a bowl speed setting of 2000 RPM and conveyor differential speed set at 60, the conveyor motor will rotate in reverse at -1120 RPM.

The correct bowl-conveyor speed relationship depends on correct wiring polarity. If polarity is reversed, the same bowl speed setting of 2000 RPM described above would result in an actual conveyor differential speed of about 17 rather than the setting of 60.

The following equations can be used to determine the conveyor differential speed or actual conveyor motor speed.

To determine conveyor motor speed when bowl speed and conveyor differential speed (Δ) setting are known:

$$Conveyor\ Motor\ Speed = Bowl\ Speed\left(\Delta\ x\ Gearbox\ Ratio\right)$$

To determine actual differential speed when bowl speed and conveyor motor speed are known:

$$\Delta = \frac{Bowl\ Speed - Conveyor Motor\ Speed}{Gearbox\ Ratio}$$

Pond Depth

Six adjustable effluent ports (Figure 4098-16) are provided on the liquid bowl head to facilitate setting the pond depth; all ports must be set identically. A deeper pond reduces the beach area at the solids discharge end of the bowl, which typically results in a wetter solids discharge. Conversely, setting the pond at a more shallow depth increases the beach area, thus producing drier solids discharge.

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

To adjust pond depth, proceed as follows:

WARNING! DO NOT OPEN COVER OR ATTEMPT ADJUSTMENT OR MAINTENANCE ON THE CENTRIFUGE UNLESS THE BOWL IS COMPLETELY STOPPED.

1. Shut down, lock out, and tag out the centrifuge using the Normal Shutdown procedure described later in this section.
2. Remove access plate from the inlet side of the case cover.
3. Loosen screws securing the weir plates, move the weir plates to the required weir opening size, and re-tighten screws to torque specified in *DER05029*.

4. Set all six weir plates to the same diameter.
5. Re-install access plate on case cover.

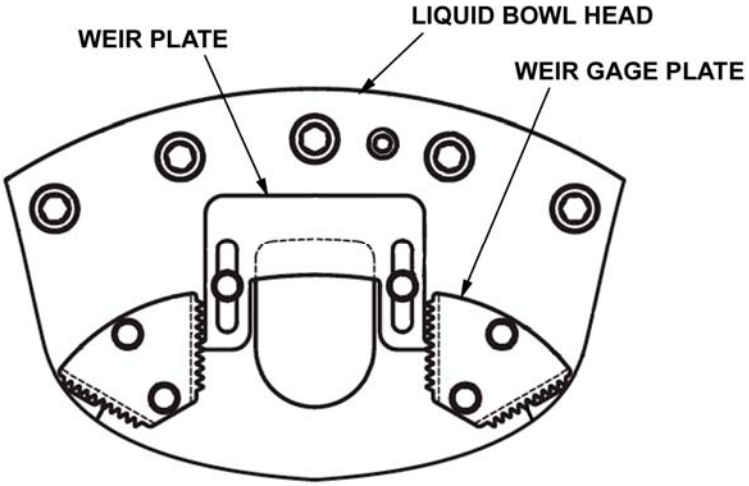


Figure 4098-16 Weir Plate Adjustment

Differential Speed/Conveyor Torque

Generally, a faster conveyor speed results in lower conveyor torque, as solids are discharged faster and usually wetter. Reducing conveyor speed must be done slowly and cautiously, allowing steady-state to be reached before further reduction. Slower conveyor speeds permit solids to remain in the bowl longer. This can permit solids to accumulate in the bowl if the input rate exceeds the discharge rate. Therefore, the torque must be monitored to prevent overload.

Torque limit settings control automatic feed reduction and centrifuge shutdown. As conveyor torque rises, the feed rate is gradually reduced. If torque continues to rise, the feed rate is more rapidly reduced. Upon reaching the maximum conveyor torque setting, the centrifuge is shut down.

At certain conveyor speeds the drive motor must reverse direction to accommodate the differential speed relationship with the bowl. If this occurs, the centrifuge control system automatically assumes control of the feed pump to reduce its flow rate. The message “Automatic Flowrate” appears on the Operation screen to alert personnel that the feed pump is under automatic control. When the reduced feed rate is reached, an 8-second timer is started. Upon expiration of the timed interval, a new conveyor differential speed is applied to correspond with the revised flow rate.

The feed pump remains under automatic control until the operator intervenes by re-setting the Pump Input GPM. Manual control of the feed pump is then restored. This action releases the feed pump from automatic control and clears the Automatic Flowrate message from the screen.

Gearbox

At regular intervals, visually inspect gearbox for oil loss and replenish if necessary (refer to *DER05023*). To perform the inspection, shut down, lockout, and tag out centrifuge, remove belt guard, and open case cover. The likely sources of leakage are the input shaft seal and areas around solids discharge openings of the drum. If oil leakage is found, the gearbox must be removed and overhauled. This procedure must be performed only by trained, qualified personnel who are experienced in gearbox repair and overhaul.

Drive Belt Tension

Drive belt tension should be checked at regular intervals (see *DER05023*).

Alarm and Fault Messages

During centrifuge operation, a message may appear to alert the operator to an anomaly that requires operator intervention. Alarm messages signify that the prevailing condition must be corrected or the centrifuge may be shut down automatically. Fault messages inform the operator that a failure requiring automatic shutdown has occurred.

Refer to *DER05105* - Troubleshooting for alarm messages and their causes and corrective actions.

CLEAN OUT PROCEDURE

If automatic reduction of the pump speed is unable to clear out solids from the conveyor, the torque will continue to rise and the centrifuge will shut down. The clean out procedure should then be used to clear out the impacted solids and return the centrifuge to operational status. The following paragraphs explain the two cleanout options: automatic and manual.

Automatic Cleanout

When the automatic option is selected (Figure 4098-3), the system will perform a cleanout cycle for a pre-set duration. The bowl operates in the forward direction at the set speed, while the conveyor operates in the forward direction at a speed that varies from 4 to 30 RPM. If resistance is encountered during the cleanout, the motors will stop and the cleanout cycle will be repeated. Following a pre-set number of cleanout attempts, the system will pause and alert the operator that the automatic cleanout has been unable to clear the centrifuge. Operator intervention is then required to repeat the automatic cleanout operation. The operator is also alerted if excessive conveyor torque occurs during the cleanout procedure.

Manual Cleanout

If the manual cleanout option is selected, the operator may elect to jog the conveyor in forward and reverse with the bowl set at zero RPM. If desired, however, the operator may choose to operate the bowl as well as the conveyor. Reverse rotation of the conveyor is governed by a timer that terminates reverse operation after a pre-set interval. The primary purpose of the manual cleanout mode is to permit jogging the conveyor in an effort to remove impacted material.

NORMAL SHUTDOWN

The normal shutdown procedure is to be used for controlled stopping of operation. Normal shutdown is performed for routine cleaning, lubrication, inspection, adjustment, end of shift, or other activity requiring the machine to be stationary.

NORMAL SHUTDOWN	
Step	**Procedure**
1	Stop the feed pump.
2	Initially continue the supply of fresh flushing water or oil to remove all solids from conveyor and bowl. Continue flushing for 3 to 5 minutes after feed pump has been shut down. Regardless of shutdown duration, the conveyor operates at a pre-set differential speed while the bowl decelerates to a stop. This process cleans the bowl during the shutdown. The centrifugal force holds the flushing liquid against the bowl wall during the flushing procedure. As the speed gradually drops during the shutdown period, the solids chute can also be flushed. Fittings on the hinge side of the case permit attachment of a hose to wash the exterior of the rotating assembly and interior of the case assembly.
3	After standstill of the centrifuge (which may take more than 10 minutes after interrupting power to the bowl motor), the centrifuge should be restarted for 20 to 30 seconds to clear away solids released during collapse of the water ring.
4	Conveyor gearbox drive motor automatically shuts down when bowl speed falls to less than 200 RPM.
5	Open fused disconnect supplying electric power to the machine, and lock out and tag out machine.
6	For cabinet with purge system, turn off compressed air supply to cabinet purge unit.

EMERGENCY SHUTDOWN

To immediately stop the centrifuge in case of emergency, press the EMERGENCY STOP button on the control cabinet or centrifuge, select STOP on the Operation screen, or open the fused disconnect supplying electric power to the machine.

AUTOMATIC SHUTDOWNS

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

Excessive vibration of the centrifuge 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 above.

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

Main Bearing Temperatures

Temperature sensors are installed on the liquid and solid end main bearings and connected to the PLC. Bearing temperatures are continuously displayed on the Operation screen. An alarm message is displayed on the control panel when bearing temperature exceeds 225°F (107°C). If temperature rises to 250°F (120°C), a fault message appears and the centrifuge is shut down. Excessively high bearing temperatures usually indicate bearing failure, which can result from inadequate lubrication, contamination, or normal wear. Refer to *DER05024* for main bearing replacement procedure.

Note: Both main bearings should be replaced if centrifuge has shut down due to high main bearing temperature.

Excessive Bowl Speed

A sensor that detects the rotating speed of the bowl provides an input to the PLC that produces a continuous display of actual bowl speed on the Operation and VFD screens. If the bowl speed exceeds 3050 RPM, the bowl speed sensor provides an input to the PLC causing an alarm message to be displayed on the control panel. A fault message is displayed and the centrifuge is immediately shut down if speed rises to 3100 RPM. To re-start the centrifuge, allow the bowl to coast to a complete stop, check for and remove the cause of excessive speed. With bowl at a complete stop, check speed sensor as follows:

1. Check speed sensor connections.
2. With bowl at a complete stop, check for a zero bowl speed reading on bowl VFD screen (Figure 4098-10). A reading of “0” indicates no defects in sensor and connection. If reading is greater than 3250 RPM, check sensor and/or connection.
3. Replace sensor if defective, and/or repair damaged connection.
4. After correcting any defect(s), re-start the machine using the Normal Startup procedure above, and re-check bowl speed.

PREVENTIVE MAINTENANCE

DE-7200 CENTRIFUGE

GENERAL

Preventive maintenance consists of overall inspection, cleaning, and lubrication. Routine maintenance will ensure maximum life and trouble-free operation. While the maintenance schedule presented in this section is not rigid, modifications should be based on experience with operating the equipment at your facilities. A maintenance log using document *DER13000* should be kept to help establish a routine maintenance schedule, as well as to monitor and adjust the schedule as necessary throughout the equipment's life.

Consider the following factors when establishing a maintenance schedule:

- Duty cycle
- Ambient temperature
- Operating environment

RECOMMENDED ROUTINE MAINTENANCE

Following is Derrick's recommended routine maintenance schedule for the centrifuge. This schedule may be altered, if warranted by local conditions and operational requirements.

PREVENTIVE MAINTENANCE SCHEDULE	
Action	**Frequency**
Inspect feed connection for leaks, and tighten connection flange hardware as required.	Every shift
Inspect liquid discharge connection for leaks. Tighten connection to prevent leakage.	Every shift
Grease main bearings (Figure 5023-1).	Every 40 Hrs
Grease conveyor bearing (Figure 5023-1).	Every 500 Hrs
Change conveyor drive gearbox oil (Figure 5023-1).	Every 2500 Hrs
Remove feed component assembly, clean interior of pipe, and reinstall.	Every 40 hrs
Check for and remove accumulated solids from interior and exterior of case.	Every 40 hrs or as needed
Remove belt cover, inspect belt for damage, and check/adjust tension.	Every 160 hrs
Inspect flexible coupling between conveyor drive motor and gearbox shaft.	Per mfctr*

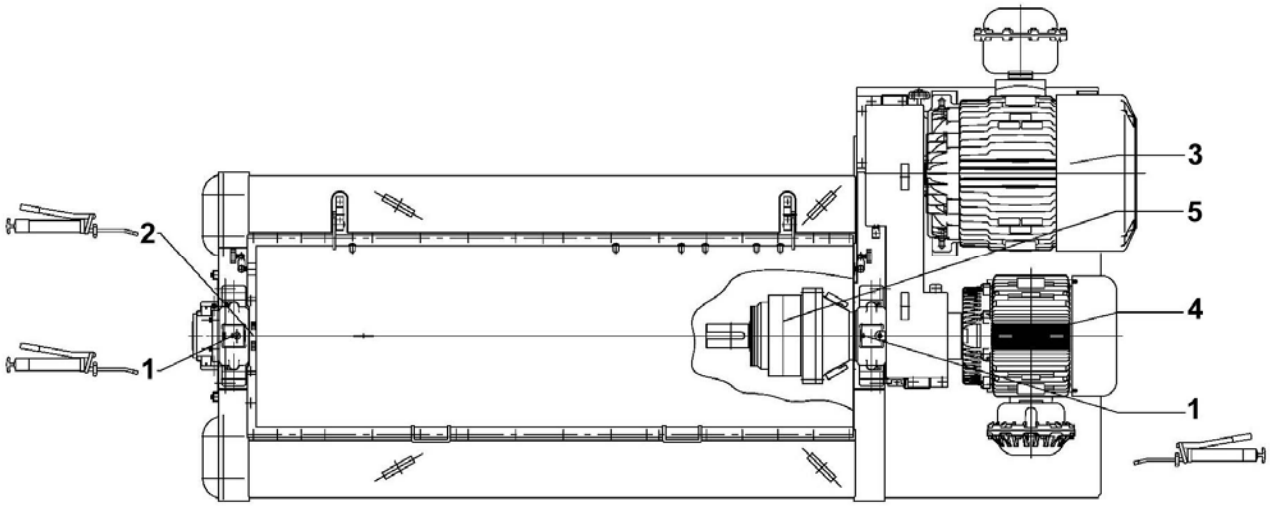
**Inspect per manufacturer recommendations (Refer to Rotex manual in Section 12).*

RECOMMENDED ROUTINE MAINTENANCE (CONT'D)

Greasing Bearings

The main bearings, conveyor bearing, bowl drive motor, and conveyor drive motor are equipped with grease fittings. Clean each fitting before greasing, and inject the specified type and quantity of grease listed in Figure 5023-1.

WARNING! USE ONLY SPECIFIED PRODUCTS. BEFORE CONNECTING GREASE GUN, REMOVE ALL VISIBLE TRACES OF GREASE FROM FITTINGS.



No.	Location	Amount	Interval	Type	Application Notes
1	Main bearings	6 cm^3 (3 strokes)	40 Hrs	Shell Albida EP2	Centrifuge running Manual grease gun
2	Conveyor bearing	Grease exits outlet port	500 Hrs	Shell Albida EP2	Centrifuge stationary Manual grease gun
3	Bowl drive motor*	Refer to Marathon Electric manual in Section 12 for lubrication details.		Exxon Polyrex EM	Centrifuge stationary
4	Conveyor drive motor*			Exxon Polyrex EM	Centrifuge stationary
5	Conveyor drive gearbox	5 qts (4.9 l)	2500 Hrs	Mobil SHC629	First oil change after 500 hrs. Change oil with centrifuge stationary; check level when warm

Figure 5023-1 Bearing Lubrication Points

Gearbox Oil Change

Change gearbox oil at intervals listed in Figure 5023-1. To change oil, proceed as follows:

1. Shut down, and lockout and tag out centrifuge.
2. Remove screws securing top cover, and open cover.
3. Place a suitable container capable of retaining 5 quarts (5.5 liters) of oil beneath gearbox.
4. Rotate gearbox until one drain plug is at bottom of gearbox.
5. Remove two plugs at top of gearbox to permit air entry and thereby facilitate draining.
6. Remove plug at bottom of gearbox to drain oil.
7. After fully draining gearbox, reinstall and tighten bottom plug.
8. Re-fill gearbox with product and quantity listed.
9. Re-install top fill plugs, and tighten securely.

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, parts list, and electrical drawings in Section 11 - Reference Drawings for Derrick component locations and part numbers. Refer to Section 12 for supplier component information.

MAINTENANCE PROCEDURES

The following paragraphs describe maintenance procedures for centrifuge components and assemblies. Obvious procedures are omitted.

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.

Drive Belts

The drive belts should be tensioned periodically and replaced if inspection reveals damage or deterioration. To tension and/or replace the belts, proceed as follows:

WARNING! ALWAYS ALLOW ROTATING ASSEMBLY TO COAST TO A COMPLETE STOP BEFORE REMOVING BELT GUARD.

1. Shut down, lock out, and tag out electric power to the centrifuge.
2. Remove belt guard.
3. Loosen four screws securing flexible coupling half (Figure 5023-2) to shaft of conveyor drive motor, and slide coupling half toward motor until end of motor shaft is visible.

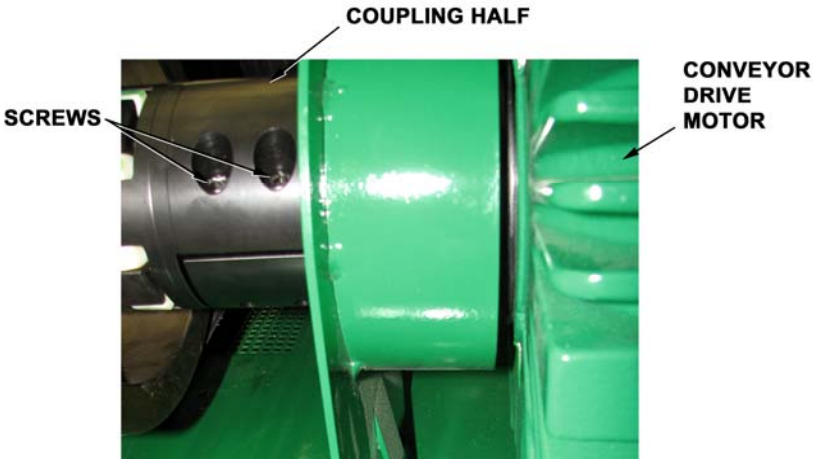


Figure 5023-2 Conveyor Flexible Coupling

4. Loosen bolts securing bowl drive motor to base, turn tensioning bolt to loosen belts, and remove belts from bowl and motor sheaves by maneuvering out between conveyor drive motor and conveyor shaft.
5. Install new belts onto bowl drive motor and bowl sheaves.
6. Turn tensioning bolt to apply tension to belt. Apply sufficient belt tension to permit a 1/2” (13mm) deflection when pressed with a 17 lb (75 N) force at the midpoint of the belt (Figure 5023-3). Correct tension will prevent slippage without overloading bearings. After correct tension is set, tighten motor base retaining bolts to secure motor.
7. Slide flexible coupling half back into engagement with coupling half on conveyor drive gearbox shaft. Set gap between coupling halves in accordance with Rotex manual in Section 12. Install and tighten screws to secure coupling half in accordance with Rotex manual.
8. Install and secure belt guard.

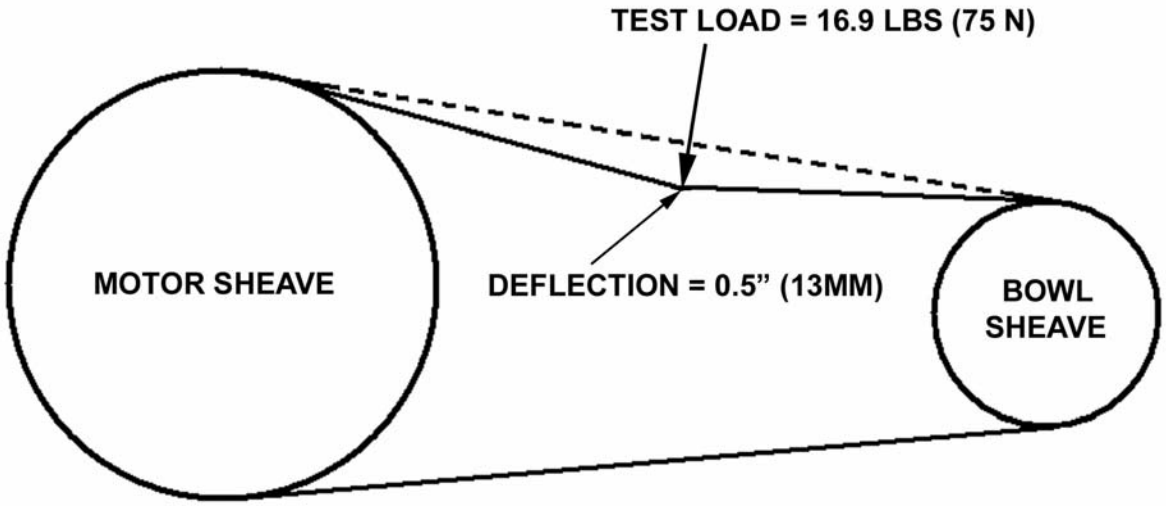


Figure 5023-3 Drive Belt Tensioning

Rotating Assembly

Maintenance of the rotating assembly requires disassembly and can only be performed with the assembly removed from the case. After removal, the rotating assembly is oriented with the solid end down to facilitate removal of the liquid bowl head and conveyor. Refer to the following procedures for rotating assembly maintenance:

DER05023 - Gearbox Removal and Installation

DER05024 - Main Bearing Replacement

DER05025 - Conveyor Bearing Replacement

DER05026 - Rotating Assembly Removal and Installation

MAIN BEARING REPLACEMENT

DE-7200 CENTRIFUGE

GENERAL

This procedure describes replacement of the main bearings. Excessive noise, vibration, or high temperature 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.

Note! All attaching hardware must be correctly tightened. Refer to *DER05029* for hardware tightening requirements.

MAIN BEARINGS

The ends of the rotating assembly are supported by roller bearings fitted within pillow blocks. The main bearings must be replaced as a set. Consequently, if one bearing is found defective, always replace both bearings.

Bearing Removal

Either bearing may be removed first. In the following procedure, however, the solid end main bearing is removed first, followed by removal of the liquid end bearing. If either bearing is found defective, both bearings must be replaced as a set.

To remove the main bearings, proceed as follows:

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. Stop feed, and shut down, lock out, and tag out electric power to the centrifuge. Allow rotating assembly to coast to a full stop.
2. Remove screws securing belt guard to base, and lift and remove guard.
3. Remove screws securing case cover to case, and open case cover.
4. Remove screws securing both conveyor drive gearbox coupling halves together, and remove coupling halves.
5. Disconnect feed pipe from feed component flange.

Bearing Removal (Cont'd)

6. Loosen nuts securing bowl drive motor to base, turn tensioning bolt to release tension, and remove belts from bowl sheave.
7. Remove bolts, flat washers, and lockwashers securing pillow blocks to base at liquid and solid ends.
8. Disconnect leads to liquid and solid end temperature sensors and speed sensor at junction box on centrifuge base.
9. The rotating assembly weighs about 3000 pounds (1400 kg). Select a suitable hoist capable of lifting at least 3500 lbs (1600 kg) to rotating assembly, and lift rotating assembly until clear of base.
10. Lower rotating assembly onto a cradle that is capable of supporting its weight.
11. Remove screws securing upper and lower halves of pillow block together, and support lower half while prying between parts to separate and remove pillow block halves from bearing.
12. Remove screws securing sheave to bowl flange, and remove sheave.
13. Remove screws securing input flange to gearbox housing, and remove flange.
14. Loosen set screw securing shell (Figure 5024-1) to conveyor drive gearbox shaft, and remove O-ring, shell, grease adjuster, and spacer ring from gearbox shaft.
15. Using a suitable puller, remove solid end bearing from gearbox shaft.

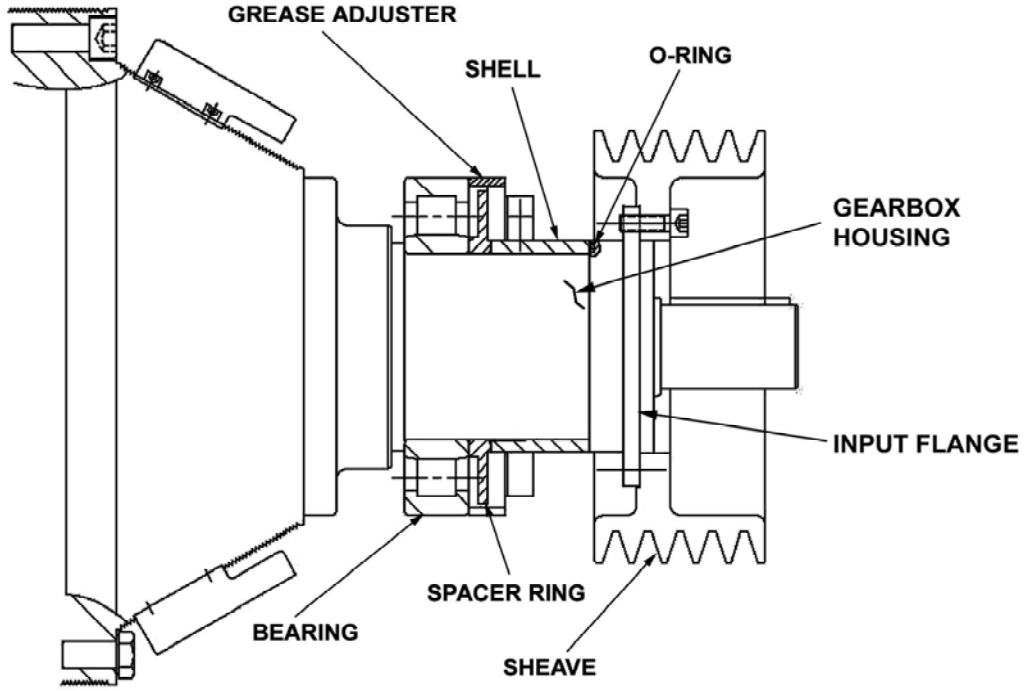


Figure 5024-1 Solid End Bearing Detail

To remove the liquid end main bearing, proceed as follows:

1. Remove screws securing clamping ring (Figure 5024-2) to liquid bowl head, loosen setscrews securing clamping ring, and remove clamping ring.
2. Remove felt ring, packing seal, O-ring, and retaining washer from bowl head.
3. Using a suitable puller, remove liquid end bearing from bowl head shaft.
4. Remove flinger and O-ring from shaft.

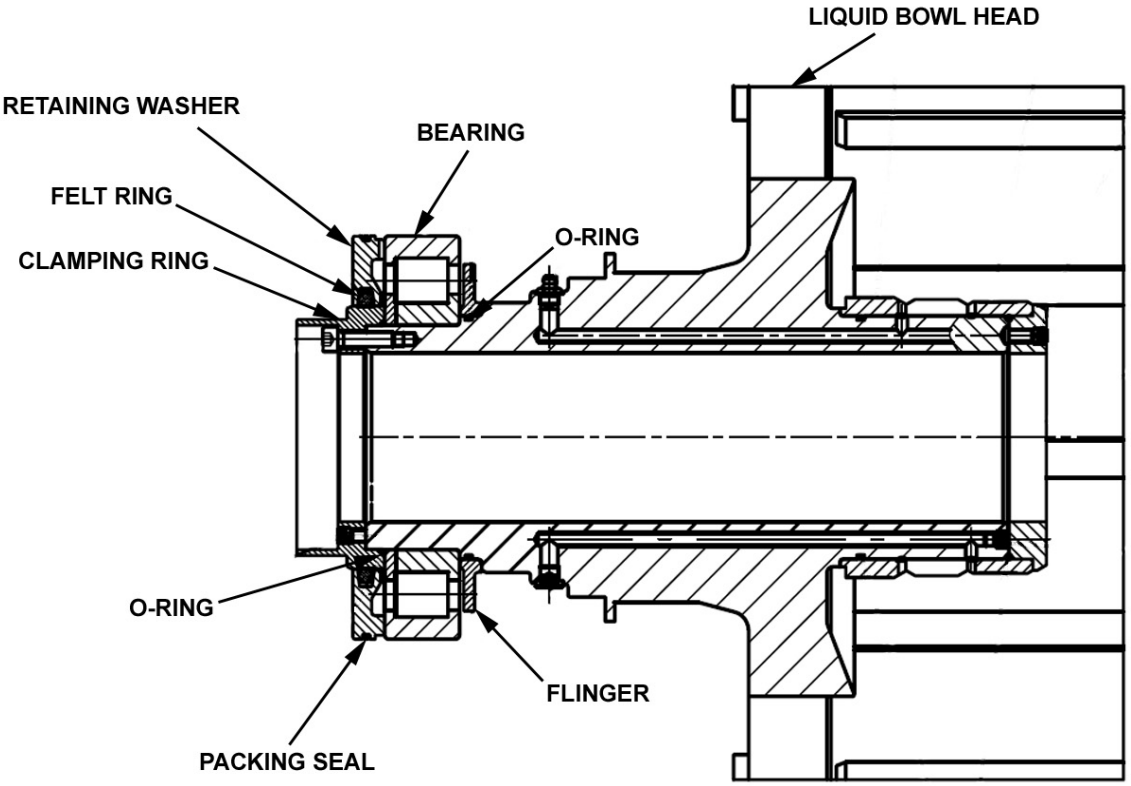


Figure 5024-2 Liquid End Bearing Detail

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 all parts for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace components that are obviously deformed or have serious flaws that render them unserviceable.
3. Using a micrometer, measure critical dimensions of liquid bowl head and conveyor drive bearing journals. If the liquid end journal is undersize, replace the liquid bowl head. Replace the conveyor drive gearbox if the solid end journal is undersize,

Cleaning, Inspection, and Repair (Cont'd)

4. Inspect pillow blocks for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects, or replace if serious defects or cracks are found.
5. Replace any component that cannot be easily repaired.
6. Replace all O-rings, seals, and bearings.
7. Place all cleaned components in clean plastic bags to prevent contamination.

Installation

The procedure describes installation of the solid end main bearing first, followed by the liquid end bearing. However, either bearing may be installed first.

To install the solid end main bearing, proceed as follows:

1. Using a bearing heater or heated oil bath, heat main bearing inner race to about 230°F (110°C). Wearing protective gloves, slide race onto journal.
2. Pack bearing with grease in accordance with lubrication chart in DER05023, and install bearing (Figure 5024-1) onto inner race.
3. Install spacer ring and grease adjuster on gearbox shaft.
4. Slide shell and O-ring onto gearbox shaft, and secure shell by tightening setscrew.
5. Position input flange on gearbox housing, and install and tighten screws in accordance with *DER05029*.
6. Place upper and lower halves of solid end pillow block on main bearing, and secure with screws tightened to torque specified in *DER05029*.
7. Orient sheave so that keyway aligns with key in gearbox shaft, and slide sheave onto shaft and against input flange.
8. Secure sheave to bowl flange with screws installed in accordance with *DER05029*.

To install the liquid end main bearing and re-install rotating assembly, proceed as follows:

1. Install O-ring (Figure 5024-2) and flinger on liquid bowl head journal.
2. Pack bearing with grease in accordance with lubrication chart in *DER05023*, and install and seat bearing on bowl head shaft.
3. Install retaining washer, O-ring, packing seal, and felt ring on bowl head shaft.
4. Install clamping ring on bowl head, and secure with screws. Tighten clamping ring setscrews to torque specified in *DER05029*.
5. Place upper and lower halves of liquid end pillow block on main bearing, and secure with bolts tightened to torque specified in *DER05029*.
6. Operate hoist to lower rotating assembly into centrifuge until pillow blocks contact base.
7. Use a brass hammer to fully seat alignment pins in bearing pillow blocks and base; then insert mounting bolts with washers and spring washers through holes. Tighten bolts incrementally to torque specified in *DER05029*. Do not tighten nuts on alignment pins.

8. Install drive belts on motor and bowl assembly sheaves, and tension belts in accordance with *DER05023*.
9. Install flexible coupling half onto gearbox shaft at location noted in *Removal*.
10. Insert spider into flexible coupling half on motor shaft, and slide coupling half back into engagement with coupling half on conveyor drive gearbox shaft. Set gap between coupling halves at about 0.125" (3mm). Install and tighten screws to secure coupling to shafts in accordance with Rotex manual, KTR-N 40226 E, in Section 12.
11. Grease main bearings in accordance with lubrication chart in *DER05023* and the following steps:
    a. Apply electric power, start up centrifuge, and adjust bowl speed to 500 rpm.
    b. While watching bearing temperature, inject new grease into pillow block until grease flows from the outlet port on the bottom half of the pillow block at the belt side.
12. Close case cover, and secure with screws, tightening from center of cover outward in both directions.
13. Install belt guard over motor and bowl assembly sheaves, and secure to base with screws.
14. Connect feed pipe to feed component flange.
15. Apply electric power, and start up centrifuge (refer to *DER04098*). Carefully monitor performance, and check for any unusual noise.

CONVEYOR BEARING REPLACEMENT

DE-7200 CENTRIFUGE

GENERAL

This procedure describes replacement of the conveyor bearing. This procedure requires removal of the conveyor assembly from the bowl assembly. Excessive noise or vibration during centrifuge operation may indicate a defective bearing. If such conditions are evident, the conveyor should be removed and the bearing inspected for looseness and replaced if necessary.

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

Note! All attaching hardware must be correctly tightened. Refer to the torque chart in *DER05029* for hardware tightening requirements.

REMOVAL

The liquid end of the conveyor is supported by a roller bearing fitted within a housing in the conveyor. The solid end is supported by the conveyor drive gearbox bearing. If the liquid end bearing is found defective, always check for gearbox shaft looseness. The gearbox shaft bearing must also be replaced if shaft looseness is found.

To remove the conveyor bearing, proceed as follows:

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 (refer to *DER04098*). Allow rotating assembly to coast to a full stop.
2. Disconnect feed piping from feed component.
3. Remove screws securing belt guard to base, and lift and remove guard.
4. Remove screws securing case cover to case, and open case cover.
5. Remove conveyor drive gearbox in accordance with the gearbox removal procedures in *DER05037*.
6. Hoist liquid end of rotating assembly until rotating assembly is vertical (Figure 5025-1), and then place solid end on a stable flat surface. Maintain suitable support of rotating assembly in vertical position throughout remainder of conveyor removal procedure.

REMOVAL (CONT'D)

Figure 5025-1 Removing Conveyor From Bowl Assembly

7. Remove screws securing liquid bowl head to bowl assembly, and install jackscrews in four locations around periphery of bowl head.
8. Attach a suitable hoist to liquid bowl head, and turn jackscrews clockwise in equal stages to separate bowl head from bowl assembly, and operate hoist to lift and remove bowl head from bowl assembly.

CAUTION! CLEARANCE BETWEEN CONVEYOR FLIGHTS AND BOWL LINING IS ONLY 1.5 MM. IN THE FOLLOWING STEP, DO NOT CONTINUE LIFT IF RESISTANCE IS FELT AS THIS COULD DAMAGE THE CONVEYOR FLIGHTS.

9. Attach a suitable hoist to conveyor, and slowly lift conveyor clear of bowl assembly.
10. Lower conveyor horizontally onto a cradle suitable to support its weight.
11. Remove screws (Figure 5025-2) securing bearing housing to conveyor, and install two jackscrews at opposite sides of housing. Tighten jackscrews equally to extract and remove bearing housing.
12. Remove screws securing seal cover to bearing housing, and remove seal cover and shaft seal.

13. Using a suitable puller, remove bearing from bearing housing and then remove second shaft seal from housing.
14. Discard bearing and shaft seals.

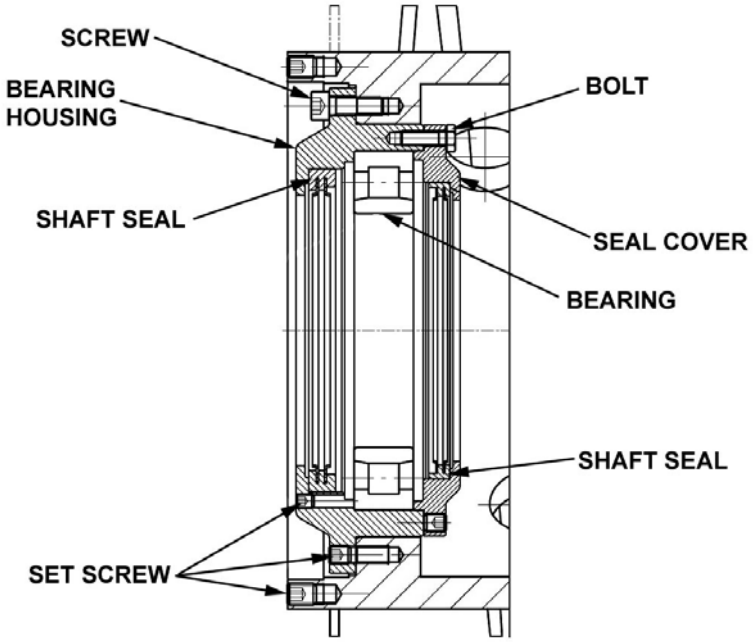


Figure 5025-2 Conveyor Bearing Detail

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 all parts for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace components that are obviously deformed or have serious flaws that render them unserviceable.
3. Inspect conveyor for distorted or gouged flights, burrs, or other obvious damage. Blend out any minor surface defects. Replace conveyor if obviously deformed or has serious defects that render it unserviceable.
4. Inspect conveyor wear inserts for obvious wear. Replace inserts if found highly damaged. To help preserve dynamic balance, always replace inserts in pairs that are opposite to each other.
5. Inspect solids discharge wear inserts and weir plates on liquid bowl head for cracks, fractures, or other damage, and replace if obviously damaged
6. Inspect drive sleeve and V-ring at gearbox end of conveyor for gouges, distortion, or obvious signs of wear. Replace part(s) if required.
7. Using a micrometer, measure critical dimensions of liquid bowl head conveyor bearing journal and bearing housing bore. If the liquid end journal is undersize, replace the liquid bowl head. Replace the bearing housing if bore is oversize.

CLEANING, INSPECTION, AND REPAIR (CONT'D)

8. Replace any component that cannot be easily repaired. Replace all shaft seals and bearings.
9. Place all cleaned components in clean plastic bags to prevent contamination.

INSTALLATION

This procedure describes installation of the liquid end conveyor bearing. If the gearbox bearing is found to be loose, the gearbox must be replaced or rebuilt as well (refer to *DER05037*).

To install the liquid end conveyor bearing, proceed as follows:

1. Install a new shaft seal into bearing housing (Figure 5025-2), and then insert and seat bearing into housing.
2. Install a new shaft seal in seal cover, and assemble cover on bearing housing. Secure parts together with hex head screws.
3. Install assembled bearing housing on conveyor, and secure with screws.

CAUTION! CLEARANCE BETWEEN CONVEYOR FLIGHTS AND BOWL LINING IS ONLY 1.5 MM. IN THE FOLLOWING STEP, USE EXTREME CARE WHEN LOWERING CONVEYOR INTO BOWL ASSEMBLY TO AVOID CONTACTING BOWL LINING AS THIS COULD DAMAGE CONVEYOR FLIGHTS.

4. Hoist conveyor into a vertical position (Figure 5025-1), and insert into vertical bowl assembly.
5. Hoist liquid bowl head, and lower onto conveyor using care to avoid damaging bearing as conveyor bearing journal enters inner bearing race. Secure liquid bowl head to bowl assembly with screws.
6. Hoist assembled rotating assembly, and position horizontally on a cradle suitable for supporting its weight.
7. Install and fill gearbox in accordance with the gearbox installation procedures in *DER05037*.
8. Close case cover, and secure with screws, tightening from center of cover outward in both directions.
9. Install and secure belt guard over motor and bowl assembly sheaves.
10. Connect feed piping to feed component flange.
11. Apply electric power, and start up centrifuge (refer to *DER04098*). Carefully monitor performance, and check for any unusual noise.

ROTATING ASSEMBLY REMOVAL AND INSTALLATION

DE-7200 CENTRIFUGE

GENERAL

This procedure describes removal and installation of the rotating assembly. Removal may be required to clean out, inspect, or perform maintenance on the rotating assembly. Excessive noise or vibration during centrifuge operation may indicate defective main or conveyor bearings. If such conditions are evident, the bearings should be inspected for looseness and replaced if necessary (refer to *DER05024* and *DER05025*).

Note! All attaching hardware must be correctly tightened. Refer to the torque chart in *DER05029* for hardware tightening requirements.

REMOVAL

The rotating assembly must be removed for thorough cleaning, bearing replacement, or to perform inspection and maintenance. To remove the rotating assembly, proceed as follows:

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. Turn off feed, and shut down, lock out, and tag out electric power to the centrifuge. Allow rotating assembly to coast to a full stop.
2. Disconnect feed pipe from feed component flange.
3. Remove screws securing belt guard to case, and lift and remove guard.
4. Remove screws securing case cover to case, and open case cover.
5. Loosen four screws securing flexible coupling half to shaft of conveyor drive motor, and slide coupling half toward motor until end of motor shaft is visible.
6. Loosen nuts securing bowl drive motor to base, turn tensioning bolt to release tension, and remove belts from bowl sheave.
7. Remove bolts, lockwashers, and flat washers securing pillow blocks to base at liquid and solid ends (Figure 5026-1) and remove alignment pins from pillow blocks.
8. Select a suitable hoist capable of lifting at least 4000 lbs (1800 kg) to rotating assembly, and lift rotating assembly until clear of base.

REMOVAL (CONT'D)

9. Lower rotating assembly onto a cradle that is capable of supporting its weight.
10. Disassemble rotating assembly to the extent necessary for inspection, repair, and parts replacement.

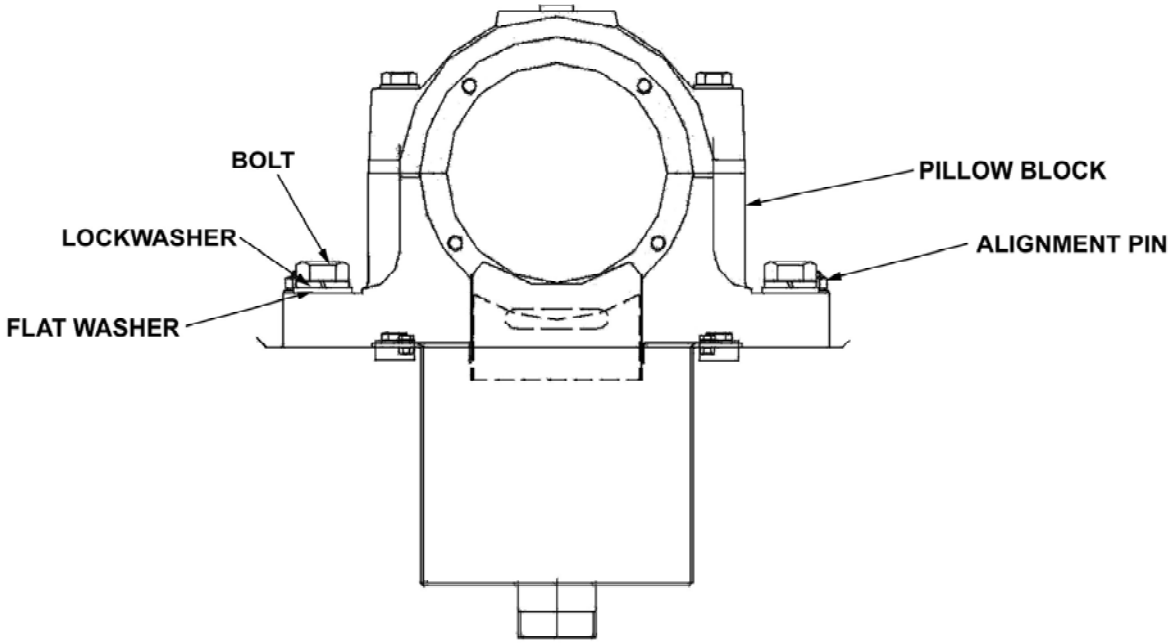


Figure 5026-1 Bearing Pillow Block

CLEANING, INSPECTION, AND REPAIR

Clean, inspect, and repair rotating assembly as follows:

1. Wash mud and debris from conveyor and interior and exterior of bowl assembly, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. If conveyor was removed, inspect conveyor for distorted or gouged flights, burrs, or other obvious damage. Blend out any minor surface defects. Replace conveyor if obviously deformed or it has serious defects that render it unserviceable.
3. If conveyor was removed, inspect wear inserts for obvious wear. Replace inserts if found highly damaged. To help preserve dynamic balance, always replace inserts in pairs that are opposite to each other.
4. Inspect drive sleeve and V-ring at gearbox end of conveyor for gouges, distortion, or obvious signs of wear. Replace part(s) if required.
5. Inspect solids discharge wear inserts and weir plates on head wall of bowl assembly for cracks, fractures, or other damage, and replace if obviously damaged.
6. Inspect bowl interior and exterior for gouges, scratches, or other damage that may affect performance. Blend out minor defects; replace bowl if damage cannot be repaired.

7. Check main bearings and conveyor bearings for looseness, noise, or rubbing. Replace any defective bearings in accordance with replacement procedures in *DER05024* and *DER05025*.
8. Inspect pillow blocks for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects, or replace if serious defects or cracks are found.

INSTALLATION

To install the rotating assembly, proceed as follows:

1. Using a suitable hoist capable of lifting at least 3500 lbs (1600 kg), lift rotating assembly from cradle and lower onto base with pillow blocks in close alignment with mounting holes.
2. Use a brass hammer to fully seat alignment pins in bearing pillow blocks and base; do not tighten nuts on alignment pins.
3. Insert mounting bolts with washers through holes. Tighten bolts in stages to torque specified in *DER05029*.
4. Install and tension drive belts between motor and bowl sheaves in accordance with *DER05023*.
5. Insert spider into flexible coupling half on motor shaft, and slide coupling half back into engagement with coupling half on conveyor drive gearbox shaft. Set gap between coupling halves at about 0.125” (3mm). Install and tighten screws to secure coupling to shafts in accordance with Rotex manual, KTR-N 40226 E, in Section 12.
6. Grease main bearings in accordance with lubrication chart in *DER05023* and the following steps:
   a. Apply electric power, start up centrifuge, and adjust bowl speed to 500 rpm.
   b. While watching bearing temperature, inject new grease into pillow block until grease flows from the outlet port on the bottom half of the pillow block at the belt side.
7. Close case cover, and secure with screws, tightening from center of cover outward in both directions.
8. Install and secure belt guard over motor and bowl assembly sheaves.
9. Connect feed piping to feed component flange.
10. Apply electric power, start up centrifuge (refer to *DER04098*). Carefully monitor performance, and check for any unusual noise.

HARDWARE TORQUE SPECIFICATIONS

DE-7200 CENTRIFUGE

GENERAL

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.

TORQUE CHART

Recommended seating torque specifications for the various types and sizes of hardware used on the centrifuge are shown on the following pages.

Use the following procedure when tightening hardware:

1. Use only a calibrated torque wrench.
2. When tightening more than one bolt, alternate tightening between bolts.
3. Always approach the final torque in several stages.

HARDWARE TORQUE				
Type	**Location**	**Torque**		
		Ft lbs	**In lbs**	**Nm**
M16	Top and bottom halves of main bearing pillow block	144	1726	195
M16	Backdrive gearbox shaft sleeve to bowl assembly	136	1628	184
M12	Bowl and backdrive gearbox motors to base	41	496	56
M8	Conveyor bearing retainer to bearing housing	12	142	16
M10	Conveyor bearing housing to conveyor	32	381	43
M10	Weir plate to liquid bowl head	24	283	32
M10	Top cover to case	24	283	32
M16	Liquid bowl head to bowl assembly	136	1628	184
M16	Backdrive gearbox to bowl assembly	100	1204	136
M10	Sheave to mounting flange on backdrive gearbox	24	283	32
M6	Sheave mounting flange to backdrive gearbox	12	142	16
M24	Main bearing pillow block to base	502	6018	680
M12	Feed tube to pillow block	55	650	75

RECOMMENDED SPARE PARTS LIST

DE-7200 CENTRIFUGE - VARIABLE FREQUENCY DRIVE

GENERAL

This section presents a list of the recommended spare parts required to support a single DE-7200 centrifuge for one year. This list includes the components most susceptible to wear; however, all potential part replacements cannot be predicted. The complete spare parts inventory should be based on the user's experience with similar equipment.

Consider the following factors when establishing a spare parts inventory:

- Duty cycle
- Ambient temperature
- Operating environment

Following is the recommended spare parts list for the DE-7200 centrifuge:

PART NO.	DESCRIPTION	REC. QTY
Base - 16601-00		
G0007717	Vibration Isolator	5
G0007725	Taper Pin	4
G0007726	Felt Strip	1
G0007727	Felt Strip	2
Bowl - 16603-00		
G0007796	Solid Discharge Wear Insert	8
G0007808	Roller Bearing, Liquid End	1
G0007809	Felt Ring	1
G0007810	Packing Seal, Liquid End	1
G0007811	O-Ring, Clamping Ring	1
G0007813	O-Ring, Liquid End	3
G0007827	Plow	2
G0007832	Socket Head Screw	6
G0007820	Sealing Ring	1
G0007821	Sealing Ring	1

PART NO.	DESCRIPTION	REC. QTY
Bowl - 16603-00 (Cont'd)		
G0007822	Roller Bearing, Solid End	1
G0007823	O-Ring Gear Box	1
G0007829	O-Ring Drive Pulley	1
G0007763	Hex Head Bolt	12
G0007729	Flat Washer	12
Case And Cover - 16602-00		
G0007759	Seal Tape	2
G0007752	Rubber Seal	5
Conveyor - 16604-00		
G0007875	Shaft Seal	1
G0007876	Shaft Seal	1
G0007877	Roller Bearing, Conveyor	1
G0007883	V - Ring	1
G0007886	Wear Insert, Feed Nozzle	8
G0008351	Adhesive, Wear Insert	1
Misc. Drive Components - 16621-00		
G0007964	Drive Belt	5
G0007870	Coupling	1
Tool Kit - 16673-00		
G0008185	Grease Cartridge	5
Misc. Parts - 16674-00		
G0007903	Gear Oil	2 Gal
Gear Unit - 16672-00		
G0008169	Sealing Ring	2

PART NO.	DESCRIPTION	REC. QTY
Electrical Parts List - 16593-00		
G0007265	RTD Sensor, Liquid End	1
G0007712	RTD Sensor, Solid End	1
G0007861	Speed Sensor	1
Control Enclosure - 16472-00-002		
G0007698	Fuse, 60 Amp, Class J	3
G0007981	Fuse, 1.5 Amp	3
G0007225	Fuse, 150 Amp, Class J	2
G0007632	Fuse, 200 Amp Class J	3
G0002910	Fuse, 2.5 Amp 600 Vac	2
G0002911	Fuse, 7.0 Amp 250 Vac	1
G0003493	Fuse, 15.0 Amp, 600 Vac	3
G0002301	Air Filter Element	1
G0002302	Air Filter Element	1
G0008005	Door Latch	4
Explosion-Proof Electrical Control Panel - 16622-00-001		
G0002902	Time Delay Fuse, 1.25 Amp	2
G0002912	Time Delay Fuse, 3.0 Amp	1

TROUBLESHOOTING

DE-7200 CENTRIFUGE

GENERAL

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

TROUBLESHOOTING PROCEDURE

Operating characteristics are continually monitored during centrifuge operation. Sensors are installed in key areas of the centrifuge to detect performance and provide inputs to the PLC, which responds by displaying real-time information on the operator's screen. If warranted, the PLC alters the feed rate or completely shuts down the equipment if pre-set limits on temperature, vibration, conveyor torque, or bowl speed are exceeded.

Charts and illustrations are included in this section to aid in troubleshooting. The troubleshooting chart describes mechanical failure modes, possible cause(s), and recommended course(s) of action. Following this chart is a table containing definitions, causes, and corrective actions for alarm and fault messages shown on the operator's screen. Some of the fault isolation procedures require electrical continuity testing, which should be performed only by trained, qualified personnel. Always shut down, lock out, and tag out electric power to 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.

Further assistance for troubleshooting is provided by several illustrations that show and describe the functions of status indicators on the variable frequency drives and other components inside the control cabinet.

Schematic diagrams of ac-dc power distribution, analog sensor connections, and Ethernet connections are included at the rear of this section for additional troubleshooting assistance. The engineering schematic in Section 11 - Reference Drawings, supplier literature in Section 12 and description and theory of operation in Section 1 provide further assistance in troubleshooting.

TROUBLESHOOTING DE-7200 CENTRIFUGE	
Possible Cause	**Isolation Procedure & Corrective Action**
Failure Mode 1: Acceptable liquid, Cake Too Thin	
Insufficient solids in feed	Increase feed rate.
	Increase weir opening (refer to DER04098).
	Reduce differential speed.
Drop in feed pump rate	Increase feed rate.
	Check feed pump; if required, check wear and replace worn parts.
	Check pump shaft seal, and correct any defects.
	Select RESET on Fault Reset screen to reset flow rate.
Failure Mode 2: Poor Liquid Quality, Acceptable Cake	
Bowl speed too low	Increase bowl speed.
	Reduce feed rate.
Excessive amount of solids in feed	Reduce quantity of solids in feed or add dilution stream if possible.
Change in feed characteristics	Reduce quantity of solids in feed or generally optimize machines settings, i.e. adjust bowl speed, differential speed, and weir opening.
Increase in solids wetness	Re-optimize machine settings.
	Reduce feed rate.
	Increase weir opening (refer to *DER04098*).
	Reduce differential speed.
Conveyor flights worn excessively. Inspect flights through the solids discharge outlets	Remove and disassemble bowl, and inspect conveyor flights (refer to *DER05026)*. Repair or replace conveyor, if required.
Failure Mode 3: Excessive Vibration	
Bowl assembly unbalanced due to uneven mechanical wear, worn parts, or deformed conveyor flights	Remove and disassemble bowl, and inspect conveyor flights (refer to *DER05026)*. Repair or replace conveyor, if required.

TROUBLESHOOTING DE-7200 CENTRIFUGE	
Possible Cause	**Isolation Procedure & Corrective Action**
Failure Mode 3: Excessive Vibration (Cont'd)	
Conveyor bearing defective due to inadequate lubrication, product entry past seal, or normal wear	Remove and disassemble bowl, and inspect conveyor bearing (refer to *DER05025)*. Replace conveyor bearing.
Bowl assembly main bearings defective.	Remove rotating assembly, and replace bearing (refer to *DER05024*).
Excessive buildup of solids in bowl and/or conveyor.	Perform cleanout procedure (refer to *DER05023*).
Failure Mode 4: No Liquid Discharge, Untreated Feed Material Exits Liquid Discharge Outlet	
Buildup of solids between flights; solids not being transported to discharge but are discharged with liquid	Shut down feed pump and bowl assembly drive motor, but keep conveyor motor running and admit rinse water into machine. If solids emerge before bowl fully stops, re-start centrifuge.
	Open top cover, and insert hose into liquid and solids discharge openings and flush bowl interior with water (preferably hot water).
	If flushing is unsuccessful in clearing the blockage, remove rotating assembly and remove conveyor to facilitate thorough cleaning. (refer to *DER05026*).
Failure Mode 5: High Power Consumption, Machine Clogged	
Solids accumulated within case	Open top cover, and thoroughly clean case interior, bowl exterior, and solids discharge chute.
Failure Mode 6: Machine Clogged Upon Starting After a Brief Shutdown	
Excessive solids volume in feed due to sedimentation in supply line	Perform cleanout procedure (refer to *DER05023*).
	Prevent future repetition by clearing feed line immediately after shutting down machine.
Failure Mode 7: Machine Shutdown Due to Excessive Power Consumption During Startup	
Discharge chute clogged	Clear discharge chute of all accumulated solids.

TROUBLESHOOTING DE-7200 CENTRIFUGE	
Possible Cause	**Isolation Procedure & Corrective Action**
Failure Mode 8: Excessively High Main Bearing Temperature	
Insufficient lubrication	Lubricate bearings (refer to *DER05023*).
Excessive grease	Remove grease fitting, and direct jet of filtered compressed air to remove grease.
Incorrect grease	Lubricate with recommended grease (refer to *DER05023*).
Defective bearing	Replace both main bearings (refer to *DER05024*).

ALARM AND FAULT MESSAGES

Intervention is required if a message appears to alert the operator that an anomaly has occurred. Alarm messages signify that the prevailing condition must be corrected or the centrifuge may be shut down automatically. Fault messages inform the operator that a failure requiring automatic shutdown has occurred.

Refer to the following table for alarm and fault messages and their causes and corrective actions for assistance in analyzing messages.

Alarm and Fault Messages	
Cause	**Corrective Action**
Air Conditioner Compressor Motor Overload Fault	
Motor drawing excessive current	Replace air conditioner compressor motor, if defective, or remove other cause of excessive current draw.
Air Conditioner Internal Fan Motor Overload Fault	
Motor drawing excessive current	Replace internal fan motor, if defective, or remove other cause of excessive current draw.
Air Conditioner Refrigerant Pressure High or Low Fault	
Check refrigerant pressure; high pressure indicates over-charging, and low pressure indicates system leakage	If pressure is high, reduce refrigerant quantity; if low, correct leak(s) and re-charge system.
Bowl Exceeded Maximum Speed, Shutdown	
Incorrect or loose connection at speed sensor, or speed sensor out of adjustment or defective	If reading on Bowl VFD status screen is about 4000 RPM, check connection (refer to *DER03022*); if connection is secure, adjust speed sensor (see *Speed Sensor Adjustment* in this section). Replace sensor if adjustment does not correct problem.
Bowl VFD has permitted bowl to exceed maximum pre-set speed limit	Replace bowl VFD, and re-start centrifuge while monitoring speed closely.

Alarm and Fault Messages	
Cause	**Corrective Action**
Bowl High Torque Alarm, Reduce Feed Rate	
Bowl torque exceeds pre-set limit	Reduce feed rate.
Bowl High Torque Fault and Shutdown, Perform Cleanout and Reduce Feed Rate	
Bowl torque exceeds pre-set limit	Following automatic shutdown, perform cleanout procedure to remove solids buildup, and re-start centrifuge at reduced feed rate.
Bowl VFD Alarm, Ref Troubleshooting Section of User Manual	
Defective bowl VFD	Press STOP, and cycle power off and then on. If alarm does not clear, replace bowl VFD.
Bowl VFD Communications Error	
Bowl VFD not communicating with PLC	Confirm that green LED next to Ethernet cable is lighted, indicating that hub is functional.
	Check connections between bowl VFD and PLC, and correct any defects.
	Replace bowl VFD, if no other defect is found.
Bowl VFD Drive OL Alarm, Ref Troubleshooting Section of User Manual	
Bowl drive motor drawing excessive current	Replace motor, if defective, or remove other cause of excessive current draw.
Bowl VFD Fault and Shutdown, Ref Troubleshooting Section of User Manual	
VFD fault detected, causing shutdown	Check and replace bowl VFD.
Bowl VFD Ground Warn Alarm, Ref Troubleshooting Section of User Manual	
Bowl motor has path to ground	Check for ground in bowl motor and connections to drive output, and correct defect.
Bowl VFD In Phase Loss Alarm, Ref Troubleshooting Section of User Manual	
Ground detected between VFD and motor in one phase	Check wiring between VFD and motor; correct defect(s).
	Check motor winding for grounded phase; remove ground, if any, or replace motor.
Bowl VFD Power Loss Alarm, Ref Troubleshooting Section of User Manual	
Incoming power loss or low voltage supply	Monitor and correct incoming power defect(s).

Alarm and Fault Messages	
Cause	**Corrective Action**
Bowl VFD Undervoltage Alarm, Ref Troubleshooting Section of User Manual	
Incoming power loss or low voltage supply	Monitor and correct incoming power defect(s).
Communication Failure with Bowl Speed Sensor	
Incorrect or loose connection at speed sensor, sensor out of adjustment, or defective sensor	If reading on Bowl VFD status screen is about 4000 RPM, check connection (refer to *DER03022*); if connection is secure, adjust sensor (see *Speed Sensor Adjustment*). Replace sensor if adjustment does not correct problem.
Incorrect connection at PLC	Check that all connectors are securely seated, as described in this section.
Defective transmitter/intrinsic barrier for speed sensor	Check and replace transmitter/intrinsic barrier, if defective.
Defective pump VFD	Check and replace VFD, if defective.
Communication Failure with Liquid End Bearing Temp Sensor	
Incorrect or loose connection at temperature sensor	If reading is constantly about 392°F (200°C), check and correct connection (refer to *DER03022* and electrical schematic diagram in Section 11).
Incorrect connection at PLC	Check that all PLC connectors are securely seated, as described in *DER04098*.
Defective temperature sensor	If reading is constantly about 392°F (200°C), sensor is defective; replace sensor.
Defective liquid end transmitter/intrinsic barrier or poor connection	Check connection and/or replace transmitter, if defective.
Defective bowl VFD	Check and replace VFD, if defective.
Communication Failure with Solid End Bearing Temp Sensor	
Temperature sensor connection insecure or disconnected	If reading is constantly about 392°F (200°C), check and correct connection (refer to *DER03022* and electrical schematic diagram in Section 11).
Incorrect connection at PLC	Check that all PLC connectors are secure, as described in this section.
Defective temperature sensor	If reading is constantly 392°F (200°C), sensor is defective; replace sensor.

Alarm and Fault Messages	
Cause	**Corrective Action**
Communication Failure with Solid End Bearing Temp Sensor (Cont'd)	
Poor connection at liquid end transmitter/intrinsic barrier or defective transmitter	If reading is constantly 392°F (200°C), check and correct connection; replace transmitter, if defective.
Defective bowl VFD	Check and replace VFD, if defective.
Control Program Downloaded from Memory Card to Controller	
Re-loading of PLC program from memory card completed	Start centrifuge, and resume operation.
Controller Internal Battery Low, Replace	
PLC battery connections not secure	Check connections, and correct, if necessary.
PLC battery low	Replace battery.
Conveyor High Torque Alarm, Reduce Feed Rate	
Conveyor torque exceeds pre-set limit	Reduce feed rate.
Conveyor High Torque Fault and Shutdown, Perform Cleanout and Reduce Feed Rate	
Conveyor torque exceeds pre-set limit	Following automatic shutdown, perform cleanout procedure to remove solids buildup, and re-start centrifuge at reduced feed rate.
Conveyor VFD Alarm, Ref Troubleshooting Section of User Manual	
Temperature sensor signal cable disconnected	Check and correct connection (refer to DER03022 and electrical schematic diagram in Section 11).
VFD temperature too high	Check Conveyor VFD status screen for temperature and alarm; shut down, lock out, and tag out centrifuge to determine and correct cause of overheating.
VFD load too high	Reduce pump feed rate.
Conveyor VFD Communications Error	
Conveyor VFD not communicating with PLC	Confirm that green LED next to Ethernet cable is lighted, indicating that hub is functional.
	Check connections between conveyor VFD and PLC, and correct any defects.
	Replace conveyor VFD, if no other defect is found.
Conveyor VFD Fault and Shutdown, Ref Troubleshooting Section of User Manual	
VFD fault detected, causing shutdown	Check and replace conveyor VFD.

Alarm and Fault Messages	
Cause	**Corrective Action**
Conveyor VFD Ground Warn Alarm, Ref Troubleshooting Section of User Manual	
Conveyor motor has path to ground	Check for ground in conveyor motor and connections to drive output, and correct defect.
Conveyor VFD In Phase Loss Alarm, Ref Troubleshooting Section of User Manual	
Ground detected between VFD and motor in one phase	Check wiring between VFD and motor; correct defect(s).
	Check motor winding for grounded phase; remove ground, if any.
Conveyor VFD Power Loss Alarm, Ref Troubleshooting Section of User Manual	
Incoming power loss or low voltage supply	Monitor and correct incoming power defect(s).
Conveyor VFD Undervoltage Alarm, Ref Troubleshooting Section of User Manual	
Incoming power loss or low voltage supply	Monitor and correct incoming power defect(s).
Electrical Enclosure High Temperature Alarm	
PLC has detected high temperature inside control cabinet	Check that air conditioner is operative; repair or replace air conditioner, if defective.
	Reduce load by decreasing bowl, conveyor differential speed, and/or pump feed rate.
	Check VFD temperatures (refer to *DER04098*); replace VFD if defective.
Electrical Enclosure High Temperature Fault and Shutdown	
PLC has shut down centrifuge due to high temperature inside control cabinet	Check that air conditioner is operative; repair or replace air conditioner, if defective.
	Reduce load by decreasing bowl, conveyor differential speed, and/or pump feed rate.
	Check VFD temperatures (refer to *DER04098*); replace VFD if defective.
Interior temperature of control cabinet too high, causing shutdown	Check that air conditioner is operating; repair or replace, as indicated. Inspect cabinet interior, and remove cause of high temperature, if any. Re-start centrifuge after removing cause of high temperature.

Alarm and Fault Messages	
Cause	**Corrective Action**
Emergency Stop Switch Activated, Shutdown	
EMERGENCY STOP pressed	Remove cause for emergency stop, and then re-start centrifuge.
High Vibration Fault and Shutdown, Correct Problem and Press Reset Button	
Excessive vibration has caused vibration switch to trip, resulting in power interruption and centrifuge shutdown	Rotating assembly overloaded or clogged, producing out-of-balance condition. Remove cause of excessive vibration and re-start centrifuge.
Liquid End Main Bearing High Temperature Alarm	
Temperature sensor connection insecure or disconnected	If reading is constantly about 392°F (200°C), check and correct connection (refer to *DER03022* and electrical schematic diagram in Section 11).
Insufficient bearing lubrication	Lubricate bearings (refer to *DER05023*).
Excess grease	Remove grease fitting, and direct jet of filtered compressed air to remove grease.
Incorrect grease	Lubricate with recommended grease (refer to *DER05023*).
Defective bearing	Replace both main bearings (refer to *DER05024*).
Liquid End Main Bearing High Temperature Fault and Shutdown	
Insufficient bearing lubrication	Lubricate bearings (refer to *DER05023*).
Excess grease	Remove grease fitting, and direct jet of filtered compressed air to remove grease.
Incorrect grease	Lubricate with recommended grease (refer to *DER05023*).
Defective bearing	Replace both main bearings (refer to *DER05024*).
Pump VFD Alarm, Ref Troubleshooting Section of User Manual	
Pump VFD needs re-booting	Press STOP, and cycle power off and then on. If alarm does not clear, replace pump VFD.
Pump VFD Communications Error	
Pump VFD not communicating with PLC	Confirm that green LED next to Ethernet cable is lighted, indicating that hub is functional.
	Check connections between pump VFD and PLC, and correct any defects.
	Replace pump VFD, if no other defect is found.

Alarm and Fault Messages	
Cause	**Corrective Action**
Pump VFD Drive OL Alarm, Ref Troubleshooting Section of User Manual	
Pump drive motor drawing excessive current	Replace motor, if defective, or remove other cause of excessive current draw.
Pump VFD Fault, Ref Troubleshooting Section of User Manual	
VFD fault detected, causing shutdown	Check and replace pump VFD.
Pump VFD Ground Warn Alarm, Ref Troubleshooting Section of User Manual	
Pump motor has path to ground	Check pump motor and connections to drive output for a grounding; remove ground connection.
Pump VFD In Phase Loss Alarm, Ref Troubleshooting Section of User Manual	
Ground detected between VFD and pump motor in one phase	Check wiring between VFD and motor; correct defect(s).
	Check motor winding for grounded phase; remove ground, if any, or replace motor.
	Replace VFD.
Pump VFD Power Loss Alarm, Ref Troubleshooting Section of User Manual	
Incoming power loss or low voltage supply.	Monitor and correct incoming power defects).
Pump VFD Undervoltage Alarm, Ref Troubleshooting Section of User Manual	
Incoming power loss or low voltage supply	Monitor and correct incoming power defect(s).
Solid End Main Bearing High Temperature Alarm	
Insufficient bearing lubrication	Lubricate bearings (refer to *DER05023*).
Excess grease	Remove grease fitting, and direct jet of filtered compressed air to remove grease.
Incorrect grease	Lubricate with recommended grease (refer to *DER05023*).
Defective bearing	Replace both main bearings (refer to *DER05024*).

Alarm and Fault Messages	
Cause	**Corrective Action**
Solid End Main Bearing High Temperature Fault and Shutdown	
Insufficient bearing lubrication	Lubricate bearings (refer to *DER05023*).
Excess grease	Remove grease fitting, and direct jet of filtered compressed air to remove grease.
Incorrect grease	Lubricate with recommended grease (refer to *DER05023*).
Defective bearing	Replace both main bearings (refer to *DER05024*).

SPEED SENSOR ADJUSTMENT

Bowl speed is sensed by a proximity switch (speed sensor) that is pulsed by the cam ring as it rotates beneath the switch. A series of equally spaced holes in the circumference of the cam ring produce the pulses in the sensor that are used by the PLC to calculate bowl speed. Pulses are lost if excessive space is present between the switch and cam ring, and insufficient space will cause the cam ring to strike the switch. Consequently, the gap between the proximity switch and cam ring is critical.

The sensor is installed in the main bearing pillow block at the solid end of the centrifuge. Adjustment is performed by turning the switch in or out within the pillow block. To adjust the speed sensor, proceed as follows:

1. Remove screws securing bowl cover to base, and open cover.
2. Remove screws securing speed and temperature sensor guard to main bearing pillow block (Figure 5105-1), and remove guard.
3. Disconnect electrical cable from speed sensor (Figure 5105-2).
4. Loosen speed sensor locknuts, and rotate locknuts counterclockwise until several threads are exposed.
5. Slowly rotate sensor clockwise until bottomed gently against cam ring, and then back out the sensor 2-1/2 turns.
6. Tighten bottom locknut against pillow block, and then tighten top locknut to secure both locknuts.
7. Reconnect electrical cable to speed sensor.
8. Close and secure bowl cover.
9. Turn on and test centrifuge for proper operation in accordance with *DER04098*.
10. If speed sensor still does not function properly, loosen locknuts, turn sensor clockwise in 1/8-turn increments until correct speed sensing is evident. Tighten locknuts against pillow block when sensor operation is restored.
11. Replace speed sensor if adjustment does not produce correct speed indication.
12. Re-install guard over speed and temperature sensors, and secure with screws.

SPEED SENSOR ADJUSTMENT (CONT'D)

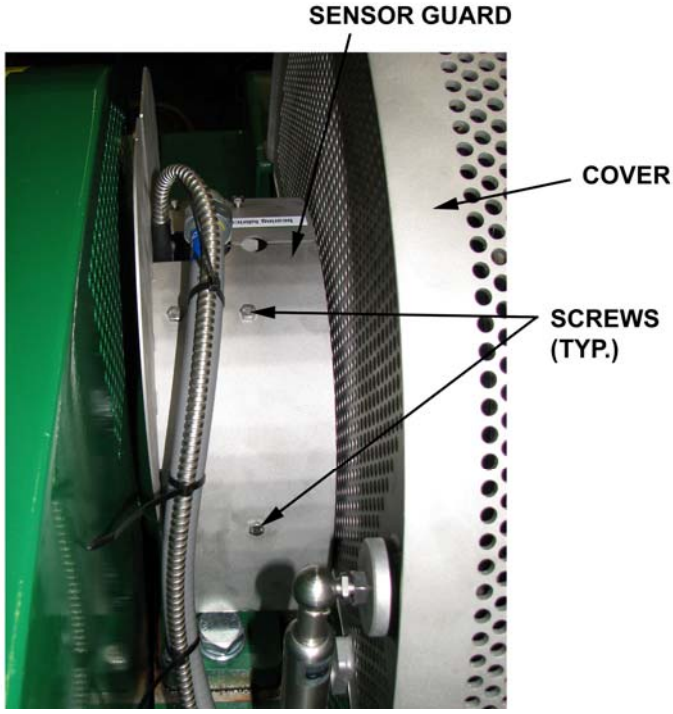


Figure 5105-1 Speed and Temperature Sensor Guard

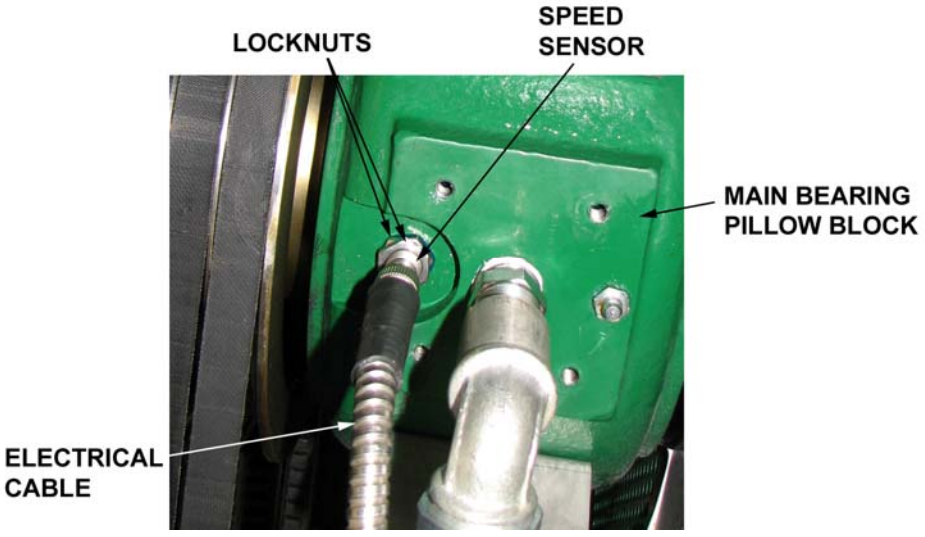


Figure 5105-2 Speed Sensor Adjustment

CONTROL COMPONENT INDICATORS

Various indicators are provided to display the operational status of components in the control cabinet. Figures 5105-3 through 5105-6 locate and define the indications shown on these components. Where applicable, corrective actions are included to assist the operator in fault analysis.

Dangerously high voltage is present in the control cabinet. Since opening the control cabinet door and bypassing the cabinet purge system is required to check the indicators, only trained, qualified personnel should be permitted to perform these procedures. Use extreme caution to ensure that the surrounding atmosphere is free of hazardous fumes before opening the cabinet door and bypassing the purge system.

WARNING! DANGEROUSLY HIGH VOLTAGE IS PRESENT. ONLY TRAINED, QUALIFIED PERSONNEL SHOULD BE PERMITTED TO OPEN CONTROL CABINET DOOR WHILE POWER IS APPLIED.

WARNING! HAZARDOUS GASES CAN CAUSE EXPLOSION. BE CERTAIN THAT SURROUNDING ATMOSPHERE IS CLEAR OF ALL POTENTIALLY EXPLOSIVE GASES BEFORE OPENING CONTROL CABINET DOOR.

CONTROL COMPONENT INDICATORS (CONT'D)

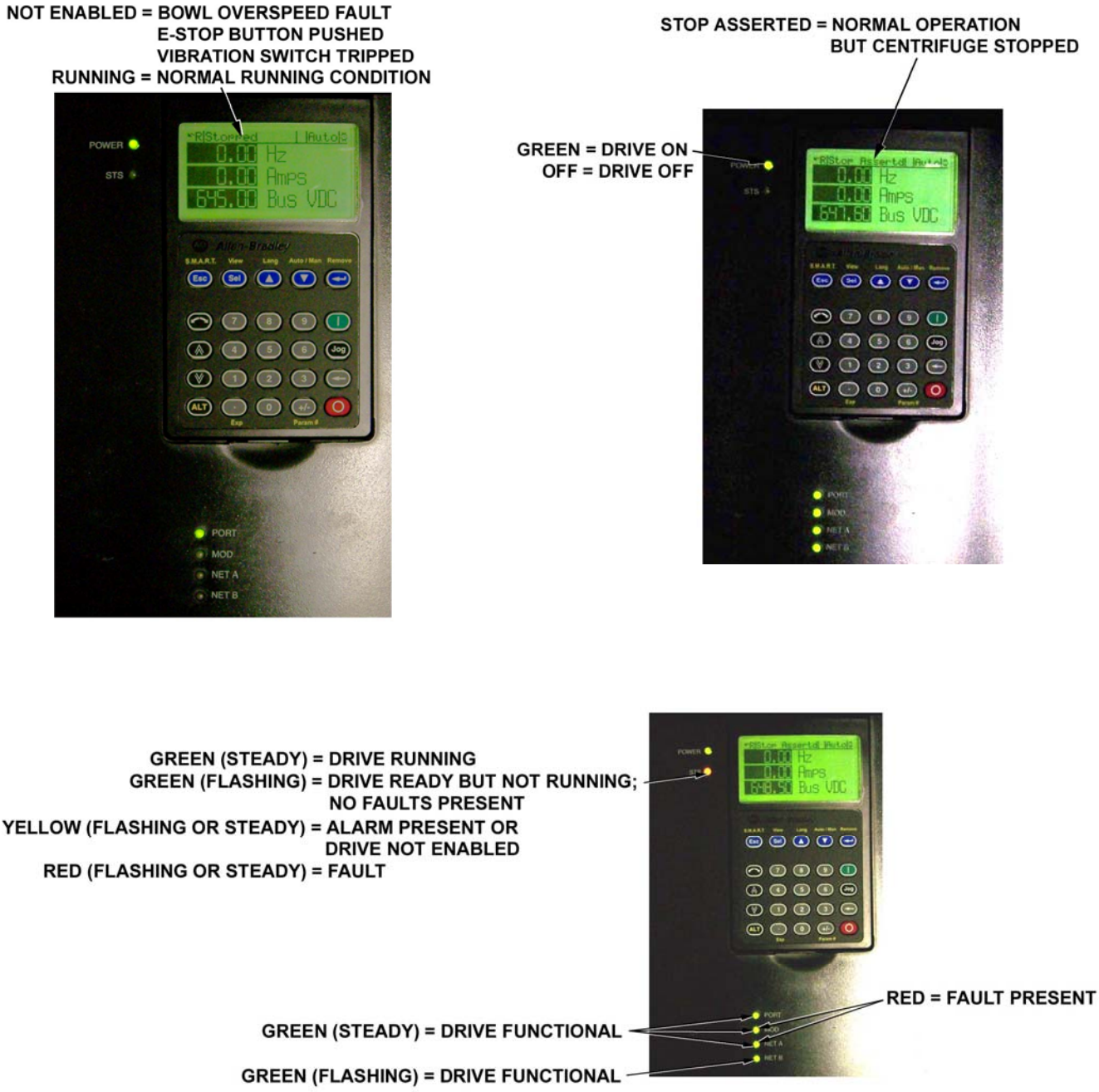
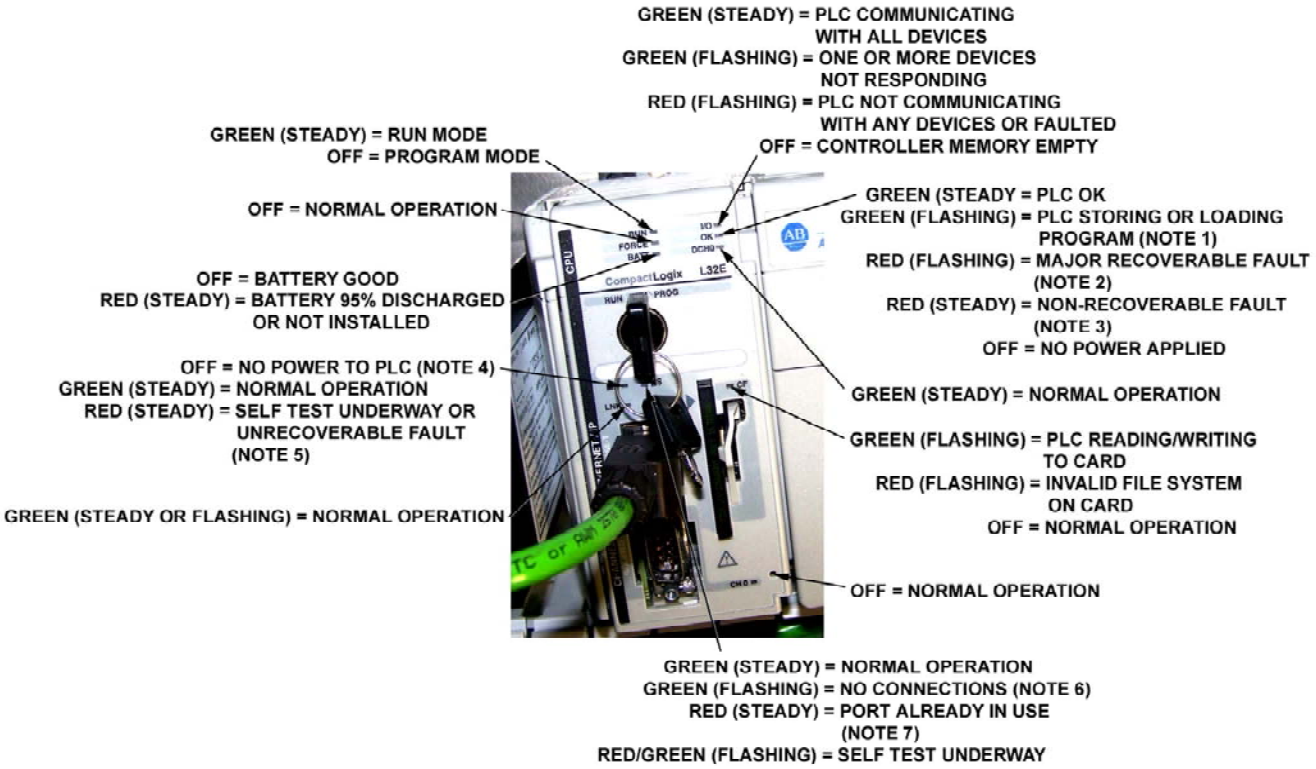


Figure 5105-3 VFD Indicators



NOTES:
1. WAIT FOR MEMORY LOAD TO COMPLETE.
2. TURN PLC KEY SWITCH FROM "PROG" TO "RUN" AND THEN BACK TO "REM"; THEN CYCLE POWER OFF AND ON.
3. CYCLE POWER OFF AND ON.
4. CHECK PLC POWER SUPPLY.
5. CYCLE POWER OFF AND ON. IF PROBLEM FAILS TO CLEAR, REPLACE PLC.
6. CHECK DRIVE CONNECTIONS AND DRIVES.
7. TWO CENTRIFUGES CONNECTED TOGETHER (NETWORKED). MACHINES MUST BE SEPARATE.

Figure 5105-4 PLC Indicators

CONTROL COMPONENT INDICATORS (CONT'D)

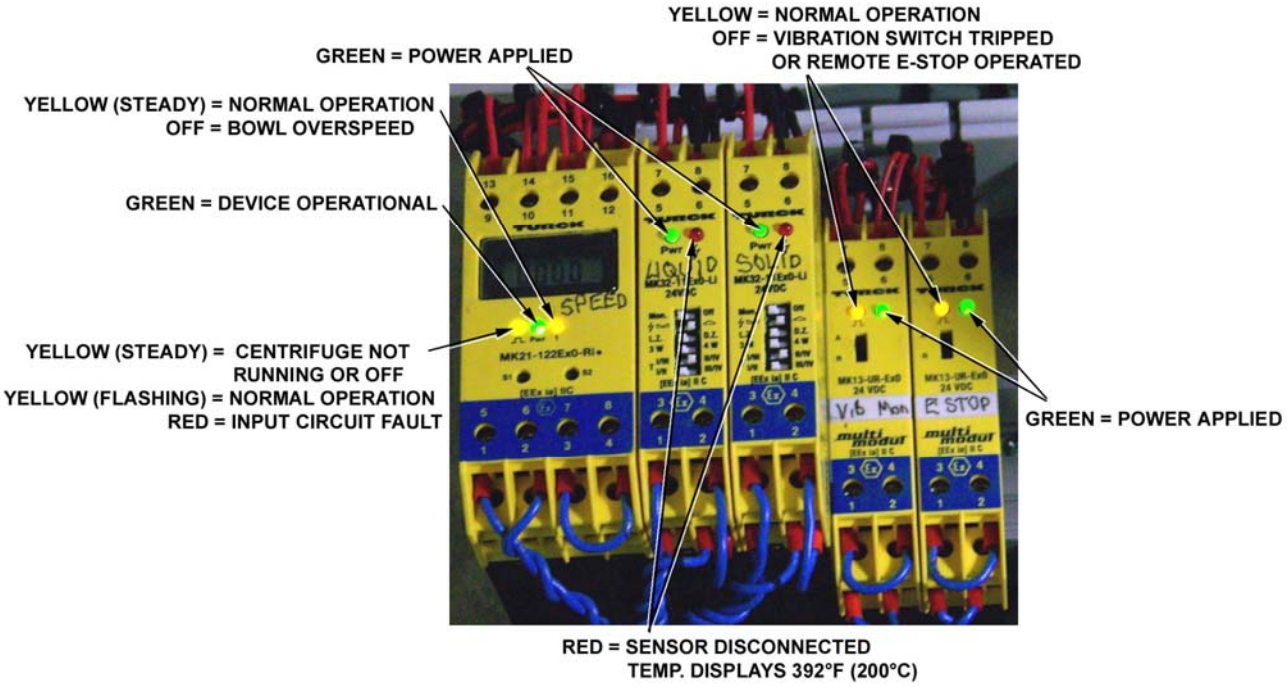


Figure 5105-5 Transmitter/Intrinsic Barrier Indicators

CONDENSER FAN MOTOR

M

1.5A 1.5A 1.5A

60A 60A 60A

15A 15A 15A

3 2 1 4 L1 L2 L3 G

AIR CONDITIONER

6 10 8 5 9 7

DIGITAL INPUTS

225A 225A 225A

L3 L2 L1

32 31 30 DIGITAL INPUTS

17 18 FEED PUMP DRIVE

1- 2+ ANALOG INPUTS

25 COM

T1 T2 T3

28 29 27

17 18 CONVEYOR DRIVE

32 31 30 DIGITAL INPUTS

150A 150A

+ - 0VAC 120VAC

25 COM T1T2T3

L1 L2 L3

32 31 30 DIGITAL INPUTS

BOWL DRIVE

1- 2+ ANALOG INPUTS

17 18 25 COM T1T2T3

PLC

POWER SUPPLY 120VAC

120V-N

120V-L

OPERATOR PANEL (SEE NOTE)

SURGE PROTECTOR

X2 X1

120 VAC 480 VAC

7A

2.5A 2.5A

L1 L2 L3

POWER SUPPLY 24VDC

RED

BLK

-24VDC +24VDC

ETHERNET SWITCH
SENSORS
OPERATOR PANEL (SEE NOTE)

PURGE SYSTEM

I.S. SWITCH

+BLU

2 CLR

21 22 E-STOP BUTTON

E-STOP MONITOR

T1 T2 T3

M

PUMP MOTOR
30HP

T1 T2 T3

M

CONVEYOR MOTOR
60HP

T1 T2 T3

M

BOWL MOTOR
150HP

NOTE: ON SOME MACHINES OPERATOR PANEL USES 24VDC; OTHERS USE 129VAC POWER.

3 4 SWITCH AMPLIFIER 6 5 2 1 7 8

SWITCH SET TO “A”

L1 L2 L3

CONTACTOR 350A

A2 A1

X1 3A

480VAC 120VAC

X2

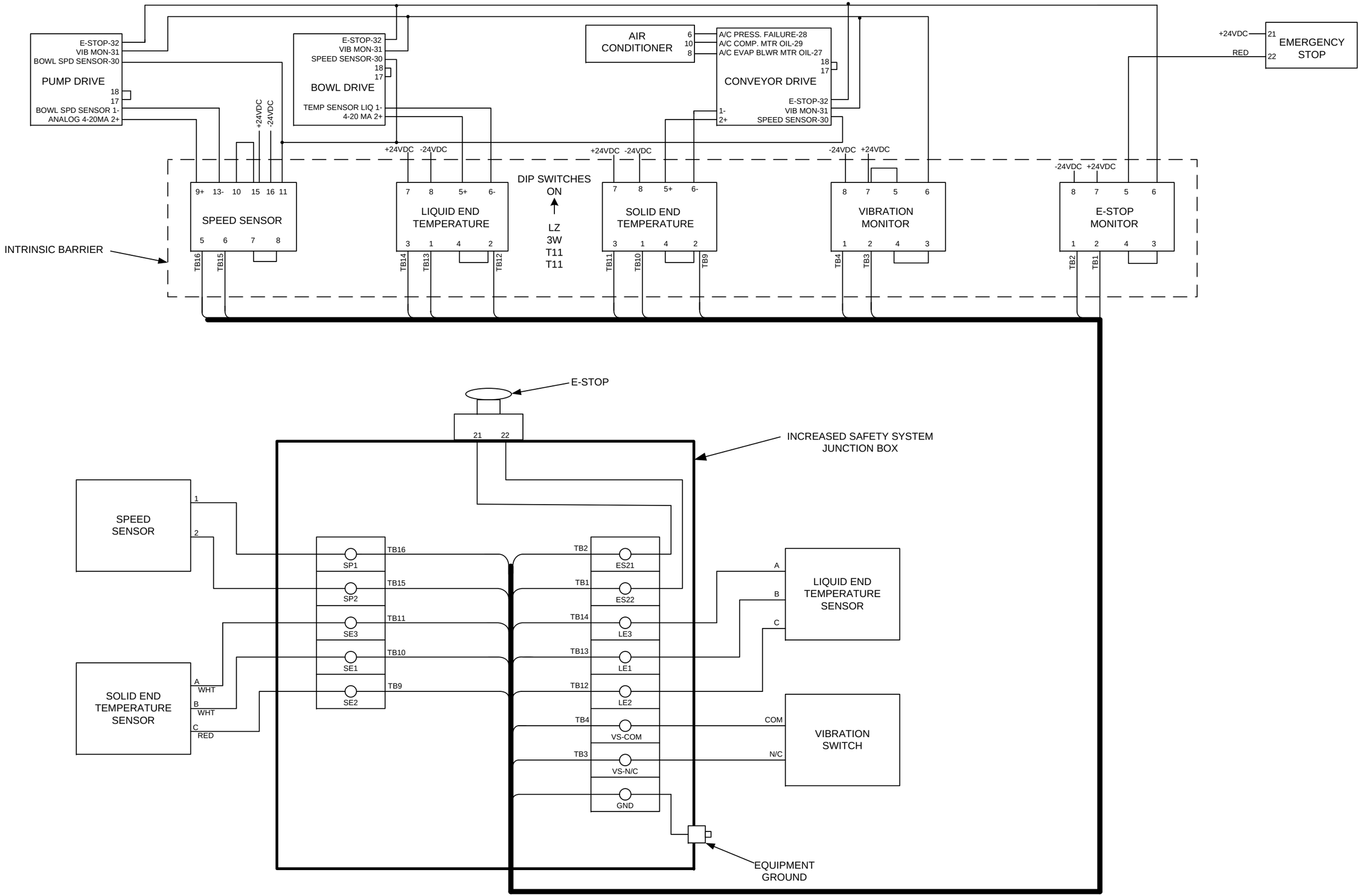
1.25A

1.25A

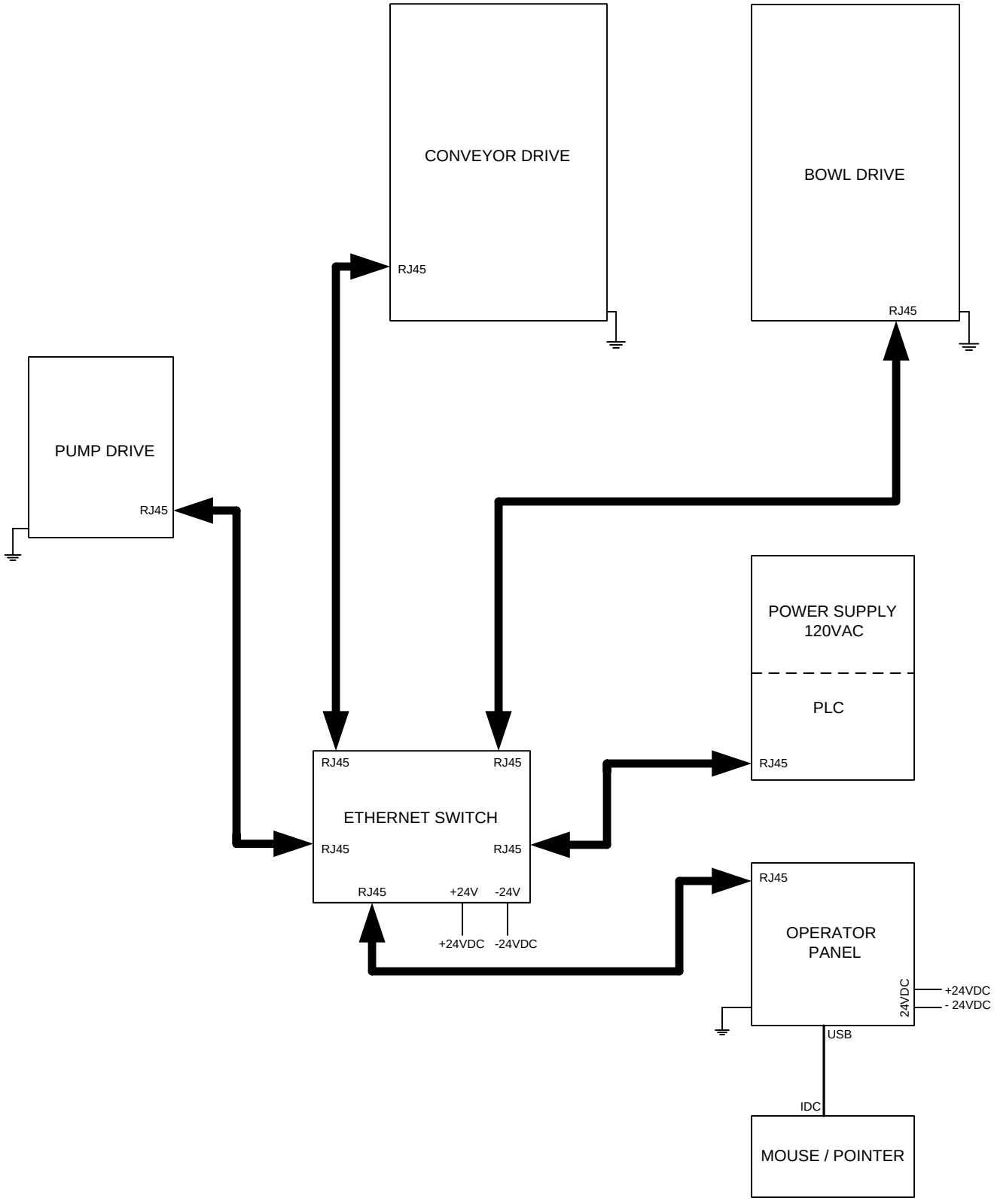
GRD LUG

MAIN POWER DISCONNECT (CUSTOMER SUPPLIED)

AC-DC POWER DISTRIBUTION – DE-7200 CENTRIFUGE



ANALOG SENSORS



ETHERNET CONNECTIONS

GEARBOX REMOVAL AND INSTALLATION

DE-7200 CENTRIFUGE

GENERAL

This procedure describes removal and installation of the gearbox. This procedure must be performed by properly trained and qualified personnel. To prevent contamination to bearings and internal components of the centrifuge, this procedure must be performed in a clean environment.

Note! All attaching hardware must be correctly tightened. Refer to *DER05029* for hardware tightening requirements.

REMOVAL

The rotating assembly must be removed for thorough cleaning, bearing replacement, or to perform inspection and maintenance. To remove the rotating assembly, proceed as follows:

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. Turn off feed, and shut down, lock out, and tag out electric power to the centrifuge. Allow rotating assembly to coast to a full stop.
2. Remove screws securing belt guard to base, and lift and remove guard.
3. Remove screws securing case cover to base, and open case cover.
4. Using a water hose, wash off process residue from inside of case and outside of rotating assembly.
5. Loosen four screws securing flexible coupling half to shaft of conveyor drive motor, slide coupling half toward motor until end of motor shaft is visible, and remove flexible spider.
6. Disconnect feed pipe from feed component.
7. Loosen nuts securing bowl drive motor mounting plate to centrifuge base, turn tensioning bolt to release tension, and remove belts from bowl sheave.
8. Remove alignment pins, bolts, lockwashers, and flat washers securing pillow blocks to base at liquid and solid ends (Figure 5037-1).
9. Remove cover from stainless steel junction box on centrifuge base (Figure 5037-2), and disconnect solid and liquid end temperature sensor leads from terminal block. Unscrew coupling nut from elbow at sensor (Figure 5037-3), and pull electrical leads out through conduit. Coil and secure leads to avoid interference during removal of rotating assembly.
10. Disconnect speed sensor cable from speed sensor.

REMOVAL (CONT'D)

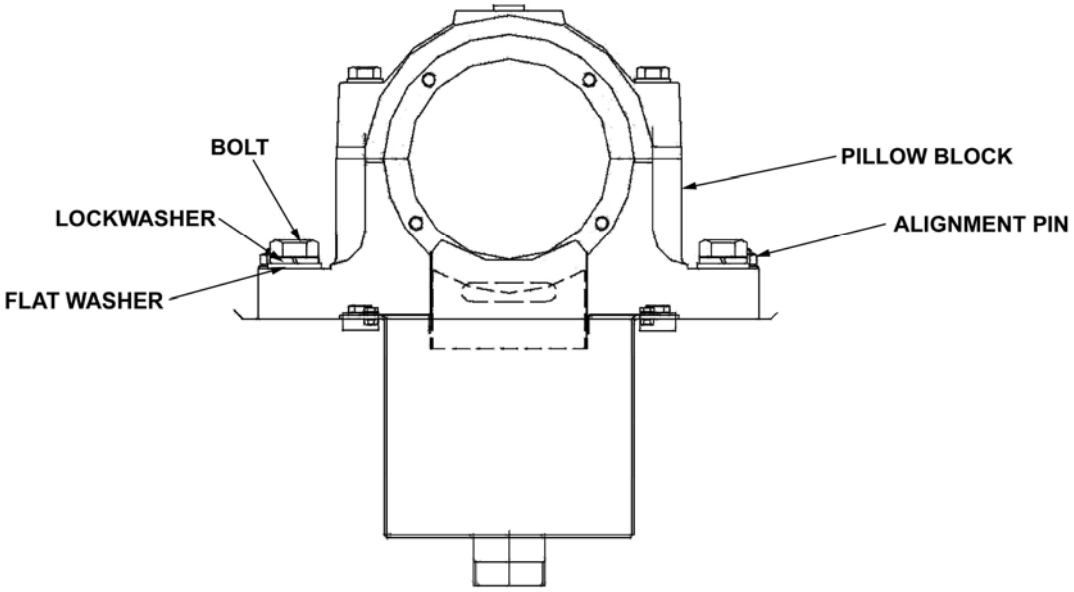


Figure 5037-1 Bearing Pillow Block Attachment

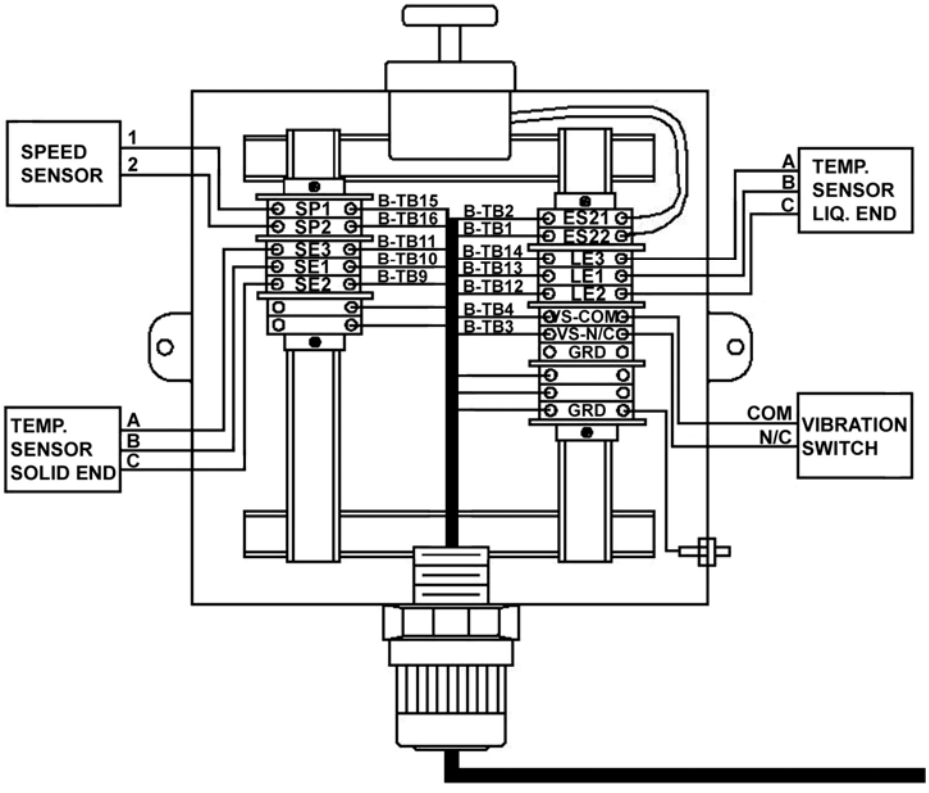


Figure 5037-2 Temperature Sensor Connections

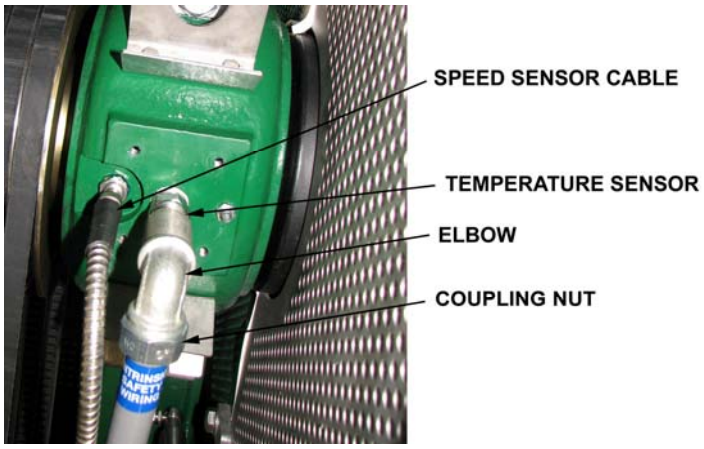


Figure 5037-3 Temperature and Speed Sensors - Solid End

11. Select a suitable hoist capable of lifting at least 4000 lbs (1800 kg) to rotating assembly.
12. Attach hoist to rotating assembly, properly balancing the hoisting straps to ensure that the assembly remains horizontal during lifting. Slowly hoist rotating assembly until clear of base.
13. Lower rotating assembly onto a cradle that is capable of supporting its weight.
14. Remove screws securing upper and lower halves of solid end pillow block together. Support lower half while prying the two halves apart, and separate and remove pillow block halves from main bearing.
15. Note location of coupling half on gearbox shaft, and remove screws securing coupling half to gearbox shaft, and remove coupling.
16. Remove screws securing sheave to bowl flange, and remove sheave.
17. Remove screws securing input flange to gearbox housing (Figure 5037-4), and remove flange.

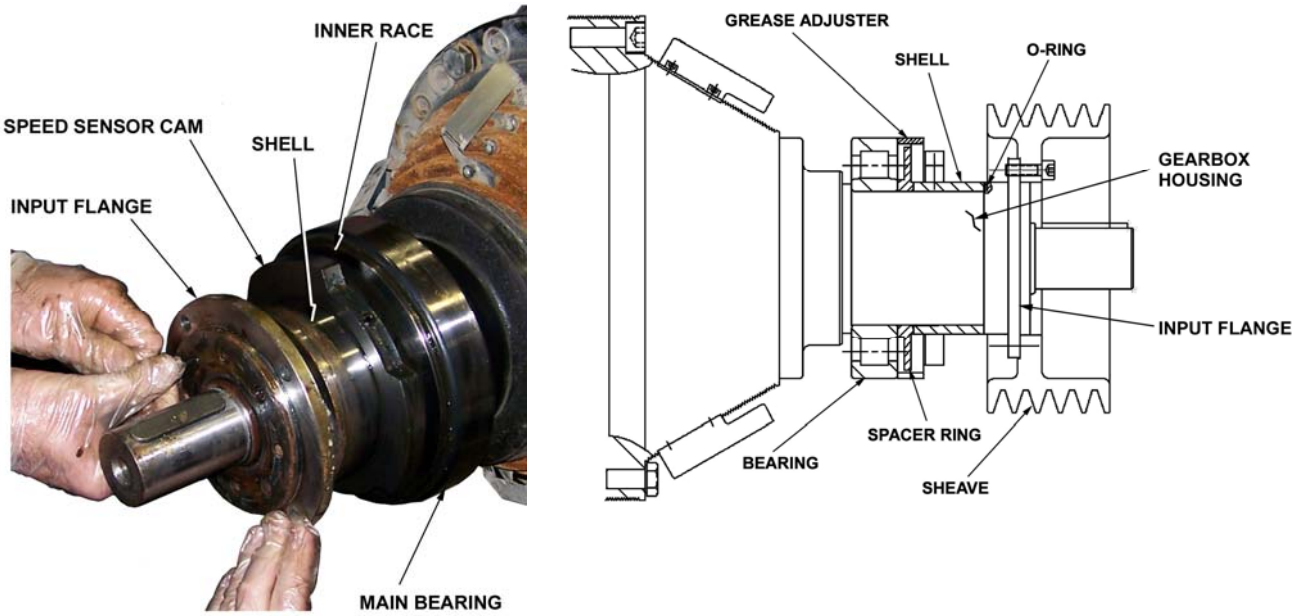


Figure 5037-4 Input Flange, Speed Sensor Cam, Solid End Main Bearing

REMOVAL (CONT'D)

18. Note orientation of parts on gearbox shaft, and remove shell (with speed sensor cam attached), grease adjuster, and spacer ring from shaft.
19. Working through two effluent ports at the liquid end, remove two M12 screws 180° apart from the conveyor. Install two plates over the ports (Figure 5037-5), insert a long M12 screw through each plate, and lightly tighten screws. These plates will retain the conveyor in place while the gearbox is extracted from the bowl assembly.
20. Remove two pipe plugs from conveyor (Figure 5037-6), and drive out dowel pin securing the gearbox shaft to the conveyor.
21. Remove 20 M16 socket head screws securing gearbox to bowl assembly (Figure 5037-7).
22. Remove four hex head M16 bolts from housing, and lubricate and install jack bolts in two of the threaded holes 180 degrees apart.
23. Attach a suitable hoist capable of lifting at least 550 lbs (250 kg) to support gearbox as it is jacked out of bowl assembly.
24. Alternately turn each jack bolt installed in step 22, above, to slowly draw gearbox out until fully clear of bowl assembly.

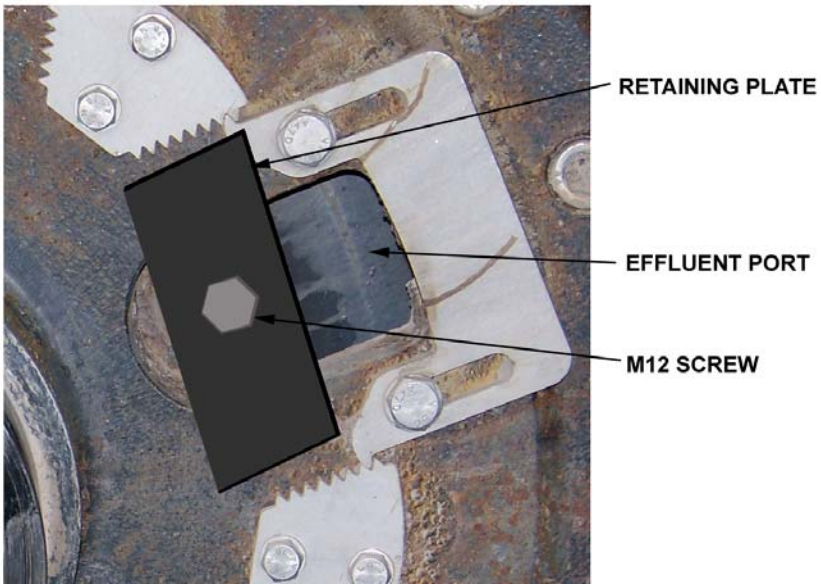


Figure 5037-5 Installing Conveyor Retaining Plate

REMOVAL (CONT'D)

Figure 5037-6 Removing Dowel Pin Securing Gearbox Shaft to Conveyor

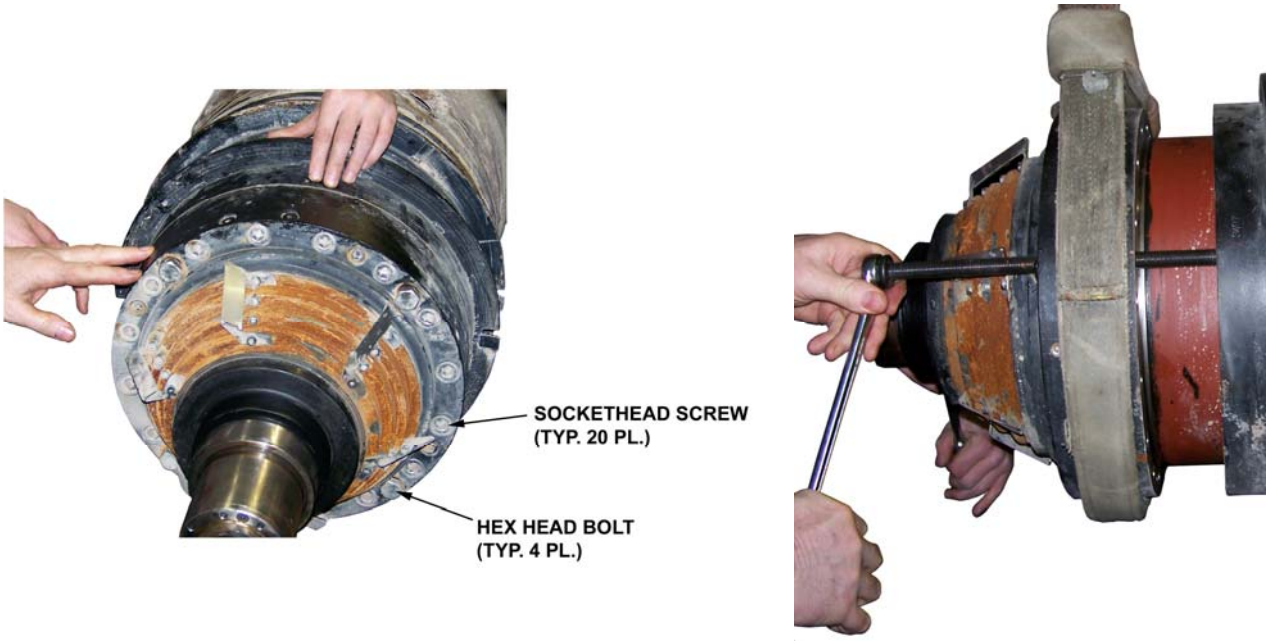


Figure 5037-7 Gearbox Removal

CLEANING, INSPECTION, AND REPAIR

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

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 all parts for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace components that are obviously deformed or have serious defects that render them unserviceable.
3. Inspect pillow blocks for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects, or replace if serious defects or cracks are found.
4. Replace all O-rings, seals and bearings.
5. To prevent contamination, place all cleaned components in clean plastic bags until ready to assemble.

INSTALLATION

To install the gearbox, proceed as follows:

1. Using a suitable hoist, support the replacement gearbox assembly in a level horizontal orientation, as previously done in *Removal*. Tap and clean all holes in gearbox. Remove protective coatings from all mating surfaces of gearbox.
2. Install new O-ring on gearbox (Figure 5037-8), and lubricate O-ring and shaft with a light coat of anti-seize compound.
3. Remove M12 screws securing the two plates that were temporarily installed to restrain conveyor during gearbox removal, and remove plates. Apply Loctite to M12 screws previously removed from conveyor, and re-install screws.
4. Rotate gearbox shaft until key is aligned with keyway in conveyor.
5. Install nuts and narrow washers on two jack bolts, and insert bolts through clear holes in gearbox flange 180 degrees apart. Thread bolts into gearbox assembly mounting holes in bowl assembly.
6. Alternately turn each nut a few revolutions at a time to gradually and evenly draw gearbox into bowl assembly.
7. When gearbox is fully seated against the bowl, remove jack bolts, and install 20 M16 socket head screws to secure gearbox. Tighten screws to torque specified in *DER05029*.
8. Install four M16 hex head bolts through clear holes in gearbox and into corresponding holes in bowl, and tighten in accordance with *DER05029*.
9. Insert a pry bar into dowel pin hole in gearbox shaft, and carefully align hole to facilitate insertion of dowel pin.
10. Apply anti-seize compound to dowel pin and pipe plugs. Insert pin through conveyor and gearbox shaft, and install pipe plugs into threaded holes in conveyor to retain pin.

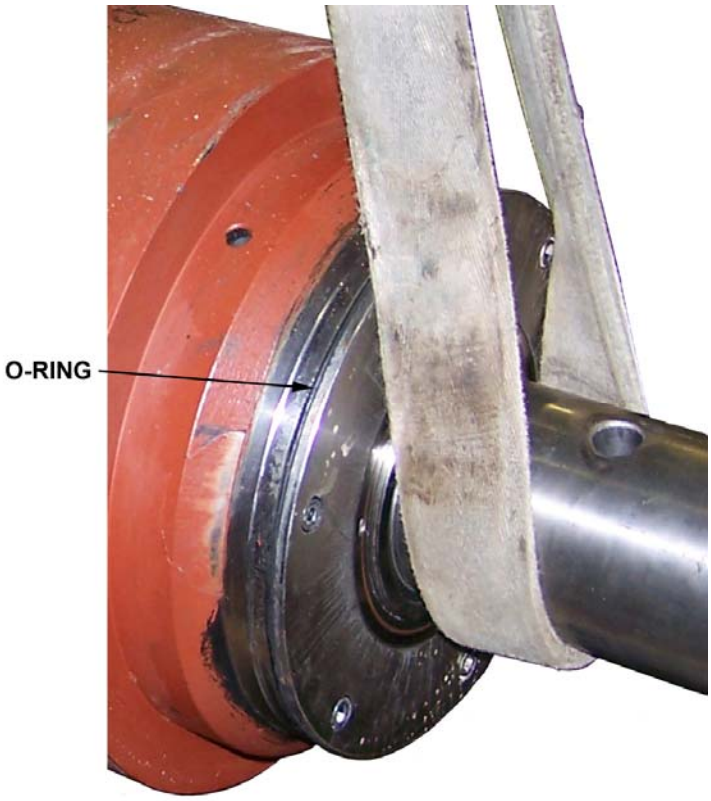


Figure 5037-8 Gearbox O-Ring Location

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.

11. Using a bearing heater or heated oil bath, heat main bearing inner race to about 230°F (110°C). Wearing protective gloves, install bearing on journal.
12. Pack bearing with grease in accordance with lubrication chart in *DER05023*, and install onto inner race.
13. Install spacer ring and grease adjuster on gearbox shaft, and slide shell (with speed sensor cam installed) and O-ring onto shaft. Secure shell by tightening setscrew.
14. Position input flange on gearbox housing, apply Loctite 242 to screws, and install and tighten screws in accordance with *DER05029*.
15. Place upper and lower halves of pillow block over main bearing, and install and tighten screws in accordance with *DER05029*.
16. Orient sheave keyway to align with key on gearbox shaft, slide sheave onto shaft and against input flange, apply Loctite 242 to screws, and tightened in accordance with *DER05029*.
17. Install flexible coupling half onto gearbox shaft at location noted in *Removal*.

INSTALLATION (CONT'D)

18. Re-install rotating assembly into centrifuge as follows:
    a. Apply rust preventive compound to mating surfaces of pillow blocks and centrifuge base.
    b. Using hoist, lift rotating assembly from cradle and slowly lower onto centrifuge until pillow blocks contact base.
    c. Insert alignment pins into pillow blocks, and use a brass hammer to fully seat pins into base; do not tighten nuts on alignment pins.
    d. Apply anti-seize compound to pillow block bolts, and insert bolts with washers through pillow blocks and into base. Tighten bolts in stages to torque specified in *DER05029*,
19. Install drive belts on motor and bowl sheaves, and tension belts in accordance with *DER05023*.
20. Insert spider into flexible coupling half on motor shaft, and slide coupling half back into engagement with coupling half on conveyor drive gearbox shaft. Set gap between coupling halves at about 0.125" (3mm). Install and tighten screws to secure coupling to shafts in accordance with Rotex manual, KTR-N 40226 E, in Section 12.
21. Uncoil and re-connect sensor leads to terminal block in junction box, and then re-install junction box cover.
22. Grease main bearings in accordance with lubrication chart in *DER05023* and the following steps:
    a. Apply electric power, start up centrifuge, and adjust bowl speed to 500 rpm.
    b. While watching bearing temperature, inject new grease into pillow block until grease flows from the outlet port on the bottom half of the pillow block at the belt side.
23. Run the conveyor for 10 to 15 minutes to allow warming of gearbox oil, and then check oil level. Fill with recommended oil if needed (refer to *DER05023*).

Note! To avoid leaks, replace brass gasket on gearbox fill plugs each time plugs are removed.

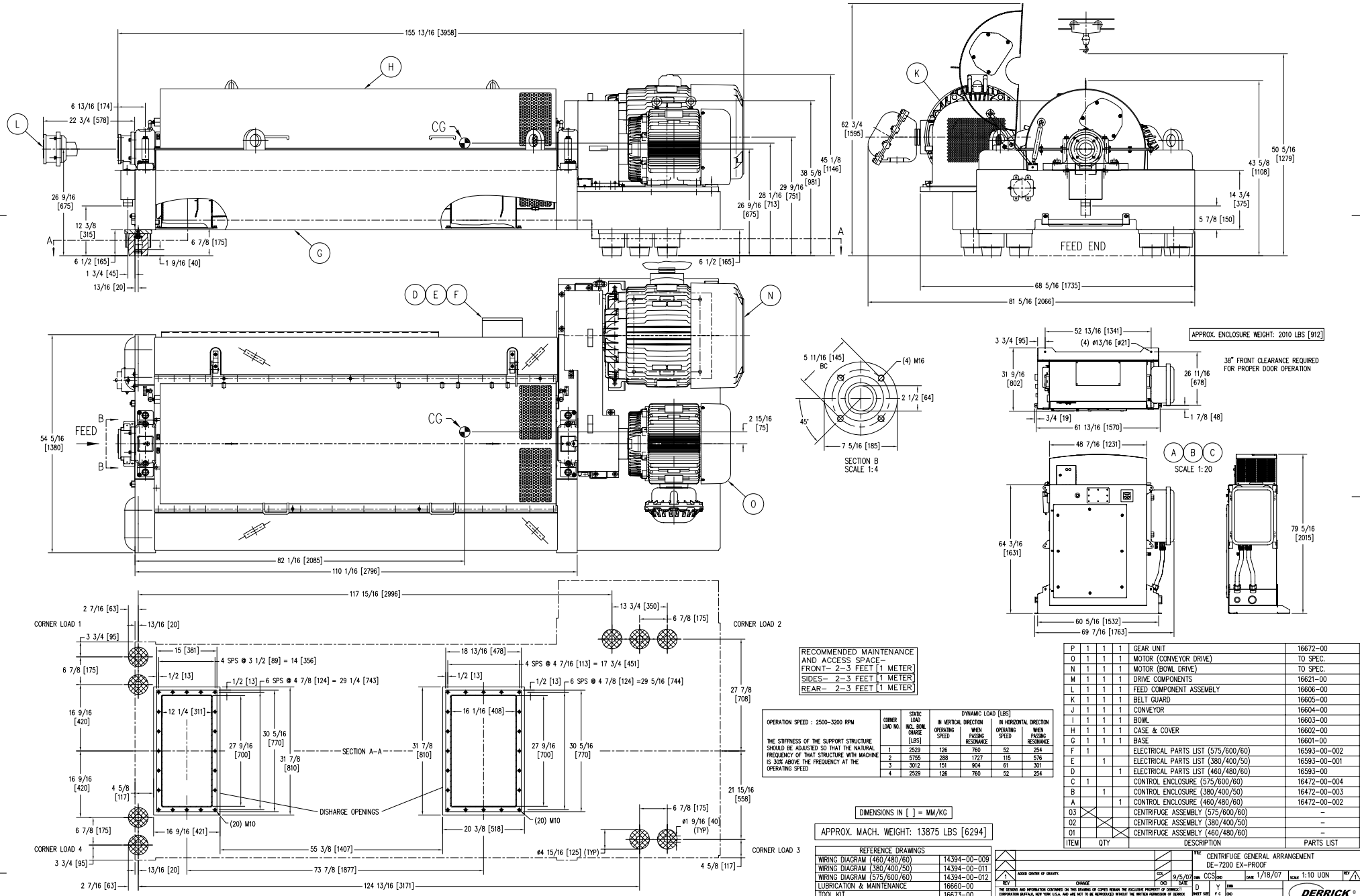
24. Close case cover, and secure with screws, tightening from center of cover outward in both directions.
25. Install and secure belt guard over motor and bowl assembly sheaves.
26. Connect feed piping to feed component flange.
27. Apply electric power, and start up centrifuge (refer to *DER04098*). Carefully monitor performance, and check for any unusual noise.

REFERENCE DRAWINGS

DE-7200 VFD CENTRIFUGE

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

DE-7200 VFD CENTRIFUGE	
16590-00 -	Centrifuge
16601-00 -	Base Parts List
16602-00 -	Case & Cover Parts List
16603-00 -	Bowl Parts List
16604-00 -	Conveyor Parts List
16605-00 -	Belt Guard Parts List
14394-00-009 -	Electrical Wiring Schematic 460/480V 60 HZ
16606-00 -	Feed Component Assembly
16618-00 -	Junction Box Assembly
16621-00 -	Miscellaneous Drive Components
16593-00 -	Base Sensor System 460/480V 60 HZ Parts List
16672-00 -	Gear Unit Parts List
16673-00 -	Tool Kit
16798-00 -	Repair Tool Kit
16472-00-002 -	Control Enclosure Assembly DE-7200 XP
16472-00-005 -	Control Enclosure Assembly DE-7200
16622-00-001 -	XP Electrical Control Panel



RECOMMENDED MAINTENANCE AND ACCESS SPACE–
FRONT– 2–3 FEET [1 METER]
SIDES– 2–3 FEET [1 METER]
REAR– 2–3 FEET [1 METER]

OPERATION SPEED : 2500–3200 RPM THE STIFFNESS OF THE SUPPORT STRUCTURE SHOULD BE ADJUSTED SO THAT THE NATURAL FREQUENCY OF THAT STRUCTURE WITH MACHINE IS 30% ABOVE THE FREQUENCY AT THE OPERATING SPEED	CORNER LOAD NO.	STATIC LOAD INCL. BOWL CHARGE [LBS]	DYNAMIC LOAD [LBS] IN VERTICAL DIRECTION OPERATING SPEED	IN VERTICAL DIRECTION WHEN PASSING RESONANCE	IN HORIZONTAL DIRECTION OPERATING SPEED	IN HORIZONTAL DIRECTION WHEN PASSING RESONANCE
	1	2529	126	760	52	254
	2	5755	288	1727	115	576
	3	3012	151	904	61	301
	4	2529	126	760	52	254

DIMENSIONS IN [ ] = MM/KG

APPROX. MACH. WEIGHT: 13875 LBS [6294]

REFERENCE DRAWINGS	
WIRING DIAGRAM (460/480/60)	14394–00–009
WIRING DIAGRAM (380/400/50)	14394–00–011
WIRING DIAGRAM (575/600/60)	14394–00–012
LUBRICATION & MAINTENANCE	16660–00
TOOL KIT	16673–00
MISCELLANEOUS COMPONENTS	16674–00

ITEM	QTY			DESCRIPTION	PARTS LIST
P	1	1	1	GEAR UNIT	16672–00
O	1	1	1	MOTOR (CONVEYOR DRIVE)	TO SPEC.
N	1	1	1	MOTOR (BOWL DRIVE)	TO SPEC.
M	1	1	1	DRIVE COMPONENTS	16621–00
L	1	1	1	FEED COMPONENT ASSEMBLY	16606–00
K	1	1	1	BELT GUARD	16605–00
J	1	1	1	CONVEYOR	16604–00
I	1	1	1	BOWL	16603–00
H	1	1	1	CASE & COVER	16602–00
G	1	1	1	BASE	16601–00
F	1	1		ELECTRICAL PARTS LIST (575/600/60)	16593–00–002
E		1		ELECTRICAL PARTS LIST (380/400/50)	16593–00–001
D			1	ELECTRICAL PARTS LIST (460/480/60)	16593–00
C	1			CONTROL ENCLOSURE (575/600/60)	16472–00–004
B		1		CONTROL ENCLOSURE (380/400/50)	16472–00–003
A			1	CONTROL ENCLOSURE (460/480/60)	16472–00–002
03	X	X	X	CENTRIFUGE ASSEMBLY (575/600/60)	–
02	X	X	X	CENTRIFUGE ASSEMBLY (380/400/50)	–
01	X	X	X	CENTRIFUGE ASSEMBLY (460/480/60)	–

REV	CHANGE	DWN	DATE
1	ADDED CENTER OF GRAVITY.	SSS	9/5/07
		CKD	

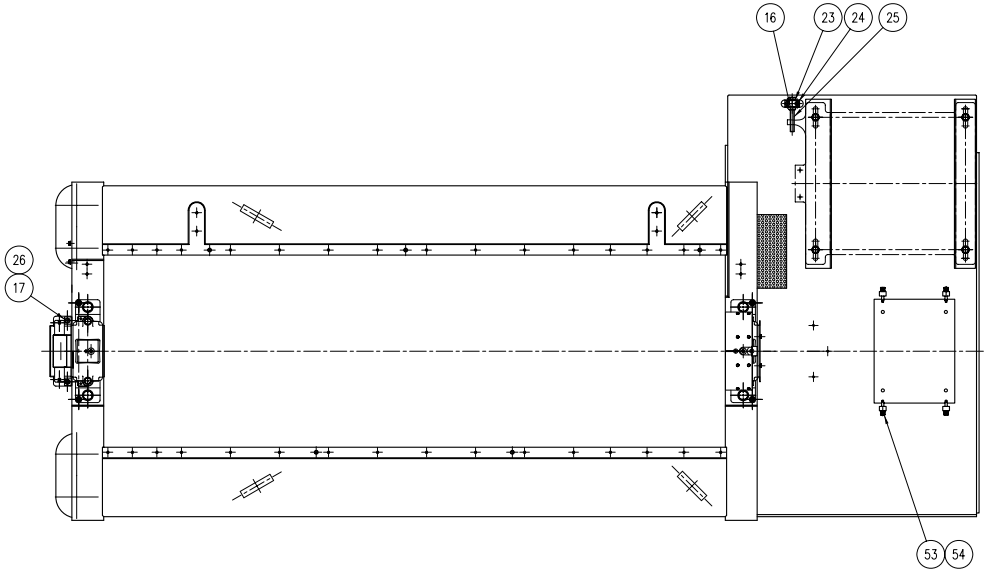
TITLE: CENTRIFUGE GENERAL ARRANGEMENT DE-7200 EX-PROOF

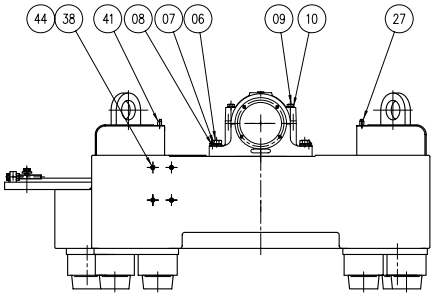
DWN CCS 1/18/07 SCALE 1:10 UON

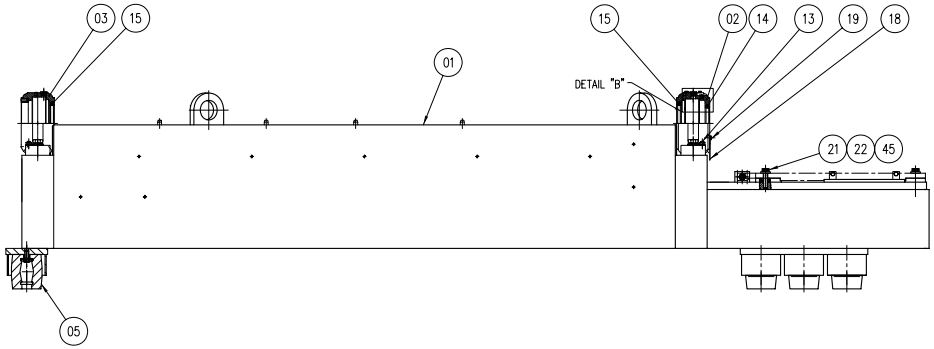
SHEET SIZE D | DRAWING NO. 16590-00

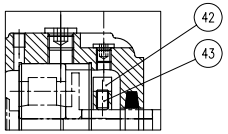
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

US MFG CENT









DETAIL "B"

QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
4	54	G0007766	HEX NUT
4	53	G0008102	ADJUSTING SCREW
	52		
	51		
	50		
	49		
	48		
	47		
	46		
4	45	G0007781	FLAT WASHER
4	44	G0007756	HEX HEAD BOLT
3	43	G0007755	SET SCREW
1	42	G0007754	CAM RING
3	41	G0007753	LOCATING PIN
	40		
	39		
6	38	G0007750	FLAT WASHER
	37		
	36		
	35		
	34		
	33		
	32		
	31		
	30		
	29		
	28		
2	27	G0007739	LOCATING PIN
2	26	G0007738	HEX HEAD BOLT
1	25	G0007737	HEX HEAD BOLT
2	24	G0007736	PAN HEAD SCREW
1	23	G0007735	TENSION BLOCK
4	22	G0007734	LOCK WASHER
4	21	G0007733	HEX HEAD BOLT
	20		
2	19	G0007731	HEX HEAD BOLT
1	18	G0007730	GUIDE PLATE
2	17	G0007729	FLAT WASHER
1	16	G0007793	HEX NUT
2	15	G0007727	FELT STRIP
2	14	G0007726	FELT STRIP
4	13	G0007725	TAPER PIN
	12		
	11		
9	10	G0007722	FLAT WASHER
4	09	G0007721	HEX HEAD BOLT
4	08	G0007720	LOCK WASHER
4	07	G0007719	FLAT WASHER
4	06	G0007718	HEX HEAD BOLT
9	05	G0007717	VIBRATION ISOLATOR
	04		
1	03	G0007715	PILLOW BLOCK, LIQUID END
1	02	G0007714	PILLOW BLOCK, SOLID END
1	01	G0007713	BASE

REF: 16590-00

REV	CHANGE	CKD	DATE
2	ITEM 04 WAS G0007716; 11 - G0007723; 12 - G0007724; 20 - G0007723; 28 - G000-7740; 29 - G0007741; 30 - G0007742; 31 - G0007743; 32 - G0007744; 33 - G000-7745; 34 - G0007746; 35 - G0007747; 36 - G0007833; 37 - G0007749; 39 - G000-7751; 40 - G0007752; 46 - G0007780; MOVED ITEMS 47-52 TO MODEL (PENDING).	CCS	11/17/07
1	ITEM 36 WAS G0007748; ADDED ITEMS 47-54.	CCS	6/15/07

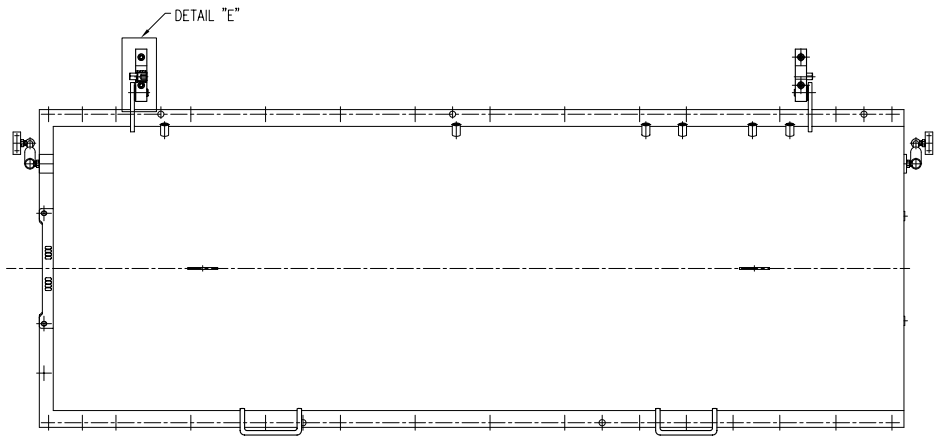
TITLE: BASE PARTS LIST
DE-7200 CENTRIFUGE

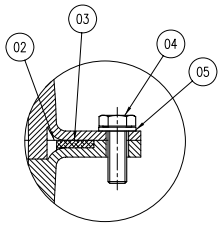
DWN CCS | CKD | DATE 1/19/07 | SCALE NTS | REV 2

SHEET SIZE C | N | DWN | F C | CKD

DRAWING NO. 16601-00

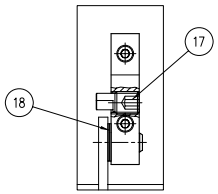
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

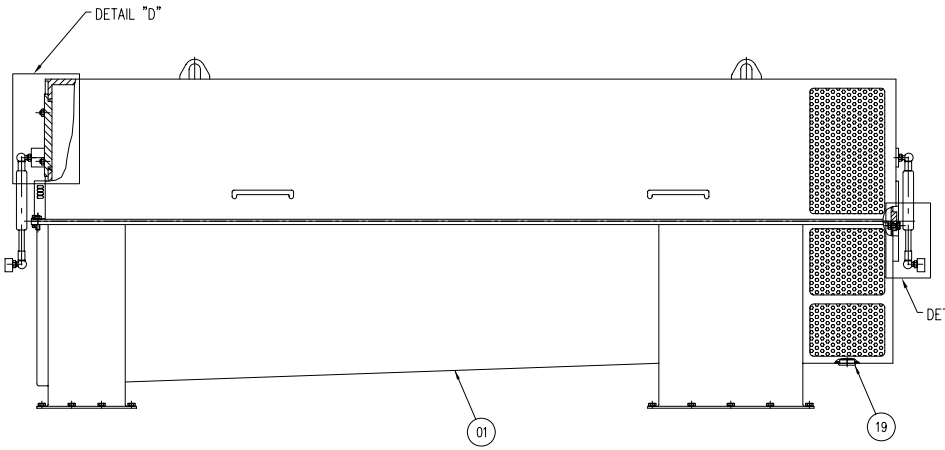


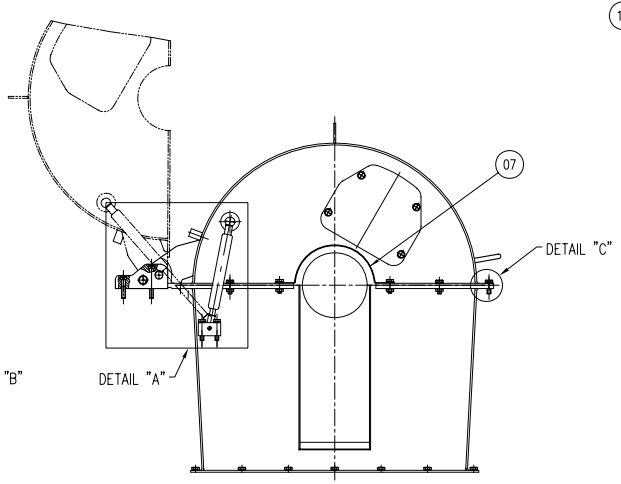


DETAIL "C"

DETAIL "E"







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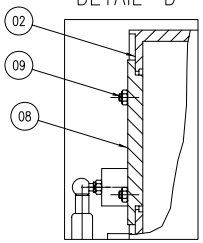
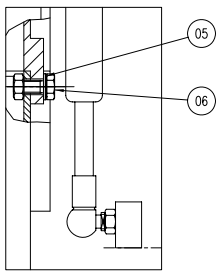
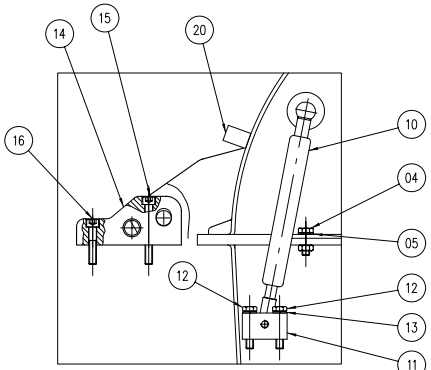


DETAIL "B"





DETAIL "A"

QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
6	20	G0007777	PIPE PLUG
1	19	G0007776	VENT PLUG
4	18	G0007775	FLAT WASHER
2	17	G0007774	STOP PIN
2	16	G0007773	SOCKET HEAD SCREW
2	15	G0007772	SOCKET HEAD SCREW
2	14	G0007771	HINGE BRACKET
4	13	G0007770	LOCK WASHER
4	12	G0007769	HEX HEAD BOLT
2	11	G0007768	CYLINDER MOUNT
2	10	G0007767	GAS CYLINDER
4	09	G0007766	HEX NUT
1	08	G0007765	COVER
1	07	G0007764	COVER PLATE
2	06	G0007763	HEX HEAD BOLT
42	05	G0007729	FLAT WASHER
36	04	G0007761	HEX HEAD BOLT
5	03	G0007752	RUBBER SEAL
2	02	G0007759	SEAL TAPE
1	01	G0007758	CASE

REF: 16590-00

TITLE: CASE & COVER PARTS LIST
DE-7200 CENTRIFUGE

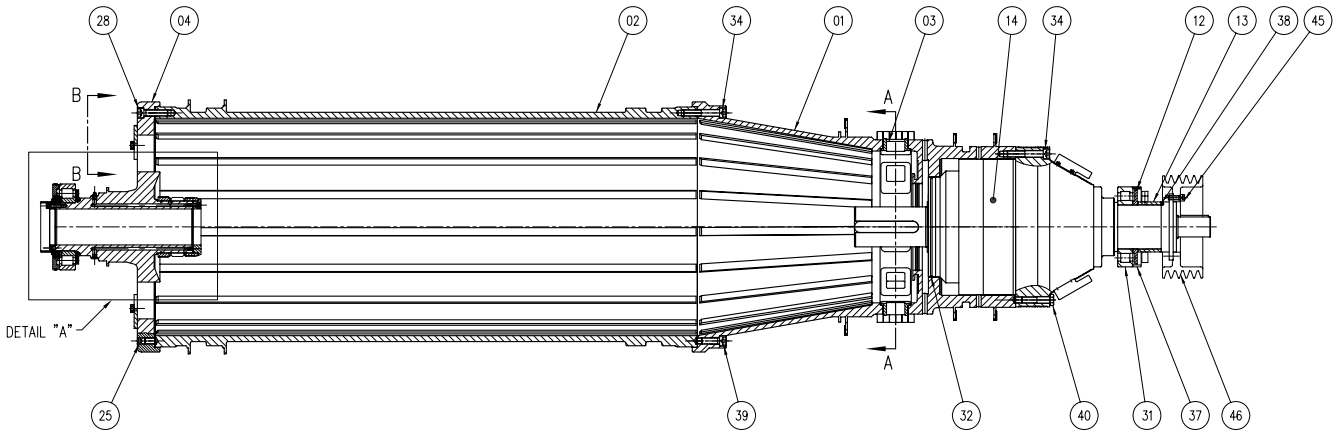
DWN CCS | CKD | DATE 1/23/07 | SCALE NTS | REV

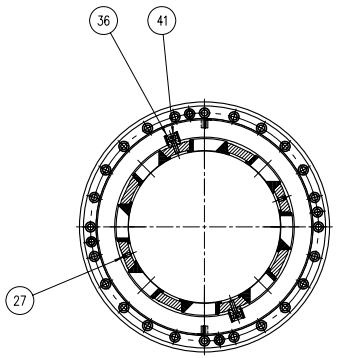
REV | CHANGE | CKD | DATE

SHEET SIZE C | N | DWN | CKD

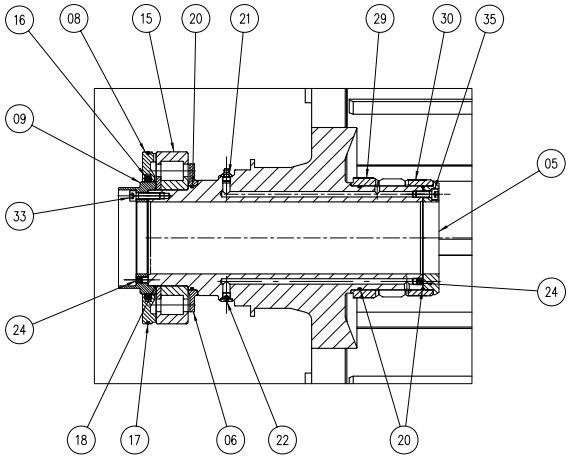
DRAWING NO. 16602-00

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

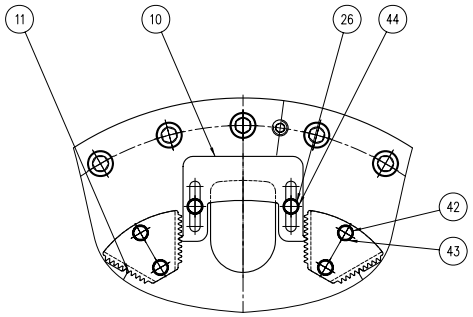




SECTION A–A



DETAIL "A"



SECTION B–B

QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
1	46	G0007959	V–BELT PULLEY
4	45	G0007873	SOCKET HEAD SCREW
12	44	G0007729	FLAT WASHER
12	43	G0007750	FLAT WASHER
12	42	G0007833	HEX HEAD BOLT
6	41	G0007832	SOCKET HEAD SCREW
4	40	G0007831	HEX HEAD BOLT
4	39	G0007830	SOCKET HEAD SCREW
1	38	G0007829	O–RING
1	37	G0007828	SPACER RING
2	36	G0007827	PLOW
6	35	G0007826	SOCKET HEAD SCREW
40	34	G0007825	SOCKET HEAD SCREW
6	33	G0007824	SOCKET HEAD SCREW
1	32	G0007823	O–RING, GEAR BOX
1	31	G0007822	ROLLER BEARING, SOLID END
1	30	G0007821	SEALING RING
1	29	G0007820	SEALING RING
24	28	G0007819	SOCKET HEAD SCREW
6	27	G0007760	SET SCREW
12	26	G0007763	HEX HEAD BOLT
4	25	G0007818	SET SCREW
6	24	G0007817	SET SCREW
⚠1	23		
1	22	G0007815	PIPE PLUG
1	21	G0007814	LUBRICATION NIPPLE
3	20	G0007813	O–RING, LIQUID END
⚠1	19		
1	18	G0007811	O–RING, CLAMPING RING–PILLOW
1	17	G0007810	PACKING SEAL, LIQUID END
1	16	G0007809	FELT RING
1	15	G0007808	ROLLER BEARING, LIQUID END
1	14	G0007807	GEAR BOX
1	13	G0007806	SPACER RING
1	12	G0007805	GREASE RING
6	11	G0007804	WEIR GUAGE PLATE
6	10	G0007803	WEIR PLATE
1	09	G0007802	CLAMPING RING, PILLOW BLOCK
1	08	G0007801	RETAINING WASHER
⚠1	07		
1	06	G0007799	FLINGER
1	05	G0007798	THRUST WASHER
1	04	G0007797	BOWL HEAD, LIQUID END
8	03	G0007796	WEAR INSERT, SOLID DISCHARGE
1	02	G0007795	CYLINDRICAL BOWL
1	01	G0007794	CONICAL BOWL

REF: 16590–00

REV	CHANGE	CKD	DATE
2	ADDED LOCATION DESCRIPTION TO ITEMS 03, 04, 05, 15, 17, 20, 31 & 32; UPDATED VIEW OF DETAIL "A".	CCS	11/8/07
1	ITEM 07 WAS G0007800; ITEM 19 WAS G0007812; ITEM 23 WAS G0007816.	CCS	6/15/07

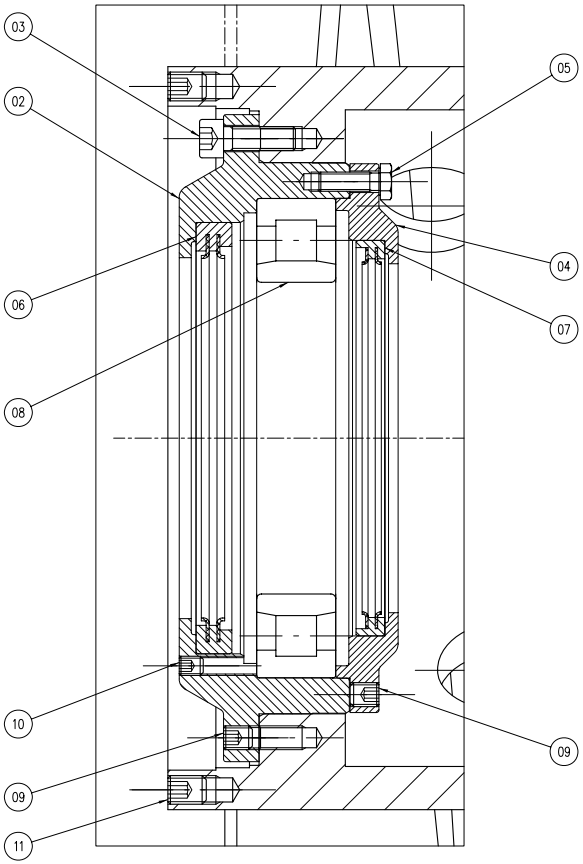
TITLE: BOWL PARTS LIST
DE–7200 CENTRIFUGE

DWN CCS | CKD | DATE 1/31/07 | SCALE NTS | REV 2

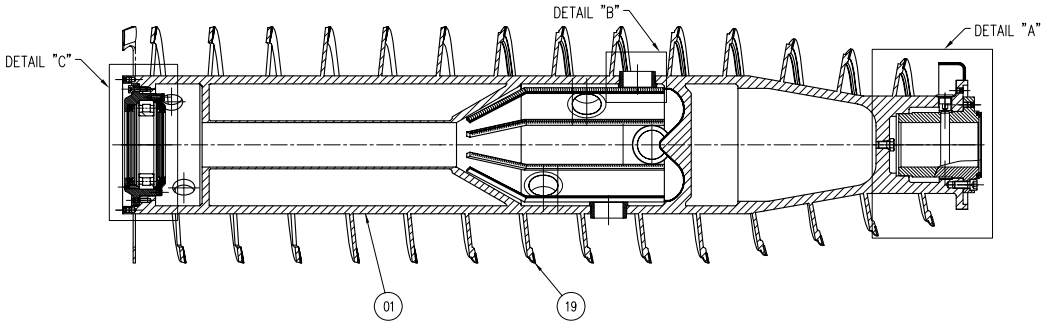
SHEET SIZE C | N | DWN | F C | CKD

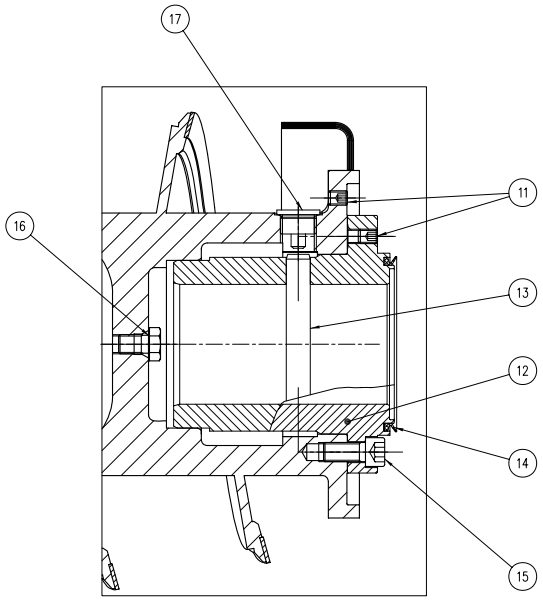
DRAWING NO. 16603–00

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

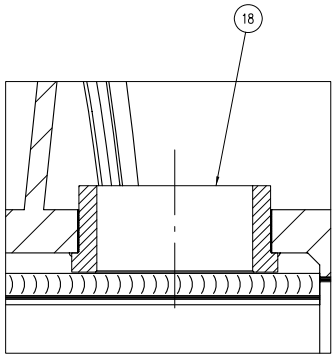


DETAIL "C"





DETAIL "A"



DETAIL "B"

⚠1				
450	19	G0008483	TILE & BACKING PLATE
8	18	G0007886	FEED NOZZLE
2	17	G0007885	PIPE PLUG
1	16	G0007901	HEX HEAD BOLT
12	15	G0007884	SOCKET HEAD SCREW
1	14	G0007883	LIP SEAL
1	13	G0007882	DOWEL PIN
1	12	G0007881	DRIVE SLEEVE
16	11	G0007880	SET SCREW
2	10	G0007879	SET SCREW
4	09	G0007878	SET SCREW
1	08	G0007877	ROLLER BEARING
1	07	G0007876	SHAFT SEAL
1	06	G0007875	SHAFT SEAL
8	05	G0007748	HEX HEAD BOLT
1	04	G0007874	SEAL COVER
8	03	G0007873	SOCKET HEAD SCREW
1	02	G0007872	BEARING HOUSING
1	01	G0007871	CONVEYOR
QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME

REF: 16590-00

REV	CHANGE	CKD	DATE
1	ADDED ITEM 19.	CCS	5/13/08

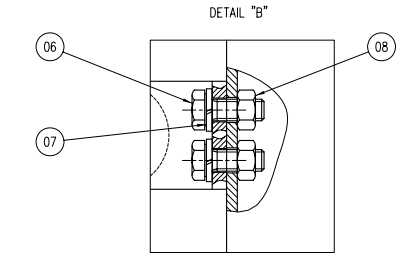
TITLE: CONVEYOR PARTS LIST
DE-7200 CENTRIFUGE

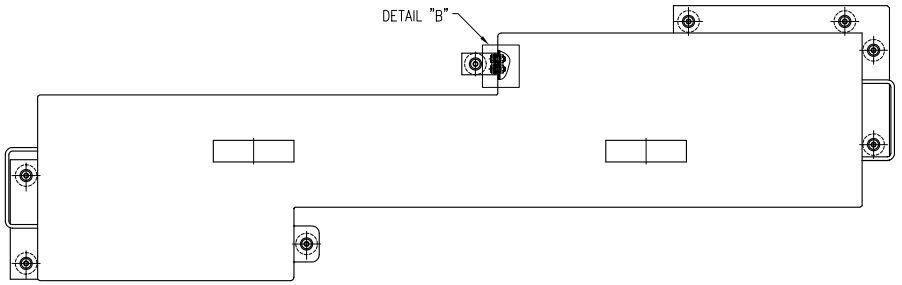
DWN CCS | CKD | DATE 2/1/07 | SCALE NTS | REV 1

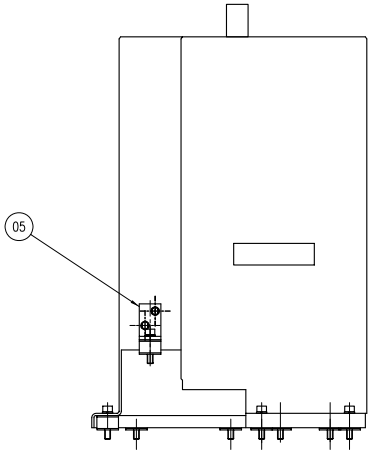
SHEET SIZE C | F C N | DWN | CKD

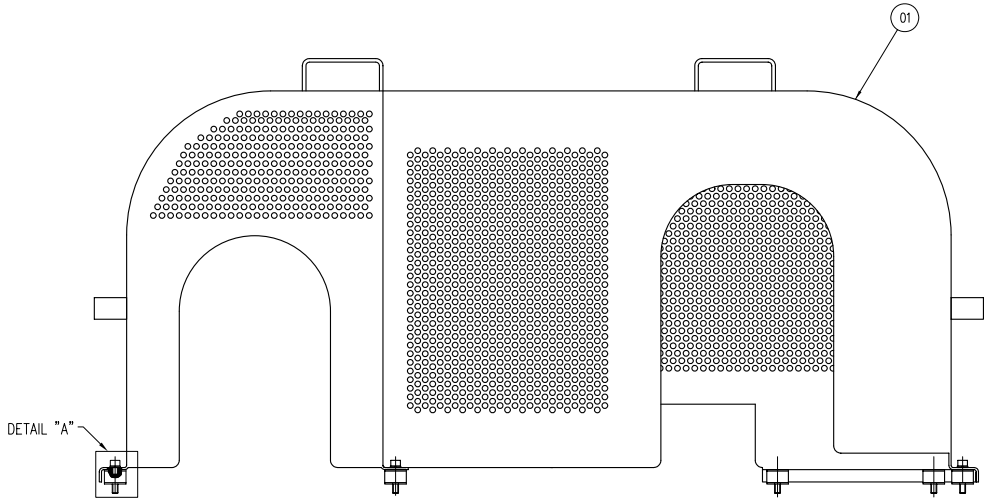
DRAWING NO. 16604-00

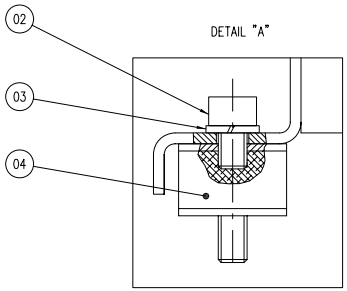
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.











QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
2	08	G0007860	NUT
2	07	G0007859	LOCK WASHER
2	06	G0007858	HEX HEAD BOLT
1	05	G0007857	MOUNTING ANGLE
8	04	G0007856	RUBBER ISOLATOR
8	03	G0007855	LOCK WASHER
8	02	G0007751	SOCKET HEAD SCREW
1	01	G0007853	BELT GUARD

REF: 16590-00

TITLE: BELT GUARD PARTS LIST
DE-7200 CENTRIFUGE

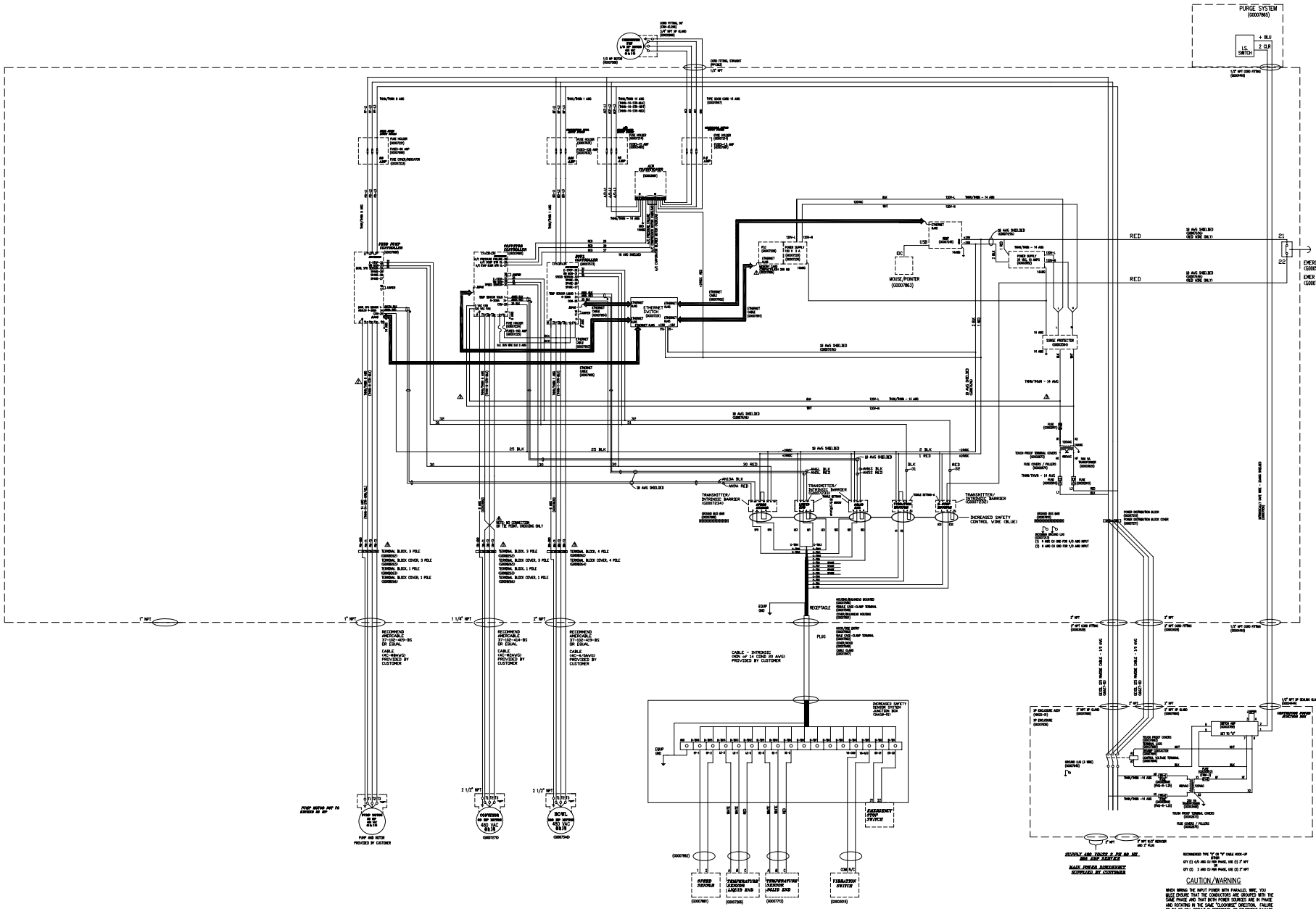
DWN CCS | CKD | DATE 1/31/07 | SCALE NTS | REV

REV | CHANGE | CKD | DATE

SHEET SIZE C | F.C. N | DWN | CKD

DRAWING NO. 16605-00

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



REF: GA#16590-00
REF. P.L. # 16593-00, # 16472-00-002 ⚠
STARTED USING ON DE-7200 UNIT# CF5001

REV	CHANGE	DWN	CKD	DATE
6	CHANGED REFERENCE DRAWING, WAS 16742-00-002	JFS	MC	04/24/08
5	CHANGED TERMINAL BLOCKS ON ALL UNITS MADE TO DATE, SEE PREVIOUS REV HARD COPY	JFS	MC	08/13/07
4	CORRECTED CONVEYOR OUTPUT WIRING FOR PROPER MOTOR ROTATION	MJS	JFS	07/02/07
3	ADDED WIRES FROM THE L.V. SURGE SUPPRESSOR TO THE CONVEYOR DRIVE FANS	JFS	MJC	06/06/07
2	THHN/THWN 8 AWG WAS THHN/THWN 10 AWG	JFS	MC	04/18/07
1	ADDED MEMORY CARD, G0007595 TO THE PLC MODULE	MJS	JFS	3/9/07

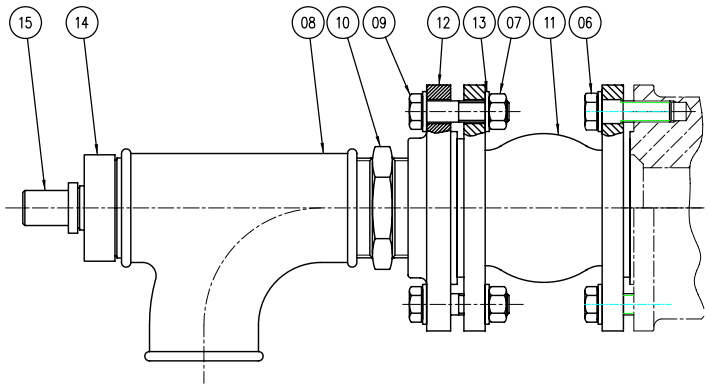
TITLE: VFD XP DE-7200™ CENTRIFUGE
ELECTRICAL WIRING SCHEMATIC 460/480V 60 HZ

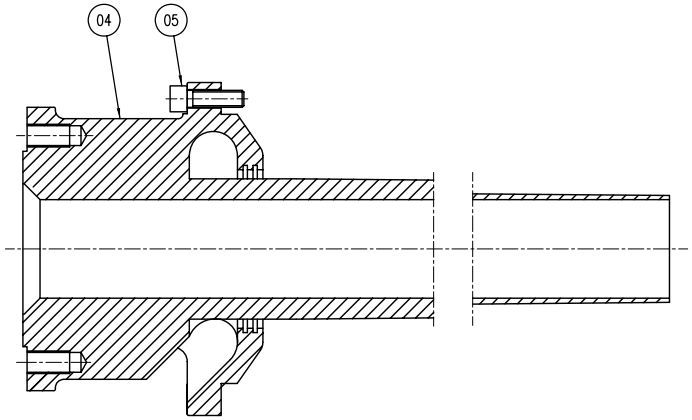
DWN	CKD	DATE	SCALE	REV
JFS		02/07/03	NONE	6

SHEET SIZE	DRAWING NO.	DWN	CKD
D	14394-00-009	JFS 09/18/06	RMK 09/19/06

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

CONT. MAN





QTY			ITEM	PART NUMBER	DESCRIPTION/PART NAME
1			15	G0007891	REDUCING ADAPTER
1			14	G0007900	REDUCING ADAPTER
12			13	G0007722	FLAT WASHER
1			12	G0007896	FLANGE
1			11	G0007895	FLEX JOINT
1			10	G0007894	PIPE NIPPLE
4			09	G0007893	HEX HEAD BOLT
1			08	G0007892	PIPE TEE
4			07	G0007793	HEX NUT
4			06	G0008103	HEX HEAD BOLT
	4		05	G0007889	SOCKET HEAD SCREW
	1		04	G0007888	FEED PIPE
X		1	03	16606-03	FEED DEVICE ASSEMBLY
	X	1	02	16606-02	FEED PIPE ASSEMBLY
		X	01	16606-01	FEED COMPONENT ASSEMBLY

REF: 16590-00

REV	CHANGE	CKD	DATE
2	ADDED ITEMS 14 & 15; QTY WAS 16 ON ITEM 13; QTY WAS 8 ON ITEM 09; QTY WAS 2 ON ITEM 10; UPDATED VIEW.	CCS	11/8/07
1	REMOVED ITEMS 14-19; ITEM 06 WAS G0007890; ITEM 07 WAS G0007891; ITEM 13 WAS G0007897; CHANGED SIDE VIEW	DRC CCS	6/5/07

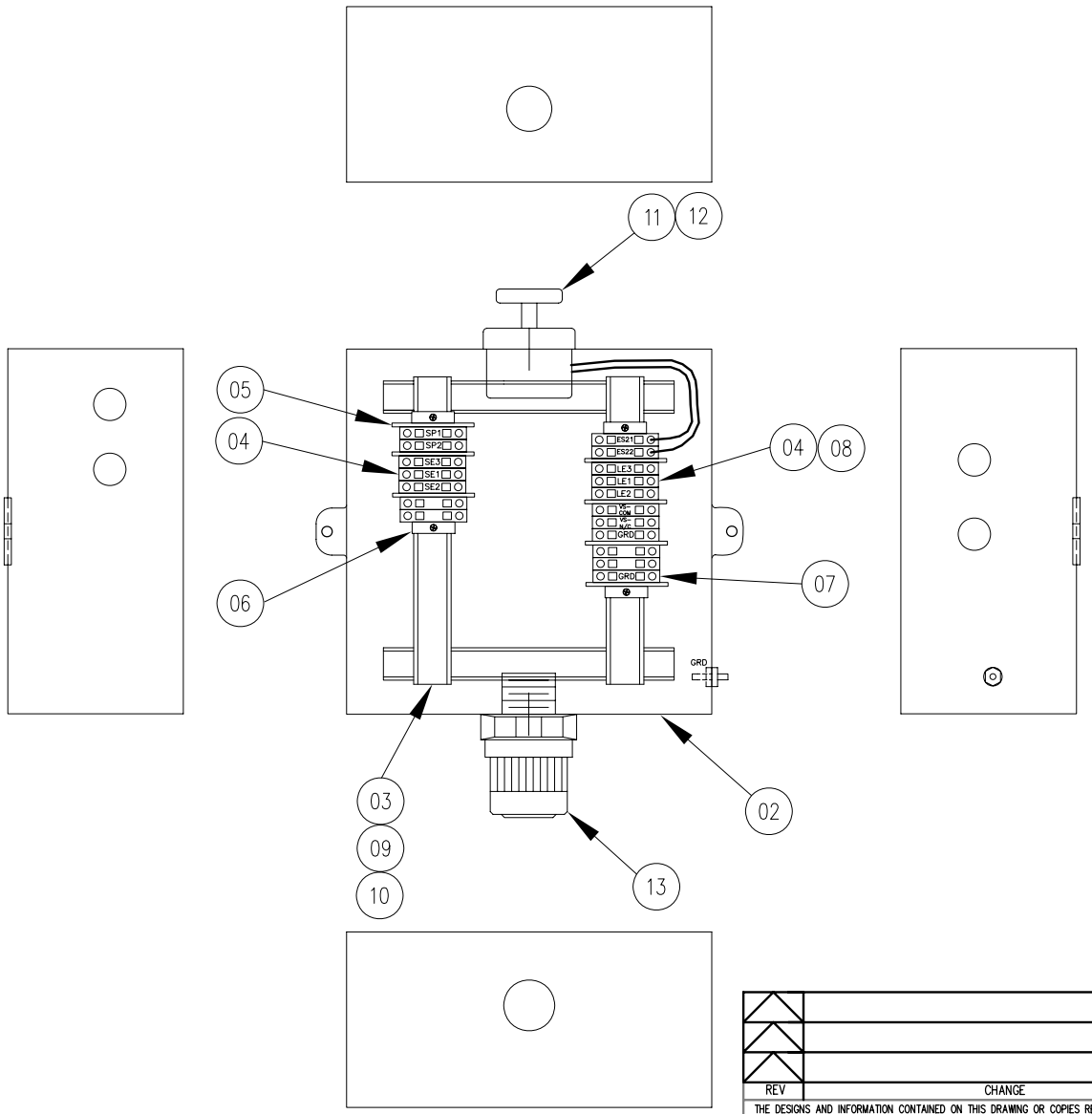
TITLE: FEED COMPONENT ASSEMBLY
DE-7200 CENTRIFUGE

DWN CCS | CKD | DATE 2/1/07 | SCALE NTS | REV 2

SHEET SIZE B | F C N | DWN | CKD

DRAWING NO. 16606-00

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



QTY	ITEM	PART NUMBER	PART NAME	DESCRIPTION
1	13	G0007933	CORD CONNECTOR	STRAIN RELIEF, 1 NPT, 0.875-1.0 GASKET
1	12	G0007244	NAMEPLATE, EMERGENCY STOP	
1	11	G0005325	EMERGENCY STOP BUTTON	
4	10	G0007675	WELD NUT	10-32X9/32 SS W/ROUND BASE
4	09	G0003875	MACHINE SCREW SS	ROUND HEAD 10-32X3/8L
16	08	G0004520	TERMINAL BLOCK LABEL	
2	07	G0007216	TERMINAL BLOCK GROUND	CLAMP, TERM BLOCK GROUND/GREEN
4	06	G0007012	TERMINAL BLOCK END CLAMP	CLAMP, TERM BLOCK 35MM DIN
7	05	G0007237	TERMINAL BLOCK DIVIDER	SEPARATOR, TERM BLK-281 SERIES/ORANGE
16	04	G0007236	TERMINAL BLOCK	BLOCK, TERM-2 COND THRU 281 SERIES/BLUE
2	03	G0003567	RAIL	RAIL, DIN-35mm X 7.5mm X 8.5
1	02	G0004278	ENCLOSURE	ENCLOSURE, SS-9.84X9.84X4.73 NEMA 4X
X	01	16618-01	PARTS LIST FOR ENCLOSURE	ASSEMBLY COMPLETE

REF G.A. 16472-00-001
REF EL 14394-00-009

REV	CHANGE	CKD	DATE

TITLE: DE-7200 BASE JUNCTION BOX ASSEMBLY

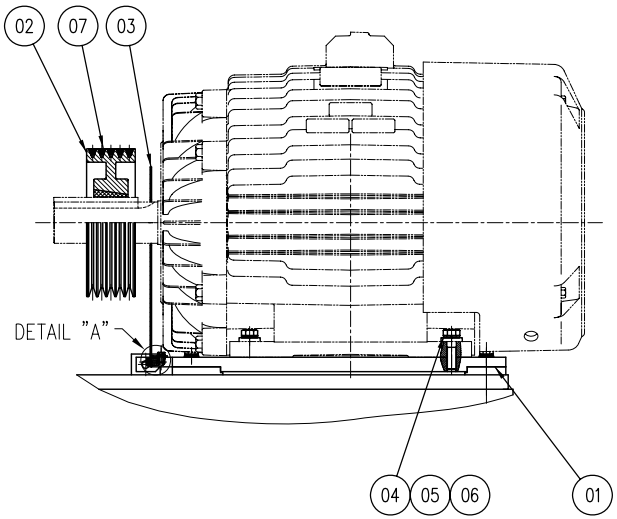
DWN JWC | CKD JFS | DATE 02/20/07 | SCALE NTS | REV

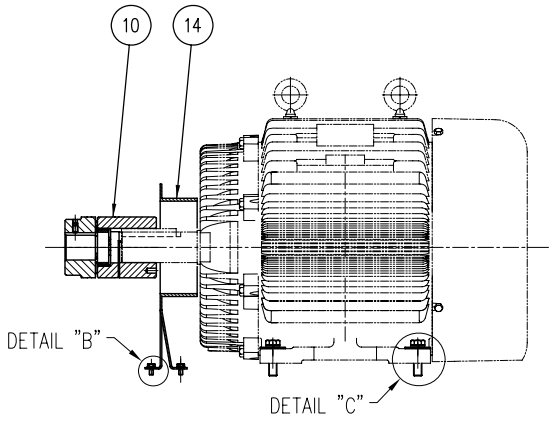
SHEET SIZE B | F C N | DWN | CKD

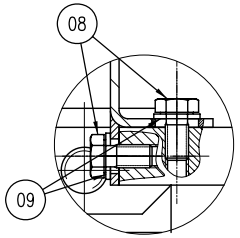
DRAWING NO. 16618-00

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

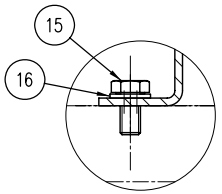
BOM,CENT,GER,MAN







DETAIL "A"



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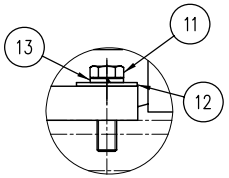


DETAIL "C"

REF: 16590-00

QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
3	16	G0007969	FLAT WASHER
3	15	G0007756	HEX HEAD BOLT
1	14	G0007968	BACK DRIVE SHAFT GUARD
4	13	G0007734	LOCK WASHER
4	12	G0007967	FLAT WASHER
4	11	G0007966	HEX HEAD BOLT
1	10	G0007870	COUPLING
3	09	G0007965	FLAT WASHER
3	08	G0007756	HEX HEAD BOLT
5	07	G0007964	DRIVE BELT
4	06	G0007963	LOCK WASHER
4	05	G0007962	FLAT WASHER
4	04	G0007961	HEX HEAD BOLT
1	03	G0007960	MAIN DRIVE SHAFT GUARD
1	02	G0007958	V-BELT PULLEY
1	01	G0007957	MOTOR PLATE

REV	CHANGE	CKD	DATE

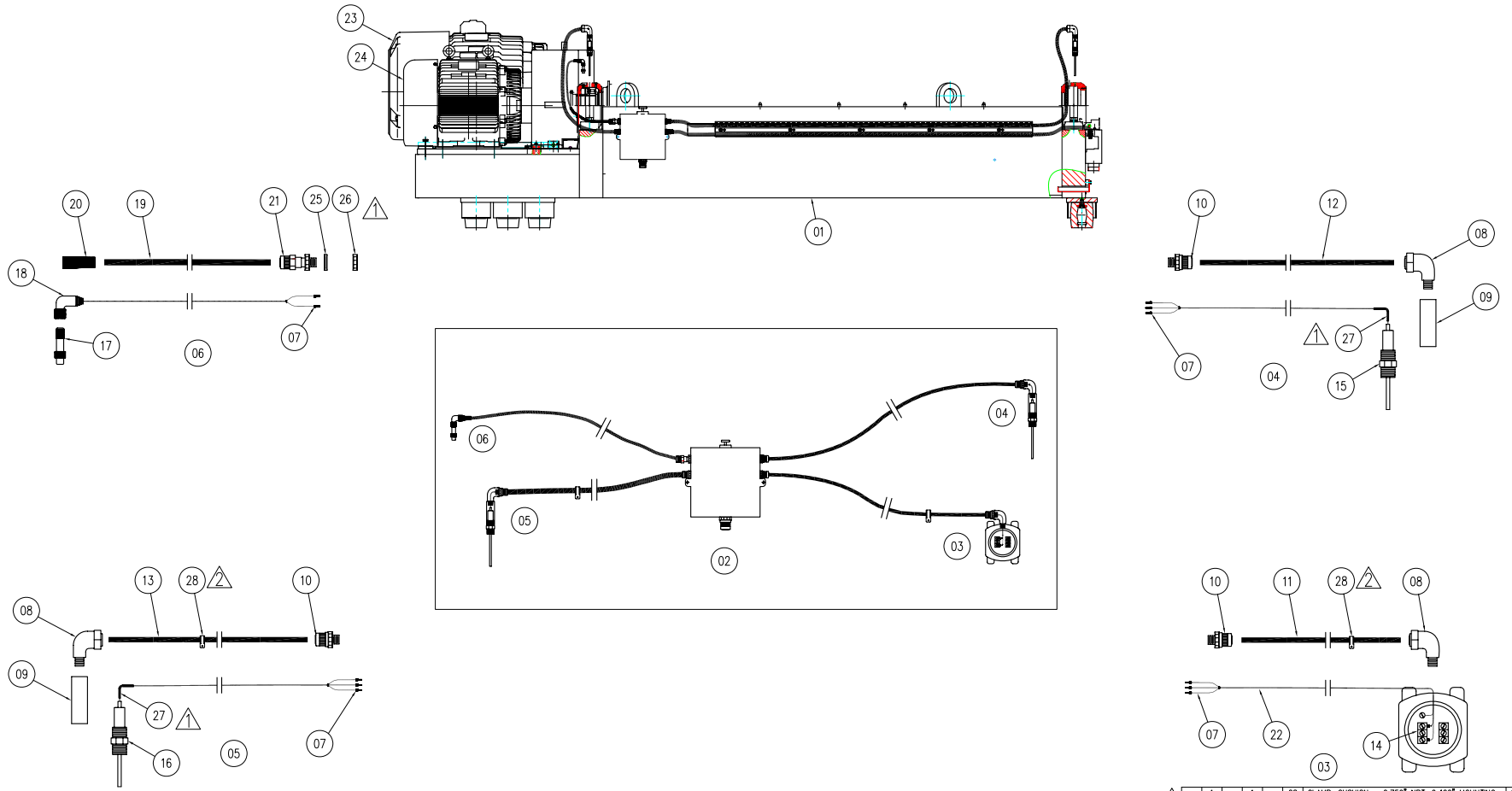
TITLE: MISCELLANEOUS DRIVE COMPONENTS
PARTS LIST FOR DE-7200 CENTRIFUGE

DWN CCS | CKD | DATE 2/27/07 | SCALE NTS | REV

SHEET SIZE B | F C N | DWN | CKD

DRAWING NO. 16621-00

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



2		1		1		28	CLAMP, CUSHION – 0.750" NPT, 0.406" MOUNTING	G0008027
1		1	1			27	SLEEVE,#8-SILICONE RUBBER 6" LENGTH	G0008035
1	1					26	LOCKNUT, 1/2" NPT – BRASS	G0007994
1	1					25	GASKET, SEALING – 0.500" NPT	G0007993
					1	24	MOTOR,EP-60HP 460/480V/60HZ/3PH 1800 RPM	G0007270
					1	23	MOTOR,EP-150HP 460/480V/60HZ/3PH 1800 RPM	G0007548
				1		22	WIRE, 3 COND 18 AWG SHIELDED X 115"	G0007941
	1					21	CABLE GLAND, XP, 1/2" NPT	G0004444
	1					20	HEAT SHRINK TUBING, 2"	G0007940
	1					19	ARMOR JACKET, .313 ID X 46"	G0007939
	1					18	CABLE, SPEED SENSOR, WITH FITTING	G0007862
	1					17	SPEED SENSOR	G0007861
		1				16	RTD SENSOR, BEARING, 5" 316SS 60" WIRE	G0007712
			1			15	RTD SENSOR, BEARING, 5" 316SS 140" WIRE	G0007265
				1		14	VIBRATION SWITCH	G0003015
2		1				13	CONDUIT, LIQUID TIGHT – 1/2" X 38"	G0007938
2			1			12	CONDUIT, LIQUID TIGHT – 1/2" X 122"	G0007937
2				1		11	CONDUIT, LIQUID TIGHT – 1/2" X 103"	G0007936
		1	1	1		10	FITTING, LIQUID TIGHT, 1/2" NPT, STRAIGHT	CRH-LT50
		1	1			09	COUPLING, PIPE – FULL, 1/2" NPT, SS	CPLG-50-S4
		1	1	1		08	90 DEGREE ELBOW, LIQUID TIGHT	CRH-LT5090
	2	3	3	3		07	FERRULE	G0002377
					1	06	SPEED SENSOR ASSY	16593-06
					1	05	SOLID END RTD ASSY	16593-05
					1	04	LIQUID END RTD ASSY	16593-04
					1	03	VIBRATION SWITCH ASSY	16593-03
					1	02	JUNCTION BOX, SENSOR ELECTRONICS ASSY	16618-01
					1	01	DE-7200 BASE ELECTICAL COMPONENT KIT	G0007702
QTY						ITEM	PART NAME	PART NUMBER

REF: W.S. #14394-00-009
STARTED ON DE-7200 UNIT #CF5001

REV	CHANGE	CKD	DATE
2	ITEM #11 WAS 106", ITEM #12 WAS 124", ITEM #13 WAS 42" AND ADDED ITEM #28	JFS SDB	03/26/07
1	ADDED ITEMS #25, 26 AND 27	MJS JFS	03/08/07

TITLE: PARTS LIST FOR DE-7200 BASE SENSOR SYSTEM 460/480 VAC 60HZ 3PH UNITS

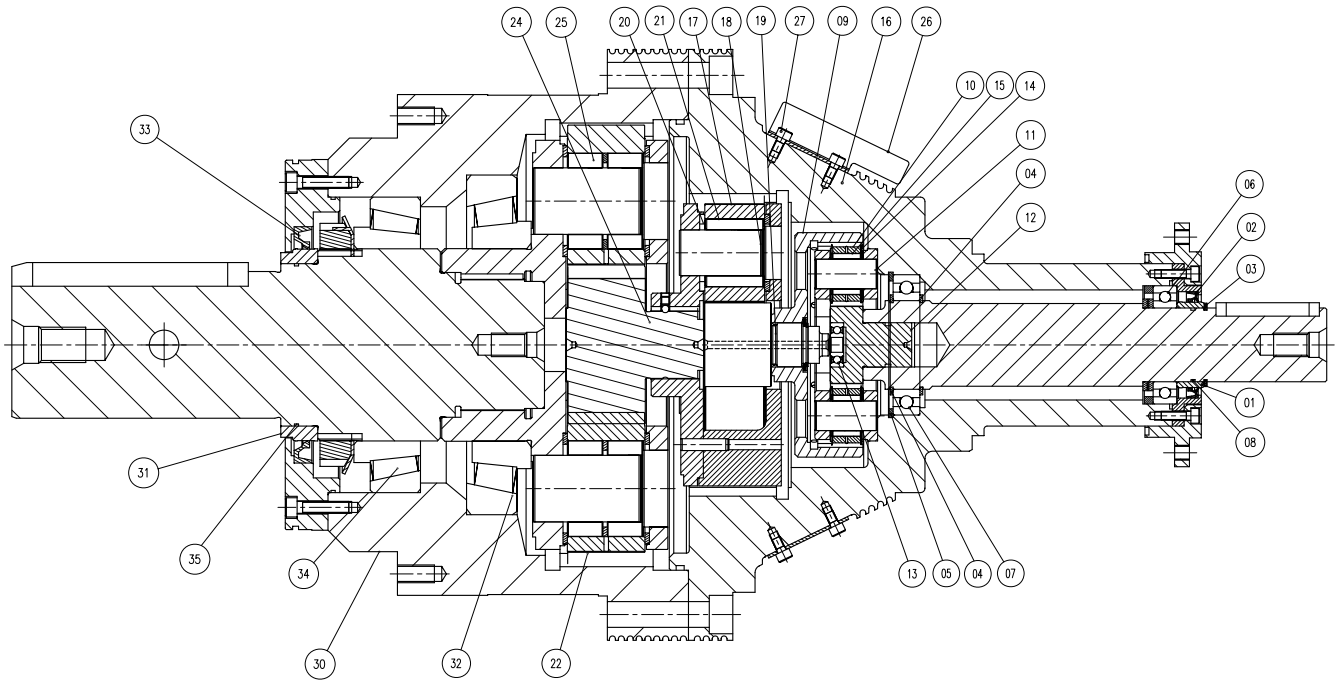
DWN MS | CKD JFS | DATE 02/14/07 | SCALE NONE | REV 2

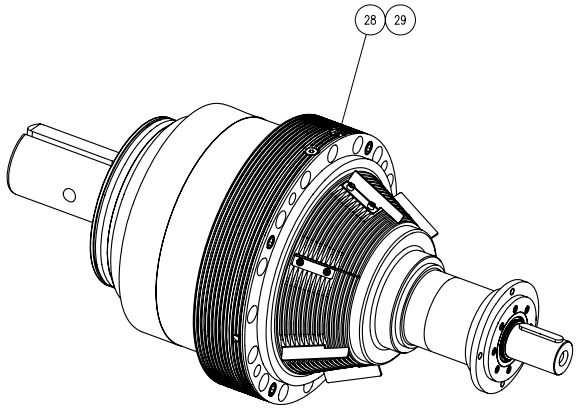
SHEET SIZE C | F C N | DWN | CKD

DRAWING NO. 16593-00

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

BOM,CENT,CER,MAN





QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
1	35	G0008175	O-RING
1	34	G0008174	TAPERED ROLLER BEARING
1	33	G0008173	SHAFT SEAL
1	32	G0008172	TAPERED ROLLER BEARING
1	31	G0008171	RING
1	30	G0008170	OUTPUT FLANGE
4	29	G0008169	SEALING RING
4	28	G0008168	PLUG SCREW
12	27	G0008167	SOCKET HEAD CAP SCREW
6	26	G0008166	AIR DEFLECTOR
136	25	G0008165	NEEDLE ROLLER
1	24	G0008164	PINION GEAR
4	23	G0008163	PLANET BOLT
4	22	G0008162	PLANET GEAR
48	21	G0008161	NEEDLE ROLLER
6	20	G0008160	RUNNING WASHER
1	19	G0008159	PINION GEAR
3	18	G0008158	PLANET BOLT
3	17	G0008157	PLANET GEAR
1	16	G0008156	SHELL
72	15	G0008155	NEEDLE ROLLER
8	14	G0008154	AXIAL WASHER
1	13	G0008153	GROOVED BALL BEARING
1	12	G0008152	GEAR PINION
4	11	G0008151	PLANET BOLT
4	10	G0008150	PLANET GEAR
1	09	G0008149	HOLLOW GEAR
1	08	G0008148	O-RING
1	07	G0008147	GROOVED BALL BEARING
1	06	G0008146	GROOVED BALL BEARING
1	05	G0008145	LOCKING RING
2	04	G0008144	LOCKING RING
1	03	G0008143	LOCKING RING
1	02	G0008142	SHAFT SEAL
1	01	G0008141	RING

REF: 16590-00

REV	CHANGE	CKD	DATE

TITLE: GEAR UNIT PARTS LIST FOR DE-7200 CENTRIFUGE

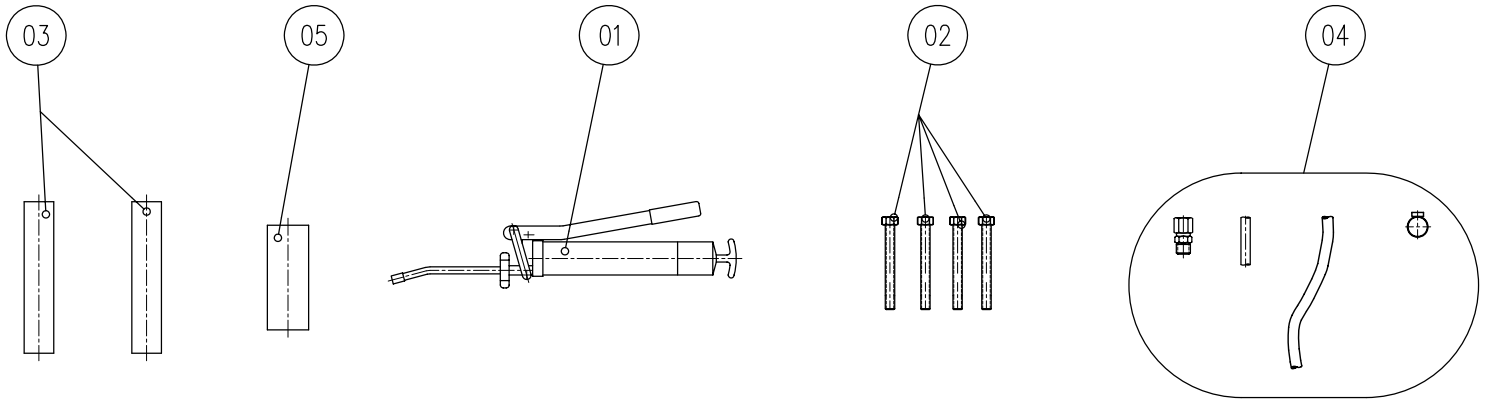
DWN CCS | CKD | DATE 6/16/07 | SCALE NTS | REV

SHEET SIZE C | N | DWN | F C | CKD

DRAWING NO. 16672-00

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

CENT, MAN



QTY	ITEM	PART NUMBER	DESCRIPTION/PART NAME
1	05	G0008190	TOUCH-UP PAINT
1	04	G0008186	DRAIN HOSE ASSEMBLY
2	03	G0008185	GREASE CARTRIDGE
4	02	G0008182	JACKING BOLT
1	01	G0008181	GREASE GUN

REF: 16590-00

REV	CHANGE	CKD	DATE
1	COMBINED G0008186, G0008187, G0008188 & G0008189 TO MAKE ITEM 04; ITEM 05 WAS ITEM 10; MOVED G0008183 & G0008184 TO DRAWING 16798-00.	CCS	7/24/08

TITLE: TOOL KIT
DE-7200 CENTRIFUGE

DWN CCS | CKD | DATE 6/17/07 | SCALE NTS | REV 1

SHEET SIZE B | F C N | DWN | CKD

DRAWING NO. 16673-00

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

CENT, MAN F

QTY	ITEM	PART NUMBER	DESCRIPTION
3	13	G0008184	BOLT – USE WITH COMBINATION PLATE
3	12	G0008183	COMBINATION PLATE – HOLDS CONVEYOR TO BOWL
1	11	G0008815	TAPER PIN REAMER
1	10	16748–01	FEED & SOLID DISCHARGE REPLACEMENT TOOL
2	09	G0008718	EYE BOLT – LIFT LIQUID END BOWL HEAD
2	08	G0008717	EYE BOLT – REMOVE CONVEYOR FROM BOWL
2	07	G0008709	JACK BOLT – REMOVE CONV. BEARING FROM HUB – REMOVE HUB FROM THRUST RING ON L.E. MAIN BEARING
2	06	G0008708	JACK BOLT – REMOVE BOWL DRIVE SHEAVE/CONV. BEARING HUB
2	05	G0008707	JACK BOLT – REMOVE CONVEYOR GEAR BOX OUTPUT SHAFT HUB
1	04	16954–01	CONVEYOR SUPPORT – CONVEYOR HORIZONTAL REMOVAL
2	03	G0002559	M16 X 2.0 NUT – REMOVE GEAR BOX
2	02	G0008706	JACK BOLT – REMOVE LIQUID END BOWL HEAD
	01	TOOL KIT ASSEMBLY	ASSEMBLY COMPLETE

REF: 16590–00

REV	CHANGE	CKD	DATE

TITLE: TOOL KIT–REPAIR
DE–7200 CENTRIFUGE

DWN: CCS | CKD: | DATE: 5/16/08 | SCALE: 1:1 | REV:

A SHEET SIZE | N F C | DWN | CKD

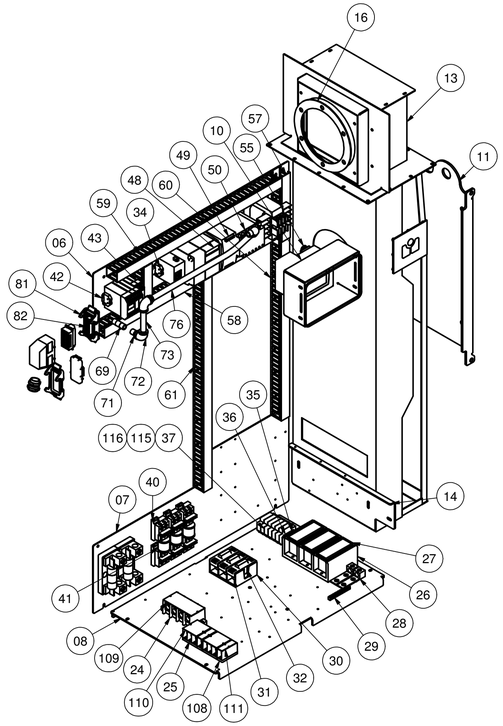
DRAWING NO. 16798–00

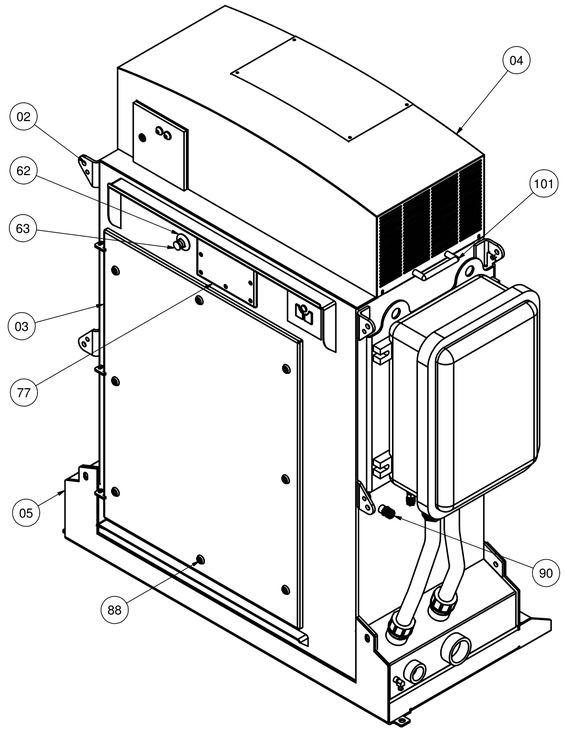
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

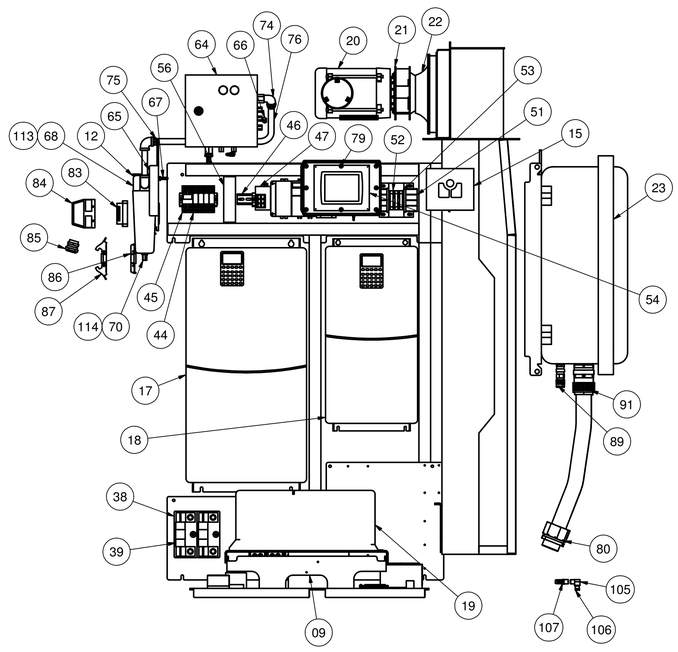
CENT

ITEM	QTY	PART NUMBER	DESCRIPTION
01	X	16472-01-002	ASSEMBLY COMPLETE
02	1	16396-01-003	ENCLOSURE ASSEMBLY
03	1	16400-01-003	DOOR ASSEMBLY
04	1	16401-01-002	COVER ASSEMBLY
05	1	16402-01-001	STAND ASSEMBLY
06	1	16404-01-004	COMPONENT PANEL (UPPER)
07	1	16404-02-004	COMPONENT PANEL (LOWER)
08	1	16404-03-004	COMPONENT PANEL (BOTTOM)
09	1	16404-01-003	COMPONENT MOUNT ASSY
10	1	16405-01	DISPLAY SCREEN MOUNT
11	1	16597-01	ENCLOSURE MOUNTING BRACKET
12	1	16598-01	AIR FILTER MOUNTING BRACKET
13	1	G0002881	AIR CONDITIONER, 12,000 BTU/HR 460/60/3
14	1	16403-01	A/C SUPPORT ANGLE
15	1	17006-01	INDUSTRIAL MOUSE
16	1	15197-01-001	INLET CONE EXTENSION
17	1	G0007573	DRIVE, 150 HP 460VAC 60 HZ
18	1	G0007690	DRIVE, 60 HP 460VAC 60 HZ
19	1	G0007689	DRIVE, 30 HP 460VAC 60 HZ
20	1	G0007588	AIR CONDITIONER COOLING MOTOR
21	1	G0002603	FAN WHEEL, 8" BACKWARD CURVED
22	1	G0002604	INLET CONE
23	1	16607-01	EX-PROOF ENCLOSURE
24	1	G0008261	POWER DIST. BLOCK, OUTGOING-2/0 AWG-8 AWG
25	2	G0008262	POWER DIST. BLOCK, OUTGOING-6 AWG
26	1	G0007210	POWER DIST. BLOCK, INCOMING
27	3	G0007211	POWER DIST. BLOCK COVER
28	2	G0007213	GROUND LUG, INCOMING
29	2	G0007610	GROUND BUS BAR, INCOMING
30	1	G0007221	FUSE BLOCK, 60 AMP 3P CLASS J
31	3	G0007698	FUSE, 60 AMP CLASS J
32	3	G0007223	FUSE COVER, INDICATING
33	1	G0007998	DIN RAIL, 35MM X 5 1/2
34	6	G0007012	TERMINAL BLOCK END BARRIER
35	2	G0007216	TERMINAL BLOCK GROUND-YELLOW/GREEN
36	1	G0007237	TERMINAL BLOCK BARRIER-ORANGE
37	2	G0007214	FUSE BLOCK, 30 AMP 3P CLASS CC
38	2	G0007224	FUSE BLOCK, 200 AMP 1P CLASS J
39	2	G0007225	FUSE, 150 AMP CLASS J TYPE HSJ
40	6	G0007631	FUSE BLOCK, 200 AMP 3P CLASS J
41	3	G0007632	FUSE, 200 AMP CLASS J
42	1	G0007645	DIN RAIL, 35MM X 5
43	2	G0007232	BARRIER, INTRINSIC SAFE-VIBR SWITCH+E-STOP
44	2	G0007233	BARRIER, INTRINSIC SAFE-RTD SENSOR
45	1	G0007234	BARRIER, INTRINSIC SAFE-SPEED SENSOR
46	1	G0007999	DIN RAIL, 35MM X 16
47	1	G0007231	ETHERNET SWITCH, 6 PORT
48	1	G0007228	PLC, COMPACTLOGIX PROCCESSOR
49	1	G0003552	POWER SUPPLY, 24VDC, 5 AMP
50	1	G0003504	SURGE SUPPRESSOR, 120V 60HZ
51	1	G0003494	TRANSFORMER, 500VA, 460V PRI/120V SEC
52	2	G0002910	FUSE, TIME DELAY 2.5A 600VAC
53	1	G0002911	FUSE, TIME DELAY 7.0A 250VAC
54	1	G0007245	OPERATOR INTERFACE
55	1	17006-02	BRACKET ASSY,VFD CENTRIFUGE-KIT
56	1	G0008000	WIRE DUCT, 1/2 X 2 X 6
57	1	G0008001	WIRE DUCT, 1/2 X 2 X 10 1/2
58	1	G0008002	WIRE DUCT, 1/2 X 2 X 33 1/8
59	1	G0007338	WIRE DUCT, 1/2 X 2 X 30 3/4
60	1	G0007650	WIRE DUCT, 1/2 X 2 X 28 7/8
61	1	G0008010	WIRE DUCT, 1/2 X 2 X 34 3/8
62	1	G0007244	NAMEPLATE, EMERGENCY STOP
63	1	G0005325	BUTTON, EMERGENCY STOP
64	1	G0007865	PURGE UNIT W/RELIEF VALVE
65	1	G0008006	RELIEF VALVE (SERIAL # OF PURGE REQUIRED)
66	2	IMP-116B-02X02	1/8 90 DEG STREET ELBOW, BRASS
67	2	G0004679	1/8 X 3/16 HOSE BARB
68	1	G0003565	AIR FILTER, DX
69	1	NPLE-50X200S-4	1/2 X 2 PIPE NIPPLE, SST
70	1	G0002300	AIR FILTER, BX
71	1	G0002716	1/2 X 1 1/2 PIPE NIPPLE, SST
72	2	G0002714	1/2 90 DEG ELBOW, SST
73	1	G0008008	1/2 X 4 1/2 PIPE NIPPLE, SST
74	1	G0008003	1/2 90 DEG STREET ELBOW, BRASS
75	3	G0008004	1/2 X 1/2 HOSE BARB
76	1	G0008009	AIR HOSE
77	1	15181-01-001	DISPLAY SCREEN PROTECTIVE COVER
78	1	G0004364	O-RING, PROTECTIVE COVER
79	8	G0008007	1/4-20 SEALING PAN HEAD SCREW
80	2	G0003529	2" CORD FITTING
81	1	G0007846	CONNECTOR HOUSING
82	1	G0007848	INSERT TERMINAL, FEMALE
83	1	G0007852	INSERT TERMINAL, MALE
84	1	G0007850	CONNECTOR HOOD
85	1	G0007847	CABLE GLAND, HOOD
86	1	G0007851	CONNECTOR COVER, HOUSING
87	1	G0007849	CONNECTOR COVER, HOOD
88	8	G0008005	DOOR LATCH
89	1	G0004444	1/2" CABLE GLAND
90	1	G0004418	1/2" CABLE FITTING
91	2	16627-01	CABLE ASSEMBLY
92	35	G0007252	WIRE DUCT FASTENER MOUNT
93	28	PAN-TM3S10-C	WIRE SADDLE, SMALL
94	13	G0003519	WIRE SADDLE, MEDIUM
95	1	16449-01	CABLE ASSEMBLY (USB TO PS2 TO IDC)
96	1	G0007951	ETHERNET CABLE X 8 1/2 (ETH SW-PLC)
97	1	G0007952	ETHERNET CABLE X 62 (ETH SW-PNL VIEW)
98	1	G0007953	ETHERNET CABLE X 84 (ETH SW-60HP)
99	1	G0007954	ETHERNET CABLE X 104 (ETH SW-150HP)
100	1	G0007955	ETHERNET CABLE X 178 (ETH SW-30HP)
101	2	G0004970	HANDLE,COVER
102	2	G0007701	LUG, CRIMP #6 AWG
103	6	G0007633	LUG, CRIMP #1 AWG
104	2	G0007256	LUG, CRIMP #2 AWG
105	1	IMP-116B-04X04	1/4 90 DEG STREET ELBOW, BRASS
106	1	CRH-ECD-284	1/4 DRAIN PLUG
107	1	G0008267	1/2 X 1/4 NPT HOSE BARB
108	2	G0008263	TERMINAL BLOCK, OUTGOING-2/0-8 AWG
109	1	G0008264	FINGER SAFE COVER FOR G0008261
110	2	G0008265	FINGER SAFE COVER FOR G0008262
111	2	G0008266	FINGER SAFE COVER FOR G0008263
112	1	G0007995	COMPACT FLASH MEMORY CARD
113	1	G0002301	AIR ELEMENT, DX (REPLACEMENT ONLY)
114	1	G0002302	AIR ELEMENT, BX (REPLACEMENT ONLY)
115	3	G0007981	FUSE, TIME DELAY-1.5 AMP CLASS CC
116	3	G0003493	FUSE, TIME DELAY-15 AMP CLASS CC

SPECIAL TOOL: PURGE PRESSURE MEASURING KIT-G0008378







REV	DESCRIPTION	BY	DATE
1	ITEM 30 WAS G0007217; ITEM 31 WAS G0007218; ADDED ITEMS.	CCS	8/13/2007
2	ITEM 03 WAS 16400-01-001; QUANTITY WAS 5 ON ITEM 88.	CCS	8/23/2007
3	ADDED ITEMS 112 THRU 116.ADDED NOTE	CCS	5/12/2008
4	ITEM 15 WAS 16609-01; ITEM 55 WAS G0007863; ITEM 22 WAS 16622-01.	CCS	11/3/2008

GEOMETRIC CHARACTERISTIC SYMBOLS	
FLATNESS	▱
STRAIGHTNESS	⏤
ROUNDNESS	○
CYLINDRICITY	⌭
PARALLELISM	//
PERPENDICULARITY	⊥
ANGULARITY	∠
RUNOUT	↗
POSITION	⌖
CONCENTRICITY	◎
SYMMETRY	⌯

TOLERANCES UNLESS SPECIFIED

	DEC	MM
(2) PLACE DEC.	+/- .0100	+/- .254
(3) PLACE DEC.	+/- .0050	+/- .127
(4) PLACE DEC.	+/- .0002	+/- .005
ANGLES	+/- .1°	+/- .1°

DO NOT SCALE DRAWING

DRAWN	fjmonroe	4/11/2007
CHECKED	CCSMITH	5/9/2007
QA		
MFG		
APPROVED		

DERRICK® CORPORATION

TITLE

CONTROL ENCLOSURE ASSEMBLY DE-7200 EX-PROOF 460/480/60/3

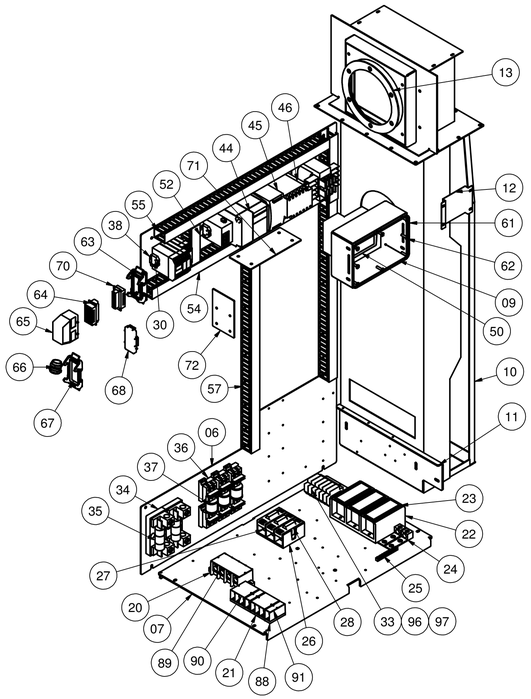
SIZE	FILECOPY	DWG NO	REV
D	Y	16472-00-002	4

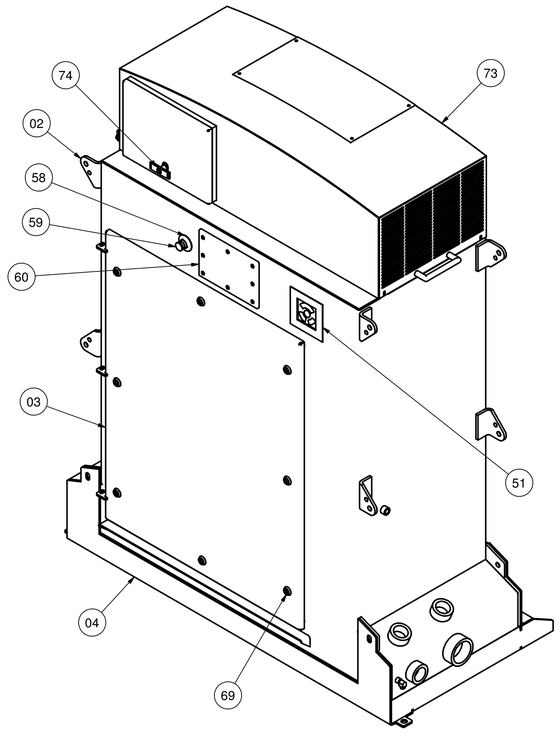
SCALE 1:10 SHEET 1 OF 1

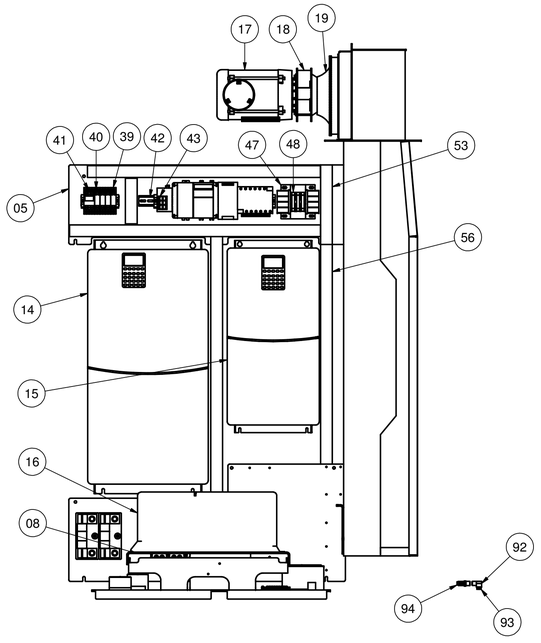
CENT, MAN

Parts List

ITEM	QTY	DRAWING NUMBER	DESCRIPTION
01	X	16472-01-005	ASSEMBLY COMPLETE
02	1	16396-01-003	ENCLOSURE ASSEMBLY
03	1	16400-01-003	DOOR ASSEMBLY
04	1	16402-01-001	STAND ASSEMBLY
05	1	16404-01-004	COMPONENT PANEL (UPPER)
06	1	16404-02-004	COMPONENT PANEL (LOWER)
07	1	16404-03-004	COMPONENT PANEL (BOTTOM)
08	1	16404-01-003	COMPONENT MOUNT ASSEMBLY
09	1	16405-01	DISPLAY SCREEN MOUNT
10	1	G0002881	AIR CONDITIONER, 12,000 BTU/HR 460/60/3
11	1	16403-01	A/C SUPPORT ANGLE
12	1	16609-01	CONTROL MOUSE COVER
13	1	15197-01-001	INLET CONE EXTENSION
14	1	G0007573	DRIVE, 150 HP 460VAC 60 HZ
15	1	G0007690	DRIVE, 60 HP 460VAC 60 HZ
16	1	G0007689	DRIVE, 30 HP 460VAC 60 HZ
17	1	G0007588	AIR CONDITIONER COOLING MOTOR
18	1	G0002603	FAN WHEEL, 8" BACKWARD CURVED
19	1	G0002604	INLET CONE
20	1	G0008261	POWER DIST. BLOCK, OUTGOING-2/0 AWG-8 AWG
21	2	G0008262	POWER DIST. BLOCK, OUTGOING-6 AWG
22	1	G0007210	POWER DIST. BLOCK, INCOMING
23	3	G0007211	POWER DIST. BLOCK COVER
24	2	G0007213	GROUND LUG, INCOMING
25	2	G0007610	GROUND BUS BAR, INCOMING
26	1	G0007221	FUSE BLOCK, 60 AMP 3P CLASS J
27	3	G0007698	FUSE, 60 AMP CLASS J
28	3	G0007223	FUSE COVER, INDICATING
29	1	G0007998	DIN RAIL, 35MM X 5 1/2
30	6	G0007012	TERMINAL BLOCK END BARRIER
31	2	G0007216	TERMINAL BLOCK GROUND-YELLOW/GREEN
32	1	G0007237	TERMINAL BLOCK BARRIER-ORANGE
33	2	G0007214	FUSE BLOCK, 30 AMP 3P CLASS CC
34	2	G0007224	FUSE BLOCK, 200 AMP 1P CLASS J
35	2	G0007225	FUSE, 150 AMP CLASS J TYPE HSJ
36	6	G0007631	FUSE BLOCK, 200 AMP 3P CLASS J
37	3	G0007632	FUSE, 200 AMP CLASS J
38	1	G0007645	DIN RAIL, 35MM X 5
39	2	G0007232	BARRIER, INTRINSIC SAFE-VIBR SWITCH
40	2	G0007233	BARRIER, INTRINSIC SAFE-RTD SENSOR
41	1	G0007234	BARRIER, INTRINSIC SAFE-SPEED SENSOR
42	1	G0007999	DIN RAIL, 35MM X 16
43	1	G0007231	ETHERNET SWITCH, 6 PORT
44	1	G0007228	PLC, COMPACTLOGIX PROCESSOR
45	1	G0003552	POWER SUPPLY, 24VDC, 5 AMP
46	1	G0003504	SURGE SUPPRESSOR, 120V 60HZ
47	1	G0003494	TRANSFORMER, 500VA, 460V PRI/120V SEC
48	2	G0002910	FUSE, TIME DELAY 2.5A 600VAC
49	1	G0002911	FUSE, TIME DELAY 7.0A 250VAC
50	1	G0007245	OPERATOR INTERFACE
51	1	G0007863	INDUSTRIAL MOUSE
52	1	G0008000	WIRE DUCT, 1/2 X 2 X 6
53	1	G0008001	WIRE DUCT, 1/2 X 2 X 10 1/2
54	1	G0008002	WIRE DUCT, 1/2 X 2 X 33 1/8
55	1	G0007338	WIRE DUCT, 1/2 X 2 X 30 3/4
56	1	G0007650	WIRE DUCT, 1/2 X 2 X 28 7/8
57	1	G0008010	WIRE DUCT, 1/2 X 2 X 34 3/8
58	1	G0007244	NAMEPLATE, EMERGENCY STOP
59	1	G0005325	BUTTON, EMERGENCY STOP
60	1	15181-01-001	DISPLAY SCREEN PROTECTIVE COVER
61	1	G0004364	O-RING, PROTECTIVE COVER
62	8	G0008007	1/4-20 SEALING PAN HEAD SCREW
63	1	G0007846	CONNECTOR HOUSING
64	1	G0007852	INSERT TERMINAL, MALE
65	1	G0007850	CONNECTOR HOOD
66	1	G0007847	CABLE GLAND, HOOD
67	1	G0007849	CONNECTOR COVER, HOOD
68	1	G0007851	CONNECTOR COVER, HOUSING
69	8	G0008005	DOOR LATCH
70	1	G0007848	INSERT TERMINAL, FEMALE
71	1	16623-01	CLOSE OFF PLATE, 10GA X 4 X 9 1/2
72	1	16623-02	CLOSE OFF PLATE, 10GA X 4 X 6
73	1	16401-01	CONDENSER COVER ASSEMBLY
74	1	G0007246	TEE HANDLE
75	35	G0007252	WIRE DUCT FASTENER MOUNT
76	28	PAN-TM3S10-C	WIRE SADDLE, SMALL
77	13	G0003519	WIRE SADDLE, MEDIUM
78	1	16449-01	CABLE ASSEMBLY (USB TO PS2 TO IDC)
79	1	G0007951	ETHERNET CABLE X 8 1/2 (ETH SW-PLC)
80	1	G0007952	ETHERNET CABLE X 62 (ETH SW-PNL VIEW)
81	1	G0007953	ETHERNET CABLE X 84 (ETH SW-60HP)
82	1	G0007954	ETHERNET CABLE X 104 (ETH SW-150HP)
83	1	G0007955	ETHERNET CABLE X 178 (ETH SW-30HP)
84	2	G0004970	HANDLE, COVER
85	2	G0007701	LUG, CRIMP #6 AWG
86	6	G0007633	LUG, CRIMP #1 AWG
87	2	G0007256	LUG, CRIMP #2 AWG
88	2	G0008263	TERMINAL BLOCK, OUTGOING-2/0-8 AWG
89	1	G0008264	FINGER SAFE COVER FOR G0008261
90	2	G0008265	FINGER SAFE COVER FOR G0008262
91	2	G0008266	FINGER SAFE COVER FOR G0008263
92	1	IMP-116B-04X04	1/4 90 DEG STREET ELBOW, BRASS
93	1	16701-01	1/4 NPT DRAIN PLUG
94	1	G0008267	1/2 X 1/4 NPT HOSE BARB
95	1	G0007995	COMPACT FLASH MEMORY CARD
96	3	G0007981	FUSE, TIME DELAY-1.5 AMP CLASS CC
97	3	G0003493	FUSE, TIME DELAY-15 AMP CLASS CC







REV	DESCRIPTION	BY	DATE
1	ITEM 20 WAS G0007217; ITEM 21 WAS G0007218; ADDED ITEMS 88-94.	CCS	8/14/2007
2	ITEM 01 WAS 16400-01-001; QUANTITY OF ITEM 69 WAS 5.	CCS	9/5/2007
3	ADDED ITEMS 95 THRU 97; UPDATED VIEWS.	CCS	5/13/2008

GEOMETRIC CHARACTERISTIC SYMBOLS	
FLATNESS	▱
STRAIGHTNESS	—
ROUNDNESS	○
CYLINDRICITY	⌭
PARALLELISM	//
PERPENDICULARITY	⊥
ANGULARITY	∠
RUNOUT	↗
POSITION	⌖
CONCENTRICITY	◎
SYMMETRY	⌯

TOLERANCES UNLESS SPECIFIED

DEC	MM
(2) PLACE DEC. +/- .0100	+/- .254
(3) PLACE DEC. +/- .0050	+/- .127
(4) PLACE DEC. +/- .0002	+/- .005
ANGLES..... +/- .5°	+/- .5°

DO NOT SCALE DRAWING

DRAWN	fjmonroe	5/15/2007
CHECKED	CCSMITH	5/17/2007
QA		
MFG		
APPROVED		

DERRICK® CORPORATION

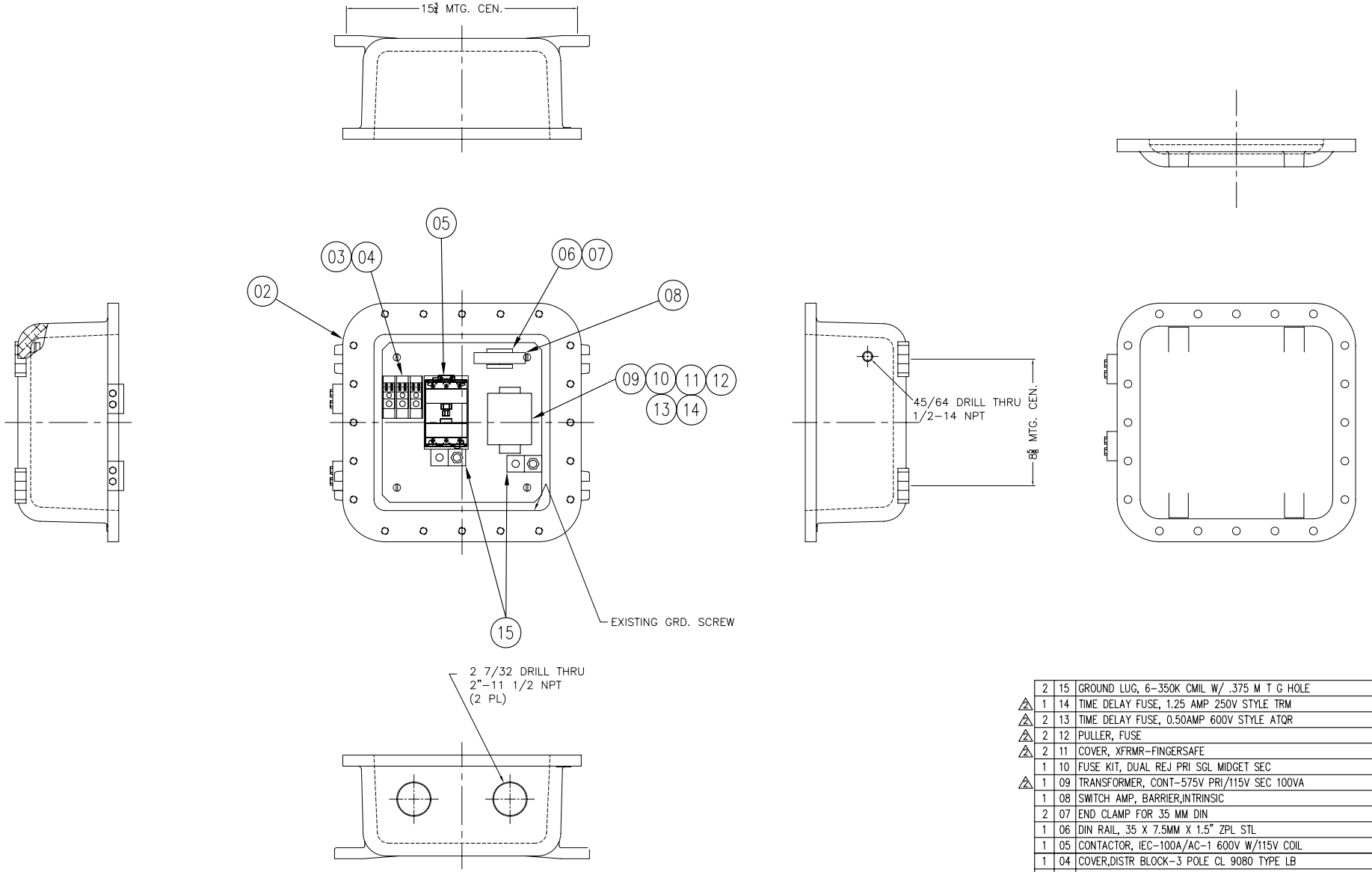
TITLE

CONTROL ENCLOSURE ASSEMBLY DE-7200 460/480/60/3

SIZE	FILECOPY	DWG NO	REV
D	N	16472-00-005	3

SCALE 1:10 SHEET 1 OF 1

1 CENT, MAN



	QTY	ITEM	PART NAME/DESCRIPTION	DWG. NO.
	2	15	GROUND LUG, 6–350K CMIL W/ .375 M T G HOLE	G0008070
2	1	14	TIME DELAY FUSE, 1.25 AMP 250V STYLE TRM	G0002926
2	2	13	TIME DELAY FUSE, 0.50AMP 600V STYLE ATQR	G0004195
2	2	12	PULLER, FUSE	G0004170
2	2	11	COVER, XFRMR–FINGERSAFE	G0004171
	1	10	FUSE KIT, DUAL REJ PRI SGL MIDGET SEC	G0008069
2	1	09	TRANSFORMER, CONT–575V PRI/115V SEC 100VA	G0002483
	1	08	SWITCH AMP, BARRIER,INTRINSIC	G0003789
	2	07	END CLAMP FOR 35 MM DIN	G0007012
	1	06	DIN RAIL, 35 X 7.5MM X 1.5" ZPL STL	G0006292
	1	05	CONTACTOR, IEC–100A/AC–1 600V W/115V COIL	G0008060
	1	04	COVER,DISTR BLOCK–3 POLE CL 9080 TYPE LB	G0001667
	1	03	DISTRIBUTION BLOCK, PWR DISTR–3 POLE CL 9080 TYPE LB	G0001666
1	1	02	ENCLOSURE, EP–12"X12"X6" NEMA 4X,7&9 AL	G0008056
		01	ASSEMBLY	16622–01–001

REF GA #14738–00–004
REF W.S.# 14394–00–010

REV	CHANGE	CKD	DATE
2	REVISED ITEMS 09, 11, 12, 13 AND 14 (WAS G0008058, G0002873, G0002874, G0002909 AND G0002912)	JWC JFS	09/18/08
1	CORRECTED BOX DIMENSIONS (WAS 10"X12"X6")	JWC JFS	02/06/08

TITLE: XP ELECTRICAL CONTROL PANEL FOR VFD DE–1000 WITH SKID

DWN	CKD	DATE	SCALE	REV
JFS	MJS	05/23/07	NTS	2

SHEET SIZE: C | N | F C
DWN DRC 06/11/07
CKD JFS 06/11/07
DRAWING NO. 16622–00–001

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

CENT, BOM, PUR

RECOMMENDED THERMAL UNIT SELECTION TABLE FOR DERRICK® SUPPLIED MANUAL STARTERS

DERRICK VIBRATING MACHINES

F, FX, K, KX, L, LX, T, TX MOTORS	575V.A.C.	60Hz	1.5HP	=	SQD-B3.30	or FUR-H19
	460V.A.C.	60Hz	1.5HP	=	SQD-B4.15	or FUR-H21
	230V.A.C.	60Hz	1.5HP	=	SQD-B10.2	or FUR-H26
	215V.A.C.	60Hz	1.5HP	=	SQD-B10.2	or FUR-H27
	440V.A.C.	50Hz	1.5HP	=	SQD-B3.70	or FUR-H19
	380V.A.C.	50Hz	1.5HP	=	SQD-B4.15	or FUR-H21
	220V.A.C.	50Hz	1.5HP	=	SQD-B8.20	or FUR-H26
E, EX, M, MX, SG, SGX MOTORS	575V.A.C.	60Hz	2.5HP	=	SQD-B6.25	or FUR-H24
	460V.A.C.	60Hz	2.5HP	=	SQD-B7.70	or FUR-H26
	230V.A.C.	60Hz	2.5HP	=	SQD-B17.5	or FUR-H32
	215V.A.C.	60Hz	2.5HP	=	SQD-B17.5	or FUR-H32
	440V.A.C.	50Hz	2.5HP	=	SQD-B6.90	or FUR-H24
	380V.A.C.	50Hz	2.5HP	=	SQD-B7.70	or FUR-H26
	220V.A.C.	50Hz	2.5HP	=	SQD-B14.0	or FUR-H31
R, RX MOTORS	575V.A.C.	60Hz	3.0HP	=	SQD-B6.90	or FUR-H25
	460V.A.C.	60Hz	3.0HP	=	SQD-B9.10	or FUR-H27
	230V.A.C.	60Hz	3.0HP	=	SQD-B19.5	or FUR-H33
	215V.A.C.	60Hz	3.0HP	=	SQD-B19.5	or FUR-H34
	440V.A.C.	50Hz	3.0HP	=	SQD-B7.70	or FUR-H26
	380V.A.C.	50Hz	3.0HP	=	SQD-B9.10	or FUR-H27
	220V.A.C.	50Hz	3.0HP	=	SQD-B17.5	or FUR-H32
A, C, N MOTORS	575V.A.C.	60Hz	5.0HP	=	SQD-B11.5	or FUR-H29
	460V.A.C.	60Hz	5.0HP	=	SQD-B15.5	or FUR-H32
	230V.A.C.	60Hz	5.0HP	=	SQD-B36.0	or FUR-H40
	215V.A.C.	60Hz	5.0HP	=	SQD-B36.0	or FUR-H40
	440V.A.C.	50Hz	5.0HP	=	SQD-B12.8	or FUR-H30
	380V.A.C.	50Hz	5.0HP	=	SQD-B15.5	or FUR-H32
	220V.A.C.	50Hz	5.0HP	=	SQD-B32.0	or FUR-H37

DERRICK DEGASSER

575V.A.C.	60Hz	5.0HP	=	SQD-B8.20	or FUR-H28
460V.A.C.	60Hz	5.0HP	=	SQD-B10.2	or FUR-H30
230V.A.C.	60Hz	5.0HP	=	SQD-B19.5	or FUR-H38
415V.A.C.	50Hz	5.0HP	=	SQD-B11.5	or FUR-H31
380V.A.C.	50Hz	5.0HP	=	SQD-B19.5	or FUR-H32

DERRICK PRIMER

575V.A.C.	60Hz	1.5HP	=	SQD-B3.30
460V.A.C.	60Hz	1.5HP	=	SQD-B3.70
230V.A.C.	60Hz	1.5HP	=	SQD-B8.20
380V.A.C.	50Hz	1.5HP	=	SQD-B3.70

NOTE: IF MOTOR VOLTAGE OR HORSE POWER IS NOT LISTED, CONTACT ENGINEERING DEPARTMENT.
**** FOR MAGNETIC STARTER OVERLOAD INFO REFER TO THE ELECTRICAL PARTS LIST THAT IS FOUND ON THE EQUIPMENTS GENERAL ARRANGEMENT DRAWING.

SUPPLIER DATA

DE-7200 LARGE BOWL CENTRIFUGE

GENERAL

This section contains manufacturers' manuals, bulletins, instructions, and other technical data for components installed on the centrifuge. Refer to Section 11 - Reference Drawings for the Derrick assembly drawings, parts lists, and electrical diagrams.

MECHANICAL COMPONENTS		
COMPONENT	**DESCRIPTION**	**DOCUMENT**
Allen-Bradley PowerFlex 700 Variable Frequency Drive	User Manual	*20B-UM002B-EN-P*
Marathon Bowl & Conveyor Drive Motors	Installation, Operation, & Maintenance Instructions	*SB181 6/2001*
Rotex Flexible Coupling	Operating & Assembly Instructions	*KTR-N 40226 E*
Johnson Air Conditioner Temperature Control	Installation & Operation Instructions	*997-349-7*
	Technical Data	*No Number*
	Circuit Diagram	*No Number*
DTS Air Conditioner	Troubleshooting	*10.99*
Expo Technologies Cabinet Purge System	Installation, Operation, & Maintenance Instructions	*ML384*
	MiniPurge Size 1 Manual	*ML306*

CERTIFICATE OF ORIGIN

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

Derrick Corporation certifies that the above described articles are of the growth, product, or manufacture of the United States of America and the prices true and correct. Material furnished is in accordance with the requirements of order.

THESE COMMODITIES, TECHNOLOGIES, OR SOFTWARE WERE EXPORTED FROM THE UNITED STATES IN ACCORDANCE WITH THE EXPORT ADMINISTRATION REGULATIONS. DIVERSION CONTRARY TO U.S. LAW PROHIBITED.

Date: 2-June-2005 **Signature:** Carl E. Root

CERTIFICATE OF QUALITY

Equipment: Centrifuge Equipment

Model: DE-1000 GBD, DE-1000 FHD, DE-1000 VFD

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

Derrick Corporation certifies that the delivered goods for the above referenced order conforms to the requirements of the specified order in that all construction materials and components are new and unused, manufactured for this order, and that the goods are free of any known defects as to their design, material, and workmanship. We also certify that the goods are of high grade and consistent with the established and generally accepted standards of material for the type ordered.

Date: 2-June-2005 **Signature:** Carl E. Root

SHIPPING FINAL INSPECTION AND RUN TEST CERTIFICATE

Equipment: Centrifuge Equipment

Model: DE-1000 GBD, DE-1000 FHD, DE-1000 VFD

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

The equipment listed above was inspected and found to be in conformance with Derrick'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. Applicable internal inspection documents available upon request.

Date: 2-June-2005 **Signature:** Carl E. Root

Document No: PE-S-036-02-06

CERTIFICATE OF CONFORMANCE

Equipment:	Mining & Oilfield equipment manufactured specifically for Hazardous Location Areas including but not limited to: Flo-Line Cleaners, Primers, Agitators, Degassers, Centrifuges, Centrifugal Pumps, Scalpers, etc.
Rating and principal characteristics:	0 - 600VAC , 50/60Hz, 3PH
Model/Type ref.:	Various
Additional information:	None

This product was found to be in conformance with (as a minimum):

U.L. listed for hazardous locations Class I, Groups C & D, which is similar to equipment marked as EExd IIB T3 for Zone 1 areas. Assembled in accordance with National Electrical Code (NEC) – articles 500 thru 504 (hazardous locations).

Signature:

for
Thomas Silvestrini

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INSTALLATION AND MAINTENANCE LOG

PURPOSE

The ruled, blank pages provided will assist the customer in establishing and maintaining historical information accumulated during the installation and operation of the Derrick equipment. The resultant log is valuable for adjusting maintenance intervals and intercepting trends that may indicate the need for changing operating procedures. Each entry in the log should be dated and a page number entered for future reference and tracking. If required, additional pages may be added to the equipment log by copying a blank page or simply inserting any ruled paper.

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