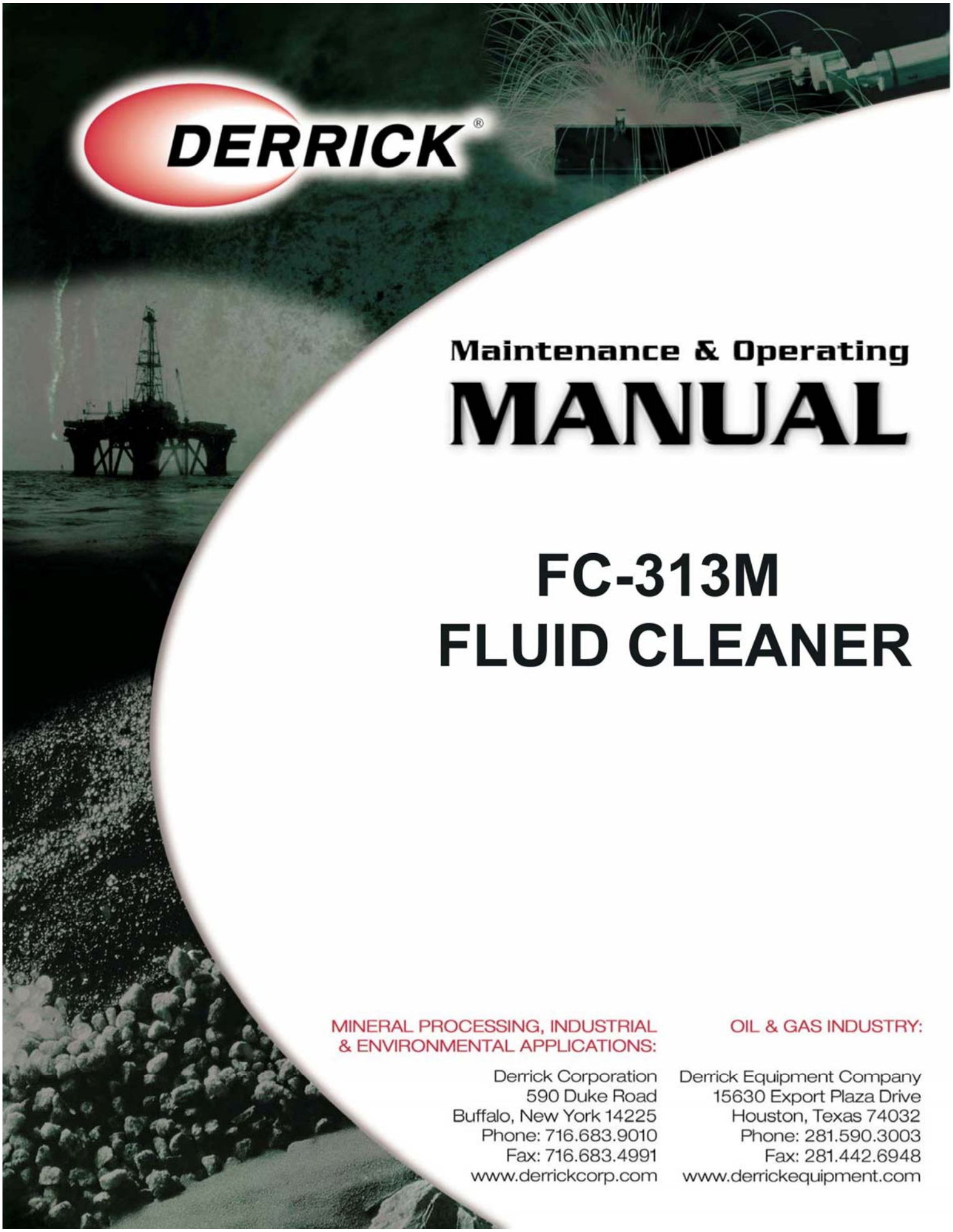


DERRICK®

Maintenance & Operating

MANUAL

FC-313M
FLUID CLEANER

MINERAL PROCESSING, INDUSTRIAL & ENVIRONMENTAL APPLICATIONS:

Derrick Corporation
590 Duke Road
Buffalo, New York 14225
Phone: 716.683.9010
Fax: 716.683.4991
www.derrickcorp.com

OIL & GAS INDUSTRY:

Derrick Equipment Company
15630 Export Plaza Drive
Houston, Texas 74032
Phone: 281.590.3003
Fax: 281.442.6948
www.derrickequipment.com

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.

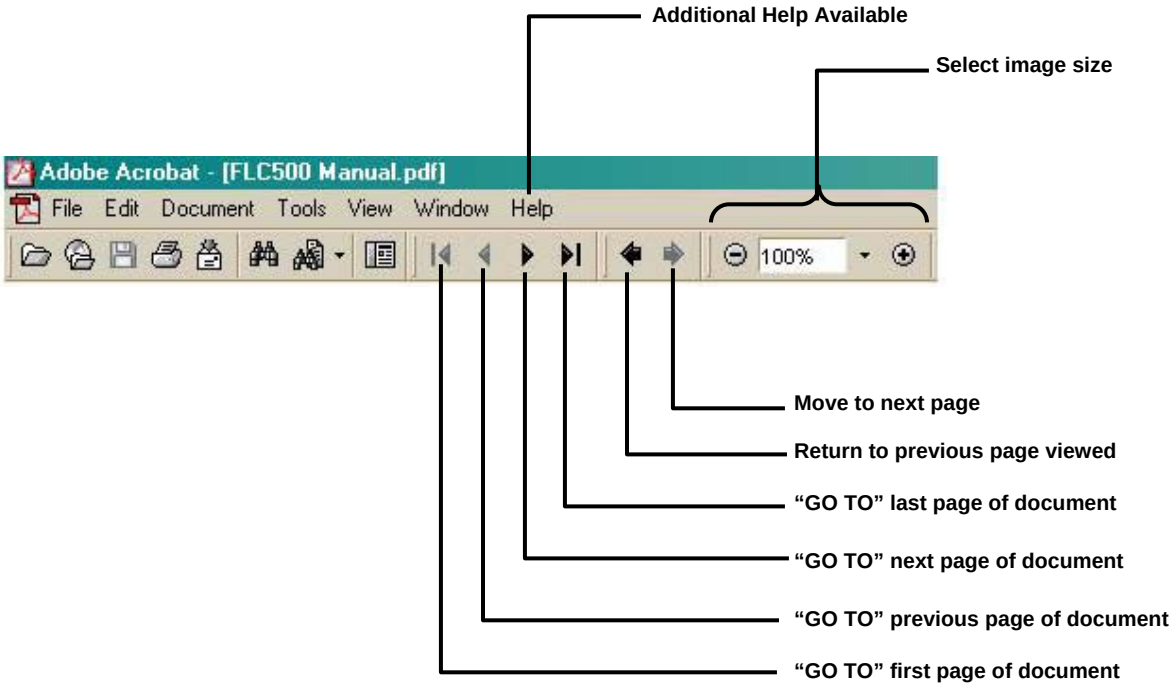


TABLE OF CONTENTS
FLUID CLEANER FC-313M

INTRODUCTION

FC-313M Fluid Cleaner™ - 15617-00-001

OVERVIEW

This manual includes installation, operation, and maintenance information for the Derrick FC-313M Fluid Cleaner (Figure 1014-1). The machine is used to separate large solids from slurries. This vibrating screen machine is designed specifically for fine particle separation in the drilling industry. A single vibrator motor transmits high frequency linear motion to the patented screens that perform the particle separation. A durable surface coating ensures that the machine will meet the most demanding abrasive and corrosive applications.

The fluid cleaner's modular design allows the equipment to be adapted to meet varied operating requirements. For example, an optional multi-cone desilter unit or cone desander may be installed to introduce the feed slurry to the machine. A choice of box, weir, or bypass weir feeder is available to receive the slurry and direct it onto the screen frame.

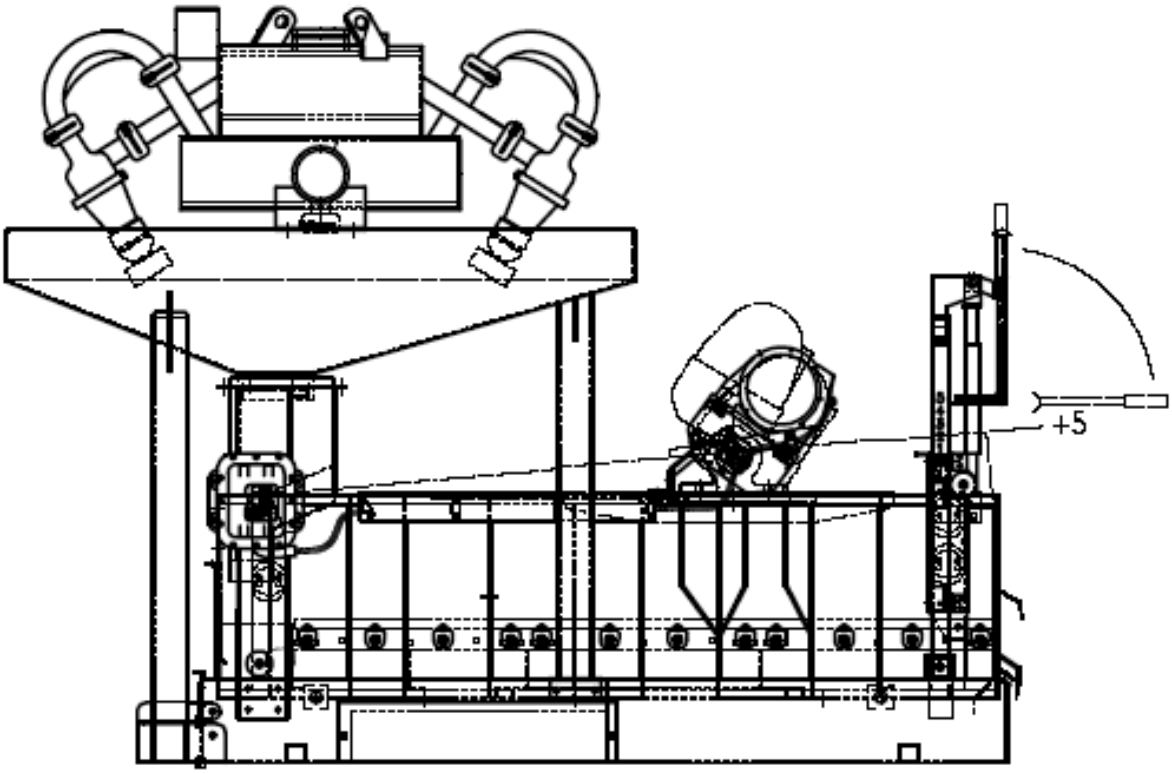


Figure 1014-1 FLC-313M Fluid Cleaner With Box Feeder and 12-Way Desilter

EQUIPMENT USE

The FC-313M Fluid Cleaner and associated components are designed expressly for removing solids from drilling fluid. Derrick 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	General Service Manager *toconnor@derrickcorp.com*
Derrick Equipment Company 15630 Export Plaza Drive Houston, Texas 77032 ***USA***	281.590.3003	281.442.6948	General Manager *rerice@derrickequipment.com*
Derrick GmbH & Co. KG Bockhorner Weg 6 29683 Fallingbostel ***GERMANY***	+49 5162 98580	+49 5162 985821	*Info@derrickinternational.com* www.derrickinternational.com

PRODUCT SUPPORT

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

PARTS SALES & SERVICE LOCATIONS
Colorado - 970.241.2417
Louisiana
Broussard - 877.635.3354
Mississippi
Laurie - 877.635.3354
New York - Corporate Headquarters
Buffalo - 716.683.9010
Oklahoma
Oklahoma City - 405.208.4070
Texas
Houston (Oilfield Headquarters) - 866.DERRICK (337.7425)
Bridgeport - 940.210.9975
Corpus Christi - 361.664.2410
Longview - 337.298.9411
Midland - 432.230.3720
Wyoming - 307.265.0445
Germany - 011.49.5162.98580

HIGHLIGHTED INFORMATION

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

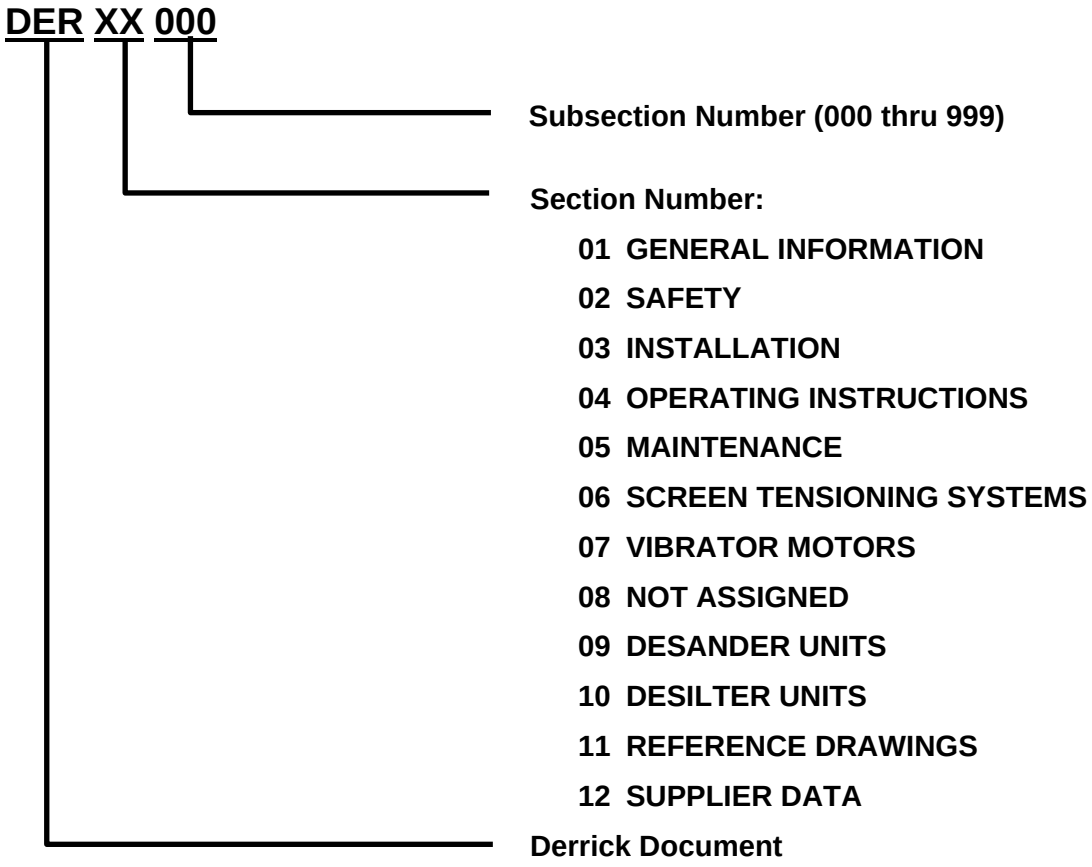
SAFETY INFORMATION

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

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

FC-313M Fluid Cleaner™ - 15617-00-001

OVERVIEW

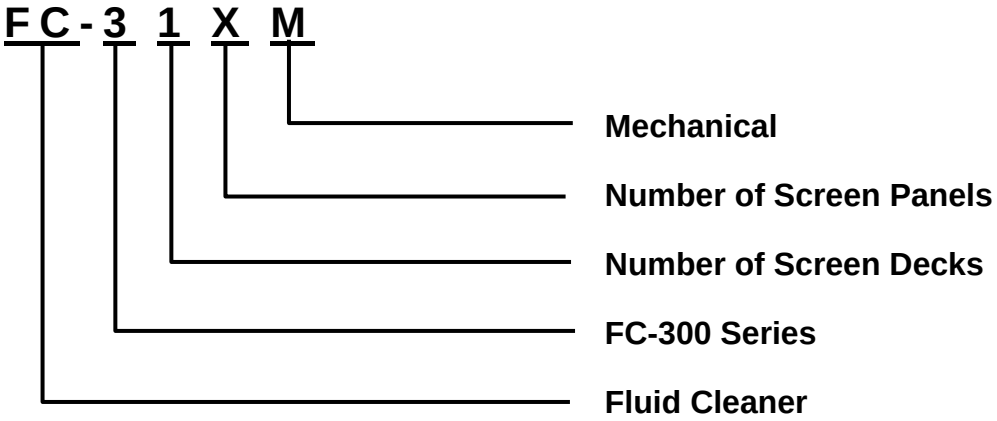
The FC-313M Fluid Cleaner is a three-panel, single-motor, high-frequency, linear-motion vibrating screen machine. The basic machine is configured with a choice of motors and a manually operated, adjustable while drilling (AWD) feature, which permits angular adjustment of the screen frame between -1° and +5° while the equipment is operating. Optional equipment includes multi-cone desilter units, 10-inch cone desander, and a choice of box, weir, or weir bypass feeders.

Several key design features combine to produce the fluid cleaner's high-speed, fine-particle separation. The vibrator motor is attached to the screen frame by two motor mount assemblies that position the motor over the screening bed. Positioning the motor in this manner maximizes and transfers the G-forces directly to the screens. Float mounts isolate the vibratory motion of the screen frame from the support frame. Screening beds are slightly crowned to allow proper tensioning of the patented screens. This method of screen tensioning improves screen performance and extends the life of the screen.

Feed slurry may be introduced into the FC-313M Fluid Cleaner through the desilter, desander, or feeder. Solids removed by the desilter enter a collection pan that empties into the feeder or directly onto the screen bed. Use of the feeder for inlet flow provides an even distribution of slurry across the entire width of the screen frame. A hopper at the underside of the unit captures liquid underflow that passes through the screen. Alternatively, the machine may be built with a support frame in place of the hopper, allowing underflow to discharge directly into the customer's receiving tank.

DERRICK MODEL NUMBER

The model number displayed on the equipment nameplate is defined below:



SERIAL NUMBER LOCATION

The serial number plate and unit number plates for the FC-313M fluid cleaner are located on the rear vertical structural member of the support frame or hopper, depending on configuration.

EQUIPMENT ORIENTATION

Left and right hand are defined by the location of components when viewed from the feed end of the fluid cleaner (Figure 1115-1).

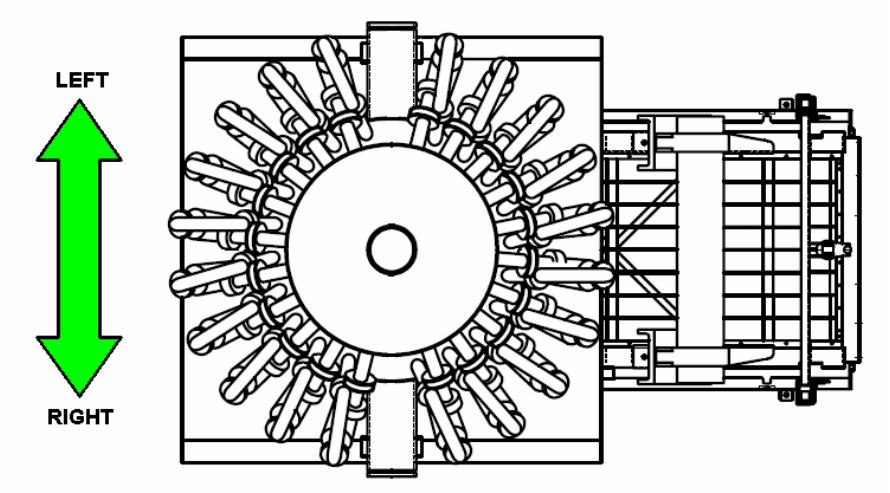


Figure 1115-1 FC-313M Fluid Cleaner Orientation Diagram

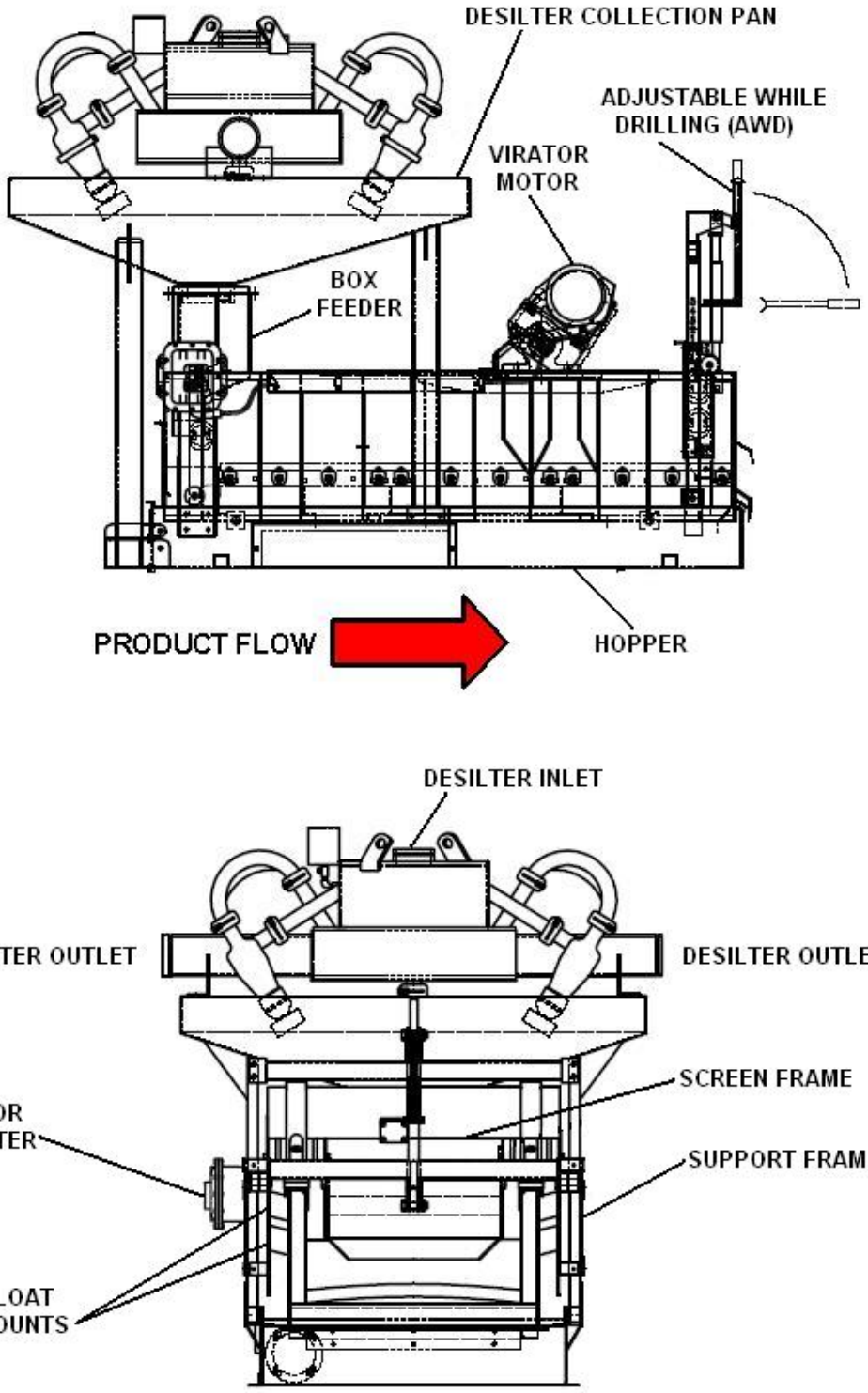
MAJOR COMPONENTS

Major components of the fluid cleaner include the screen frame, vibrator motor, AWD, desilter, desander, feeder, and discharge hopper or support frame, (Figure 1115-2). The following paragraphs describe these components.

Screen Frame

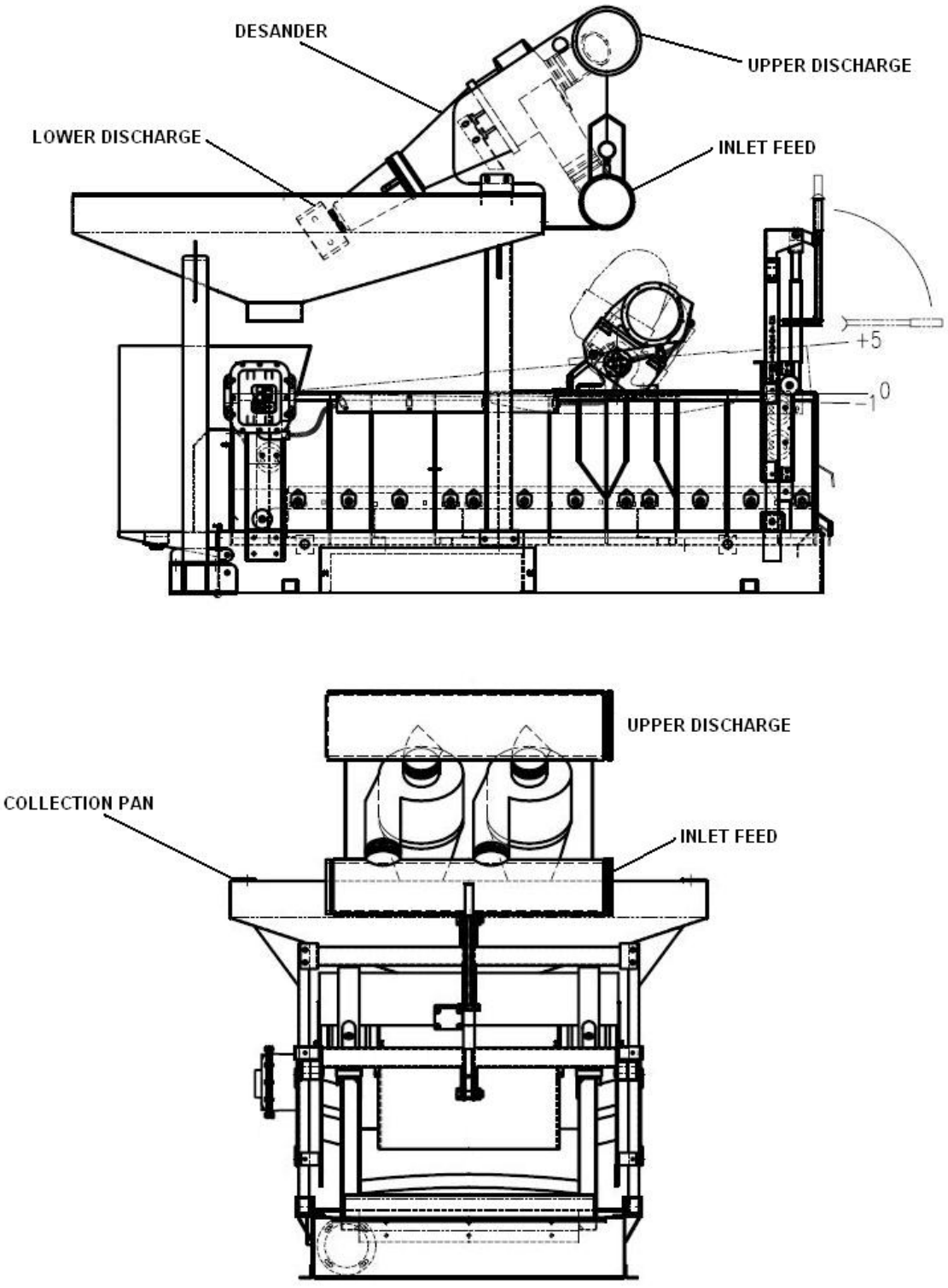
The screen frame is a structural component having mounting provisions for the vibrator motor and screen panels. The screen frame is suspended between the vertical legs of the support frame. The vibrating motion of the screen frame is isolated from the surrounding structural members by six float mounts. Two mounts are installed on each side at the discharge end, and one is mounted at the feeder end of the fluid cleaner.

The three screen panels are installed on the bed of the screen frame and held in place by the adjustable under-screen tensioning system. A combination of vertical supports and cross supports provide firm support and a curved bed for the screen panels. The curvature facilitates proper screen tensioning, which is critical to efficient solids separation and maximizing the life of the screen panels.



Shown With Optional Round Desilter Installed

Figure 1115-2 FC-313M Fluid Cleaner Major Components (Sheet 1 of 2)



Shown With Optional 10-Inch Desander Installed

Figure 1115-3 FC-313M Fluid Cleaner Major Components (Sheet 2 of 2)

Vibrator Motor

A single vibrator motor is attached directly to motor mounting pads on the fluid cleaner's screen frame. The vibrator motor is an electric induction motor employing eccentric weights to generate the high-amplitude vibration required to separate and convey solids over the screen panels. Detailed information on the vibrator motor is provided in Section 7 - Vibrator Motors.

Adjustable While Drilling (AWD)

The AWD, mounted at the discharge end of the support frame, is used to manually adjust the vertical angle of the screen frame for maximum efficiency in conveying and separating solids from drilling fluid. Adjustment may be performed without shutting down the fluid cleaner. Operated by a manual crank, the AWD provides an adjustment range of -1° to +5°. Vertical adjustment of the screen frame is performed by pivoting the manual crank handle downward to the horizontal position and then rotating the jack screw barrel to drive the screen frame up or down. A pawl in the adjustment handle locks into notches in the jack screw barrel in one direction while slipping in the opposite direction, creating a ratcheting action as the handle is moved left and right. The pawl may be set to lock the handle in either direction. When set to grip the jack screw barrel in left rotation, the screen frame is raised; locking in right rotation lowers the frame.

Desilter

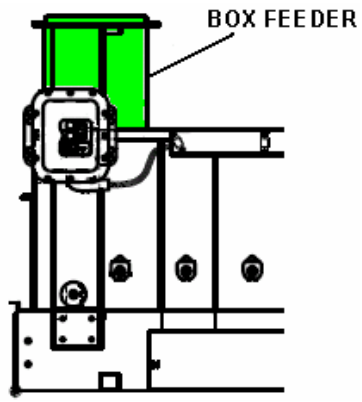
Round desilters are available for the FC-313M fluid cleaner in 8-, 10-,12-, 16-, and 20-way configurations. All desilters have 4-inch hydrocyclones (cones) and are mounted on a collection pan installed above the feeder. The 4-inch cones are designed to remove solids (10 to 74 micron range) from drilling fluid (mud). When larger solids (40 microns and larger) are expected in the drilling fluid, the drilling fluid should first be processed through a desander or similar equipment to remove oversize particles. Each 4-inch cone has a nominal flow rate of 50 GPM at 75 feet of head. Refer to Section 10 for additional information on desilters.

Desander

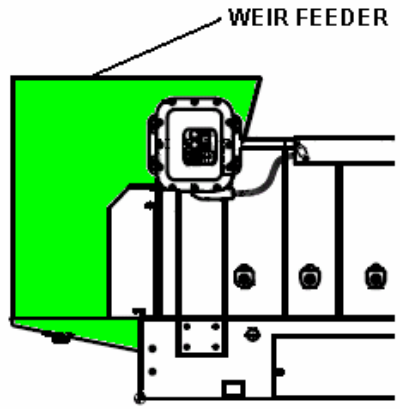
The optional two-cone 10-inch desander features 10-inch hydrocyclones (cones) and is mounted on a collection pan installed above the feeder. Designed for removal of solids (40- to 100-micron range) from drilling fluid (mud), the desander should be used when larger solids are expected in the drilling fluid. Each 10-inch cone has a nominal flow rate of 500 GPM at 75 feet of head. Refer to Section 9 for additional information on desanders.

Feeders

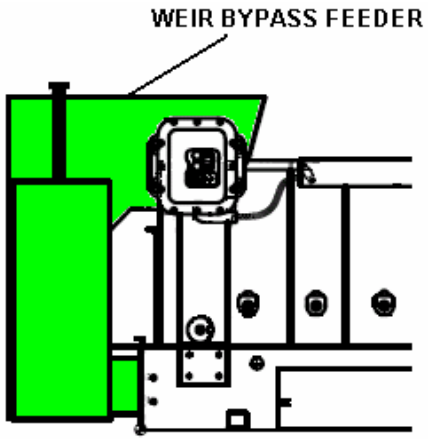
Box, weir, and weir bypass feeders are available for the FC-313M fluid cleaner. A brief description and sketch of each feeder are presented in Figure 1115-3.



Box Feeder
The box feeder receives and distributes feed slurry evenly across the screen frame. Slurry may be received either directly from the process stream or from a desilter collection pan. Pipe targets (8” and 10” / 203 and 254mm) are provided on the rear of the box feeder for locating the customer feed connection.



Weir Feeder
The weir feeder is divided into inlet and outlet tanks. This design allows the inlet slurry to rise in the inlet tank until sufficiently high to overflow into the outlet section. Slurry is evenly distributed across the screen frame, as slurry flows uniformly over the weir. Pipe targets (8” and 10” / 203mm and 254mm) are provided on both sides and the rear of the feeder for locating the customer feed connection. A clean-out plug is provided at the bottom of the inlet tank to facilitate removal of accumulated solids.



Bypass Weir Feeder
The bypass weir feeder is similar to the weir feeder, except that it includes provisions for diverting slurry directly to hopper. The bypass handle is used by the operator to open and close the feeder’s internal gate. When open, slurry bypasses the screen panels and flows directly to the hopper or receiving tank. Pipe targets (8” and 10” / 203mm and 254mm) are provided on both the sides and rear of the feeder for locating the customer feed connection.

Figure 1115-3 Box, Weir, and Weir Bypass Feeders

Hopper and Support Frame

Depending on customer requirements, the fluid cleaner is built either with a discharge hopper or support frame. Machines incorporating a hopper may have either a standard or bypass hopper to capture underflow from the screen panels. The bypass hopper has an outlet fitting for discharging the hopper contents into a receiving tank. A door is provided in the side of the hopper to permit inspection and maintenance.

Uprights on each side of the frame at the rear of the hopper provide the attachment points for the rear float mounts—one on each side of the hopper. Mounting provisions for the motor starter box are provided at the rear left or right of the hopper, depending on customer order. The AWD attaches to a fitting welded to the frame near the front of the hopper. Attachment points are provided on the AWD for the four float mounts—two on each side—that support the front of the screen frame.

The support frame is an alternative to the hopper that includes mounting provisions for the motor starter box, AWD, and rear float mounts but no provision for capturing screen panel underflow. This configuration allows the underflow to pass directly to the customer's receiving tank.

EQUIPMENT SPECIFICATIONS

FC-313M FLUID CLEANER™ - 15617-00-001

General equipment specifications are presented below for the FC-313M Fluid Cleaner. Refer to Section 11 - Reference Drawings for additional information and specifications.

Dimensions	Dimensions vary depending on equipment configuration. **Note:** Refer to General Arrangement drawing in Section 11 for dimensions.
Weight	Weights vary according to equipment configuration. **Note:** Refer to General Arrangement drawing in Section 11 for weight.
Screen Panel Dimensions	36” x 30” (914 mm x 762 mm)
Screen Tensioning System	
Type	Rapid Change Draw Bolt or optional Ramp-Lok® Draw Bolt
No. of Assemblies	24 **Note:** Refer to Section 6 for details of screen tensioning system
Motor Type	Totally enclosed non-ventilated (TENV) and rated for continuous duty. For specific information regarding operating voltage, speed (RPM), horsepower, etc., refer to the data plate on the motor case. **Note:** Refer to Section 7 for details of vibrator motor
Desilter (Optional)	
Type	Round, 4” polyurethane cones
No. of Cones	8-, 10-, 12-, & 20-way
I/O Connections	6” Victaulic
Collection Pan	74” x 75”, 3” discharge **Note:** Refer to Section 10 for details of desilter

Desander (Optional)

Type	10” polyurethane cones
No. of Cones	Three
I/O Connections	8” Victaulic
Collection Pan	74” x 75”, 3” discharge

AWD Manual; -1° to +5°; infinitely variable within range; 1° stamped increments.
Note; Refer to Section 4 for details of AWD.

Feeders

Types	Box, weir, or weir bypass
Inlet Connection	8” & 10” (203 mm & 254 mm) pipe targets on both sides & rear
Weir Height (except box feeder	28-1/2” (724 mm)

Note: Refer to Section 11 for feeder drawing.

SERVICES & UTILITIES REQUIRED

FC-313M FLUID CLEANER™ - 15617-00-001

GENERAL

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

UTILITIES

Electric Power

For electrical service requirements, refer to the voltage label above the electrical junction box. Also consult the data plate on the vibrator motor housing to verify power requirements. Refer to Section 11 - Reference Drawings for the wiring schematic that applies to your fluid cleaner.

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

REQUIRED SERVICES

The customer is required to supply a pump and/or gravity feed system capable of delivering the feed rates indicated in the paragraph below. Actual flow rates will depend on pump output, mud weight expressed in pounds per gallon (ppg), size of particulate being processed, rate of penetration (ROP), and mesh of the screen panels installed.

The average flow rate varies based on mud weight. For a single fluid cleaner, the average inlet flow rate should be 300 gpm with a mud weight of 9 to 10 ppg. Flow requirement varies with mud weight. If multiple machines are configured in a system, be sure to provide sufficient flow to each fluid cleaner.

Desilter

If the fluid cleaner is equipped with a desilter, refer to Section 10 for desilter service requirements.

Desander

If a desander is installed on the fluid cleaner, refer to Section 9 for desander service requirements.

EQUIPMENT HANDLING PROCEDURES

FC-313M FLUID CLEANER™ - 15617-00-001

RECEIVING THE EQUIPMENT

Immediately upon receipt of the Derrick equipment, examine contents for damaged and/or missing components. All equipment is sold FOB Derrick Corporation, Buffalo, New York. 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 fluid cleaner is usually shipped fully assembled, except for screen panels and desilter or desander, and mounted on a shipping skid. A label indicating the weight of the unit was affixed to the machine. Refer to Equipment Specifications *DER01215* for equipment weight and other information.

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

MOVING/POSITIONING THE EQUIPMENT (CONTINUED)

Four reinforced lifting holes are built into the equipment frame to allow attachment of an overhead-lifting device (Figure 1415-1). Lifting points are labeled **"LIFT HERE ONLY"**. **DO NOT** attempt lifting equipment by attaching slings or similar lifting aids to the vibrator motor or other non-designated portions of the unit. Use of spreader bars is recommended.

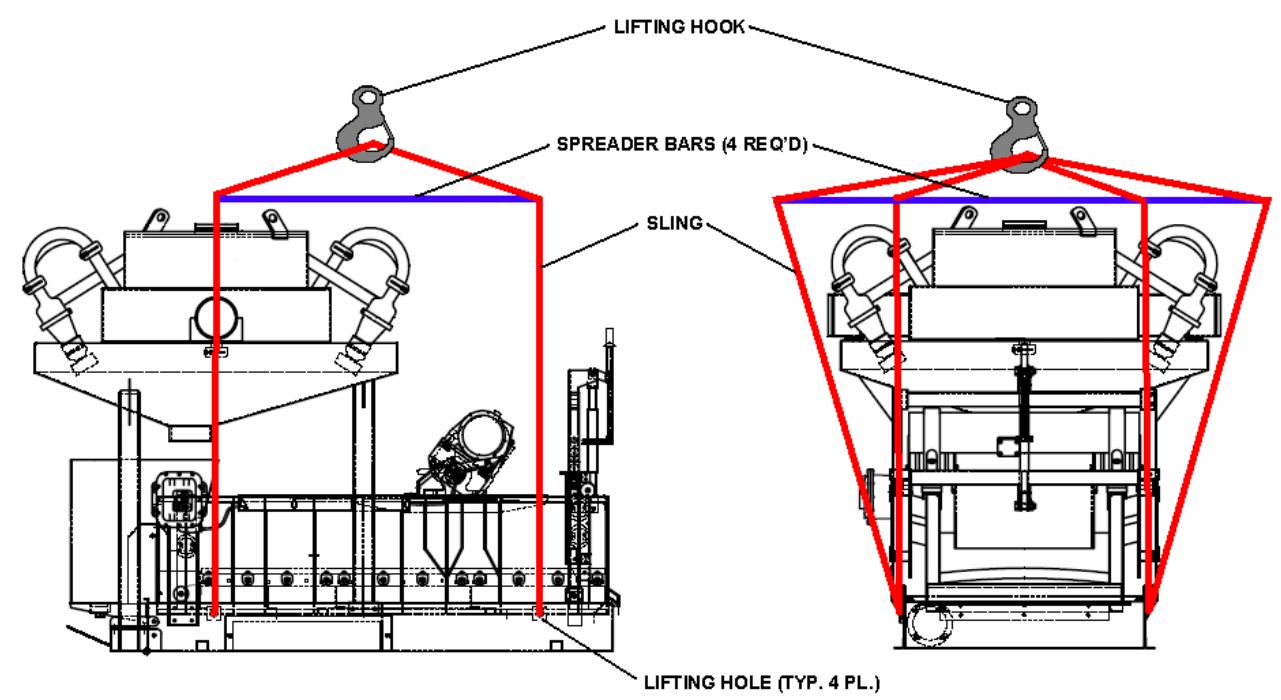


Figure 1415-1 Lifting Arrangement

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 flanges on feeder and desilter or desander, if installed. 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.

Vibrator Motors

Spare new vibrator motors as well as used motors should be stored in accordance with *DER07000* in Section 7 - Vibrator Motors.

Note! Do not lubricate motor bearings during storage. Bearings are packed with grease at the factory and can be damaged by excessive grease.

WARNINGS SUMMARY
FC-313M FLUID CLEANER™ - 15617-00-001

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 THAT EQUIPMENT IS DE-ENERGIZED, LOCKED OUT, AND TAGGED OUT PRIOR TO PERFORMING MAINTENANCE AND/OR ADJUSTMENTS.

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

WARNING! HIGH VOLTAGE MAY BE PRESENT. BE SURE THAT 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 AND/OR DAMAGE EQUIPMENT. ENSURE THAT ALL ELECTRICAL AND CONDUIT CONNECTIONS 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 MOTOR OR ANY OTHER LOCATION.

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

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

OPERATION

WARNING! MOTOR HOUSING BECOMES HOT DURING OPERATION AND MAY CAUSE SEVERE BURNS. DO NOT TOUCH MOTOR HOUSING DURING OR IMMEDIATELY AFTER MOTOR HAS BEEN OPERATING.

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 ALL PERSONNEL ARE CLEAR OF MACHINE BEFORE ADJUSTING ANGLE OF SCREEN BED.

WARNING! DO NOT ATTEMPT TO OPERATE EQUIPMENT WITH SHIPPING BRACKETS INSTALLED

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

MATERIAL SAFETY DATA SHEETS (MSDSs)
FC-313M FLUID CLEANER™ - 15617-00-001

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
Sundur Beige Polyester TGIC - Vibrator Motor	*P-1609* / 10-30-02

Lubricants and Sealants	
Chevron Dura-Lith Grease EP - Jack Screw	Contact Manufacturer
Exxon Mobil Mobilux EP 1 Grease - Jack Screw	Contact Manufacturer
Exxon Mobil Mobilith SHC-100 Grease - Motor Bearings	Contact Manufacturer
Loctite 76764 Anti-Seize Lubricant - Fasteners	Contact Manufacturer

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

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: BEIGE POLYESTER TGIC
PRODUCT CODE: P-1609

HMIS CODES: H F R P
1 0 1 E

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: SUNDUR POWDER COATINGS
ADDRESS : 824 S. VANDEVENTER
ST. LOUIS, MO 63110

EMERGENCY PHONE : (314)776-4450
INFORMATION PHONE : (314)531-4950
DATE PRINTED : 10/30/02
NAME OF PREPARER : LAB

SECTION II - INGREDIENTS

COMPONENTS	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP		WEIGHT PERCENT
* 1,3,5 - TRIGLYCIDYL ISOCYANURATE NO EXPOSURE LIMITS ESTABLISHED	2451-62-9	N.A.	N.A.	<10%

*Indicates toxic chemical(s) subject to the reporting requirements of section 313 of Title III and 40 CFR 372.
n/a

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING RANGE: n/a
VAPOR DENSITY: n/a
COATING V.O.C.: 0.00 lb/gl
SOLUBILITY IN WATER: n/a
SPECIFIC GRAVITY (H2O=1): >1.15
EVAPORATION RATE: Not applicable.
MATERIAL V.O.C.: 0.00 lb/gl
APPEARANCE AND ODOR: Free flowing powder with minimal odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: n/a
METHOD USED: n/a
FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: n/a
UPPER: n/a

EXTINGUISHING MEDIA: Dry chemical, sand or ground limestone.

SPECIAL FIREFIGHTING PROCEDURES
Water spray may be ineffective. Water spray may be used to cool closed containers that are exposed to extreme heat. If water is used, fog nozzles are preferable. Firefighters should wear self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Dust can form explosive mixture in air.

SECTION V - REACTIVITY DATA

STABILITY: This product is normally stable and will not undergo hazardous reactions.
CONDITIONS TO AVOID
Excessive heat and direct sunlight.

INCOMPATIBILITY (MATERIALS TO AVOID)
Avoid contact with strong alkalies, strong mineral acids, or strong oxidizing agents.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS

May produce the following hazardous decomposition products when exposed to extreme heat: carbon monoxide; carbon dioxide; lower molecular weight polymer fractions; hydrogen cyanide; ammonia; oxides of nitrogen; traces of isocyanate.
Extreme heat includes, but is not limited to flame cutting, brazing, and welding.

HAZARDOUS POLYMERIZATION: Will not occur.

========== SECTION VI - HEALTH HAZARD DATA ==========

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE
Dusts generated during application of powder coatings harmful if inhaled.

SKIN AND EYE CONTACT HEALTH RISKS AND SYMPTOMS OF EXPOSURE
May cause slight skin irritation. Causes eye irriation.

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE
n/a

INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE
Harmful if swallowed. Dried film of this product may be harmful if chewed or swallowed.

HEALTH HAZARDS (ACUTE AND CHRONIC)
n/a

CARCINOGENICITY: NTP CARCINOGEN: Yes **IARC MONOGRAPHS:** n/a **OSHA REGULATED:** n/a
n/a

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
Not applicable.

EMERGENCY AND FIRST AID PROCEDURES
If swallowed, do not induce vomiting. Gently wipe out inside mouth to remove any residual material. Contact physician.
If affected by inhalation of powder, remove to fresh air. Apply artificial respiration and other support measures as required. Contact physician.
In case of skin contact, flush immediately with plenty of water for at least 15 minutes followed by washing with soap and water.
In case of eye contact, remove contact lenses and flush eyes immediately with a gentle stream of luke warm water for at least 15 minutes.

========== SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE ==========

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Wear appropriate protective clothing and respirator to prevent overexposure. Sweep up material taking care not to generate airborne dust. Collect into closable conatiners for proper disposal. Prevent runoff to storm sewers and ditches leading to neutral waterways.

WASTE DISPOSAL METHOD
Waste material must be disposed of in accordance with federal, state, provincial, and local environmental control regulations. Empty containers should be recycled or disposed of through an approved waste management facility.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
For better shelf life, do not store above 80 degrees Fahrenheit (26 degrees C.). Store in a well ventilated area separate from acids and alkalis. Protect from physical damage and keep containers closed and upright when not in use.

OTHER PRECAUTIONS
Store in a dry, cool place. Use only with adequate ventilation. Do not take internally. Keep out of reach of children and individuals unfamiliar with this product. Avoid contact with skin and eyes. Do not breathe dust. Wash thoroughly after handling.

SECTION VIII - CONTROL MEASURES

RESPIRATORY PROTECTION

Use an appropriate NIOSH-approved particulate filter respirator. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Select in accordance with OSHA 1910.134 and good industrial hygiene practice.

VENTILATION

Provide adequate general and local exhaust ventilation in volume and pattern to remove decomposition products during baking, welding or flame cutting of parts coated with is product.

PROTECTIVE GLOVES

This coating does not pose a skin absorption hazard, Gloves selection should be based on the work task to prevent skin irritation.

EYE PROTECTION

Wear sufficient eye protection to prevent contact with powdered materials. Safety goggles are recommended.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

n/a

WORK/HYGIENIC PRACTICES

Maintain a clean dust free work environment. Wash skin thoroughly with soap and warm water after handling and before smoking, eating or applying makeup.

SECTION IX - DISCLAIMER

As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for any use of this material. Information contained herein is believed to be true and accurate but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Such data are offered solely for your consideration, investigation, and verification.

INSTALLATION INSTRUCTIONS
FC-313M FLUID CLEANER™ - 15617-00-001

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 FC-313M Fluid Cleaner is shipped fully assembled; no additional assembly is required.

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 *DER01415* 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! USE SPREADER BARS TO PREVENT DAMAGE WHEN LIFTING THE EQUIPMENT.

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

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

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

INSTALLATION SEQUENCE

Following is the sequence of steps for installing the FC-313M Fluid Cleaner. The sequence presented may vary depending on selected options, the user's facilities, and previous experience with this type of equipment.

1. Read and understand all safety information in *DER02015* Warnings Summary in Section 1 before installing and operating this equipment.
2. Read and understand *DER01415* Equipment Handling Procedures in Section 1 before lifting and moving the equipment.
3. Position and level equipment at installation site.
4. Remove shipping brackets.
5. Connect feed line to desilter or desander (if installed) or to feeder.
6. Connect discharge duct to hopper.
7. Connect electric power supply to the equipment.
8. Install screen panels.
9. Refer to *DER04093* Operating Instructions in Section 4 for startup and operating instructions.

REQUIRED CLEARANCES AND POSITIONING

Sufficient space should be provided around the equipment to facilitate access for maintenance, inspection, and adjustment. The recommended clearances between the fluid cleaner and structural walls are shown in Figure 3015-1.

Typical operation and maintenance functions include, but are not limited to, the following activities:

1. Change screen panels
2. Access to the motor starter box and electrical junction box
3. Adjust screen frame angle
4. Adjust desilter or desander cones (if installed)
5. Remove and replace desilter or desander cones (if installed)
6. Connect and disconnect desilter or desander (if installed) and feed line
7. Connect and disconnect hopper discharge duct

EQUIPMENT LEVELING

The fluid cleaner must be properly leveled to enable even distribution of the feed slurry across the screen panels. The equipment must be leveled along the length and width of the unit (Figure 3015-2). A 4-foot level is recommended to check level. Non-compressible shims should be used as required to level the machine.

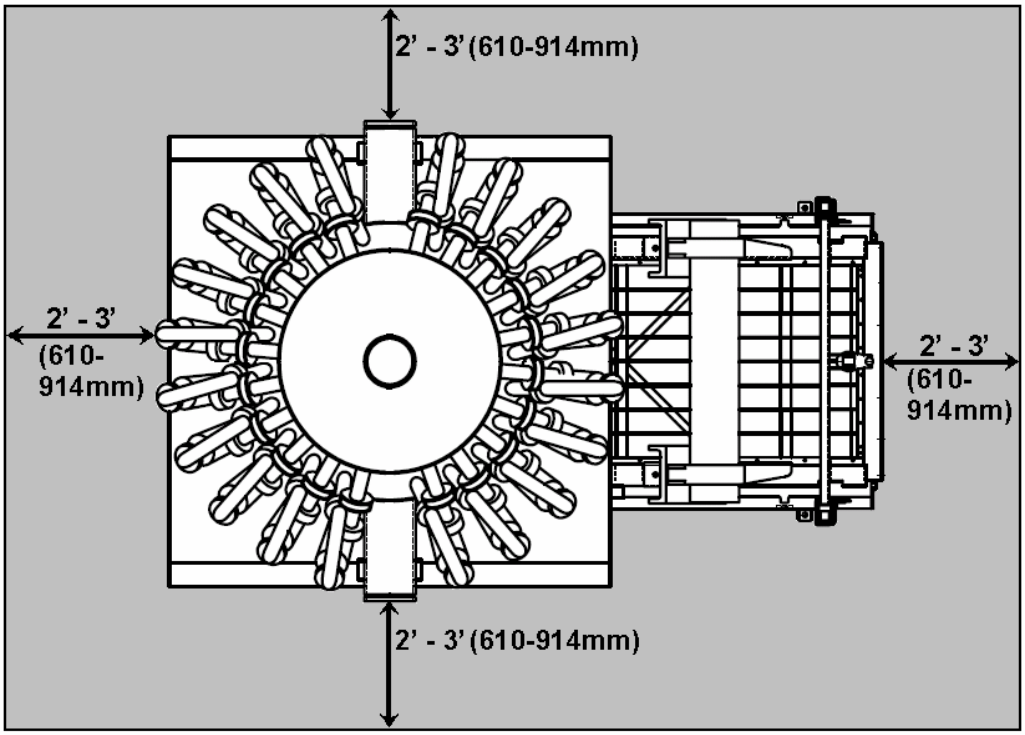


Figure 3015-1 Recommended Clearances (Shown With Optional Desilter)

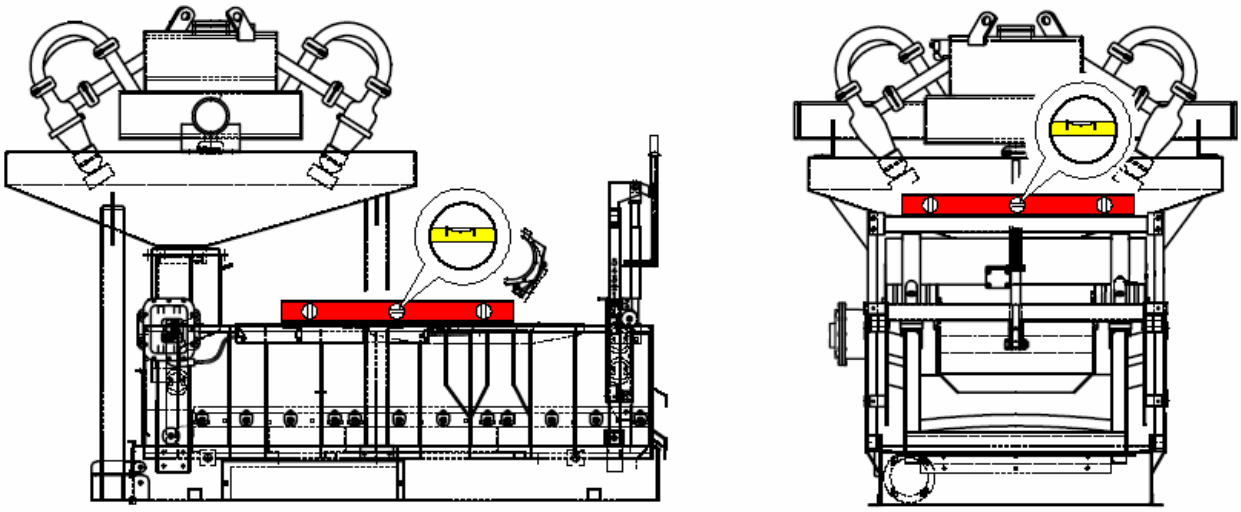


Figure 3015-2 Fluid Cleaner Leveling

SHIPPING BRACKETS

Note! Do not discard shipping brackets after removal. These components should be re-installed whenever the machine is moved to prevent movement of the screen frame during transit.

Following final positioning and leveling of the fluid cleaner, remove the shipping brackets (Figure 3015-3) that were installed to stabilize the screen frame and motor during transit. Two shipping brackets and two PVC plugs secure the movable screen frame to the stationary support frame. In addition, two shipping pins are installed to secure the motor mount in position during transit. The shipping brackets **must be re-installed whenever the fluid cleaner is moved** and **must be removed prior to startup and operation** of the machine.

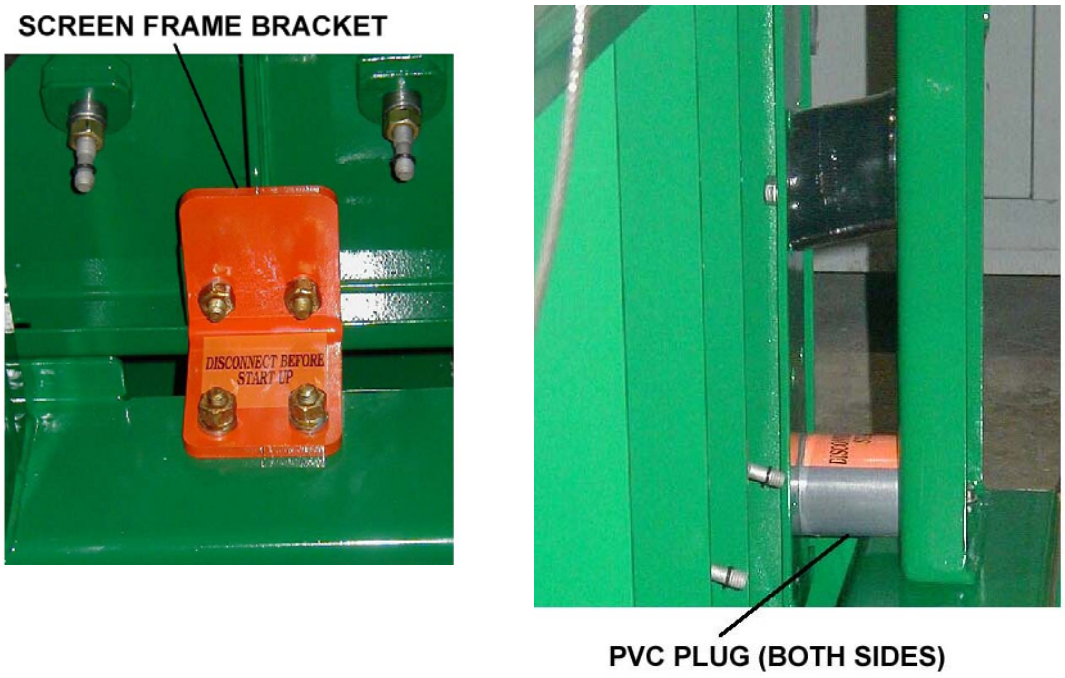
For high visibility, the two shipping brackets are painted orange, and the PVC plugs are gray with an orange label. To prevent loss, the two shipping pins are attached to the machine by lanyards. Each shipping component is labeled **DISCONNECT BEFORE STARTUP**. Shipping brackets are installed on both the left and right sides of the machine and may be removed in any desired sequence.

Remove shipping brackets as follows:

1. Remove the two orange brackets and two orange-labeled PVC plugs securing screen frame to support frame. No special removal sequence is required.
2. Unscrew motor shipping pins from inboard motor mount bushings. Withdraw pins from orange motor mount brackets, and insert into holders near attachment point of each lanyard assembly. Leave orange brackets in place between motor bushings for future use when moving machine.

Note! Do not remove orange brackets between motor mount bushings.

3. Retain all removed shipping brackets and associated attaching hardware for future use.



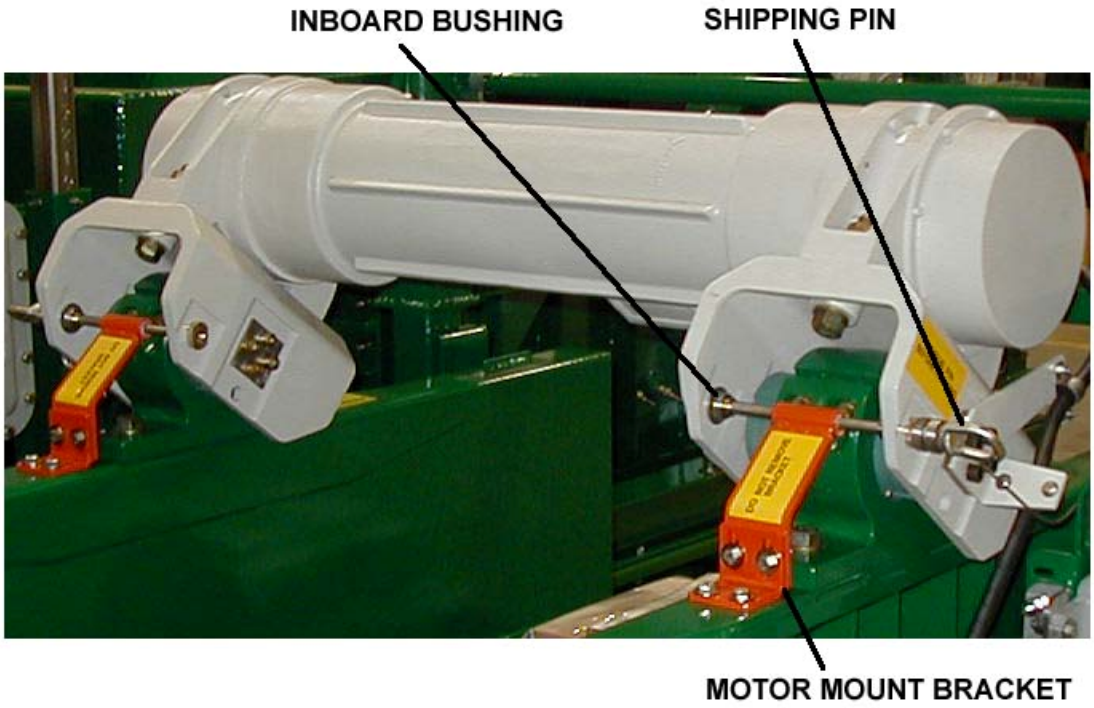


Figure 3015-3 Shipping Bracket Locations

DESILTER OR DESANDER INLET AND DISCHARGE

Six sizes of round desilters (8-, 10-, 12-, 14-, 16-, and 20-way) are available for the fluid cleaner. Each desilter has inlet and discharge pipes designed to accept Victaulic® couplings (Figure 3015-4). The inlet connection is on top of the unit, and two horizontal discharge connections are provided. Either or both discharge connection(s) may be used to accommodate the customer piping arrangement. For single inlet piping, the unused connection must be capped.

The 10-inch desander has horizontal inlet and discharge pipes, which are also designed for Victaulic® couplers. The lower pipe is the 8-inch inlet connection, and discharge is the 10-inch upper pipe. Customer piping may be connected to either or both inlet and discharge desander pipes.

Refer to. Section 9 - Desanders and Section 10 - Desilters for additional information on these units.

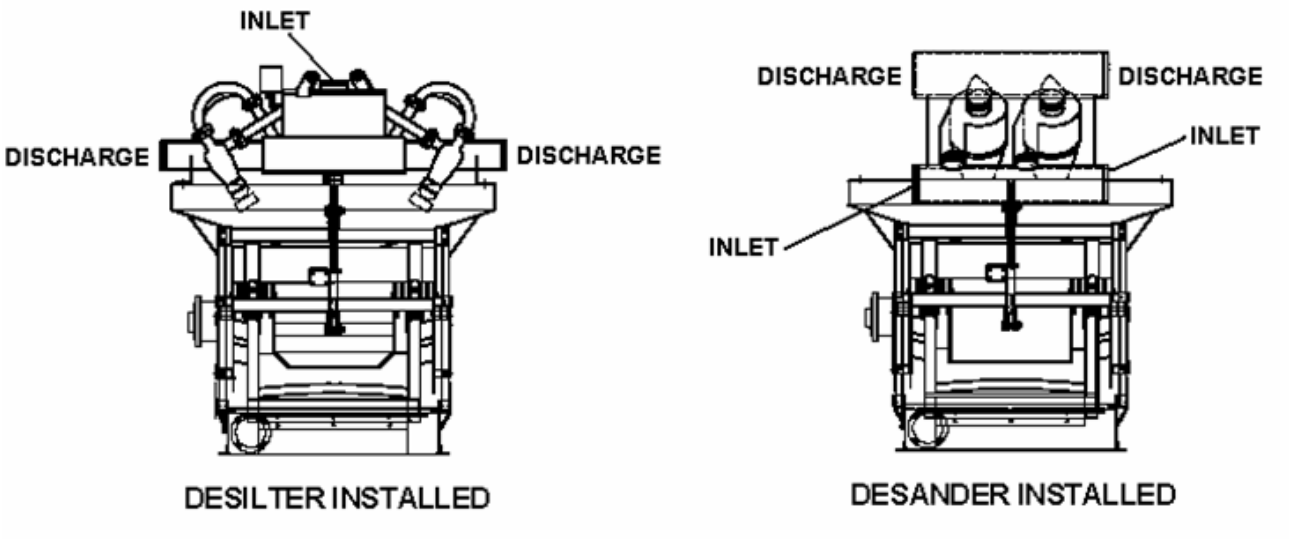


Figure 3015-4 Desilter and Desander Connections

COLLECTION PAN

The collection pan feeds directly into the feeder. No connection is required.

HOPPER DISCHARGE

Fluid cleaners built with a hopper to receive underflow from the screen frame have a 5”H x 30”L rectangular discharge cutout (Figure 3015-5) on one side of the hopper. As shipped, the discharge cutout is covered by a removable panel bolted to the hopper. To connect a discharge line to the cutout, construct a discharge duct to fit the cutout and use the four bolts provided to secure the discharge duct flange to the hopper.

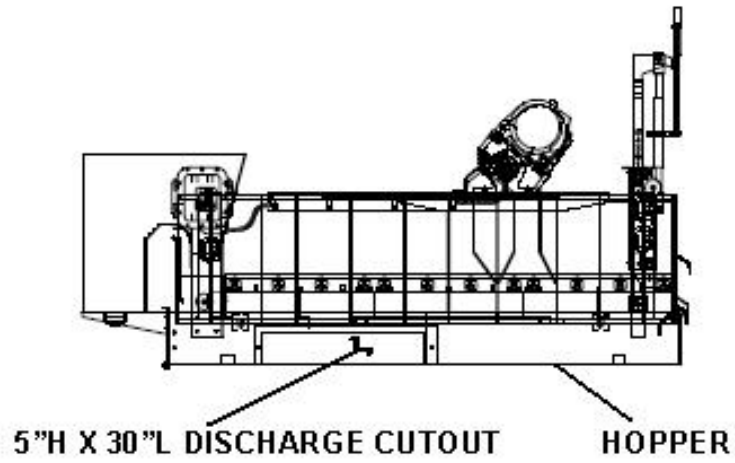


Figure 3015-5 Bypass Hopper Discharge Cutout

FEEDER CONNECTION

Pipe targets are imprinted on the outside of all fluid cleaner feeder units (Figure 3015-6) to indicate the proper location for connecting the feed line. Use these pipe targets to locate an 8- or 10-inch (203 or 254 mm) feed pipe. Using the appropriate-size target, cut out a circle to receive a customer-supplied flange to accept the feed line.

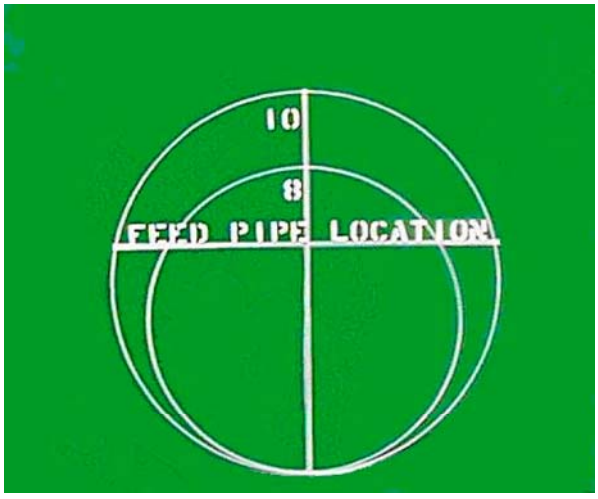


Figure 3015-6 Pipe Targets – Feeder Units

ELECTRIC POWER CONNECTIONS

Connect the facility electrical power supply to the starter box in accordance with Figure 3015-7 and wiring diagram in Section 11.

The vibrator motor is a three-phase, 50 or 60 Hz motor. The **motor is not dual wound** and must be operated at the design voltage. For motor power requirements, refer to the label on the motor data plate.

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

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

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

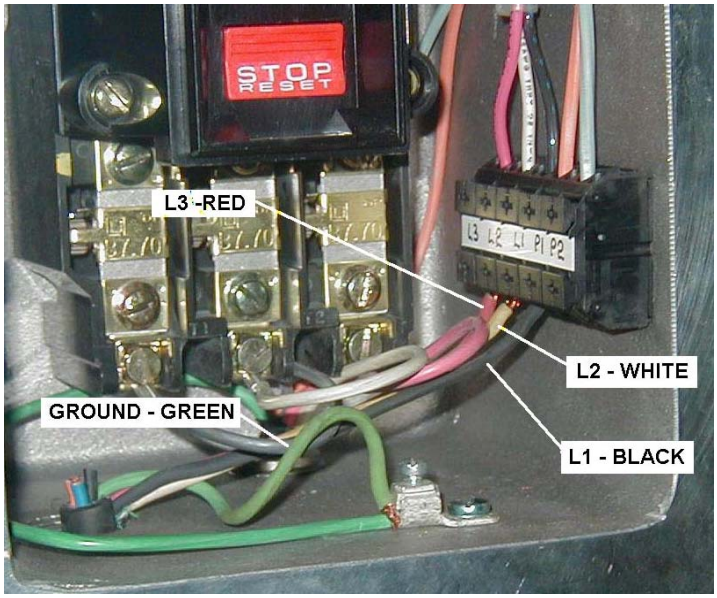


Figure 3015-7 Electric Power Connections

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

Additional wiring requirements are as follows:

1. The fused disconnect device shall have sufficient interrupting capacity to clear the maximum fault current capability of the power supply system.
2. The GROUND connection in the power supply junction box must be connected to a known ground.

SCREEN PANELS

Prior to installing screen panels, remove all packing and shipping materials from the bed of the screen frame. Depending on customer specifications, the fluid cleaner is equipped with either of the following screen panel tensioning systems:

DER06001 **RAPID CHANGE DRAW BOLT ASSEMBLY**

DER06002 **RAMP-LOK® DRAW BOLT ASSEMBLY**

Refer to the appropriate document for screen installation and tensioning procedures:

MACHINE STARTUP

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

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

OPERATING INSTRUCTIONS
FC-313M FLUID CLEANER™ - 15617-00-001

GENERAL

This section includes initial and normal startup, normal shutdown, and emergency shutdown procedures for the fluid cleaner.

OPERATING SAFETY

WARNING! MOTOR HOUSING BECOMES HOT DURING OPERATION AND MAY CAUSE SEVERE BURNS. DO NOT TOUCH MOTOR HOUSING DURING OR IMMEDIATELY AFTER MOTOR HAS BEEN OPERATING.

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 ALL PERSONNEL ARE CLEAR OF MACHINE BEFORE ADJUSTING ANGLE OF SCREEN BED.

WARNING! DO NOT ATTEMPT TO OPERATE EQUIPMENT WITH SHIPPING BRACKETS INSTALLED.

WARNING! BEFORE STARTING UP MACHINE, BE SURE THAT ALL PERSONNEL ARE CLEAR OF EQUIPMENT.

INITIAL STARTUP

Perform the Initial Startup procedure when the fluid cleaner is being started for the first time or when equipment has been removed from service for an extended period. Refer to the following table for initial startup instructions.

INITIAL STARTUP (CONT'D)

INITIAL STARTUP		
Step	**Procedure**	**Reference**
1	Confirm that all operators and maintenance personnel have read and understand all operating and safety information in Section 2 - Safety.	*DER02015*
2	Verify that equipment has been installed properly.	*DER03015*
3	Check that all tools, documents, and shipping brackets have been removed and there are no obstructions to operation, giving special attention to bed of screen frame.	*DER03015*
4	Check that services and utilities are available at the installation site.	*DER01315*
5	Verify that screen panels have been installed properly.	*DER06001* or *DER06002*
5	Start fluid cleaner in accordance with Normal Startup procedure below.	—

NORMAL STARTUP

The following procedure shall be performed at each machine startup:

NORMAL STARTUP	
Step	**Procedure**
1	Verify that all personnel are clear of fluid cleaner before applying electric power to equipment.
2	Press **START** pushbutton to apply electric power to the vibrator motor. Allow 5 minutes for motor to reach operating temperature.
3	Start pump or open valve to introduce flow of material to feeder, desilter, or desander, as applicable.
4	Observe pool configuration that forms on bed of screen frame, and adjust the AWD and/or inlet flow rate as described in *DER04100* and *DER04200* to achieve desired pooling on screen panels.

NORMAL SHUTDOWN

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

NORMAL SHUTDOWN	
Step	**Procedure**
1	Divert or discontinue flow of material to fluid cleaner.
2	Allow all oversize and undersize material and liquid to discharge from screen frame.
3	Shut down electric power to stop vibrator motor, and open fused disconnect supplying electric power to the machine.
4	Lock out and tag out machine.
5	Using a water hose, wash remaining material from surfaces of screen panels and edges of screen panels where they contact sidewalls of screen frame.

EMERGENCY SHUTDOWN

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

OPERATING PRINCIPLES - AWD TILT CONTROL

GENERAL

The Adjustable While Drilling (AWD) screen frame angle adjuster allows the operator to extend the time that the feed slurry remains on the screening medium by elevating the discharge end of the screen frame. This additional time improves the separation of solids from the liquid.

With conventional screening equipment the feed slurry is fed onto a screening frame, and the slurry moves unimpeded toward the discharge end of the screen frame. Consequently, little time is available for the liquid to separate from the solids and pass through the screening medium. Solids discharged from the screen frame may, therefore, contain a significant amount of liquid, which adds significant weight to the fines and makes handling and storage more difficult.

The AWD feature allows the discharge end of the screen frame to be elevated slightly, causing the slurry to pool toward the rear of the screen frame. This pooling allows the slurry to remain on the screen panels longer, permitting more liquid to drain off, and drier solids to be discharged from the screen frame.

THEORY OF OPERATION

The G-forces produced by the vibrator motor(s) separate the solids from the liquid, causing the solids to settle onto the screen panels, while the fluid passes through the screening media into the collection hopper directly below the screen frame. The fluid is then routed for further processing. In addition to the separation process, the G-forces produce a linear motion that conveys the solids out of the pool toward the last screen panel where they are discharged from the machine.

Using the AWD to elevate the discharge end of the screen frame slows the forward progress of the slurry over the screen bed (Figure 4100-1). The screen frame may be elevated several degrees, as determined by several factors:

- Particle size
- Concentration of solids in the slurry
- Feed rate
- Type of slurry
- Type of screen
- Screen cut point

THEORY OF OPERATION (CONT'D)

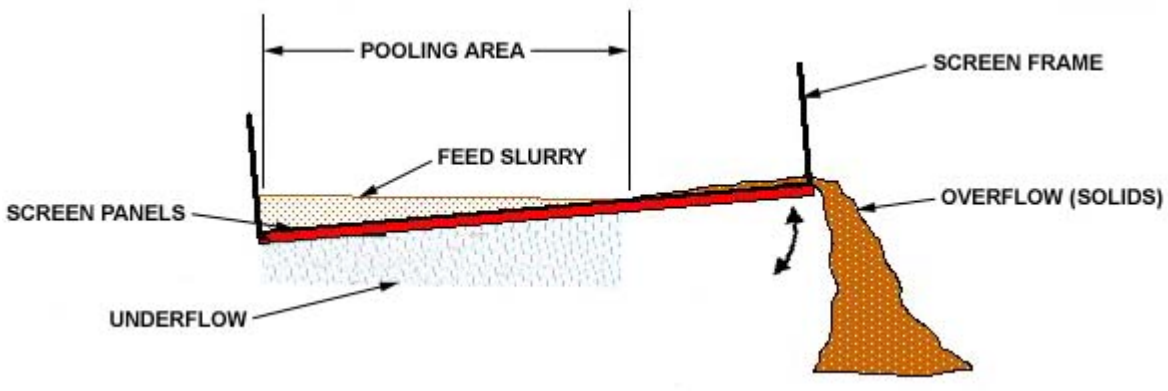


Figure 4100-1 Screen Frame Pooling Area

ADJUSTMENT PROCEDURE

Several styles of AWD tilt adjustment are available for Derrick equipment. Refer to the Table of Contents for operating instructions that apply to the AWD installed on your machine.

POOL CONFIGURATION

Extensive testing has shown that the most efficient pool configuration maximizes use of the available screen area. In general, the pool should cover all screen panels except for the discharge screen, which is the last screen on the screen frame.

There is **no "one correct setting"** for the AWD. The AWD allows the operator to easily change the angle of elevation in rapid response to ever-changing conditions and feed rates of the slurry. Suggested changes to an existing screen angle are shown in Figure 4100-2. Note that the dark pattern at the left represents the area of the screen panels covered by the pool. The ideal coverage is for the pool to cover screen panels 1 and 2. If coverage retreats to halfway on screen panel 1, the screen frame angle may be reduced and/or flow increased. Finally, if the pool covers nearly all of screen panel 3, the screen angle may be increased and/or flow decreased to reduce the pooling area.

Note! A negative screen frame angle is useful for cleaning slurry deposits from interior walls of the screen frame and from the top surfaces of the screen panels.

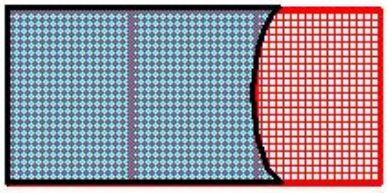
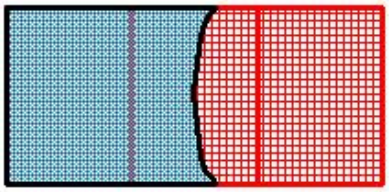
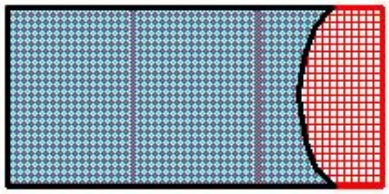
POOL CONFIGURATION	ANGLE ADJUSTMENT	ALTERNATIVE ADJUSTMENT
	**Correct screen angle No adjustment required**	
	**Decrease screen angle**	**Increase flow**
	**Increase screen angle**	**Decrease flow**

Figure 4100-2 Pool Configuration and Adjustments

AWD ADJUSTMENT - MANUAL JACK SCREW

GENERAL

The manual jack screw Adjustable While Drilling (AWD) (Figure 4200-1) allows the discharge end of the screen frame to be raised or lowered while the machine is operating. The unit consists of two vertical upright shafts connected by the upper cross at the top while the upright shafts are attached to the hopper at the bottom. The movable portion of the AWD consists of the lower cross, guides to control vertical movement, an angle indicator to display AWD angular position, and the jack screw used to drive the movable screen up and down. The fixed end of the jack screw is attached to the upper cross and the movable barrel of the jack screw is attached to the lower cross.

OPERATION

A spring-loaded plunger and reversible pawl provides a ratcheting action during movement of the operating handle. A full 180 degrees of movement is possible in both directions. Depending on pawl setting, moving the handle in one direction turns the jack screw to raise or lower the screen frame, while in the other direction the jack screw remains stationary during handle movement. The spring-loaded pawl permits the operator to switch the direction to either raise or lower the screen frame, as required.

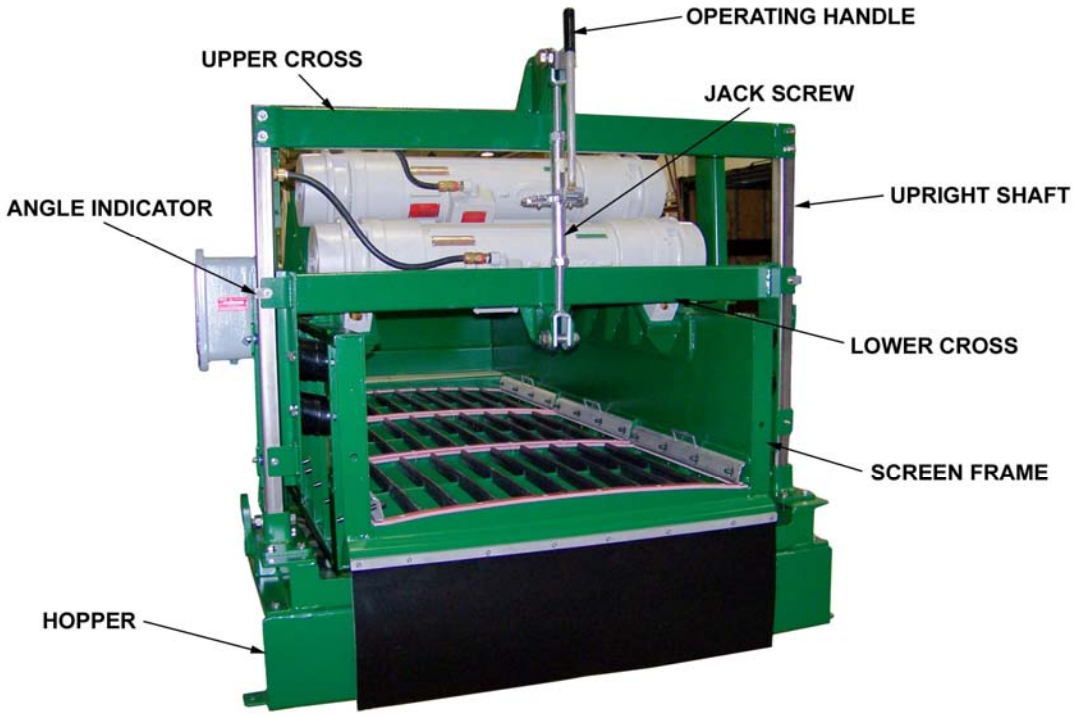


Figure 4200-1 Manual Jack Screw AWD Components

ANGLE ADJUSTMENT

The angle of the discharge end of the screen frame is infinitely adjustable within the equipment's available range. To adjust the AWD, proceed as follows:

WARNING! BE SURE THAT ALL PERSONNEL ARE CLEAR OF MACHINE BEFORE ADJUSTING ANGLE OF SCREEN BED.

1. Pivot operating handle (Figure 4200-2) downward until horizontal, if not already done, and set jack screw ratchet detent to either raise or lower discharge end of screen frame.
2. Using the operating handle, rotate jack screw left to raise or right to lower screen frame end to the desired angle. Use stamped markings on the upright shafts to assist in determining angular setting.

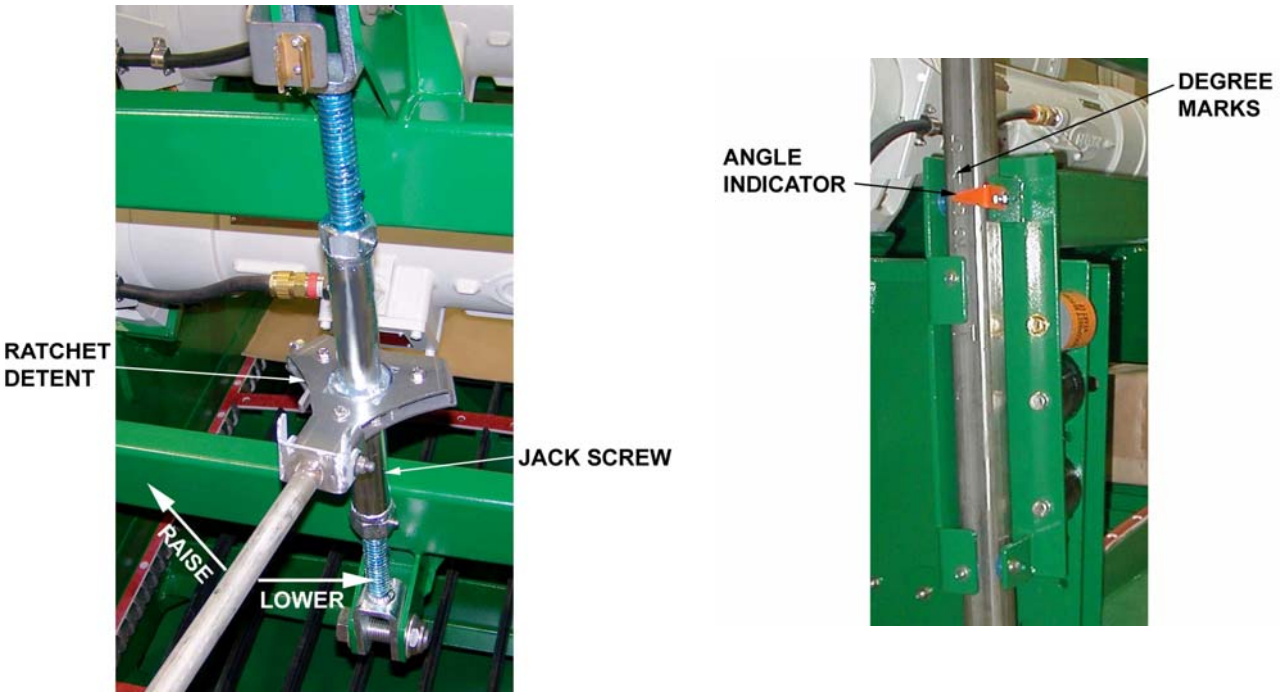


Figure 4200-2 Manual Jack Screw AWD Adjustment

MAINTENANCE

The manual AWD jack requires periodic lubrication and occasional adjustment of the spring plunger. Refer to Section 5 for lubrication instructions. If the ratchet action becomes noticeably imprecise or the pawl fails to latch during jack handle movement, the spring plunger should be adjusted as follows:

1. Turn adjusting screw (Figure 4200-5) clockwise to increase spring tension on plunger.
2. Move operating handle in both directions to confirm proper ratcheting action and pawl engagement during jack screw rotation.
3. If pawl does not engage jack screw properly or ratchet action is insufficient, repeat steps 1 and 2.

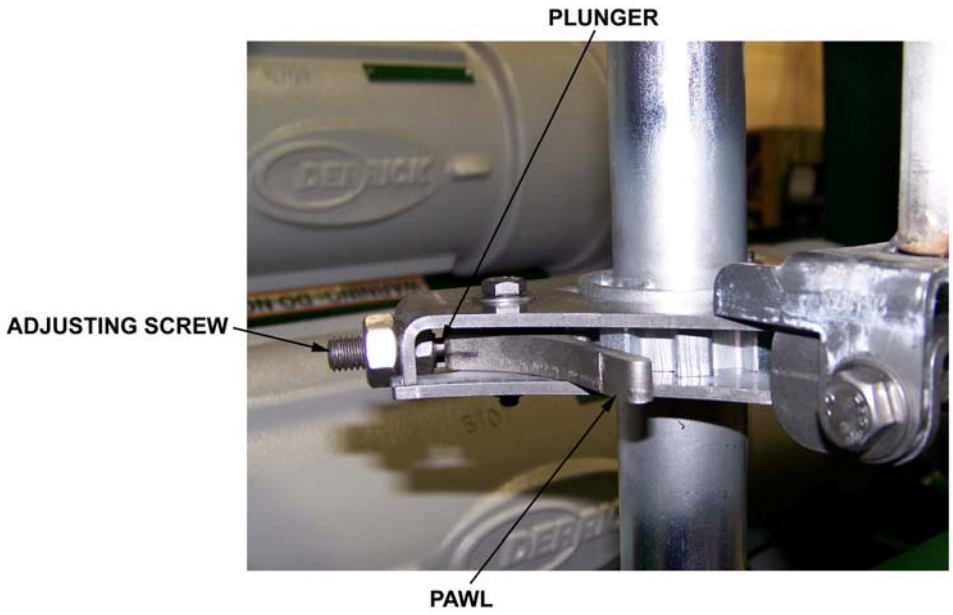


Figure 4200-5 Spring-Loaded Plunger Adjustment

MAINTENANCE PROCEDURES

FC-313M FLUID CLEANER

GENERAL

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 should be kept using document *DER13000* 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:

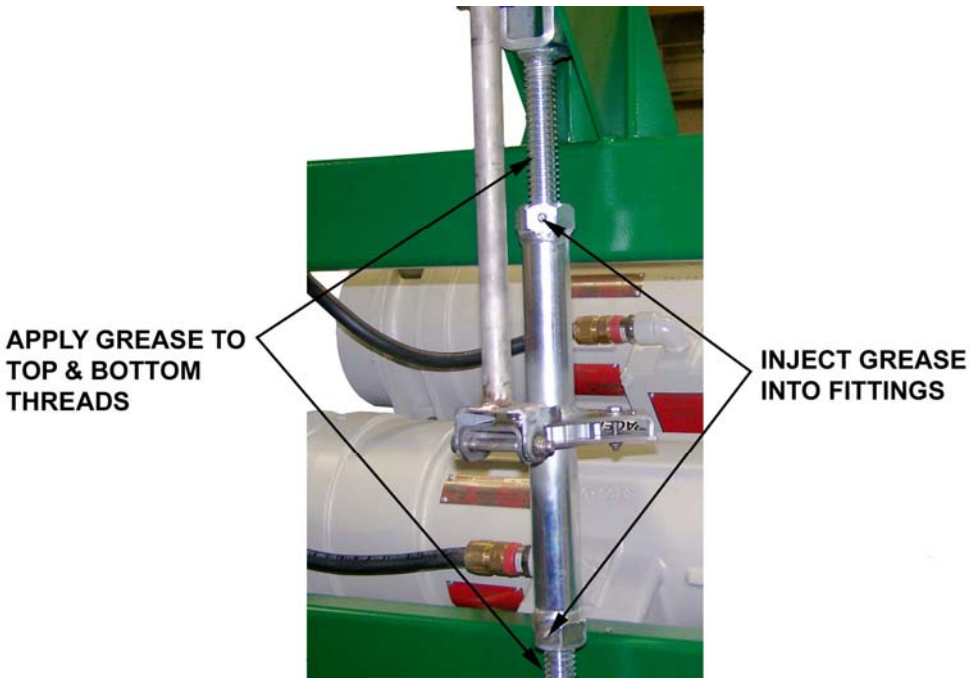
- Duty cycle
- Ambient temperature
- Operating environment

ROUTINE MAINTENANCE

Routine maintenance consists of overall inspection and cleaning. Following are the recommended routine maintenance procedures.

ROUTINE MAINTENANCE	
Action	**Frequency**
Inspect feed connection to feeder, desander, or desilter for leaks, and tighten connection as required.	Each shift
Inspect discharge duct connection on side of hopper for leaks. Tighten connection and/or add silicone sealant to prevent leakage.	Each shift
Inspect cover on unused hopper discharge connection for leaks. Tighten connection and/or add silicone sealant to prevent leakage.	Each shift
Using a water hose, wash off accumulated process material from screen frame, interior of hopper, and AWD angle adjustment components. Excessive process material in these areas may impede angle adjustment of screen frame and can reduce screen frame vibration if the frame bottoms out on the buildup.	Each shift
Check for and remove any accumulation of process material or other obstruction in feeder interior. Feeder blockage may cause excessive splashing and uneven distribution of slurry onto the screen bed.	Weekly

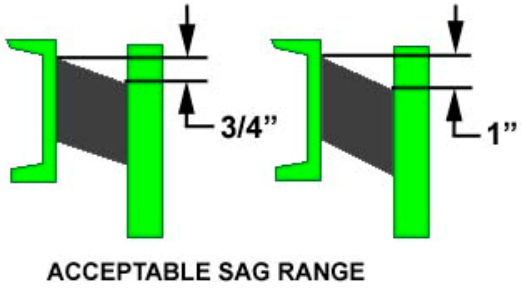
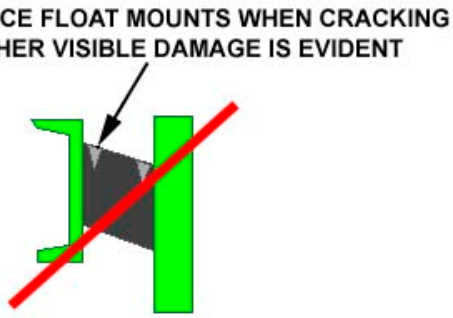
ROUTINE MAINTENANCE	
Action	**Frequency**
Inspect entire machine for evidence of coating damage, including exposed base metal, corrosion, deep scratches, or other voids. Repair damaged areas in accordance with coating manufacturer's specifications (refer to *DER02895*).	Weekly
Using Dura-Lith EP, Mobilux EP, or equivalent grease, lubricate threads of AWD jack screw assembly and inject grease into fittings.	Quarterly



SCREEN FRAME

The screen frame includes mounting provisions for the vibrator motor and the screen tensioning system, as well as providing the mounting surface for the screen panels. It is suspended between the vertical legs of the support frame or hopper. During normal operation, the screen frame and tensioning components accumulate residual mud that should be removed periodically. Refer to the screen frame maintenance table for key inspection and maintenance locations.

In addition, the six float mounts should be inspected and replaced when damage is evident. Since these components isolate the vibratory motion of the screen frame from the stationary parts of the machine, deterioration may occur over time.

SCREEN FRAME MAINTENANCE	
Action	**Frequency**
Wash accumulated process material from interior walls and screen frame bed. Excess accumulation increases the load on the float mounts and reduces solids separation capabilities.	Each shift or as required
Inspect float mounts for excessive sag (greater than 1 inch / 25.4 mm) and/or signs of deterioration or damage. If excessive sag is found, clean excess buildup of process material from screen frame to reduce loading on float mounts. If excessive sag remains, or damage is evident, float mounts must be replaced. Note that mounts at discharge end must be replaced as a pair (top and bottom).	Monthly or as required
 ACCEPTABLE SAG RANGE 	
Inspect front curtain and rear feeder seal for signs of deterioration or damage (Figure 5014-1). The rear feeder seal prevents feed slurry from entering the hopper at the feed end, while the front curtain prevents solids from entering the hopper at the discharge end. Replace front curtain and/or rear feeder seal if function is compromised.	Monthly
Check tension and condition of screen panels. They should be in complete contact with the screen frame bed and should not have holes or other damage that would allow solids to pass through. Replace damaged screen panel(s).	Each shift
Inspect side supports, cross supports, and channel protectors for deterioration or damage. Defective components may permit damage to the screen panels. Refer to appropriate drawing in Section 11 for replacement parts information.	Each screen panel change
Inspect screen tensioning components (refer to Section 6) for signs of deterioration or damage. The screen tensioning components apply tension to the screen panels to securely position them against the bed of the screen frame. Improper screen panel tensioning will reduce the life of the screen panels. Refer to Section 6 for operation and repair parts.	Each screen panel change
Perform routine maintenance on vibrator motor as described in Section 7 - Vibrator Motors.	See Section 7 for frequency

VIBRATOR MOTOR

Removal, installation, parts replacement, and troubleshooting procedures for the vibrator motor are included in Section 7 - Vibrator Motors.

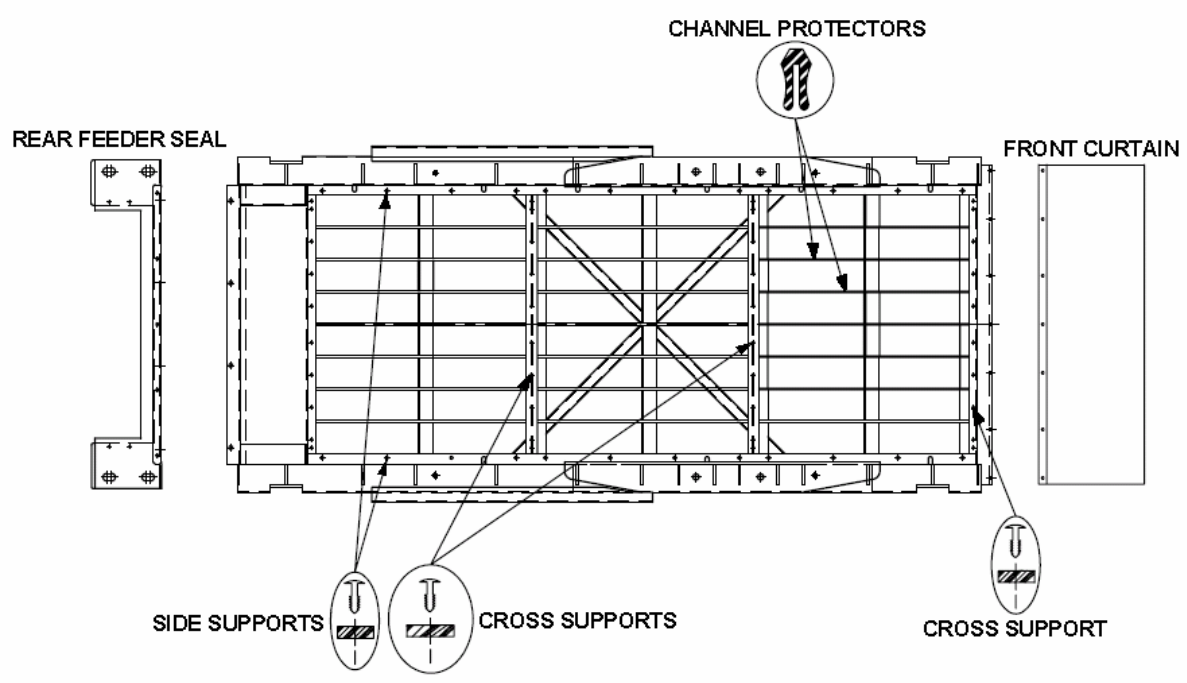


Figure 5014-1 Screen Frame Inspection and Maintenance

RAPID CHANGE DRAW BOLT ASSEMBLY

GENERAL

Proper screen functioning relies on tight retention and full contact with the screen bed and related components (side supports, cross supports, and channel protectors). The rapid change draw bolt assembly is a highly effective screen tensioning system used on Derrick equipment to properly secure the screen panels. Consult the applicable drawings in Section 11 - Reference Drawings to determine the type of screen tensioning system and component part numbers on your machine.

DESCRIPTION

The rapid change draw bolt assembly allows screen panels to be changed quickly and easily. Several rapid change draw bolt assemblies are used in combination with a draw bar (Figure 6001-1) to apply tension to the screen panel. The lower edge of the draw bar engages a hook strip on the outer edge of the screen panel.

The shaft of the draw bolt passes through the sidewall of the screen frame, and the T-shaped head of the draw bolt is passed through slots in the draw bar and then rotated to provide the clamping action. Tightening the nut outside the screen frame pulls the draw bolt and draw bar to tighten and securely clamp the edge of the screen panel to the screen frame. Eight rapid change draw bolt assemblies—four per side—are required for each 48” x 30” or 36” x 30” screen panel.

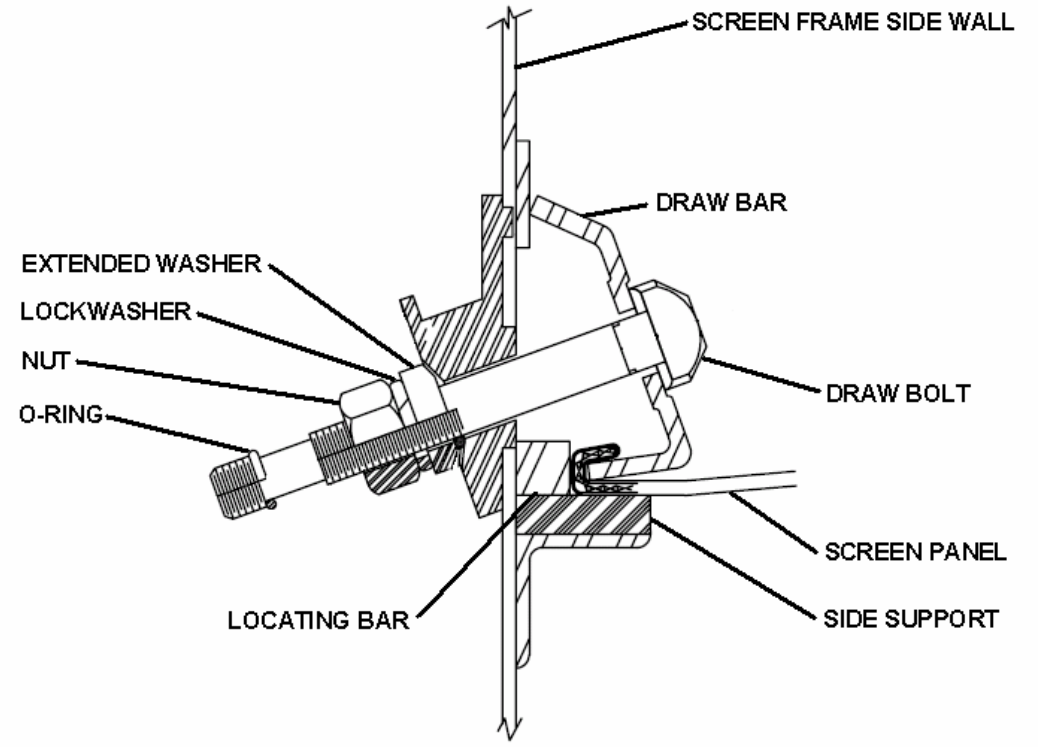


Figure 6001-1 Rapid Change Draw Bolt Assembly Components

TOOLS REQUIRED

Two different styles of wrenches (Figure 6001-2) may be used for removal, tensioning, and installation of the rapid change draw bolt assemblies. Both wrench styles are available from Derrick. The ratchet-type, double-ended box wrench allows the nuts to be loosened or tightened very quickly, while the T-handle wrench with a universal joint and socket is sufficient for these operations.

Ratchet Wrench (P/N PP1116)

T-Handle Wrench (P/N 5925-01)

Figure 6001-2 Rapid Change Draw Bolt Assembly Wrenches

INSPECTION, REPAIR, AND INSTALLATION

Rapid change draw bolt assemblies should be replaced if inspection reveals distortion, damaged threads, severe corrosion, or galling. If any mounting holes are elongated, contact the Technical Services department for assistance in making the repair(s). Only rapid change draw bolt assemblies in serviceable condition may be installed as shown in Figure 6001-3. Replace any draw bolt assembly that cannot be restored to fully serviceable condition.

Draw bars should be inspected for distortion, corrosion, or material buildup. Thoroughly clean draw bars, removing any built-up material on the edge that engages the hook strip on the screen panel. Replace any draw bar that cannot be restored to fully serviceable condition.

REPLACEMENT PARTS

Rapid change draw bolt assemblies are available in several different material configurations to accommodate a wide variety of fluid applications. Refer to applicable drawings in Section 11 to determine the components of the draw bolt assemblies installed on your machine.

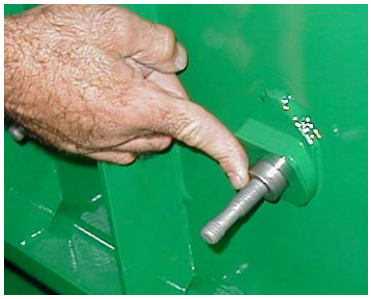
Step 1 - Insert draw bolt through frame from inside.

Step 2 - Install O-ring on bolt.

Step 3 - Push O-ring into counterbore in screen frame.

Step 4 - Apply anti-seize compound to draw bolt threads

Step 5 - Orient extended washer with counterbored hole toward screen frame, and install on draw bolt



Step 6 - Push in extended washer fully to seat O-ring.

Step 7 - Install lockwasher on draw bolt.

Step 8 - Install nut on draw bolt.

Step 9 - Install O-ring on unthreaded area of draw bolt.

Step 10 - Using wrench (Figure 2), tighten nut until snug*.

* Torque will vary depending on screen panel type and condition of channel protectors and cross and side supports (Figure 6001-1).

Figure 6001-3 Rapid Change Draw Bolt Assembly Installation

RAMP-LOK® DRAW BOLT ASSEMBLY

GENERAL

Proper screen functioning depends on tight retention and full contact with the screen bed and related components, i.e. side supports, cross supports, and channel protectors. The Ramp-Lok® draw bolt assembly is one of the screen tensioning systems installed on Derrick equipment to properly secure the screen panels. Consult the applicable drawings in Section 11 - Reference Drawings to determine the type of screen tensioning system and component part numbers on your machine.

DESCRIPTION

The Ramp-Lok® draw bolt assembly (Figure 6002-1) is an adjustable tensioning system that facilitates fast and easy screen panel installation and removal. Several Ramp-Lok® draw bolt assemblies are used in combination with a draw bar to apply tension to the screen panel. When rotated clockwise, the tensioning nut rides up an incline, pulling the draw bolt outward to tighten the screen panel. A compression spring inside the locking nut returns the draw bolt when the tensioning nut is rotated counterclockwise. A locking nut allows adjustment of the clamping force by altering the length of the draw bolt. A 180-degree rotation of the tensioning nut is all that is required to alternately apply and release tension.

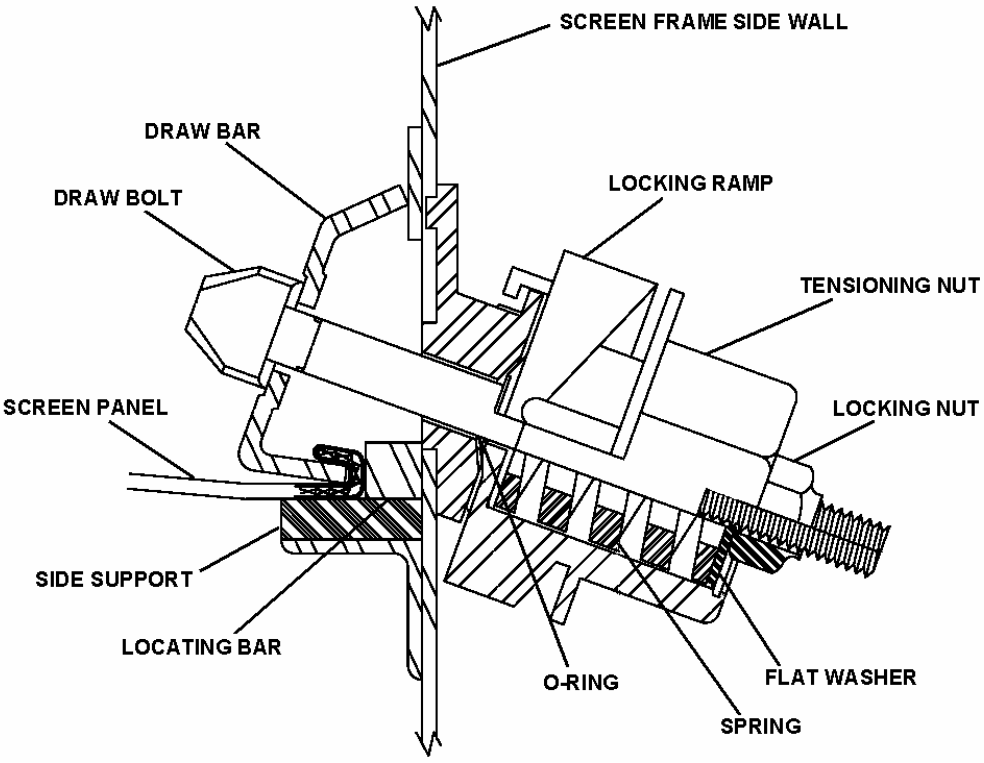


Figure 6002-1 Ramp-Lok® Draw Bolt Assembly Components

DESCRIPTION (CONT'D)

The shaft of the draw bolt passes through the sidewall of the screen frame, and the T-shaped head of each draw bolt is passed through a vertical slot in the draw bar. Rotating the draw bolt head to the horizontal position engages the bolt with the draw bar. The lower edge of the draw bar engages a hook strip along the outer edge of the screen panel. Eight Ramp-Lok® draw bolt assemblies—four per side—are required for each 48" x 30" screen panel.

TOOLS REQUIRED

A double-ended combination wrench (Figure 6002-2) is available for operation and adjustment of the Ramp-Lok® draw bolt assemblies. The wrench's large open end is used to rotate the tensioning nut, and the smaller box end is used for adjusting the locking nut that sets the clamping force applied in the clamp position.

Figure 6002-2 Ramp-Lok® Draw Bolt Assembly Wrench

RAMP-LOCK® DRAW BOLT ASSEMBLY INSTALLATION

If removal of the Ramp-Lok® draw bolt assemblies is necessary, re-install as shown and described in Figure 6002-3.

TENSION ADJUSTMENT

Prior to use, the draw bolt assembly clamping force must be adjusted to suit the application. The clamping force applied by the draw bolt assembly is directly related to the pre-loading of the compression spring during final adjustment of the Ramp-Lok® draw bolt assembly. To adjust clamping tension, proceed as follows:

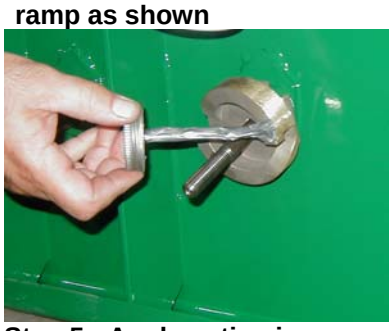
1. Verify that a screen panel is installed on the screen frame bed.
2. Confirm that each draw bolt head is properly engaged with the draw bar.
3. Verify that tensioning nut is rotated fully clockwise (clamped position).
4. Using wrench, 10045-01-004 or equivalent, rotate locking nut clockwise until the flat washer has been drawn approximately 1/4" (6.3 mm) into the tensioning nut.
5. Inspect screen panel for rippling along the hook strip or looseness along the sides or ends of the screen panel. Adjust clamping as required to correct any defects.
6. Check each screen panel for correct clamping tension, and adjust tension as required.

Step 1 - Insert draw bolt through frame from inside.

Step 2 - Install O-ring on end of draw bolt; orient locking ramp as shown

Step 3 - Hook locking ramp channel on screen frame.

Step 4 - Push draw bolt fully through locking ramp.



Step 5 - Apply anti-seize compound to locking ramp inclined surfaces.

Step 6 - Apply anti-seize compound to threads of draw bolt.

Step 7 - Orient tensioning nut.

Step 8 - Slide tensioning nut onto draw bolt threads.

Step 9 - Install flat washer and locking nut.

Step 10 - Pre-load spring, leaving 1/8”-1/4” (3.2-6.4mm) of draw bolt threads exposed.

Released Position - Tensioning nut rotated fully counter-clockwise

Clamped Position - Tensioning nut rotated fully clockwise.

Figure 6002-3 Ramp-Lok® Draw Bolt Assembly Installation and Operation

SCREEN PANEL INSTALLATION

This procedure should be used when installing screen panels for the first time or whenever panels are replaced. To ensure that screen panels are properly centered across the width of the screen bed, locating bars are provided along the left interior wall of the screen bed (Figure 6002-4). When installing a screen panel, first position and tighten the screen panel against the left side of the screen frame. Final tensioning of the screen panel is accomplished from the right side of the screen frame.

Note! Left and right sides of the equipment are defined by facing the feed end and looking toward the discharge end.

WARNING! INCORRECT TIGHTENING WILL RESULT IN IMPROPER SCREEN PANEL TENSIONING, CAUSING PREMATURE WEAR. BE SURE THAT CORRECT TIGHTENING SEQUENCE IS FOLLOWED.

Preparation

Prior to installing screen, shut down machine in accordance with Section 4 - Operation.

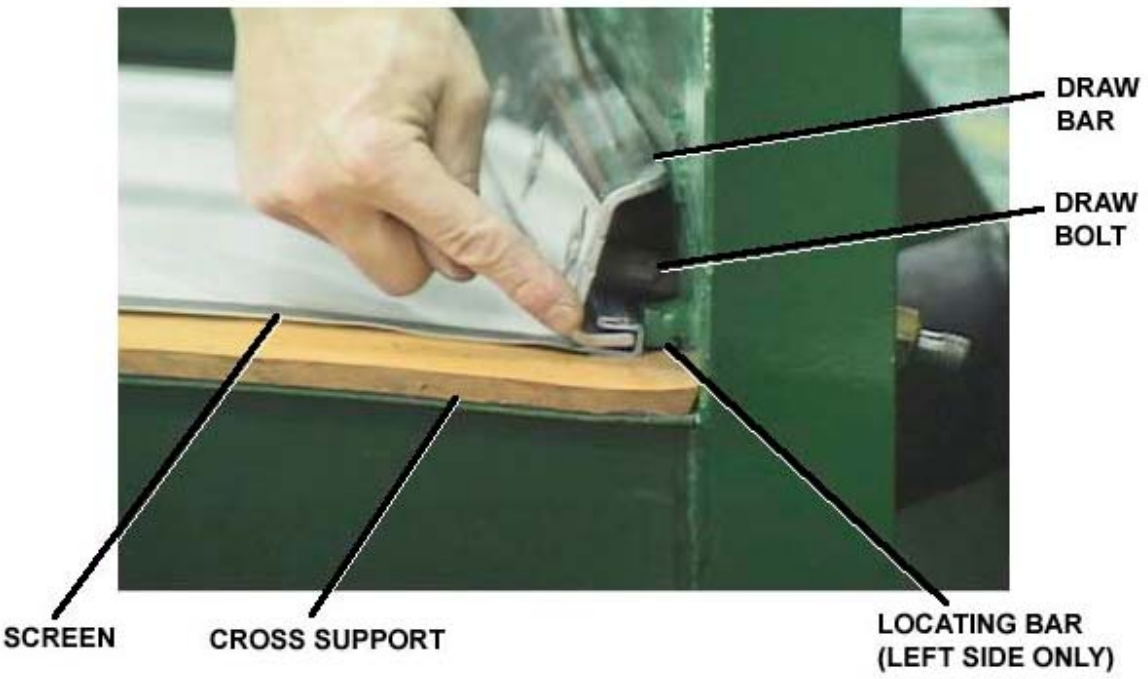


Figure 6002-4 Screen Panel Installation

Installation Procedure

This procedure should be used to install screen panels for the first time on a new machine or install replacement panels on a machine already in service. If replacing screen panels, first remove existing panels using the preceding paragraph.

Correct installation of screen panels ensures optimal screen performance and long life. The left side is tightened first, followed by the right side. To install screen panels, proceed as follows:

1. Before placing screen panel in the screen frame, verify that all components of the screen frame bed are in good condition (refer to Section 5 - Maintenance). Replace worn or damaged components.
2. Position screen panel on bed of screen frame, and slide panel into contact with locating bars on left side of screen bed (Figure 6002-5).
3. Verify that heads of draw bolts are oriented in the vertical (unlocked) position (Figure 6002-6).
4. Position draw bar to engage hook strip along top outer edge of screen panel, and pass heads of draw bolts through slots in draw bar. Rotate heads of draw bolts 90 degrees to horizontal (locked) position.

Note! In the following steps the tightening sequence must be followed. Incorrect tightening sequence will cause screen to flutter, resulting in premature wear.

5. Using open-end side of wrench (Figure 6002-2) rotate left side Ramp-Lok® draw bolt assemblies clockwise from exterior of screen frame. Tighten draw bolts in the sequence shown in Figure 6002-5).
6. Repeat tightening sequence on right side of screen frame.
7. After tightening all Ramp-Lok® draw bolts, manually verify that screen panel is firmly in contact with bed of screen frame. Adjust as required.

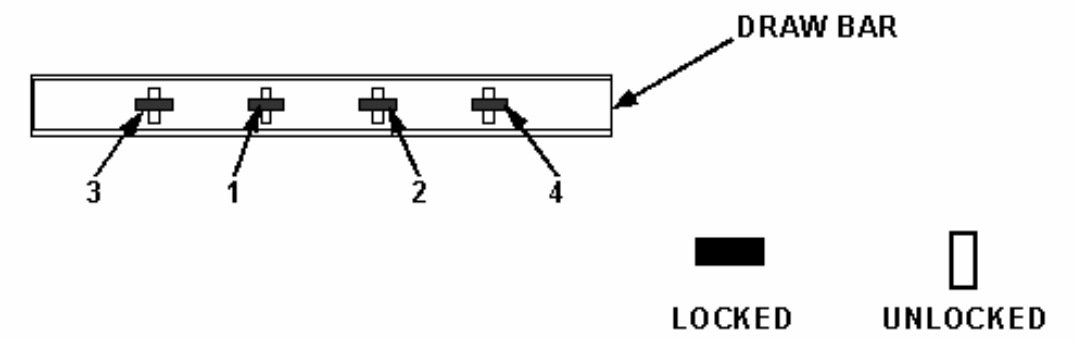


Figure 6002-5 Ramp-Lok® Tightening Sequence

SCREEN PANEL REMOVAL

Preparation

Before beginning removal of screen, shut down, lock out, and tag out machine in accordance with Section 4 - Operation.

Removal Procedure

This procedure should be used to remove screen panel(s) requiring replacement. Install new screen panel(s) in accordance with Installation, which precedes this procedure:

1. Turn off feed slurry to feeder, desander, or desilter.
2. Using a water hose, rinse residue from screen panel surfaces.
3. Confirm that machine is shut down, locked out, and tagged out.
4. Using open-end side of wrench (Figure 6002-2), rotate each Ramp-Lok® tensioning nut (Figure 6002-1) on right side of screen panel counterclockwise approximately 180 degrees. Loosen draw bolts in the sequence shown in Figure 6002-6.
3. From inside of screen frame rotate heads of draw bolts 90 degrees to the unlocked (vertical) position, and remove draw bar.
4. Remove screen panel(s) from bed of screen frame.
5. Following screen panel removal, inspect condition of side supports, cross supports, and channel protectors. Replace worn or damaged components as required.
6. Rinse any remaining residue or debris from side and cross supports and from channel protectors before installing replacement screen panel(s).

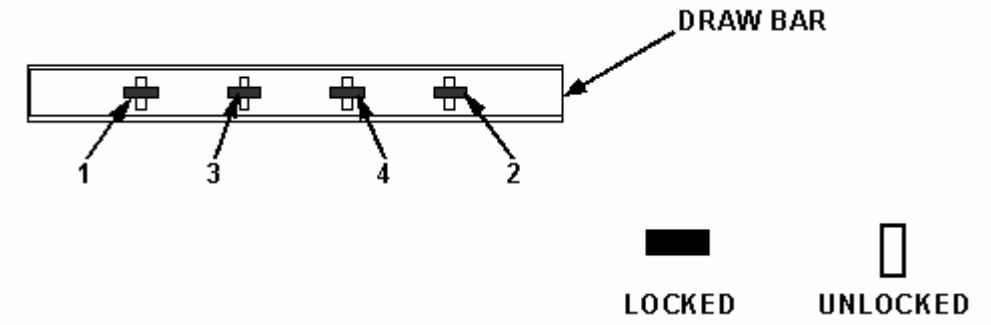


Figure 6002-6 Ramp-Lok® Loosening Sequence

REPLACEMENT PARTS

Ramp-Lok® Draw Bolt Assemblies draw bolt assemblies are available in several different material configurations to accommodate a wide variety of fluid applications. Refer to applicable drawings in Section 11 to determine the components of the draw bolt assemblies installed on your machine.

SCREEN PANEL REPLACEMENT

RAPID CHANGE DRAW BOLT ASSEMBLY

GENERAL

This procedure should be used to replace damaged or worn screen panel(s), as well as for initial panel installation. Screen panels and screen bed components should be inspected in accordance with Section 5 - Maintenance. They should be replaced when wear is evident and the screen has become ineffective.

REMOVAL

1. Shut down, lock out, and tag out machine in accordance with Section 4 - Operation.
2. Using ratchet or T-handle wrench, loosen nuts on all draw bolts on right side of screen frame in the sequence shown in Figure 6200-1. Loosen each nut until fully disengaged from upper threads of draw bolt, with nut between the threaded areas of the bolt.

Note! Right and left sides of the equipment are determined by standing at the feed end and looking toward the discharge end.

3. Loosen all draw bolts on the left side of the screen frame in the same manner as described in step 2.
4. From inside of screen frame, rotate heads of the draw bolts 90 degrees to the unlocked (vertical) position and remove both draw bars. If this is an initial installation, remove and discard shipping pads from draw bars (Figure 6200-2).
3. Remove screen panel(s) from bed of screen frame.
4. Following removal of the screen panel, inspect condition of side supports, cross supports, and stringer protectors (refer to Section 5 - Maintenance). Replace worn or damaged components, as required, to ensure that screen bed will provide full and even support for the screen.
5. Thoroughly clean any remaining residue or debris from side and cross supports and from stringer protectors before installing replacement screen panel(s).

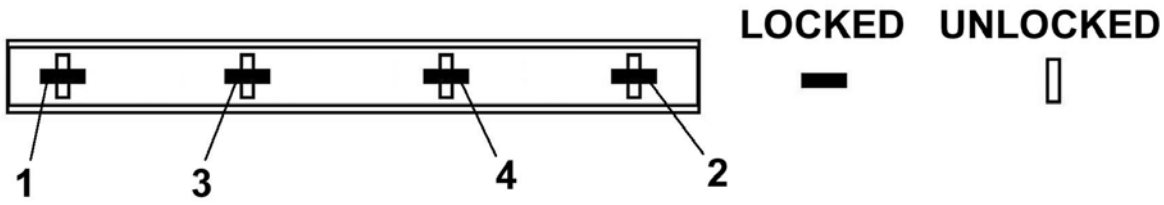


Figure 6200-1 Draw Bolt Loosening Sequence

REMOVAL (CONT'D)

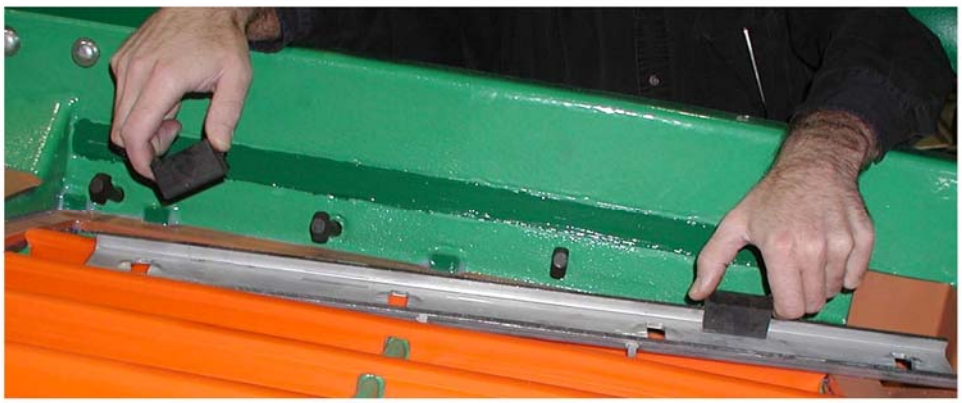


Figure 6200-2 Removing Shipping Pads From Draw Bar

INSTALLATION

Locating bars are provided along the left interior wall of the screen bed (Figure 6200-2) to ensure that screen panels are centered left to right on the screen bed. Draw bolts are then engaged and tightened in stages, going from left to right side and finishing with final tensioning on the right side.

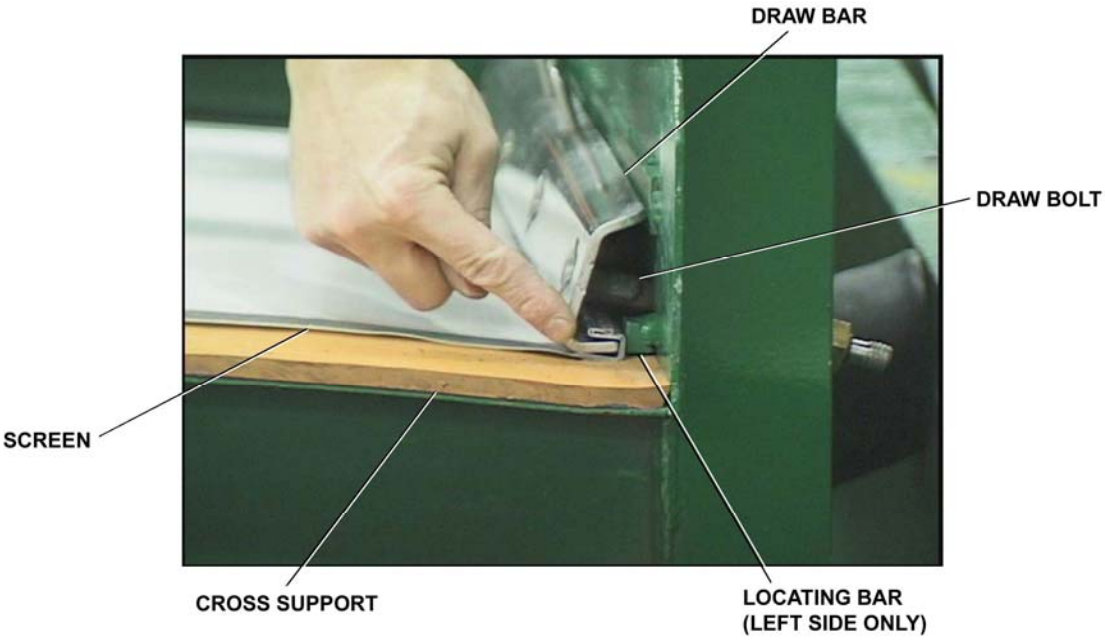
Note! Right and left sides of the equipment are determined by standing at the feed end and looking toward the discharge end.

Correct installation of screen panels optimizes screen performance and extends life. To install screen panels, proceed as follows:

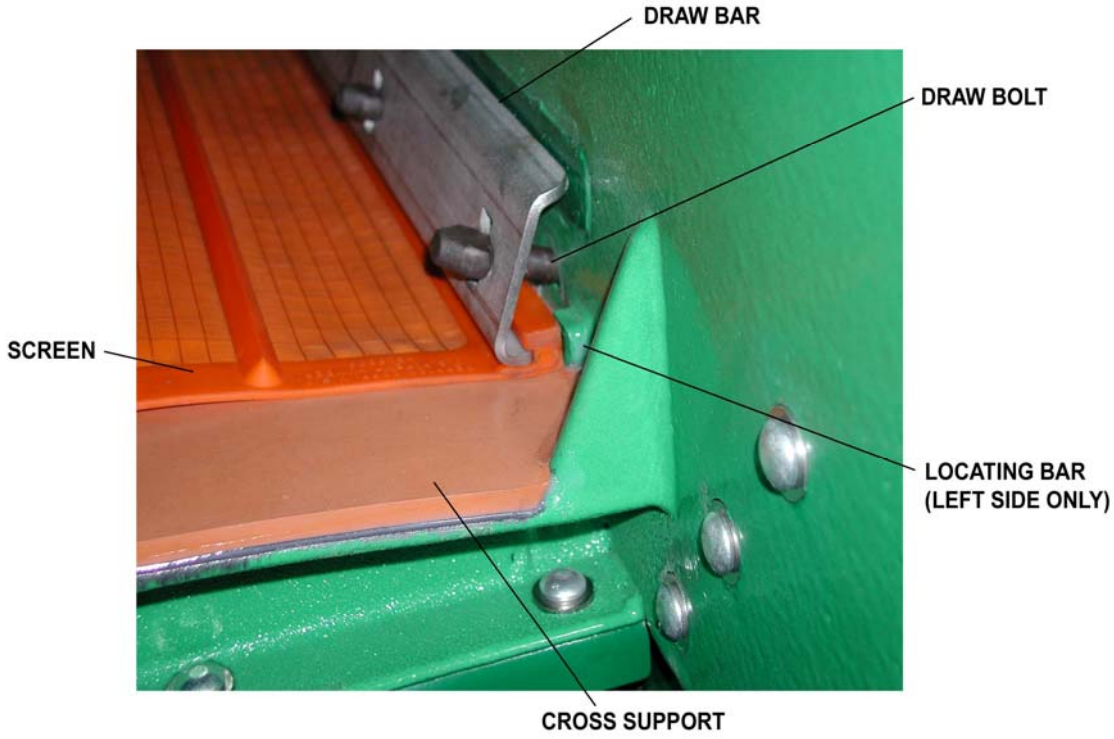
1. Before placing screen panel in the screen frame, verify that all components of the screen frame bed are in good condition (refer to Section 5 - Maintenance). Replace any worn or damaged components.
2. Place screen panel on bed of screen frame, slide panel into contact with locating bars on left side of screen bed (Figure 6200-3), and slide against shoulder of cross support at the feed end of the screen frame (Figure 6200-4).

Note! To ensure proper tensioning and prevent process material from passing beneath screen, the panel must contact the locating bars on the left side of the screen frame and be pulled rearward against the step on the cross support.

3. Verify that all draw bolts are present and in satisfactory condition. Wire brush threads, if necessary, to remove accumulated residue. Replace any distorted, severely corroded, or otherwise damaged draw bolts as described in *DER06001*.
4. Check that draw bars are straight. Remove any accumulated process material from draw bar edge that engages screen panel hook strip.



Wire Screen Panel

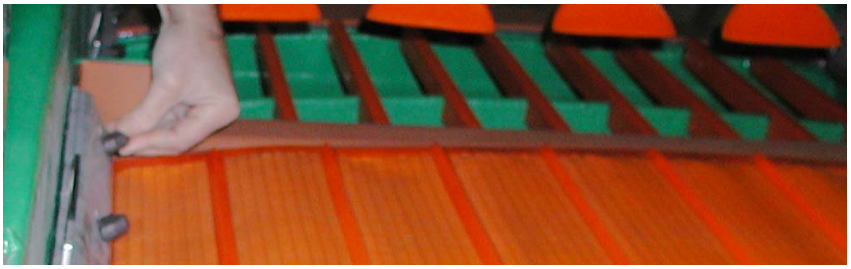


Urethane Screen Panel

Figure 6200-3 Draw Bar Engagement With Hook Strip

INSTALLATION (CONT'D)

Press screen panel against shoulder of cross support at feed end.



Rotate draw bolts to horizontal (locked) position.

Lift draw bar slightly to ensure that screen panel is above side support.

Figure 6200-4 Screen Positioning

5. Confirm that heads of left side draw bolts are oriented in the vertical (unlocked) position.
6. Position draw bar on left side of screen frame to engage hook strip along top outer edge of screen panel, and pass heads of draw bolts through slots in draw bar. Rotate heads of draw bolts 90 degrees to horizontal (locked) position.
7. Lift draw bar slightly to ensure that screen panel is above side support (Figure 6200-7), and hand-tighten left side draw bolt nuts.
8. Repeat steps 5 through 7 on right side of screen frame.

Note! In the following steps the tightening sequence must be followed. Incorrect tightening sequence will cause screen to flutter, resulting in premature wear.

9. Using ratchet or T-handle wrench, tighten the left side draw bolts from outside screen frame in the sequence shown in Figure 6200-5.
10. Repeat tightening sequence on right side of screen frame.

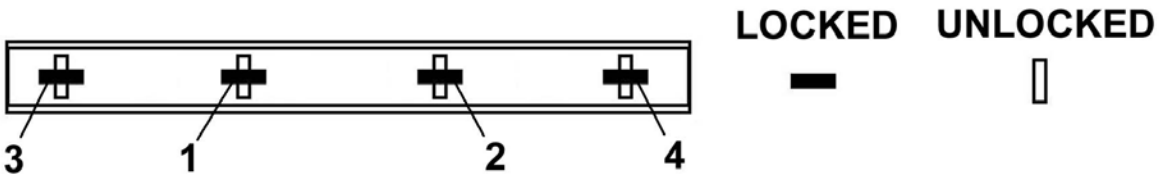
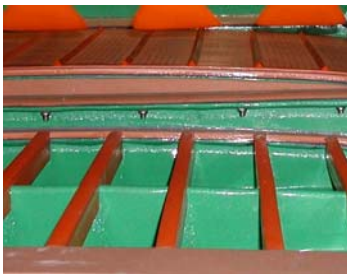


Figure 6200-5 Draw Bolt Tightening Sequence

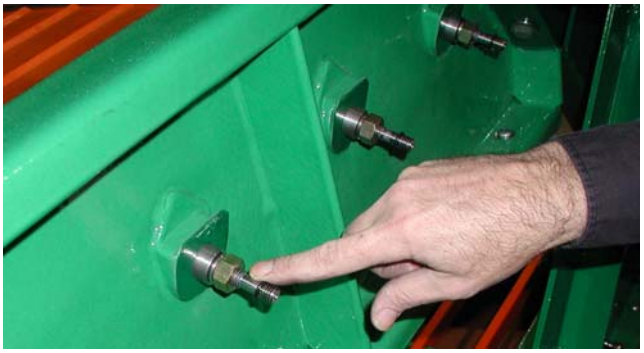
11. After tightening all draw bolts, manually verify that screen panel is correctly positioned, properly tensioned, firmly in contact with screen frame bed, and that ribs are straight and aligned with stringer protectors of adjacent screen frame (Figure 6200-6). When properly tensioned, exposed threads on all draw bolts should be about equal (usually about three threads), as shown. Re-adjust panel positioning and re-tension as required.

WARNING! INCORRECT TIGHTENING WILL CAUSE IMPROPER SCREEN PANEL TENSIONING, RESULTING IN PREMATURE WEAR. BE SURE THAT CORRECT TIGHTENING SEQUENCE IS FOLLOWED.

Check panel tension by lifting at edge.



Check for straight alignment of panel ribs with stringer protectors.



Check for consistent number of exposed threads on all draw bolts.

Figure 6200-6 Confirming Proper Screen Panel Installation

10” HYDROCYCLONE DESANDER

DESCRIPTION

The 10” hydrocyclone desander is used to separate solids in the 40- to 100-micron range. It incorporates a precise combination of proportions, angles, ratios, and materials to optimize separation of solids from the feed material. The desander discharge may be fed to a desilter for finer particle separation or directly to the screening equipment. For optimum performance, the hydrocyclone requires a steady inlet feed pressure (feed head) and steady feed rate (GPM). The feed head may be produced by a gravity-feed system or a centrifugal pump. Each 10” hydrocyclone requires a nominal inlet flow rate of 500 GPM at 75 feet of head. To accommodate high flow rate requirements, up to three hydrocyclones can be grouped together with common feed and discharge manifolds (Figure 9000-1).

Machine-Mounted Desander

Stand Alone Desander

Figure 9000-1 Hydrocyclone Configurations

The hydrocyclone body consists of three main components: Upper, middle, and lower sections (Figure 9000-2). The soft orifice bushing (apex) is positioned in the tapered hole inside the orifice nut, which is threaded onto the lower section. The diameter of the apex orifice controls the spray pattern produced during operation. Tightening the orifice nut (turning clockwise) compresses the apex, thereby reducing the orifice diameter. Loosening the orifice nut (turning counterclockwise) releases compression, allowing the apex to return to its normal size. The hydrocyclone spray pattern may be adjusted during operation by varying the opening of the apex.

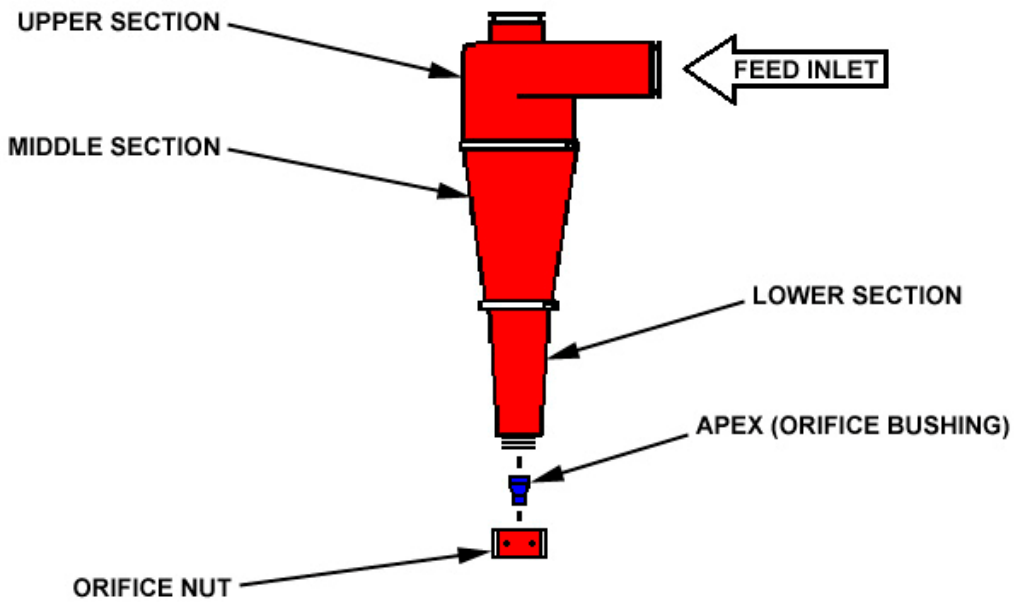


Figure 9000-2 10” Hydrocyclone Components

THEORY OF OPERATION

Optimal performance of hydrocyclones requires a proper balance of feed head, feed rate (GPM), and apex opening. Improper balance of any of these variables can adversely affect performance.

Two operational scenarios are presented in the following paragraphs. The first scenario describes normal operating conditions in which all variables are correctly balanced. The second scenario shows a condition referred to as “roping” which results from an improper balance of the variables.

Normal Operation

In normal operation, feed slurry is introduced tangentially into the interior of the hydrocyclone (Figure 9000-3) at high velocity causing a whirlpool effect to occur inside the cone. The swirling motion of the slurry drives the larger, denser particles outward against the cone wall while the smaller, lighter particles move toward the center of the cone.

The low-pressure vortex at the center of the cone pulls in the excess liquid and small particles, as well as drawing in air through the apex at the lower discharge end of the cone. The high-velocity air stream aids the upward flow of liquid and small particles toward the cone’s upper discharge, while the spiraling stream of liquid and larger particles flows downward along the cone wall toward the lower discharge. Large solids leaving the lower discharge may be further processed for removal of remaining small particles and liquid, while the upper discharge from the hydrocyclone is often routed to desilters having 4-inch hydrocyclones for removal of finer particles.

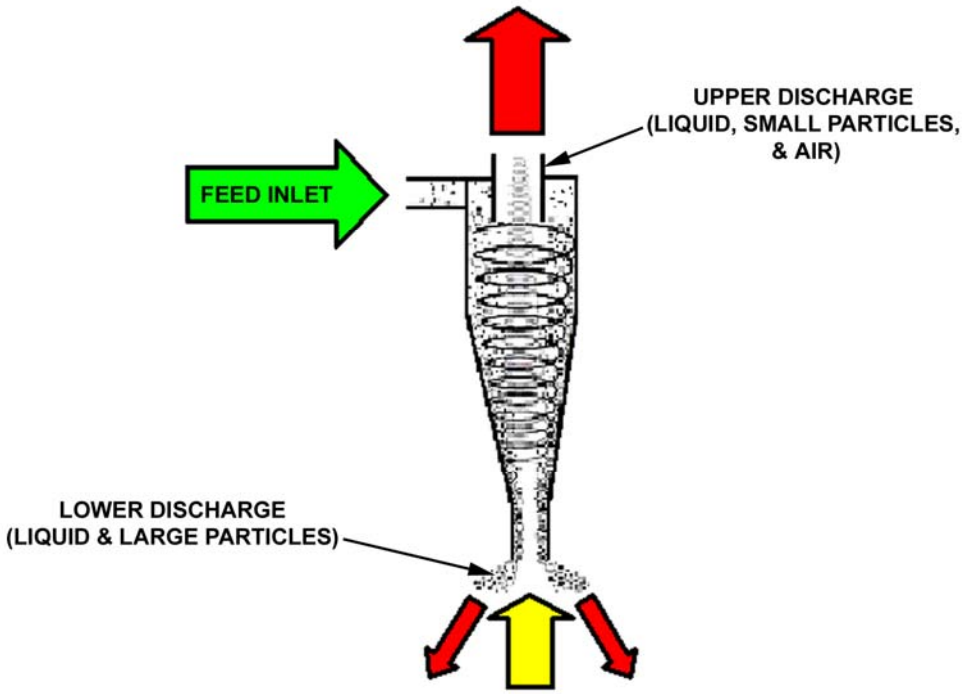


Figure 9000-3 Normal Hydrocyclone Operation

"Roping"

"Roping" is a term applied to a solid discharge stream (Figure 9000-4) flowing from the hydrocyclone. This undesirable discharge pattern results from overloading the apex opening with solids, thereby preventing air from entering the cone. Due to the apex blockage, feed material entering the cone can no longer move downward and, therefore, flows directly out the upper discharge at the top of the cone. In this abnormal operating mode, flow from the upper discharge contains large particles that would normally flow out the lower discharge at the bottom of the cone. If permitted to continue for a lengthy period of time, the blockage becomes difficult to clear and the risk of internal damage to the cone increases.

"Roping" discharge results in reduced solids removal capability, increased probability of wear to hydrocyclone components, and potential damage to the feed pump.

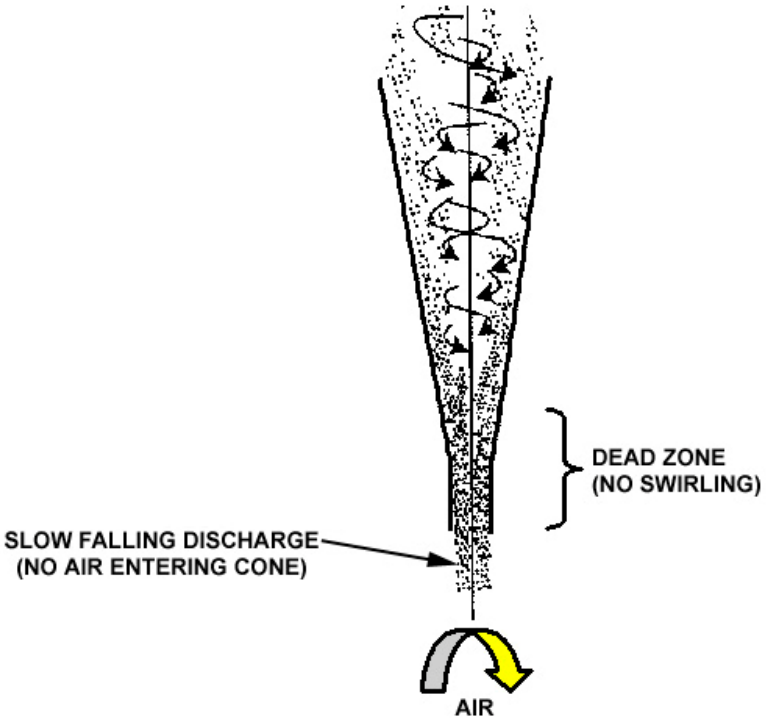


Figure 9000-4 Abnormal Hydrocyclone Operation - “Roping” Discharge

ADJUSTMENT

Hydrocyclones must be properly adjusted to operate efficiently. Tightening the orifice nut (turning clockwise) compresses the apex and thereby reduces its orifice diameter. Loosening the orifice nut (turning counterclockwise) releases the compression, allowing the apex to return to its normal size. The following paragraphs describe the spray pattern adjustments to achieve optimal performance.

Spray Patterns

The spray pattern varies in response to the feed head (inlet pressure), feed rate, and hydrocyclone apex opening. To maximize overall desander efficiency, the spray pattern of each cone must be balanced for optimal performance. This is done by observing the lower discharge pattern and then adjusting the apex opening to achieve the correct discharge angle (Figure 9000-5) for the prevailing feed rate and inlet pressure.

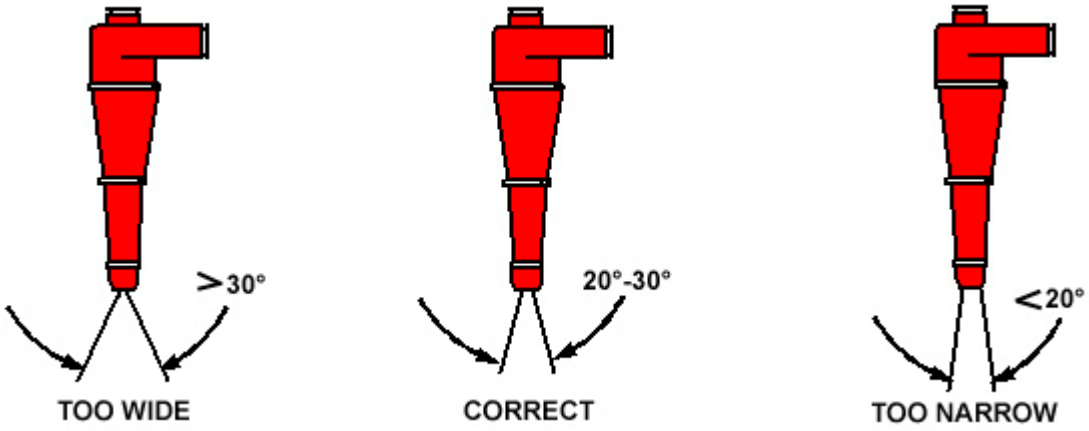


Figure 9000-5 Spray Patterns – 10" Hydrocyclones

Spray Pattern Versus Performance

The three spray patterns shown in Figure 9000-5 are interpreted as follows:

TOO WIDE - Spray angle greater than 30° with a hollow center. In normal operation, this pattern is undesirable. This spray pattern indicates that the exit diameter of the apex is too large, and an excessive amount of liquid discharges along with the solids flowing from the bottom of the cone.

Correct this condition by tightening orifice nut (turning clockwise) until desired spray profile is achieved.

CORRECT - Spray angle in the range of 20° to 30° with a hollow center. In normal operation, this pattern is desirable.

No adjustment required.

TOO NARROW - Spray angle less than 20° with a hollow center. In normal operation, this pattern is undesirable. This spray pattern indicates exit diameter of the apex is too small, the solids discharge is too dry, and excessive solids are being discharged with the liquid from the upper discharge.

Correct this condition by loosening orifice nut (turning counterclockwise) until desired spray profile is achieved.

RECOMMENDED OPERATING PRESSURES

Recommended operating pressures for the 10” hydrocyclone desander are listed in the following table.

Recommended Desander Operating Pressures (75’ Head Inlet Pressure)		
Mud Weight (PPG)	**Specific Gravity**	**Operating Pressure (PSI)**
8.33	1.00	32
9.00	1.08	35
10.00	1.20	39
11.00	1.32	43
12.00	1.44	47
13.00	1.56	51
14.00	1.68	54
15.00	1.80	58
16.00	1.92	62
17.00	2.04	66

Where:

PPG = Pounds per gallon

Specific Gravity = $\left(\frac{Mud\quad Weight}{8.33}\right)$

1 PSI = 2.309 Feet of Head

Operating Pressure = $\left(\frac{Feet\quad of\quad Head}{2.309}\right)\left(\frac{Mud\quad Weight}{8.33}\right)$

REPLACEMENT PARTS

Replacement parts for the 10” hydrocyclone desander are shown and listed on the appropriate engineering drawings. Refer to the Reference Drawings section in this manual for parts information.

10” DESANDER
MACHINE MOUNTED

DESCRIPTION

The desander assembly (Figure 9100-1) consists of up to three 10” hydrocyclones connected to common feed and discharge manifolds. The desander removes solids in the 40- to 100-micron range from the feed material. The desander discharge may be fed to a desilter for finer particle separation or directly to the screening equipment. Optimum performance of the hydrocyclones requires a steady feed pressure (feed head) and steady feed rate (GPM). Feed pressure may be produced by a gravity-feed system or a centrifugal pump within the drilling fluid recovery system. Each 10” hydrocyclone requires a nominal flow rate of 500 GPM at a 75’ head.

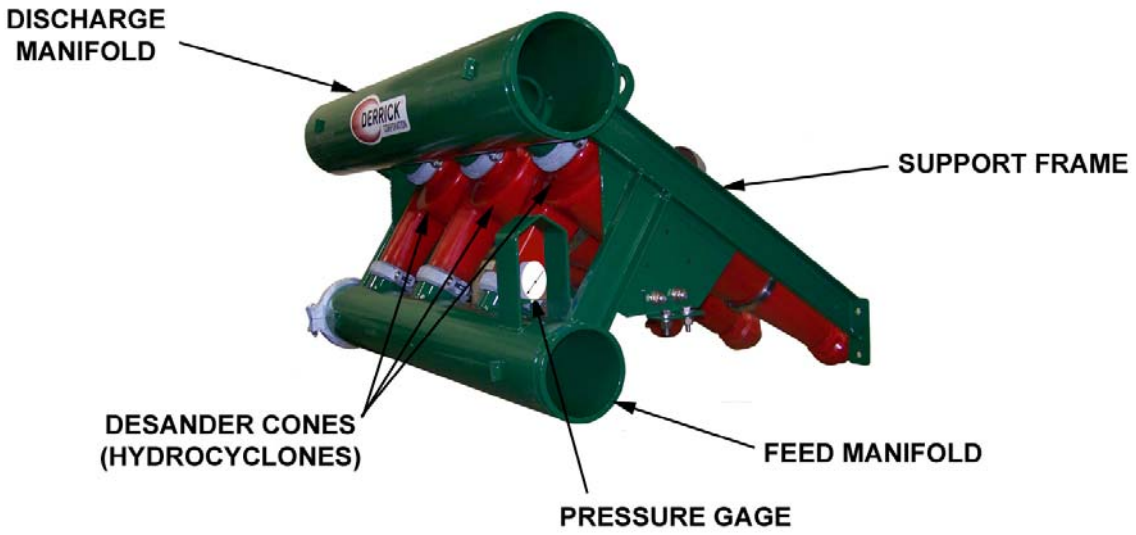


Figure 9100-1 Machine-Mounted Desander Assembly

THEORY OF OPERATION

Optimal performance of hydrocyclones requires a proper balance of feed pressure (feed head), feed rate (GPM), and apex opening. Improper balance of these variables can adversely affect performance. A pressure gage on the unit allows feed pressure monitoring.

This document describes the operation of a group of assembled hydrocyclone desanders sharing common feed and discharge manifolds. Refer to *DER09000* for hydrocyclone operating principles and adjustment procedures.

THEORY OF OPERATION (CONT’D)

The desander accepts up to three 10” polyurethane hydrocyclones (cones). The feed inlets of all three cones are connected to a common feed manifold, and the overflow outlet of each cone is connected to a common discharge manifold. Feed slurry is introduced into the feed manifold and is equally distributed to the inlets of the cones (Figure 9100-2). Extracted solids (underflow) are discharged from the lower end of the cones into a collection pan. Liquid discharge (overflow) exits the top of the cones and enters the discharge manifold. Underflow from the cones is routed to a screen-type cleaning machine, i.e., Derrick FLC 2000, or to a centrifuge for removing additional solids. Overflow from cones is routed to a desilter or similar equipment to remove smaller particles.

The Victaulic® cap supplied with the unit may be installed on either end of the feed manifold. This allows the feed slurry to be introduced from either the left or the right side of the unit. One end of the discharge manifold is permanently sealed. Discharge is from the open end only.

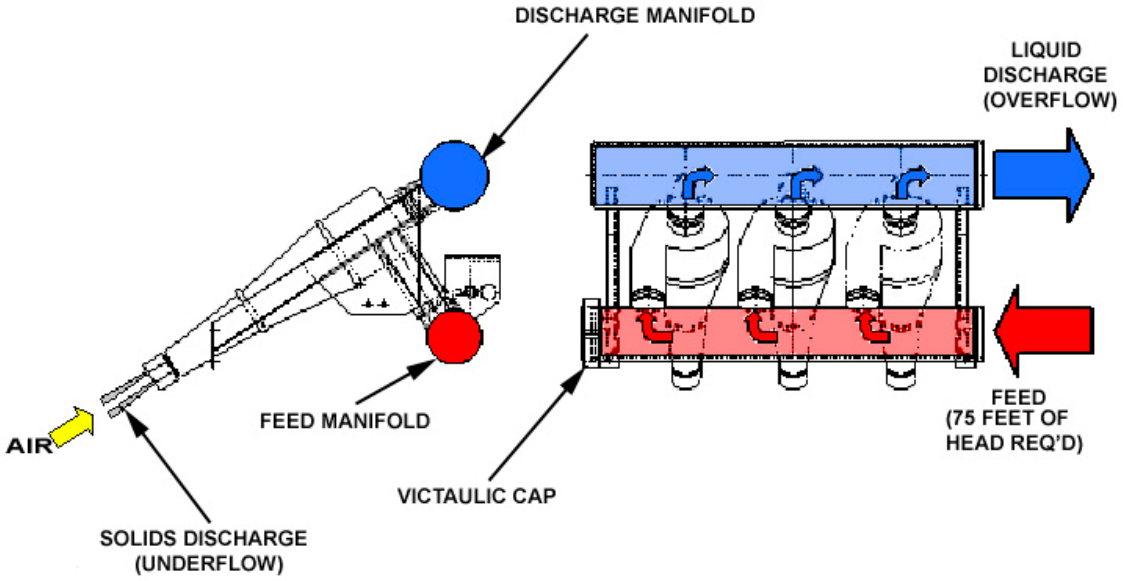
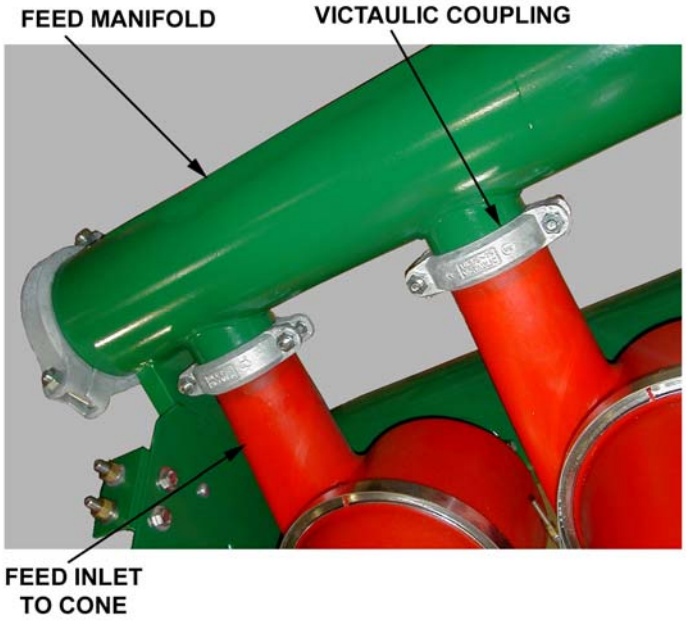


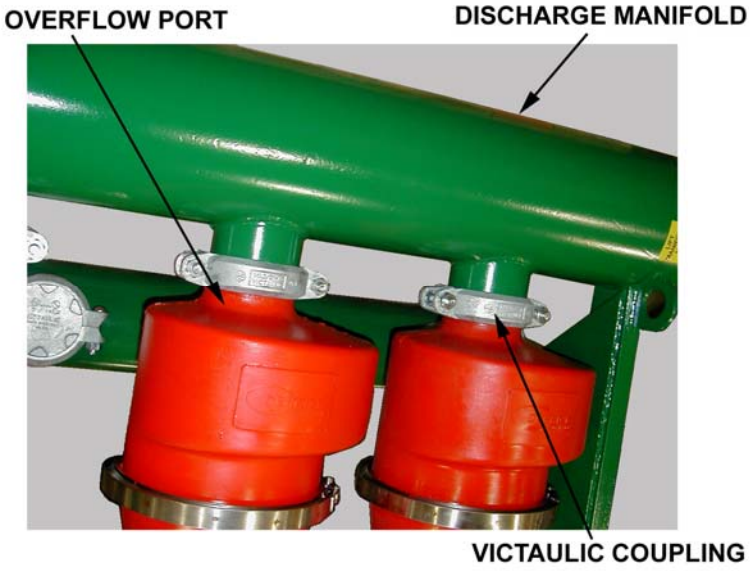
Figure 9100-2 Desander Operation

HYDROCYCLONE REMOVAL AND INSTALLATION

Dedicated shutoff valves are not provided for the 10” desander cones. Consequently, individual desander cones **CANNOT** be removed from the desander while the unit is operating. Desander cones are attached to the desander assembly with two 5” Victaulic® couplings (Figure 9100-3). One coupling secures the feed inlet of the cone to the feed manifold, and the other clamp secures the overflow port of the cone to the discharge manifold.



Desander Cone to Feed Manifold



Desander Cone to Discharge Manifold

Figure 9100-3 Desander Cone Connections

HYDROCYCLONE REMOVAL AND INSTALLATION (CONT’D)

WARNING! DISCONTINUE FLOW OF FEED SLURRY TO DESANDER, AND RELIEVE PRESSURE FROM FEED LINE BEFORE REMOVING OR INSTALLING DESANDER CONE(S). DO NOT ATTEMPT TO REMOVE OR INSTALL DESANDER CONE(S) WHILE MACHINE IS OPERATING.

WARNING! DESANDER CONES WEIGH APROXIMATELY 100 LBS (45 KGS) EACH (NET WEIGHT). PROPERLY SUPPORT CONE BEFORE BEGINNING REMOVAL PROCEDURE.

Removal

1. Shut down feed to desander, and relieve pressure to feed manifold.
2. Support desander cone to be removed.
3. Using a suitable wrench, loosen and remove Victaulic® couplings that connect desander cone to feed and discharge manifolds.
4. Carefully lift and remove desander cone from desander.
5. If desander will be returned to service before replacing the removed cone, cap the feed and discharge manifold ports for the removed cone using 5” Victaulic® caps (Derrick p/n VIC-5-60). Secure caps using Victaulic® couplings previously attaching cone to manifolds.

Note! Be sure to cap feed and discharge ports if desander is to be returned to service before replacing cone removed in preceding steps.

Installation

1. Shut down feed to desander, and relieve pressure to feed manifold.
2. If Victaulic® caps were installed, remove caps from ports on feed and discharge manifolds.
3. Install coupling gaskets on feed and discharge manifold ports.
4. Support desander cone, and align inlet and outlet ports of cone with corresponding ports on the feed and discharge manifolds.
5. Center coupling gasket between the coupling grooves in both the cone and manifold pipe. Place Victaulic® coupling halves on joint being sure that gasket remains centered on cone and manifold pipe grooves.

HYDROCYCLONE ADJUSTMENT

Refer to *DER09000* for hydrocyclone spray pattern adjustment procedure.

RECOMMENDED OPERATING PRESSURES

Recommended operating pressures for the 10" hydrocyclone desander are listed in the following table.

Recommended Desander Operating Pressures (75' Head Inlet Pressure)		
Mud Weight (PPG)	**Specific Gravity**	**Operating Pressure (PSI)**
8.33	1.00	32
9.00	1.08	35
10.00	1.20	39
11.00	1.32	43
12.00	1.44	47
13.00	1.56	51
14.00	1.68	54
15.00	1.80	58
16.00	1.92	62
17.00	2.04	66

Where:

PPG = Pounds per gallon

Specific Gravity = $\left(\frac{Mud\quad Weight}{8.33}\right)$

1 PSI = 2.309 Feet of Head

Operating Pressure = $\left(\frac{Feet\quad of\quad Head}{2.309}\right)\left(\frac{Mud\quad Weight}{8.33}\right)$

NOMINAL FLOW RATES

Flow rates may vary depending on slurry weight, particle sizes, and cone adjustment. The following nominal flow rates are based on 500 GPM per hydrocyclone at 75 feet of head inlet pressure:

Number of Hydrocyclones	**3**	**2**	**1**
Nominal Flow Rate (GPM)	1500	1000	500

REPLACEMENT PARTS

Replacement parts for the 10” hydrocyclone desander are shown and listed on the appropriate engineering drawings. Refer to the Reference Drawings section in this manual for parts information.

4” HYDROCYCLONE

DESCRIPTION

The Derrick 4” hydrocyclone incorporates a precise combination of proportions, angles, ratios, and materials to optimize separation of solids. The 4” hydrocyclone removes 10 to 74 micron solids from drilling fluid (mud). When larger solids (40 to 100 microns) are expected in the drilling fluid, it should first be processed through a desander or similar equipment to remove oversize particles. Optimum performance of the hydrocyclone requires a steady feed pressure (feed head) and steady feed rate (GPM). Feed pressure may be produced by a gravity-feed system or a centrifugal pump in the drilling fluid recovery system. Each 4” hydrocyclone requires a nominal flow rate of 80 GPM at a 75’ head inlet pressure. To accommodate the high flow rate requirements of the drilling industry, up to 20 hydrocyclones can be grouped together with common feed and discharge manifolds (Figure 10000-1) in either round or in-line configurations.

Round Desilter

In-Line Desilter

Figure 10000-1 Hydrocyclone Configurations

The hydrocyclone body is the main component of the 4” hydrocyclone (Figure 10000-2). A cone tip is threaded into the bottom of the body. The soft apex is positioned in the tapered hole inside the triangular nut, which is threaded onto the cone tip. Tightening the triangular nut (turning clockwise) compresses the apex, thereby reducing the diameter of its opening. Loosening the triangular nut (turning counterclockwise) releases compression, allowing the apex to return to its normal size. By varying the opening of the apex the hydrocyclone spray pattern may be adjusted during operation.

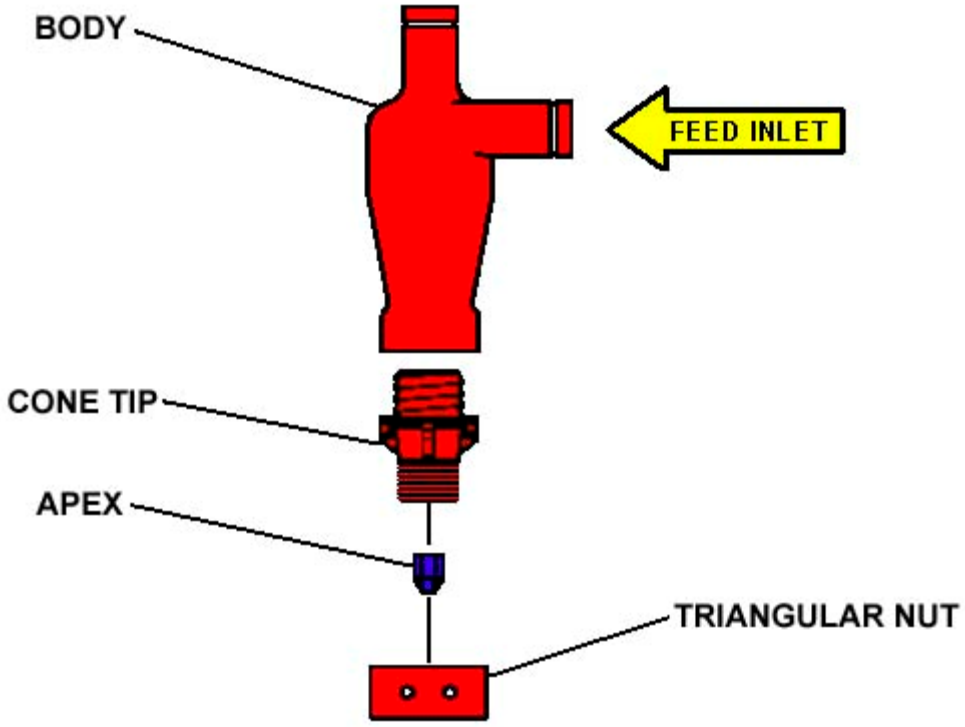


Figure 10000-2 Hydrocyclone Components

THEORY OF OPERATION

Optimal performance of hydrocyclones requires a proper balance of feed head (inlet pressure), feed rate (GPM) and apex opening. Improper balance of any of these variables can adversely affect performance.

Two operational scenarios are presented in the following paragraphs. The first scenario describes normal operating conditions in which all variables are correctly balanced. The second scenario shows a condition referred to as "roping" which results from an improper balance of the variables.

Normal Operation

In normal operation, feed slurry is introduced tangentially into the interior of the hydrocyclone (Figure 10000-3) at high velocity causing a whirlpool effect to occur inside the cone. The swirling motion of the slurry drives the larger, denser particles outward against the cone wall while the smaller, lighter particles move toward the center of the cone.

The low-pressure vortex at the center of the cone pulls in the excess liquid and small particles, as well as drawing in air through the apex at the lower discharge end of the cone. The high-velocity air stream aids the upward flow of liquid and small particles toward the cone's upper discharge, while the spiraling stream of liquid and larger particles flows downward along the cone wall toward the lower discharge. Large solids leaving the lower discharge may be further processed for removal of remaining small particles and liquid, while the upper discharge from the hydrocyclone is often routed to a centrifuge for additional solids removal.

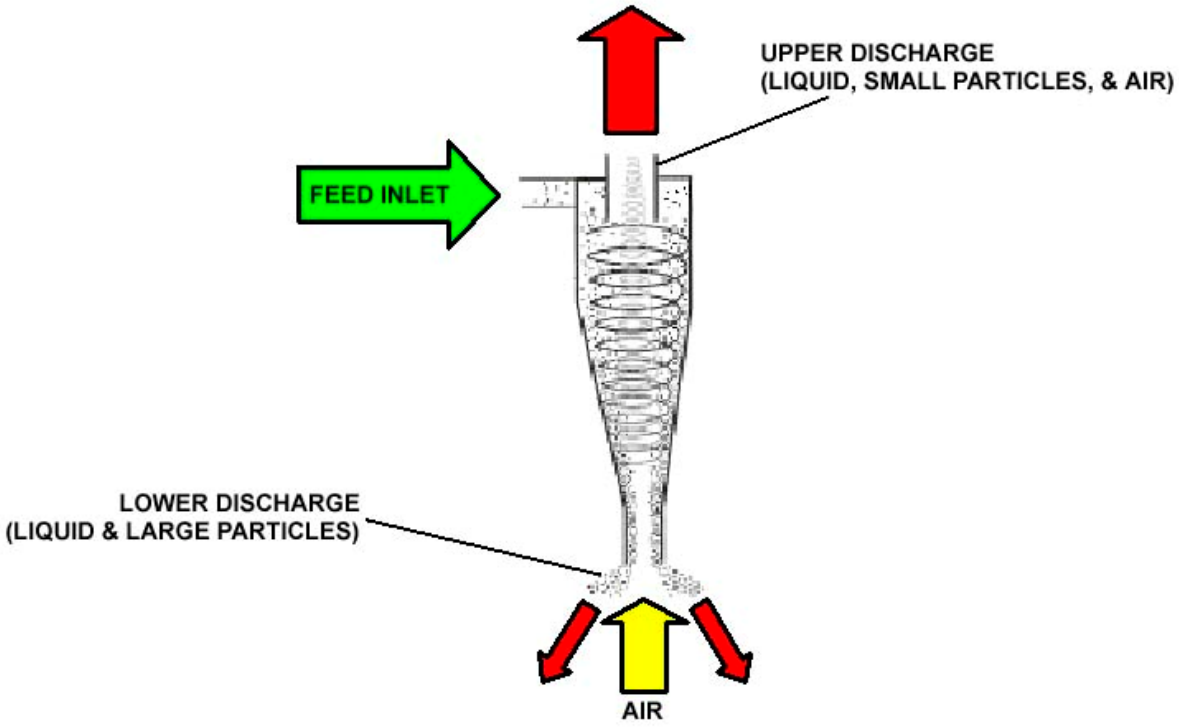


Figure 10000-3 Normal Hydrocyclone Operation

"Roping"

"Roping" is a term applied to a solid discharge stream (Figure 10000-4) flowing from the hydrocyclones. This undesirable discharge pattern results from overloading the apex opening with solids, thereby preventing air from entering the cone. Due to the apex blockage, feed material entering the cone can no longer move downward and, therefore, flows directly out the upper discharge at the top of the cone. In this abnormal operating mode, flow from the upper discharge contains large particles that would normally flow out the lower discharge at the bottom of the cone. If permitted to continue for a lengthy period of time, the blockage becomes difficult to clear and the risk of internal damage to the cone increases.

"Roping" discharge results in reduced solids removal capability, increased probability of wear to hydrocyclone components, and potential damage to the feed pump.

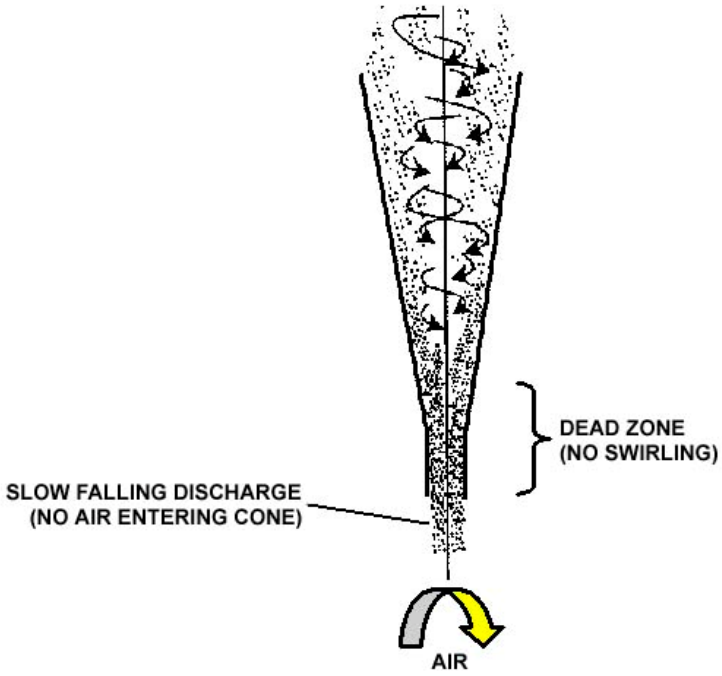


Figure 10000-4 Abnormal Hydrocyclone Operation - "Roping" Discharge

ADJUSTMENT

Hydrocyclones must be properly adjusted to operate efficiently. Tightening the orifice nut (turning clockwise) compresses the apex and thereby reduces its orifice diameter. Loosening the orifice nut (turning counterclockwise) releases the compression, allowing the apex to return to its normal size. The following paragraphs describe spray pattern adjustments to achieve optimal performance.

Spray Patterns

The spray pattern varies in response to the feed head (inlet pressure), feed rate, and hydrocyclone apex opening. To maximize overall desilter efficiency, the spray pattern of each cone must be balanced for optimal performance. This is done by observing the lower discharge pattern and then adjusting the apex opening to achieve the correct discharge angle (Figure 10000-5) for the prevailing feed rate and inlet pressure.

Spray Patterns (Cont'd)

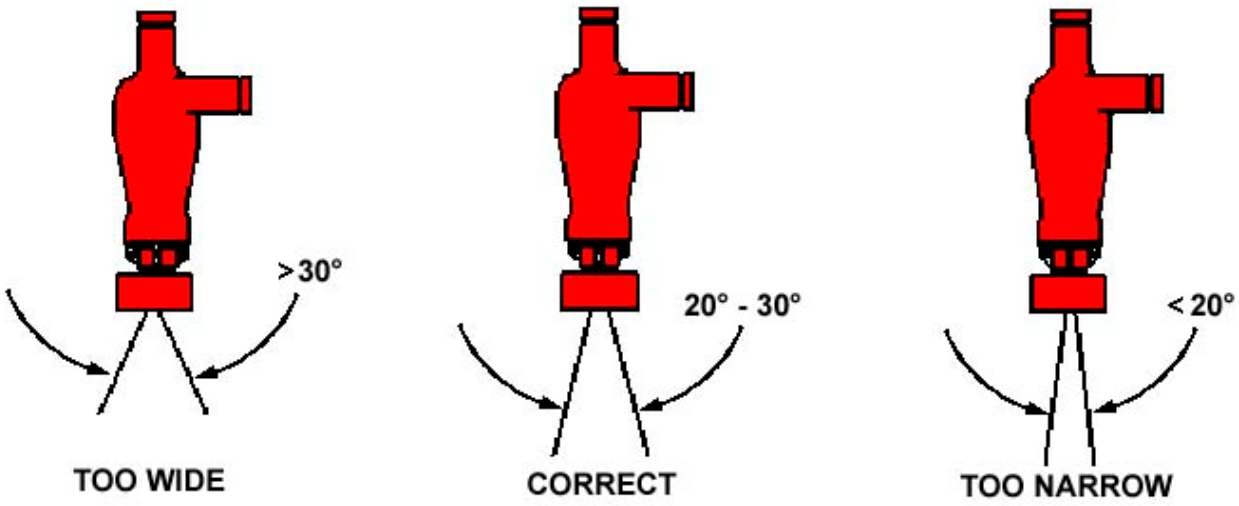


Figure 10000-5 4" Hydrocyclone Spray Patterns

Spray Pattern Versus Performance

The three spray patterns are interpreted as follows:

TOO WIDE - Spray angle greater than 30° with a hollow center. In normal operation, this pattern is undesirable. This spray pattern indicates that the exit diameter of the apex is too large, and an excessive amount of liquid discharges along with the solids flowing from the bottom of the cone.

Correct this condition by tightening triangular nut (turning clockwise) until desired spray profile is achieved.

CORRECT - Spray angle in the range of 20° to 30° with a hollow center. In normal operation, this pattern is desirable.

No adjustment required.

TOO NARROW - Spray angle less than 20° with a hollow center. In normal operation, this pattern is undesirable. This spray pattern indicates exit diameter of the apex is too small, the solids discharge is too dry, and an excessive solids are being discharged with the liquid from the upper discharge.

Correct this condition by loosening triangular nut (turning counterclockwise) until desired spray profile is achieved.

RECOMMENDED OPERATING PRESSURES

Recommended operating pressures for the 4" hydrocyclone are listed in the following table.

Recommended Desilter Operating Pressures (75' Head Inlet Pressure)		
Mud Weight (PPG)	**Specific Gravity**	**Operating Pressure (PSI)**
8.33	1.00	32
9.00	1.08	35
10.00	1.20	39
11.00	1.32	43
12.00	1.44	47
13.00	1.56	51
14.00	1.68	54
15.00	1.80	58
16.00	1.92	62
17.00	2.04	66

Where:

PPG = Pounds per gallon

Specific Gravity = $\left(\frac{Mud\quad Weight}{8.33}\right)$

1 PSI = 2.309 Feet of Head

Operating Pressure = $\left(\frac{Feet\quad of\quad Head}{2.309}\right)\left(\frac{Mud\quad Weight}{8.33}\right)$

REPLACEMENT PARTS

Replacement parts for the 4" hydrocyclone are shown and listed on the appropriate engineering drawings. Refer to the Reference Drawings section in this manual for parts information.

ROUND DESILTER

GENERAL DESCRIPTION

For efficient, high-volume processing of drilling fluids, multiple 4” hydrocyclones are mounted in a single desilter assembly. To accommodate high flow rate requirements, up to twenty 4” hydrocyclones (Figure 10100-1) can be grouped together with a common feed and discharge manifold. Desilters are available in circular and in-line designs, either mounted directly on the screening equipment or as standalone units. This section applies to both machine-mounted and standalone round desilters, which are identical except for mounting provisions.

The desilter removes solids in the 10- to 74-micron range from drilling fluid (mud). When larger solids (40 micron and larger) are expected, the drilling fluid should first be processed through a desander or similar equipment for removal of oversize particles. Optimum performance of the hydrocyclones requires a steady feed pressure (feed head) and steady feed rate (GPM). Feed pressure may be the produced by a gravity-feed system or a centrifugal pump within the drilling fluid recovery system. Each 4” hydrocyclone has a nominal flow rate of 80 GPM at a 75’ head.

Figure 10100-1 Typical Round Desilter

THEORY OF OPERATION

Optimal performance of hydrocyclones requires a proper balance of feed head (inlet pressure), feed rate (GPM) and apex opening. Improper balance of these variables can adversely affect performance. A pressure gage on the unit allows feed pressure monitoring.

This document describes the operation of a complete round desilter. Refer to *DER10000* for 4” hydrocyclone operating principles and adjustment procedures.

THEORY OF OPERATION (CONT'D)

The desilter consists of a round, dual-chamber cyclone cluster that accepts a maximum of twenty 4" polyurethane hydrocyclones (cones). Feed slurry is introduced into the top manifold of the cyclone cluster and is equally distributed to the inlet ports of the cones (Figure 10100-2). Liquid discharged from the cones is directed into the lower chamber of the desilter. A shut-off valve is provided for each cone to permit removal and inspection of each cone without interrupting operation of the desilter. The collection pan usually mounted below the desilter is either attached to a Flo-Line® cleaner or skid mounted and positioned adjacent to the cleaner to receive the solids removed by the cones. Discharge from the collection pan is often routed to a screen-type cleaning system, i.e., Derrick FLC 2000, or to a centrifuge for additional solids removal.

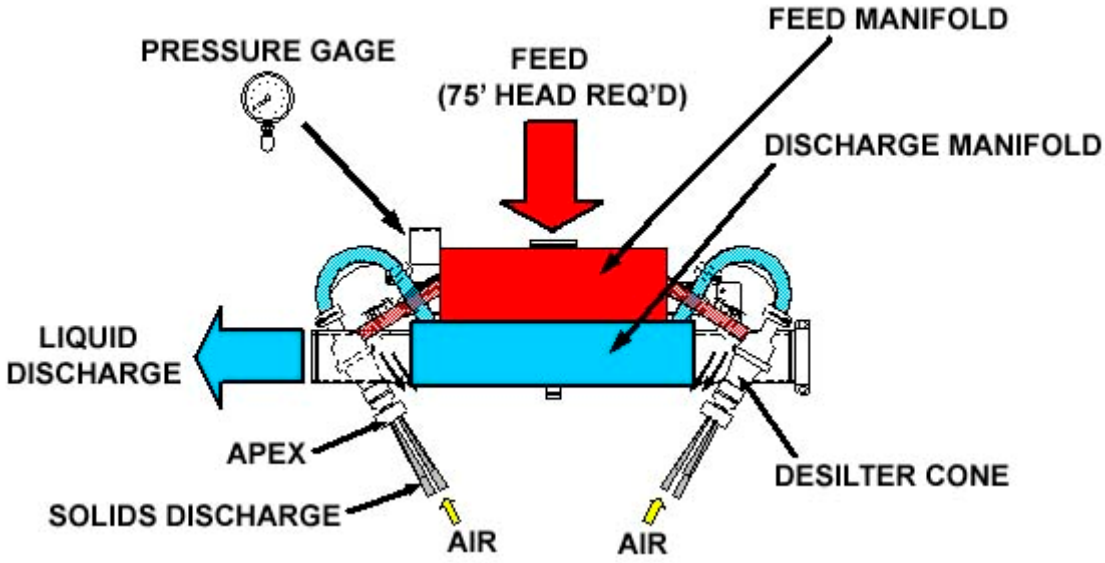


Figure 10100-2 Desilter Operation

CONE ARRANGEMENT

When multiple desilter cones are grouped together, the supply of feed material must be evenly distributed to each desilter cone. To ensure equal distribution, the incoming feed slurry is introduced into the feed (upper) manifold. The feed manifold has 20 outlet ports equally spaced around its circumference. Ten outlets are positioned on each side of the discharge pipe (Figure 10100-3) to maintain balance. When a round desilter is outfitted with a full complement of cones, all 20 positions are filled. When fewer than 20 cones are installed, equal numbers of cones must be installed on each side of the discharge pipe to maintain balance. Consequently, hydrocyclone desilters are supplied only with an even number (8, 10, 12, 16, etc.) of cones.

When permanently removing cones from the desilter, first eliminate positions closest to the discharge pipe and then extend outward from those positions, as necessary. To maintain balance, remove cones in pairs directly across the discharge pipe from each other (one from each side of the discharge pipe). For example, if cone “A” is removed, also remove cone “K.” If the desilter has a full complement of cones, the following removal sequence is suggested when removing cones:

A & K, J & T, B & L, I & S, C & M, H & R, etc.

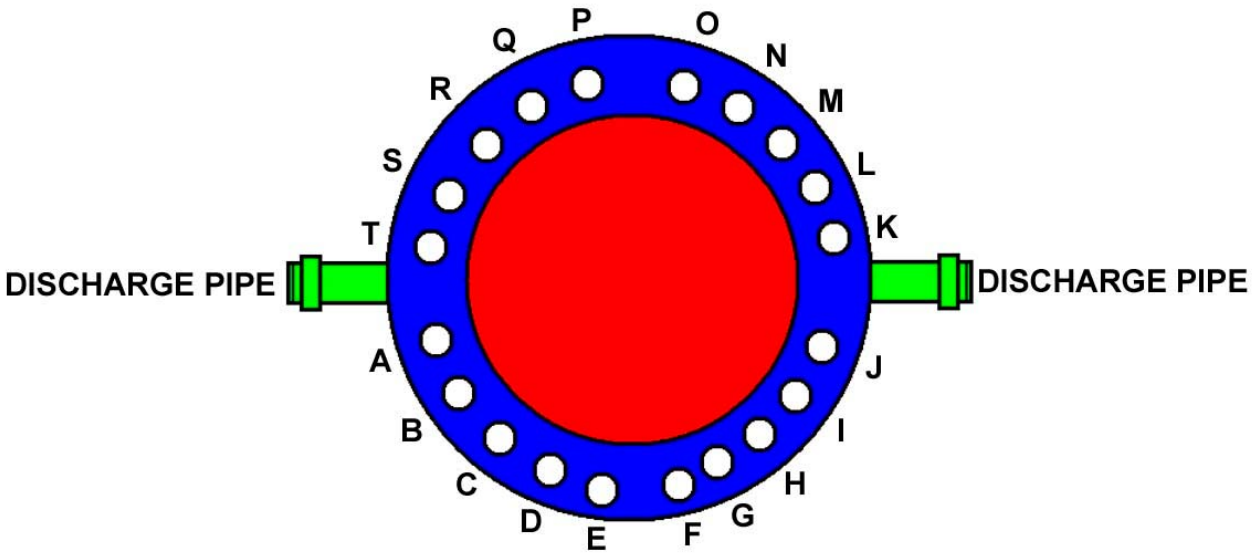


Figure 10100-3 Cone Arrangement

HYDROCYCLONE REMOVAL AND INSTALLATION

Note! If desilter does not have dedicated a shutoff valve for each hydrocyclone, the desilter must be shut down before beginning removal of any component.

If desilter does not have dedicated a shutoff valve for each hydrocyclone, the desilter must be shut down before beginning removal of any component. For desilters having a dedicated shutoff valve for each cone (Figure 10100-4), one or more cones may be removed from a cluster or manifold arrangement without shutting down the desilter. Snap couplings allow cone(s) to be removed without tools.

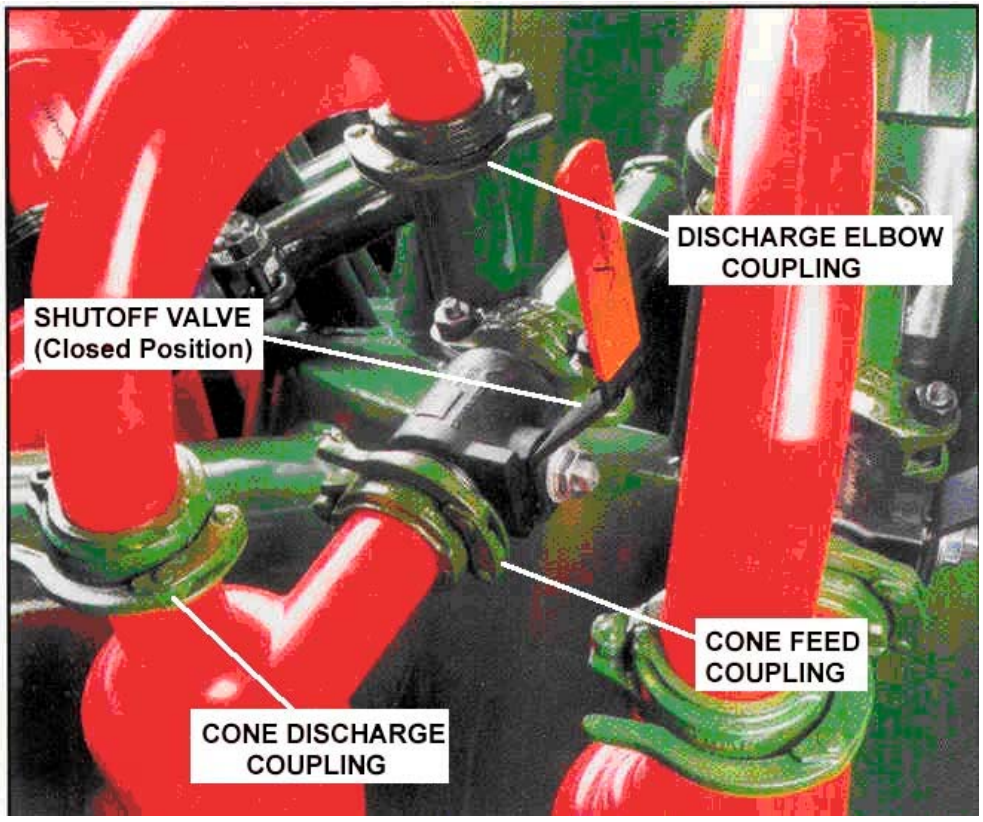


Figure 10100-4 Hydrocyclone Removal

Removal

WARNING! WHEN REMOVING CONE FROM AN OPERATING DESILTER, BE SURE THAT SHUTOFF VALVE IS CLOSED OR DESILTER IS SHUT DOWN BEFORE RELEASING SNAP COUPLINGS.

WARNING! ALWAYS WEAR SAFETY GLASSES WHEN REMOVING HYDROCYCLONES FROM A PRESSURIZED DESILTER.

1. If shutoff valves are installed, close valve of cone to be removed by moving handle to the CLOSED (vertical) position (perpendicular to the line of flow). If shutoff valves are not installed, shut down feed to desilter.
2. Release cone feed and elbow discharge snap couplings to remove hydrocyclone and discharge elbow as a single unit, or release cone feed and cone discharge snap couplings to remove hydrocyclone alone.
3. Remove corresponding hydrocyclone on opposite side of manifold, if desilter will be operated without all hydrocyclones installed (Figure 10100-3).

Installation

WARNING! WHEN INSTALLING CONE ON AN OPERATING DESILTER, BE SURE THAT SHUTOFF VALVE IS CLOSED BEFORE RELEASING SNAP COUPLINGS SECURING VICTAULIC® CAPS TO PRESSURIZED MANIFOLD.

WARNING! ALWAYS WEAR SAFETY GLASSES WHEN INSTALLING HYDROCYCLONES IN A PRESSURIZED DESILTER.

1. If Victaulic® caps (Derrick part number VIC-2-60) were installed on manifold ports, release snap couplings and remove caps.
2. Slide snap coupling gasket on end of manifold pipe.
3. Align inlet pipe of hydrocyclone with manifold pipe, and center gasket between the snap coupling grooves in hydrocyclone and manifold pipe (Figure 10100-5).
4. Install Victaulic® snap coupling so that coupling engages grooves in manifold pipe and hydrocyclone.
5. Engage and close locking handle of snap coupling to secure manifold pipe and hydrocyclone.
6. Repeat steps 1 through 5 for remaining hydrocyclone-to-manifold connections.

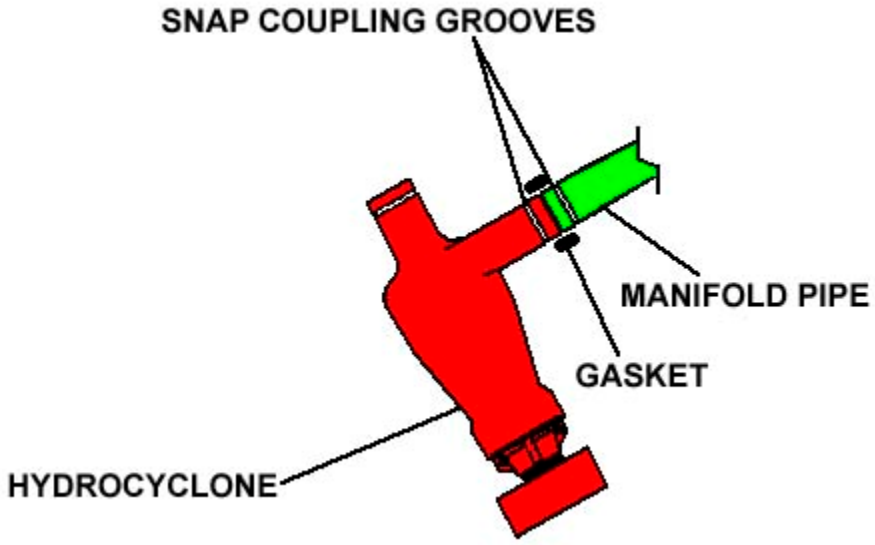


Figure 10100-5 Installation of Snap Coupling Gasket

HYDROCYCLONE ADJUSTMENT

Refer to *DER10000* for information regarding hydrocyclone spray patterns and adjustment procedures.

RECOMMENDED OPERATING PRESSURES

Recommended operating pressures for the 4" hydrocyclone are listed in the following table.

Recommended Desilter Operating Pressures (75' Head Inlet Pressure)		
Mud Weight (PPG)	**Specific Gravity**	**Operating Pressure (PSI)**
8.33	1.00	32
9.00	1.08	35
10.00	1.20	39
11.00	1.32	43
12.00	1.44	47
13.00	1.56	51
14.00	1.68	54
15.00	1.80	58
16.00	1.92	62
17.00	2.04	66

Where:

PPG = Pounds per gallon

Specific Gravity = $\left(\frac{Mud\quad Weight}{8.33}\right)$

1 PSI = 2.309 Feet of Head

Operating Pressure = $\left(\frac{Feet\quad of\quad Head}{2.309}\right)\left(\frac{Mud\quad Weight}{8.33}\right)$

NOMINAL FLOW RATES

The following nominal flow rates are based on 80 GPM per hydrocyclone at a 75' head inlet pressure. Actual flow rates may vary, depending on mud weight, particle sizes, and cone adjustment.

Number of Hydrocyclones	**20**	**18**	**16**	**14**	**12**	**10**
Nominal Flow Rate (GPM)	1000	900	800	700	600	500

REPLACEMENT PARTS

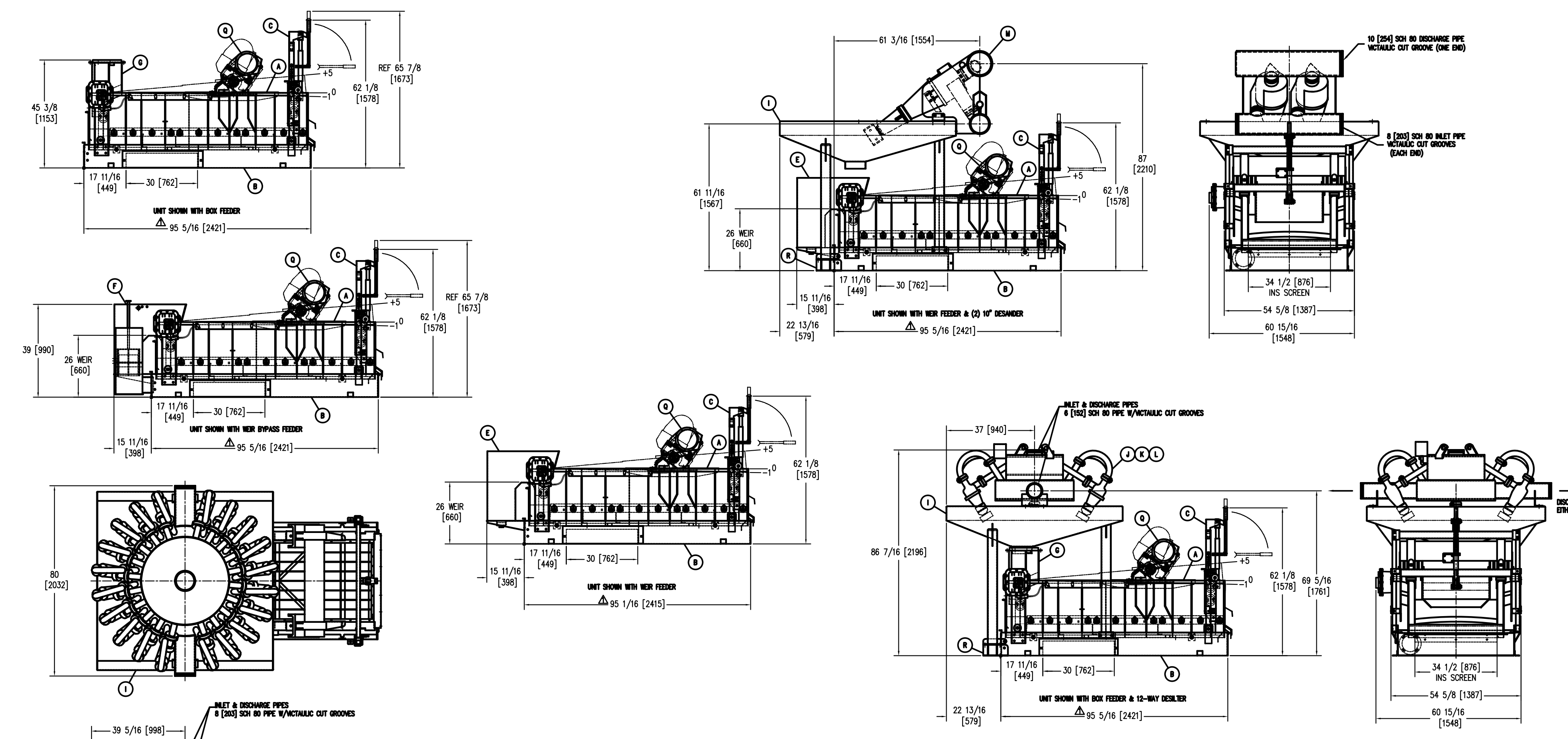
Replacement parts for the round desilter are shown and listed on the engineering drawings included in Section 11 - Reference Drawings. Refer to the appropriate drawings for parts information.

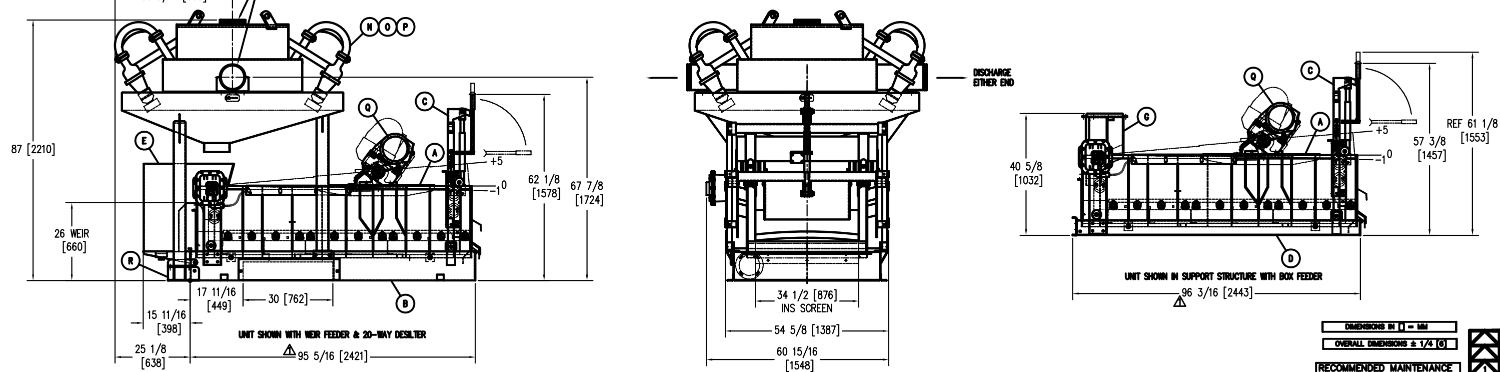
REFERENCE DRAWINGS

FC-313M

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

FC-313M	
15617-00-001	- General Arrangement
15634-00-001	- Parts list - Screen Frame
15687-00-001	- Electrical Parts List
14973-00-001	- FC-313M Wiring Schematic
11234-00	- Parts List - 4” Hydrocyclone
12048-00	- Sealing Rapid Change Draw Bolt Assembly
12945-01-014	- Parts list - Desander, 2-Cone Assembly
13205-00-002	- Parts List - 4” Cone Desilter, 8-, 10- and 12-Way
13245-00-001	- Parts List - 4” Cone Desilter, 14-, 16-, and 20-Way
15523-00	- Parts List - 300 Series Motor Mount
15635-01-001	- Parts list - Hopper
15635-02-001	- Parts list - Bypass Hopper
15637-01-001	- Parts List - AWD (-1° to +5°)
15636-01-001	- Parts List - Bypass Weir Feeder
15712-01-001	- Parts List - Box Feeder
15713-01-001	- Parts List - Weir Feeder
16173-01	- Parts List - Support Frame
9744-00	- Ramp-Lok® Screen Tensioning Assembly





* FOR OPTIONS & SPECIAL REQUIREMENTS – REFERENCE EQUIPMENT ORDER FORM

WIRE SCHEMATIC: [redacted]

QTY				ITEM	PART NAME	DESCRIPTION/PART NUMBER	PARTS LIST
–	–	1	–	R	PAN SPACER ASSY	[redacted]	–
1	1	1	1	Q	SGX/SG2X MOTOR	TO SPECIFICATION	–
•	–	•	–	P	20-WAY CYCLONE	[redacted]	[redacted]
•	–	•	–	O	16-WAY CYCLONE	[redacted]	[redacted]
•	–	•	–	N	14-WAY CYCLONE	[redacted]	[redacted]
•	–	•	–	M	(2) 10" CONE DESANDER	[redacted]	[redacted]
•	–	•	–	L	12-WAY CYCLONE	[redacted]	[redacted]
•	–	•	–	K	10-WAY CYCLONE	[redacted]	[redacted]
•	–	•	–	J	8-WAY CYCLONE	[redacted]	[redacted]
1	–	1	–	I	PAN	[redacted]	–
1	1	1	1	H	ELECTRICAL PARTS	–	[redacted]
•	•	•	•	G	BOX FEEDER	[redacted]	[redacted]
•	•	•	•	F	WEIR BYPASS FEEDER	[redacted]	[redacted]
•	•	•	•	E	WEIR FEEDER	[redacted]	[redacted]
1	1	–	–	D	SUPPORT FRAME	[redacted]	[redacted]
1	1	1	1	C	AWD	[redacted]	[redacted]
–	–	1	1	B	HOPPER/BYPASS HOPPER	[redacted]	[redacted]
1	1	1	1	A	SCREEN FRAME	[redacted]	[redacted]
X				04	FC-313M W/SUPPORT FRAME & CONES	[redacted]	
	X			03	FC-313M W/SUPPORT FRAME	[redacted]	
		X		02	FC-313M W/CONE PACKAGE	[redacted]	
			X	01	FC-313M	[redacted]	

DIMENSIONS IN [ ] = MM

OVERALL DIMENSIONS ± 1/4 [6]

RECOMMENDED MAINTENANCE AND ACCESS SPACE–
FRONT– 2–3 FEET [610–914]
SIDES– 2–3 FEET [610–914]
REAR– 2–3 FEET [610–914]

REV	CHANGE	CKD	DATE
1	95 5/16 WAS 95 1/16; 96 3/16 WAS 95 15/16.	CCS	5/11/05

GENERAL ARRANGEMENT
FC-313M -1 TO +5

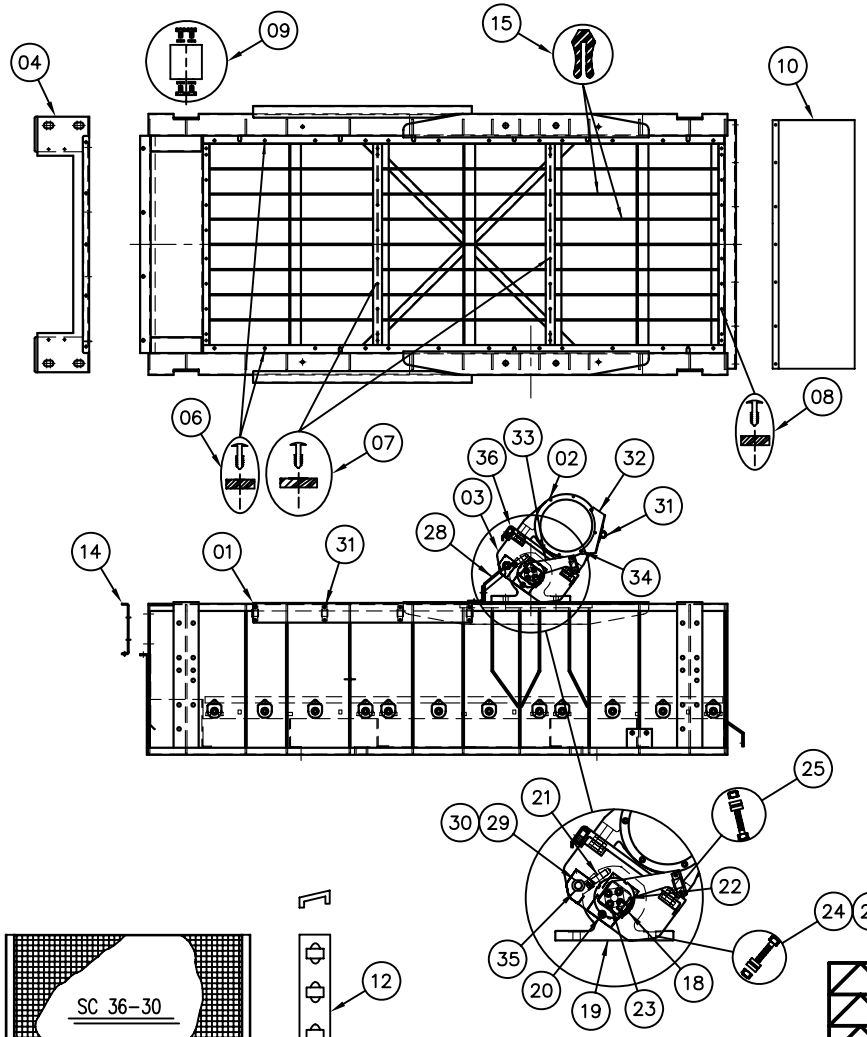
DWN CCS | DATE 8/1/03 | SCALE 1:20 | REV 1

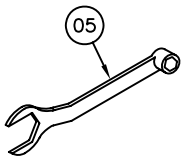
D | Y | DM 3/10/05 | CCS 3/15/05

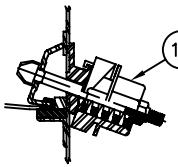
15617-00-001

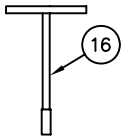
DERRICK® CORPORATION

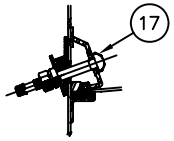
EB DEPT.
M 1abc, 2abce, 4a











* OPTIONAL– REFERENCE ORDER FORM
** 15814-01 USE WITH SGX2 MOTORS ONLY (OMIT ITEMS 32 & 33)
*** QUANTITY OF 5 WHEN SGX2 MOTOR REQUIRED

	QTY	ITEM	PART #	PART NAME	DESCRIPTION
	1	01	15619-01-001	SCREEN FRAME	SGA36-90-3
	1	02	SGX/SGX2	VIBRATING MOTOR	TO SPECIFICATION
	2	03	15522-01	MOTOR MOUNT BRACKET	ALUMINUM
*	1	04	14972-01-002	REAR FEEDER SEAL	OPTIONAL (WEIR FEEDER)
*	1	05	10045-01-004	WRENCH	SPECIAL (FOR RAMP-LOK SYSTEM)
	6	06	14681-01-001	SIDE SUPPORT ASSY	1 X 28 (FIBERGLASS,W/HDW)
	2	07	14681-03-001	CROSS SUPPORT ASSY	1 7/16 X 32 (FIBERGLASS,W/HDW)
	2	08	14681-02-001	CROSS SUPPORT ASSY	1 X 32 (FIBERGLASS,W/HDW)
	6	09	1129-00	FLOAT MOUNT	4 DIA. X 3 W/BOLT ASSY
	1	10	14659-00	FRONT CURTAIN	3/16 X 39 1/2 X 16 PVK-120 W/HARDWARE
	3	11	SC36-30	SCREEN PANEL	TO SPECIFICATION
	6	12	181-Q-30-304	Q.R. DRAW BAR	27 3/8 (304 SS)
*	24	13	9744-00	RAMP-LOK ASSY	SS (OPTIONAL)
*	1	14	13478-00-005	REAR CLOSE-OFF	1/4 HRS W/HARDWARE (OPTIONAL)
⚠	21	15	3660-05-30	CHANNEL PROTECTOR	NITRILE X 26 1/8
	1	16	5925-01	SPINNER WRENCH	SPECIAL (FOR RAPID CHANGE SYSTEM)
	24	17	14995-00	RAPID CHANGE ASSY	SEALING W/BRASS NUT
	2	18	G0004449	RUBBER SUSPENSION UNIT	DK-A RBR
	2	19	14980-01	FIST BRACKET HOUSING	CAST IRON
	2	20	G0004084	KEYSTOCK	KEY,SQ-.313 X 4" 304SS
	4	21	G0002388	SOCKET HEAD CAP SCREW	5/8 X 1 3/4 ALY/ZINC
	4	22	14982-01	WASHER PLATE	SS
	16	23	G0004614	SOCKET HEAD CAP SCREW	M12-1 3/4 X 50MM ALY/ZINC
	4	24	G0001926	HEX CAP SCREW L9 BOLT	.750-16 X 3.500 L9 ALY/ZINC
	4	25	G0002995	MOTOR BOLT	ASSEMBLY L9
	8	26	PP1514	FLAT WASHER	.750-16 L9 ALY/CAD PLD
	4	27	G0004470	HEX HEAD NUT	.750-16 L9 ALY/CAD PLD
	2	28	15256-01-001	SHIPPING BRACKET	ASSEMBLY
	2	29	15351-01-001	RECEPTACLE	NON-THREADED INS ALUMINUM BRONZE-954
	2	30	15351-02-001	RECEPTACLE	THREADED INS ALUMINUM BRONZE-954
***	8	31	G0004632	CORD CLAMP	.75 SINGLE STRAP SST
	1	32	15625-02	UPPER BRACKET	7GA X 7 1/4 X 7 3/4 COR-TEN
	1	33	15625-03	LOWER BRACKET	7GA X 6 7/16 X 7 5/8 COR-TEN
	3	34	G0004613	UPPER BRACKET CAP SCREW	M6-1.0 X 25MM BOLT 18-8 SST
	4	35	NNLS-75-16-HHLT	HALF HEIGHT HEX NUT	.750-16 18-8 SST
**	1	36	15814-01	CORD SUPPORT ASSY	ASSEMBLY

EB	DEPT.
M	1bc, 2abc, 4a

GA: **15617-00-001**

REV	CHANGE	DRC CKD	DATE
1	ITEM 15 PART # WAS G0003402 AND DESCRIPTION WAS NITRILE X 26	CCS	8/21/07

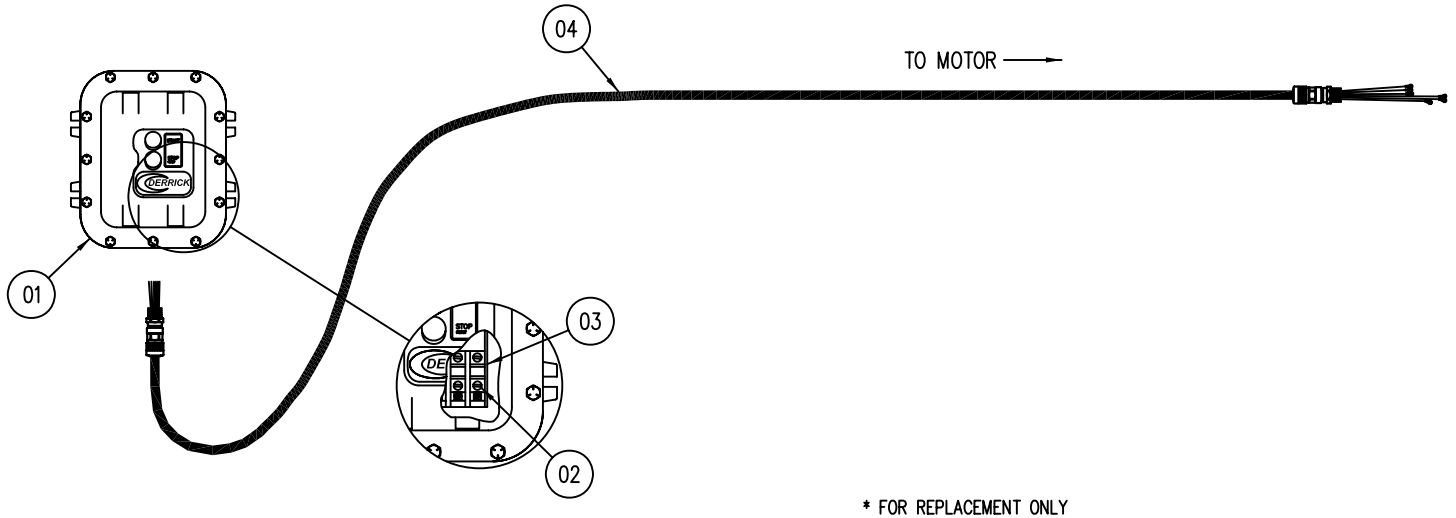
TITLE: SCREEN FRAME PARTS LIST
FC-313M

DWN	CKD	DATE	SCALE	REV
CCS	SB	7/31/03	NTS	1

SHEET SIZE		DWN	CKD
B	Y	CCS 3/31/05	
	F C		

DRAWING NO. 15634-00-001

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



* FOR REPLACEMENT ONLY

	QTY	ITEM	PART NAME	PART NUMBER/DESCRIPTION
	1	04	MOTOR CORD ASSY	**11881-01-005**
	3	03	THERMAL UNIT	REF: PE-S-014.DOC
*	1	02	MANUAL STARTER	SQD-2510-MC03
	1	01	STARTER BOX ASSY WITH TERMINAL BLOCK	G0005512 (NEMA 4, 7 & 9)

EB	DEPT.
M	2c,4a

GEN ARR: **15617-00-001**
WIRE SCHEMATIC: 14973-00-002

REV	CHANGE	CKD	DATE

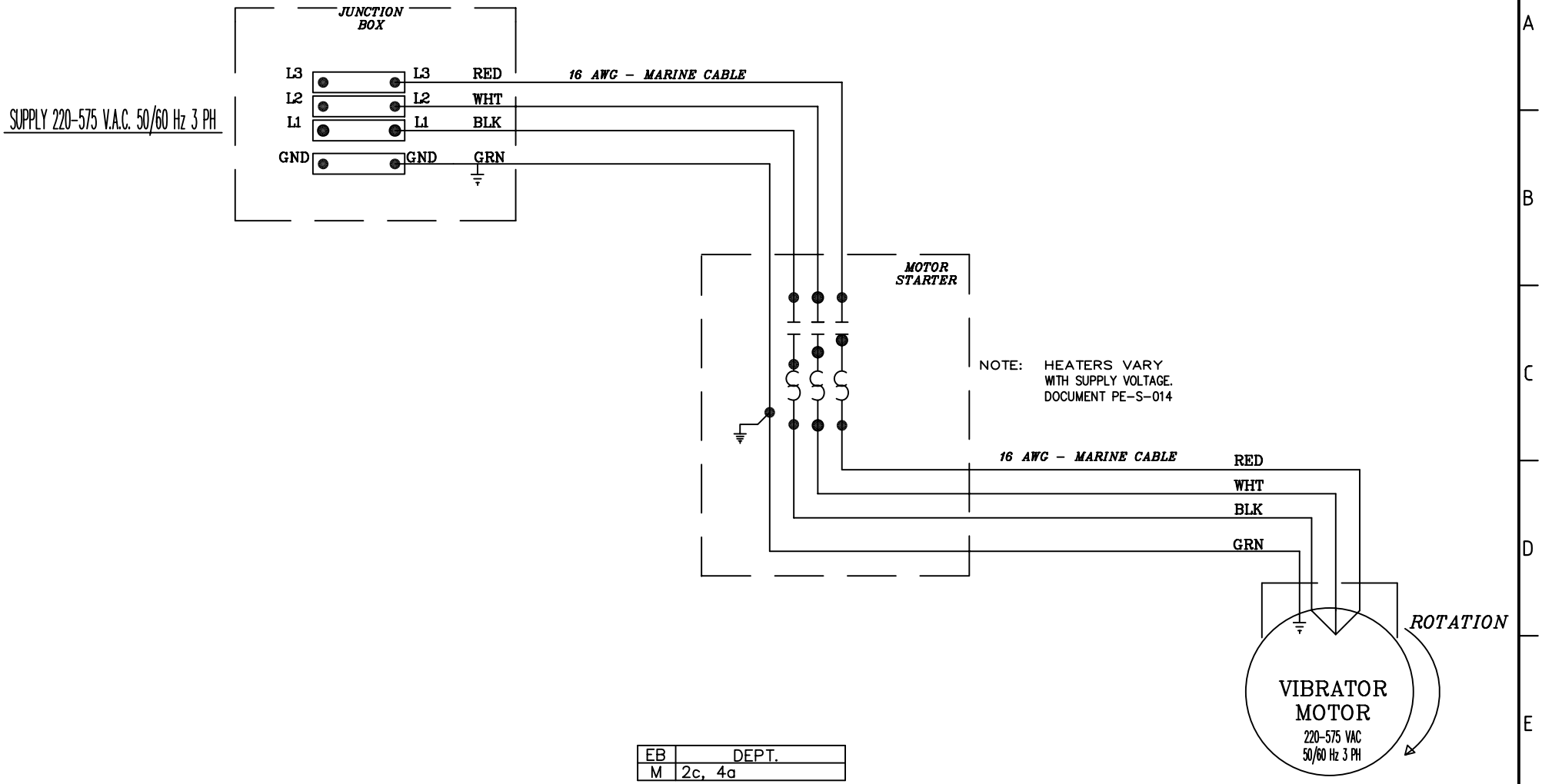
TITLE: ELECTRICAL PARTS LIST
FC-313M

DWN CCS | CKD JS | DATE 09/19/03 | SCALE NONE | REV

SHEET SIZE B | F C N | DWN JFS 04/05/05 | CKD RMK 04/05/05

DRAWING NO. 15687-00-001

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



EB	DEPT.
M	2c, 4a

REF: GA #15617-00
REF: EXPLOSIONPROOF ELECTRICAL ASSY #15687-00

REV	CHANGE	CKD	DATE

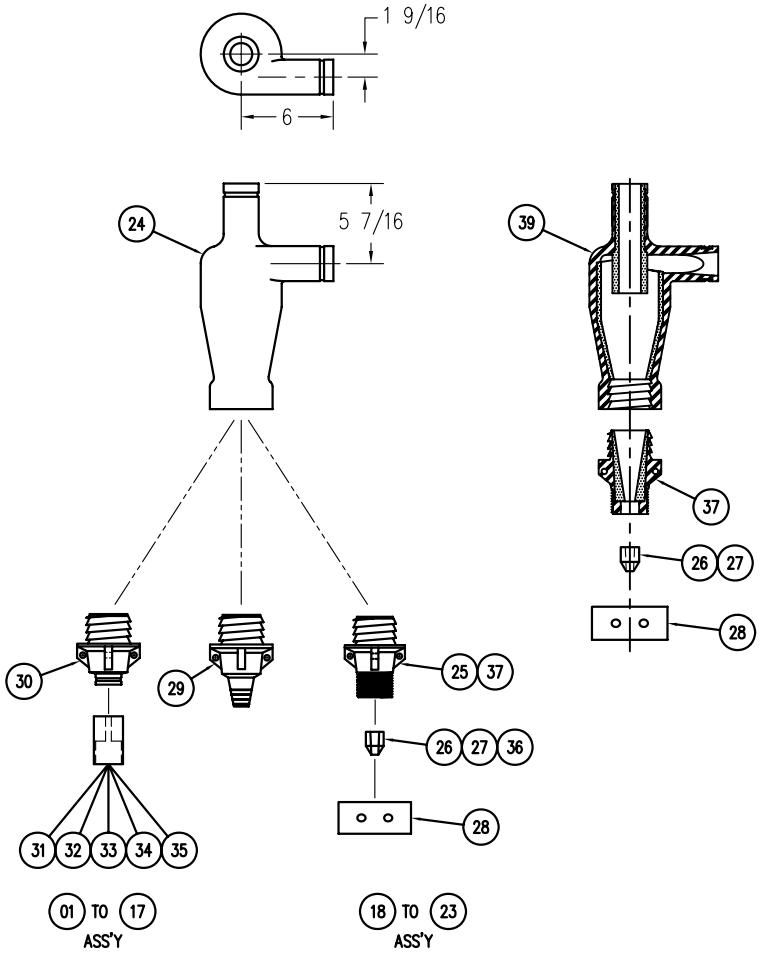
TITLE: FC-313M WIRING SCHEMATIC

DWN JFS | CKD | DATE 11/10/03 | SCALE NONE | REV

SHEET SIZE B | F C Y | DWN | CKD

DRAWING NO. 14973-00-001

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



* – DETERMINED PER MODS AND / OR MOIS SHEET

	QUANTITY	ITEM	PART NAME/ DESCRIPITION	PART NO
	1 1 1 1 1 1	39	4" HYDROCYCONE BODY CERAMIC LINED (B836 URETHANE)	13939-07
	1 1 1	38	4" HYDROCYCONE BODY (RAMPLESS)	10523-23
	1 1 1 1 1 1 1	37	THREAD ON CONE TIP CERAMIC LINED	13868-00
*	1 1 1	36	DROP IN APEX (.375)	10523-21
	1	35	SNAP ON APEX (.240 ORIFICE)	10523-10
	1	34	SNAP ON APEX (.300 ORIFICE)	10523-09
	1	33	SNAP ON APEX (.400 ORIFICE)	10523-08
	1	32	SNAP ON APEX (.500 ORIFICE)	10523-07
	1	31	SNAP ON APEX (.600 ORIFICE)	10523-06
	1 1 1 1 1	30	SNAP ON CONE TIP	10523-05
	1 1	29	CUT OFF CONE TIP	10523-11
	1 1 1 1 1 1 1 1 1 1 1	28	TRIANGULAR NUT	10523-04
*	1 1 1 1 1	27	DROP IN APEX (.500 ORIFICE ADJ TO .375)	10523-03
*	1 1 1 1 1 1	26	DROP IN APEX (.625 ORIFICE ADJ TO .500)	10523-02
	1 1 1 1 1 1 1	25	THREAD ON CONE TIP	10523-01
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	24	4" HYDROCYCONE BODY (B836 URETHANE)	10523-00
		23	CONE ASSY W/ CERAMIC VORTEX & FULL CONE	13939-17
		22	BODY ASSY W/ CERAMIC VORTEX & FULL CONE	13939-15
		21	CONE ASSY W/ CERAMIC FULL CONE	13939-16
		20	BODY ASSY W/ CERAMIC FULL CONE	13939-14
		19	CONE ASSY W/ CERAMIC VORTEX	13939-02
		18	BODY ASSY W/ CERAMIC VORTEX	13939-05
		17	4" CONE ASSEMBLY	10523-33
		16	4" CONE ASSEMBLY	10523-32
		15	4" CONE ASSEMBLY	10523-29
		14	4" CONE ASSEMBLY	10523-28
		13	4" CONE ASSEMBLY	10523-27
		12	4" CONE ASSEMBLY	10523-26
		11	4" CONE ASSEMBLY	10523-25
		10	4" CONE ASSEMBLY	10523-22
		09	4" CONE ASSEMBLY	10523-20
		08	4" CONE ASSEMBLY	10523-19
		07	4" CONE ASSEMBLY	10523-18
		06	4" CONE ASSEMBLY	10523-17
		05	4" CONE ASSEMBLY	10523-16
		04	4" CONE ASSEMBLY	10523-15
		03	4" CONE ASSEMBLY	10523-14
		02	4" CONE ASSEMBLY	10523-13
		01	4" CONE ASSEMBLY (STANDARD)	10523-12

REV	CHANGE	CKD	DATE
6	UPDATED TO CURRENT STANDARDS, ADDED CERAMIC CONES, PUT ON NEW FORMAT	JHM TJS	6/19/08

TITLE: PARTS LIST FOR DERRICK 4" CONE ASS'Y. AND 4" CERAMIC LINED HYDROCYCLONE ASSY.

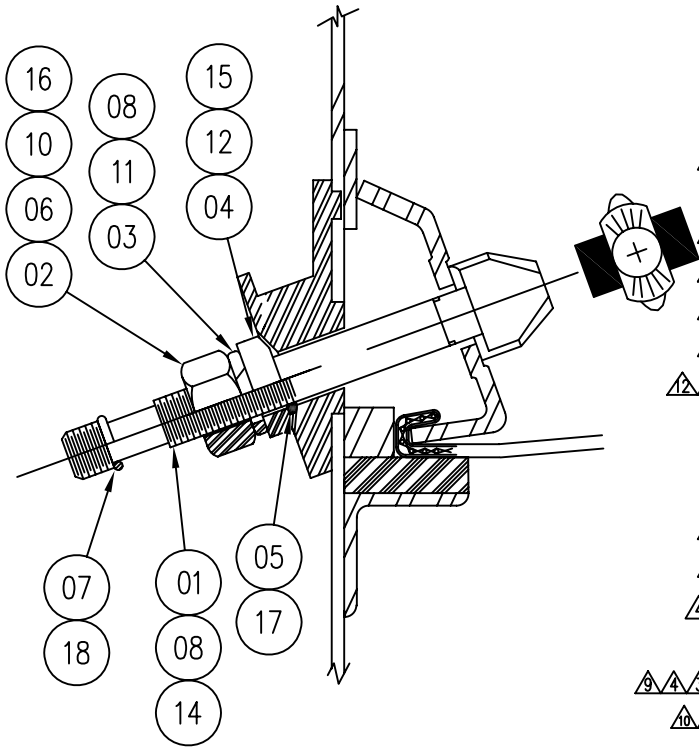
DWN JHM | CKD TJS | DATE 6/19/08 | SCALE NONE | REV 6

SHEET SIZE B | F C N | DWN | CKD

DRAWING NO. 11234-00

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

MAN



ITEM	QTY					PART NAME	DESCRIPTION/PART NUMBER
19	X					ASSEMBLY COMPLETE	w/ STAINLESS NUT
18	1					'O' RING	G0004182
17	1					'O' RING	G0004181
16		1				NUT	NHHS-50-13-316
15		1				EXTENDED WASHER	**12049-03**
14		1				SEALING RAPID CHANGE BOLT	**12015-02-002**
13		X				ASSEMBLY COMPLETE	W/ 316 SS
12			1			EXTENDED WASHER	**12049-02**
11			1			LOCK WASHER	WLPL-50
10			1			NUT	NHHP-50-13
09			X			ASSEMBLY COMPLETE	W/ZPL NUT
08		1				LOCK WASHER	WLSS-50-316
07		1	1	1	1	'O' RING	ORBN-2110N67470
06	1			1		NUT	NHHS-50-13
05		1	1	1	1	'O' RING	PP1490
04	1			1	1	EXTENDED WASHER	**12049-00**
03	1			1	1	LOCK WASHER	WLSS-50
02					1	NUT	NHHB-50-13
01	1		1	1	1	SEALING RAPID CHANGE BOLT	**12015-01-001**
00-S				X		ASSEMBLY COMPLETE	w/ STAINLESS NUT
00					X	ASSEMBLY COMPLETE	w/ BRASS NUT

EB	DEPT.
AB	1b, 2a, 4a

REV	CHANGE	CKD	DATE
14	ADDED ITEMS 17, 18 & ASSEMBLY 19	NVB	10/31/02
13	CHANGED DRAWING NUMBER FROM 12015-01-002 TO 12015-01-001	TMR DM	4/23/02
12	CHANGED DRAWING NUMBER FROM 12015-01-001, TO 12015-01-002	TMR RM	4/09/02
11	ITEM 08 WAS 12015-03-001, ADDED ITEM 01 TO ASSY 09 SEE RECORD COPY OR OLDREV LAYER FOR REVISIONS 1-10	RGD WS	11/22/00

TITLE: SEALING RAPID CHANGE BOLT

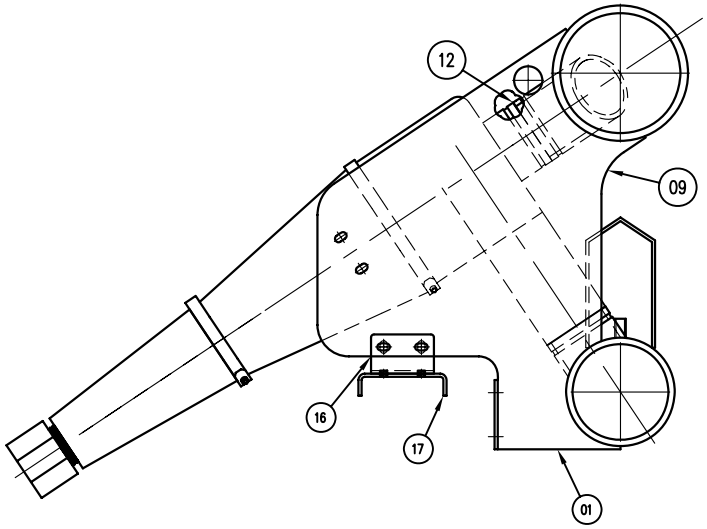
DWN SB | CKD | DATE 2/23/95 | SCALE 1=2 | REV 14

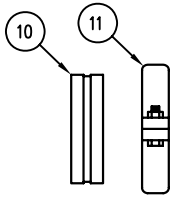
A | SHEET SIZE | Y | F C | DWN | CKD

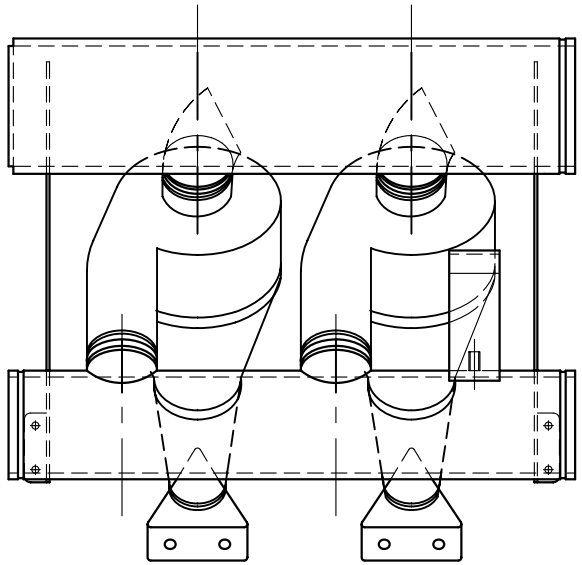
DRAWING NO. 12048-00

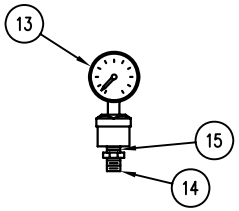
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

LO,WE,SH,PC



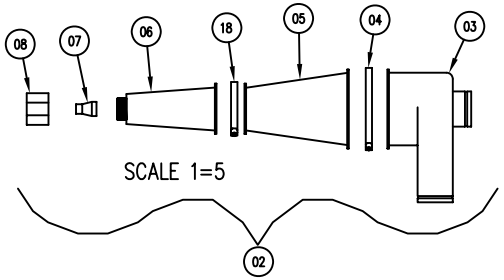






GAUGE ASSEMBLY

NTS



SCALE 1=5

QTY	ITEM	PART NAME	PART NUMBER	
1	18	LOWER BAND CLAMP	**6066-55**	1
1	17	PAN CROSSOVER	16183-02	
2	16	MOUNTING ANGLE	16183-03	
1	15	1/4 CLOSE NIPPLE	NPLE-25-S4	
1	14	REDUCER 3/8 TO 1/4	IMP-24SB-06X04	
1	13	0-100 PSI GAUGE	PP1429	
4	12	5" VICTAULIC COUPLING # 75	VIC-5-75	
1	11	8" VICTAULIC CAP	VIC-8-60	
1	10	8" VICTAULIC COUPLING # 75	VIC-8-75	
1	09	DESANDER STRUCTURE	10243-01-009	
1	08	APEX HOLDER	**6066-58**	1
1	07	APEX 1.25	**6066-57**	1
1	06	LOWER SECTION	**6066-56**	1
1	05	MIDDLE SECTION	**6066-54**	1
1	04	UPPER BAND CLAMP	**6066-53**	1
1	03	UPPER SECTION	**6066-52**	1
2	02	10" DESANDER CONE ASSEMBLY	ASSEMBLY	1
1	01	TWO CONE DESANDER ASSEMBLY	12945-01-014	

GA: 15617-00-001

REV	CHANGE	CKD	DATE
1	ITEMS 03 - 08 CHANGED PART NUMBER; ADDED ITEM 19	TRD	10/16/08

TITLE: DESANDER PARTS LIST
FC-313M

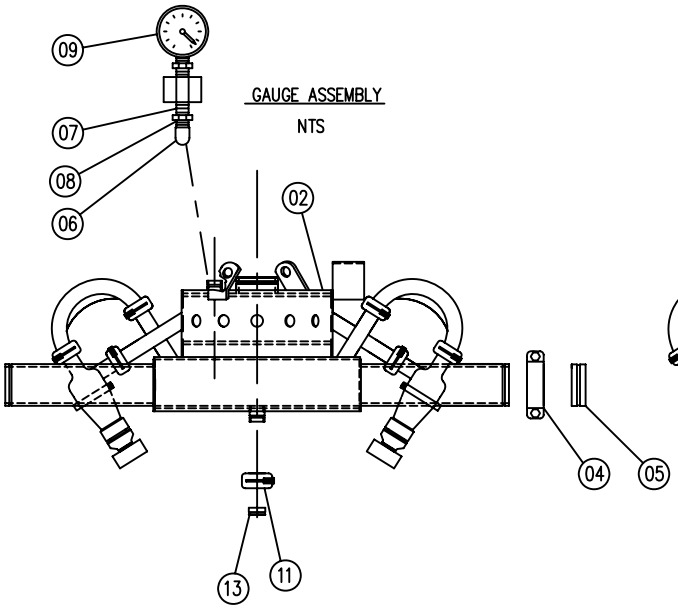
DWN CR | CKD MP | DATE 7/8/96 | SCALE 1:10 | REV 1

B | SHEET SIZE | N | F C | DWN CCS 4/8/05 | CKD

DRAWING NO. 12945-00-014

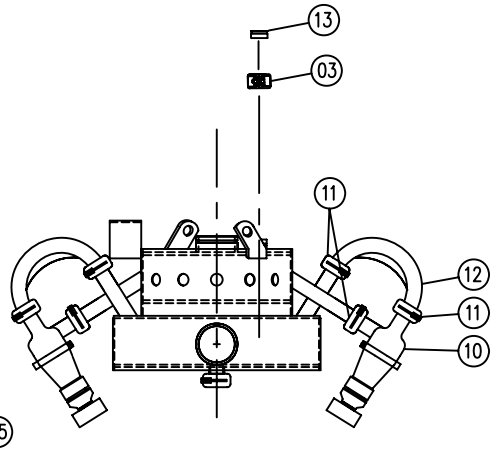
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

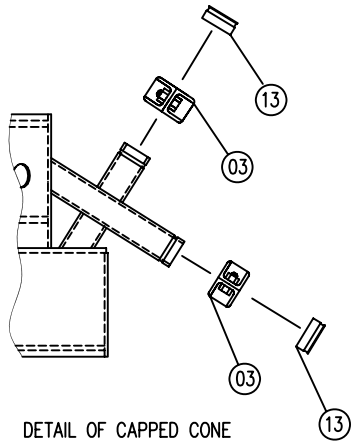
LO, WE, TI SH, PC, UR



GAUGE ASSEMBLY

NTS





DETAIL OF CAPPED CONE
(TYPICAL FOR EACH DELETED CONE)

X			15	8-WAY PARTS ASSEMBLY	13205-15-002
	X		14	10-WAY PARTS ASSEMBLY	13205-14-002
10	6	2	13	2" VICTAULIC CAP	VIC-2-60
8	10	12	12	180° VICTAULIC URETHANE ELBOW	6431-00
25	31	37	11	2" VICTAULIC SNAP COUPLING	VIC-2-78
8	10	12	10	4" URETHANE CONE	10523-12
1	1	1	09	0-100 PSI GAUGE	PP1429 (GAUGE ASSY, PRESS-0-100 PSI)
1	1	1	08	3/8"-1/4" REDUCER (STEEL)	IMP-24SB-06X04
1	1	1	07	1/4 CLOSE NIPPLE	NPLE-25-S4
1	1	1	06	3/8"-90° BLACK STREET ELBOW	ESB-38
1	1	1	05	6" VICTAULIC CAP	VIC-6-60
1	1	1	04	6" VICTAULIC COUPLING	VIC-6-75
9	5	1	03	2" VICTAULIC ZERO-FLEX COUPLING	VIC-2-07
1	1	1	02	CYCLONE CLUSTER	11693-01-002
		X	01	12-WAY PARTS ASSEMBLY	13205-01-002
QTY			ITEM	PART NAME	PART NUMBER

GA: **15617-00-001**

EB	DEPT.
M	1ac, 2e, 4a

REV	CHANGE	CKD	DATE
1	ADDED ASSEMBLIES 14 & 15.	CCS	2/26/05

TITLE: PARTS LIST FOR DERRICK 4" CONE

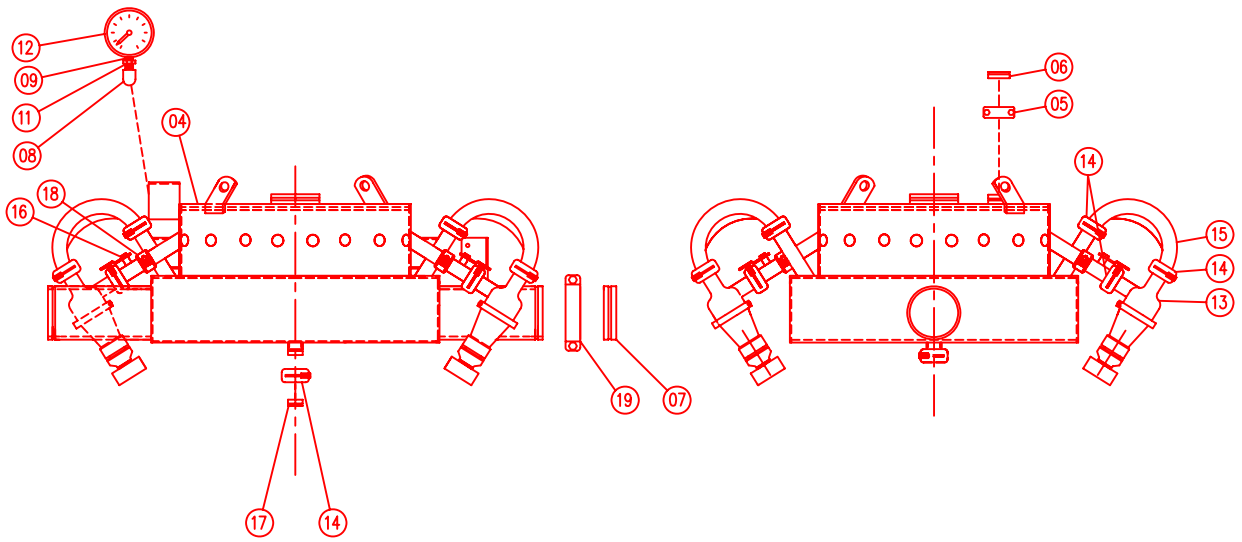
DWN CR | CKD | DATE 3/18/92 | SCALE 1=10 | REV 1

B | SHEET SIZE | Y | F C | DWN CCS 2/3/05 | CKD

DRAWING NO. 13205-00-002

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

SHEET SIZE = B10



DWN: PR 4/13/99
CKD:

ITEM	REQ'D			PART NUMBER	DESCRIPTION /PART NAME
19	1	1	1	VIC-8-75	8" VICTAULIC COUPLING
18	26	24	20	VIC-2-07	2" VICTAULIC ZERO-FLEX COUPLING
17	13	9	1	VIC-2-60	2" VICTAULIC CAP
16	14	16	20	G0002077	2" VICTAULIC BALL VALVE
15	14	16	20	6431-00	180° VICTAULIC URETHANE ELBOW
14	43	49	61	VIC-2-78	2" VICTAULIC SNAP COUPLING
13	14	16	20	10523-12	4" URETHANE CONE
12	1	1	1	PP1429	0-100 PSI GAUGE
11	1	1	1	IMP-24SB-06X04	3/8"-1/4" REDUCER (STEEL)
09	1	1	1	NPLE-25-S4	1/4 CLOSE NIPPLE
08	1	1	1	ESB-38	3/8"-90° BLACK STREET ELBOW
07	1	1	1	VIC-8-60	8" VICTAULIC CAP
06	1	1	1	VIC-3-60	3" VICTAULIC CAP
05	1	1	1	VIC-3-75	3" VICTAULIC COUPLING
04	1	1	1	7292-01-001	CYCLONE CLUSTER
03	X				14-WAY PARTS ASSEMBLY
02		X			16-WAY PARTS ASSEMBLY
01			X		20-WAY PARTS ASSEMBLY

GA 12964-07

REV	CHANGE	CKD	DATE
1	DELETED ITEM 10, CHANGES FOR NEW STYLE GAUGE PER ECN 0018 ITEM 16, G0002077 WAS VIC-2-271	MJC	10/14/99

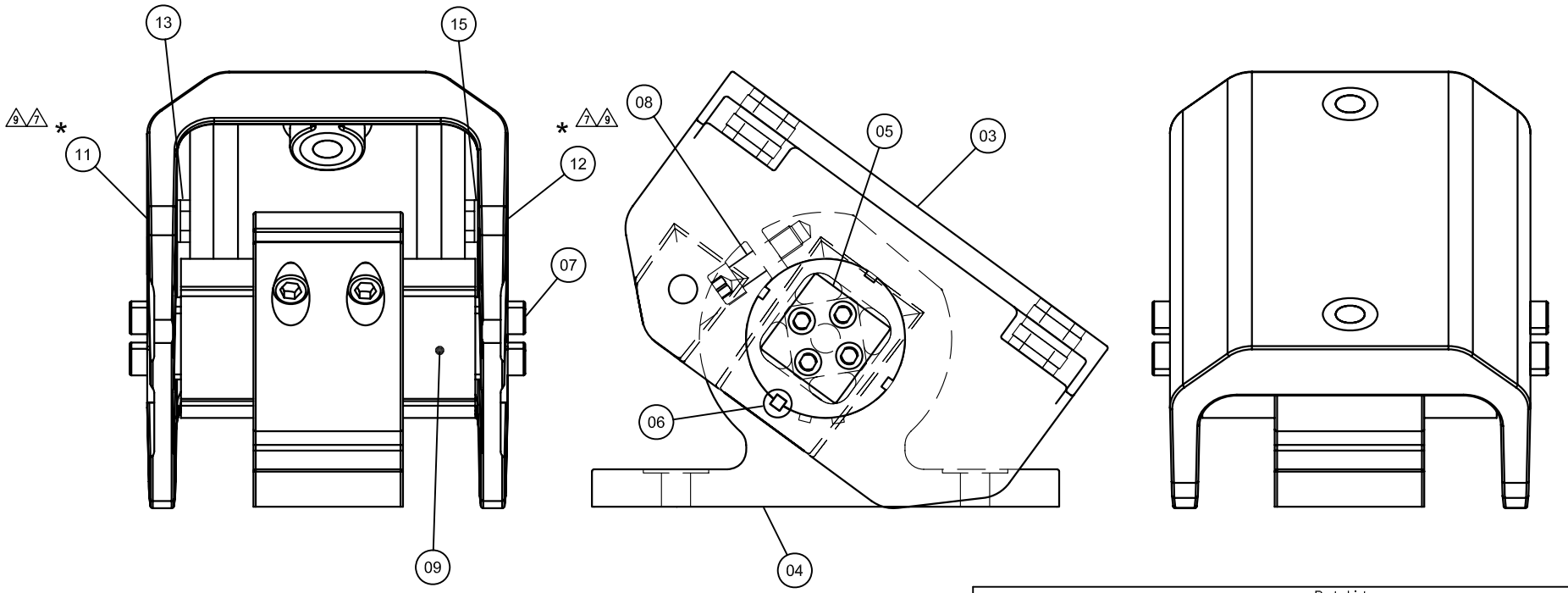
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NEW YORK 14225 U.S.A.

TITLE
DESILTER PARTS LIST

DWN	CKD	DATE	SCALE
TOC	MP	1/17/97	1=10

00B	N	DRAWING NO.	REV
D B	F C	13245-00-001	1

TK, LO, WE, SH



△7

* NOTE:
ASSEMBLIES CONFIGURED FOR RH INSTALLATION
REVERSE ITEMS 11 & 12 FOR LH INSTALLATION

Parts List

ITEM	QTY		PART NUMBER	DESCRIPTION	TORQUE SPEC
01		X	15523-01	SINGLE MOTOR MOUNT W/ SHIPPING BRACKET	
△1 02	X		15523-02	SINGLE MOTOR MOUNT ASSY	
03	2	2	15522-01	MOTOR PAD	
04	2	2	14980-01	FIST BRACKET	
05	4	4	14982-01	WASHER PLATE	
06	2	2	G0004084	5/16" x 5/16" x 4" - KEYSTOCK	
△6 07	16	16	G0004614	BOLT, HEX SOCH - M12 - 1.75 50 ALY STL/ZPL	100 FT-LBS △1 △3
08	4	4	G0002388	BOLT, HEX SOCH - .625 - 11 X 1.75 ALY STL/ZPL	150 FT-LBS
△5 △4 △1 09	2	2	G0004449	DKA - 50 x 200 - BUSHING	
10		2	15256-01-001	SHIPPING BRACKET ASSY (NOT SHOWN)	
11	2	2	15351-02-001	PIN RECEPTACLE (THREADED IN & OUT)	
12	2	2	15351-01-001	PIN RECEPTACLE (THREADS OUTSIDE ONLY)	
13	4	4	NNLS-75-16-HH-LT	NY-LOCK HALF HEIGHT HEX NUT	
△8 14		2	15370-01-001	SHIP PIN ASSY W/LANYARD (NOT SHOWN)	
△9 15	4	4	WFSS-75-SAE	WASHER	

△5 △5

REV	CHANGE	CKD	DATE
9	ADDED ITEM 15,REAR VIEW ITEM 11 WAS 12 AND ITEM 12 WAS 11	TJS SB	1/30/04
8	ITEM 14 WAS G0002724	SB JMK	10/17/03
7	ADDED NOTE	SB JMK	10/08/03
6	ITEM 07 G0004614 WAS G0002388 (40 MM BOLT)	SB CCS	10/3/03
5	REMOVED ITEMS 09, 10, 11 & 12. 09 WAS G0001926, 10 WAS G0004470, 11 WAS FP1514 & 12 WAS G0002602, UPDATED QTY'S TO REFLECT COMP 321, ADDED ITEM 14	SB CCS	10/1/03
4	ADDED ITEM 17, CHANGED 15 FROM 15351-02 TO 15351-02-001, CHANGED 16 FROM 15351-01 TO 15351-01-001, & CHANGED 14 FROM 15380-00-002 TO 15380-00-001	TMR CKD	9/23/03
3	TORQUE SPEC UNITS WERE IN-LBS IN ERROR	EJR KNB	8/6/03
2	ADDED EQUIPMENT BOOK TO DWG, ADDED "PARTS LIST" IN TITLE BLOCK, ADDED MACHINE SHOP TO DISTRIBUTION	EJR KNB	8/1/03
1	ADDED ITEMS 1, 5, 8, 10, 11, 13. ITEM 12 WAS ITEM 1. ADDED TORQUE SPECS FOR ITEMS 6, 7, 8, 11.	TMR KNB	7/10/03

TITLE: 300 SERIES SINGLE MOTOR MOUNT PARTS LIST

CKD AJL DATE 3/28/03 SCALE NTS REV 9

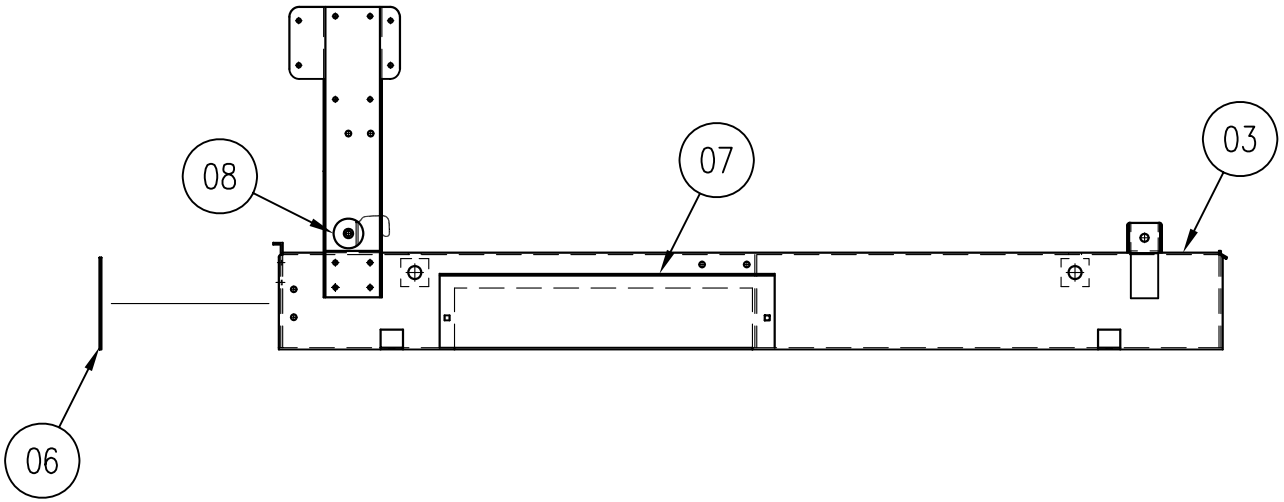
DRN TMR CKD

SHEET SIZE C Y F C

DRAWING NO. 15523-00

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

MADE IN U.S.A.



QTY	ITEM	PART NUMBER	DESCRIPTION /PART NAME
2	08	16182-01	SHIPPING LUG ASSY
1	07	16159-04	DOOR
1	06	16159-03	HOPPER CLOSE-OFF
	05		
	04		
1	03	15618-01-001	HOPPER
X	02	15635-02-001	HOPPER (BYPASS)
X	01	15635-01-001	HOPPER (STANDARD)

EB	DEPT.
M	1abc, 2bc, 4a

GA: **15617-00-001**

REV	CHANGE	CKD	DATE
1	ITEMS 04 & 05 WERE 16159-01 & 16159-02 FLOAT UPRIGHTS, COMPONENTS ARE NOW WELDMENTS.	CCS	4/13/06

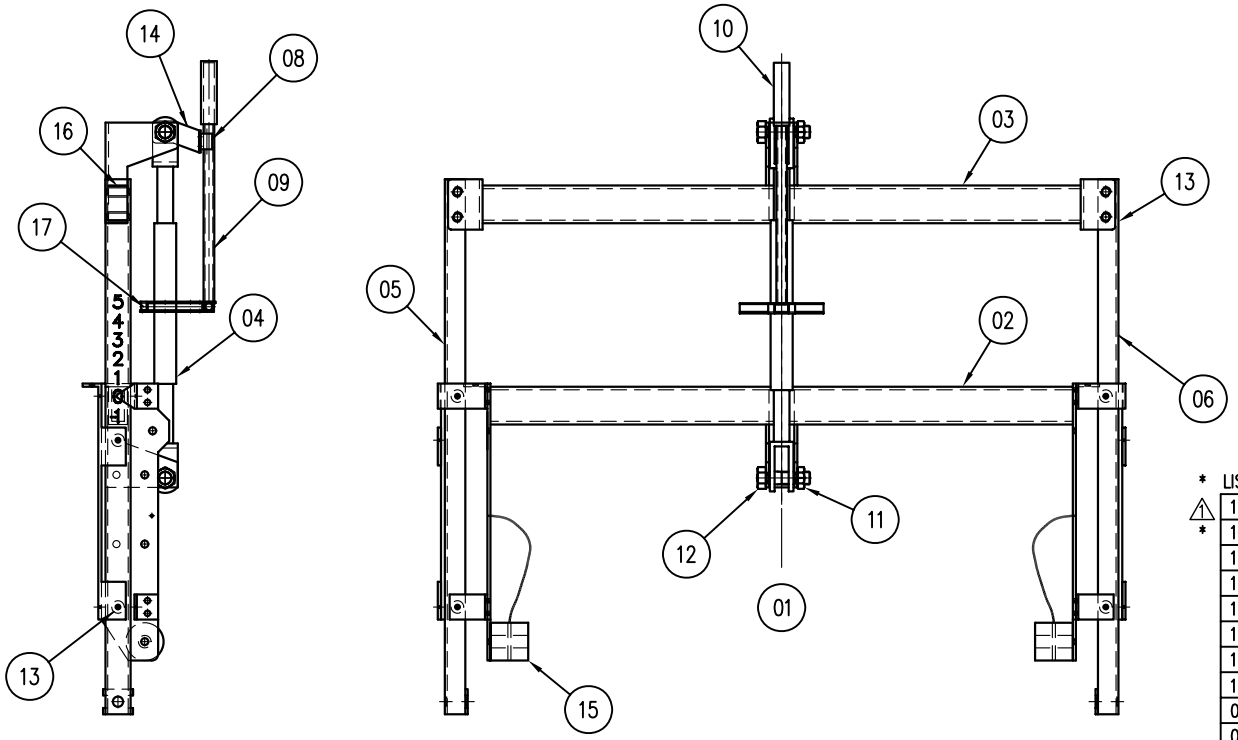
TITLE: HOPPER PARTS LIST
FC-313M

DWN CCS | CKD | DATE 7/31/03 | SCALE NTS | REV 1

A SHEET SIZE | Y F C | DWN CCS 4/4/05 | CKD

DRAWING NO. 15635-00-001

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



* LISTED FOR REPLACEMENT ONLY

	ITEM	QTY	DESCRIPTION/PART NUMBER	PART NAME
⚠	17	1	G0007201	SPRING PLUNGER
*	16	4	15628-14-001	SPACER
	15	2	16182-01	SHIPPING LUG ASSEMBLY
	14	1	16001-00	HANDLE CLIP MOUNTING ANGLE
	13	12	OTCB-25X100X38	ELEVATOR BOLT
	12	2	G0004582	BOLT (1"-8 X 3 1/2 SS)
	11	2	G0004581	NUT (1" THIN NYLOC)
	10	1	G0003626	HANDLE GRIP
	09	1	15941-01	HANDLE ASSEMBLY
	08	1	G0005177	HANDLE CLIP
*	07	2	15628-12-001	ANGLE INDICATOR ARROW
	06	1	15628-05-001	UPRIGHT SHAFT (LH)
	05	1	15628-04-001	UPRIGHT SHAFT (RH)
	04	1	G0005164	MECHANICAL JACK
	03	1	15628-03-001	UPPER CROSS ASSEMBLY
	02	1	15628-02-001	LOWER CROSS ASSEMBLY
	01	X	15637-01-001	AWD ASSEMBLY COMPLETE

EB	DEPT.
M	1abc, 2bc, 4a

GA: **15617-00-001**

REV	CHANGE	CKD	DATE
1	ADDED ITEM 17.	CCS	2/16/06

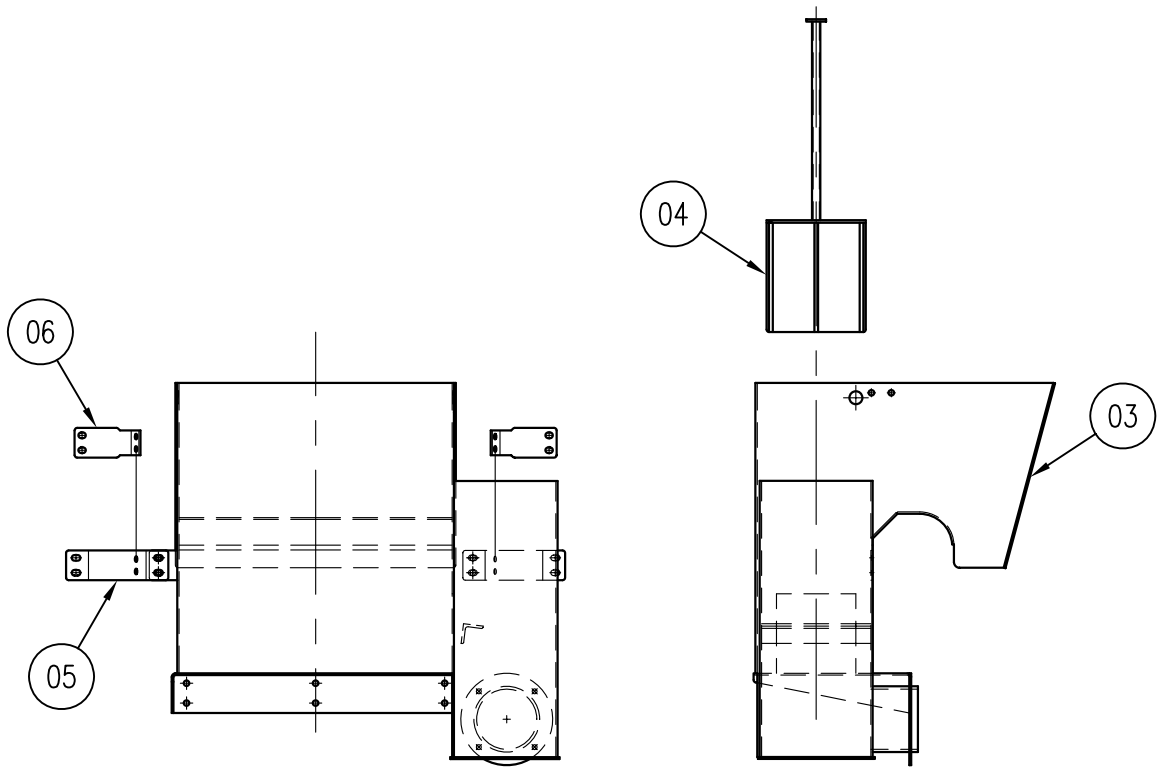
TITLE: AWD PARTS LIST
FC-313M

DWN CCS | CKD | DATE 7/31/03 | SCALE NTS | REV 1

B | SHEET SIZE | Y | F C | DWN CCS 3/31/05 | CKD

DRAWING NO. 15637-00-001

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



QTY		ITEM	PART NUMBER	DESCRIPTION /PART NAME
2		06	16181-05	STABILIZER ANGLE
2	2	05	16181-02	STABILIZER BRACKET
1	1	04	16171-01	BYPASS CLOSE-OFF
1	1	03	15629-01-001	BYPASS FEEDER
X		02	15636-02-001	BYPASS FEEDER ASSEMBLY (CONE PACKAGE)
	X	01	15636-01-001	BYPASS FEEDER ASSEMBLY (STANDARD)

EB	DEPT.
M	1abc, 2bc, 4a

GA: **15617-00-001**

REV	CHANGE	CKD	DATE

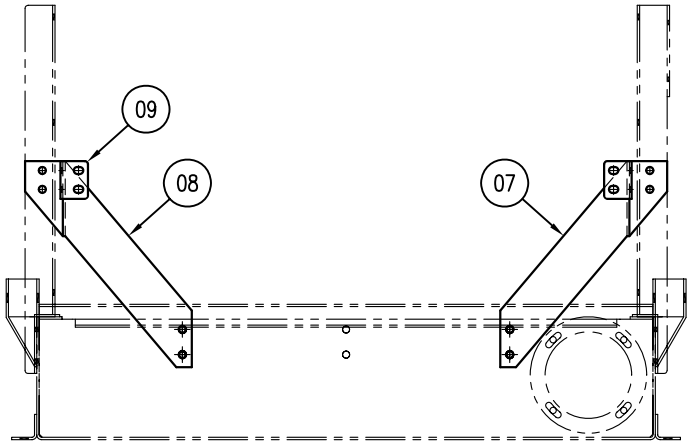
TITLE: BYPASS FEEDER PARTS LIST
FC-313M

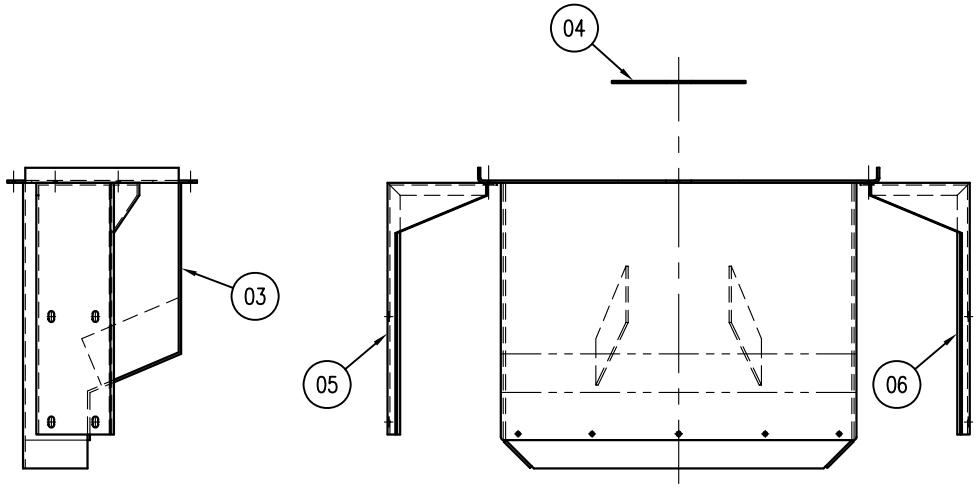
DWN CCS | CKD | DATE 7/31/03 | SCALE NTS | REV

A SHEET SIZE | Y F C | DWN CCS 4/4/05 | CKD

DRAWING NO. 15636-00-001

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





2		09	16181-06	STABILIZER ANGLE
1	1	08	16181-04	STABILIZER (LH)
1	1	07	16181-03	STABILIZER (RH)
1	1	06	15627-02-001	FEEDER LEG (LH)
1	1	05	15627-01-001	FEEDER LEG (RH)
	1	04	16181-01	COVER
1	1	03	15708-01-001	BOX FEEDER
X		02	15712-02-001	BOX FEEDER ASSEMBLY (CONE PACKAGE)
	X	01	15712-01-001	BOX FEEDER ASSEMBLY (STANDARD)
QTY		ITEM	PART NUMBER	DESCRIPTION /PART NAME

REV	CHANGE	CKD	DATE
1	ADDED ITEM 09.	CCS	5/11/05

TITLE: BOX FEEDER PARTS LIST
FC-313M

DWN CCS | CKD | DATE 10/21/03 | SCALE NTS | REV 1

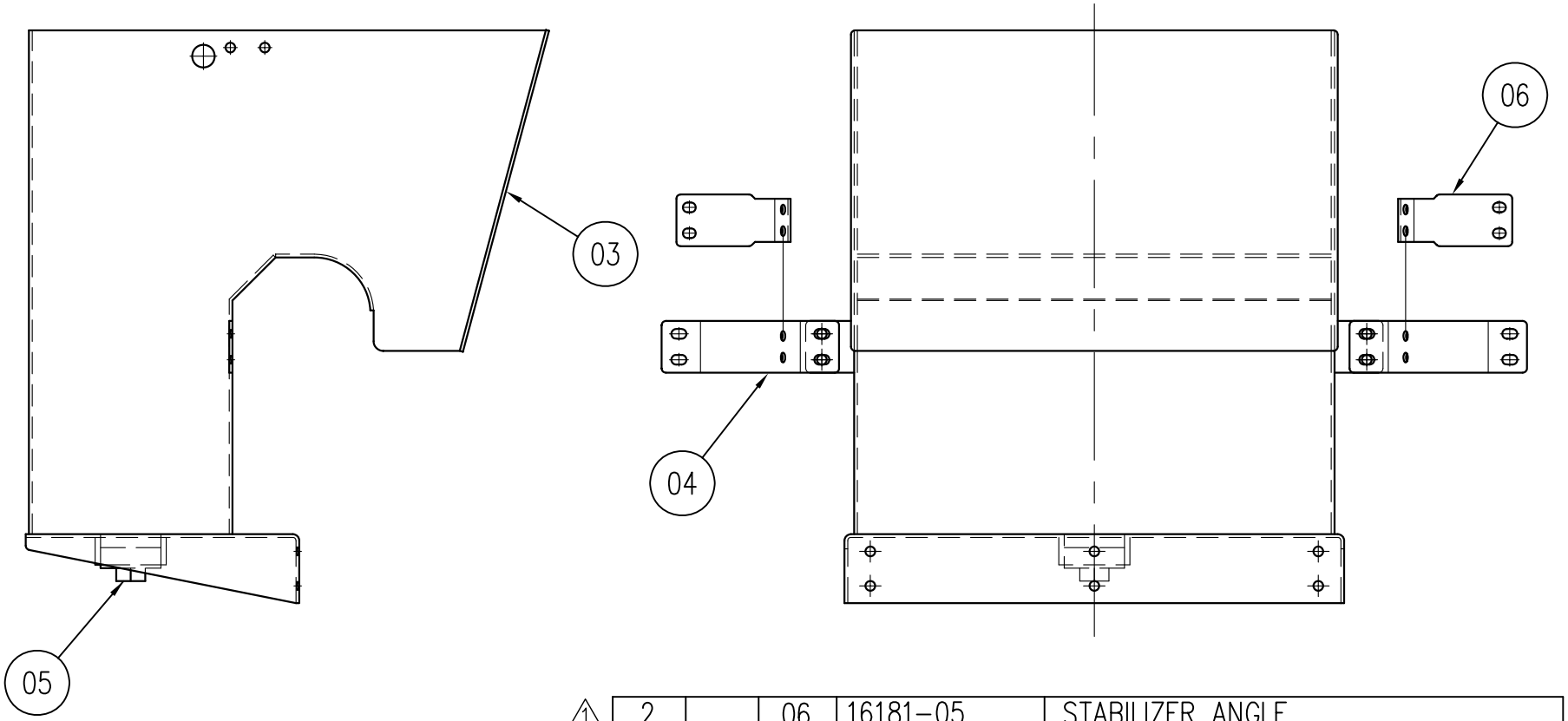
SHEET SIZE B | F C Y | DWN CCS 3/31/05 | CKD

DRAWING NO. 15712-00-001

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

EB	DEPT.
M	1abc, 2bce, 4a

GA: **15617-00-001**



	QTY	ITEM	PART NUMBER	DESCRIPTION /PART NAME
	2	06	16181-05	STABILIZER ANGLE
	1	05	SHPP-300	CLEAN-OUT PLUG
	2	04	16181-02	STABILIZER BRACKET
	1	03	15630-01-001	WEIR FEEDER
1	X	02	15713-02-001	WEIR FEEDER ASSY (CONE PACKAGE)
	X	01	15713-01-001	WEIR FEEDER ASSY (STANDARD)

EB	DEPT.
M	1abc, 2bce, 4a

GA: **15617-00-001**

REV	CHANGE	CKD	DATE
1	ADDED ASSEMBLY 02; ADDED ITEM 06.	CCS	5/11/05

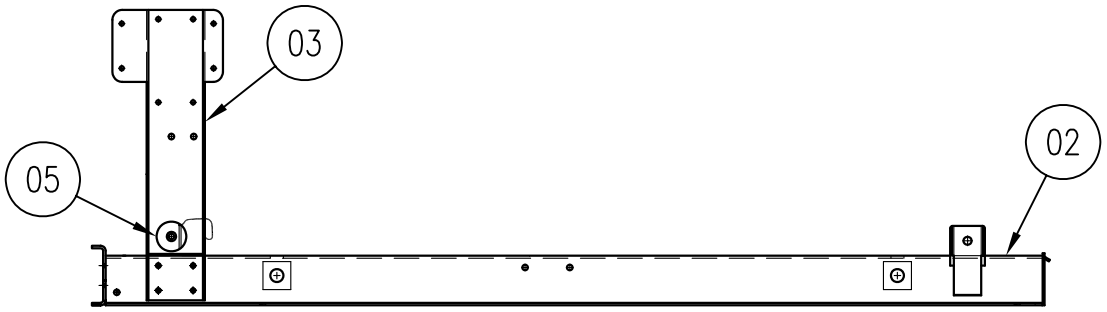
TITLE
PARTS LIST
WEIR FEEDER FOR FC-313M

DWN WS | CKD | DATE 10/22/03 | SCALE NTS | REV 1

A SHEET SIZE | Y F C | DWN CCS 4/4/05 | CKD

DRAWING NO. 15713-00-001

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



QTY	ITEM	PART NUMBER	DESCRIPTION /PART NAME
2	05	16182-01	SHIPPING LUG ASSY
1	04	16159-02	FLOAT MOUNT UPRIGHT (LH)
1	03	16159-01	FLOAT MOUNT UPRIGHT (RH)
1	02	14806-01-002	SUPPORT STRUCTURE
X	01	16173-01	SUPPORT STRUCTURE ASSY

EB	DEPT.
M	1abc, 2bc, 4a

GA: **15617-00-001**

REV	CHANGE	CKD	DATE

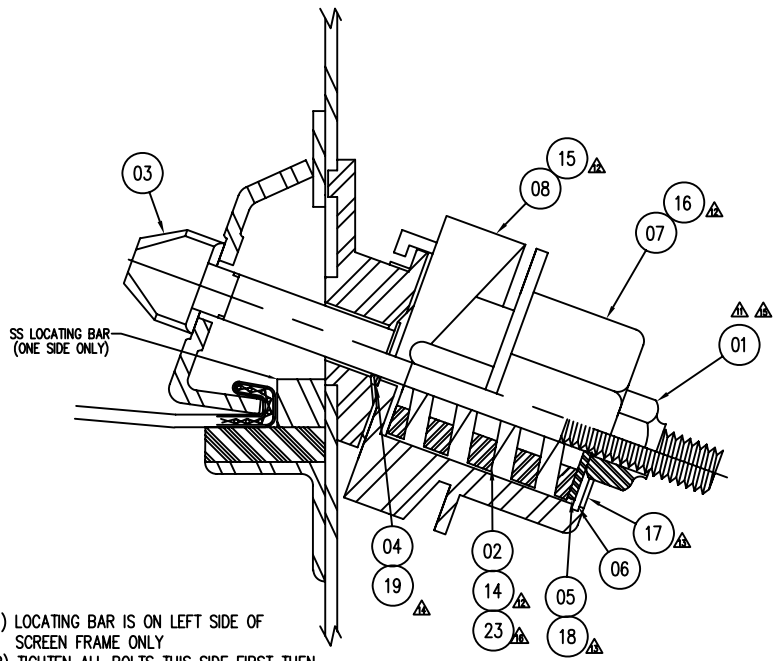
TITLE: SUPPORT SRUCTURE PARTS LIST
FC-313M

DWN CCS | CKD | DATE 4/4/05 | SCALE NTS | REV

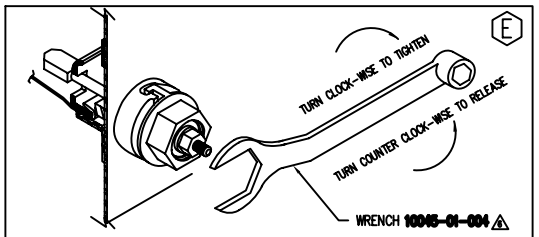
A SHEET SIZE | Y F C | DWN | CKD

DRAWING NO. 16173-00

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



NOTES:
1) LOCATING BAR IS ON LEFT SIDE OF SCREEN FRAME ONLY
2) TIGHTEN ALL BOLTS THIS SIDE FIRST THEN, ENGAGE OTHER DRAW BAR
3) BOLTS SHOULD BE TIGHTENED AT CENTER OF DRAW BAR FIRST – THEN ALTERNATE TO ENDS



OPERATION INSTRUCTIONS

1) INSTALL SCREEN PANEL & DRAW BAR ON BED SECTION
2) INSTALL RAMP-LOK ASSEMBLY
3) WRENCH PART 07 UNTIL IT IS TOTALLY ENGAGED ON PART 08 (PRELIMINARY SPRING TENSION SET BY PART 01 SHOULD ALLOW APPROXIMATELY 1/2" OF FREE TRAVEL ON PART 08 BEFORE COMPRESSION OF SPRING OCCURS)
4) AFTER ENGAGING RAMP-LOK ASSEMBLY, FINAL TENSION CAN NOW BE SET BY ADJUSTING PART 01 UNTIL PART 05 IS RECESSED INTO PART 07 APPROXIMATELY 1/4"
5) FOLLOW MAINTENANCE SCHEDULE IN MANUAL FOR SERVICING RAMP-LOK ASSEMBLY (NOTE-PART 01 SHOULD NOT HAVE TO BE ADJUSTED EACH TIME RAMP-LOK ASSEMBLY IS ENGAGED OR DISENGAGED, BUT PERIODIC CHECKS SHOULD BE MADE

DASH	REQUIRED							PART NAME	DESCRIPTION/PART NUMBER
23						1		238LB SPRING	G0003891
22	1					X		238LB SPRING HOUSING ASSEMBLY	9744-22
21	X							238LB RAMP-LOK ASSEMBLY	W/BRASS NY-LOC
20		X						470LB RAMP-LOK ASSEMBLY	W/BRASS NY-LOC
19		1						O-RING	G0001737
18			1					FLAT WASHER	1.50X.656X.075
17	1	1		1			1	FLAT WASHER	WFSS-50-SAE
16			1					SPRING HOUSING W/NUT	12558-01
15				1				LOCKING RAMP	12558-02
14			1					135LB SPRING	PP1395
13			X	1				135LB SPRING HOUSING ASSY	9744-13
12				X				135LB RAMP-LOK ASSY	W/BRASS NY-LOC
11									
10		1			X		1	470LB SPRING HOUSING ASSY	9744-10
09									
08	1	1					1	LOCKING RAMP	9058-03-001
07					1	1		SPRING HOUSING W/NUT	9058-01
06			1		1	1		SNAP RING	N5000-156-H
05					1	1		FLAT WASHER	1.50X.563X.075 SEE Ⓔ
04	1			1			1	"O" RING	4488-00
03	1	1		1			1	DRAW BOLT	9753-01
02					1			470LB SPRING	9752-00
01	1	1		1			1	NY-LOC NUT LT HLF HGT BRASS	G0003654
00							X	470LB RAMP-LOK ASSEMBLY	W/BRASS NY-LOC

REV	CHANGE	CKD	DATE
16	ADDED ASSY 21 & 22, ADDED ITEM 23 UPDATED DESCRIPTION OF ITEMS-02 & 14	RGD	02/05/01
15	DELETED ASSY 09, ITEM 20,12 & 00 WAS W/STAINLESS STEEL NUT, DELETED ITEM 11 ITEM 01 WAS NNLS-50-13-MHLT, ASSY 13 DELETED ITEM 17	RGD	10/23/00
	OPERATING INSTRUCTION 3 & 4 WAS 01/11 SEE REVISION LAYER AND RECORD COPY FOR REVISIONS 1-14		

TITLE: RAMP-LOK SCREEN TENSIONING ASSEMBLY

DWN GAK | CKD | DATE 12/4/90 | SCALE NTS | REV 16

SHEET SIZE B | F C Y | DWN | CKD

DRAWING NO. 9744-00

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

SH, PC

EB ABEF | DEPT. 1b, 2a, 4g

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.

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

(J:\ENG\DOCS\Conformance\2\. . .

SHIPPING FINAL INSPECTION AND RUN TEST CERTIFICATE

Equipment: High Speed Vibratory Screening Equipment

Model: Series: C, E, EX, F, FX, J, K, KX, L, LX, M, MX, RX, SG, SGX, SG2X, T, T2, TX

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

CERTIFICATE OF QUALITY

Equipment: High Speed Vibratory Screening Equipment

Model: Series: C, E, EX, F, FX, J, K, KX, L, LX, M, MX, RX, SG, SGX, SG2X, T, T2, TX

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

CERTIFICATE OF ORIGIN

Equipment:	High Speed Vibratory Screening Equipment
Model:	Series: C, E, EX, F, FX, J, K, KX, L, LX, M, MX, RX, SG, SGX, SG2X, T, T2, TX
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

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.

Notes:

Notes:

Notes:

Notes:

Notes:

Notes: