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HH Model 5500 BrakeSmart™ Centrifuge Operations Manual

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5500 BRAKESMART™ DECANTING CENTRIFUGE OPERATIONS MANUAL

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SECTION I

INTRODUCTION

OVERVIEW
HUTCHISON HAYES MODEL 5500 BRAKESMART™ CENTRIFUGE

This Service Manual describes the centrifuge, and lists instructions for the installation, operation, and maintenance requirements.

The basic purpose of this centrifuge is to separate the liquid and solids from the fluid feed (slurry.)

A stainless steel rotating bowl, driven by a 60 H.P. electric motor is used to centrifuge the slurry; that is to sling the solids against its inside wall surface while a stainless steel screw conveyor (faced with hard tiles) gathers and conveys these solids to a central discharge area.

The conveyor drives at a slightly slower RPM through a planetary gear reducer.

The liquids migrate to the front end of the machine and are dispelled through four (4) adjustable plate dam openings, to a central discharge area.

For a more comprehensive description of how the centrifuge operates, see the Operation Section of this manual.

MODEL 5500 BRAKESMART™ DECANTING CENTRIFUGE

DATA

Normal Bowl Centrifugal Force:	2118 G's
Normal Bowl Operating Speed:	3053 RPM
Normal Conveyor Operating Speed:	3022 RPM
Max. Bowl Centrifugal Force:	3110 G's
Max. Bowl Operating Speed:	3700 RPM
Max. Conveyor Operating Speed:	3663 RPM
GB-100 Gear Unit	
Max. Output Shaft Torque:	36,000 LB. IN.
Max. Pinion Shaft Torque:	363.6 LB. IN.
Ratio:	99.28 :1
Differential Speed:	31 RPM
Motor Speed:	1750 RPM
Motor Sheave:	14" O.D.
Centrifuge Sheave:	8.025" O.D.
Rated Solids Output:	12,000 LBS./HR.
	35.500 (MAX.)
Bowl Inside Diameter:	16 IN.
Bowl Length:	55.56 IN.
Package Weight Empty: (Floormount Unit)	7,365 LBS.

OILFIELD MODEL (SKID MOUNTED)

Normal Bowl Centrifugal Force:	2118 G's
Normal Bowl Operating Speed:	3053 RPM
Normal Conveyor Operating Speed:	2996 RPM
Max. Bowl Centrifugal Force:	3110 G's
Max. Bowl Operating Speed:	3700 RPM
Max. Conveyor Operating Speed:	3630 RPM
GB-53 Gear Unit	
Max. Output Shaft Torque:	36,000 LB. IN.
Max. Pinion Shaft Torque:	679 LB. IN.
Ratio:	53 :1
Differential Speed:	57 RPM
Bowl Dimensions:	Same as Above
Package Weight Empty: (Approx.)	8,000 LBS.

SECTION 2

START-UP

SAFETY

Because the 5500 BrakeSmart™ Centrifuge is a high-speed, high-torque piece of rotating machinery, ***caution*** should be exercised by operating personnel.

HH recommends operating personnel review the centrifuge manual ***before*** working with the equipment.

Periodic safety meetings to familiarize new operating personnel with the centrifuges characteristics are also recommended.

This manual is intended for use by ***qualified operators*** familiar with processing equipment and trained for this particular centrifuge.

Maintenance personnel should be experienced mechanics.

Electricians should be licensed, qualified personnel familiar with electrical safety procedures.

CAUTION

Persons without recommended experience may not understand the instructions listed in this manual

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A. GENERAL

1. Read all manuals and instructions before attempting to install or operate equipment, and follow all recommendations.
2. Follow all lubricating and/or greasing procedures and schedules recommended in the equipment instructions.
3. If nameplates are lost, damaged, or removed, replace them. They have been affixed to the equipment to provide warnings, instructions, etc., for the maintenance and operating personnel.
4. Do not operate belt driven or chain driven equipment without guards. If equipment was purchased without guards, user is responsible for providing proper guards that meet all applicable codes.
5. Make periodic checks for loose bolts on rotating assemblies, the supporting structure, covers, hatches, guards, and piping connections.
6. Do not operate equipment if excessive vibration or abnormal noise develops.
7. If the equipment is supplied with covers or guards, do not remove these until the equipment has come to a complete stop.
8. Never operate equipment with parts that have not been manufactured or approved by the original equipment manufacturer.

B. HANDLING

1. Safe practices for lifting and handling equipment should be followed. Hoists and slings should be of adequate capacity, inspected regularly, and in good repair.

2. Always use extra caution when lifting, moving, or holding worn parts, since these may be sharp, slippery, or weakened. Never place hands, feet or head at possible pinch points.
3. Always provide a sufficiently large cleared area around the equipment during maintenance.

C. ROTATING EQUIPMENT

1. Do not exceed the maximum speed, process material specific gravity, process pressure or temperature, or maximum design feed rate as specified on the equipment nameplate or within the operating manual.
2. Do not use a pipe wrench on any part of the rotating equipment.
3. Do not interchange parts that have been balanced as an assembly.
4. Do not attempt to utilize the rotating equipment in an application for which it was not originally selected.
5. When taking samples or removing any material from equipment like grinders, screw conveyors, open throat pumps, etc., make sure all machine components are at rest and the power is shut off with the disconnect switch locked in the off position.
6. Do not get rags, loose clothing, sticks, etc., near rotating or moving parts.
7. The equipment must coast to a complete stop. Do not brake it by hand or in any other way force it to stop, unless it is equipped with a braking mechanism supplied by the original equipment manufacturer.
8. Do not operate the rotating equipment unless the direction of the rotating part or assembly conforms to that of the Instruction and/or Operation Manual.
9. If a rotating assembly must be turned by hand, use caution: Avoid sharp edges and close areas where fingers may be cut or trapped (example: pulleys).

D. PUMP

1. If positive displacement pumps are used in the process be sure the discharge line is unobstructed before starting the pump.
2. In plants using any type of grinder with the discharge directly connected to a pump, be sure that the pump is in operation before putting any product into the grinder.
3. Do not run a positive displacement pump dry.

E. EXPLOSION PROOF EQUIPMENT

1. Do not operate equipment driven by an explosion-proof motor and control until all seal fittings are properly sealed with recommended fiber or compound, and tagged.
2. Never use abrasive material or a file to remove corrosion from explosion-proof equipment.
3. Cover screws and bolts used to hold explosion-proof joints together must always be tight, and only of the type and material recommended by the manufacturer.

F. MOTOR

1. Do not neglect to check that the line voltage applied to the motor controller is the same voltage for which the motor is wired.
2. Always follow motor manufacturer's specifications on bearing lubrication.
3. Do not attempt to operate a motor that is overheated due to frequent starts and stops. Allow the motor to cool to ambient temperature (as designated on the motor nameplate) before each restart.

G. ELECTRICAL (General)

1. Install and ground all equipment (permanent and portable) in accordance with requirements of the National Electric Code and local electric codes.
2. Use circuit breakers or fused disconnects between equipment and power source.
3. Never touch electrical components with wet hands or when standing on a wet surface. Insulate yourself from ground and use insulated tools.
4. When handling electrical equipment, take care to avoid contacting live parts. Assume all circuits are live. Check with a voltmeter.
5. Label all control circuits clearly.
6. Keep electrical controls and motors clean and free of dust – dust prevents thorough air circulation, generating heat; heat in turn can ignite the dust or flammable vapors if present in the atmosphere.
7. Never wash electrical equipment unless it is constructed for that purpose. Never wash live electrical equipment.

H. ELECTRICAL (Repairs)

1. Only qualified personnel, familiar with electrical safety procedures and the construction and operation of the equipment, should work on electrical equipment.
2. De-energize all power before opening any electrical enclosure, or before connecting and disconnecting test equipment and components. Provide a safety lockout at the power source.
3. Use only approved safety rubber gloves and mats, insulated tools, and eye shields when doing electrical work.
4. Periodically inspect and operate all of the automatic shut-off devices and monitoring systems provided.
5. On DC powered equipment, do not perform any inspection (mechanical or electrical) until the power has been turned off and disconnected, and all rotating assemblies have come to a complete stop. The moving motor may generate DC voltage feed back.

I. CHEMICALS

1. If corrosive and/or toxic chemicals or solvents are used as part of the process or as cleaning materials: become thoroughly familiar with the properties of the products and their hazards, the precautions necessary to handle the product

safely, and follow all manufacturer recommendations for the type of product being handled.

a. Use in well ventilated area and keep employee exposure below permissible limits.
b. If flammable, take care to prevent fire or explosion.
c. Avoid contact with the skin and eyes – wear goggles, gloves, shields, etc., as required by the nature of the solvent or chemical.

2. If in doubt whether a product is dangerous or not – Assume It Is. Take all necessary precautions to avoid personal injury.

J. VENTILATION

1. Toxic fumes, if present in the system, must not be permitted to escape to the operating area. They should be adequately vented away form the worker in accordance with applicable environmental regulations.
2. If in doubt whether any vapor is toxic or not – Assume It Is. Take all necessary precautions to avoid personal injury or adverse health effects. Worker exposure should be maintained below the permissible limit and at the lowest feasible level.
3. If it is necessary to enter an area where toxic vapors are present, consult with responsible authorities for recommendations concerning safety.
4. Use NIOSH approved breathing apparatus when working with toxic or hazardous materials, or with materials that reduce the oxygen concentration in the air, such as carbon dioxide.

K. COMBUSTIBLE PRODUCTS

1. If combustible products are used as part of the process or as cleaning products, become thoroughly familiar with the safety precautions necessary to handle the product. Follow all recommendations to avoid personal injury or property damage that could be caused by fire or explosion.

L. PRESSURE VESSELS

1. Vessels operating under internal pressure should be maintained and inspected in accordance with the manufacturer instructions and/or applicable local or state codes. If corrosion or erosion is expected, frequency of inspection should be increased. Qualified personnel should make all necessary repairs.
2. Vessels operating under internal pressure should be provided with a safety device to relieve excess pressure in accordance with the Unfired Pressure Vessels Code.
3. Safety devices should be in good operating condition at all times. It is recommended that they be inspected and tested frequently and maintained in accordance with manufacturer instructions and/or applicable local and state codes.

4. If any repair on a safety device is necessary, return it to the manufacturer. Inexperienced personnel should never attempt repair. Any adjustment should be made according to the recommendations supplied by the manufacturer.
5. The outlet connections of all safety devices should be installed in a manner that will not cause injury to personnel should discharge or actuation occur.
6. Before attempting maintenance on pressurized equipment, reduce internal pressure to atmospheric pressure.

M. HOT / COLD PRODUCTS

1. When working with very hot or very cold processes or products, extreme caution should be used to avoid personal injury.

N. LEAKAGE AND SPILLAGE

1. Any leakage in the system should be quickly corrected.
2. Any type of spillage (oil, water, etc.) should be quickly cleaned off floors, walls, equipment, lines, etc., and the entire operating area kept clean.

O. DANGEROUS MATERIAL APPLICATIONS

HH makes both standard equipment and equipment furnished with certain explosion-proof accessories (motor, controls, etc.), as specified by the purchaser. Standard equipment not furnished with explosion-proof accessories must never be used with explosive, chemically unstable, or flammable materials of any kind. Severe personal injury or property damage could result. When we supply equipment furnished with explosion-proof accessories, whether we are the manufacturer or not, we warrant that the particular accessories we describe as explosion-proof comply with accepted industry standards for that term. However, this does not mean, and we cannot and do not guarantee, that one of our machines furnished with explosion-proof accessories is safe for use with explosive, chemically unstable, or flammable materials under ALL conditions.

In some instances, it may be necessary for the user to equip the machine with safety devices not ordinarily placed on equipment of this type. In other cases, the application may be so hazardous that the only prudent operating procedure is to isolate the equipment in an expendable building and operate it by remote control from a safe distance. Because HH has no control over these potential dangerous operating conditions, we do not guarantee that equipment made by us can be safely used with explosive, chemically unstable, or flammable materials, regardless of whether we installed industry accepted explosion-proof accessories. The user has the responsibility for insuring that all precautions required by his particular method of operation have been taken.

P. REPAIRS

1. Do not make mechanical or electrical repairs or attempt disassembly unless the equipment has come to a complete stop, the power is shut off, and a safety lockout or other padlock is installed on the disconnected circuit. The locking device should be tagged to identify the working party.

2. Do not make any repairs until dangerous vapors and gases are replaced with clean air.
3. HH should be consulted before attempting to make major repairs to any of the rotating equipment we manufacture. Under no circumstances should weld repair or other alterations be made to major rotating components without the full knowledge and assistance of qualified Manufacturer personnel. Failure to obtain this assistance may result in rupture of parts involved with possible injury to personnel or damage to equipment.
4. Repairs to hard-surfaced parts must be performed with strict quality control of materials and methods. Hard-surfacing materials are brittle, and can break off if improperly applied. After startup, periodic inspection of these parts is necessary to anticipate separation of materials.
5. During repairs, when equipment may be physically or electronically unstable, post barriers or signs announcing hazardous conditions.
6. After repairs and before restarting, reinstall all guards and reconnect all mechanical and electrical safety devices.

Q. CORROSION, EROSION, AND PITTING OF ROTATING EQUIPMENT

1. To insure a high factor of safety under severe operating conditions, high speed rotating equipment manufactured by HH is designed after a careful stress analysis has been made of highly stressed parts. A thorough control of metallurgical properties is maintained throughout manufacture, and all material is warranted as free of defects at time of shipment.
2. It should be noted that equipment subjected to severe erosive or corrosive environment could deteriorate over a period of time, depending on the severity of the exposure and/or possible misuse. Users of high speed rotating equipment should be aware of the fact that extremely high forces are brought into play when their equipment is in operation. Any weakening of highly stressed members by misuse, erosion, corrosion, chemical pitting, or stress cracking must be guarded against to prevent possible metal failure.
3. In the interest of longer and safer operation of the equipment, HH recommends that the equipment owner maintain a periodic (at least monthly) inspection on highly stressed rotating and/or moving parts which are subjected to erosive or corrosive wear.
4. The following points should be noted and the recommended action taken:

    a. Do not operate equipment when:

    1. Holes are wearing through rotating and/or moving parts.
    2. Grooves greater than 1/16” deep are worn in rotating and/or moving parts.
    3. Evidence of cracks is present, especially in rotating and/or moving parts.
    4. Chemical pitting of 1/16” depth or greater on rotating and/or moving parts.
    5. Component surfaces are covered with a light corrosion or etching.

    b. Chemical pitting is observed:

All cases of chemical pitting, even less than 1/16” depth, should be watched carefully. This pitting action is almost always due to the breakdown of the passive film on stainless surfaces in the presence of chlorides. This often occurs under product cake that has not been sufficiently cleaned from the surface. High temperature, low pH, and high acidity accelerate the pitting action.

5. Contact HH regarding the repair or replacement of rotating and/or moving parts whose surface is noticeably pitted.

INSTALLATION

Location

a. Install the centrifuge unit in a location where sufficient headroom is allowed for lifting the bowl out of its' frame enclosure.
b. A 2-ton overhead hoist should be installed to facilitate inspection or repair work.
c. A clear area in the vicinity of the centrifuge should be provided to set the bowl during inspection or repair.
d. Room should be allowed at the ***front end*** of the machine for withdrawing the planetary gearbox. A zone approximately 2'0" wide x 2' 6" long from the front end of the gearbox should be kept clear.
e. Room should be allowed at the ***rear end*** of the machine for withdrawing the feed tube. A zone approximately 6" wide x 3' 0" long from the end of the feed tube support clamp should be kept clear.
f. Clear access space should be provided around the centrifuge.
g. The centrifuge isolators should set on a smooth level surface on structural members of sufficient strength.

IMPORTANT CAUTION

Since this centrifuge operates at high speed and is subjected to severe wear conditions, it is important that any indications of weakening of highly stressed components be recognized before a failure can occur.

To facilitate this HH recommends a ***monthly*** visual inspection on highly stressed components, such as:
Bowl
Shafts wear plates
Wear tiles
Conveyor, etc.

If inspection reveals:
1. Holes worn through moving parts
2. Wear grooves greater than 1/16" thick in moving parts
3. Cracks present is moving parts
4. Chemical pitting to a depth of 1/16" or greater in moving parts

DO NOT OPERATE THE EQUIPMENT UNTIL REPAIRS ARE MADE

FAILURE TO FOLLOW THE ABOVE RECOMMENDATIONS MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE

PIPING

1. Customer piping tie-ins to the centrifuge should be made with flexible connections.

2. Customer tie-in at feed tube should have a suitable pipe support so that no weight is imposed on the centrifuge feed tube.

   A flexible connection is required here.

3. A flush line should be provided at the feed tube tie-in. HH recommends hot water.

   A ball valve should be located as close as possible to the feed line to prevent plugging the flush branch with solids.

4. Use a screen at the pump suction to protect the pump and centrifuge from oversize solids.

5. Liquid discharge lines should have a minimum of ¼ " per ft. slope.

6. HH recommends installation of a pressure indicator in the feed line upstream of the customer tie-in to regulate the feed supply to the centrifuge.

PRESTART SAFETY PRECAUTIONS

FAILURE TO FOLLOW THE RECOMMENDED SAFETY PRECAUTIONS LISTED BELOW MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE

Read through this entire list before attempting start-up

Initial Installation

1. The correct bowl rotation must be verified. The bowl should rotate counter-clockwise when viewed from the gear box end (front of centrifuge) looking inboard.

2. The Back Drive should rotate clockwise when viewed from the Gearbox end in the forward run direction.

3. The drive group enclosure guard, the gearbox shroud and the back drive belt guard must be secured in place.

4. Check to see that the centrifuge unit is clear of rags, ropes, wires, or any other material which could catch or snag rotating parts.

5. All bolts and capscrews must be engaged per recommended torque requirements shown in Charts 1 and 2 at the end of this section.

6. All rings and seals should be in good condition and securely fastened.

7. The centrifuge cover should be tightly secured.

8. The frame bolts should be fully tightened.

9. Check all lubrication points. (See Lubrication Section)

10. Verify that all seal fittings at explosion-proof motor and control are sealed with CHICO X Fiber and/or sealing compound.

11. The drive belt should be checked for correct tension. *Caution:* Over tightening belts can damage the fluid coupling. (See Figure 1 at the end of this list.)

12. Electrical grounding straps must be secured in place, where required.

13. Maximum Speed, specific gravity, or pressure, indicated on the centrifuge name plate is not to be exceeded.

14. No work is to be performed on the electrical system unless the power is shut-off.

15. Check the line voltage on initial start-up to ascertain that the voltage applied to the motor controller is the same voltage that the motor is wired for.

16. If excessive vibration is present during start-up, shut the unit down immediately and notify HH service representative.

17. Do not replace any damaged or worn out ***Machine Parts*** with other than HH replacements.

18. The customer may replace ordinary wear parts such as oil seals, o-ring and gaskets. A replacement list is in the Parts List Section.

19. Do not open the cover or attempt removal of a shroud or belt guard until the centrifuge is motionless.

20. Use the correct tools for any assembly or disassembly work.

21. Do not supply slurry into the centrifuge until the unit is fully up to normal operating speed.

22. If more than one (1) centrifuge is in operation, never attempt to exchange any machined parts.

23. Never use a pipe wrench on any part of the centrifuge.

24. There is a slow down period as the machine decelerates towards shut-down. Leave the cover shut until the centrifuge is motionless. Do not attempt any disassembly before the machine is static.

25. Never prop the centrifuge cover partially open by using blocks of wood or any other foreign object.

IMPORTANT CAUTION

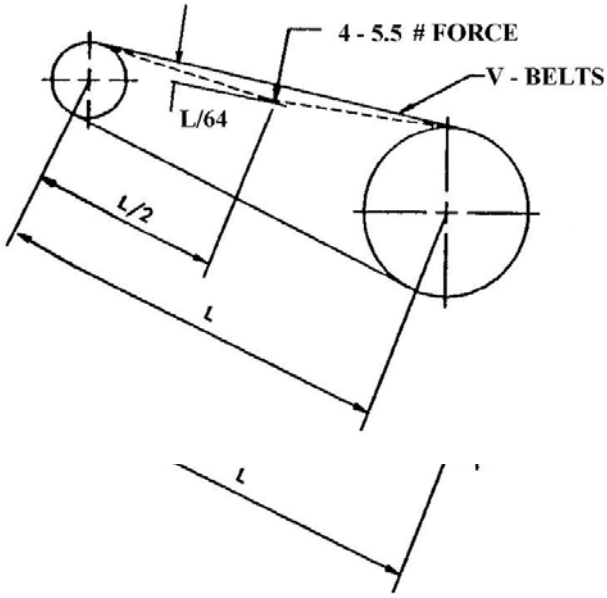
26. Whenever the centrifuge cover is opened for cleaning, inspection, etc., the one (1) hinge safety pin must be engaged to prevent accidental closing of the cover, this procedure should ***always*** be followed.

27. Flexible connections should be used at all customer piping tie-ins.

28. Do not attempt any repairs to the gearbox at the front of the machine beyond replacement of the pinion shaft oil seal.

5500 BRAKESMART™ CENTRIFUGE
BELT TENSIONING PROCEDURE

FIGURE 1.



Remove Belt Guard

Measure Distance "L" in inches.
Divide by 64.
Force required to deflect belt = 4 to 5.5 Lbs.

Caution:
Do not over-tighten belts

Do not over-tighten belts

5500 BrakeSmart™
(High Speed Mode for Low Density Fluids)
Start-Up Procedure

1. Read through Pre-Start Safety Precautions.

2. Turn main breaker on the control panel to the 'On' position. Pull out the emergency stop button. (Power light should be illuminated.)

3. Select the off position on the back drive start button.

4. Press the main drive start button. (The centrifuge bowl will reach full speed in approximately ninety (90) seconds.)

5. Select the conveyor speed by turning back drive selector switch to:
   a) Reverse = 55 rpm (dryer solids discharge, but higher torque can cause plugging.)
   b) Off = 58 rpm (highest solids through put, but wetter solids .)
   c) Forward = not available in high-speed mode.

6. Start feed pump at minimum speed.

7. Increase to desired flow rate.
   Note: If operating in the reverse mode, the torque value is displayed on the control panel as 0 – 100%. Do not exceed 100% torque, or the autoguard will trip and shut the unit down. No value is displayed when the back drive selector switch is on the off position.

8. Take samples of the liquid and solids discharge for analysis to justify further adjustments.

(High Speed Mode for Low Density Fluids)
Shut Down Procedure

1. Reduce feed rate to minimum, then press the feed pump stop button.

2. Select off on the back drive selector switch.

3. Open the flush valve on the feed inlet pipe and flush with appropriate fluid until liquid discharge comes out clear. Then turn off flush valve.

4. Press the centrifuge main drive stop button. Wait for bowl to come to rest.

5. Turn back drive selector switch to the forward position for two (2) minutes.

6. Turn back drive switch to the off position.

5500 BrakeSmart™
(Low Speed Mode for High Density Fluids)
Start-Up Procedure

1. Read through Pre-Start Safety Precautions.

2. Turn main breaker on the control panel to the 'On' position. Pull out the emergency stop button. (Power light should be illuminated.)

3. Select the off position on the back drive start button.

4. Press the main drive start button. (The centrifuge bowl will reach full speed in approximately ninety (90) seconds.)

5. Select the conveyor speed by turning back drive selector switch to:
   a) Reverse = 15 rpm (not recommended.)
   b) Off = 38 rpm (dryer solids discharge, but higher torque can cause plugging.)
   c) Forward = 60 rpm (highest solids throughput, but wetter solids.)

6. Start feed pump at minimum speed.

7. Increase to desired flow rate.
   Note: If operating in the reverse mode, the torque value is displayed on the control panel as 0 – 100%. Do not exceed 100% torque, or the autoguard will trip and shut the unit down. No value is displayed when the back drive selector switch is on the off position.

8. Take samples of the liquid and solids discharge for analysis to justify further adjustments.

(Low Speed Mode for High Density Fluids)
Shut Down Procedure

1. Reduce feed rate to minimum, then press the feed pump stop button.

2. Select off on the back drive selector switch.

3. Open the flush valve on the feed inlet pipe and flush with appropriate fluid until liquid discharge comes out clear. Then turn off flush valve.

4. Press the centrifuge main drive stop button. Wait for bowl to come to rest.

5. Turn back drive selector switch to the forward position for two (2) minutes.

6. Turn back drive switch to the off position.

SECTION 3

OPERATION

OPERATION

The slurry to be separated is pumped into the feed tube, axially located at the rear of the machine.

The slurry is directed into a feed chamber where it is dispersed by four (4) externally mounted feed nozzles and directed by centrifugal force along and against the inside wall of the bowl.

This ring of slurry or "pond" will contain solids against the bowl wall. These solids are scrolled forward over a "beach area" by the screw conveyor and discharged through four (4) ports at the solids end of the centrifuge located in the rear.

The lighter liquids migrate forward and are discharged through four (4) adjustable plate dam nozzles at the liquids discharge area located at the front end of the centrifuge; i.e. the gearbox end.

BRAKESMART™ OVER TORQUE PROTECTION

A TORQUE CONTROL DEVICE is located at the front of the gearbox referred to as an Autogard coupling. If a predetermined torque limit on the Autogard is reached during operation, the device will trip, sending a signal to the control panel to stop the feed pump and the main drive.

This protects the screw conveyor and the gearbox from over-torque damage.

If the pre-set torque limit is exceeded, the Autogard will trip and the unit will shut down. An alarm will sound and the Autogard trip light will illuminate.

When this happens, no solids can be conveyed to the solids discharge ports.

When the Autogard device trips:

a. Press the reset button once to silence the alarm horn and a second time to reset fault lights.
b. Wait for the centrifuge to stop.
c. If prior to the over-torque condition, the back drive was being operated in the ***off*** or ***forward*** mode, turn the back drive switch in reverse momentarily. This will re-engage the Autogard.
d. Now turn the back drive switch to forward momentarily. If the Autogard trips again, then repeat step c above.
e. Note: The object is to jog the back drive forward and reverse to free up the internal conveyor.
f. Caution: Once the conveyor is free, it is important not to run the back drive in reverse while the bowl is stationary. This will convey solids back to the liquid end of the machine and possibly plug off the damn plates.

PLATE DAMS ADJUSTMENT

1. The four (4) plate dams are used to set the “Pond” depth.

2. The plate dams are located in the front hub. Access to the plate dams is allowed by raising the centrifuge cover with the machine shut down.

3. The plate dams are adjusted by loosening three (3) capscrews and rotating the plate clockwise.

4. A Maximum Setting, (i.e., the highest number engraved on the plate aligned with the arrow mark on the front hub) will cause ***a maximum pond depth*** giving maximum clarification of the liquid.

5. A Minimum Setting (i.e., the lowest number engraved on the plate aligned with the arrow mark on the front hub) will cause ***a minimum pond depth*** and will result in the ***Maximum dryness of the discharged solids.***

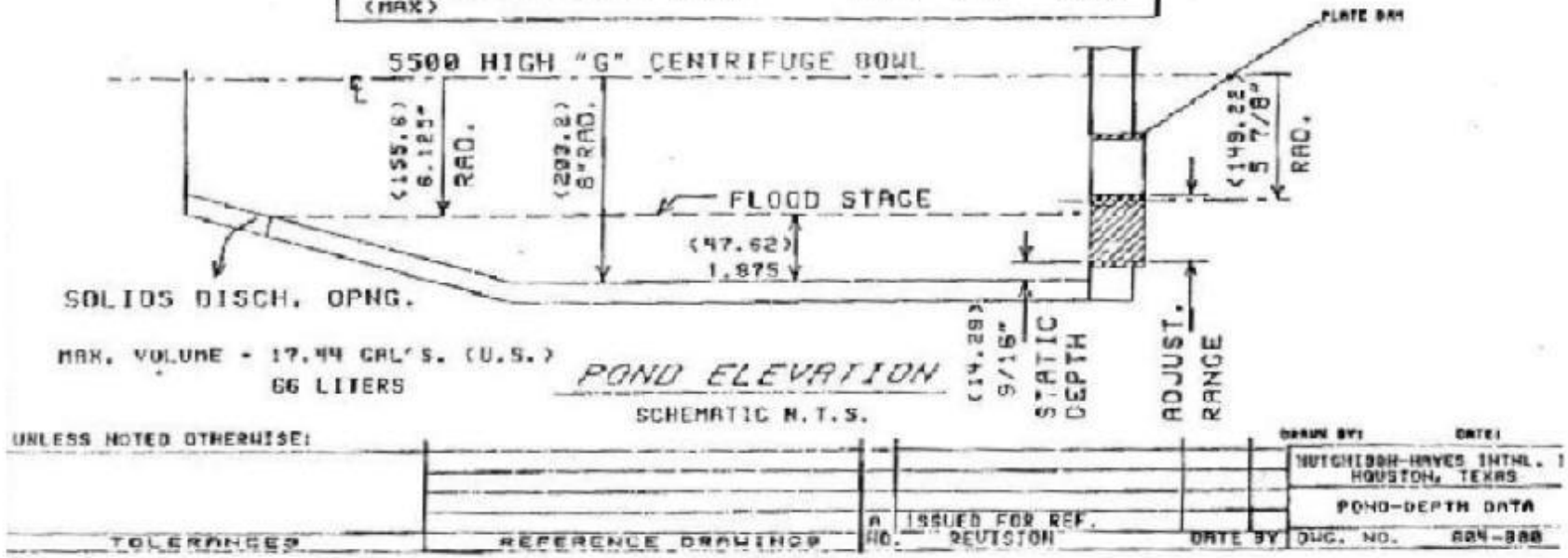
IMPORTANT

6. When plate dams are indexed by rotation, all four (4) dams must be indexed to the same number.

7. After adjusting, always recheck all twelve (12) capscrews for correct tightness.

PLATE DAM SETTING	POND DEPTH (IN)	POND DEPTH (MM)	VOLUME (GAL.)	VOLUME (LITERS)
1 (MIN.)	9/16"	14.29	5.27	19.95
2	5/8"	15.88	5.85	22.14
3	11/16"	17.46	6.44	24.38
4	13/16"	20.64	7.6	28.77
5	15/16"	23.81	8.77	33.2
6	1 1/8"	28.58	10.51	39.8
7	1 5/16"	33.34	12.25	46.37
8	1 1/2"	38.10	13.98	52.92
9	1 5/8"	41.28	15.12	57.24
10	1 3/4"	44.45	16.27	61.59
11 (MAX)	1 7/8"	47.63	17.4	65.87

NOTE:
DISREGARD SETTINGS 12 AND 1
THEY ARE BEYOND WORKING
POOL DEPTH RANGE.



UNLESS NOTED OTHERWISE:

TOLERANCES

REFERENCE DRAWINGS

NO.	REVISION	DATE	BY
A	ISSUED FOR REF.		

DRAWN BY: DATE:

HUTCHISON-HAYES INTNL.
HOUSTON, TEXAS

POND-DEPTH DATA

DWG. NO. 884-888

SECTION 4

LUBRICATION

RECOMMENDED LUBRICATING GREASE FOR THE 5500 BRAKESMART™ CENTRIFUGE

CHEVRON SRI-2 or MOBIL SHC 220

Lubrication fittings are located at the pillow block housing (front and rear) and on the front and rear hub shafts for conveyor bearing lubrication.

NOTE: The conveyor bearing grease fittings are located inside the machine frame, and the cover must be opened to gain access to the grease fittings.

NOTE: Pillow block and conveyor bearings are shipped from our manufacturing plant properly lubricated with grease.

Hutchison Hayes 5500 Centrifuge
Lubrication Schedule

	Frequency	Lubricant
Pillow Block Bearings:	24 Hrs Run Time 2 Shots per fitting	Chevron SRI-2 Mobil SHC-220
**Conveyor Bearings:	15 Days Purge till relief	Chevron SRI-2 Mobil SHC-220
Back Drive Flange Bearings:	1 shot every 72 Hrs Run Time	Chevron SRI-2 Mobil SHC- 220
Gearbox:	First Oil Change after 500 hrs. of operation, then every 6 months.	Royal Purple Synergy Gear Oil ISO Grade 150 SAE 90 AGMA Grade 4EP
Torque Control Linkage:	6 months	NEVER-SEEZ Compound
Fluid Coupling:	"FORMSPRAG" Model 12.4 HSD	
138 Fl. Oz. Cap. (fill#11) Change oil every 4000 hrs. For fire resistant fluid, every 10,000 hrs. or every two years.	ABOVE 130 DEG. F.	SAE 10W Fyrquel 550 Houghto Safe 1010
	BELOW 130 DEG. F.	SAE 5W Fyrquel 90 Houghto safe 1010 Pydraul 29E LT

(See Vendor Section of this manual
for complete filling instructions)

**** After every washing or steam-cleaning of the conveyor, check the conveyor bearing lubrication.**

Royal Purple

NEW IMPROVED

SYNERGY ™
HIGH PERFORMANCE GEAR OIL

SYNERGY is an ultra-tough, multi-service gear oil designed to smoothly lubricate all types of gears under all conditions. Synergy outperforms other E.P gear oils because it contains Synslide ™, our proprietary synthetic oil film so tough and tenacious it is not squeezed out of the pressure area. It virtually eliminates both gear and bearing wear – even under severe "squeeze film" conditions caused by extremely high loads, sudden shock loads, or low Rpm's. Slippery synthetic molecules increase the lubricity and oiliness of SYNERGY. Gears run smoother, quieter, cooler and longer without overhauls. SYNERGY is non-corrosive to both ferrous and non-ferrous metals. Its ability to separate rapidly and completely from water prevents sludge and wear found in wet gear boxes (such as cooling tower gear boxes). SYNERGY employs a unique, dense, high molecular weight synthetic cushioning additive to prevent fatigue failure in gears subjected to sudden loads.

SYNERGY'S exclusive performance advantages:

- Severe Service – performs under loads where other E.P. gear oils fail
- Lower Coefficient of Friction – saves energy and reduces temperatures
- High Temperature Performance – eliminates harmful deposits – extends oil drains
- Cushioning Molecules – reduces fatigue failures in bearings and gears
- Environmentally Safe – non-toxic as all components are on TSCA's approved list and fully comply with all OSHA and EPA guidelines
- Synslide ™ - proprietary, slippery, tenacious, ultra-tough synthetic film
- Prevents Corrosion – protects both ferrous and non-ferrous metals during operation and shut-down
- Water Separation – complete separation of oil and water to prevent emulsion
- Compatibility – 100% compatible with both mineral and synthetic gear oils

Customer Benefits:

- Saves Money – Saves energy, extends gear box life and reduces down-time
- Multi-Applications – one oil for all gears – spur, helial, herringbone, worm, etc.
- Multi-Conditions – for all speeds, all horsepower, all loads and all temperatures
- Superior Lubrication – smoother, quieter, cooler, more efficient gear boxes

Recommended For:

- All Gear Boxes – regardless of type, horsepower, speed, load or temperature
- All Metals – non-corrosive to both ferrous and non-ferrous metals
- All Service – shock load, high pressure, high and low temperature
- All Users – ready for a quantum leap in gear box performance

SYNFILM® GT

Multi-Purpose Industrial Oil

ROYAL PURPLE

Beyond Synthetic™

Beyond Synthetic™

Synfilm® GT is recommended for use in gas and steam turbines, pumps, bearings, gears, air tools, etc. Synfilm® GT should be considered instead of Synfilm® when oil reservoir temperatures exceed 200°F, improved low temperature fluidity is desired or when a viscosity grade is not available in Synfilm®.

Synfilm® GT is a long life, high film strength, energy efficient, synthetic lubricant that significantly increases bearing life and equipment reliability. Synfilm® GT gains its performance advantages over competing mineral and synthetic oils through its superior blend of synthetic base oils plus Royal Purple's proprietary Synerlec® additive technology. This unique additive technology is proven to make equipment run smoother, cooler, quieter, longer and more efficiently.

Synfilm® GT typically replaces conventional, low film strength, R&O (rust and oxidation inhibited) oils that rely solely on their viscosity to protect equipment against wear.

Synerlec® additive technology makes the difference!

Synthetic oils enable Royal Purple to make superior lubricants, but it is Royal Purple's advanced Synerlec® additive technology that gives Royal Purple's lubricants their amazing performance advantages. Synerlec® additive technology truly is *beyond synthetic.*™

Synerlec® additive technology forms a tough, slippery, synthetic film on all metal surfaces. This proprietary film significantly improves lubrication: first, by increasing the oil's film thickness, and second, by increasing the oil film's toughness, both of which help to prevent metal-to-metal contact. It displaces moisture from metal surfaces and protects all metals against rust and corrosion. It also fortifies the oil against the detrimental effects of heat, which causes oil to oxidize.

Exclusive Performance Advantages:

- **High Film Strength**
  Synfilm® GT protects bearings far beyond the ability of other turbine oils, carrying up to 700 percent greater loads.
- **Rapidly Separates from Water**
  Synfilm® GT rapidly and completely separates from water, which is easily drained from the bottom of the oil reservoir.
- **Saves Energy**
  Synfilm® GT has an extremely low coefficient of friction that is proven to save energy over conventional oils. In rotating equipment these savings frequently exceed the total cost of the oil within several months, making what was once an oil expense a profit.
- **Extremely Clean**
  Synfilm® GT is packaged in new poly containers, has a typical ISO 4406 Cleanliness Level of 14/13/11 (ISO 32, 46 and 68 only) and is verified by a laser particle counter. This is up to 250 times cleaner than other new oils delivered in steel drums or by bulk delivery.
- **Reduces Bearing Vibrations**
  The tough oil film of Synfilm® GT coupled with its ability to micro-polish contacting bearing elements provides superior bearing lubrication.
- **Longer Oil Life**
  Synfilm® GT has outstanding oxidation stability that greatly extends oil change intervals while keeping equipment clean.
- **Excellent Corrosion Protection**
  Synfilm® GT's tough oil film forms an ionic bond on metal surfaces, which acts as a preservative oil during shutdown and provides instant lubrication at startup.
- **Synthetic Solvency**
  Synfilm® GT's natural solvency cleans up dirty equipment and keeps it clean.
- **Compatible with Seals**
  Synfilm® GT has excellent seal compatibility.
- **Compatible with Other Oils**
  Synfilm® GT is can be mixed with other mineral oils and most synthetic oils. (It is not compatible with silicone or glycol synthetics.)
- **Environmentally Responsible**
  Synfilm® GT components are TSCA listed and meet EPA, RCRA and OSHA requirements. Synfilm® GT extends oil drain intervals, eliminates premature oil changes, decreases the amount of oil purchased and disposed of and conserves energy.

Royal Purple, Ltd. • 1 Royal Purple Lane • Porter, Texas 77365
Phone: 281-354-8600 • Fax: 281-354-7600 • www.royalpurple.com

PS0003 09/01

	ISO Grade / AGMA Grade										
Typical Properties*	10	22	32	46	68	100	150	220	320	460	680
AGMA Grade	—	—	—	1	2	3	4	5	6	7	8
Viscosity											
cSt @ 40°C	10	22	32	46	68	100	150	220	320	460	680
cSt @ 100°C	2.6	4.5	5.8	7.4	9.9	12.6	16.8	21.9	28.2	34.1	45.7
SSU @ 100°F	61	115	165	236	350	518	780	1151	1685	2445	3632
SSU @ 210°F	35	41	46	51	60	70	87	110	139	166	222
Viscosity Index	105	118	126	126	128	120	120	120	119	110	114
Flash °F	375	440	480	520	495	490	490	500	500	500	500
Pour Point °F	-70	-80	-80	-75	-65	-45	-45	-35	-30	-30	-30
ISO Cleanliness Level	**	**	14/13/11	14/13/11	14/13/11	N/A	N/A	N/A	N/A	N/A	N/A
ASTM D-1401 Demulsibility (from 40/40/0/0 to 40/40/0/30)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-892 Foam Tests											
Sequence I, II, & III	—	—	—	—	—	—	—	—	—	—	—
D-130 Copper Corrosion											
3 hrs. @ 210°F	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A
250 hrs. @ 210°F	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A
Cincinnati Millicron "A"											
72 hrs. @ 275°F	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-665 Rust Test											
Fresh Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Salt Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D 2893 Dry Air Oxidation											
312 hrs. @ 203°F											
% Viscosity Increase	0	0	0	0	0	0	0	0	0	0	0
Precip. No. (% Solids)	0	0	0	0	0	0	0	0	0	0	0

*All properties are typical and may vary.
**Check with manufacturer regarding availability with 14/13/11 cleanliness.

afilm® GT's solvency cleans wear metals and deposits left behind by previous oils. These wear metals and deposits can become soluble in the new oil, causing abnormal-alues on used oil analysis until equipment is clean.

SECTION 5

ASSEMBLY AND DISASSEMBLY

BRAKESMART™ BACK DRIVE GB53
GEARBOX REMOVAL

STEPS:

1. **Follow all lock out and tag out safety procedures. Insure power is off.**
2. Remove back drive motor belt guard and gear guard.

3. Loosen motor and slide towards gearbox to loosen the back drive belt.

4. Remove the proximity counter bracket under the Autogard on the side of the gearbox and the wire clamps on the side of the support arm assembly and lay carefully on the subbase. Do not remove or adjust the proximity switch on the bracket.

5. Place a sling under the Autogard shaft to carry the weight of the back drive support arm assembly.

6. Remove the four (4) bolts from the back drive arm assembly to the base. There are two (2) hardened dowel pins for line up purposes. Caution must be taken not to break or damage these pins.

7. Slide the arm assembly off laying it in a clean dry place.

8. Place a sling (held by the overhead hoist) under the gearbox.

9. Remove the twelve (12) adaptor hub screws.

10. With the sling carrying the gearbox weight, carefully withdraw the gearbox and set it on its side in a clean, clear area.

Do not attempt to dismantle the gearbox. A damaged gearbox must be returned to HH for repairs.

ROTATING ASSEMBLY REMOVAL

STEPS:

1. Remove gearbox shroud by removing six (6) capscrews and slowly lifting vertically.

2. Carefully remove the drive group enclosure.

3. Remove drive belt by moving the motor toward towards the centrifuge using the Nema adjust motor base to slacken the belt. (The adjusting bolt is 3/ 4", 1-1/ 8" across the hex flats.)

4. Disconnect the feed-line to centrifuge.

5. Untighten feed tube clamp by loosening four (4) bolts. Do not remove feed tube clamp cover.

6. Remove feed tube. It pulls straight out.

7. Remove the front and rear pillow block dowel pins by jacking them out using the threaded connection at the top of the pins to withdraw them.

8. Remove pillow block bolts.

9. Fully open centrifuge cover and secure one (1) safety latch pins.

10. Using hardened capscrews, attach bowl lift lugs at front and rear of bowl.

11. Using the bowl spreader-bar, attach shackles to lifting lugs and slowly lift the bowl and gearbox assembly as a unit, using the 2-ton overhead hoist.

12. Set the assembly down horizontally in a clean clear area.

CONVEYOR REMOVAL
Positioning bowl for conveyor removal
(After gearbox removal)

1. With bowl assembly now sitting horizontally in a clear, clean work area, remove the bowl spreader bar.

2. Attach the conveyor lifter to the adaptor hub (at gearbox end of centrifuge) using four (4) 7/16 – 14 UNC X 2- 3/ 4**"** long bolt with heavy hex head nuts. The gearbox must be removed prior to this procedure.

3. Place the bowl assembly on a support stand as shown in Figure 1.

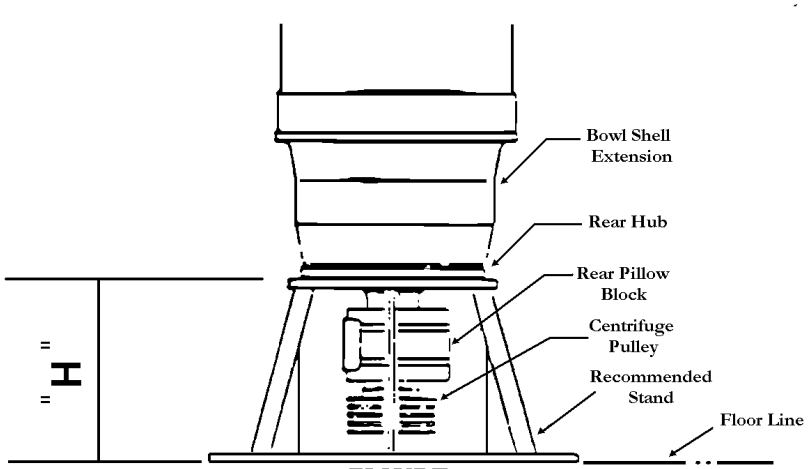


FIGURE 1

4. Height "H" in diagram must be tall enough so the drive sheave (pulley) clears the floor by at least two (2) inches.

CAUTION: Never allow the drive shaft to contact any surface during this lifting procedure. It is not designed to carry any load and can easily be damaged.

5. The weight must be carried through the rear hub resting on the stand.

With the bowl assembly now resting securely in an upright position:

6. Remove the twelve (12) 3/8**"** / capscrews from the front hub at top end of the bowl assembly.

7. Using four (4) bolts just removed, screw them into the four (4) jackscrew holes and remove the hub.

8. Once the front hub is jacked free, it can be lifted out with the overhead hoist.

9. Set this front hub, pillow block, and gearbox adaptor hub assembly in a clean, clear space.

10. Unbolt the **Conveyor Lifter Plate** from the gearbox adaptor hub just removed.

11. Remove four (4) capscrews from the seal housing at the end of the conveyor and attach the **Conveyor Lifter Plate**.

12. Slowly hoist out the conveyor.

13. Set the conveyor upright on a smooth, clean and clear work area.

14. With the hoist still attached to the conveyor, secure the conveyor assembly with ropes so it cannot topple over.

15. Once secured, disconnect the hoist connection and remove the Conveyor Lifter Plate.

CONVEYOR DISASSEMBLY
FRONT CONVEYOR BEARING REMOVAL

1. If the front conveyor bearings are in good condition, they do not need to be pulled. Disregard Steps 2, 3 and 4 and go to Step 5.

2. If the Front Conveyor Bearings are worn out or damaged, remove the six (6) capscrews from the liquids and seal housing.

3. Jack out the liquids end seal housing using two (2) capscrews just removed.

4. Using a slide hammer type bearing puller, remove the two (2) bearings.

5. Remove the Conveyor Bearing Housing by removing the eight (8) capscrews and jacking it out using two (2) of the removed capscrews.

   This opens the end of the Conveyor Tube and allows access to the Accelerator Plate and Feed Chamber Liner.

ACCELERATOR PLATE AND FEED NOZZLES

1. The accelerator plate is removed by inserting the long T-handle wrench into the conveyor tube and screwing it tightly into the threaded hub on the centerline of the accelerator plate.

2. With the T-handle wrench * attached firmly, loosen the two (2) 3/8**"** setscrews and the two (2) 3/8**"** lockscrews from the conveyor tube. They are located just forward from the feed nozzle located on the outside of the conveyor tube.

3. With the setscrews and lockscrews backed-off enough to allow the plate to be pulled out, slowly withdraw the accelerator plate.

4. Remove the four (4) externally mounted feed nozzles by unscrewing two (2) capscrews at each nozzle and withdrawing each nozzle by gripping its' flange and pulling it out.

5. Note the condition of the O-Ring on each feed nozzle.

* T-handle wrench (available from HH)

CONVEYOR REAR BEARING HOUSING REMOVAL

1. Remove the conveyor as per the previous **Conveyor Removal Section**, but set the conveyor in a horizontal position on a clean, clear work surface.

2. Remove the conveyor lifter plate from the front of the conveyor.

3. Carefully raise the conveyor to **a *vertical position*** with the front end (gearbox end) resting on a very clean surface.

4. Remove the rear bearing housing by unscrewing the six (6) 1/ 4**"** capscrews.

5. Using two (2) of the screws just removed, place them in the two (2) jackscrew locations and evenly jack the solids-end bearing seal housing (Item 11) out.

6. Inspect the two (2) oil seals, and the O-Ring for any damage. If damaged or worn, remove them.

7. Inspect the ball bearing. If it is in good condition, go to Step 10.

8. If the bearing must be replaced due to wear or damage, reinsert the six (6) capscrews in the rear bearing housing to stabilize it for pulling the ball bearing.

9. Use a slide hammer type bearing puller to extract the bearing.

10. Remove the six (6) capscrews from the rear bearing housing and using two (2) of them, jack-out the bearing housing, the retainer tube assembly will come out with the rear bearing housing.

11. Remove the six (6) capscrews from the retainer tube flange.

12. Pull the retainer tube assembly out.

13. Inspect the front oil seals for wear or damage.
    If the front oil seals are worn or damaged, they will have to be replaced.

14. To replace the two (2) front oil seals, the bearing must be pulled.
    Replace the rear bearing housing into the conveyor and replace the six (6) capscrews.

15. Remove the ball bearing using a slide hammer type bearing puller.

16. Remove the oil seal retaining ring.

17. Pull the two (2) oil seals and replace them.

18. Remove the rear bearing housing.

Now access is clear for removal and inspection of the retainer tube seal.

RETAINER TUBE SEAL REMOVAL

1. Reach into the conveyor and remove the four (4) 1/ 4**"** capscrews on the seal retainer plate.

2. Pull the seal retainer plate out.

3. Inspect the oil seal and replace if worn or damaged.

Part Numbers
Hutchison Hayes 5500 BrakeSmart™ Centrifuge
HH Machined Components

Item No.	Description	HH Part
1	Bowl	04065
1A	Bowl Liner	
2	Bowl Extension	04052
3	Conveyor	04053
6	Flinger	04073
9	Rear Hub	04050
10	Conveyor Bearing Housing (Solids End)	04054
11	Conveyor Bearing Seal Housing (Solids End)	04083
12	Retainer Ring	04071
13	Retainer Tube	04010
15	Pillow Block Housing	04058
16	Pillow Block Housing	04058
17	Bearing End Plate	04059
18	Spacer Ring	04081
19	Flinger Cover	04060
19A	Flinger Cover (nearest gearbox)	04072
20	Flinger	04073
21	Case Flinger	04084
22	Feed Tube Assembly	04009/ 13994
24	Accelerator Plate Assembly	04056
27	Feed Nozzle	04057
28	Wear Liner @ Feed Nozzle	04046
29	Solids Discharge Wear Insert	04062
35	Drive Sheave	04061/ 04001
36	Drive Sheave Seal Housing	04087
37	Conveyor Bearing Housing (Liquids End)	04055
38	Splined Adapter	04078
39	Front Hub	04051
40	Seal Housing (Liquids End)	04063
41	Plate Dam	04067
42	Gearbox Adaptor Hub	04064

*** S.T.C. (Sintered Tungsten Carbide**

Seal Retaining Rings
Customer Replaceable Items

Item No.	Description	HH Part
12	Snap Ring Solids Bearing Housing	04036
43	Snap Ring Liquid Seal Housing	04037

Bearings
Customer Replaceable Items

Item No.	Description	HH Part
100	Rear Pillow Blow Bearing	04042
101	Front Pillow Blow Bearing	04043
102	Conveyor Bearings, Rear (Solids End)	04040
103	Conveyor Thrust Bearings, Front (2-Req'd)	04041

Oil Seals
Customer Replaceable Items

Item No.	Description	HH Part
200	Seal for the Rear Seal Housing	04032
201	Seal for the Rear Bearing Housing	04031
202	Sheave Seal	04033
203	Retainer Tube Seal	04030
204	Front Seal Housing Seal	04032

All seals good for 300°F

Gaskets
Customer Replaceable Items

Item No.	Description	HH Part
205	Drive Sheave Gasket	04069
207	Dam Plate Gasket	04068

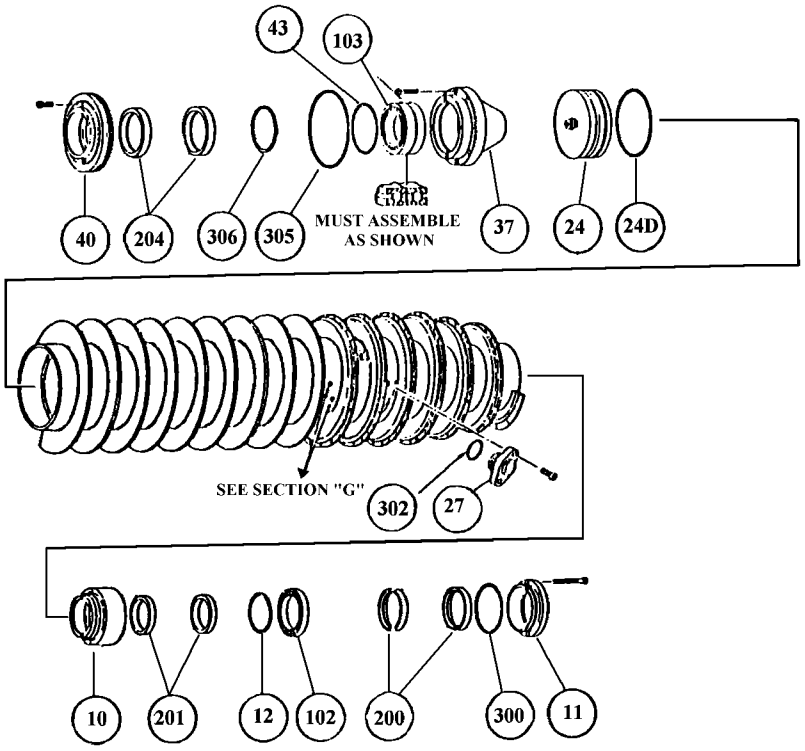
O-Rings
Customer Replaceable Items

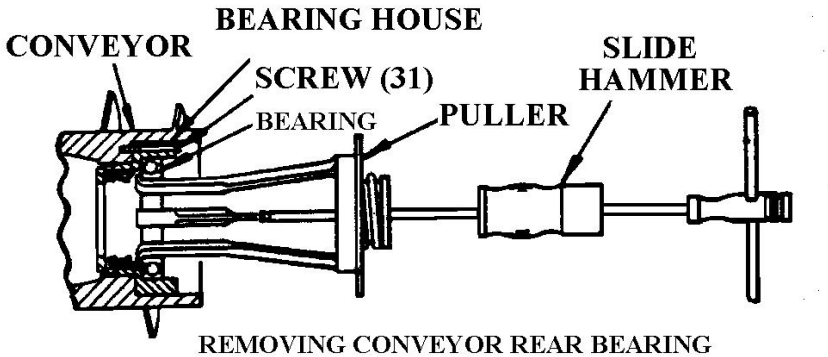
Item No.	Description	HH Part
24d	O-ring accelerator plate	04022
300	O-ring solid end seal housing	04023
304	O-ring Liquid hub & conical section	04025
302	O-ring feed nozzle	04020
305	O-ring liquid end Seal Housing Inner	04024
306	O-ring liquid end seal Housing Inner	04021

Grease Fittings
Customer Replaceable Items

Item No.	Description	HH No.
400	Grease Fitting, Non-Corroding 1/8" PTF Straight Type	03089
401	Grease Pressure Relief Fitting	03088

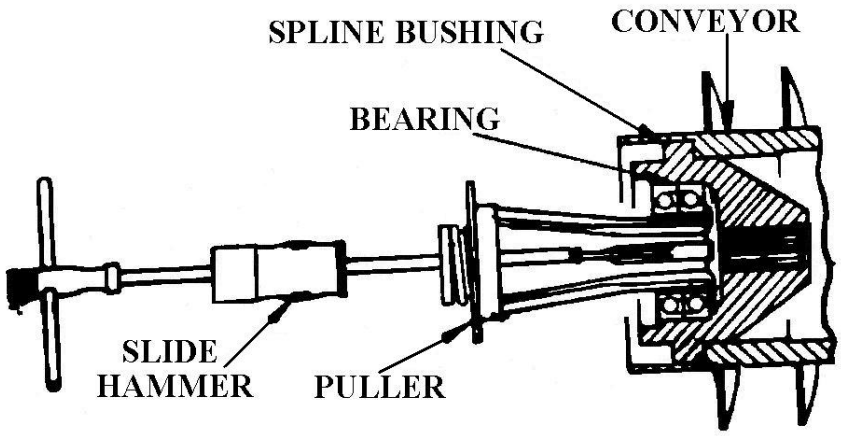
5500 CONVEYOR ASSEMBLY



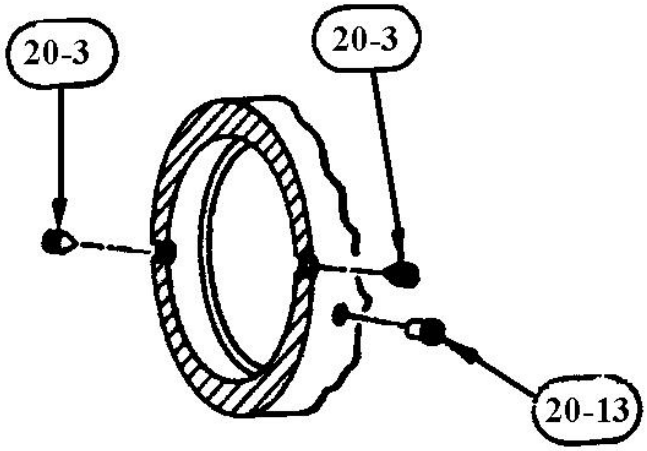


REMOVING CONVEYOR REAR BEARING
VIEW "E"

5500 CONVEYOR ASSEMBLY
(CONTINUED)



REMOVING CONVEYOR FRONT BEARING
VIEW "D"



SECTION "C"

PILLOW BLOCK DISASSEMBLY

1. Stamp the top of the pillow block assemblies with an “S” for solid and an “L” for liquid, also stamp the top with a “V” with the point directed toward the bowl assembly. Be sure to stamp the horseshoe covers and pillow block covers on both sides of the pillow also.

2. Remove the six (6) bolts that retain the two (2) horseshoe covers and remove the horseshoe covers.

3. Remove eight (8) bolts from the sheave and using jack bolts remove the sheave from the bowl hub.

4. For liquid hub, remove the gear flange.

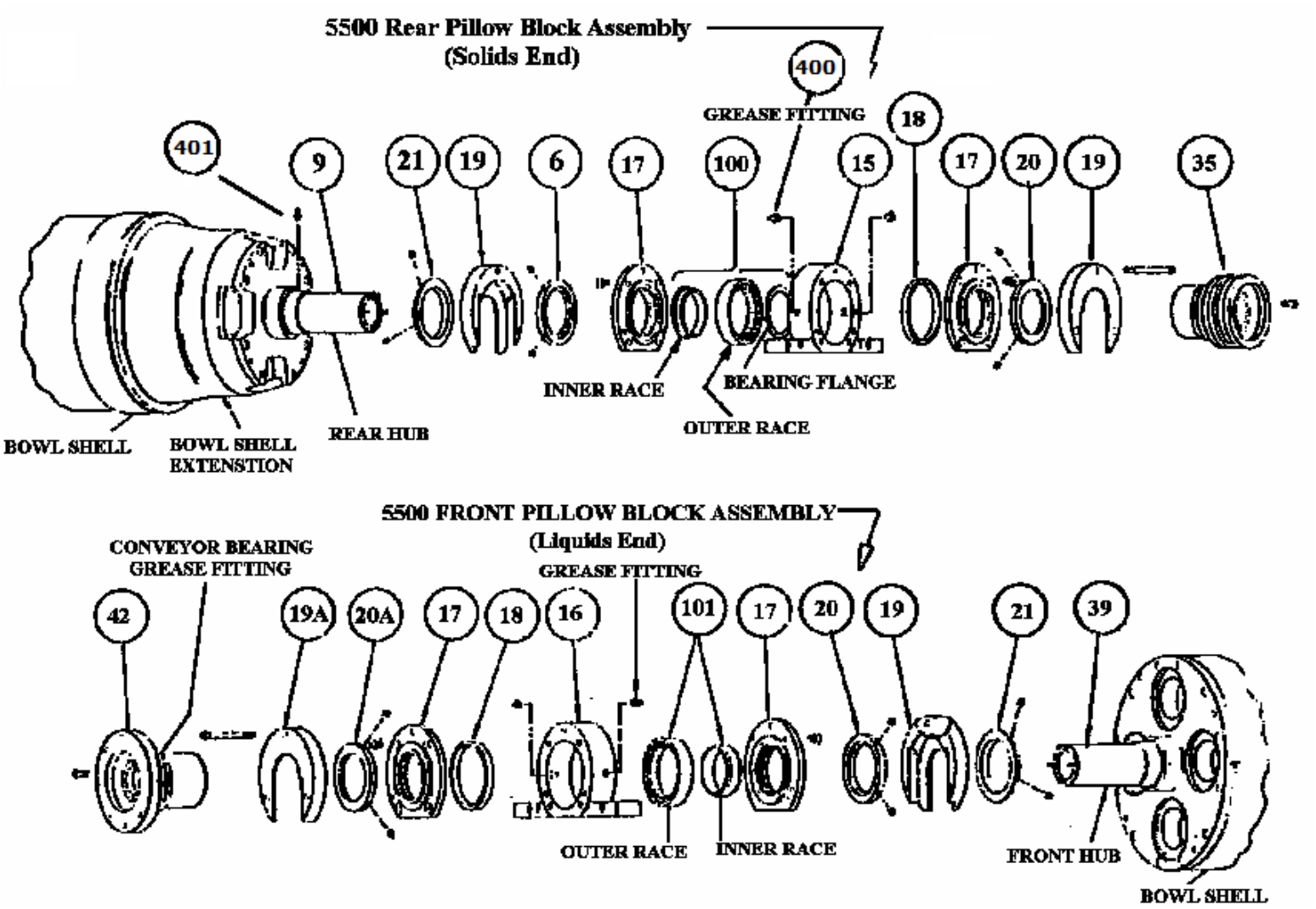
5. Using a two (2) or three (3) jaw puller, remove the pillow block as an assembly. Put a plate across the top of the hub for the stud to push on.

6. Remove the two (2) pillow block covers and remove the bearing from the housing.

7. Loosen the two (2) setscrews in the pillow block flingers and the case flingers and remove both from the hub.

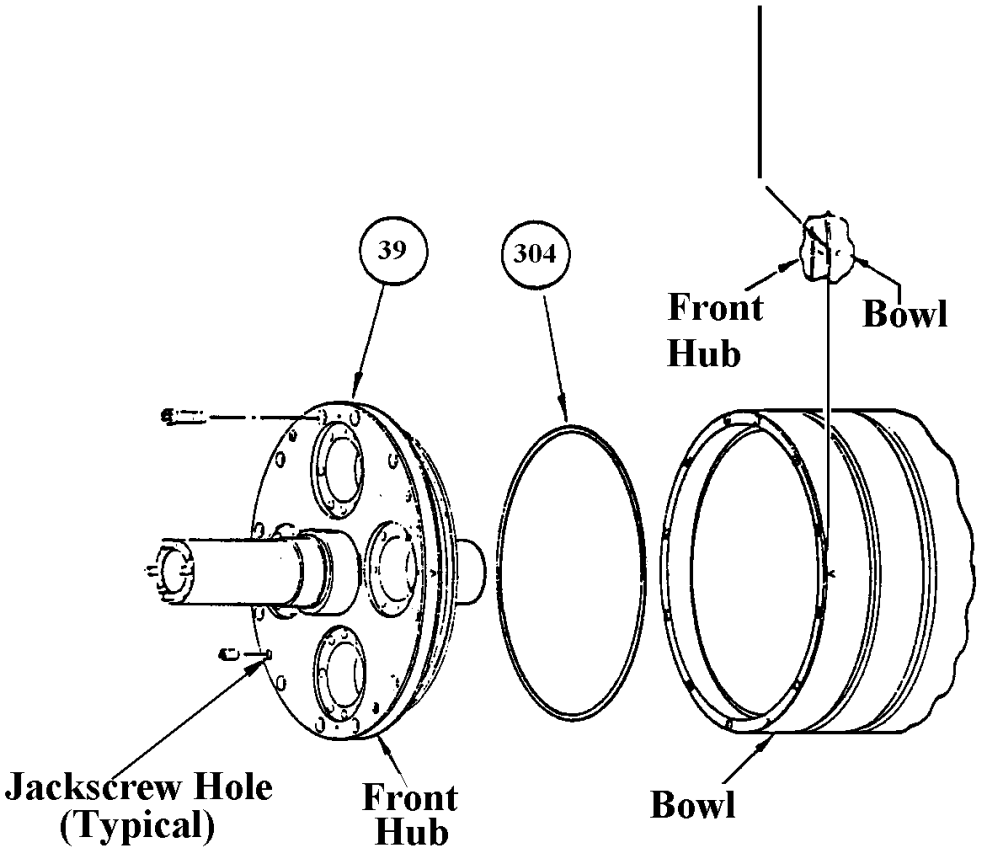
8. Clean all parts thoroughly and assembly in reverse order.

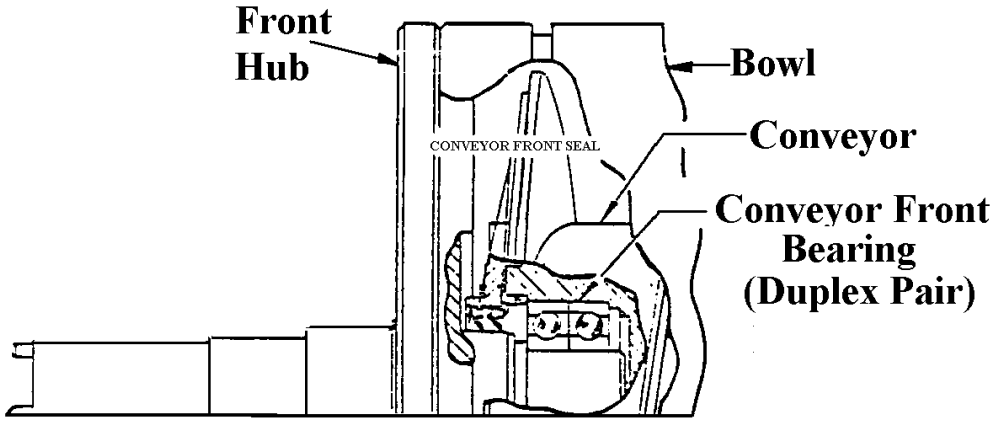
REAR PILLOW BLOCK ASSEMBLY
(SOLIDS AND LIQUIDS END)



BOWL FRONT HUB ASSEMBLY

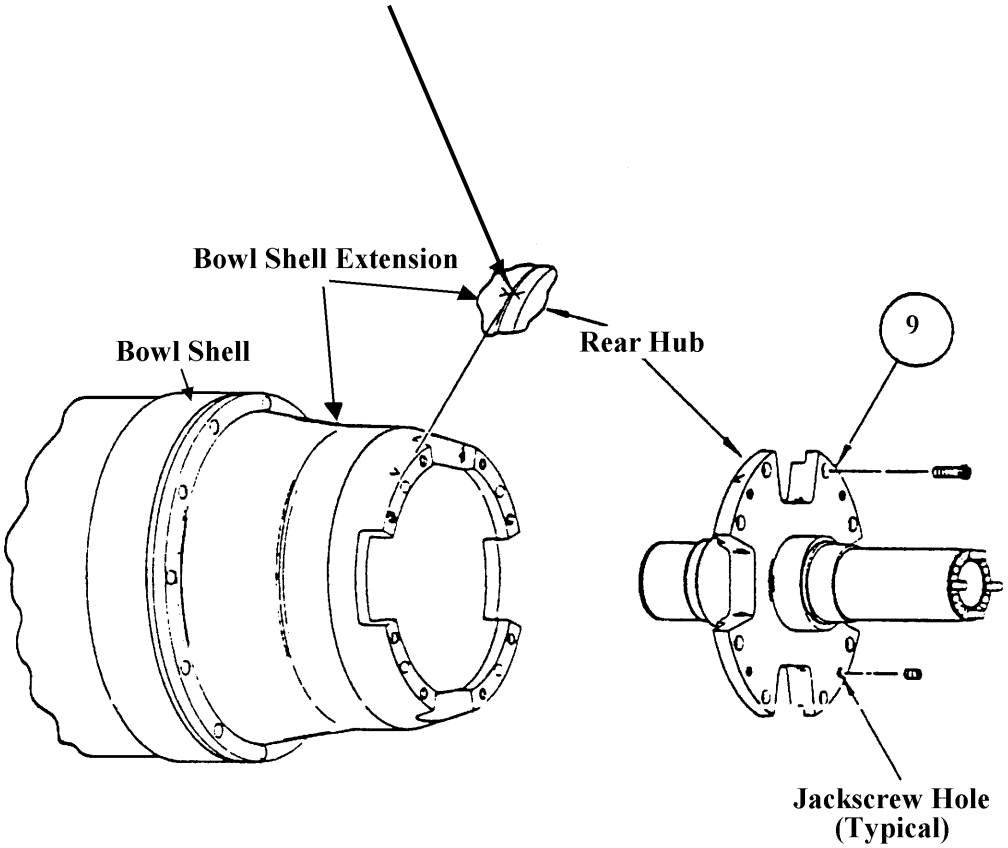
FRONT HUB AND BOWL SHELL ARE BALANCING AND STAMPED WITH BOWL ASSEMBLY: THEREFORE, THEY MUST BE REASSEMBLED WITH "V" MARKS IN LINE AS SHOWN





BOWL REAR HUB ASSEMBLY

REAR HUB AND BOWL SHELL EXTENSION ARE BALANCED AND STAMPED WITH BOWL ASSEMBLY: THEREFORE, THEY MUST BE REASSEMBLED WITH "V" MARKS IN LINE AS SHOWN



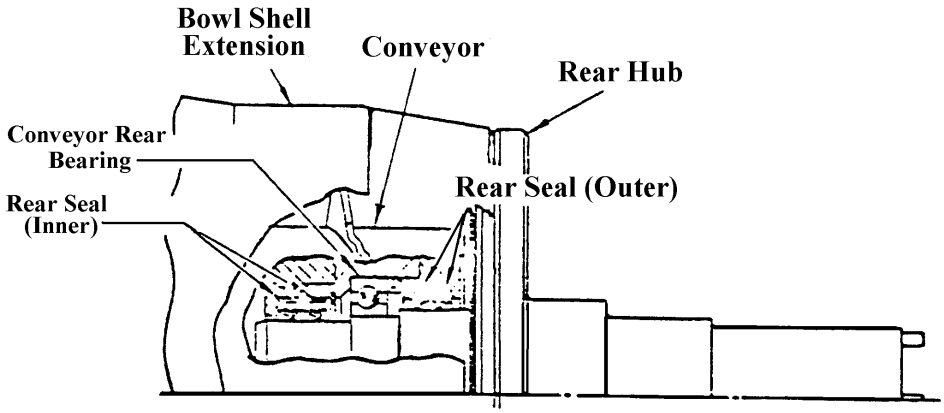
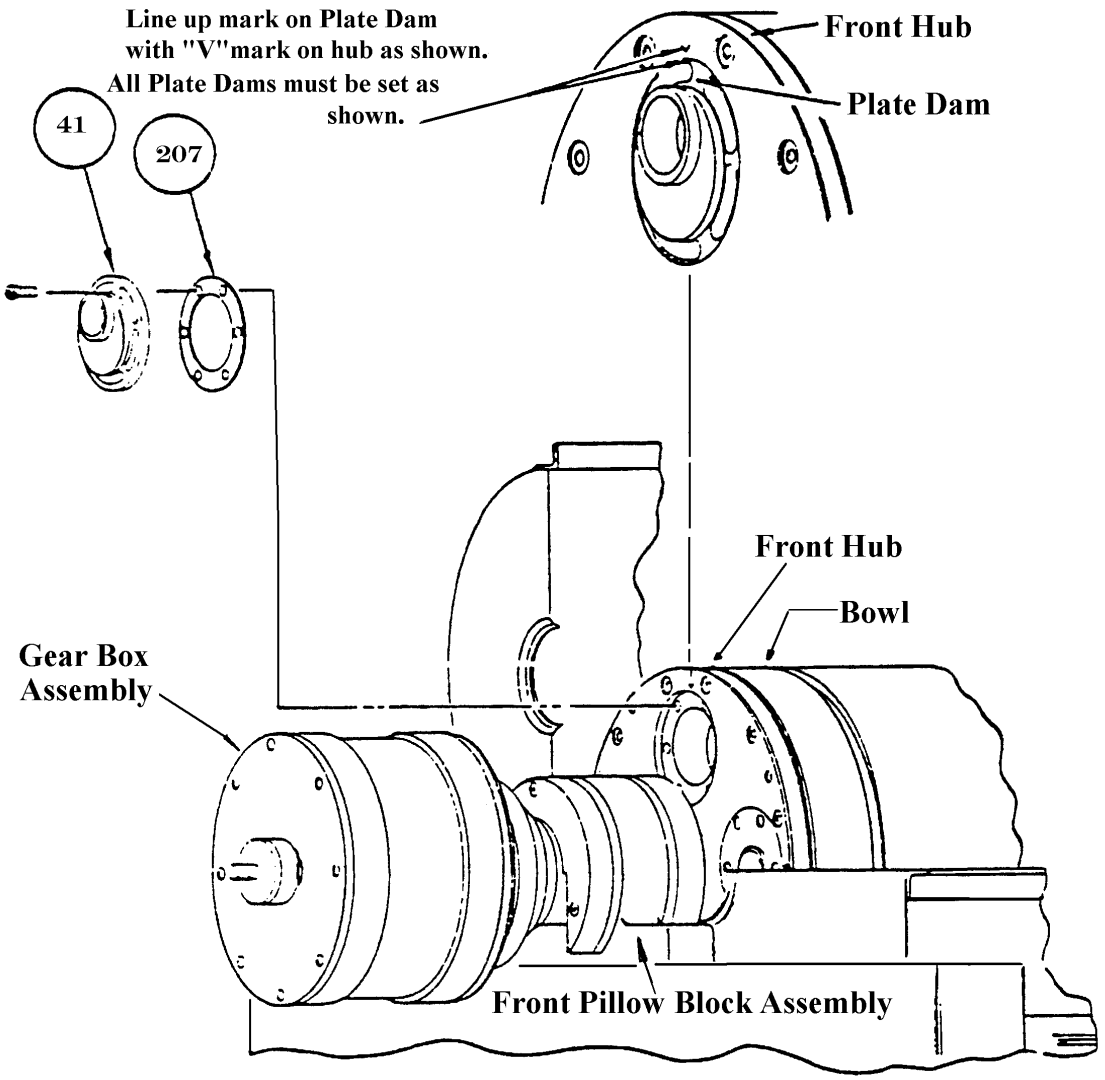


PLATE DAM ASSEMBLY



MAINTENANCE CAUTIONS FOR THE 5500 HIGH 'G' CENTRIFUGE

Bearings:

The inner and outer race must be replaced as a set.

Opened bearing, or cleaned parts should be kept covered until assembly.

Always use a thermometer to check the temperature of oil used to heat the bearings.

If no heat is used to install bearings, use only an arbor press to insert bearings in place.

Correctly lubricate all bearings before operating the centrifuge.

Do not wash new bearings with solvent before installing.

Keep new bearing wrapped and boxed until ready for use.

Seals:

Avoid touching the sealing surface. Keep seals wrapped in soft tissue until ready for installation.

Threaded Connections:

All threaded connections and pilot diameters should be wiped clean and lubricated with an anti-galling compound such as NEVER-SEEZ.

Torque all screws on the rotating assembly per the "Recommended Capscrew Seating Torque" charts shown in the Start-Up Section of this Manual. To help prevent capscrew failure – if excessive torque is required to seat mating parts during assembly, the over torqued screws should be removed, discarded and replaced with new screws installed at the correct torque.

O-Rings:

Inspect for nicks and cuts before installing, if damaged, do not install. Lubricate O-Rings for easier installation.

Machined Parts:

Clean with degreasing solvent before reassembly.

Set parts on clean work area and protect finished surfaces and openings on the part.
Be sure to align any balanced parts on the rotating assembly by matching the V-Marks stamped on the parts.

If more than one (1) centrifuge is owned, do not interchange any parts which comprise a balanced rotating assembly.

Some Assembly and Disassembly Tips

1. Read the Service Manual

2. Keep all mating surfaces free from dirt and handle carefully to avoid nicks and burrs to the mating surfaces.

3. Check the inside of the conveyor for solids build-up
   Not cleaning solids build-up can be the cause of vibration problems.

4. Lubricate O-Rings and fasteners when reassembling centrifuge components.
   Anti-seize compound should be used on stainless steel fasteners because of their tendency to gall when used with mating stainless steel parts.

5. Follow the recommended torque values shown in the torque chart in the Service Manual.

6. Conveyors equipped with carbide tiles should never be set down directly on a concrete floor. The carbide is very brittle and tile damage could result.

7. Monitor items such as drive belts, O-Rings, seals, and vibration isolators.
   These items will become brittle with age and deterioration will adversely affect centrifuge performance.

   Replace these items when indicated by inspection.

5500 HARDWARE INVENTORY

ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
CONVEYOR							
1	ACCELERATOR PLATE	2	SS	SET/CUP	SOCKET HEAD	3/8" X 1"	242 LOCTITE
2	FEED NOZZLES	8	SS		SOCKET HEAD	1/2" X 3/4"	242 LOCTITE
3	SPLINE ADAPTER TO BRG. HSG.	8	BLACK		SOCKET HEAD	3/8" X 1"	NEVER SEIZE
4	SPLINE ADAPTER	4		DOWEL PIN		3/8" X 1"	
5	LIQ BRG HOUSING	12	BLACK		SOCKET HEAD	3/8" X 1 3/4"	NEVER SEIZE
6	LIQ BRG HSG SEAL COVER	6	SS		SOCKET HEAD	3/8" X 1 1/4"	NEVER SEISE
7	SOLID END BRG HSG	6	SS		SOCKET HEAD	5/16" X 3 3/4"	NEVER SEIZE
8	SOLID END BRG HSG SEAL COVER	(HELD BY ABOVE)					
BOWL							
1	BOWL EXTENTION	12	SS		SOCKET HEAD	3/8" X 1 1/4"	NEVER SEIZE
2	SOLID END HEAD	8	SS		SOCKET HEAD	3/8"X 1 1/4"	NEVER SEIZE
3	SOLID END HEAD WEAR PLATE	8	SS		SOC.FLAT HEAD	3/8" X 3/4	242 LOCTITE
4	LIQ END HEAD	12	SS		SOCKET HEAD	3/8" X 2"	NEVER SEIZE
5	DAM PLATES	12	SS		SOCKET HEAD	5/16" X 7/8"	NEVER SEIZE
6	DISCHARGE PLOWS	28	SS		SOCKET HEAD	3/8" X 3/4"	242 LOCTITE

PILLOW BLOCK BEARINGS

(BOTH LIQ AND SOLIDS END ARE TYPICAL)

ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
1	PILLOW BLOCKS TO BASE	8	BLACK		HEX HEAD	3/4 X 3"	NEVER SEIZE
2	END COVER	4	BLACK		SOC. FLAT HEAD	3/8" X 1"	NEVER SEIZE
3	HORSE SHOE COVER	12	SS		SOCKET HEAD	3/8" X 1 1/4	NEVER SEIZE
4	CASE FLINGER	2	SS		SET/CUP	5/16 X 1/2"	NEVER SEIZE
5	GREASE FLINGER	6	SS		SET/CUP	3/8" X 5/8"	NEVER SEIZE
6	GREASE ZERT	6	PLATED		HEX	1/8" NPT	N/A
7	GREASE RELIEF	1	PLATED		HEX	1/8" NPT	N/A
	GEAR END						
1	GEAR FLANGE	8	BLACK		SOCKET HEAD	3/8" X 1 1/4"	NEVER SEIZE
2	GEAR BOX	12	BLACK		SOCKET HEAD	7/16" X 1 3/4"	NEVER SEIZE
3	GEAR FLANGE TO HEAD	4		DOWEL PIN		1"	
	SHEAVE						
1	SHEAVE	8	BLACK		SOCKET HEAD	3/8" X 1 3/4	NEVER SEIZE
2	SHEAVE TO HEAD	4		DOWEL PIN		1"	

SUB BASE TO SKID SHOCK MOUNTS

ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
1	SHOCK MOUNT TO SKID (LONG SKID)	16	SS		HEX HEAD	1/2" X 1 1/4" FLAT AND LOCK WSHR.	NEVER SEIZE
2	SHOCK MOUNT TO SKID (STD. SKID)	12	SS		HEX HEAD	1/2" X 1 1/4" FLAT AND LOCK WSHR.	NEVER SEIZE
SUB BASE TO SHOCK MOUNT							
1	BOLT THROUGH SUB BASE	8	SS		HEX HEAD	5/8" X 3 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	NUTS UNDER SHOCK MOUNT	8	SS		EXTRA HEAVY	5/8"	
BASE TO SUB BASE							
1	BOLTS THROUGH BASE	4	SS		HEX HEAD	5/8" X 4 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	FEED TUBE ARM TO BASE	4	SS		HEX HEAD	5/8" X 2" LOCK WSHR	NEVER SEIZE
3	FEED TUBE ARM CAP	6	SS		SOCKET HEAD	3/8" X 1 3/4"	NEVER SEIZE
4	EYE BOLT HOLES	4	SS		HEX HEAD	3/4" X 1 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
CASE TO BASE							
1	BOLTS THROUGH CASE TO BASE	8	SS		HEX HEAD	5/8" X 1 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	TEFLON IN CASE	6	SS		HEX HEAD	5/16 X 1" FLAT AND LOCK WSHR	NEVER SEIZE
3	COVER SAFETY PIN	1	PLATED		HITCH PIN	5/8" X 2	

GEAR GUARD							
ITEM #	**POSITION**	**QTY**	**ALLOY**	**TYPE**	**STYLE**	**SIZE**	**LOCK TIGHT OR NEVER SEIZE**
1	BOLTS THROUGH GUARD	6	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
2	BACK DRIVE LOCK OUT PLATE	4	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
3	BACK DRIVE LOCK OUT PLATE	4	SS		NUT	3/8" NUT	NEVER SEIZE
BELT GUARD							
1	BOLTS THROUGH GAURD TO SUB BASE	6	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
2	TORQUE BLOCK	4	BLACK		SOCKET HEAD	3/8" X 2"	NEVER SEIZE
MD MOTOR TO SUB BASE							
1	MAIN DRIVE MOTOR MOUNT TO SUB BASE	4	SS		HEX HEAD	5/8" X 2" FLAT AND LOCK WSHR	NEVER SEIZE

ELECTRIC BACK DRIVE

BACK DRIVE

ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
1	FLANGE BRGS. FOR AUTOGARD	4	SS		HEX HEAD	1/2" X 3" LOCK WSHR	NEVER SEIZE
2	BRG. MOUNT TO BACK DRIVE ARM	4	SS		HEX HEAD	1/2" X 1 3/4" FLAT AND LOCK WSHR	NEVER SEIZE
3	BACK DRIVE ARM TO BASE	4	SS		HEX HEAD	1/2" X 1 3/4" FLAT AND LOCK WSHR	NEVER SEIZE
4	GEAR GUARD	7	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
5	LOCK OUT PLATE	4	SS		HEX HEAD	3/8" X 1 1/4" FLAT AND LOCK WSHR	NEVER SEIZE
6	BD MOTOR MOUNT TO SUB BASE	4	SS		HEX HEAD	1/2" X 1 3/4" FLAT AND LOCK WSHR	NEVER SEIZE
7	AUTOGARD ON SHAFT	1	BLACK	SET/CUP	SOCKET HEAD	3/8 SET SCREW	242 LOCTITE

MAIN DRIVE

1	BELT GUARD	5	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE

RECOMMENDED CAPSCREW SEATING TORQUE

Follow recommended seating torques when assembling all socket head cap screws.

Nominal Size	Recommended Seating Torque	
	Coarse Thread (Lubricated)*	
1 /4	75 in lbs	6.25 ft. lbs.
5/16	135 lbs.	11.25 ft. lbs
3/ 8	240 in lbs	20 ft. lbs.
1/ 2	600 in lbs	50 ft. lbs

CHART I
(STAINLESS STEEL)

Nominal Size	Recommended Seating Torque			
	Coarse Thread Dry		Coarse Thread Lubricated*	
	Plain	Plated	Plain	Plated
1/ 4	150/13	112/9	120/10	90/7.5
5/16	305/25	230/19	245/20.4	185/15.4
3/ 8	545/45	410/34	435/36	330/27.5
1/ 2	1300/108	970/81	1040/87	775/65
3/ 4		3300/275	3520/293	2640/220

CHART 2
(ALLOY STEEL)
IN. LBS./FT. LBS

* Lubricate with “Never-Seez” or equivalent.

Flighting Tile Caution

Caution

The Flighting Tiles used on the 5500 conveyor may be the spray-on hard face type or the sintered tungsten carbide backing tile type.

The backing tile type is comprised of stainless steel backing plate, a sintered tungsten carbide tile and a copper/silver solder “sandwich” between the two.

Even though the rotating assembly is comprised of 316 S.S., the copper will not withstand attack by highly corrosive chemicals such as sulfuric and nitric acids.

If the copper/silver solder tile bond is attacked by corrosive chemicals, the result will be tiles coming loose during centrifuge operation.

To avoid this potentially costly problem, always check any chemicals for compatibility with copper/silver solder before attempting to introduce them into the centrifuge.

SECTION 6

PLANETARY GEARBOX AND BACKDRIVE ASSEMBLY

Hutchison Hayes, L. P.
Model GB-53/GB-100 Planetary Gearbox
Instruction Manual

CONTENTS

1. Construction
2. Installation
3. Operation
4. Lubrication
5. Maintenance
6. Dismantling
7. Assembly

Table 1 Recommended Oil Products

1. Construction

(1) The reduction gear unit is a two (2) stage planetary system. The first stage uses two (2) planetary gears and the second stage uses three (3) planets.

(2) All bearings are either ball or cylindrical roller type.

(3) Lip style oil seals are used at the gearbox cover plates where the output and first stage pinion shafts pass through.
O-Rings are used to seal mating parts which are static with respect to each other.

(4) Threaded plug openings are provided for oil fill, overflow, and drain.

2. Installation

(1) The gearbox is designed to operate in the horizontal plane, that is, axially in line with the model 5500 centrifuge rotating assembly.

(2) The gearbox is driven by means of a gear flange which attaches at the centrifuge end to the liquids end bowl hub assembly. The gearbox bolts directly to the other end of the gear flange.

(3) The gear flange must be accurately aligned within .002 inches runout, and secured correctly to the bowl hub before the gearbox is mounted.

(4) After mounting the gearbox, check runout on the first stage side. If runout exceeds .005 inches, shims may be required.

3. Operation

(1) Before running the gearbox, be sure that the unit is filled to the proper level with lubricating oil.

(2) For recommended lubricating product, see Table 1.

(3) With the fill opening at top dead center, remove the plug from the fill connection and the uppermost level connection which is located on the cover plate furthest away from the centrifuge.
Pour oil into the fill port located on top of the casing until it starts to overflow from the side port.
Plug tightly after filling. Use Teflon tape. The required oil quantity is approximately one (1) gallon.

(4) On initial operation, check the direction of rotation of the gearbox. It should be counter-clockwise as you stand at the gearbox end facing the centrifuge.

(5) If excessive temperature on the casing (above 180 deg. F.) occurs, stop the centrifuge and check for the cause.

(6) If excessive noise and/or vibration occur suddenly, stop the centrifuge and check for the cause.

4. Lubrication

(1) Gears are lubricated by oil bath.

(2) Refer to Table 1 for recommended lubricating product.

(3) Never add a different brand of lubricating oil to the existing supply. Mixing oil must be strictly avoided.

(4) When changing brands, flush gear unit thoroughly before filling.

5. Maintenance

(1) Oil Change Intervals
First, change after 500 hours of operation, then every six (6) months or 2500 operating hours whichever comes first.

(2) Any unusually severe operating conditions such as rapid ambient temperature fluctuations, or the presence of corrosive gases in the operating area could affect the life and characteristics of the lubricating product. Contact the manufacturing company for recommendations to follow.

(3) For extended storage of the GB-53 (30 days or longer) fill the unit with a corrosion preventive oil and run for a short period after flushing.

(4) Restarting the Unit:
Empty and flush the gearbox. Refill with the correct type and quantity of oil.

(5) Wipe off any spilled oil. Run the unit briefly and check for leaks.

6. Dismantling

We recommend that the gearbox not be dismantled because special handling procedures are required for maintenance of these units. A clean room environment and a thorough knowledge of clearances and fits are required. With the exception of replacement of the first stage pinion bearing and seal, the gearbox should be returned to its manufacturer for inspection and damage and/or wear assessment.

An incorrectly reassembled planetary gearbox could cause major damage to the unit, the centrifuge, and could pose a potentially lethal danger to operating personnel.

7. Assembly

(1) Use care to prevent any foreign debris from entering the gearbox.

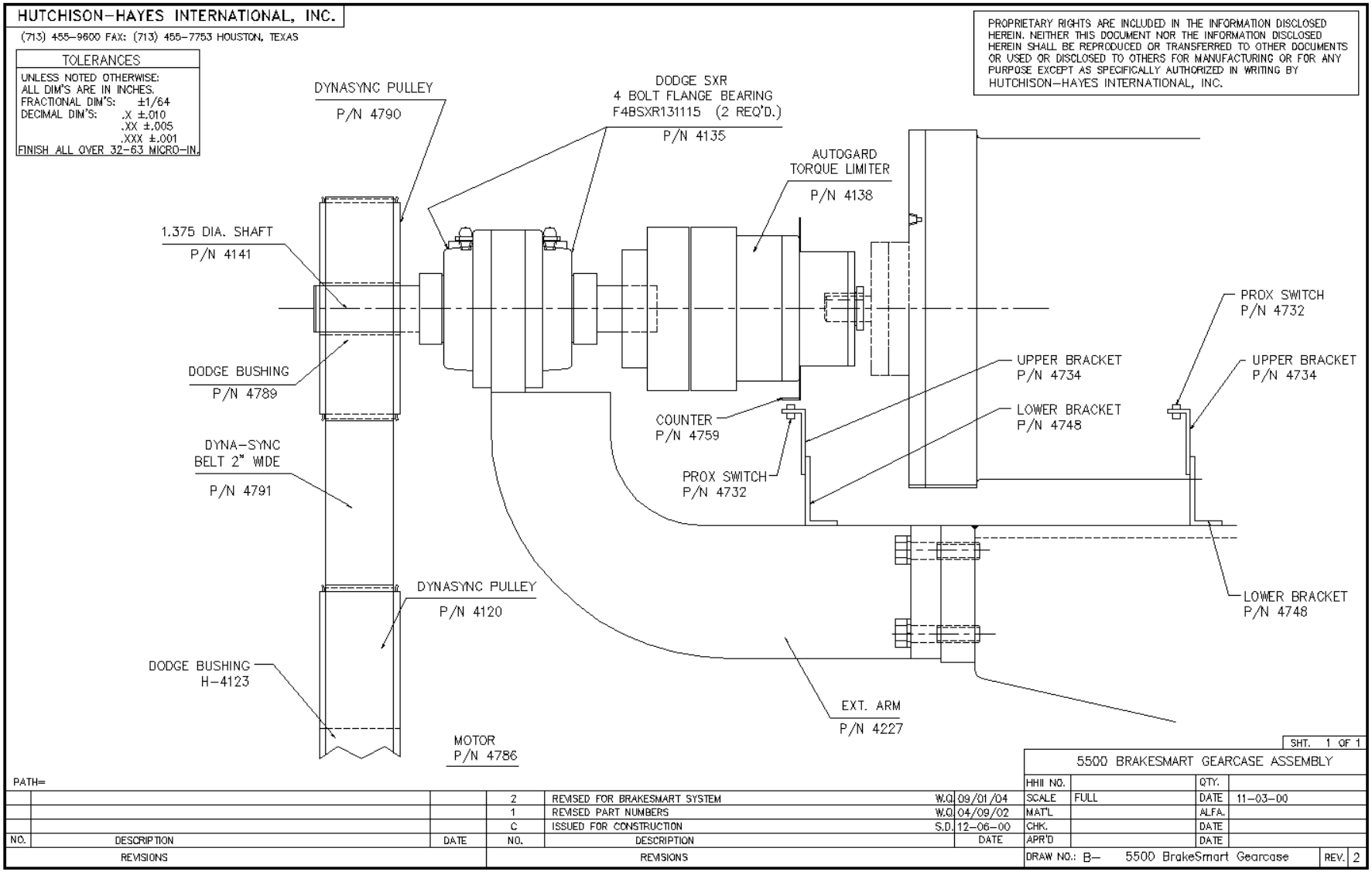
(2) Secure capscrews using proper torque.
1/ 4-20 Capscrews = 150 in. lbs.
5/16-18 Capscrews = 305 in. lbs.

(2) Change O-Ring whenever the gearbox is opened up.

TABLE 1

RECOMMENDED OIL PRODUCT

ROYAL PURPLE "SYNERGY" GEAR OIL ISO GRADE 150
SAE 90
AGMA GR. 4EP


HUTCHISON–HAYES INTERNATIONAL, INC.
(713) 455–9600 FAX: (713) 455–7753 HOUSTON, TEXAS
TOLERANCES
UNLESS NOTED OTHERWISE:
ALL DIM'S ARE IN INCHES.
FRACTIONAL DIM'S: ±1/64
DECIMAL DIM'S: .X ±.010
.XX ±.005
.XXX ±.001
FINISH ALL OVER 32–63 MICRO–IN.
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DYNASYNC PULLEY
P/N 4790
DODGE SXR
4 BOLT FLANGE BEARING
F4BSXR131115 (2 REQ'D.)
P/N 4135
AUTOGARD
TORQUE LIMITER
P/N 4138
1.375 DIA. SHAFT
P/N 4141
PROX SWITCH
P/N 4732
UPPER BRACKET
P/N 4734
UPPER BRACKET
P/N 4734
DODGE BUSHING
P/N 4789
COUNTER
P/N 4759
LOWER BRACKET
P/N 4748
DYNA–SYNC
BELT 2" WIDE
P/N 4791
PROX SWITCH
P/N 4732
DYNASYNC PULLEY
P/N 4120
LOWER BRACKET
P/N 4748
DODGE BUSHING
H–4123
EXT. ARM
P/N 4227
MOTOR
P/N 4786
SHT. 1 OF 1
5500 BRAKESMART GEARCASE ASSEMBLY
PATH=
2 REVISED FOR BRAKESMART SYSTEM W.Q. 09/01/04
1 REVISED PART NUMBERS W.Q. 04/09/02
C ISSUED FOR CONSTRUCTION S.D. 12–06–00
NO. DESCRIPTION DATE
REVISIONS
HHII NO.
QTY.
SCALE FULL
DATE 11–03–00
MAT'L
ALFA.
CHK.
DATE
APR'D
DATE
DRAW NO.: B– 5500 BrakeSmart Gearcase
REV. 2

SECTION 7

PARTS LIST

PARTS LIST

To order parts contact:

Hutchison Hayes, L. P.
P. O. Box 2965
Houston, Texas 77252

3520 East Belt
Houston, Texas 77015
Tel: (713) 455-9600
Fax: (713) 455 7753
(800) 441 4850
Web site: www.hutch-hayes.com
Email: ewarren@hutch-hayes.com

The parts listed in this section are customer replaceable components, except for the machined items, which should be ordered from HH.

5500 BRAKESMART™ CENTRIFUGE BASE UNIT PARTS LIST

Qty.	Part #	Description
2	2879	5500 Flange gasket
3	2926	Case hinge washer
1	2989	Solid head wear plate (2 per set)
16	3044	Hinge pin for lid clamp
19	3044P	Cotter pin
16	3047	Clamping shoe for case
16	3048	Eyebolt for clamping shoe
17	3049	Nut for clamping shoe
1	3056	Solid end discharge transition
1	3057	Liquid end discharge transition
1	3088	Relief grease fitting
7	3089	Grease fitting
4	3123	Expanding dowel pins for PB
4	3441	Dam plates
2	3710	Warning stickers
1	3994	Feed tube (Heavy Duty)
4	4020	O-ring, feed nozzle
1	4021	O-ring, liquid end seal housing - Inner
2	4022	O-ring, accelerator plate
1	4023	O-ring, solid end seal housing
1	4024	O-ring, liquid end seal housing - Outer
2	4025	O-ring, bowl ext. and liquid head
2	4031	Seal, solid end conv. Bearing Housing
4	4032	Seal, sol. And Liquid Seal Housing.
1	4034	Case cover assy.
1	4036	Rtn. Ring
1	4037	Rtn. Ring
1	4040	Bearing, solid end conv.

5500 BRAKESMART™ CENTRIFUGE BASE UNIT PARTS LIST (CONTINUED)

Qty.	Part #	Description
2	4041	Bearing, liquid end conv.
1	4042	Bearing, solid end PB
1	4043	Bearing, liquid end PB
1	4050	Solid end bowl hub
1	4051	Liquid end bowl hub
1	4052	Bowl extension
1	4053	Axial flow conveyor
1	4054	Solid end conv. Bearing Housing
1	4055	Liquid end conv. Bearing Housing
1	4056	Accelerator plate
4	4057	Feed nozzle with carbide insert
2	4058	Pillow block
4	4059	Pillow block cover
3	4060	Horse shoe cover
1	4061	Sheave for bowl
4	4062	Wear inserts plows
1	4063	Liquid end conv. seal housing
1	4064	Gear flange
1	4065	Bowl assembly with liner
4	4068	Dam plate gasket
1	4072	Horse shoe cover gear end
3	4073	Pillow block flinger
1	4078	Spline adapter
1	4080	Rtn. Ring for sol. End seal housing
2	4081	Pillow block spacer
1	4083	Solid end conv. Seal housing
2	4084	Case flinger
1	4091	Base assy.
1	4098	Nameplate

5500 BRAKESMART ™ CENTRIFUGE BASE UNIT PARTS LIST (CONTINUED)

Qty.	Part #	Description
1	4100	GB-53 gearbox
1	4779	Teflon wear liner for case

5500 BRAKE PANEL PARTS LIST

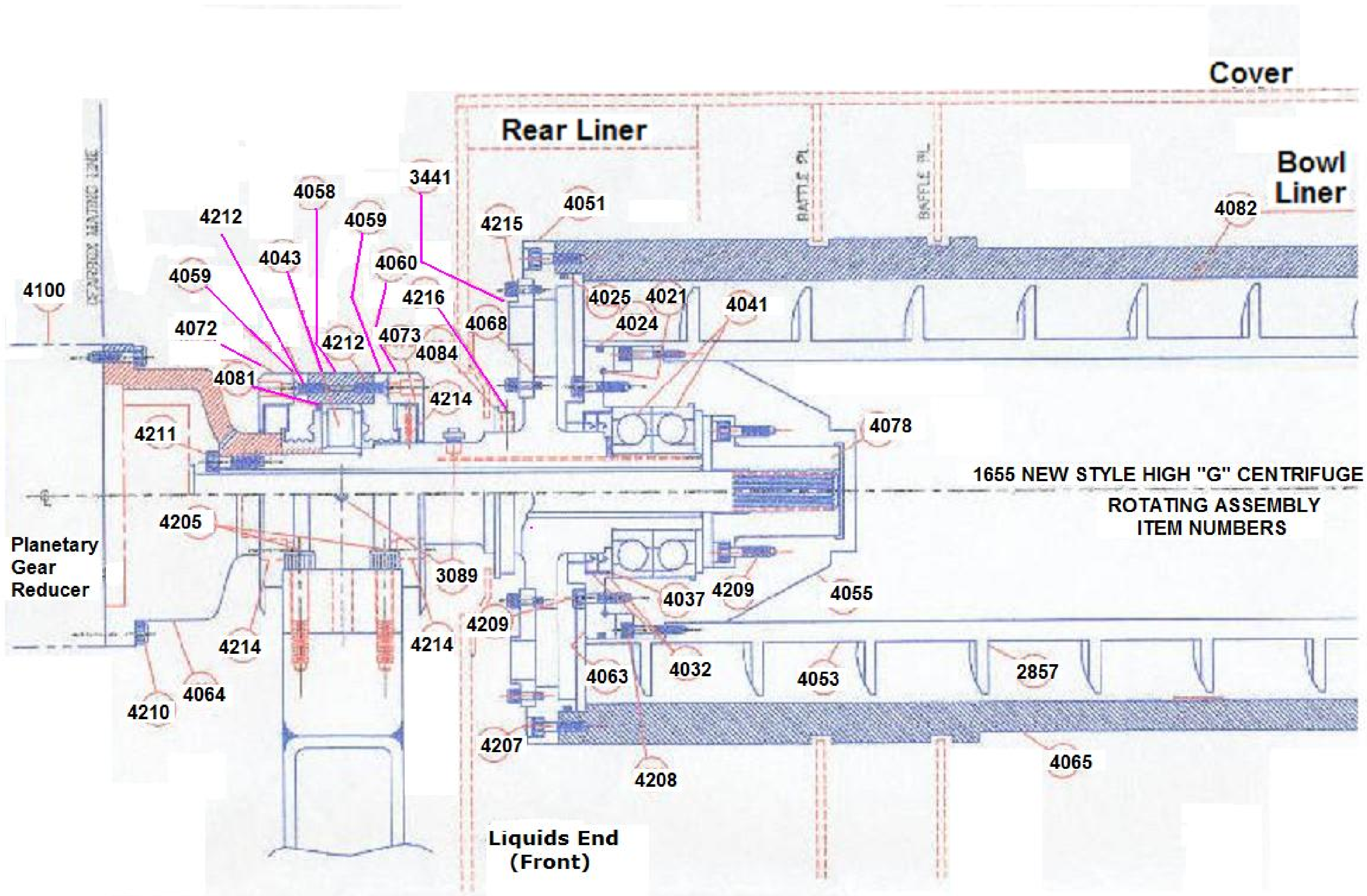
Qty	Hutch PN	Mfr PN	Description
6	3164		ISOLATOR 1448 (STARTOR RACK)
1	4251	6583K42	CURRENT TRANSDUCER
2	4252	MK33-LI-EX0/24VDC	ISB
1	4633	9070T750D1	CONTROL TRANSFOMER P/N 9070T750D1
1	4636	9080LBA362106	DISTRIBUTION BLOCK - P/N9080LBA362106
1	4651	LC1D8011G6	CONTACTOR - P/ N LC1D8011G6
2	4653	MK15-RPN-EXO/24 VDC	AMPLYFIER CONTROLLER - MK15-RPN-EXO/24
1	4666	TSXSUP1051	POWER SUPPLY - TSXSUP1051
1	4678	MG24443	MINI 9 PRIM - P/N MG24443
1	4679	MG17415	MINI 9 SEC - P/N MG17415
1	4716	ETH 2313	HORN - ETH 2313
1	4792	TWDXDPPAK4M	PLC (TWIDO) TWDLMDA20DRT
1	4785	TWADAMI2HT	ANALOG CARD (TWIDO)
1	4943	LC2D32G7	CONTACTOR
1	4944	LRD32	OVER LOAD
1	4945	GV2ME32	MOTOR STARTER
1	4946	LC1D25G7	CONTACTOR
1	4947	LRD22	OVERLOAD
1	4948	GV2ME22	MOTOR STARTER
1	4949	FAL3615024M	BREAKER
4	4950	CA2KN22G7	RELAY
1	4951	ATSY48C11Y	SOFT START
1	4952	GOL1K1	PUSH BUTTON
1	4953	GOL53C3	3 POS SEL SWITCH
1	4954	GOM1RM3C	MUSHROOM RED PUSH
2	4955	GOL2GR33	START/STOP PUSH BUTTON
4	4956	GOL3G	PILOT LIGHT
2	4957	GOL3R	PILOT LIGHT
1	4958	KDB-1	DRAIN
1	4959	EXB203611 N34	EX PROOF ENCLOSURE

5500 BRAKE PANEL PARTS LIST
(Continued)

Qty	Hutch PN	Mfr PN	Description
1	4960	EXH1A10	HANDLE
1	4961	20" X 36"	BACK PAN
2	4962	ABS2SA01MB	RELAY

BRAKESMART™ SKID PARTS LIST

Hutch PN	Mfr PN	Qty	Description
2653	LPM3046	100	10-4-16-4C GEXOL ARMORED & SHEATHED
2654	LPM3006	100	6-4C +16-4C GEXOL ARMORED & SHEATHED
2860		1	MOTOR MOUNT, 20 HP SLIDE BASE
3083		1	SLIDE BASE MOTOR MT, 60HP 2 BOLT 5500
4013		8	ISOLATOR, 5500
4019		1	SHEAVE, DRIVE DUEL SPEED FORMSPRAG 14"
4044		1	SHEAVE, DUEL SPEED DRIVE BOWL
4120		1	P/N 40H200 SK TIMING SHEAVE
4123		1	Q D BUSHING SK X 1-5/8 - SHAFT
4135		2	FLANGED BEARING # P/N RCJ - 1-3/8
4138	102700-002	1	AUTOGARD COUPLING MODEL 406
4141		1	SHAFT 1-3/8" FOR AUTOGARD MOD 406
4227		1	BACK DRIVE EXT ARM 1655 (NEWPARK)
4245		1	NARROW PROFILE SKID, 5500
4246		1	NARROW PROFILE SUB BASE.5500
4247		1	5500 NARROW PROFILE GUARD MD
4248		1	5500 NARROW PROFILE GUARD BD
4687		1	BELT R3VX670-5
4732	NI5G12YO	2	PROX SWITCH NI5G12YO
4734	MB-12	2	MOUNT BRACKET FOR PROX SWITCH
4748		2	PROX SWITCH L BRACKET
4755	14R019X142H4	1	60 HP MAIN DRIVE MOTOR
4759	406-2A	2	COVER-406-2A
4786		1	20 HP EX PROOF MOTOR WITH BRAKE
4787		1	BRAKE SMART PANEL & RACK
4788		1	"E" 2 3/8 QD BUSHING
4789		1	SF X 1 3/8 BORE QD BUSHING
4790	60H200	1	TIMING SHEAVE 60H200
4791	630-H200	1	TIMING BELT 630-H200


Cover
Rear Liner
Bowl Liner
4082
4051
4215
3441
4058
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4212
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4216
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4025
4021
4024
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4100
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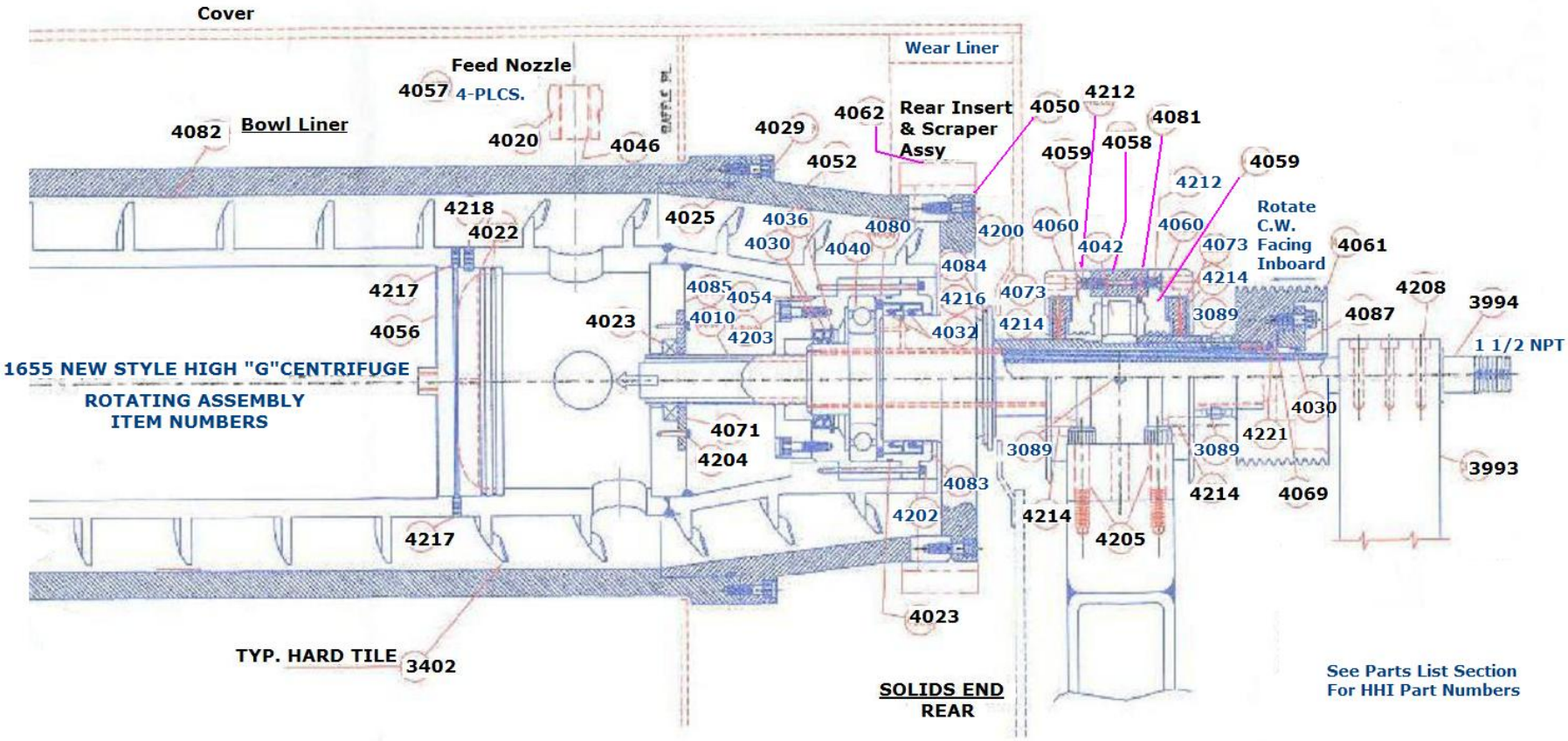
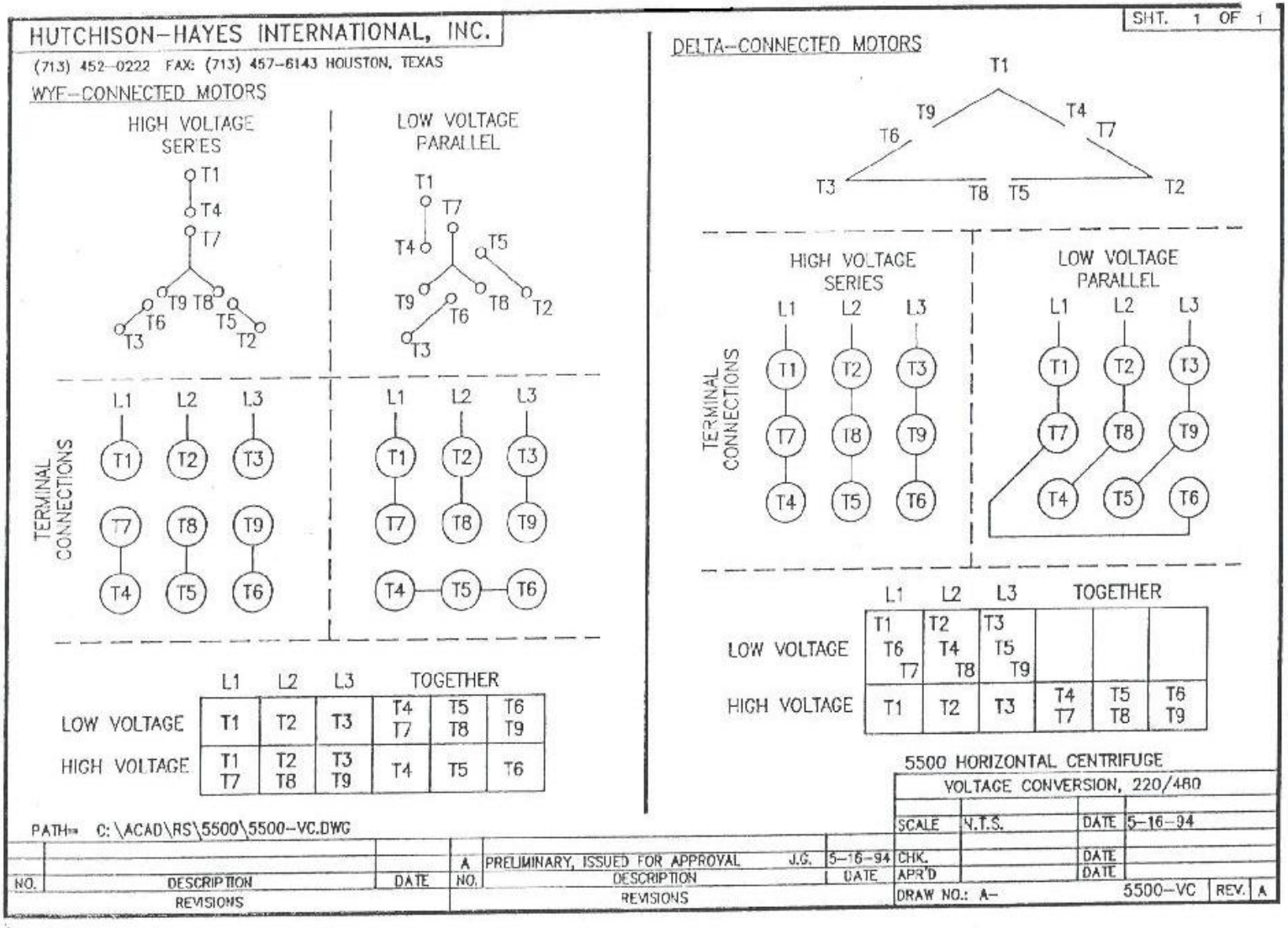
4072
4212
4073
4084
4081
4214
4078
4211
1655 NEW STYLE HIGH "G" CENTRIFUGE
ROTATING ASSEMBLY
ITEM NUMBERS
4205
Planetary
Gear
Reducer
3089
4037
4209
4055
4209
4214
4214
4063
4032
4053
2857
4210
4064
4207
4208
4065
Liquids End
(Front)



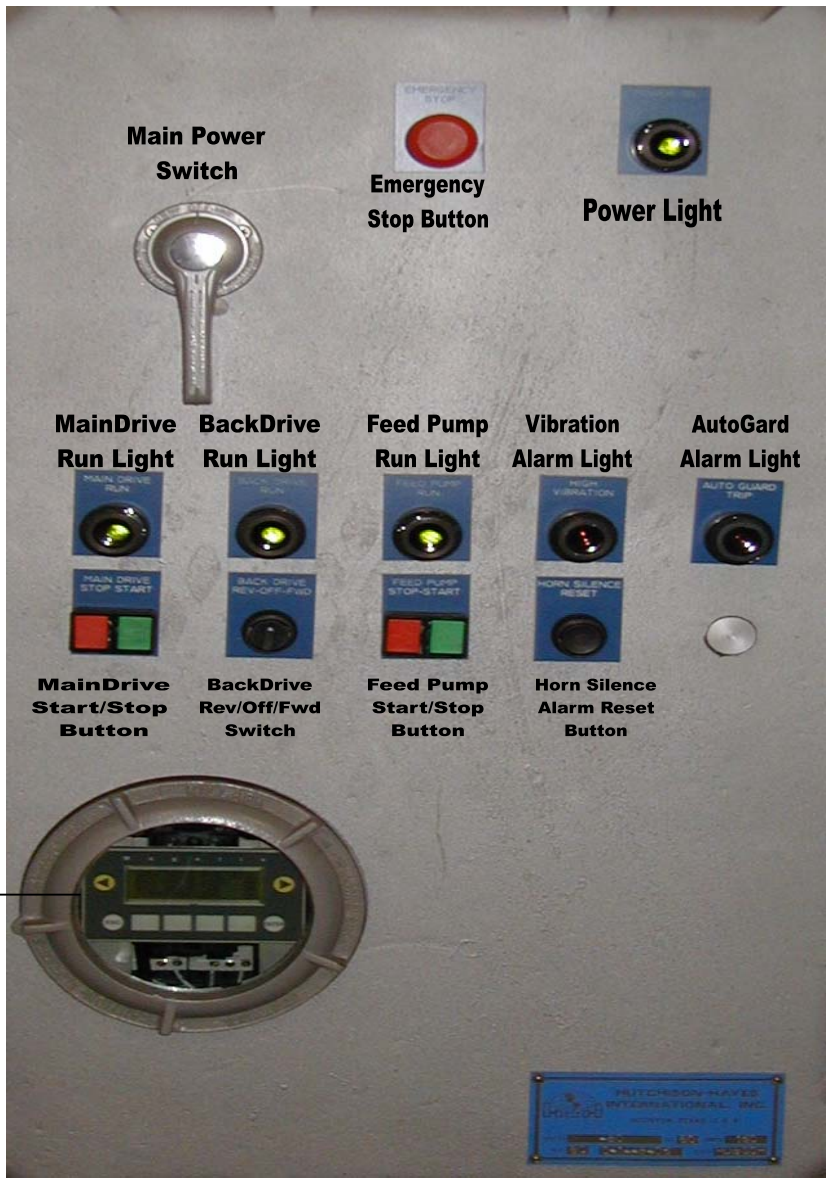
SECTION 8

ELECTRICAL & WIRING

Wire size and length for 5500 BrakeSmart™ Skid Unit				
Main drive motor 60 HP	100'	6/4 with 16/4 gexol armored and sheathed	753-C 1 1/4"	753-C 1 1/4"
Back drive motor to J box	3'	10/4 with 16/4 gexol armored and sheathed	753-B 1"	753-B 3/4"
J box to panel	100'	10/4 with 16/4 gexol armored and sheathed	753-B 3/4"	753-B 1"
Vibration and Prox Switches	100'	16awg 3 pair shielded armored and sheathed	753-B 3/4"	753-B 3/4"
Note: The 5500 Centrifuge and Duster main drive that has 6/4 gexol armored and sheathed without the 16/4 conductors a 753-B-1" gland is used. Hutchison Hayes uses Hawke type 753 glands				


HUTCHISON-HAYES INTERNATIONAL, INC.
(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS
SHT. 1 OF 1
WYE-CONNECTED MOTORS
HIGH VOLTAGE SERIES
LOW VOLTAGE PARALLEL
TERMINAL CONNECTIONS
L1 L2 L3
T1 T2 T3
T4 T5 T6
T7 T8 T9
L1 L2 L3 TOGETHER
LOW VOLTAGE T1 T2 T3 T4 T7 T5 T8 T6 T9
HIGH VOLTAGE T1 T7 T2 T8 T3 T9 T4 T5 T6
DELTA-CONNECTED MOTORS
T1 T9 T4 T6 T7 T3 T8 T5 T2
HIGH VOLTAGE SERIES
LOW VOLTAGE PARALLEL
TERMINAL CONNECTIONS
L1 L2 L3 TOGETHER
LOW VOLTAGE T1 T6 T7 T2 T4 T8 T3 T5 T9
HIGH VOLTAGE T1 T2 T3 T4 T7 T5 T8 T6 T9
5500 HORIZONTAL CENTRIFUGE
VOLTAGE CONVERSION, 220/460
PATH= C:\ACAD\RS\5500\5500-VC.DWG
SCALE N.T.S. DATE 5-16-94
CHK. DATE
APR'D DATE
DRAW NO.: A- 5500-VC REV. A
NO. DESCRIPTION DATE
A PRELIMINARY, ISSUED FOR APPROVAL J.G. 5-16-94
REVISIONS

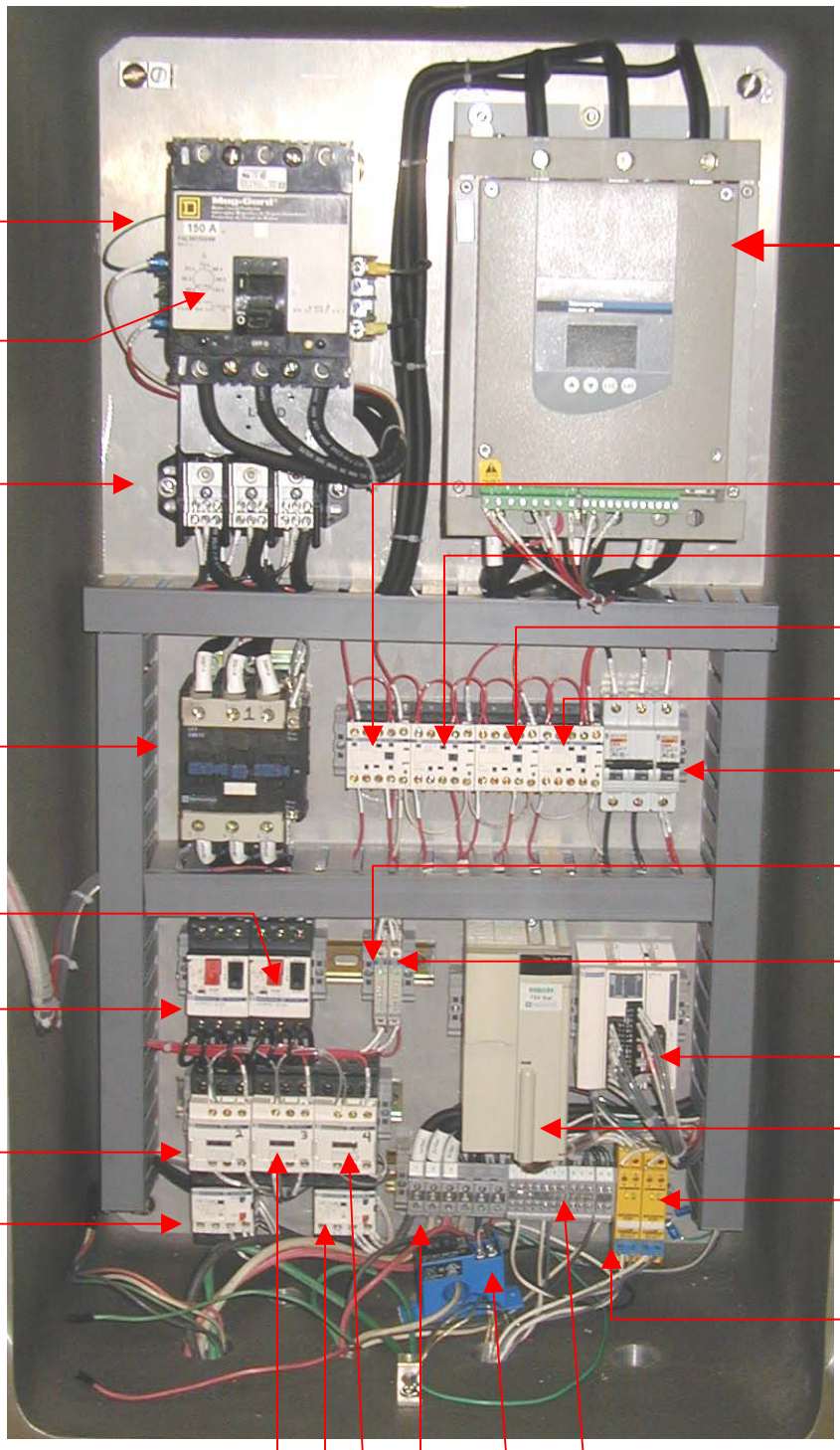
KILLARK CONTROL PANEL (EXTERNAL)



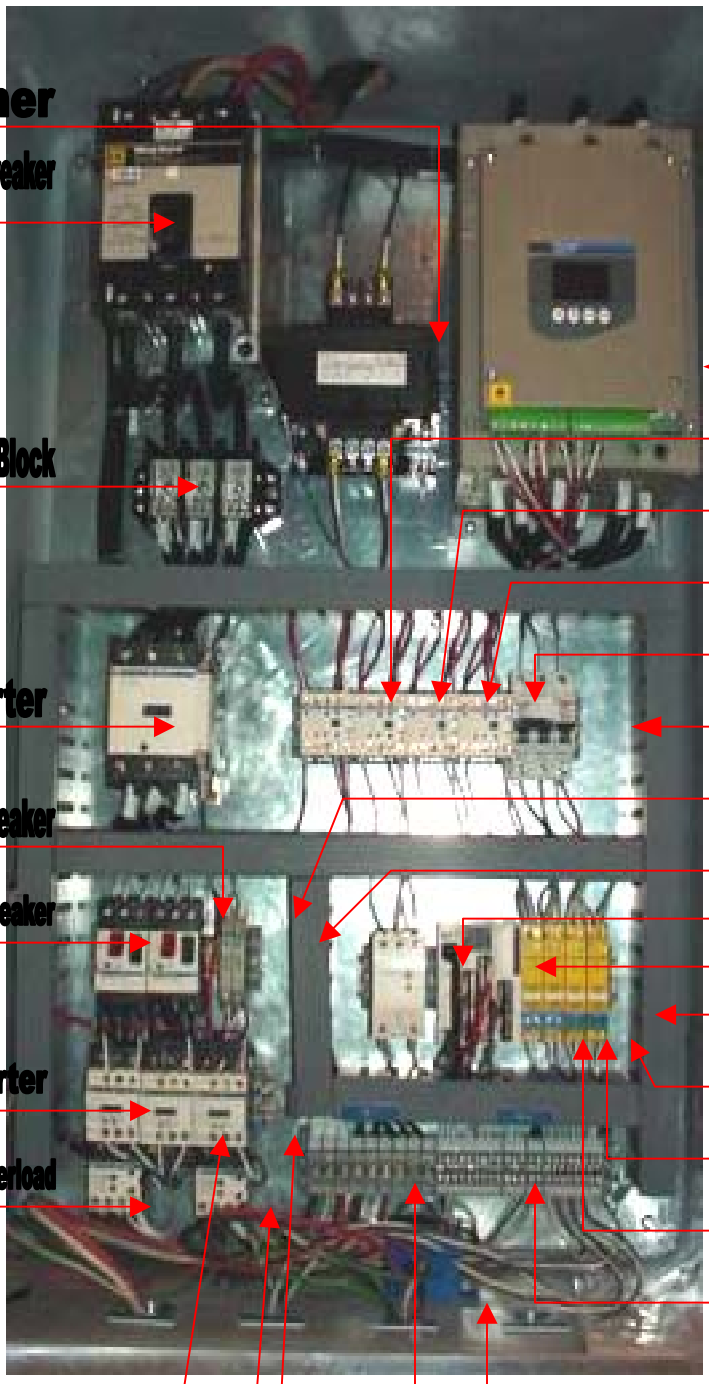
Display

CURLEE CONTROL PANEL (EXTERNAL)

KILLARK CONTROL PANEL (INTERNAL)



CURLEE CONTROL PANEL (INTERNAL)



CONTROL PANEL DEFINITIONS	
Transformer	Transformer used to convert 480-volt power to 110-volt power for control systems.
Main Power Circuit Breaker	MPCB used to open the electrical circuit as soon as current climbs to unsafe levels in the panel. Used mainly for short circuit protection.
Power Distribution Block	PDB used to make connection of 480-volt incoming power to all other 480-volt systems in the panel.
Main Drive Starter	MDS used to control main drive motor (not used until motor is up to speed then engaged to put motor across line.)
Back Drive Circuit Breaker	BDCB used to open the electrical circuit as soon as current climbs to unsafe levels in the Backdrive circuit. Used mainly for short circuit protection.
Feed Pump Circuit Breaker	FPCB used to open the electrical circuit as soon as current climbs to unsafe levels in the Feed Pump circuit. Used mainly for short circuit protection.
Feed Pump Starter	FPS used to control the feed pump motor.
Feed Pump Starter Overload	FPSO used to open the electrical circuit as soon as current climbs to unsafe levels in the Feed Pump motor circuit.
Backdrive Starter Forward	BSF used to control Backdrive motor when in a forward direction.
Back Drive Starter Overload	BSO used to open the electrical circuit as soon as current climbs to unsafe levels in the Backdrive motor circuit.
Back Drive Starter Reverse	BSR used to control Backdrive motor when in a reverse direction.
TB-1	Terminal Block 1 used to make connection between motors and motor control devices.
Current Transducer	Measures torque on the backdrive motor.
TB-2	Terminal Block 2 used to make connection between field sensors and PLC and/or relays.
ISB#1	Intrinsically Safe Barrier #1 used to isolate and amplify proximity switch signal for main drive.
ISB #2	Intrinsically Safe Barrier #2 used to isolate and amplify proximity switch signal for AutoGard.
ISB #3	Intrinsically Safe Barrier #3 used to isoloate and amplify vibration signal for the accelerometer.
ISB #4	Intrinsically Safe Barrier #4 used to isolate and amplify the signal from the current transducer.
Power Supply	Converts 110-volt power to 24-volt power to be used in the control panel.

CONTOL PANEL DEFINITIONS (Continued)	
PLC	Programmable Logic Controller is a computer-like control device that reads inputs and energizes electrical devices called outputs based on a user programmable memory. The PLC is responsible for controlling the centrifuge operation.
Relay #6	Relay #6 is used to turn on/off the Autogard light. A relay is an electrical switch that allows a low power to control a higher one. A small current energizes the relay, which closes a gate allowing a large current to flow through.
Relay #5	Relay #5 used to turn on/off the Vibration Light. A relay is an electrical switch that allows a low power to control a higher one. A small current energizes the relay, which closes a gate allowing a large current to flow through.
Control Power Circuit Breaker	CPCB is used to open the electrical circuit as soon as current climbs to unsafe levels in the Control Power circuit (480-volt primary and 110 volt secondary.)
Relay #4	Relay #4 is used to turn on/off the Alarm Horn. A relay is an electrical switch that allows a low power to control a higher one. A small current energizes the relay, which closes a gate allowing a large current to flow through.
Relay #3	Relay #3 is used to start/stop the Feed Pump. A relay is an electrical switch that allows a low power to control a higher one. A small current energizes the relay, which closes a gate allowing a large current to flow through.
Relay #2	Relay #2 is used to start/stop the Backdrive in a forward direction. A relay is an electrical switch that allows a low power to control a higher one. A small current energizes the relay, which closes a gate allowing a large current to flow through.
Relay #1	Relay #1 is used to start/stop the Backdrive in a reverse direction. A relay is an electrical switch that allows a low power to control a higher one. A small current energizes the relay, which closes a gate allowing a large current to flow through.
Soft Start	Soft start is an electronic device that regulates the maximum main drive current during start-up. Once the main drive reaches operating speed, the soft start is taken off line.

SECTION 9

TROUBLE SHOOTING

TROUBLE SHOOTING

THE HUTCHISON HAYES BRAKESMART™ SYSTEM CONTROL PANEL IS EQUIPPED WITH FAULT LIGHTS. SHOULD YOU ENCOUNTER A PROBLEM, THE FAULT LIGHTS ARE THE FIRST INDICATION OF WHAT THE PROBLEM MIGHT BE. ONCE A FAULT LIGHT IS ACTIVATED, THE RESET BUTTON ON THE FRONT OF THE CONTROL PANEL WILL HAVE TO BE PRESSED. ONCE WILL SILENCE THE HORN AND THE SECOND TIME WILL CLEAR THE FAULT. AFTER A FAULT HAS OCCURRED, APPROPRIATE ADJUSTMENTS SHOULD BE MADE TO PREVENT IT FROM REOCCURRING.

Centrifuge Trouble Shooting

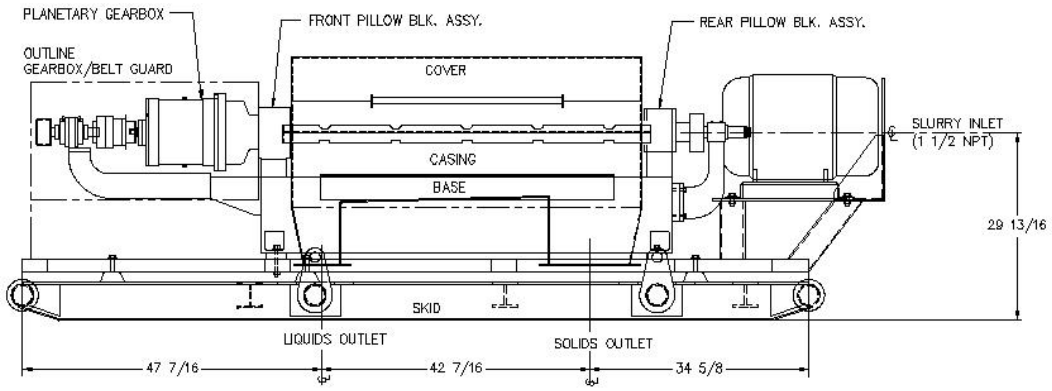
BEFORE PERFORMING ANY REMEDIES FOLLOW THE PROPER LOCK-OUT, TAG-OUT PROCEDURES

Problem	Possible Cause	Remedy
Unit will not start	No power	Check source
	Blown fuses	Replace & trace cause
	Drive starter	Repair or replace
	Soft start drive failure	Repair or replace
	Overheated Drive	Cool, restart, trace problem
	Autogard tripped	Reset fault light, reset Autogard.
Centrifuge shuts down	Blown fuse	Replace, trace cause
	Overload relays tripped	Reset
	Overheated drive motor	Cool, trace cause
	Vibration switch tripped	Reset, trace cause
	Torque control switch tripped	Reset, trace cause
Excessive Vibration	Isolators improperly secured	Check and tighten any loose bolts.
	Flexible piping not used at machine connections	Repipe
	Conveyor flights plugged with solids	Flush or clean as required
	Conveyor dead chamber filled with product	Remove feed tube & flush conveyor with high pressure
	Loose fasteners or components	Tighten
	Gearbox misaligned	Recheck runout
	Pillow block or conveyor bearings damaged	Install new bearings.

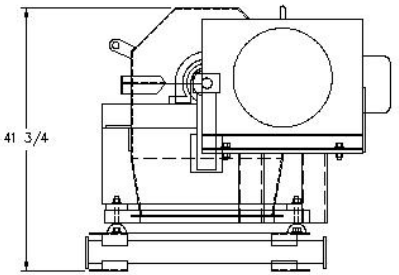
Problem	Possible Cause	Remedy
Poor separation	Incorrect Pond Depth	Change setting
	Feed rate too high	
	Feed viscosity too high	Repair or replace
Solids too wet	Conveyor speed too fast	Lower diferential speed
	G-force too low	Increase G-force
	Pond depth too high	Lower pond depth
	Feed rate too high	Lower feed rate
Solids discharge too dry	Conveyor speed too slow	Increase conveyor speed
	Pond depth too low	Increase pond depth

SECTION 10

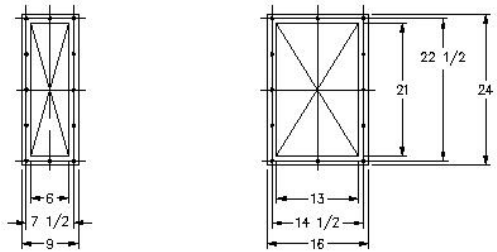
ELEVATIONS, DIMENSIONS & WEIGHTS



ELEVATION



SOLIDS END



LIQUIDS OUTLET

SOLIDS OUTLET

FILENAME:
UNLESS NOTED OTHERWISE:

ALL DIM'S ARE IN INCHES.

NTL:

TOLERANCE NOTES: MATERIAL SPECIFICATIONS & NOTES:

PART NUMBERS/REFERENCE DRAWINGS/DISC FILES

NO.	DESCRIPTION	BY	DATE
0	ISSUED FOR REFERENCE	WQL	08/03/04

REVISIONS

HUTCHISON-HAYES INTERNATIONAL, INC.
P.O. BOX 2955 HOUSTON, TEXAS 77015
TELEPHONE: 1-713-455-9900 FAX: 713-455-7753

1448 BrakeSmart LAYOUT

1448 CENTRIFUGE

DRAFTER:	DATE:	CHECK:	JOB:
W. QUINN	08/03/04	APPROVAL:	

SCALE: FULL

DRAWING: D- 1448 BrakeSmart

REV. 0

Components Weights & Measures

Description	Weight lbs.
5500 components	
5500 Variable Speed Skid Unit	8200
5500 Brake Smart Skid Unit	8300
5500 Oil Field Skid Unit	8200
5500 Hyd. Back Drive Unit	10400
5500 Full Hyd. Unit	12,800
5500 Base Unit	5,100
5500 Case and Cover	1,000
5500 Rotating Assembly (no g.b.)	2,000
5500 Bowl Assembly Complete (no conv.)	1250
5500 Conveyor Assembly Complete	750
GB 53 Gearbox	250
5500 Brake Panel	1100
VFD Control Panel	1,400

SECTION 11

MISCELLANEOUS

Recommended Spare Parts List for Two (2) Years Service
For the 5500 BrakeSmart™ Centrifuge

HH Part	Quantity	Description	Item	Op Spares 2 Years
04043	1	Pillow Blk. Bearing, Front	(101)	4
04042	1	Pillow Blk. Bearing, Rear	(100)	4
04041	2	Conveyor Bearing, Front	(103)	8
04040	1	Conveyor Bearing, Rear	(102)	4
04032	2	Oil Seal, Solids End	(200)	8
04030	1	Oil Seal, Drivesheave	(203)	4
04032	2	Oil Seal, Liquids End	(204)	4
04068	4	Gasket, Plate Dam	(207)	16
04025	1	O-Ring, Bowl Extension	(301)	6
04031	2	Oil Seal, Retainer Tube	(201)	6
04024	1	O-Ring, Conveyor Liquid End	(305)	6
04025	1	O-Ring, Bowl Liquid End	(304)	6
04022	2	O-Ring, Accelerator Plate	(24D)	6
04023	1	O-Ring, Solids End Seal Housing	(300)	4
04020	4	O-Ring, Feed Nozzle	(303)	8
*04057	4	Feed Nozzle	(27)	8
*04062	4	Wear Insert/Scraper Assembly	(29)	8
04687	1	Belt R3VX670-5		2
04013	6	Vibration Isolators		12
02879	1	Case Seal 1655 (5500) New Style 2		2
02989	1	Wear Plate, 5500 Solid Bowl Hub		2
03047	4	Clamping Shoe for 1655 Case Hinge		6
03048	4	Eyebolt for 1655 Case Hinge		6
03049	4	Nut for 1655 Hinge Bolt		6
04691	1	4 Bolt 2" Flange Bearing		1

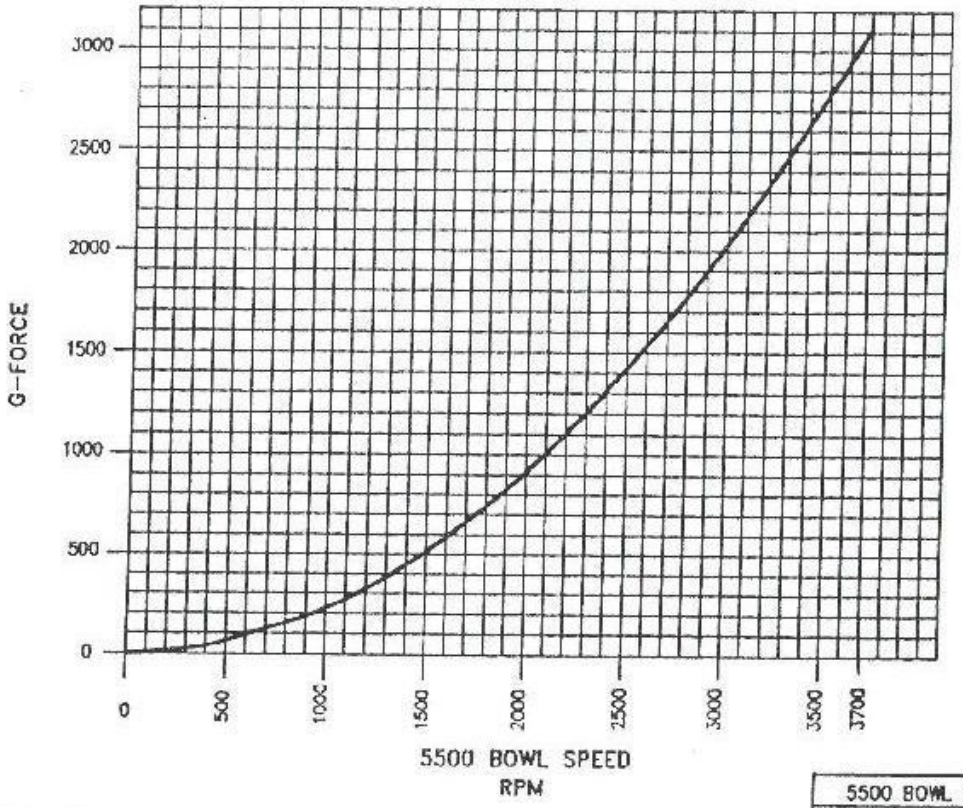
*Indicates Custom Part Available from HH Only

HUTCHISON–HAYES INTERNATIONAL, INC.

(713) 452–0222 FAX: (713) 457–6143 HOUSTON, TEXAS

SHT. 1 OF 1

HHI 5500 High "G" Centrifuge
BOWL SPEED VS. G-FORCE



PATH= C:\ACAD\RS\CURVES\5500-GF.DWG

NO.	DESCRIPTION	DATE
B	ISSUED FOR CUSTOMER REF.	2-1-93
A	PRELIMINARY, ISSUED FOR APPROVAL	9-17-92

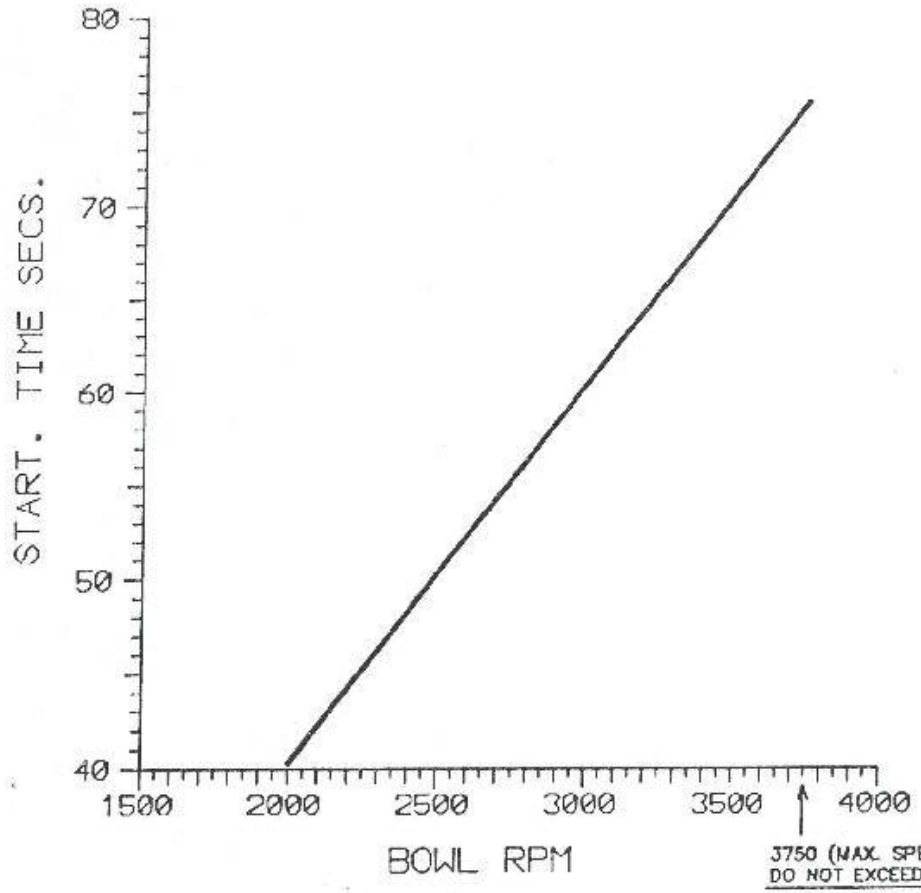
REVISIONS

5500 BOWL SPEED VS. CENTRIFUGAL FORCE			
HHR NO.		QTY.	
SCALE		DATE	9-17-92
CHK.		DATE	
APR'D		DATE	
DRAW NO.: A-	5500-GF-01	REV.	B

HUTCHISON–HAYES INTERNATIONAL, INC.

(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS

SHT. 1 OF 1



NOTE:

GRAPH BASED ON COMPUTER PREDICTED PERFORMANCE.

MACHINE: 5500 HIGH "G" CENTRIFUGE

5500 START TIME (WYE-DELTA)

PATH= C:\ACAD\RS\START-55.DWG

NO.	DESCRIPTION	DATE
	REVISIONS	

NO.	DESCRIPTION	DATE
A	PRELIMINARY, ISSUED FOR APPROVAL	
	REVISIONS	

JOB NO.		
DATE DWN.	8-30-93	
DRAWN BY:	R.S.	
CHK.		DATE
APR'D		DATE

DRAW NO.: A- START-55-01 REV. A

Storage of HH Centrifuge

Recommended indoor storage and rust prevention procedures for new horizontal decanting centrifuges (long-term storage implies periods in excess of three (3) months idle time.)

Note:
It is the responsibility of the owner to protect and maintain the equipment after shipment from HH.

If the centrifuge is not to be installed immediately after shipment, the unit should be left in the original factory packaging.

Centrifuge Assembly:

1. All accessible openings are closed with tape, overwrap, plugs, etc., for protection.

2. Nameplates are covered with tape.

3. Electrical devices such as the junction box, vibration shutdown switch, micro-switches, conduit boxes, etc., are wrapped with overwrap* and protective tape. *Overwrap refers to any self-adherent, grease, oil and waterproof material which can be molded around component parts.

4. The grease lubricated pillow block bearings are filled with the specified grease at the factory prior to shipment.

5. The planetary gearbox is filled with the specified lube oil at the factory prior to shipment.

6. The fluid coupling (located at the main drive motor output shaft) is filled with the specified oil at the factory.

Guidelines for Long Term Storage

1. The centrifuge should be stored in a building with a minimum temperature of 50° F. (10° C.). The storage area should be a clean, dry place free from excessive vibration, high humidity, dust, or corrosive fumes.

2. The unit should be tagged with instructions for startup after an extended period of storage.

3. Any loose parts should be boxed with rust inhibitor paper. No paper should be placed on the base of the box and machined unpainted surfaces should be coated with a rust preventive product.

4. The centrifuge assembly should be placed on a sturdy wooden platform. The platform boards should be spaced with 1/ 4**"** gap between the boards.

5. A protective waterproof shroud should cover the entire centrifuge assembly, top and four (4) sides.

Storage Maintenance

1. The centrifuge rotating assembly should be rotated by hand at least six (6) times every three (3) months.

2. Leave the sealed openings on the equipment closed.

3. Touch-up any damaged paint surfaces.

4. Do not paint rotating parts or threaded surfaces.

5. Motors should have their shafts rotated every three (3) months in order to keep the bearings lubricated and prevent rusting.

Coatings & Oils

At regular intervals during equipment storage, all exposed-machined surfaces unpainted steel parts, shafts, pipe fittings, etc., should be examined for signs of rust, pitting, and moisture.

These parts should be thoroughly cleaned and coated with the appropriate medium listed below:

1. Molykote Metal Protector (Dow Corning)

A wax type rust preventative, which may be sprayed, brushed, or dipped onto bare steel parts. This product dries to a hard, dry film, which is almost invisible.

For long storage periods, or shipment overseas, an overwrap must be used.

2. Rust Veto 342 (Houghton Co.)

A soft amber colored material leaving a transparent, dry plastic film on the coated part.

Applied by brushing, dipping or spraying, it is used for maximum heavy-duty protection on interior or exterior surfaces with or without a covering.

Before using the treated part, remove rust veto with solvent.

3. Rust Veto 377 (Houghton Co.)

A light, polar type water-displacing oil. It is used on metal parts stored indoors. It can be sprayed on intricate parts and bearings.

Long-term storage requires an overwrap. Removal from the treated part is not required before use.

An equivalent is “Antirust #77” WD Oil by International Chemical.

4. Rust Veto Concentrate (Houghton Co.)

A rust preventive that is mixed in one (1) part with nine (9) parts lubricating oil, or hydraulic oil, etc. It is circulated through gearboxes and hydraulic systems and then drained before shipment. It is compatible with most hydraulic oils and removal is not required before use.

5. Ferrocote 346 (Quaker Chemical Co.)

A heavy oil which leaves a soft, paste like film on the part surface. Used for outdoor storage, it must be used with overwrap. The treated part must have this coating removed with solvent before use.

Contact each Manufacturer as required to determine if the rust preventives are compatible with the type of oil you are using.

SECTION 12

VENDOR DATA

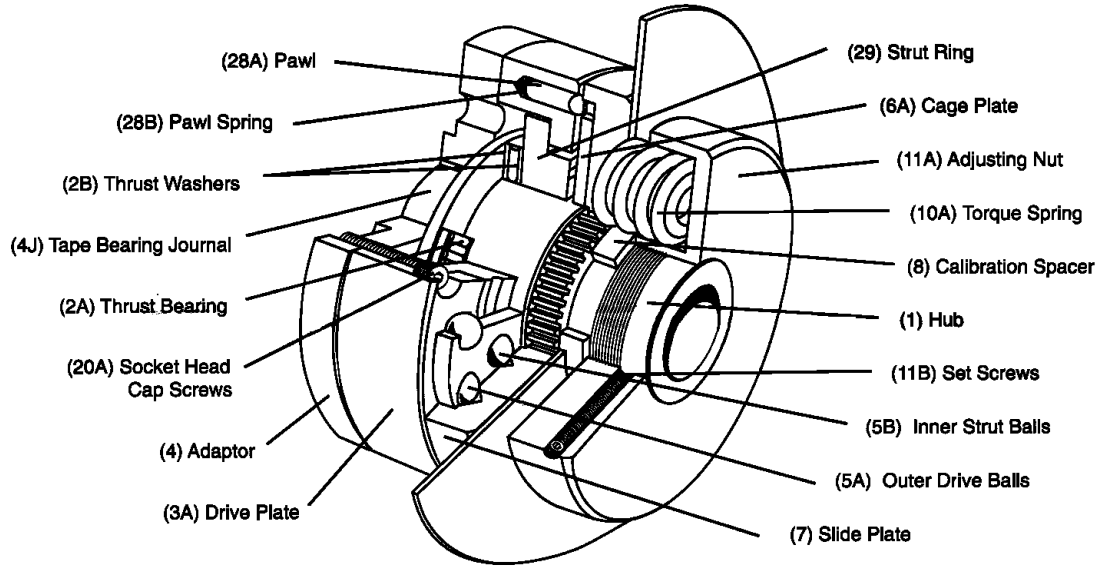
Index of Vendor Supplied Data
Operating Instructions and Service Manuals
(Refer to this Section before servicing equipment)

Auto Guard	04038
Baldor Motors & Drives	
Main Drive Electric Motor	04755
60 HP 1750 RPM (Mfr. Varies)	
Back Drive	04139

High Temp Shutdown Switch (OPTIONAL)
At front & rear pillow block housings
"United Electric Controls Co."
Model B-121-120-2000-m201
Explosion Proof
Open contact with temp. rise to 220 Deg. F.
(MFGR. MAY VARY)

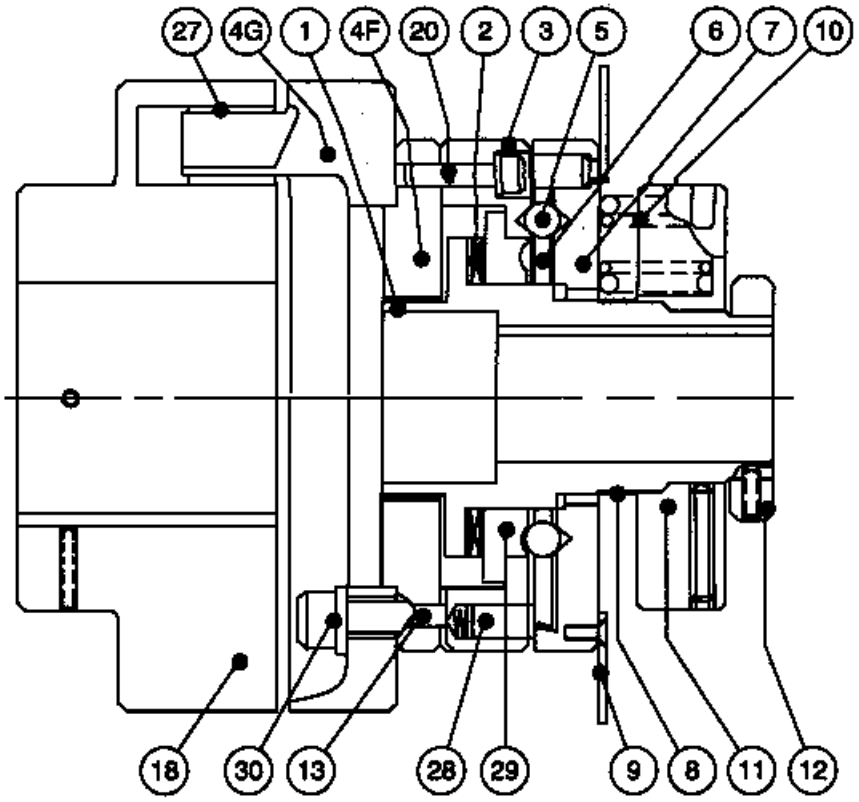
Autogard

Installation and Operation Manual
Autogard Torque Limiter
400 Series



OPERATION:

The Autogard 400 Series torque limiters disengage the drive completely on overload in both directions of rotation. After disengagement the drive is running free, which permits high-speed operation (at or above normal motor speeds). A shut down switch must be incorporated, as the unit is not designated to run continuously disengaged.



MODEL 406

PRIOR TO INSTALLATION

1. Mounting Sprocket or Sheave.

   A. Mounting with tapered bushing. (Taper-lock, Q.D., etc.)

   A sprocket, sheave, or timing belt pulley may be mounted directly on Model 401 by using a tapered bushing. Select a sprocket or sheave to fit "M" dia. Of the Autogard (Table 1.) No key is used with the bushing when mounting on the torque limiter. Thoroughly clean all grease and oil from "M" dia. With solvent prior to mounting the bushing. Be certain that the bushing is properly mounted and tightened according to the instructions accompanying each bushing. CAUTION: It is possible to overtighten the bushing capscrews to an extent that will deform the adapter (4) and prevent its free rotation on the hub (1). Make sure that the adapter and bushing assembly is free to rotate on the hub after the bushing is fully tightened. To check this, the adjusting nut (11) must be backed off to release all pressure from the spring (10). Re-tighten adjusting nut to original position after free-rotation check is completed.

   B. A sprocket sheave, etc., may also be mounted on Model 401 by bolting. The adapter (4) must be removed for drilling and tapping the mounting holes (Table 1) if they were not ordered with the unit. See Disassembly Procedure.

Table 1

Size	No. of Bolts	Bolt Size	Dimensions -Inches			M Dia.
			Max. Bolt Depth in Adapter	Bolt Circle Dia.	Sprocket Bore	
1	6	#8-32	.25	1.750	1.376/1.378	1.375
2	6	#10-24	.31	2.500	2.126/2.128	2.125
3	6	1/ 4x20	.38	3.375	2.876/2.878	2.875
4	6	5/16x18	.50	4.125	3.5015/3.5035	3.500
5	6	3/8x16	.62	5.687	5.0015//5.0035	5.000

Attach sprocket, sheave, etc., onto adapter prior to reassembly. Use bolts of a length that provides no more engagement in the adapter (4) than the maximum shown in Table 1. Make sure there are no protrusions inside the adapter, which might interfere with the hub. The unit may then be reassembled per instructions.

2. Mounting Sprocket or Sheave on Models 402 and 409.
3. Proper Spring
   Check to see that the correct number of springs is being used to release torque (Table 4). DO NOT TIGHTEN THE SPRINGS BEYOND ITS MINIMUM OPERATING LENGTH (with the torque limiter engaged) or the springs will not allow sufficient movement of the slide plate to let the balls leave their seats during an overload. Damage to the machinery or to the Autogard will result.
4. Lubrication
   The needle bearing, spline surfaces, plate faces and balls have the proper type and amount of lubricant applied during the assembly at the factory. No further lubrication should be required at initial installation.

MOUNTING TORQUE LIMITER ON SHAFT

MODEL 406

Mount the torque limiter hubs on the shafts in the same manner as described. For coupling units, Model 406, mount the torque limiter assembly on one of the shafts and the coupling hub, part 15, 16 or 18 on the other shaft. Bring the shafts together and align the coupling carefully, checking with a dial indicator. For optimum life, maintain alignment within the limits shown in Table 3.

Table 3

Model	Size	Allowable Angular Misalignment	Allowable Parallel Misalignment	Gap between Hub & Adapter	
403*	1 – 5	0	0	Min.	Max.
404	1 – 5	0	0		
405	1 – 5	.5 deg	0		
406	1	.10 deg.	.005”	.08”	.16”
	2		.008”	.80”	.16”
	3		.010”	.08”	.25”
	4		.013”	.08”	.25”
	5		.017”	.12”	.31”
	6		.020”	.12”	.31”
	7		.028”	.20”	.39”

TORQUE ADJUSTMENT DATA

Table 4

Size	Standard Torque Adjustment Spring			Y - Inches	Clearance CA In.	Movement to disengage X
	Spring Assembly		Torque Range	Min Allowable		
	Qty	Positions	Lb. In.			
1	8	Outer	100-250	.075	None Required	.059
	6	Outer	75-188	075		
	4	Outer	50-125	075		
	2	Outer	25-63	075		
2	8	Outer	400-2,000	.20	None Required	.112
	6	Outer	300-1,500	.20		
	4	Outer	200-1,000	.20		
3	6	Inner & Outer	1,700-6,000	.20	None Required	.137
	6	Outer	1,200-3,000	.20		
	4	Outer	800-2,100	.20		
	3	Outer	600-1,600	.20		
4	8	Inner &Outer	2,500-10,000	.20	None Required	.137
	8	Outer	2,000-6,800	.20		
	6	Outer	1,500-5,100	.20		
	4	Outer	1,000-3,400	.20		
5	8	Inner &Outer	8,000-22500	.40	None Required	.173
	8	Outer	6,000-17,000	.40		
	6	Outer	4,500-12,750	.40		
	4	Outer	3,000-8,500	.40		
6	8	Spring Stacks	12,000-50,000	1.05	3/8	.210
	6	Spring Stacks	9,000-37,500	1.05		
	4	Spring Stacks	6,000-25,000	1.05		

INITIAL STARTUP

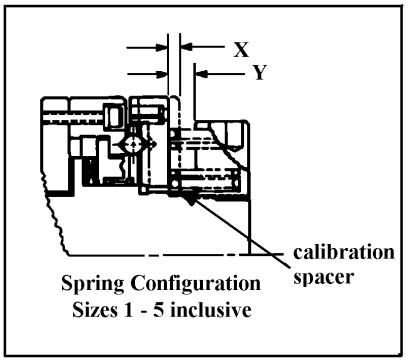
Prior to startup, examine torque limiter to make sure it is fully engaged with the balls seated correctly in both plates.

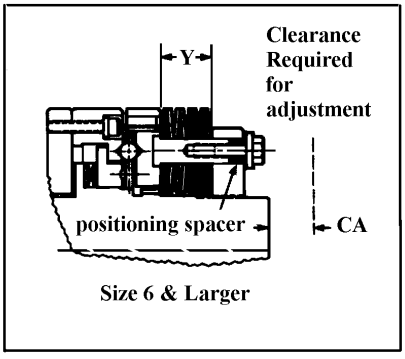
Obtain initial torque setting by one of the following methods:

A. The setting as furnished will be within ± 10% of the torque value specified on the order. If the factory adjustment has been altered during assembly procedure, be sure to reposition the adjusting nut in its original location as measured during the first step of the disassembly procedure. Secure nut in place with setscrews.

B. Torque limiter to be set at job site Sizes 1 through 5.

1. Setting by trial adjustments:
Start up the drive at minimum torque setting. If the torque limiter disengages before the normal operating load level is reached, progressively tighten the adjusting nut until the drive will start and operate under normal load without tripping.
Starting torque is usually the highest torque that the torque limiter must transmit, but occasionally the torque limiter must be set to accommodate higher peak operating torques.
After desired torque setting is obtained, secure adjusting nut with setscrews.
2. Setting to an established specified torque:
An appropriate setting can be made from a Torque Adjustment Chart furnished with the torque limiter if requested at the time of order.





CALIBRATION SPACERS

The torque limiter is shipped from the factory either with the torque setting pre-adjusted as specified at the time of the order, or furnished unset for adjustment at the time of installation.

All units are supplied with minimum spacer only to prevent from locking up (unless required otherwise by customer.)

TORQUE ADJUSTMENT

SIZE 6 AND LARGER

To facilitate adjustment under the high loads, these larger units use a number of adjusting bolts. See Fig 12.

When building, assemble all components as Fig. 12, but omit *the adjustment spacer*. Be careful to stack the disc springs correctly. This is generally as shown in Fig 12, but reference should be made to the assembly drawing as the number and method of stacking can vary.

Assemble the pillars (10B), springs (10A, washers (10C) and adjustment bolts (10E) into the adjusting nut (11A), and lightly tighten the bolts, so that as the adjusting nut is tightened, the hexagon engages with the groove in the slide plate.

Tighten the adjusting nut as far as possible, using the bolts to equalize the length of each spring stacks, so that all pillars are engaged with the groove on the slide plate.

To increase the torque, tighten each bolt by an equal amount, but not enough to disengage the hexagons from the slide plate. One or two turns of the bolt are normally a convenient amount. Then tighten the adjusting nut without using excessive force. Shortening of the spring stack is by means of the bolts, not by the nut. Continue with this procedure of alternately tightening bolts and adjusting nut until the correct spring length is achieved, then slacken the bolts. THE UNIT WILL NOT OPERATE CORRECTLY UNTIL THIS IS DONE.

When the correct torque setting is achieved, remove the pillar bolts completely, replace the adjustment spacer, and retighten the bolts. There must be a gap between the thick washer and the bolts. There must be a gap between the thick washers and the adjusting nut. Lock the adjusting nut with the setscrews.

NOTE

IT IS ESSENTIAL THAT ANY SET OF SPRINGS IS NOT USED ABOVE ITS CORRECT RANGE. IF THE SPRINGS ARE OVER-TIGHTENED, THE BALLS WILL BE PREVENTED FROM ROLLING FROM THE SEATINGS, IF SLACKENED TOO FAR, SO THAT A POSITIVE LOAD IS NOT APPLIED TO THE BALLS AT ALL TIMES. IT IS POSSIBLE THAT ONE OR MORE BALLS MAY REMAIN IN THEIR SEATINGS DURING TRIPPING. IN BOTH CASES IT IS PROBABLE THAT

DAMAGE WILL OCCUR TO THE MACHINERY OR TO THE AUTOGARD TORQUE LIMITER.

RESETTING PROCEDURE

1. Shut down the drive.
2. Investigate and remove the cause of overload or jam.
3. Reset.
   This is achieved either by reversing the driving side of the drive or by taking the driven side forward.

   Note that these units will trip at an accurate torque setting in both directions. Re-engaging must, therefore, be carried out at a speed slow enough to allow the unit to fully re-engage and then accelerate the mass of the driven machine.

   If this is attempted at too high a speed (e.g. by direction-line starting) the set torque of the unit can be exceeded, causing tripping in the opposite direction.

   The limiting re-engaging speed depends on factors such as the inertia of the driven plant, elasticity of the drive, and the torque setting of the Autogard, so it is not possible to give exact limiting re-engaging speeds. However, as a guide for most applications it should be under rather than over 100 RPM. Many drives incorporate a jogging facility, which can be used for re-engaging.

DISASSEMBLY PROCEDURE

1. Measure and make note of the position of the adjusting nut on the hub before proceeding with disassembly.
2. With spring end up, loosen the setscrews and remove the adjusting nut, spring, spacer, limit switch plate, slide plate and drive balls.
3. Carefully work drive plate over spline so as not to damage bearing material on I.D. of drive plate.
4. Clean all parts thoroughly and inspect the bearing surfaces. Carefully blend out any scratches.
5. Reassemble

MAINTENANCE

The frequency of maintenance will depend on the operating environment and number of trips, but once every 2,000 operating hours should be adequate in most applications. Proceed as follows:

If requested a grease fitting is located at either the end of the hub or the outer diameter of the adapter. Apply good quality lithium grease to all grease points. A general inspection of the unit should also be performed at this time, checking that all fasteners are tight, etc.

For unusual conditions, such as a very high RPM, high ambient temperatures, high vibration or dirty environment, more frequent or special maintenance may be required.

It is good practice when other equipment in the drive train is down for service to make a general inspection of the torque limiter. Check for tightness of the torque limiter on its shaft, tightness of the sprocket, etc., and check for appearance of adequate lubrication. This may be done by backing off the adjusting nut and separating the plate set to permit viewing the interior components. If there is any indication that further servicing may be desirable, the torque limiter should be disassembled and inspected as described above under DISASSEMBLY PROCEDURE.

NOTE: If, after the drive has been in operation for some time and the torque limiter suddenly starts disengaging for no apparent reason, check to see whether something in the drive train or driven machine, such as normal wear, a bad bearing, damaged sprocket, misalignment, change in machine duty, etc., may be the cause of the problem.

A visual inspection of the drive and slide plate is then recommended. Follow disassembly procedure above. Note that although a ball path between the ball seats should normally be visible, excessive wear on the seats themselves may require replacement of the drive plate.

Reassemble and follow INITIAL STARTUP procedure.

BUILDING PROCEDURE

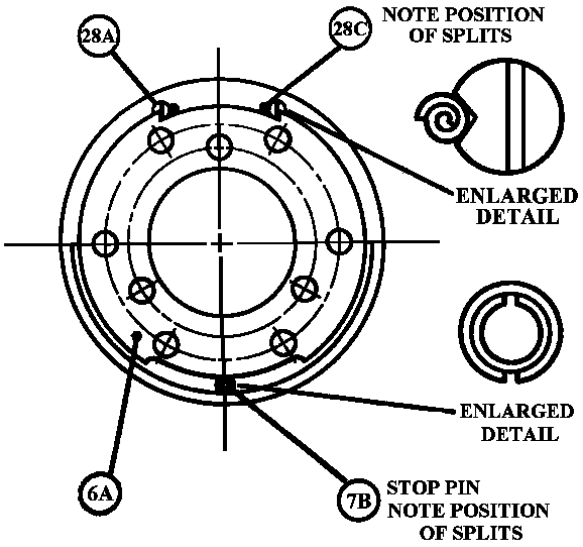
If the components being used are not new, they should be inspected for accidental damage or wear. Particular attention should be paid to bearing surfaces. Any slight damage marks should be carefully blended out.

Any components showing substantial damage or wear should be replaced.

GREASE

Use good quality grease. Units operating in conditions of high or low temperatures may require the appropriate special grease.

View from Drive Plate to Cage Plate
Figure 10



REFER TO FIGURES 10 AND 11
TO ASSIST THE FOLLOWING PROCEDURE:

A. Check the hub thread by running the adjusting nut (11A) down its full length on the hub.
B. Grease the needle bearing (2) and assemble onto the hub in this order:
   1. Thrust washer (2B)
   2. Needle bearing (2A)
   3. The second thrust washer (2B)
C. Assemble the strut ring (29A) onto the hub, with the flat face against the thrust bearing. Check that it can rotate freely.
D. Drive plate/pawl sub-assembly.
   Lightly oil the pawls and pawl springs (28A and 28B) and assemble into the drive plate (3).
   Check that the pawls can move freely. It must be possible to push them into the drive plate flush with the surface and they must move easily from that position due to the spring pressure.
E. Additional Notes for SR units.
   If the pawl locating pins (28C) are not already in place, they should now be carefully fitted after removal of the pawls and springs. Note, the pins must be positioned with the seam away from the pawl, see Fig. 10 (28C). Re-assemble pawls and springs and check that they still have free movement.
F. Assemble the drive plate onto the strut ring.
G. Lightly grease the bearing surface of the hub and assemble the tape thrust bearing (4K) against the flange. If tape journal bearing (4J) is included, carefully position in the bore of the adapter (4), and assemble onto the hub. Make sure the tape bearing stays in position during this assembly and check that the adapter can then turn freely on the hub.

Connect the adapter to the drive plate with capscrews (20A) and roll pins (7B). Check that the drive plate/adapter assembly can rotate freely on the hub.

H. On size 1 and 2 SR units, assemble the cage plate spring (6B) onto the hub, ensuring that it is housed in the counterbore in the strut ring, and that the coils are not intertwined. On size 3 and larger, a bayonet type of cage plate retention is used. The cage plate is placed in the slide plate with the stop pin notch 90° to the proper location. The stop pin (7B) should now be installed per Fig. 10. (Note position of splits in rollpins.)

I. Check that the stop pin (7B) is correctly positioned in the slide plate (7) and is not loose or damaged. It should lie flush with the top of the flange of the slide plate.

Size 1 uses a single pin, all other sizes use double pins, see Fig. 10.

Place the slide plate (7) on the bench with the flange and ball seat face upwards. Lightly grease the cage plate (6A) and place it on the slide plate with the shallow recess in the bore upwards.

The correct angular positioning of this plate relative to the ball seats and pins is most important, see Fig 10. The cage plate holes must be directly over the ball seatings, and the stop pin (7B) in the slide plate must be central in the cage plate cutout. Ensure that the plate is not 180 degrees out of position – the stop pin must be centrally positioned in the wider slot.

J. Insert some grease into each of the cage plate holes, and place drive balls (5A) and strut balls (5B) in these holes. There should be sufficient grease to hold these balls in position when the assembly is inverted.

K. Insert springs (10A) into the adjusting nut (11A). Some grease in the holes will help hold these positions for the next stages of assembly.

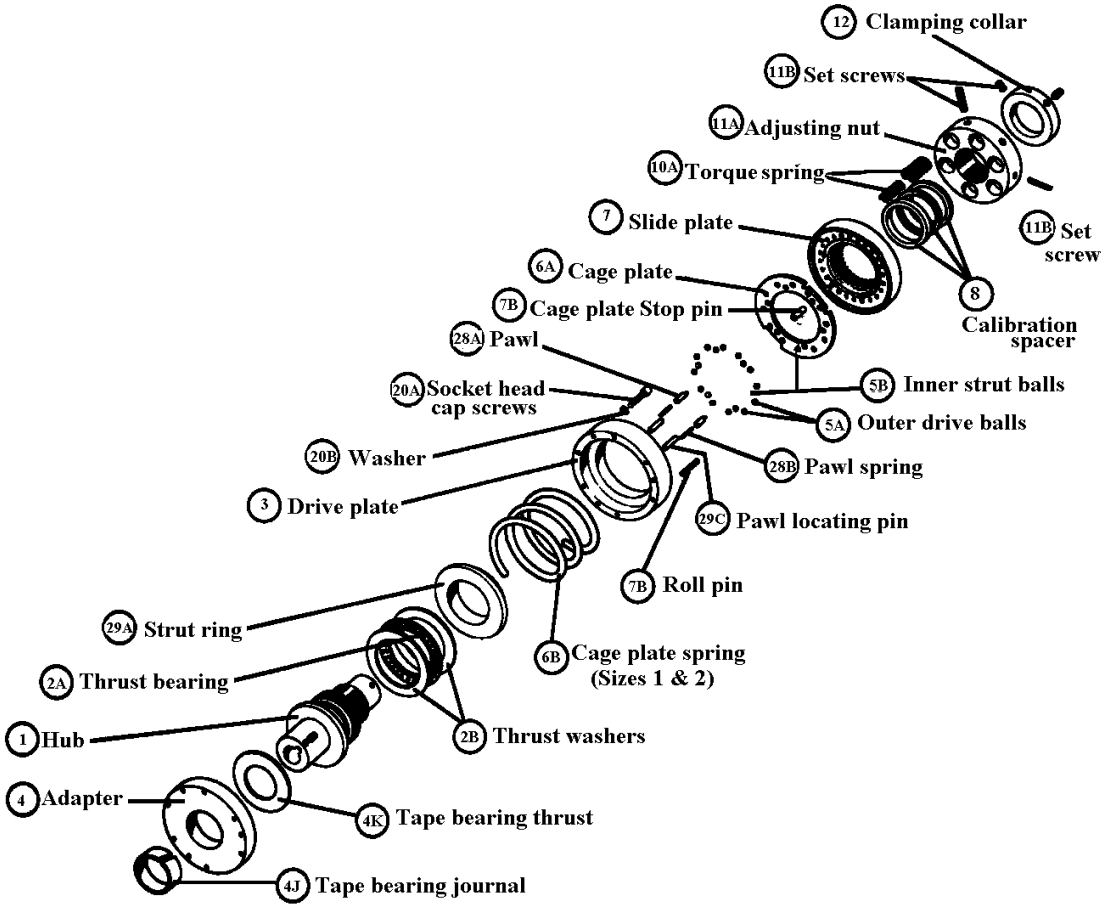
L. Carefully holding the cage plate in position, invert the slide plate, and pass it over the hub thread to engage with the splines on the hub. As soon as the splines are engaged, rotate the drive plate until the pawls are symmetrically facing the cutout in the slide plate flange. Then push the slide plate fully home, holding the cage plate until the last possible moment.

The drive balls should now be engaged with the seatings in the drive plate, and the pawls pushed almost completely into the drive plate by the flange on the slide plate.

There should be a small gap, about 0.010 inches (0.25mm) between the slide plate flange and the drive plate.

M. Hold the slide plate in this position against the cage plate spring pressure, and screw the nut/spring assembly onto the hub until the springs are against the slide plate with a positive pressure – more than the cage plate spring load so that the slide plate is held in position.

Figure 11

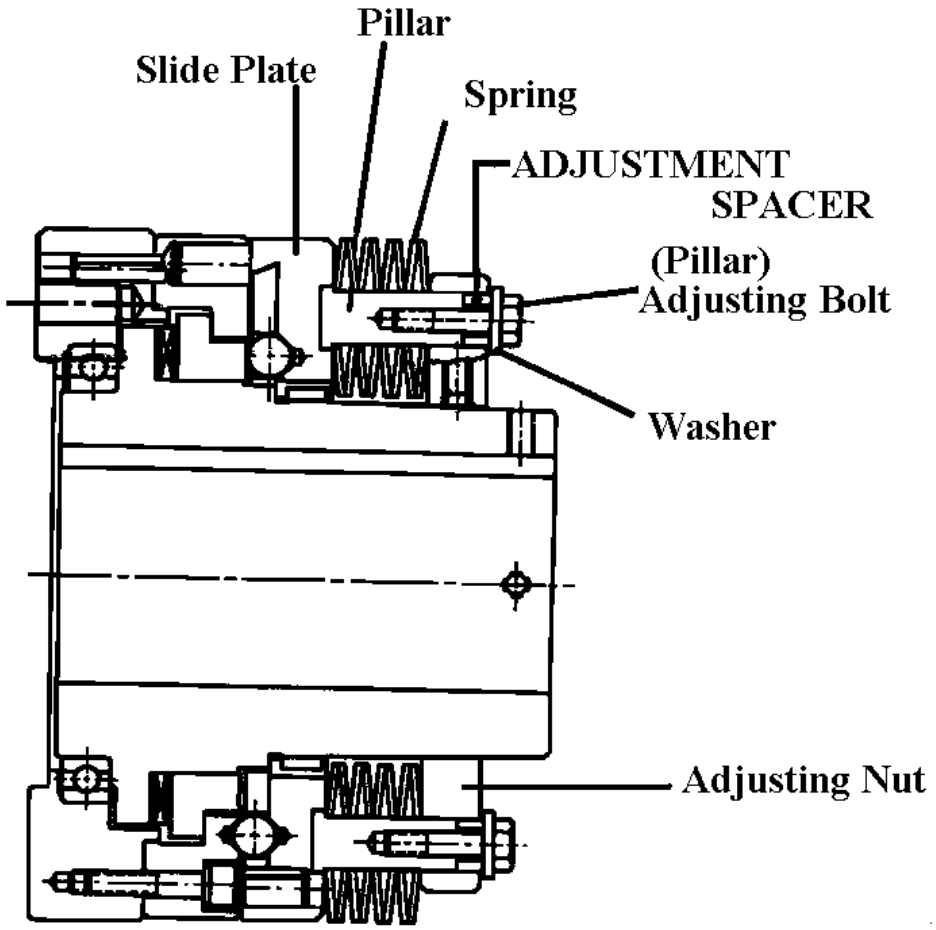

12 Clamping collar
11B Set screws
11A Adjusting nut
10A Torque spring
7 Slide plate
11B Set screw
6A Cage plate
8 Calibration spacer
7B Cage plate Stop pin
28A Pawl
5B Inner strut balls
20A Socket head cap screws
5A Outer drive balls
20B Washer
28B Pawl spring
3 Drive plate
29C Pawl locating pin
7B Roll pin
29A Strut ring
6B Cage plate spring (Sizes 1 & 2)
2A Thrust bearing
1 Hub
2B Thrust washers
4 Adapter
4K Tape bearing thrust
4J Tape bearing journal

SIZE 6 AND LARGER. (See Fig. 12)

These units differ from the smaller sizes in three respects, and the assembly procedure is as for the smaller units apart from these features.

1. The tape bearings in the adapter are replaced by a ball bearing.
2. The torque springs are guided on pillars instead of being housed in the adjusting nut. Disc springs are normally used on these sizes.
3. See notes on Torque Adjustment regarding assembly of the spring System on these larger units.

Figure 12



H and EH Barrel

Barrel, Metal Miniature with Potted-In Cable
Smooth picoprox
2-Wire DC, Requires Remote Amplifier
5-30 VDC
Variable Resistance Output, NAMUR (EN 50227)

Sensor Selection

Part Number	Embeddable	Rated Operating Distance (mm)	Barrel Diameter (mm)	Barrel Material	Drawing #	Wiring Diagram	# of LEDs	Switching Frequency	FM Approved Division 1 *	Time Delay Before Availability (ms)	ID Number
Bi 1 -EH04 -Y0	•	1.0	4.0	SS	1	A	0	5000	•	≤1	S1003040
Bi1.5-EH6.5-Y1	•	1.5	6.5	SS	2	A	0	5000	•	≤1	
Bi1.5-H08 -Y1	•	1.5	8.0	CPB	6	A	0	5000	•	≤1	
Ni 2 -H08 -Y1		2.0	8.0	CPB	7	A	0	5000	•	≤1	S1021500
Ni 3 -EH6.5-Y1		3.0	6.5	SS	3	A	0	5000	•	≤1	
5-EH6.5K-Y1 Torque	•	1.5	6.5	SS	4	A	0	5000	•	≤1	S1004600
-EH6.5K-Y1		3.0	6.5	SS	5	A	0	5000	•	≤1	S1004700

* Factory Mutual approval applies only when used with Factory Mutual approved switching amplifiers.
Note: Y0 and Y1 units have identical electrical properties. See Section A for differences in European approvals.

ACCESSORIES

Accessories and mounting devices can be found in Section J.
Remote Amplifier required. Consult TURCK multimodul or Automation Controls catalog

CABLE/CONDUCTOR

Cable: PVC Jacket; 2 meter standard length
Copper Conductor: EH04: 26 AWG
(PVC insulated) EH6.5.H08: 24-AWG

MATERIAL

Barrel: Stainless Steel
Locknuts/Lockwashers: Stainless Steel
Sensing Face/End Cap: PA 12-GF30 / Trogamid T Plastic

TURCK
Inductive Sensors - Barrels

G and EG Barrel

Barrel, Metal with Potted-In Cable - Standard Stainless Steel

full Threading

2-Wire DC, Requires Remote Amplifier

5-30 VDC

Variable Resistance Output, NAMUR (EN 50227)

Sensor Selection

Part Number	Embeddable	Rated Operating Distance (mm)	Barrel Diameter (mm)	Barrel Material	Drawing #	Wiring Diagram	# of LEDs	Switching Frequency	FM Approved Division 1 *	Time Delay Before Availability (ms)	ID Number
Bi 2-G12-Y0	•	2	12	CPB	1	A	0	5000	•	≤1	T1005400
Bi 2-G12-Y0X	•	2	12	CPB	1	A	1	5000	•	≤1	T4010000
Bi 5-G18-Y0	•	5	18	CPB	3	A	0	1000	•	≤1	T1006000
Bi 5-G18-Y0X	•	5	18	CPB	3	A	1	1000	•	≤1	T4015000
Bi10-G30-Y0	•	10	30	CPB	5	A	0	500	•	≤1	T1006200
Bi10-G30-Y0X	•	10	30	CPB	5	A	1	500	•	≤1	T4020000
[illegible]0-G47-Y1	•	20	47	CPB	7	A	0	200	•	≤1	M1006800
[illegible]-G47-Y1X	•	20	47	CPB	7	A	1	200	•	≤1	M1020200
Ni 5-G12-Y0		5	12	CPB	2	A	0	2000	•	≤1	T1005500
Ni 5-G12-Y0X		5	12	CPB	2	A	1	2000	•	≤1	T4010100
Ni10-G18-Y0		10	18	CPB	4	A	0	500	•	≤1	T1006100
Ni10-G18-Y0X		10	18	CPB	4	A	1	500	•	≤1	T4015100
Ni15-G30-Y0		15	30	CPB	6	A	0	200	•	≤1	T1006300
Ni15-G30-Y0X		15	30	CPB	6	A	1	200	•	≤1	T4020100
Ni25-G47-Y1		25	47	CPB	8	A	0	150	•	≤1	M1006900
Bi 2-EG12-Y0X	•	2	12	SS	1	A	1	5000	•	≤1	T4012000

CASE/COVER

* Factory Mutual approval applies only when used with Factory Mutual approved switching amplifiers.
Note: Y0 and Y1 units have identical electrical properties. See Section A for differences in European approvals.

Cable/Conductor

Cable: PVC Jacket; 2 meter standard length
Copper Conductor: G12.24 AWG
(PVC insulated): G18/G30/G47

MATERIAL

Barrel/Locknuts: CPS = Chrome Plated Brass
SS = Stainless Steel
Sensing Face: PA 12-GF30 Plastic
End Cap: G12/G18/G30:PUR Plastic

ACCESSORIES

Accessories and mounting devices can be found in Section 1
Remote Amplifier required. Consult TURCK multimodul or Automation Control catalog

BALDOR®
MOTORS AND DRIVES

Explosion Proof AC and DC Motors

BALDOR
MOTORS AND DRIVES

Integral Horsepower
AC Induction Motors
ODP, WPI, WPII Enclosure
TEFC Enclosure
Explosion Proof

Installation & Operating Manual

7/02 MN400

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Section 1
General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personne . A Caution statement indicates a condition that can cause damage to equipmen..

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Ins.allation and Use of Electr c Motors and Gene.a.ors.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Baldor Electric motors are warranted for a period of one (1) year, from date of shipment from the factory or factory warehouse against defects in material and workmanship. To allow for stocking and/or fabrication period and to provide one year of actual service, the warranty period is extended for an additional period of six (6) months for a total of eighteen (18) months from the original date of shipment from the factory or factory warehouse stock. In no case will the warranty period be extended for a longer period. Baldor extends this limited warranty to each buyer of the electric motor for the purpose of resale and to the original purchaser for use.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
   a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
   b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state

Note that **Baldor Super-E® Premium Efficiency** electric motors are warranted for a period of three (3) years. **Baldor IEEE 841** electric motors are warranted for a period of five (5) years.
All other terms and conditions of the Limited Warranty statement apply.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**

WARNING: **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**

WARNING: **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**

WARNING: **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**

WARNING: **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**

WARNING: **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

WARNING: **Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.**

WARNING: **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**

WARNING: **Do not use these motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.**

WARNING:	**Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate.**
	Specific service conditions for these motors are defined in NEC 70-599.
WARNING:	**UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**
Caution:	**To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**
Caution:	**Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.**
Caution:	**If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**
Caution:	**To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**
Caution:	**If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG-1 and MG-2 standards to avoid equipment damage.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WPII motor.
2. When lifting a WPII (weatherproof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc. it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

   If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include: coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

The motor should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles, and vibration. Exposure to these can reduce the operating life and degrade performance. Be sure to allow clearance for ventilation and access for cleaning, repair, service and inspections. Ventilation is extremely important. Be sure the area for ventilation is not obstructed. Obstructions will limit the free passage of air. Motors get warm and the heat must be dissipated to prevent damage.

These motors are not designed for atmospheric conditions that require explosion proof operation. They must NOT be used in the presence of flammable or combustible vapors or dust.

1. ODP motors are suitable only for indoor applications.
2. TEFC and WPII motors are suitable for indoor or outdoor standard service applications.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation rails and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. **Direct Coupling**
   For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
   The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
   The pulley ratio should not exceed 8:1.
4. **Belt Drive**
   Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

Conduit Box

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

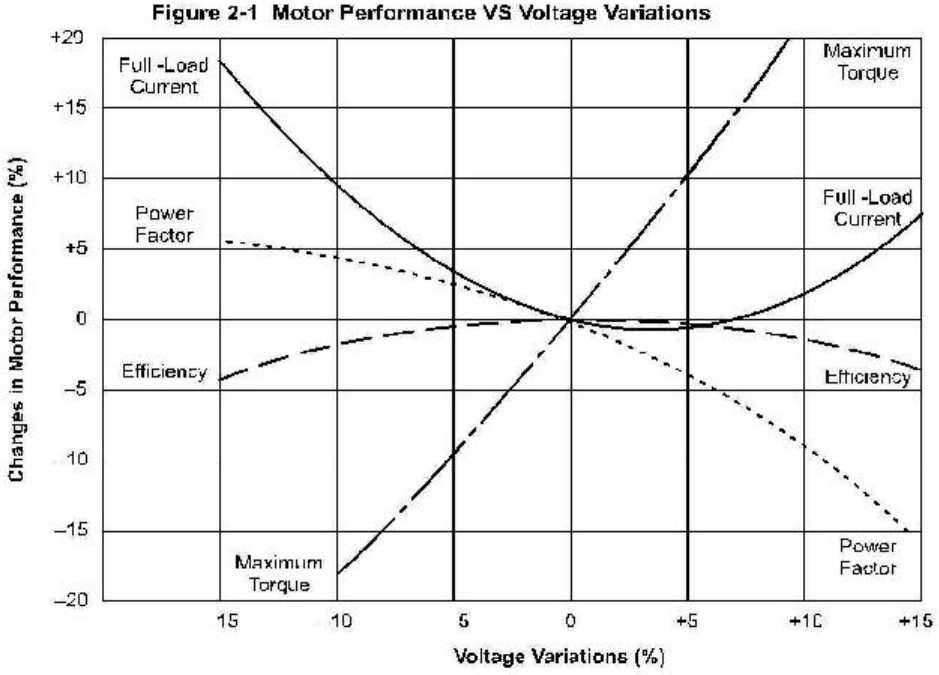
AC Power

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within ±10% of rated voltage with rated frequency. (See motor name plate for ratings).
   OR
2. AC power is within ±5% of rated frequency with rated voltage.
   OR
3. A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-1.

Figure 2-1 Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than that by the same motor under full load. If it is necessary to to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3
Maintenance & Troubleshooting

WARNING: **UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Lubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:
Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

– Maximum operating temperature for standard motors = 110° C.
– Shut–down temperature in case of a malfunction = 115° C.

Lubrication Intervals

Recommended lubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2 and 3-3.

Table 3-1 Lubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)			3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)			* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)			*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN401).
Relubrication interval for 6205 bearing bearing is 1550Hrs. (using grease lubrication).
Relubrication interval for 6806 bearing bearing is 720Hrs. (using grease lubrication).

Table 3-2 Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40° C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50° C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<–30° C **		

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)					
	Bearing	OD D mm	Width B mm	Weight of Grease to add * oz (Grams)	Volume of grease to be added in^3	tea-spoon
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (7)	1.2	3.9
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23)	1.5	5.2
Over 360 to 449 incl. (280)	6319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	6328	300	62	4.70 (130)	8.2	30.0
Over 360 to 449 incl. (280)	NU319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	NU328	300	62	4.70 (130)	8.2	30.0
Spindle Motors						
76 Frame	6207	72	17	0.22 (6.1)	0.44	1.4
77 Frame	6210	90	20	0.32 (9.0)	0.64	2.1
80 Frame	6213	120	23	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Lubrication Procedure

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

   If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.
4. Re-install grease outlet plug.

Without Grease Outlet Plug

1. Disassemble motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)

Note: Bearing is 1/3 full when only one side of bearing is completely full of grease.

3. Assemble motor.

Sample Lubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 3-4 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Accessories

The following is a partial list of accessories available from Baldor.
Contact your Baldor distributor for availability and pricing information.

Note: Space heaters and RTD's are standard on some motors.

Bearing RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor bearing during operation.

Bearing Thermocouples
Used to measure or monitor bearing temperatures.

Bearing Thermostat
Temperature device that activates when bearing temperatures are excessive. Used with an external circuit to warn of excessive bearing temperature or to shut down a motor.

Conduit Boxes
Optional conduit boxes are available in various sizes to accommodate accessory devices.

Cord & Plug Assembly
Adds a line cord and plug for portable applications.

Drains and Breathers
Stainless steel drains with separate breathers are available.

Drip Covers
Designed for use when motor is mounted in a vertical position. Contact your Baldor distributor to confirm that the motor is designed for vertical mounting.

Fan Cover & Lint Screen
To prevent build-up of debris on the cooling fan.

Nameplate
Additional stainless steel nameplates are available.

Roller Bearings
Recommended for belt drive applications with a speed of 1800 RPM or less.

Rotation Arrow Labels
Rotation arrows are supplied on motors designed to operate in one direction only. Additional rotation arrows are available.

Space Heater
Added to prevent condensation of moisture within the motor enclosure during periods of shut down or storage.

Stainless Hardware
Stainless steel hardware is available. Standard hardware is corrosion resistant zinc plated steel.

Winding RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor winding during operation.

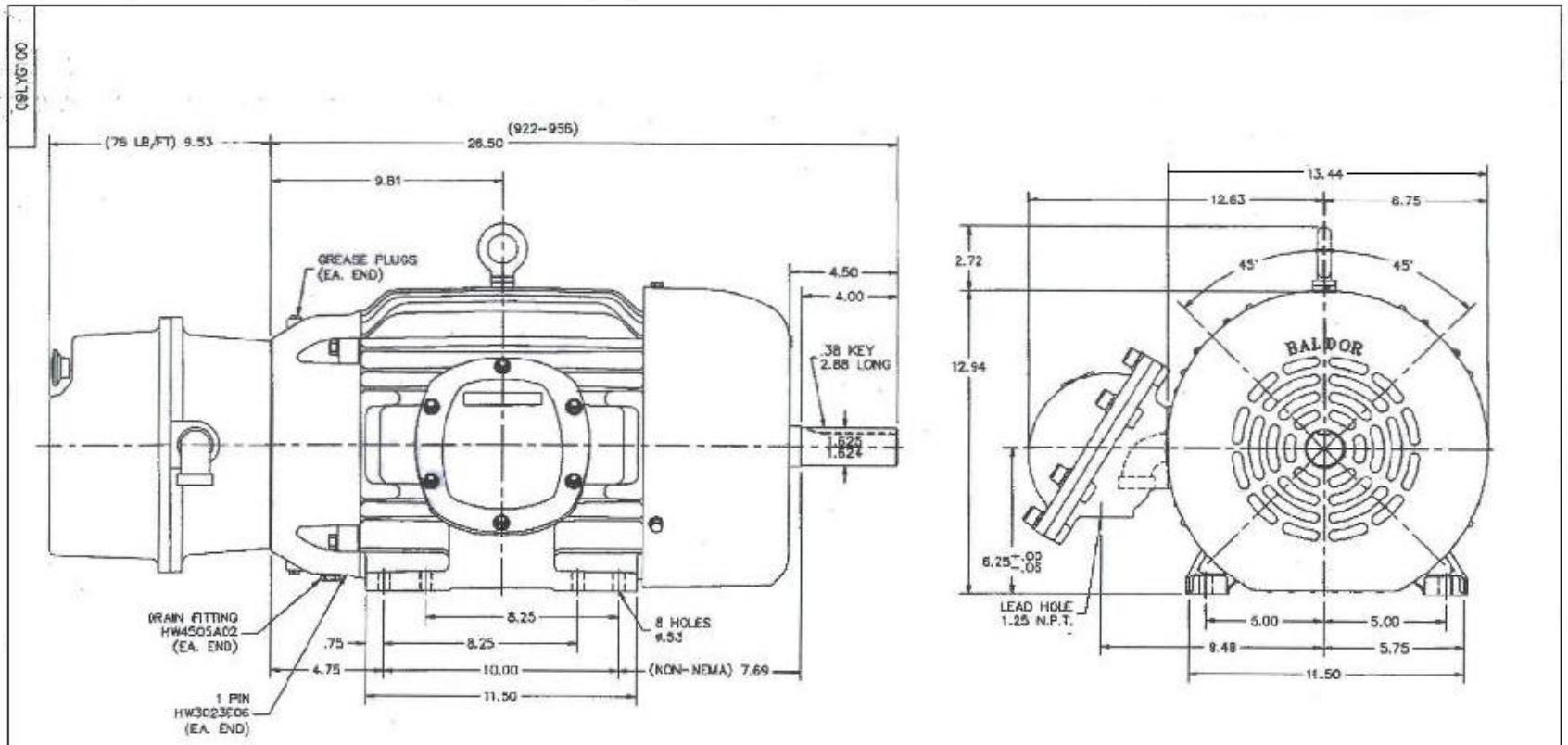
Winding Thermocouples
Used to measure or monitor winding temperatures.

Winding Thermostat
Temperature device that activates when winding temperatures are excessive. Used with an external circuit to warn of excessive winding temperature or to shut down a motor.

Note: On some motors, leads for accessory devices are brought out to a separate conduit box located on the side of the motor housing (unless otherwise specified).

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings. Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately ¾ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately ¾ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately ¾ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately ¾ filled.


09LYG100
(75 LB/FT) 9.53
(922-956)
26.50
9.81
GREASE PLUGS
(EA. END)
4.50
4.00
.38 KEY
2.88 LONG
1.629
1.624
DRAIN FITTING
HW4505A02
(EA. END)
1 PIN
HW3023E06
(EA. END)
.75
8.25
4.75
10.00
11.50
8.25
8 HOLES
9.53
(NON-NEMA) 7.69
13.44
12.63
6.75
2.72
45°
45°
12.94
BALDOR
6.25 +.00 -.05
LEAD HOLE
1.25 N.P.T.
5.00
5.00
8.48
5.75
11.50
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.
REV. DESC: NEW
REV. LTR: -
BY: JHM
REVISED: 11:27:14 03/05/2003
TDR: 295401
FILE: AAA00103621
REF: 09LYG100
MTL: -
BALDOR ELECTRIC Co.
HORZ XPFC 254-6T, CLI GRP C&D ONLY, DRILL RIG, W/BRAKE
09LYG100

AC Induction Motor Performance Data

Winding: 09WGX927	**Type:** 0946M	**Enclosure:** XPFC

Rated Output	20 HP			Full Load Torque	59.3 LB-FT
Volts	230/460			Break Down Torque	207.0 LB-FT
Full Load Amps	48/24			Pull-Up Torque	97.3 LB-FT
R.P.M.	1760			Locked-rotor Torque	115.0 LB-FT
Hz	60	Phase:	3	Starting Current (AMPS)	168.0 @ 460
NEMA Design Code	A	KVA Code:	H	No-load Current (AMPS)	9.63 @ 460
Service Factor	1.00			Line-line Res. @ 25 °C.	0.458 Ohms
NEMA Nom. Eff.	91.0	P.F.:	84	Temp. Rise @ rated load, °C	46
Rating - Duty	40C AMB-CONT			Temp. Rise @ S.F., °C	
S.F. Amps					

Load Characteristics at 460 Volts, 60 Hz

% of Rated Load	*25*	*50*	*75*	*100*	*125*	*150*	*S.F.*
Power Factor	49	71	80	84	86	87	
Efficiency	84.5	90.2	91.6	91.7	91.3	90.5	
Speed	1791	1783	1774	1765	1755	1744	
Line Amperes	11.2	14.6	19.1	24.1	29.7	35.7	

Baldor Electric Company Fort Smith, Arkansas