COMPLETE OPERATION GUIDE AND PARTS MANUAL

R&R MACHINE WORKS

24 x 56 Flaker

R&R MACHINE WORKS
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randrmachineworks.com

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R & R Machine Works Inc.

We really appreciate you making this purchase from us and we hope the equipment meets your expectations. We strive to sell equipment that will make your business as well as ours, prosper. When you have future equipment or service needs please think of us first!

If we can be of further services to you or your company, please call us at

(806) 244-5686.

Sincerely,

Owners and Management

Dalhart R&R Machine Works, Inc.

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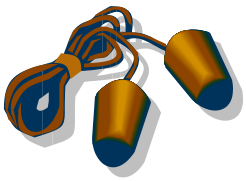
INTRODUCTION

Your new flaker is a quality flaking mill that will give you many years of low cost operation if given the proper amount of care and maintenance.

Your mill has been engineered and designed with simplicity of operation in mind, but first and foremost to give the best quality product at maximum operating capacity.

Your flaker manufacturer stands ready to serve you at any time with service, whether it be in the form of maintenance and operating instructions, or on location with help performed by a qualified factory representative.

Your flaker manufacturer has on hand at all times any replacement part for your mill that you will need, and also a supply of rolls corrugated and journaled to fit your mill and your operation.



GENERAL SAFETY PRACTICES

ALWAYS OBSERVE SAFE OPERATING PRACTICES AROUND MACHINERY. MOST ACCIDENTS ARE THE RESULT OF CARELESSNESS OR NEGLIGENCE. ALL ROTATING MACHINERY IS POTENTIALLY DANGEROUS.

OPERATION

READ OWNERS MANUAL BEFORE OPERATING.

MAINTENANCE

SHUT OFF AND LOCK OUT MAIN POWER SOURCE. DO NOT DO MAINTENANCE UNTIL ALL MOVING PARTS HAVE STOPPED.

DO NOT USE FLAKER MILL WITHOUT GUARDS IN PLACE.

ON A DUAL DRIVE MACHINE, TIGHTEN HTD BELTS ONLY WHEN ROLLS ARE CLOSED.

FAILURE TO COMPLY WITH SAFETY INSTRUCTIONS CAN RESULT IN INJURY OR DEATH.

STEAM FLAKE PROCESSING

There are four basic criteria that are controlled by the milling operator that have a significant affect on grain processing. They are:

1. Grain Moisture
2. Cook Time (time in the steam cabinet)
3. Grain Temperature
4. Grain Flake Bushel Weight

Each of the areas must be addressed in order to assure proper and adequate grain processing, regardless of grain involved.

GRAIN MOISTURE –Moisture is required within the grain kernel in order to provide steam expansion of the kernel during the cooking process and maximize the gelatinization of starch when passing through the rolls. The desired moisture level of the grain after processing is 21 percent. Because endogenous moisture varies depending on time in storage, harvest conditions, etc, the moisture addition though conditioning must be monitored regularly and changes made if grain becomes too wet or too dry.

It is normally anticipated that we will pick up three to four percent moisture from steam in the cabinet when boiler pressure is 80 to 90 pounds. So based on the moisture of incoming grain, the grain conditioner should be calibrated accordingly.

COOKING TIME –The time spent in the steam cabinet at steam temperature, which is about 206 deg. F, at 3800 feet elevation, is necessary to improve the starch availability. It is this portion of the process that determines the improved conversion of starch to glucose in the rumen. For most grain, specifically corn or milo, the “cook time” necessary is about 45 minutes. Excessive cooking time (more than one hour) is not harmful but may cause some mechanical problems such as wrapping. The time spent cooking will be determined based on run time and total tons processed.

GRAIN TEMPERATURE –Grain in the steam cabinet will equilibrate at the aforementioned steam temperature of about 206-210 deg. F. The primary purpose of the steam is to heat the grain. When grains are extremely wet, i.e. right after harvest, the boiler pressure may be increased to provide the same temperature with less water (dry steam). That can be accomplished around 90 to 100 psi boiler pressure.

The grain should be heated for about 15 minutes prior to the start of the rolls. Maximum effectiveness is not reached until 30 to 40 minutes into the rolling process, after the rolls have heated and the process becomes uniform and consistent. Once temperatures are reached throughout the system, adjustments to high and low steam injection can be made (reduced) to improve the cost efficiency of boiler operation.

FLAKE BUSHEL WEIGHT –Without this final process all of the foregoing effort is for naught. The rolling process actually finalizes the gelatinization process and makes it irreversible. And, in the case of milo, disrupts the protein matrix that surrounds the starch granule. Without the roller process, the grain would dry and return to its pretreatment status with no improvement in utilization of starch.

Flake bushel weight can be measured directly from beneath the rolls. The flake weight for corn should be from 27 to 28 pounds per bushel and the flake weight for milo should be 24 to 26 pounds per bushel. Weights above these levels will not produce the desired percentage of starch gelatinization and weights below these values will not appreciably improve utilization and will only result in added roll wear.

Flake weights must be determined to each side of the rolls, since they are independently adjustable. There should be no more than two pounds per bushel difference between the sides.

The rolls are corrugated specifically for the grain to be processed. The corn rolls normally have 14 corrugations per inch and the milo rolls normally have 16 corrugations per inch. If we determine that milo will be the only grain processed through a particular set of rolls, we may suggest an 18 corrugation.

Maintaining maximum recommended amps on the rolls during processing provides for maximum tonnage production.

In summary, the objectives of grain processing are:

1. Maintain flake moisture at 21 percent.
2. Maintain a minimum cook time of 45 minutes.
3. Maintain maximum temperature, 206-208 degrees F.
4. Produce desirable flake bushel weight for the grain processed:

Flaked Weight
Corn – 27-28 lbs/bu
Milo -25-26 lbs/bu
Barley-26-27 lbs/bu
Wheat-30-33 lbs/bu

By doing these four things consistently, you will experience a marked improvement in efficiency of feed utilization and increased profit for both the feed yard and the cattle feeders.

INSTALLATION

The installation of your flaking mill should be carefully planned and well engineered.

The following points should be followed to get the most out of your roller mill, both in capacity and quality:

1. There should be sufficient space around the machine for adjustments, repairs and removal of rolls for recorrugation.

2. The mill should be installed on a level surface capable of withstanding the weight of the mill. Micro/Level Isolators are ideal to place between the mill and the floor or stand that the mill is to be mounted on.

3. If the surface is not level, shims or grout should be used to avoid warping or binding the frame.

4. Install motor and drive as recommended by the factory. If the motor base or rails are not mounted, the motor must be fastened securely and the V –Belt aligned with the available space to tighten belts at a later time.

5. Provisions should be made to adequately feed the Mill.

6. Provisions must be adequate to take the product from the Mill. This is usually done by any of several methods.

7. The discharged grain is hot and moist when a steamer is used. This moisture in the grain is very corrosive, therefore, proper conveying is very important. If the grain is to be stored, proper cooling is a must.

8. Rolls must be kept in TRAM at all times. It is especially important when rolls are changed.

PREOPERATIONAL CHECK LIST

1. The rolls have been preset at the factory with a clearance of .015 when the rolls are drawn together.
2. All points requiring lubrication should be noted. Your mill has been lubricated at all points before leaving the factory.
3. Check all bolts for tightness.
4. Check all V-Belts for tightness.
5. Adjust SCR control at different settings to become familiar with its features.
6. Open and close the rolls several times to become acquainted with the mechanisms.

TIPS ON OPERATING YOUR ROLLER MILL

The Roller Mill was designed to efficiently produce a high quality of commercial grade flaked grain.
The capacity of your mill will be dependent on the following conditions, either singly or in combination:

1. Plumpness of kernel
2. Toughness of hull
3. Moisture content
4. Amount of conditioning, when steam is used
5. Thinness of flake desired
6. Foreign material in grain, particularly rocks
7. Corrugation on rolls
8. The RPM of your feeder bar

The capacity can be increased somewhat if the quality of the final product is not critical.

The rolls are usually set further apart when rolling corn because of the large kernel size.
It may be necessary to adjust the roll clearance to obtain your desired final product.

As the corrugation begins to wear off you will notice a decrease in capacity at first, but as the corrugation becomes extremely dull, the capacity will be greatly reduced.

TO START UP YOUR MILL

1. Blow all return steam lines to rid system of water.

2. Fill steam cabinets with grain.

3. Start rolls, airlift and augers.

4. To avoid pulling boilers too low, steam only two cabinets at one time.

5. Turn all steam valves to full open, when top and bottom gauges reach 205 degrees close valves and go to next machine, using same process on all machines.

6. When all cabinets are heated to 205 degrees, start first machine; set SCR 50% of regular use; open steam valves slightly; check to see if feed is getting to rolls; engage rolls.

7. Go to next machine with same process until all are running.

8. Return to first machine, raise SCR speed to 75% and adjust steam.

9. Repeat previous process on all machines, but increasing SCR to desired setting.

10. After all machines are operating at desired speed for one hour check and record flake weight and appearance, also check and record bearing temperature.

11. Use all steam laterals; usually the top valve will run full open, next at ¾ , next at ½ , and bottom cracked slightly. If you get steam out of the top of the cabinet, or too much on bottom, adjust accordingly.

12. Record flake and bearing temperature every two to four hours.

OPERATING INSTRUCTIONS FOR FEED ROLLS

Feed Mill Rolls have a long life provided they are carefully maintained.

The following instructions should be observed:

1. The material to be crushed must be evenly distributed over the whole barrel length of the roll in order to avoid excessive wear on any surface. If, because of uneven wear or other factors, there is a direct metal to metal roll pressure, the specific load at such points may be so high as to result in work hardening. This may eventually lead to cracks and spalling at the barrel edges. Optimum performance is only obtained if the roll body wears equally all over and if local pressure applications are avoided, especially at points near the barrel edges.

2. The saddle parts should never be placed tightly on the rolls. This would result in frictional heat which might damage the roll surface. It is important to provide a clearance between the saddle and the roll which correspond approximately to the size of a flake.

3. Mineral impurities in the grain such as sand, stones and metallic components, increase the wear or can even destroy the barrel surface. For this reason, it is important to clean the grain before processing.

4. The mill should be started up and shut down with feed material in the roll gap. If this is not possible, metal to metal running should take place for the shortest possible period only. Metallic contact under pressure between revolving rolls may lead to high specific compression loads at certain points of the roll surface.

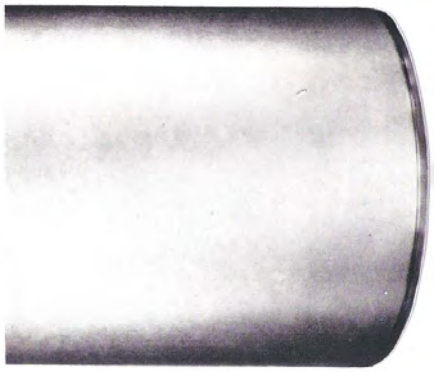
5. The mill should be stopped immediately if the supply of grain is interrupted.

6. In order to avoid spalling, it is helpful to chamfer the roll edges slightly. This should be carried out over a minimum length of 2". This process alone, however, does not provide adequate protection against damage to the barrel ends.

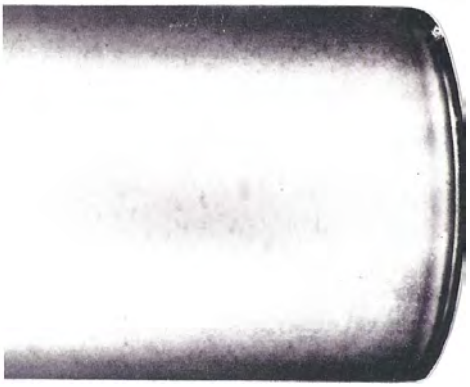
7. Regrinding of rolls should be done at regular intervals, the frequency of which will depend on the type and rate of feed and the volume of impurities.

8. It is essential that the rolls in operation should be inspected regularly. Before spalling or cracks appear, the surface becomes shiny. At that point it is absolutely essential to regrind the roll edges in the roll frame or to remove the rolls and regrind them on a special grinding lathe.

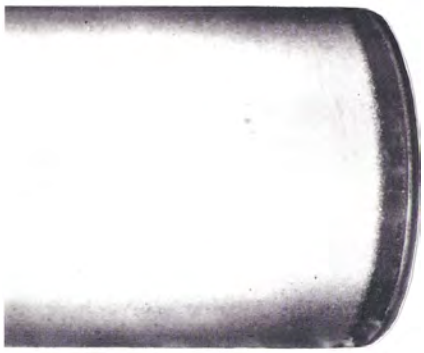
9. Damaged rolls should be repaired only by a specialist company.



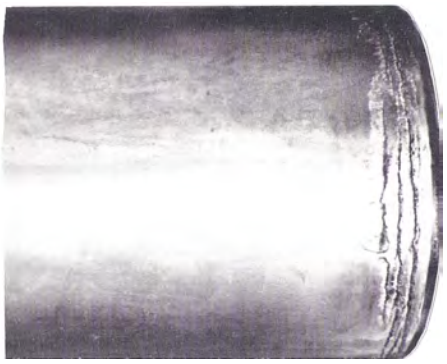
Pictured above: Chilled cast iron
Roll after a certain operation time.
The body surface is dead-proof of a
Good and uniform wearing.



Shining areas and worn out saddles.
Parts show above roll has not run perfectly.



The shining barrel end indicates metal to
metal running. Regrinding is immediately
necessary otherwise…



…spalling will appear as in above
picture.

NEVER LET ROLLS RUN TOGETHER, AS THIS WILL DESTROY CORRUGATION QUICKLY AND CAN CREATE FLAT SPOTS.

To Set Roll Scrapers:

1. The roll scraper is designed to prevent chipping of the rolls and product buildup on the roll, which would cause them to bounce and thus yield an inconsistently milled grain.

2. It is intended this scraper has contact with the roll. A small amount of tension between the roll and scraper is desired.

To Increase Tension:

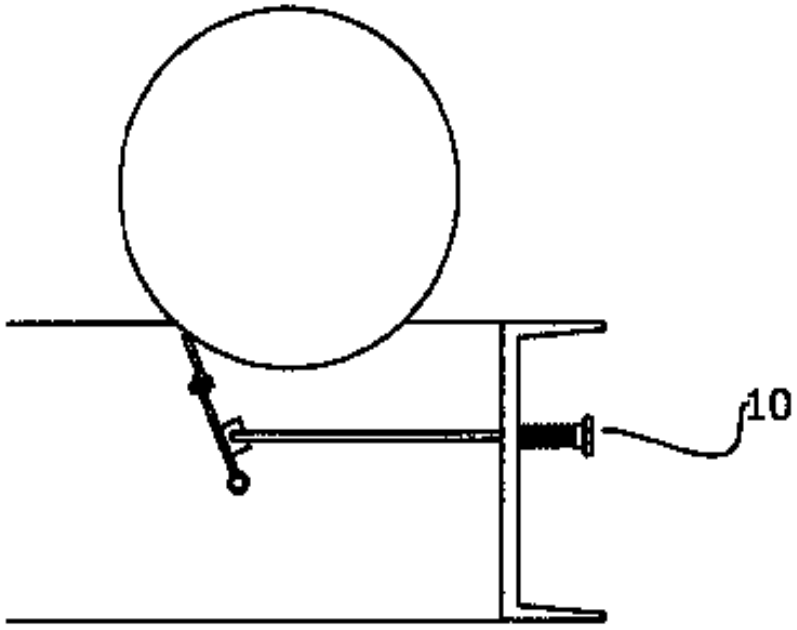
A. Adjust both sides simultaneously.

B. Turn the scraper adjusting knob #10 clockwise or inward, bringing it close to the roll.

To Reduce Tension:

A. Adjust both sides simultaneously.

B. Turn the scraper adjusting knob #10 counterclockwise or outward, bringing the scraper away from the roll.



Setting Flake Weight:

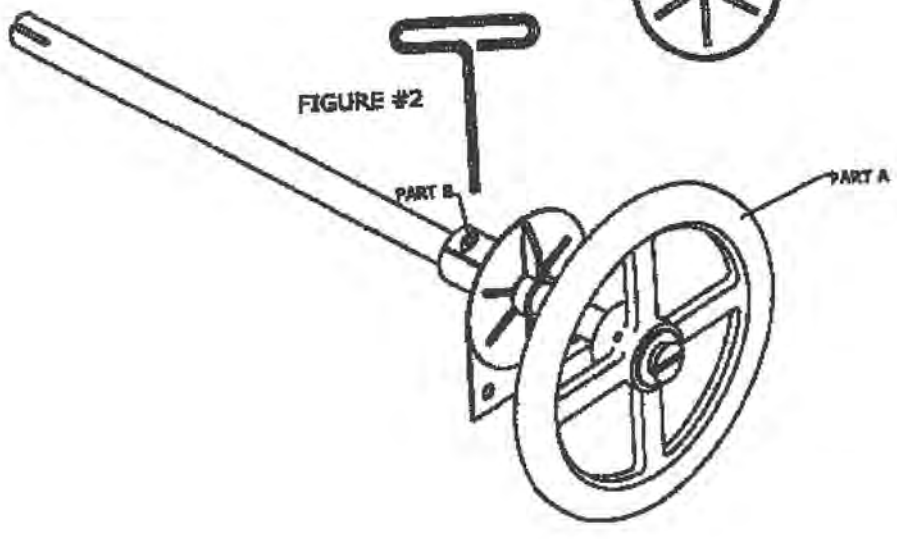
The R&R 2" Flaking Mill is simply adjusted by the hand wheel (Fig. 2) located on each side of the front of the mill. The rolls can continue to flake as the flake weight is adjusted.

Turning the hand wheel clockwise (open) will produce a heavier flake and turning the hand wheel counterclockwise (close) will produce a lighter flake. One complete turn of the hand wheel will move the roll back approximately .006 of an inch towards whichever direction the hand wheel is turned. Each side of the mill can be adjusted separately to enable the rolls to be set to exact customer specifications.

To move the handwheel:

1. Loosen the set screw (Fig 2. Part B)
2. Turn hand wheel desired direction (Fig. 2 Part A)
3. Tighten the set screw (Fig 2. Part B).

FIGURE #1



MAINTENANCE OF MILL

1. Lubrication- Depending on mill conditions, lubrication methods will vary. Contact your grease representative or mill technician for the correct method. Main roll bearings should be greased every day. Grease manufacturer, "Lincoln", recommends .07 cu. Inches of grease every 4 hours be applied to a 22234k or a 22330 bearing which are the bearings used in R&R 24" Mills. Other factors to consider in determining lube requirements are (1) Extreme Heat, (2) High Speed, (3) Shock loading, (4) product contamination, and (5) dirt or water.

2. Roll tension—950 to 1500 psi in normal pressure for quality flaking with this flaker.

3. Check fixator for current adjustment.

4. Check all bolts periodically for tightness.

5. Check all shims for current adjustment.

6. Check bearings for roughness and excessive heat.

7. Check V-Belt for tightness and wear.

8. Check mill for level periodically.

9. Keep V-block adjusted to prevent whole grain from slipping between the face of the roll and the hood of the mill.

10. Do not run rolls together without grain.

11. Rolls should be recorrugated as needed to ensure against low capacity and inconsistent quality. **An even wear improves roll life.**

12. Keep scraper blades adjusted to assure rolls are being cleaned properly. Slight tension on the rolls is all that is needed.

13. Excessive vibration may be caused by rough or worn bearings. These bearings should be replaced. By continuing use of worn bearings, shaft breakage chances are greatly increased.

RECOMMENDED LIST OF SPARE PARTS

1. If operating more than one mill, or in case where a shut down for recorrugation hampers the overall operation, a spare set of rolls is recommended.

2. It is not necessary, but is a spare set of rolls is equipped with housings, bearings and adapters, a roll change can be made in less than 1/4 of the normal time.

3. Belts, hydraulic cylinders or other closure system parts.

TO SHUT YOUR MILL DOWN

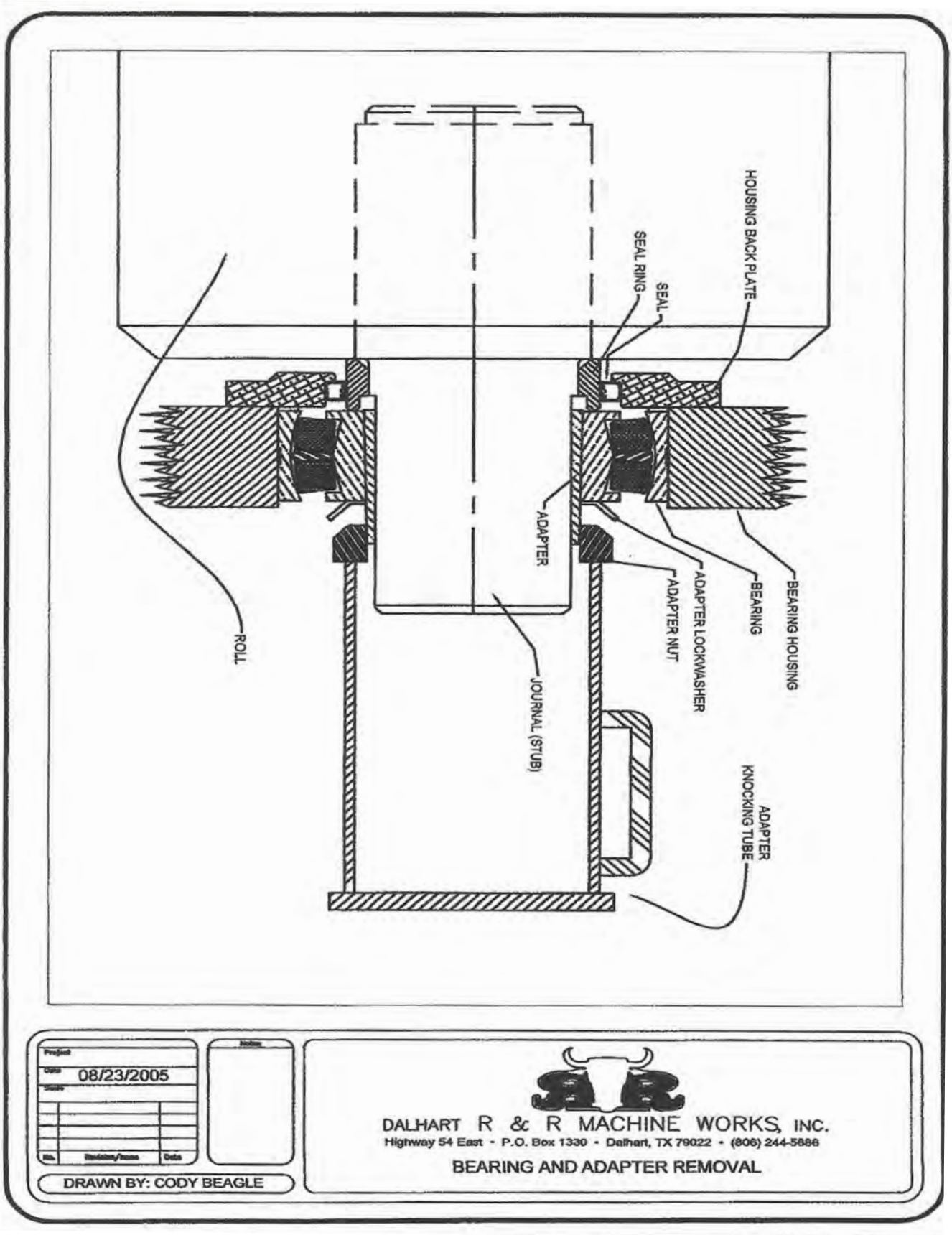
1. Close gates from grain bin to steam cabinet, leave steam on until grain drops below each lateral.
2. When grain gets below bottom sight glass, watch closely so that grain does not run out with rollers engaged.
3. Roller man needs to monitor peg feeder regularly to see that rolls do not run dry.
4. Always release rolls before turning off feeder.
5. Turn off peg feeder bar and rolls.
6. Make sure peg feeder bar and rolls have completely stopped turning.
7. Shut off power and lock-out electrical box.
8. Clean peg feeder and inside of roll covers.

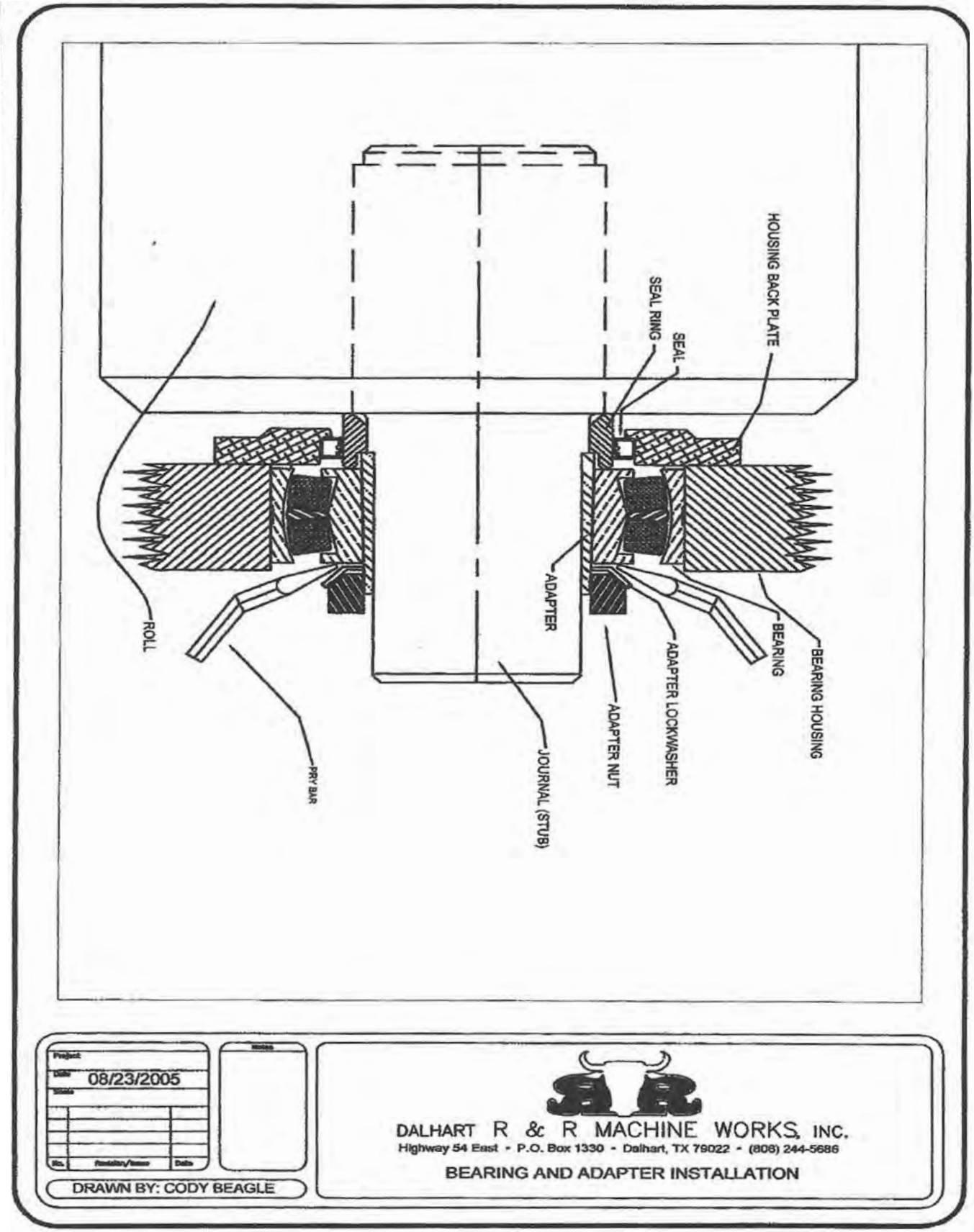
TO REMOVE ROLLS FROM FRAME

1. Empty Steamchest of grain to remove pressure from center section.
2. Remove all guards, belts, sheaves, and hubs.
3. Remove front roll cover.
4. Remove four grease fittings from font brackets. (two on each side).
5. Remove four 1” bolts from bottom front brackets on each side.
6. Remove four bolts on each side holding front bracket to front roll.
7. Remove four 1” bolts from top front brackets on each side.
8. Remove both front brackets.
9. Remove four 1” bolts from top brackets on each side.
10. Remove both top brackets.
11. Remove front roll.
12. Remove center section sides,
13. Loosen bold scraper assemblies,
14. Unscrew alignment nut from end chrome shaft.
15. Remove four bolts that hold cylinder shaft brackets to bearing housing,
16. Remove back roll.

TO INSTALL ROLLS INTO FRAME

1. Retract hydraulic cylinders completely.
2. Reverse removal process until front cover is installed with the exception of #13. (Leave scrapers loose at this time).
3. Turn hand wheel counterclockwise until it bottoms out. Then turn clockwise for 12 complete turns. This is an approximate midway point of fixator, which will give plenty of adjustment throughout corrugation life.
4. Push rolls together using hydraulic cylinders and pump.
5. Fill gap between fixator pad and spacer bracket until spacers fill in entire gap.
6. Turn hand wheel clockwise to adjust roll gap to .015 prior to flaking.
7. Replace all hubs, sheaves, belts, and guards.
8. Set scrapers following start-up procedures on page 7.


HOUSING BACK PLATE
SEAL RING
SEAL
ADAPTER
ADAPTER NUT
ADAPTER LOCKWASHER
BEARING
BEARING HOUSING
ROLL
JOURNAL (STUB)
ADAPTER KNOCKING TUBE
08/23/2005
DRAWN BY: CODY BEAGLE
DALHART R & R MACHINE WORKS, INC.
Highway 54 East - P.O. Box 1330 - Dalhart, TX 79022 - (806) 244-5686
BEARING AND ADAPTER REMOVAL


HOUSING BACK PLATE
SEAL RING
SEAL
ROLL
ADAPTER
BEARING
BEARING HOUSING
ADAPTER LOCKWASHER
ADAPTER NUT
JOURNAL (STUB)
PRY BAR
08/23/2005
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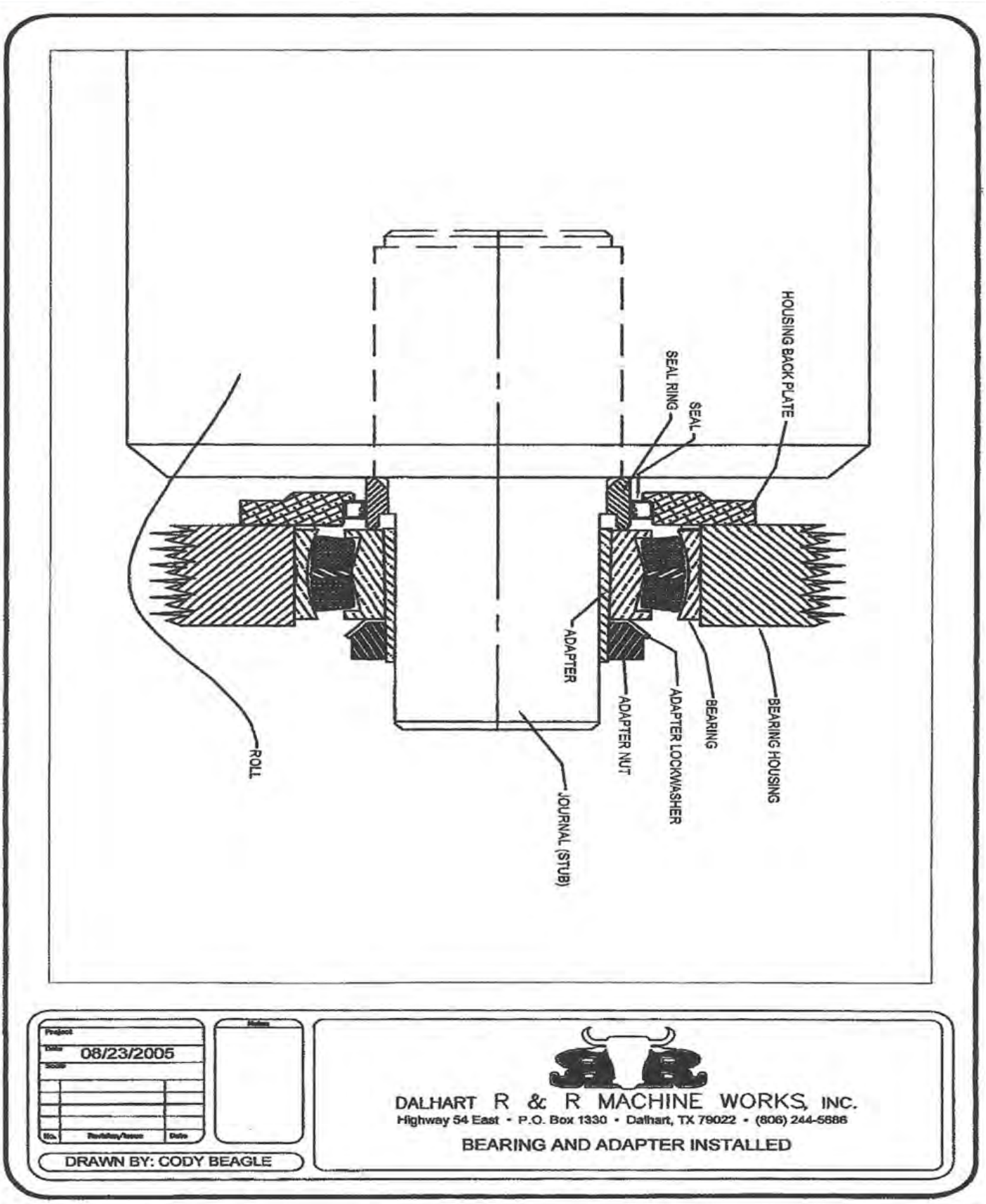
Highway 54 East - P.O. Box 1330 - Dalhart, TX 79022 - (806) 244-5686
BEARING AND ADAPTER INSTALLATION


HOUSING BACK PLATE
SEAL RING
SEAL
ADAPTER
ADAPTER NUT
ADAPTER LOCKWASHER
BEARING
BEARING HOUSING
ROLL
JOURNAL (STUB)
Project
Date
08/23/2005
Scale
No.
Revision/Issue
Date
Notes
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BEARING AND ADAPTER INSTALLED

INSTRUCTIONS FOR REMOVING TAPERED ROLLER BEARINGS AND ADAPTERS

CAUTION: Do not use a standard bearing puller because this will force the bearing on the journal tighter.

1. Remove the bearing housing cover plate.

2. Clean the excess grease off the slotted nut so the tangs of the lock washer can be bent clear of the lock slots so the nut may be loosened.

3. The nut is then loosened in the following manner:

   a. The nut has right hand threads so it must be loosened in a counterclockwise direction.

   b. A soft steel bar or a spanner wrench is placed in one of the nut slots.

   c. Strike the bar or a spanner wrench with several sharp blows using a hammer.

   d. Loosen the nut until approximately three-fourths (3/4) of the threads are still in contact with the adapter.

   e. The factory uses a Bearing Knocker that is manufactured at the factory.

   f. Strike the Bearing Knocker on the end squarely with a sledgehammer and this will force the bearing adapter inside the shaft collar.

   g. Then the bearing housing, bearing and adapter will slip easily off the journal.

To Install Bushings:

1. Remove all paint, oil, grease, etc. from tapered surface of bushing and bore of mating part.

2. If bushing has a keyway, install shaft key. (Note: If a rectangular key is required, one will be furnished with the bushing.)

3. Select **standard** or **reverse** mounting assembly. See figures 1 and 2.

Note: If bushing does not slide freely on shaft, wedge a screwdriver blade into the saw cut at the flange OD to open the bore of the bushing. Caution: Excessive wedging will split the bushing.

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4. **Standard Mount** –Slide bushing on shaft, flange first. If using the setscrew, snug it against the key. **Excessive Torque will cause mating part to be eccentric.** Position mating part in place on bushing aligning drilled holes in mating parts with tapped holes in bushing flange. Using lock washers, install cap screws thru the mating hub into the bushing flange. (Note: M thru S Bushings can only be Standard Mounted. Be sure the two tapped holes in the mating hub **do not** align near the bushing saw cut. If they do, rotate the bushing 90 degrees.)

5. **Reverse Mount**-Place mating part over and onto shaft as far as possible with large bore end of taper outward. Slide bushing onto shaft so tapered end will engage into the mating part. Tighten setscrew, align drilled holes in bushing flange and into the mating hub.

6. **Use A Torque Wrench**-Tighten all cap screws evenly and progressive in rotation to the torque valve listed in the table. **Excessive wrench torque, closing the gap between the bushing flange and mating hub, or the use of lubricants will break the mating hub.**

TO REMOVE BUSHING:

1. Loosen and remove all capscrews.
2. For **Standard Mount**, thread capscrews into tapped holes in mating part to jack against bushing flange. For **Reverse Mount,** thread capscrews into tapped holes in bushing flange to jack against mating hub. Tighten bolts evenly and progressively in rotation to separate the two components.
3. Loosen setscrew to slide bushing from shaft.

Screw Tightening Information

Tapered Bushing	Size & Thread of Capscrew	Ft.- Lbs. To Apply With Torque Wrench
QT	1/4-20	9
JA	No. 10-24	5
SH,SDS,SD	1/4-20	9
SK	5/16-18	15
SF	3/8-16	30
E	1/2-13	60
F	9/16-12	110
J	5/8-11	135
M	3/4-10	225
N	7/8-9	300
P	1-8	450
W	1-1/8-7	600
S	1-1/4-7	750

Standard Mounting

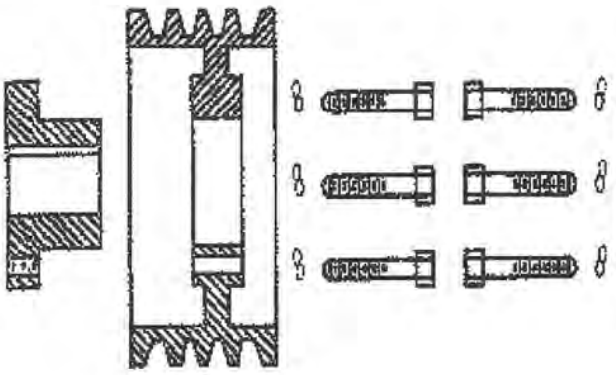


Fig. 1

Reverse Mounting

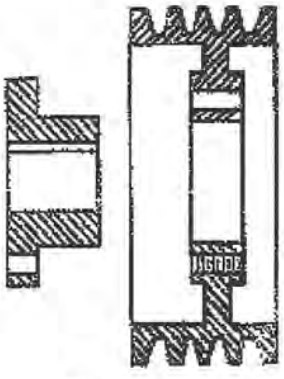


Fig.2

T.B.WOOD'S SONS COMPANY –Chambersburg, PA
T.B.WOOD'S CANADA LTD. /Stratford, Ontario

Hydronic Corporation

Air Driven Hydraulic Pumps and Intensifiers

P820 Installation, Use and Maintenance Manual

Contents

Hydronic Corporation, 32613 Folsom, Farmington Hills, MI 48336, ☎(248) 477 2288, 🖷 (248) 478 3689

Introduction

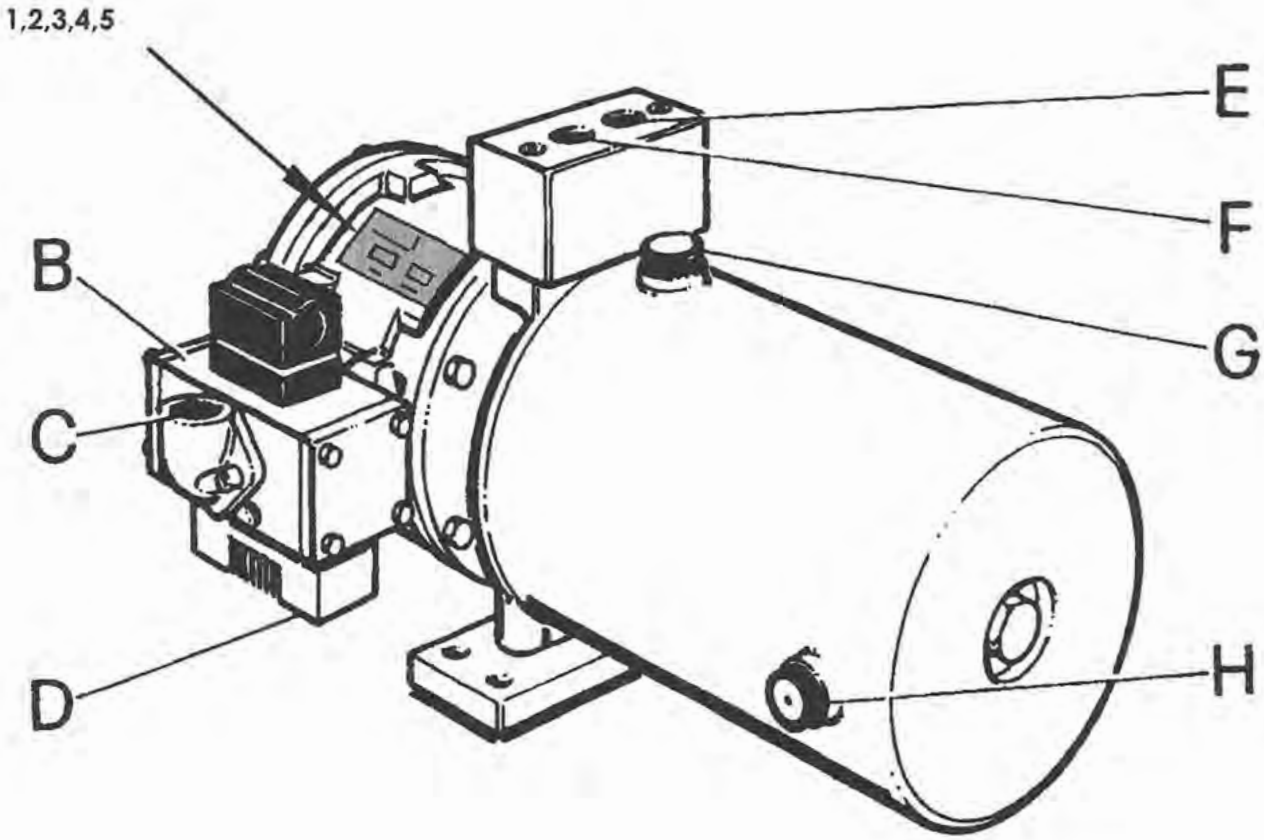
This handbook is intended to give the operator the basic instructions for the use and maintenance of the pump. The air hydraulic pump operator must read this handbook before putting the pump into operation. After correctly installing the pump, keep this manual stored in a safe place. If you have difficulty in understanding any part of this handbook, contact Hydronic Corporation. Regular servicing and correct use of the pump are fundamental in obtaining optimum performance over its life. When contacting our service center, specify the pump model and serial number; this will help us to respond quickly and effectively.

Guarantee

Hydronic pumps are guaranteed both for the quality of materials used and for overall design. The warranty runs for six months of normal use at eight hours per day and five days per week. The warranty itself does not cover seals or defects arising out of operating with unsuitable fluids or at pressures above the specified maximum. The guarantee cannot cover pumps that may have been tampered with. Defective goods must be sent to Hydronic Corporation at Farmington Hills or to the distributor covering the area, freight pre-paid in either case. Any pump returned to us must be accompanied by a full written description of such faults or defects as have been discovered. Please also ensure that the pump's serial number is attached to the paperwork.

Identification Plate

1	Pump model and multiplication ratio
2	Serial number pump
3	Maximum air pressure
4	Maximum working oil pressure allowed
5	Year of construction



Installation Guide

Pumps may be installed in a horizontal or vertical position for optimum functioning of suction and delivery valves. The round reservoir may be used horizontally and it is advised that the breather and sight glass be interchanged and/or the reservoir rotated to allow the breather to remain uppermost. The suction and return tubes inside the reservoir may also be rotated to ensure fluid is taken from, and returned to, the bottom of the reservoir in any given position.

The air inlet connection can be rotated at 90 ° and piping of not less than 3/8" bore should be used. 1/2" should be used if the pump is to be run at higher speeds for greater flows.

It is advisable to use or maintain :

- Hydraulic oil having viscosity of 150 to 250 SSU
- Oil temperature 32° F to 150° F
- Air temperature 40° F to 100° F
- Room temperature 40° F to 100° F

Obstructive icing of the silencer may occur under certain temperature/humidity conditions. This can be remedied by the addition of antifreeze oil for pneumatic equipment to a mist lubricator.

Compressed Air System

It will be advisable to fit an air filter/regulator unit having minimum flow capacity of 50 scfm plus a pressure gauge in order to ensure the pump has sufficient air energy to work correctly and provide the hydraulic performance you expect.

Hydraulic System

Valves, pipes, hoses and accessories should all correspond to maximum working pressure of the pump used and be of a size that will fulfill flow requirements.

Hydronic Air Driven Pumps & Intensifiers	P820 Installation, Use and Maintenance Booklet	01-01-99

Application

Hydronic air driven hydraulic pumps are designed for operating oil hydraulic circuits and to cover the widest range of requirements to the best advantage. The pump itself operates quite simply, using a known pressure intensification principle. A piston with a large surface area is actuated by compressed air. Attached to it is a piston with a smaller surface area, which is driven in a hydraulic chamber generating a high level of hydraulic pressure. The continuous pumping action is produced by the compressed air being switched by a special seal less valve. By regulating the compressed air supply pressure from 30 psi to 100 psi, the maximum hydraulic pressure can be adjusted by the ratio of the pump used. As the hydraulic load of the circuit increases and the oil pressure rises, the pump will slow down and eventually stop. In this way, the maximum load of the circuit will be maintained without air consumption.

Storage

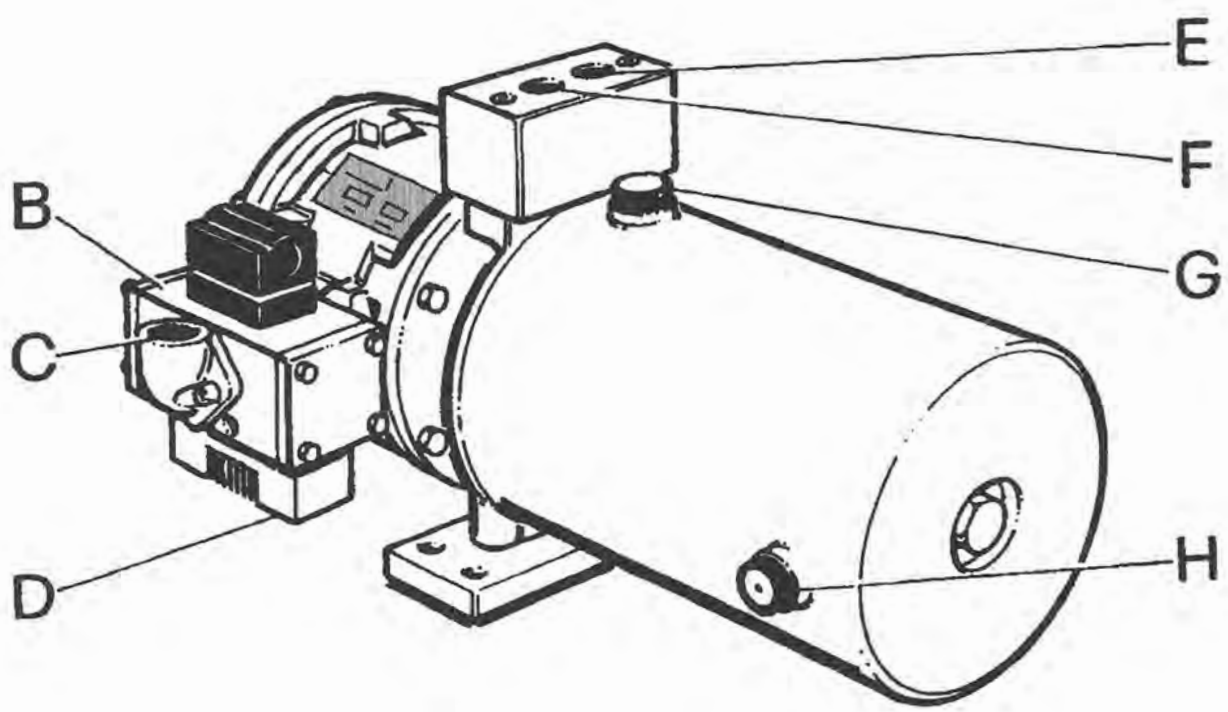
If the pump is to be kept out of use for a long period, clean the pump in general and drain the oil from the tank. Cover the pump and store it in a dry, well-protected place. It is advisable to wrap the pump in a plastic film. To put back into service, check all parts, fill tank with oil and try the pump out to ensure that it is working properly. **This operation must be carried out by qualified personnel**.

Disposal

If the pump is to be scrapped, treat as a special type of waste. Dismantle it and divide it into materials of the same type and dispose of them in accordance with the local laws and regulations in your state.

Description of the standard pump components

B	Air valve
C	Air inlet 1/2" NPT
D	Air silencer
E	Oil outlet #8 SAE
F	Oil return #8 SAE
G	Oil filler plug
H	Oil level sight glass



Starting - Up

Oil pressure can be determined by regulation of the compressed air, bearing in mind of course the multiplication ratio pre-selected for the pump itself.

The models are:
P820 RATIO 1:5
P820 RATIO 1:10
P820 RATIO 1:20
P820 RATIO 1:30
P820 RATIO 1:40

For instance, when supplied with compressed air at 80 psi, the P820-5 will produce oil pressure of 80 x ratio, 400 psi. It should be remembered however, that real efficiency produced by the pump is slightly less than given by the above theoretical calculation. This difference will not be noticed by a hydraulic gauge.

Having connected the compressed air supply at a low pressure, allow the pump to operate slowly until primed and oil comes through to the output port. Now shut off the air supply to the pump and securely connect the hydraulic circuit. Switch on the air supply again and allow the pump to run in order to bleed any air out of the hydraulic circuit.

Pump components:

- Standard block with oil output and return line.
- Modular block for optional mounting D03 valve. Other accessories are available.
- Minimum internal diameter of air supply line is 3/8".
- Optional rotation of the air inlet C in four positions.
- Maximum oil pressure can be preset by regulating the air supply at point C between 30 psi and 100 psi.
- The air exhaust and silencer are mounted to one side at point D.
- The oil outlet is positioned to one side at point E and the return at point F.
- The pump itself works automatically and operates by way of a special valve.
- The hydraulic section comprises a pump casing, piston and dynamic rod-seal assembly.
- The suction side of the pump is equipped with spring-loaded check valve. A spring-loaded outlet ball type check valve is incorporated in the hydraulic piston.

Fault Finding Chart

Fault	Cause	Remedy
1] Pump does not cycle or runs slowly.	1.1] Low pressure in compressed air line. 1.2] Formation of ice on the exhaust side. 1.3] Accumulation of waste in the silencer. 1.4] Blocked element in air filter/regulator.	1.1] Clear any blockage or restriction on the air line. 1.2] Shut off pump for a short time and drain off water from the filter. 1.3] Remove silencer, clean and replace. 1.4]Close down air-supply, dismantle and clean filter.
2] Pump loses air from silencer when stalled.	2.1] Worn valve or seal	2.1] Replace seal or valve.
3] Excess oil leakage from air silencer.	3.1] Worn hydraulic seal	3.1] Replace seal.
4] Pump cycles without pumping oil.	4.1] Blocked oil-intake 4.2] Bad connection on suction line.	4.1] Clean out filter. 4.2] Check for bad connections or air leaks on suction line.
5] Pump functions but only generates low pressure and does not stall at max. pressure.	5.1] Internal leakage in the circuit. 5.2] Suction valve seats damaged and leaking. 5.3] Output valve seats damaged and leaking. 5.4] Worn oil seal.	5.1] Find heat source and change valve. 5.2] Replace suction valve parts. 5.3] Replace output valve parts. 5.4] Replace seal.

Maintenance

Periodically release the condensation from the air filter. Replace the hydraulic oil every 1500 hours or whenever the oil is polluted.

Warning: Remember that repair work can only be made when pneumatic and hydraulic pressure has been released and you are sure that no pressure remains in the circuit.

Delivery of the pump

Transport

All the material shipped, including the detached parts, has been thoroughly checked before being consigned to the forwarding agent. The pump is shipped in double corrugated cardboard packaging, which assures protection of the product.

Unpacking

On receipt of the product, open the packaging and remove the pump. Take care not to damage any part of the pump. Make an initial check on the pump for damage in transit. In case of damage or if in doubt, do not use the pump and contact Hydronic Corporation or your distributor. The packaging [plastic bags, expanded polystyrene, nails, screws, wood, etc.] must not be left within reach of children since it is a potential source of danger. Be sure to dispose of pollutant or non biodegradable materials in the correct way. Materials must be disposed of in accordance with the laws in force.

Gross weight

P820 standard reservoir	33 lbs.
P828 Large reservoir	44 lbs.

Contents of the package

The packaging will always contain the following:
1 x air driven hydraulic pump
1 x installation, use and maintenance manual

Original spare parts

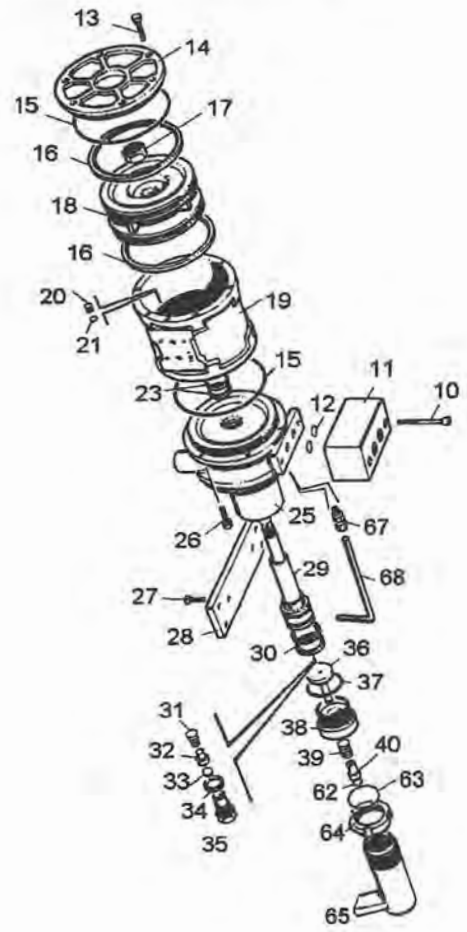
Parts orders must always be accompanied by the following information:

A] The pump model, pump serial number and the pumps year of construction (all this data is given on the nameplate)
B] The part numbers, quantity required and the name of the part (All this data is given in the parts list)

A clear and correct statement of this data will allow our after-sales service to respond quickly and appropriately. Every spare part must be replaced by professionally qualified staff. The manufacturer declines all responsibility for malfunctions or accidents deriving from any failure of the product when unqualified persons have made any attempt at repair.

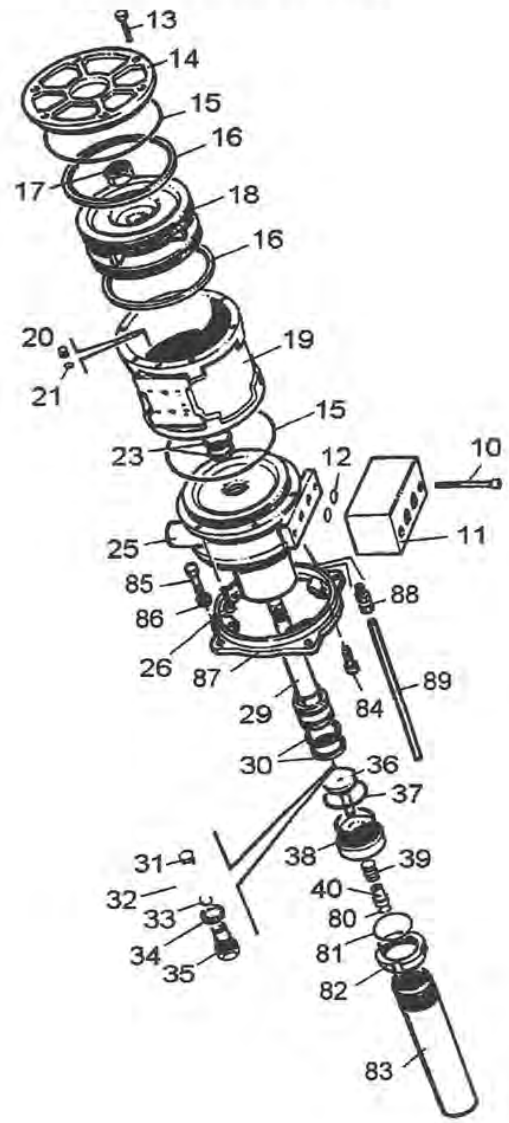
Number	Description	Code #	Quantity
10	Screw	3.94.010	2
11	Distributor body	5.65.004	1
12	O-ring	3.51.109	2
13	Screw+washer	3.94.207	6
14	Cylinder head	5.86.006	1
15	O-ring	3.51.075	2
16	Slip ring	3.51.076	2
	O-ring	3.51.077	2
17	Locknut	3.45.204	1
18	Piston	5.68.045	1
19	Cylinder barrel	5.18.030	1
20	Plug	5.84.002	2
21	O-ring	3.51.083	2
23	O-ring+Slip Ring (ratio)		
	1:5	3.51.089+3.51.088	2
	1:10	3.51.086+3.51.087	2
	1:20	3.51.085+3.51.014	2
	1:30	5.50.019+3.51.057	2
	1:40	3.51.011+3.51.010	2
25	Pump Body (ratio)		
	1:5	5.28.030	1
	1:10	5.28.029	1
	1:20	5.28.028	1
	1:30	5.28.057	1
	1:40	5.28.027	1
26	Screw+Washer	3.94.208+3.72.104	6
27	Screw	3.94.013	2
28	Clamping Plate	5.65.003	1
29	Piston (ratio)		
	1:5	5.68.049	1
	1:10	5.68.048	1
	1:20	5.68.047	1
	1:30	5.68.177	1
	1:40	5.68.046	1

Wall Mounted Version



Number	Description	Code #	Quantity
10	Screw	3.94.010	2
11	Distributor body	5.65.004	1
12	O-ring	3.51.109	2
13	Screw+washer	3.94.207	6
14	Cylinder head	5.86.006	1
15	O-ring	3.51.075	2
16	Slip ring	3.51.076	2
	O-ring	3.51.077	2
17	Locknut	3.45.204	1
18	Piston	5.68.045	1
19	Cylinder barrel	5.18.030	1
20	Plug	5.84.002	2
21	O-ring	3.51.083	2
23	O-ring+Slip Ring (ratio)		
	1:5	3.51.089+3.51.088	2
	1:10	3.51.086+3.51.087	2
	1:20	3.51.085+3.51.014	2
	1:30	5.50.019+3.51.057	2
	1:40	3.51.011+3.51.010	2
25	Pump Body (ratio)		
	1:5	5.28.030	1
	1:10	5.28.029	1
	1:20	5.28.028	1
	1:30	5.28.057	1
	1:40	5.28.027	1
26	Screw+Washer	3.94.208+3.72.104	6
27	Screw	3.94.013	2
28	Clamping Plate	5.65.003	1
29	Piston (ratio)		
	1:5	5.68.049	1
	1:10	5.68.048	1
	1:20	5.68.047	1
	1:30	5.68.177	1
	1:40	5.68.046	1
30	O-ring+Slip Ring (ratio)		
	1:5	3.51.096+3.51.097	2
	1:10	3.51.094+3.51.095	2
	1:20	3.51.092+3.51.093	2
	1:30	3.51.173+3.51.033	2
	1:40	3.51.091+3.51.090	2
31	Spring (ratio)		
	1:5+1:10	5.46.028	1
	1:20+1:30+1:40	5.46.029	1
32	Center (ratio)		
	1:5+1:10	5.46.007	1
	1:20+1:30+1:40	5.46.006	1
33	Ball (ratio)		
	1:5+1:10	3.76.006	1
	1:20+1:30+1:40	3.76.002	1
34	Washer (ratio)		
	1:5+1:10	3.52.010	1
	1:20+1:30+1:40	3.52.003	1
35	Valve Connector (ratio)		
	1:5+1:10	5.94.303	1
	1:20+1:30+1:40	5.94.302	1
36	Valve rod	5.66.011	1
37	O-ring(ratio)		
	1:5+1:10	3.51.127	1
	1:20+1:30+1:40	3.51.055	1

Tank Mounted Version



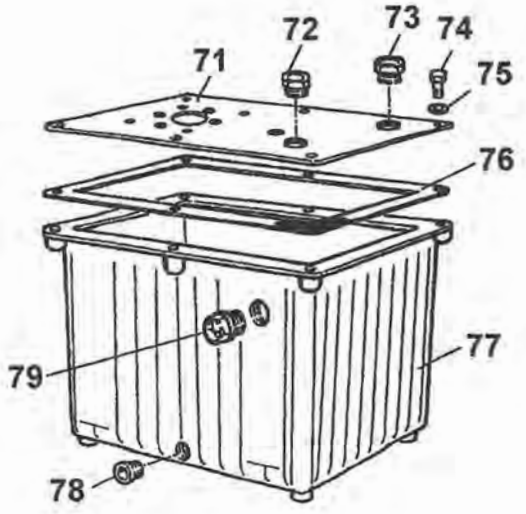
Hydronic Air Driven Pumps & Intensifiers **P820 Installation, Use and Maintenance Booklet** **01-01-99**

Tank Mounted Version

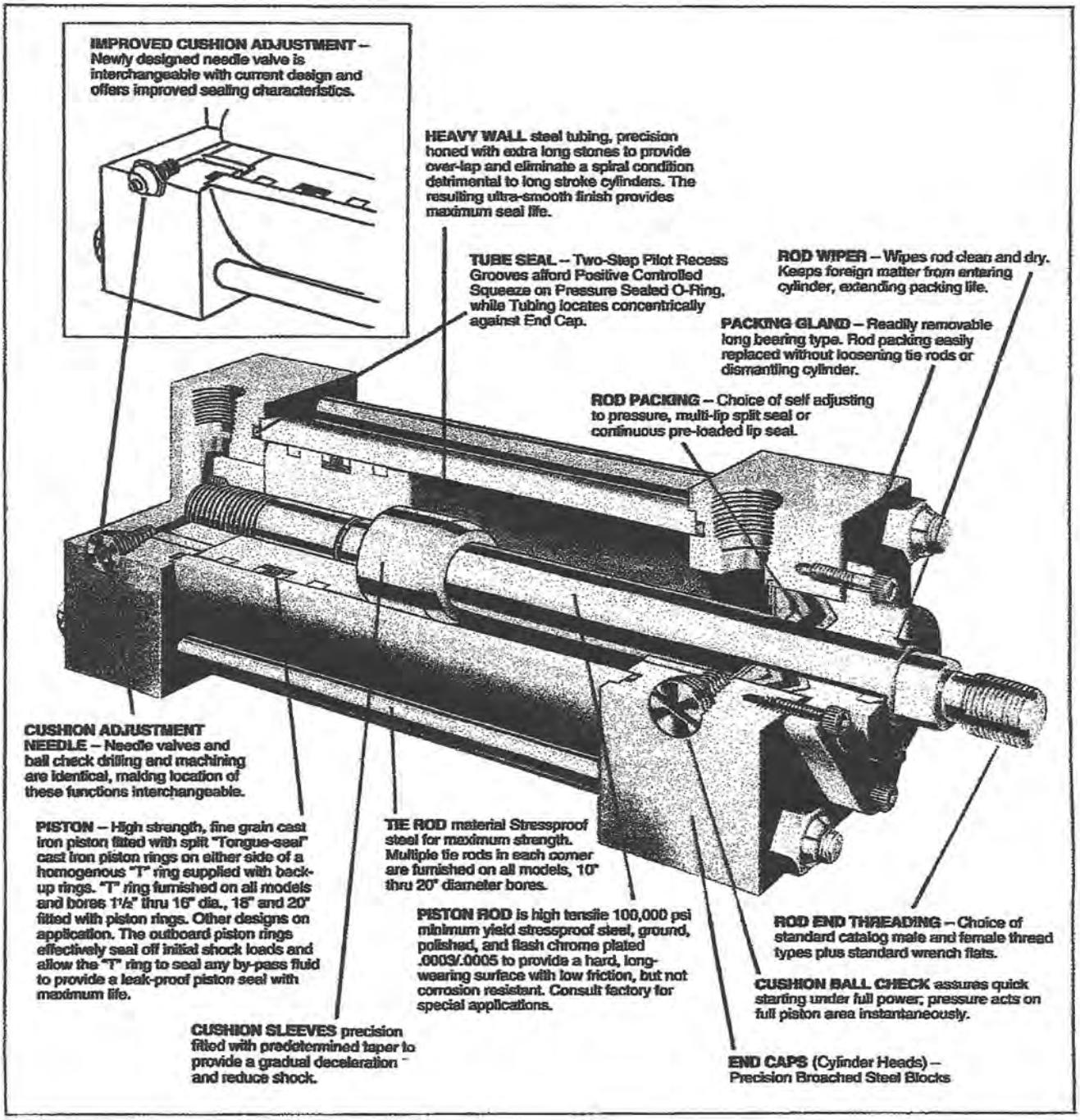
Number	Description	Code #	Quantity
38	Valve body(ratio)		
	1:5+1:10	2.28.032	1
	1:20+1:30+1:40	5.28.031	1
39	Spring	5.64.030	1
40	Guide	5.13.008	1
71	Reservoir Lid	5.055.0150	1
72	Filler/breather	OQ10003A	1
73	Discontinued		
74	Screw (and washer)	3.094.0203	4
75	Washer	3.072.0103	4
76	Gasket	5.050.0006	1
77	Reservoir	3.074.0009	1
78	Plug (and washer)	3.069.0203	1
79	Sight level glass	OQ10004A	1
80	Collet	3.06.006	2
81	O-ring	3.51.079	1
82	Locknut	3.45.212	1
83	Suction tube	6.90.003	1
83/1	Filter	3.41.0021	1
83/2	Bush	5.08.014	1
83/3	O-ring	3.51.084	1
83/5	Self-locking nut	3.31.053	1
84	Screw	3.94.008	4
85	Screw+47	3.94.023	4
86	Washer	3.72.104	4
87	Flange	5.42.002	1
88	Tube	5.90.017	1
89	Connector	3.70.006	1

Seal Kits

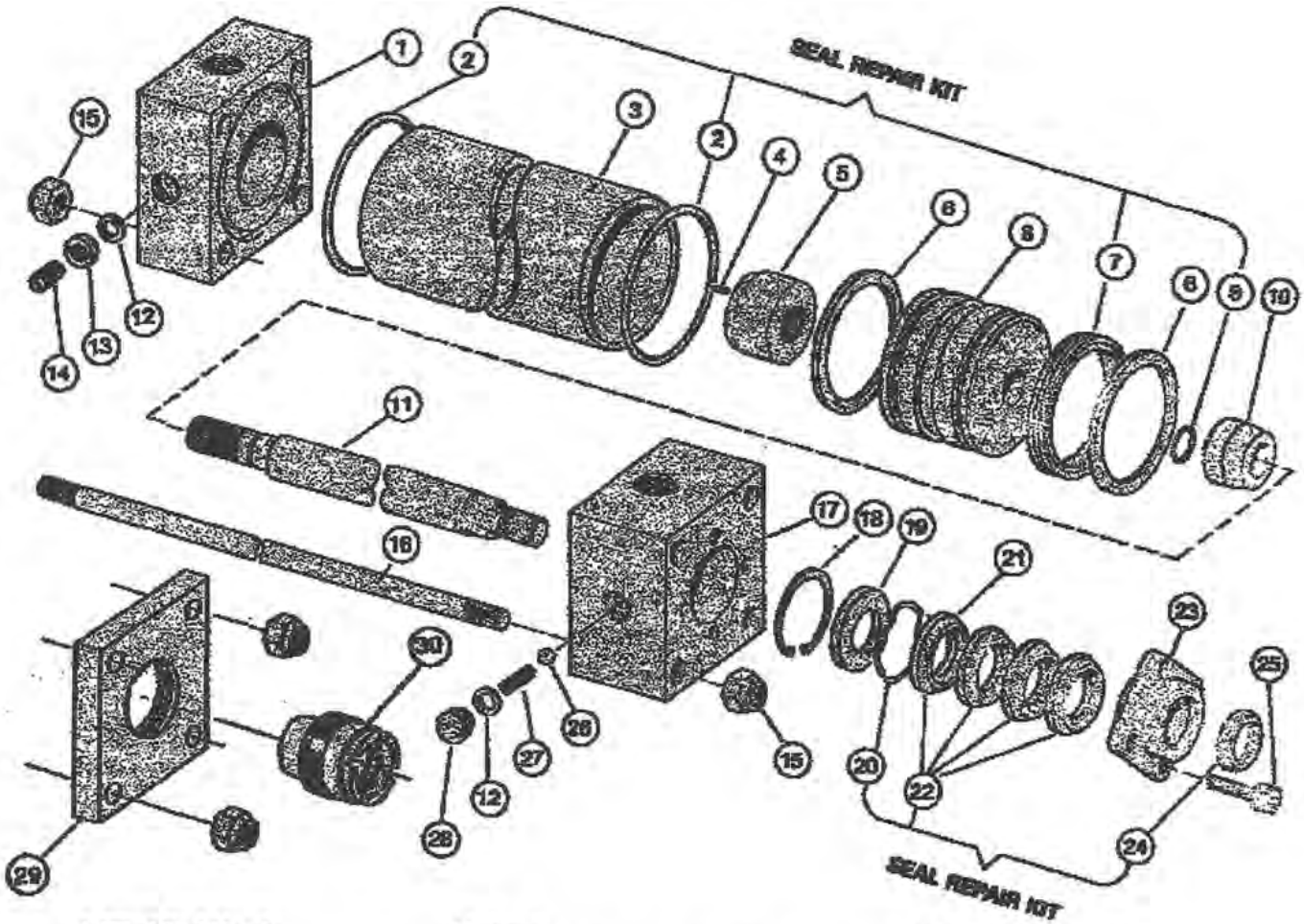
Ratio	Code #
1:5	3.54.028
1:10	3.54.029
1:20	3.54.030
1:30	3.54.080
1:40	3.54.034



NOPAK HIGH PRESSURE SQUARE-HEAD CLASS 3 HYDRAULIC CYLINDERS



REPLACEMENT PARTS



1. Blind End Head
2. Tube Seal★
3. Tube
4. Lock Screw
5. Lock Sleeve
6. Piston Ring
7. "T" Seal and Back-Ups★††
8. Piston
9. Piston O-Ring★
10. Cushion Sleeve – Rod End
11. Piston Rod
12. Seal
13. Cushion Adjusting Screw Gland
14. Cushion Adjusting Screw
15. Tie Rod Nut
16. Tie Rod
17. Rod End Head
18. Snap Ring††
19. Packing Spacer††
20. Wave Spring★††
21. Bottom Adapter Ring★★††
22. Rod Packing★††
23. Packing Gland††
24. Rod Wiper★
25. Packing Gland Cap Screw
26. Check Ball
27. Ball Check Spring
28. Ball Check Plug

IF APPLICABLE:
29. Head Plate
30. Screw Gland

† "T" Seal used thru 16" dia. bore 18" and 20" fitted with piston rings.
†† For 7" dia. rods and larger.
Parts 18, 19, 20, and 21 are eliminated
Part 22 replaced by a U-cup style seal
Part 23 replaced by a rod bearing and a multi-bolt gland retainer.

★ Items are included in seal repair kits.
See page 5 for ordering information.
★ Item 21 is metallic for high temp applications.

When ordering replacement parts be sure to specify:
– Part by name and item number
– Bore, stroke, mounting, and Serial number shown on Nupak label

NOTE: Isometric view of DOUBLE ROD cylinders available at N/C.
Consult factory or our authorized distributor.

HYDAC

OPERATING AND INSTALLATION INSTRUCTIONS FOR HYDAC ACCUMULATORS

HYDAC CORPORATION
2280 City Line Road
Bethlehem, PA 18017
Telephaone: (610) 264-9503
Telefax: (610) 264-9519

Operating and Installation Instructions for HYDAC Accumulators

1. General:

Prior to installation and during the operation of hydraulic accumulators, the regulations governing accumulators in the place of installation must be observed. In the USA and Canada accumulators are subject to ASME Pressure Vessel Code. In addition, HYDAC suggests a thorough inspection, including a pressure test, every 5 to 10 years depending upon the application.

HYDAC recommends the use of mounting components to minimize the risk of failure due to system vibrations; refer to HYDAC Mounting Components brochure #02071834.

As part of the commissioning process, vent all air from the system piping once the hydraulics have been connected.

WARNING!
Hydraulic accumulators are pressurized vessels and only qualified technicians should perform repairs. **Never** weld, braze, or perform any type of mechanical work on the accumulator shell. **Never lift the accumulator by the gas valve**. Always drain the fluid completely from the accumulator before performing any work, such as recommended repairs *(see Maintenance Instructions)* or connecting pressure gauges.

Always observe the maximum working pressure, operating temperature range, pressure ratio, recommended flow rate, and mounting position. For details refer to specific HYDAC product literature. Never use car tire valve cores in accumulators. All defective parts should be replaced with original HYDAC parts.

2. Precharging The Accumulator:

Precharge new or repaired accumulators with dry nitrogen gas to the proper gas precharge pressure (P_0) prior to applying hydraulic system pressure.

2.1 Recommended Gas Precharge Pressure (P_0):

FOR ENERGY STORAGE	$P_0 = 0.9 \times P_1$
FOR SHOCK ABSORPTION	$P_0 = (0.6 \text{ to } 0.9) \times P_m$
FOR PULSATION DAMPENING	$P_0 = (0.6 \text{ to } 0.8) \times P_m$
P_1 = minimum working pressure	P_m = median working pressure

2.2 Procedure

Remove valve protection and valve seal caps (where applicable). Attach appropriate HYDAC charging and gauging unit *(type FPS for HYDAC gas valve version 4, type FPK for HYDAC gas valve version 1 and type FPK with adapter FPK/SB for top repairable bladder accumulators)* to the accumulator by following the instructions in the HYDAC Charging and Gauging Units brochure # 02071833. Once attached, slowly open the shut-off valve on the commercially available nitrogen bottle and allow the gas to slowly enter the accumulator. The first 20 to 25 PSI should take 2 to 3 minutes.

If gas precharge pressure is too low, continue charging; refer to HYDAC Charging and Gauging Units brochure #02071833.

If gas precharge is too high, it can be reduced by carefully opening the manual bleed valve and relieving some pressure. Once the proper gas precharge pressure has been reached, disconnect the charging and gauging unit from the accumulator by following the instructions in the HYDAC Charging and Gauging Units brochure. Check for leaks; NONE are permissible. Torque valve seal cap *(see torque requirements below)* and hand tighten valve protection cap *(where applicable)*.

Notes:
1) When using FPK unit **DO NOT** use the "T"-handle in the charging and gauging unit to loosen the socket head cap screw; use a 6 mm Allen wrench.
2) HYDAC diaphragm accumulators with gas port version E2 are factory precharged and sealed with a welded steel plug. The gas precharge pressure **CANNOT** be adjusted.

Torque Requirements:

Gas Valve Version 1	- socket head cap screw	- 20 Nm (15 lb-ft)
	- valve protection cap	- hand tighten *(where applicable)*
Gas Valve Version 4	- gas valve core	- 0.5 Nm (0.4 lb-ft)
	- valve seal cap	- 30 Nm (22 lb-ft)
	- valve protection cap	- hand tighten *(where applicable)*

!

CAUTION
GAS CHARGING
Pressurized Vessel -
Use Dry Nitrogen Only!
HYDAC CORPORATION • Accumulator Division
2280 City Line Road • Bethlehem, PA 18017
Phone (610) 266-0100 • Fax (610) 264-7529
www.hydacusa.com

2.3 Temperature Effects:
To ensure that the recommended gas precharge pressure is maintained, even at relatively low or high operating temperatures, the gas precharge pressure should be adjusted for temperature; refer to HYDAC Charging and Gauging Units brochure #02071833. When adjusting an existing gas precharge pressure allow 5 to 10 minutes for the gas precharge pressure to reach equilibrium. When precharging for the first time or after performing maintenance work, allow 20 to 30 minutes for the gas precharge pressure to reach equilibrium.

3. Checking Gas Precharge Pressure:
The gas precharge pressure on gas port version E2 can only be checked using the method described in paragraph 3.2.

3.1 Measuring Gas Precharge Pressure on the Gas Side:
To check precharge pressure, attach HYDAC charging and gauging unit by following the instructions in the HYDAC Charging and Gauging Units brochure #02071833. Once attached, turn "T" handle until pressure registers on gauge. Adjust gas precharge pressure if necessary *(refer to paragraph 2)*.

3.2 Measuring Gas Precharge Pressure on the Fluid Side:
This method requires that a pressure gauge be installed on the safety and shut-off block *(fig. 1, item 2)* or similar device, which is connected directly to the accumulator. The procedure utilizing the SAB Block is as follows:

- Using hydraulic system pressure fill accumulator with fluid.
- Close shut-off valve *(fig. 1, item 3)*.
- Discharge fluid slowly, by opening the manual bleed valve *(fig. 1, item 4)*.
- While draining the fluid, monitor the pressure gauge closely. The pressure in the gauge will suddenly drop to zero; the pressure indicated immediately prior to this sudden drop is the gas precharge pressure.

3.3 Intervals Between Checking:
The gas precharge pressure should be checked at least once during the first week of operation. If there is no loss of gas precharge pressure, it should be rechecked in 3 to 4 months. Thereafter, it should be checked at least once a year.

4. Safety Equipment:

HYDAC recommends that the following safety equipment be used in conjunction with accumulators:

4.1 Safety and Shut-off Block:

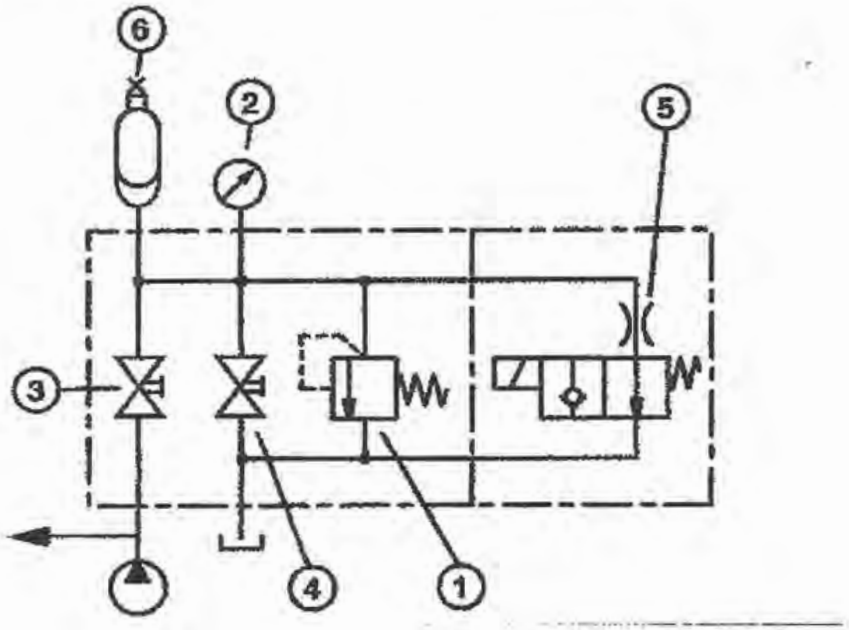
The Hydac safety and shut-off block *(see fig. 1)* was designed to incorporate the following safety features:

- Pressure measurement device.
- Pressure relief device.
- Shut-off device.
- Bleed down device *(manual or electric operation)*.
- Locking device

4.2 Thermal Fuse Cap:

In addition to the above, HYDAC also recommends the use of its Thermal Fuse Cap to release gas pressure in the event of a fire.

Fig. 1; Schematic of a HYDAC Safety and Shut-off Block:



1 - pressure relief valve
2 - pressure gauge *(optional)*
3 - shut-off valve
4 - manual bleed valve
5 - solenoid operated bleed valve *(optional)*
6 - thermal fuse cap *(optional)*

SBO Series

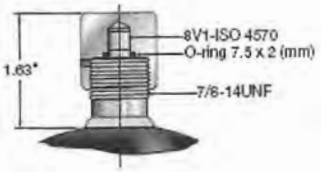
Non-Repairable Welded Diaphragm Accumulators

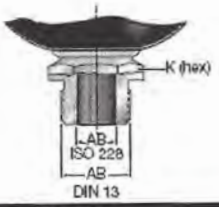
Version E1

Version E2

Not available on SBO330 or on any accumulator larger than 1.4 liters.

Version E4



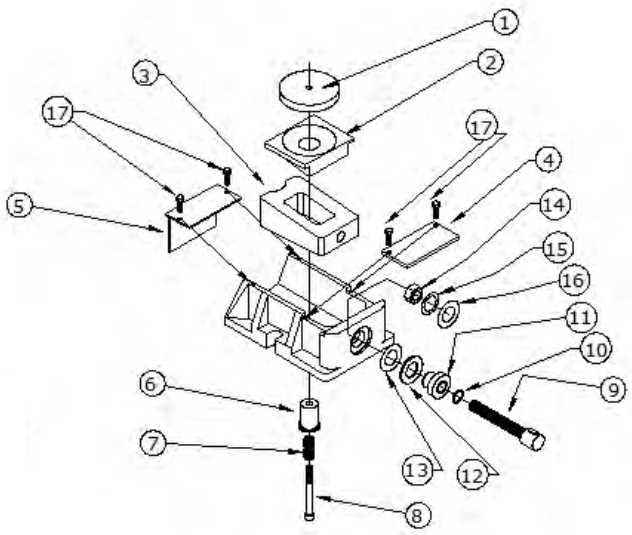


Series	Max. p_s:p_o	Size (liters)	Effective Gas Vol In³	MAWP psi/(bar)	Weight	A	øD[2]	F Thread CK (SAE)	F Thread AK (ISO 228)	F Thread AB (ISO 228)	F Thread AB (DIN 13)	K (hex)	Q gpm
SBO 250	8 : 1	0.075	5	3600 (250)	1.5 (0.7)	2.68 (68)	2.52 (64)	9/16-18 UNF	G 1/2	N/A	N/A	1.18 (30)	10
SBO 210	8 : 1	0.16	10	2600/(180)[1] 3000/(210)	1.8 (0.8)	3.15 (80)	2.91 (74)	9/16-18 UNF	G 1/2	N/A	N/A	1.18 (30)	10
SBO 210	8 : 1	0.32	20	2400/(160)[1] 3000/(210)	2.9 (1.3)	3.66 (93)	3.66 (93)	3/4-16 UNF	G 1/2	N/A	N/A	1.42 (36)	25
SBO 210	8 : 1	0.5	30	3000 (210)	3.7 (1.7)	4.35 (124)	4.13 (105)	3/4-16 UNF	G 1/2	N/A	N/A	1.42 (36)	25
SBO 330	8 : 1	0.6	36	4700 (330)	7.3 (3.3)	5.04 (128)	4.53 (115)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 210	8 : 1	0.75	45	2000/(140)[1] 3000/(210)	6.2 (2.8)	4.88 (124)	4.76 (121)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 330	8 : 1	0.75	45	4700 (330)	8.9 (4.0)	4.78 (122)	4.96 (126)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 200	8 : 1	1	60	3000 (210)	7.9 (3.6)	5.39 (137)	5.35 (136)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 140	8 : 1	1.4	85	2000 (140)	8.6 (3.9)	5.91 (150)	5.71 (145)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 210	8 : 1	1.4	85	3000 (210)	11.9 (5.4)	6.14 (156)	5.91 (150)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 330	8 : 1	1.4	85	4700 (330)	16.6 (7.5)	6.33 (160)	6.1 (155)	3/4-16 UNF	G 1/2	G 1/2	M33 x 1.5	1.42 (36)	25
SBO 100	8 : 1	2	120	1500/(100)[1] 1500/(100)	8.8 (4.0)	6.57 (167)	6.30 (160)	1 1/16-12 UNF	G 3/4	G 3/4	M45 x 1.5	1.81 (46)	40
SBO 210	8 : 1	2	120	3000 (210)	14.6 (6.6)	6.81 (173)	6.57 (167)	1 1/16-12 UNF	G 3/4	G 3/4	M45 x 1.5	1.81 (46)	40
SBO 330	8 : 1	2	120	4700 (330)	17.7 (8.0)	7.12 (180)	6.77 (172)	1 1/16-12 UNF	G 3/4	G 3/4	M45 x 1.5	1.81 (46)	40
SBO 210	4 : 1	2.8	170	3000 (210)	18.0 (8.2)	8.94 (227)	6.57 (167)	1 1/16-12 UNF	G 3/4	G 3/4	M45 x 1.5	1.81 (46)	40
SBO 250	4 : 1	3.5	230	3000 (210)	24.6 (11.2)	11.14 (283)	6.69 (170)	1 1/16-12 UNF	G 3/4	G 3/4	M45 x 1.5	1.81 (46)	40
SBO 330	4 : 1	3.5	230	4700 (330)	30.6 (13.8)	10.78 (274)	6.77 (172)	1 1/16-12 UNF	G 3/4	G 3/4	M45 x 1.5	1.81 (46)	40

Dimensions are for general information only, all critical dimensions should be verified.
Dimensions are in inches/(mm) and lbs/(kg)
1) Stainless steel version for chemical, water, and oil service
2) Diameter at electron beam weld may be up to +0.150" larger
3) May be supplied with adapter

FIXATOR PARTS ASSEMBLY

#	PART NUMBER	DESCRIPTION
1	24FIX13	SPHERICAL BEARING PLATE
2	24FIX11	SLIDE MEMBER
3	24FIX10	WEDGE
4	24FIX12	CASING COVER
5	24FIX14	STAINLESS STEEL COVER
6	24FIX08	SPRING BUSHING
7	24FIX07	SPRING
8	24FIX06	8 MM ALLEN HEAD BOLT
9	24FIX01R	R&R SET SCREW
10	24FIX15	SPACER WASHER
11	24FIXATB	ALL THREAD BUSHING
12	24FIX03	BRASS THRUST WASHER
13	24FIX03A	MACHINE WASHER
14	24FIX02	LOCK NUT
15	24FIX04	5/8” x 1” BEVELED WASHER
16	24FIX05	7/8” x 1” BEVELED WASHER
17	BOL6X12MM	6MM X 12 MM BOLT
9-10-12-13-14-15-16	24FIXAT	ALL THREAD ASSEMBLY
6-7-8	24FIXHD	FIXATOR HOLD DOWN KIT
—	24FIXRK	BOTH 24FIXAT-24FIXHD
—	24FIX	R&R FIXATOR ASSEMBLY



RK FIXATOR® TECHNICAL SPECIFICATIONS

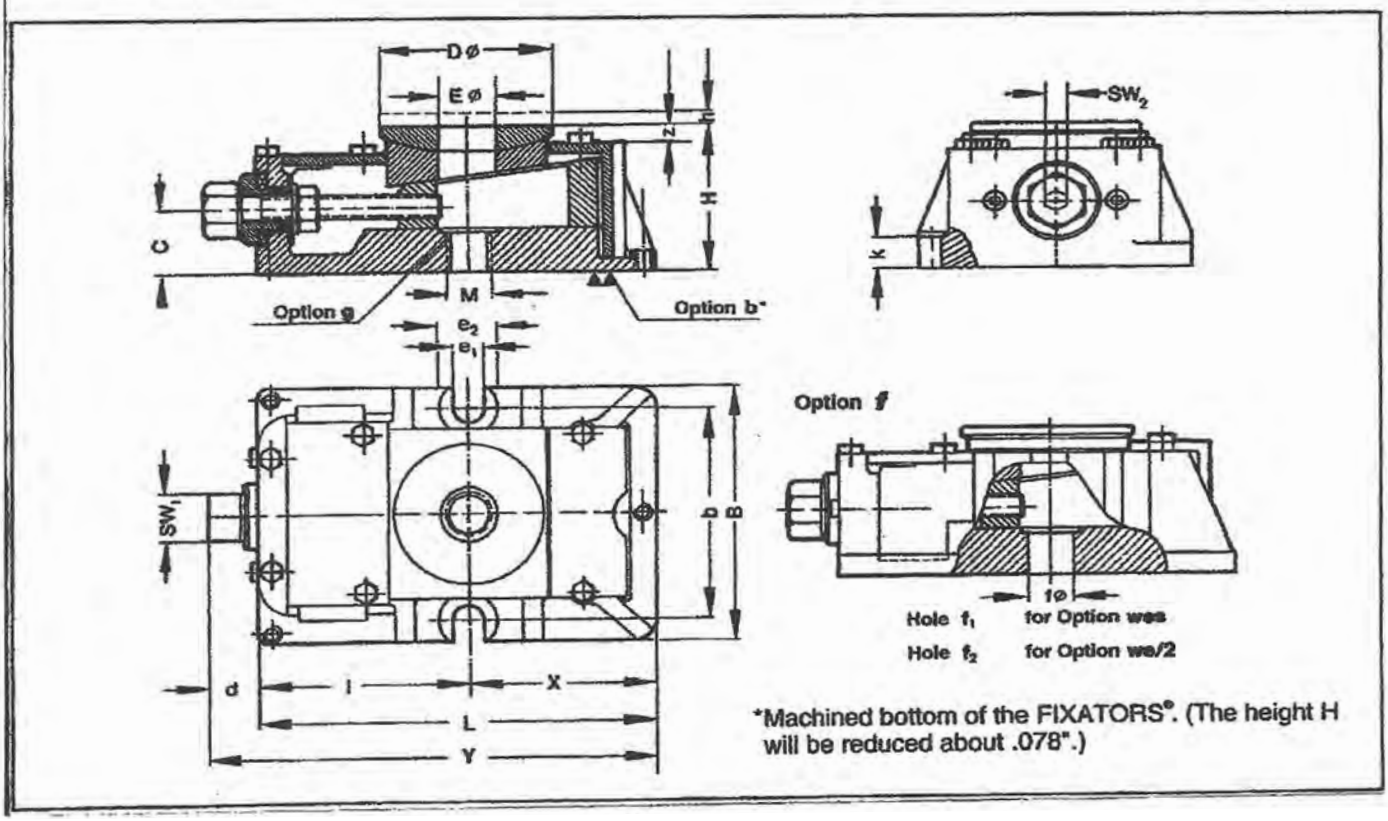
RK2

DESCRIPTION	Dim.	RK I	RK II	RK III	RK IV	RK V
Recommended machine dead weight	lbs.	Contact Factory	4,400	8,800	13,200	26,400
Maximum allowable lifting load per FIXATOR®	lbs.	Contact Factory	26,500	53,000	80,000	155,000
Spring constant	lb./in.	Contact Factory	22,800,000	37,100,000	45,700,000	79,900,000
Vertical adjustment per revolution of height adjusting screw	in.	0.010	0.010	0.012	0.014	0.017
Maximum vertical adjustment	in.	0.20	0.20	0.24	0.32	0.40
Approximate torque required to turn adjusting screw	ft. lb./1000 lbs. load	1.0	1.0	1.3	1.5	1.8
Maximum allowable torque on adjusting screw	ft. lb.	22	29	73	117	294
Thread dimensions	M x S metric	16 x 2 mm	20 x 2.5 mm	24 x 3 mm	30 x 3.5 mm	36 x 4 mm
Approximate torque on anchor bolt nut at yield point of bolt	ft. lb.	116	217	376	723	1300
Approximate tension on anchor bolt at yield point	lbs.	Contact Factory	19,800	28,600	44,000	66,000
Weight of Basic Unit	lbs.	8.8	12.1	25.3	46.2	92.4

DIMENSIONS*

SIZE RK	M	L	B	H	DØ	SW_1	SW_2	EØ	d	c	z	h	l	b	e_1	e_2	k	x	Y	$f_1Ø$	$f_2Ø$
I	M12	6.89	4.13	2.17	2.36	19 mm	—	.80	.63	.93	.39	.20	3.62	3.54	.55	1.02	.55	3.27	7.52	.67	.75
II	M20	6.89	4.72	2.95	2.95	19 mm	—	1.00	.63	1.30	.51	.20	3.66	3.94	.55	1.02	.59	3.23	7.52	.83	.98
III	M24	8.66	5.91	3.74	3.54	24 mm	—	1.25	.81	1.61	.55	.24	4.63	5.12	.71	1.26	.91	4.03	9.47	.98	1.22
IV	M30	10.83	7.09	4.53	4.33	32 mm	17 mm	1.55	1.26	2.09	.71	.32	5.61	6.30	.94	1.50	1.10	5.22	12.09	1.22	1.46
V	M36 M42	13.58	9.06	5.31	5.91	36 mm	19 mm	1.80	1.38	2.52	.79	.40	7.09	8.07	1.10	1.81	1.50	6.49	14.96	1.46 1.73	1.73 —

*CASTING DIMENSIONS MAY VARY



*Machined bottom of the FIXATORS®. (The height H will be reduced about .078".)

CE

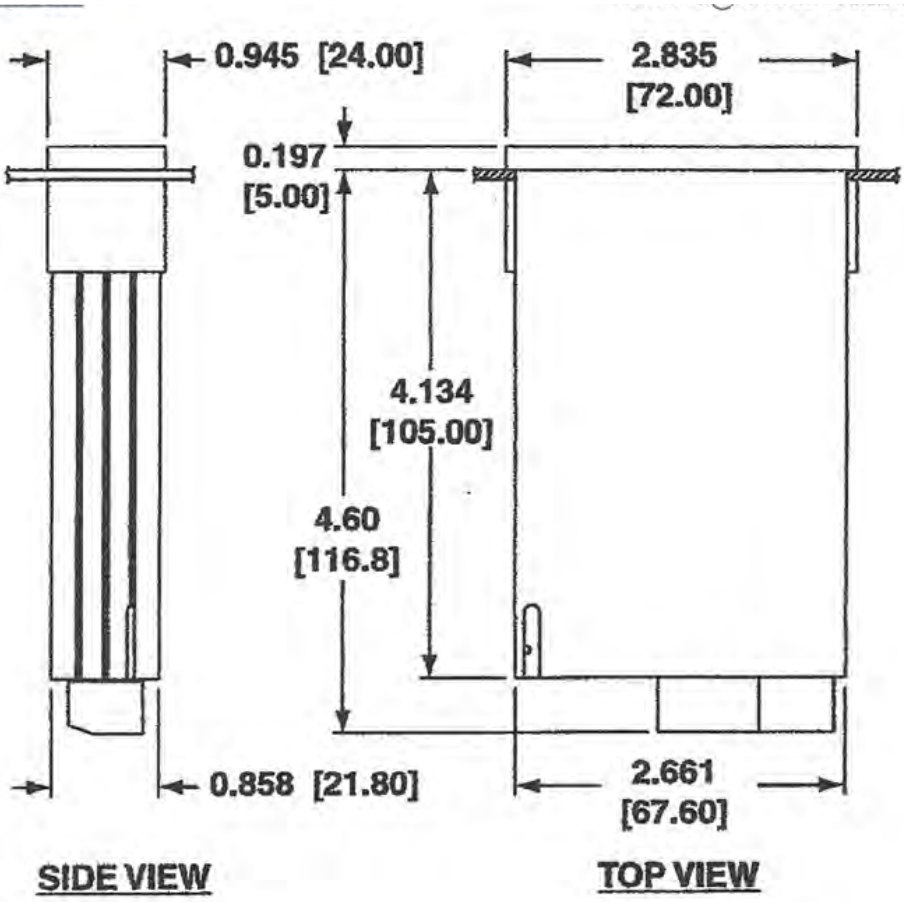
205-TC

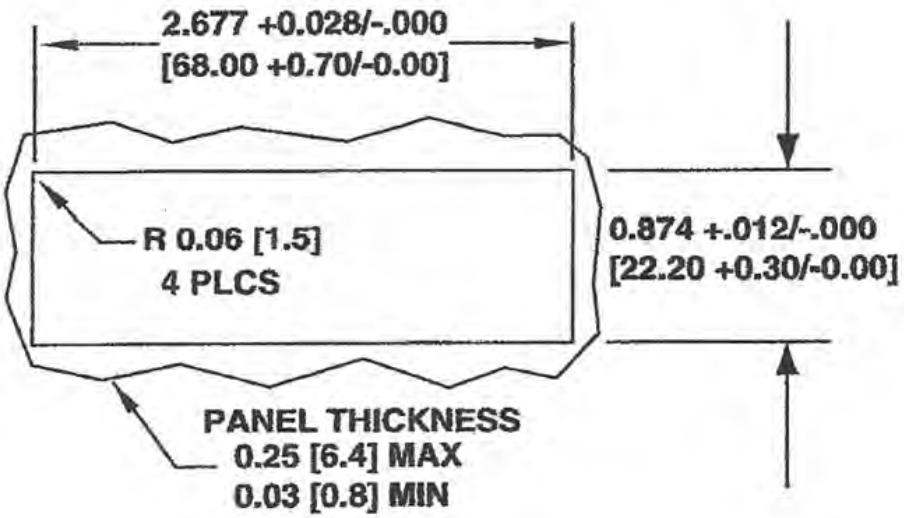
THERMOCOUPLE
MINIATURE PANEL THERMOMETER

Operator's Manual

MADE IN THE U.S.A.

NEWPORT Electronics, Inc.





PANEL CUTOUT

Figure 5-1 Dimensions

DISPLAY

Type:	7-segment, LED
Height:	0.56" (14.2 mm)
Symbols:	-1.8.8.8
Overrange Indication:	Three least-significant digits blank
Colors:	Red - standard Green - optional

DIGITAL INPUTS

Hold:	TTL or 5V CMOS compatible

ENVIRONMENTAL

Operating Temperature:	0° to 60°C(32° to 140°F)
Storage Temperature:	-40° to 85°C (-40° to 185°F)
Relative Humidity:	95% at 40°C (non-condensing)

MECHANICAL DIMENSIONS

Bezel:	0.94" x 2.83" (24 x 72 mm)
Depth Behind the Bezel:	4.72" (120 mm) w/ connectors
Panel Cutout:	0.87"H x 2.68" W (22.2 x 68 mm)
Weight:	7 ounces (200 grams)
Panel Thickness	minimum: 0.03" (0.76mm) maximum: 0.25" (6.25mm)
Case Material:	94V-1 UL-rated thermoplastic

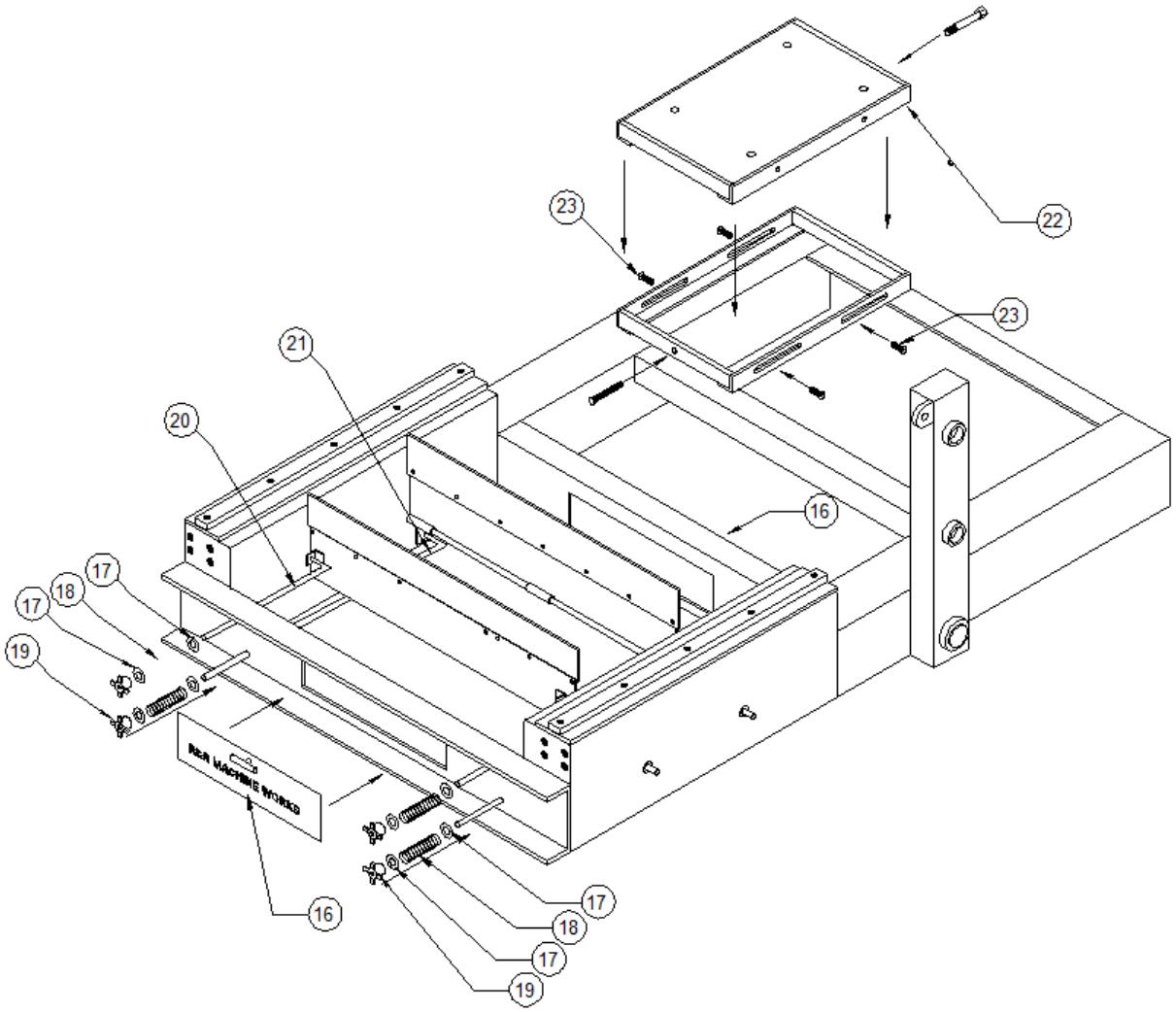
POWER

AC Frequency:	50/60 Hz
Max. Power:	2.4 watts max.
AC Voltage:	115Vac ±15% 25mA max. 230Vac ±15% 14mA max. 100Vac ±15% 30mA max. 24Vac ±15% 127mA max.
DC Voltage:	9-26 Vdc @ 110mA
External Fuse Protection needed: UL Slow-blow (per single unit)	32mA, 115Vac/230Vac 40mA, 100Vac 160mA, 24Vac 125mA, 9-26Vdc
Installation Category:	I per EN61010
Equipment Class:	I per EN61010
Pollution Degree:	2 per EN61010

† Refer to the Glossary in Section 6.

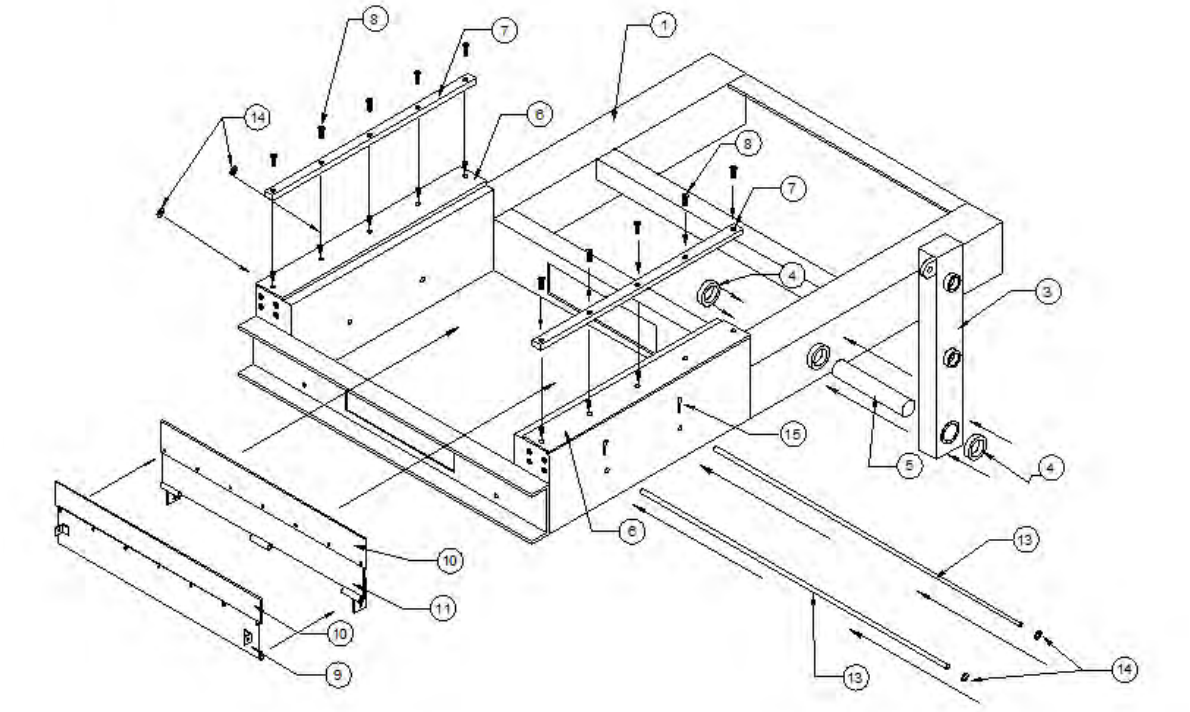
24 x 56 CONVENTIONAL FRAME ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
16	DOR0024	FRAME INSPECTION DOOR
17	WF12	1/2” FLAT WASHER
18	SCR1804	ADJUSTING ROD SPRING
19	SCR1803	STAR KNOB FOR SCRAPER TENSION ROD
20	SCR24FTRA	FRONT (SHORT) TENSION ROD ONLY
21	SCR24RTRA	FRONT (LONG) TENSION ROD ONLY
22	MTRMT125	LARGE MOTOR MOUNT
23	BOL58X2	5/8” X 11 X 2” GR5 BOLT
24	N/A	MOTOR MOUNT ADJUSTING BOLT



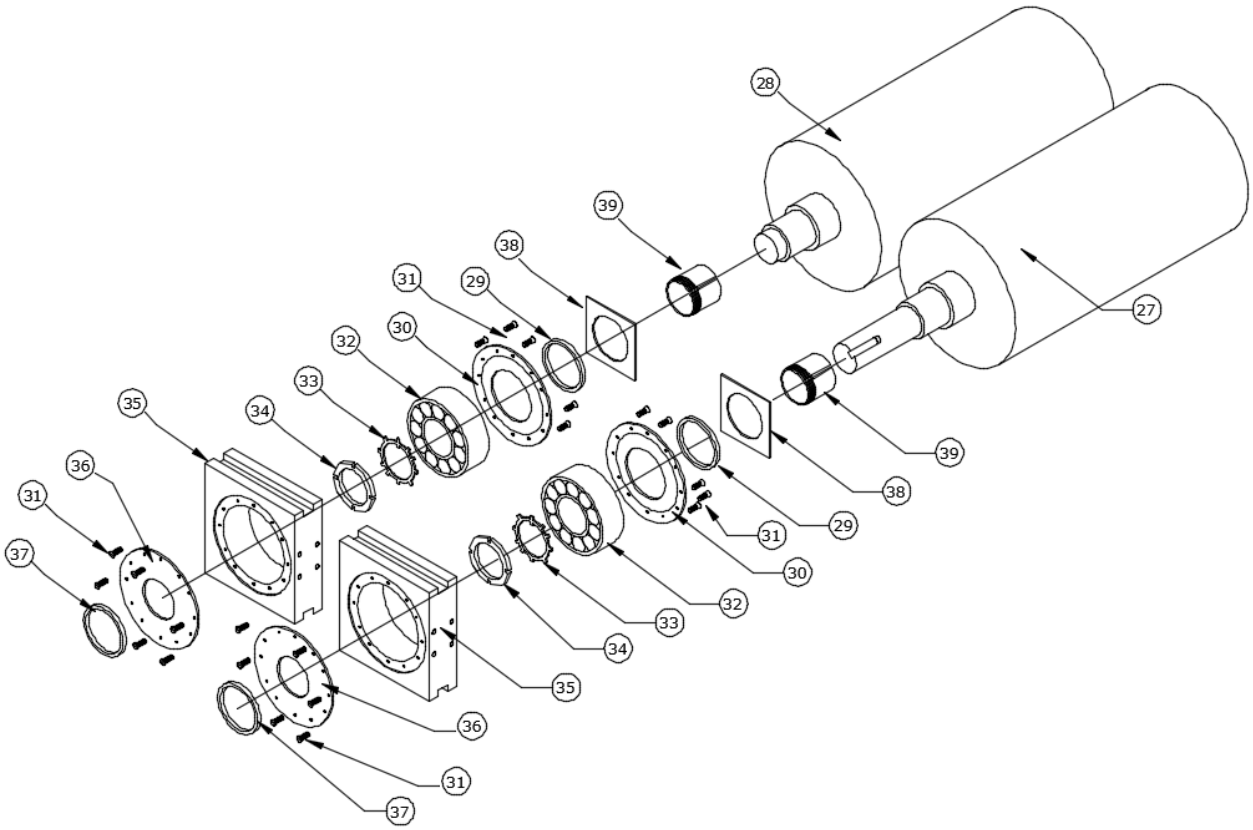
24 x 56 CONVENTIONAL FRAME ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	FR245	24 X 56 DUAL DRIVE FRAME
6	FR2406	HOUSING WEAR PLATE
7	FR2407	HOUSING GUIDE
8	BOL58X2FHSC	5/8” - 11 2” SOCKET HEAD FHSC
9	SCR56BRF	FRONT SCRAPER BRACKET
10	SCR5601	ALUMINUM SCRAPER BLADE
11	SCR56BRR	REAR SCRAPER BRACKET
13	SCR56ROD	SCRAPER ASSEMBLY SUPPORT ROD
14	WF34	3/4” FLATWASHER
15	KYP4	1/4” COTTER KEY



24 X 56 CONVENTIONAL BEARING ASSEMBLY WITH ADAPTER

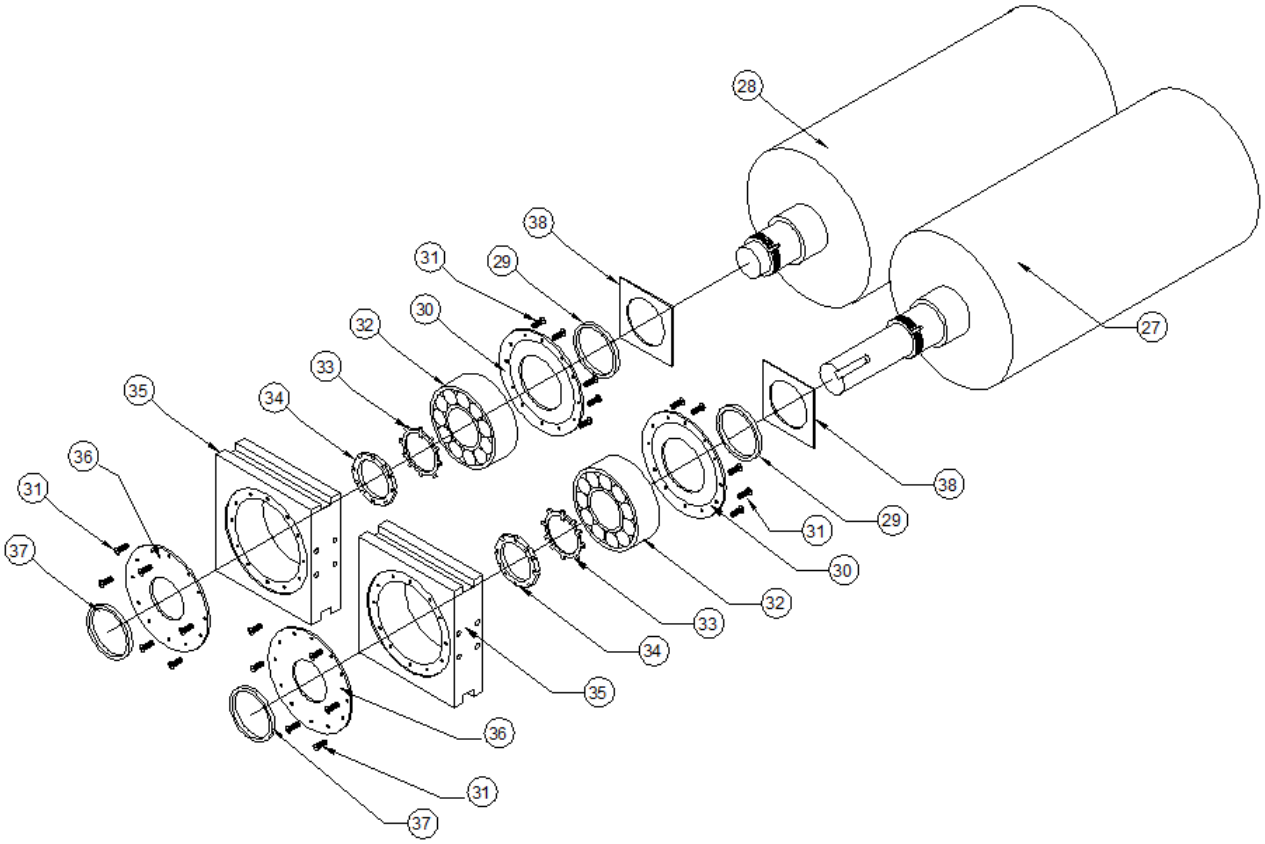
ITEM	ITEM #	PART DESCRIPTION
27	R2456G	DUAL DRIVE ROLL
28	R2456G	DUAL DRIVE ROLL
29	SL416044	HOUSING BACKPLATE SEAL
30	HSGR232	HOUSING BACKPLATE
31	BOL12X112	1/2” X 1 1/2” CT BOLT
32	BRG2234K	SPHERICAL BEARING
33	W34	ADAPTER LOCK WASHER
34	NAN34	ADAPTER LOCKNUT
35	HSGR202SMI	BEARING HOUSING
36	HSGR242	HOUSING OUTER CAP
37	SL415066	HOUSING OUTER CAP SEAL
38	DS1178SQ	PLASTIC DUST SHIELD
39	ADS34	BEARING ADAPTER



24 X 56 CONVENTIONAL

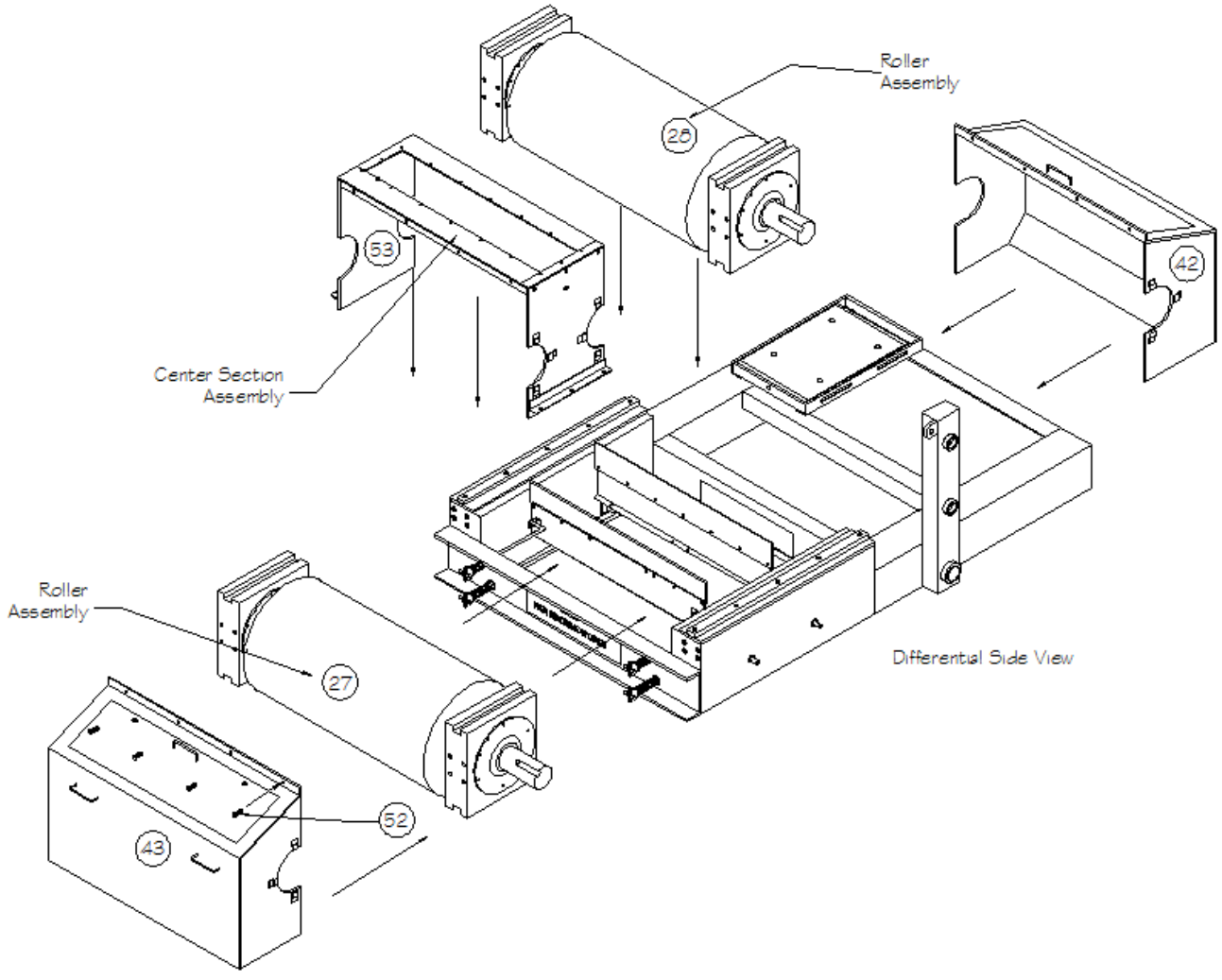
BEARING ASSEMBLY WITH STRAIGHT BORE

ITEM	ITEM #	PART DESCRIPTION
27	R2456G	DUAL DRIVE ROLL
28	R2456G	DUAL DRIVE ROLL
29	SL415066	HOUSING BACKPLATE SEAL
30	HSGR231	HOUSING BACKPLATE
31	BOL12X112	1/2” X 1 1/2” CT BOLT
32	BRG2330S	SPHERICAL BEARING
33	W30	ADAPTER LOCK WASHER
34	NAN30	ADAPTER LOCKNUT
35	HSGR201SMI	BEARING HOUSING
36	HSGR241	HOUSING OUTER CAP
37	SLA415066	HOUSING OUTER CAP SEAL
38	DS1178SQ	PLASTIC DUST SHIELD



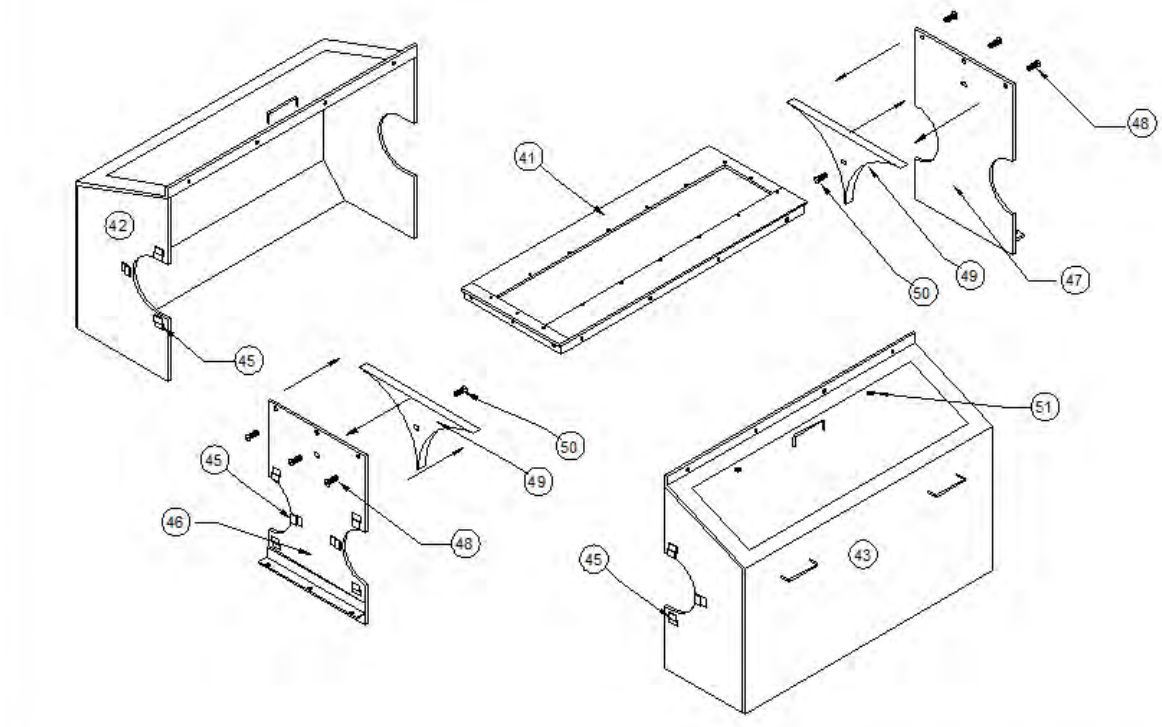
ROLL ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
27	N/A	DUAL DRIVE ROLL ASSEMBLY
28	N/A	DUAL DRIVE ROLL ASSEMBLY
42	COV0S56DR	REAR ROLL COVER W/DOOR
43	COV0S56DF	FRONT ROLL COVERW/DOOR
52	BOLSS12X1	S/S CENTER SECTION ASSY.
53	FR245CSS	S CENTER SECTION ASSY



COVER ASSEMBLY

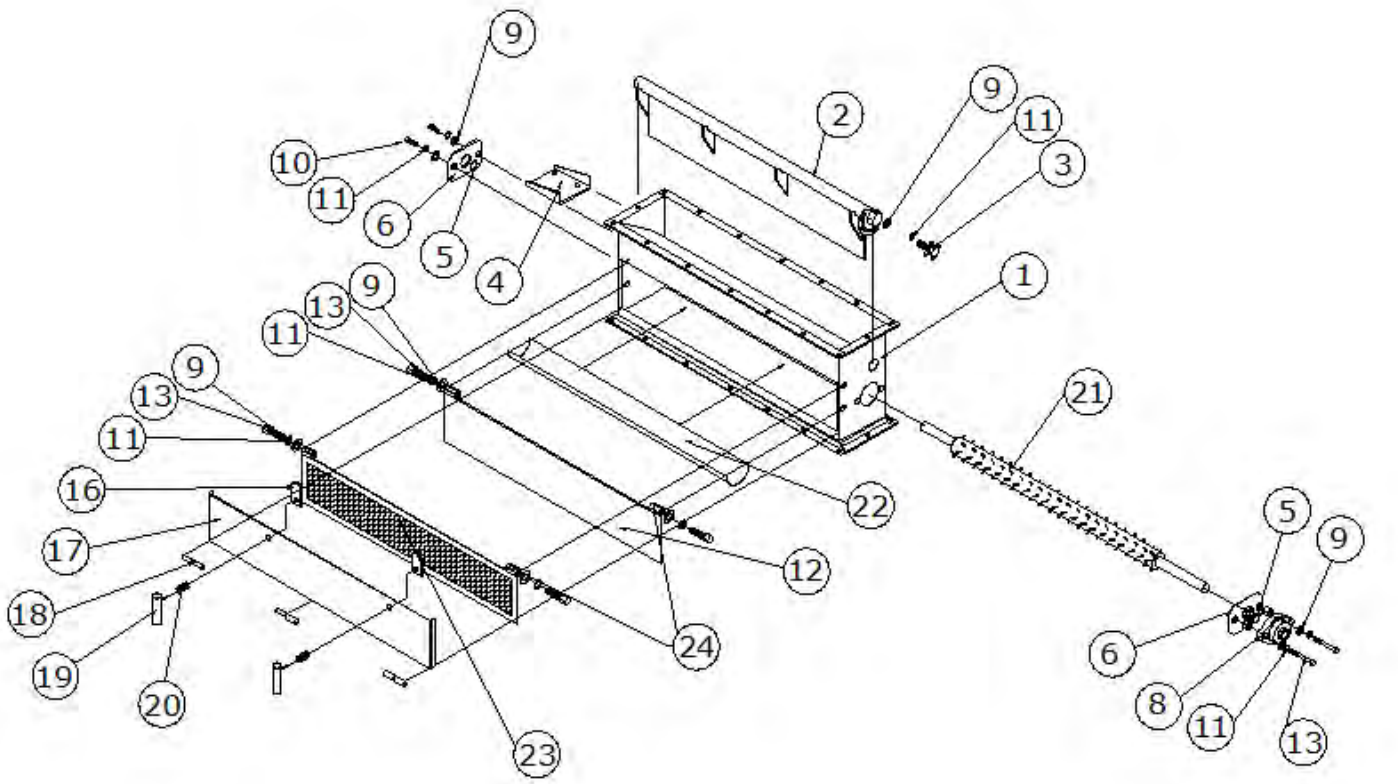
ITEM	ITEM #	PART DESCRIPTION
41	FR245CST	CENTER SECTION TOP
42	COV0S56DR	REAR ROLL COVER W/ DOOR
43	COV0S56DF	FRONT ROLL COVER W/ DOOR
45	COV0050	DUST SHIELD CLIPS
46	FR24CSL	CENTER SECTION LEFT SIDE
47	FR24CSR	CENTER SECTION RIGHT SIDE
48	BOLSS12X1	1/2” - 13 X 1” SS BOLT
49	SAD24	ALUMINUM SADDLE
50	BOL12X3	1/2” - 13 X 3 GRS BOLT
51	MAGS38	3/8” STAR KNOB



PEG FEEDER

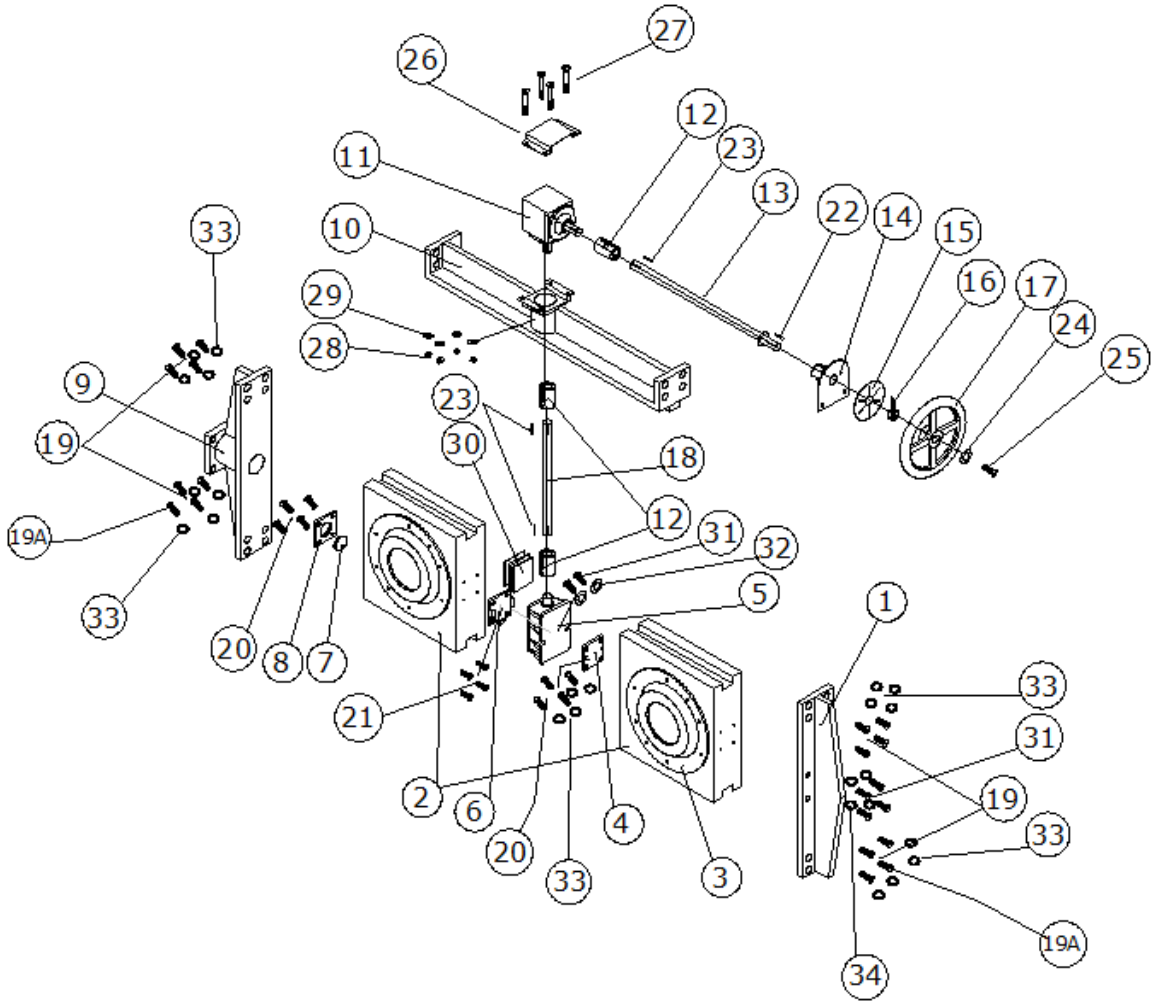
ITEM	ITEM #	PART DESCRIPTION
1	PFCAB245	FEEDER CABINET
2	PFSG24N	SHUTOFF GATE
3	PFKNB	TENSION KNOB
4	PFGBEB	GEAR BOX BRACKET
5	HYW171611516	WIPER
6	PFGBE031	ROD GLAND
8	BRG1716UIA	1 7/16” BEARING W/ INSERT
9	WF12SS	1/2” S/S FLATWASHER
10	BOLSS12X1	1/2” X 1” S/S BOLT
11	WL12SS	1/2” S/S LOCKWASHER
12	PFFGT56	DIRECTIONAL GATE

ITEM	ITEM #	PART DESCRIPTION
13	BOLSS12X112	1/2” X 1 1/2” S/S BOLT
16	MSSF25X125	DOOR TAB
17	PFDR24	FEEDER CABINET DOOR
18	DORSD18L	DOOR HINGE
19	PFDRH	S/S DOOR HINGE
20	DOR0018S	STAINLESS STEEL SPRING
21	PFBAR532	PEG FEEDER BAR
22	PFPAN56	FEEDER TROUGH
23	PFFG24	FINGER GUARD
24	PFFH	1/2” COUPLING NUT



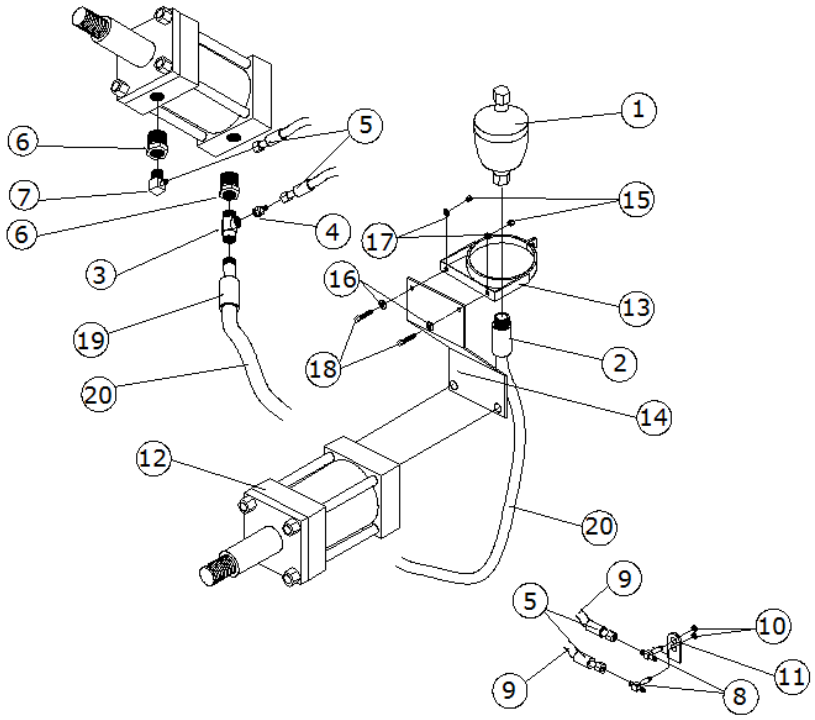
CLOSURE ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION	ITEM	ITEM #	PART DESCRIPTION
1	FR24BRF	FRONT HOUSING BRACKET	19	BOL1X212GR8	1” X 2 1/2” GR8 BOLT
2	HSGR202SMI	34K BEARING HOUSING	19A	BOL1X312GR8	1” X 3 1/2” GR8 BOLT
3	HSGR242	OUTER CAP	20	BOL58X2FHSC	5/8” X 2” FHSC
4	FR24FB	FIXATOR BRACKET	21	BOL58X112FHSC	5/8” X 1 1/2” FHSC
5	24FIX	R&R FIXATOR	22	KY25X2	1/4” X 2” KEYSTOCK
6	FR24SB	FIXATOR SPACER BRACKET	23	KY25X1	1/4” X 1” KEYSTOCK
7	HY24AN6	6” ALIGNMENT NUT	24	WF38	3/8” FLAT WASHER
8	HY24AP	ALIGNMENT PLATE	25	BOL38X1	3/8” X 1” BOLT
9	FR24BRRH	REAR HYD. BRACKET 6”	26	FR24RABR	TOP GEARBOX BRACKET
10	FR24BRTD	TOP DRIVE HOUSING BRACKET	27	BOL12X612	1/2” X 6 1/2” BOLT
11	24RAGB21	RIGHT ANGLE GEARBOX	28	N12CT	1/2” NUT
12	24COUP	SHAFT COUPLING	29	WL12	1/2” LOCKWASHER
13	24CLLS	1” X 23” CHROME SHAFT	30	FR24S	FIXATOR SPACER
14	24CLCC	CLAMP COLLAR DIAL PLATE	31	BOL58X2F12	FIXATOR BOLT
15	24DPL	DIAL PLATE	32	WF58	5/8” FLAT WASHER
16	24CLR1A	SET COLLAR W/ POINTER	33	WL1	1” LOCK WASHER
17	24CLAW	HAND WHEEL	34	WL58	5/8” LOCK WASHER
18	24CLSS	1” X 6” CHROME SHAFT			



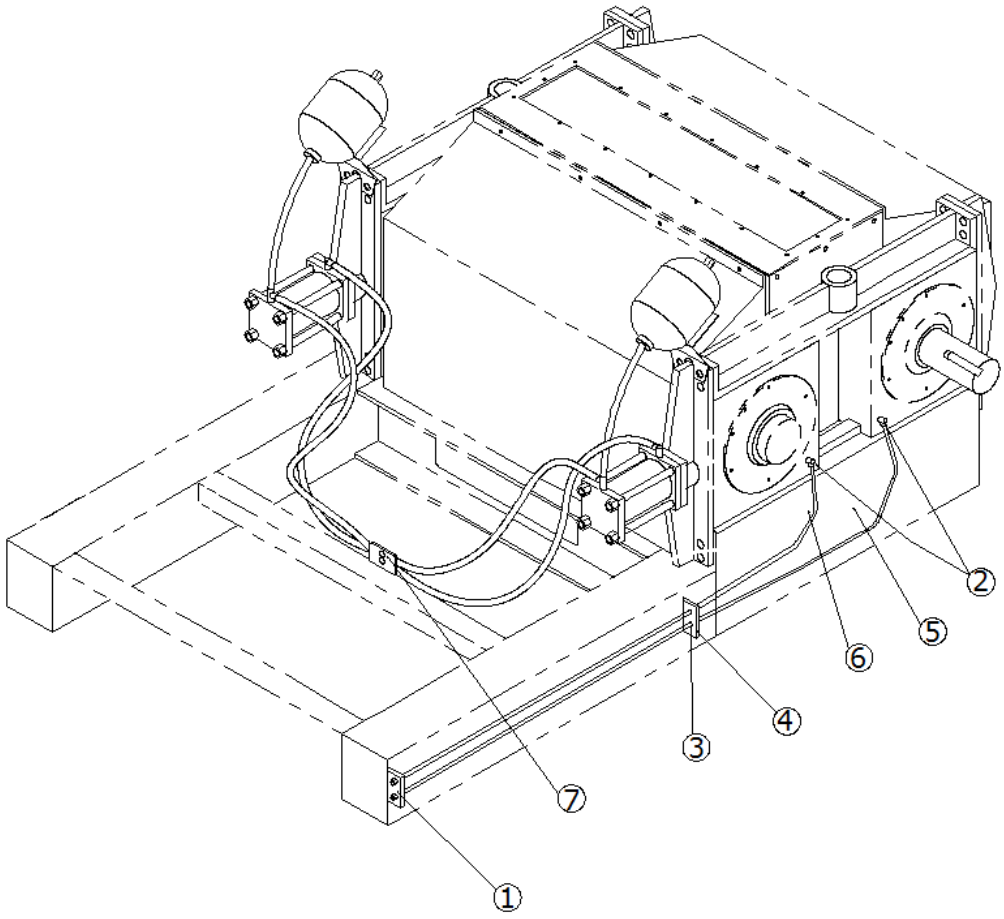
ACCUMULATOR/HYDRAULIC ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	24ACC2L	LARGE ACCUMULATOR
2	HYFT12G12MB	12G-12MB FITTING
3	HYFT12FP12MPT	12FP-12FP-12MPT
4	HYFT6MJ12MP	6MJ-12MP FITTING
5	HYFT6G6FJX	6G-6FJX FITTING
6	HYFT16MP12FP	16MP-12FP FITTING
7	HYFT6MJ12MP90	6MJ-12MP-90 FITTING
8	HYFT6MJBH6MJT	6MJBH-6MJT
9	HYFT38HS	6M3K HYD. HOSE
10	HYFT6LN	6LN BULKHEAD NUT
11	HYFTBRKTT	FRAME BRACKET
12	HY24RR6	6” CYLINDER
13	24ACCB	ACC. MOUNTING CLAMP
14	24ACCB2	MOUNTING PLATE
15	N38CT	3/8” CT NUT
16	WF38	3/8” WASHER
17	WL38	3/8” LOCKWASHER
18	BOL38X1	3/8” X 1” BOLT
19	HYFT12G12MPX	12G-12MPX FITTING
20	HYFT34HS	12M3K HYD. HOSE



GREASE LINES

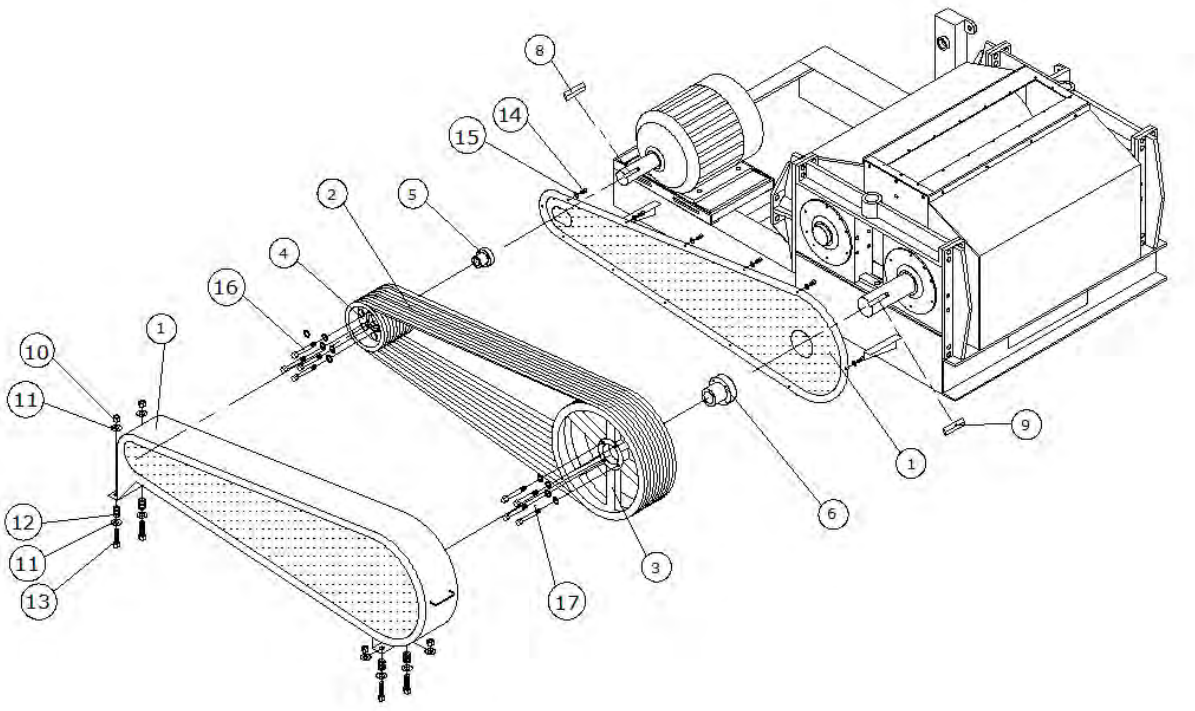
ITEM	ITEM #	PART DESCRIPTION
1	HYFT4G2MP	4G-2MP
2	HYFT2MP2FP90	2MP-2FPX 90 DEG.
3	BOL38X3	3/8” X 3 BOLT
4	HYFT24BRK	HOSE HOLDER
5	HYFT14HS	4M3K 1/4” 90”
6	HYFT14HS	4M3K 1/4” 90”
7	HYFTBRKTT	TEE BRACKET



R&R CONVENTIONAL

SHEAVE & BELT ASSEMBLY

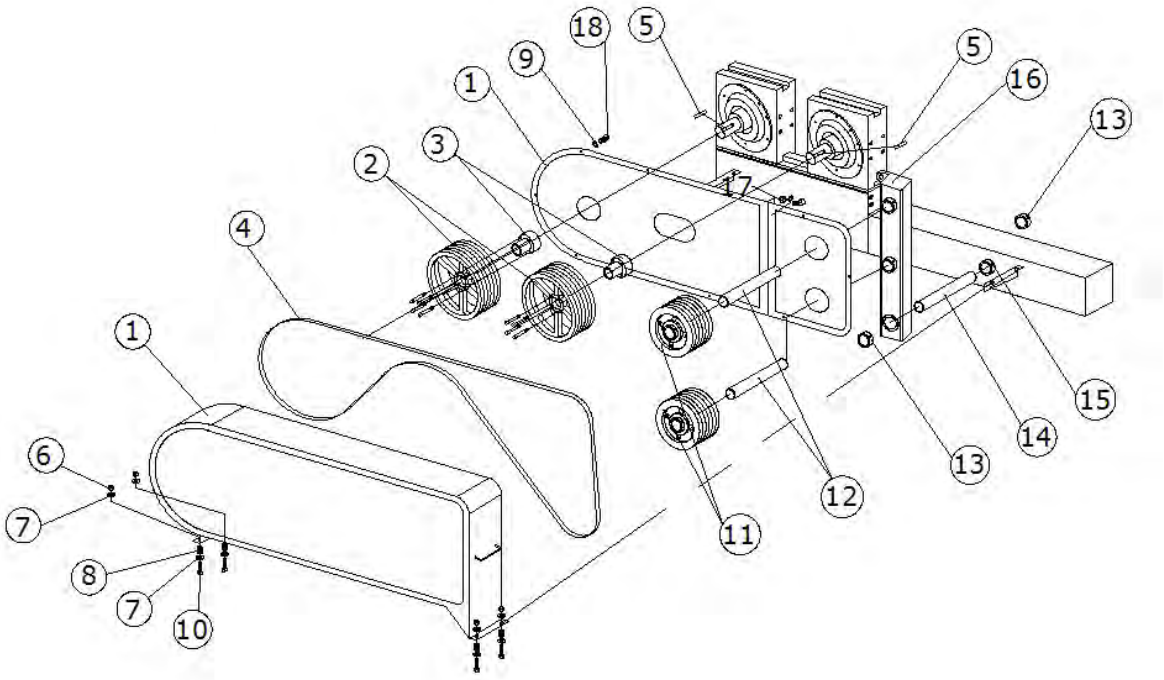
ITEM	ITEM #	PART DESCRIPTION
1	GAR24D	DRIVE GUARD TOTALLY ENCLOSED
2	BLTC225	10 C225 DRIVE BELTS
3	SH10C36	10 C36.0 M. SHEAVES
4	SH10C10	10 C10.0 J SHEAVES
5	HBJ338	J X 3 3/8” J HUB
6	HBM434	M X 4 3/4” HUB
8	KY58	5/8” X 3” KEYSTOCK
9	KY125	1 1/4” X 6” KEYSTOCK
10	N12CTNL	1/2” NYLOCK NUT
11	WF12	1/2” FLAT WASHER
12	GARSPR80	VIBRATION SPRING
13	BOL12X312	1/2” X 3 1/2” BOLT
14	BOL38X34	3/8” X 3/4” BOLT
15	WL38	3/8” LOCK WASHER
16	BOLHJ	BOLT KIT FOR J HUB
17	BOLHM	BOLT KIT FOR M HUB



24 X 56 CONVENTIONAL

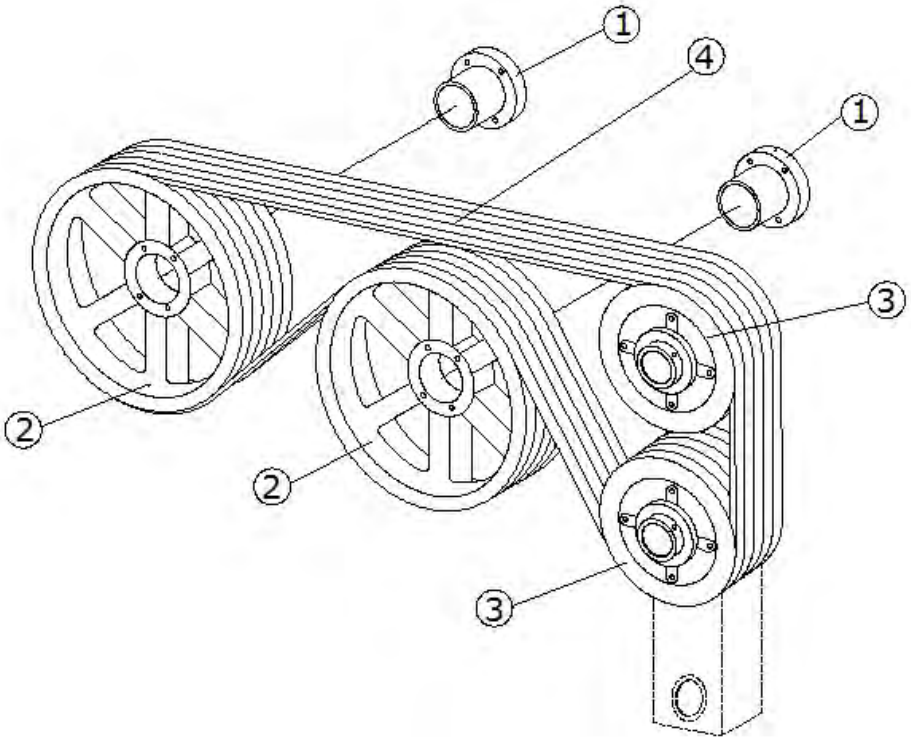
IDLER ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	GAR24I	IDLER GUARD TOTALLY ENCLOSED
2	SH6C20	6 C20.0 SHEAVES
3	HBF3716	F 3 7/16” HUB
4	BLTCC180	6 CC180 BELTS
5	KY7858	5/8” X 7/8” KEYSTOCK
6	N12CTNL	1/2” NYLOCK NUT
7	WF12	1/2” LOCKWASHER
8	GARSPR80	GUARD VIBRATION SPRING
9	WL38	3/8” LOCKWASHER
10	BOL12X312	1/2” X 3 1/2” BOLT
11	IDL24MHB	IDLER SHEAVE ASSEMBLY
12	IDL2405SS	2 3/16” IDLER SHAFT
13	IDL2404B2	3” LOCKING COLLAR
14	IDL2405	3” LOWER IDLER SHAFT
15	IDL2404	3” COLLAR
16	IDL24AA	IDLER ARM W/ BUSHINGS
17	N38CT	3/8” NUT
18	BOL38X34	3/8” X 3/4” BOLT
—	BOLSTS38X112SQ	SET SCREWS FOR ALL LOCK COLLARS



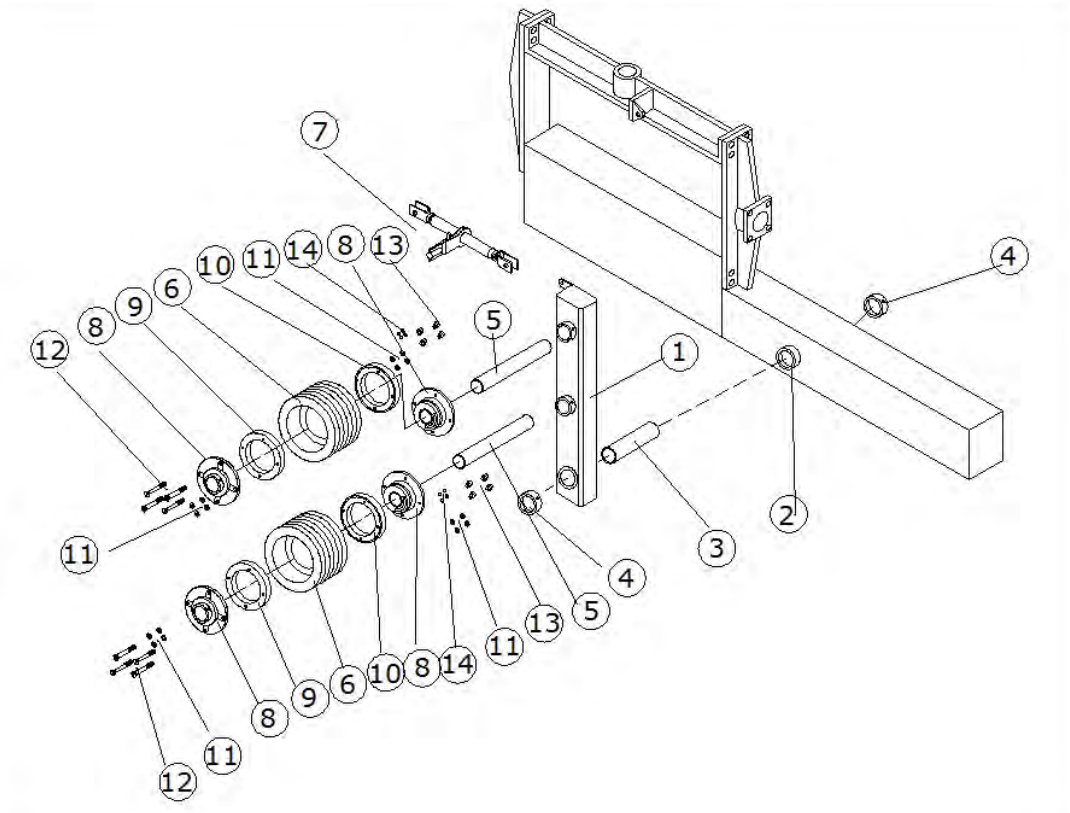
IDLER BELT ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	HBF3716	F 3 7/16” HUB
2	SH6C20	6 C20 SHEAVES
3	IDL24MHB	IDLER SHEAVE ASSEMBLY
4	BLTCC180	6 CC180 BELTS



IDLER ARM ASSEMBLY

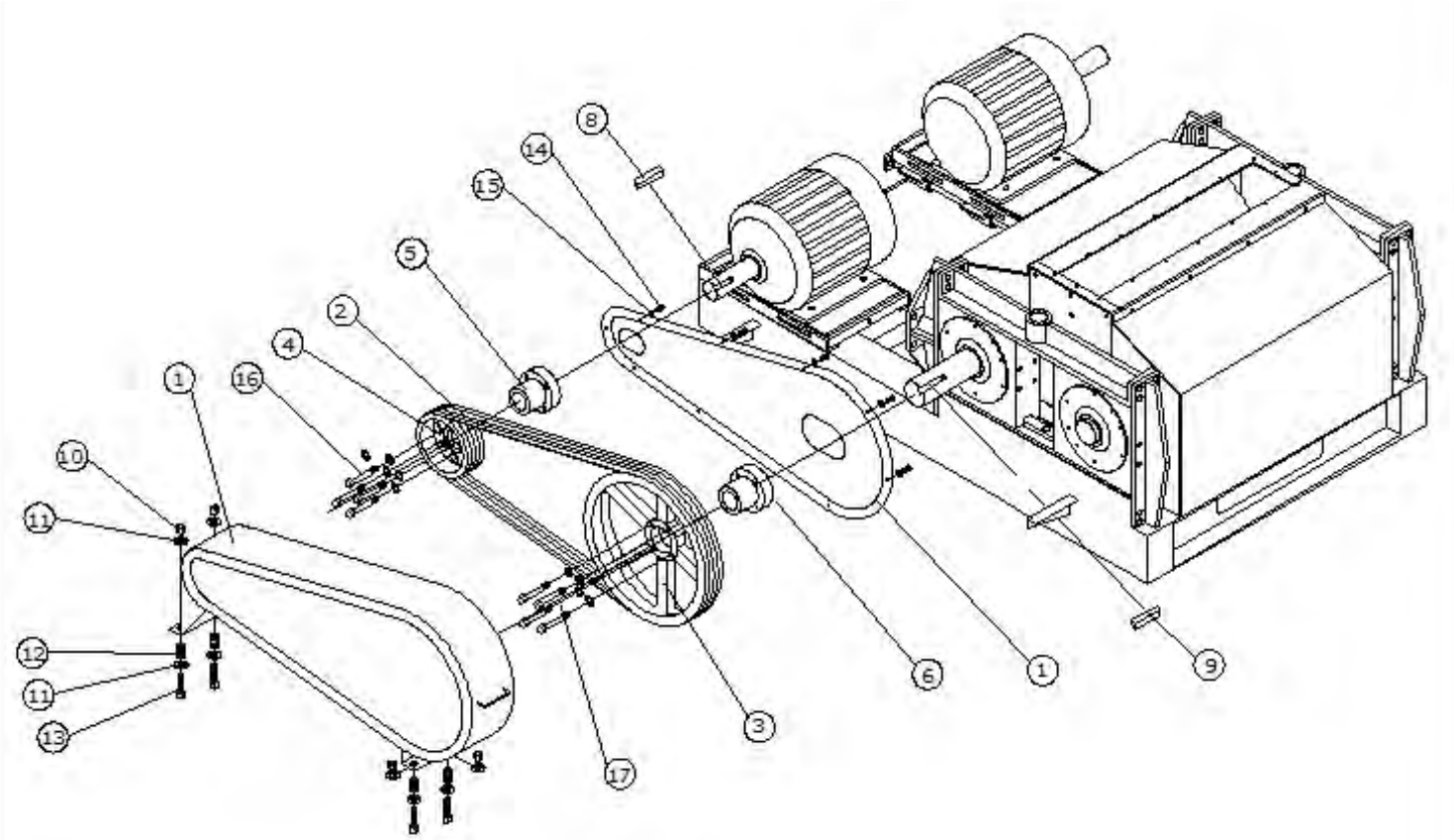
ITEM	ITEM #	PART DESCRIPTION
1	IDL24AA	IDLER ARM W/ BUSHINGS
2	IDL2404	FRAME BUSHING
3	IDL2405	3” BOTTOM IDLER SHAFT
4	IDL2404B	1” TOP LOCK COLLAR
5	IDL2405SS	2 3/16” IDLER SHEAVE SHAFT
6	SH6C20	6 C20.0 F IDLER SHEAVE
7	IDL24RJ	RACHET JACK WITH PINS
8	BRG2316F4QM	4 BOLT FLANGE BEARING 2 3/16”
9	IDL24MHA	1 1/2” SHEAVE FLANGE
10	IDL24MH	2” SHEAVE FLANGE
11	WF12	1/2” FLAT WASHER
12	BOL12X612	1/2” X 6 1/2” CT BOLT
13	N12CT	1/2” CT NUTS
14	WL12	1/2” LOCK WASHER



DUAL MOTOR MOVEABLE

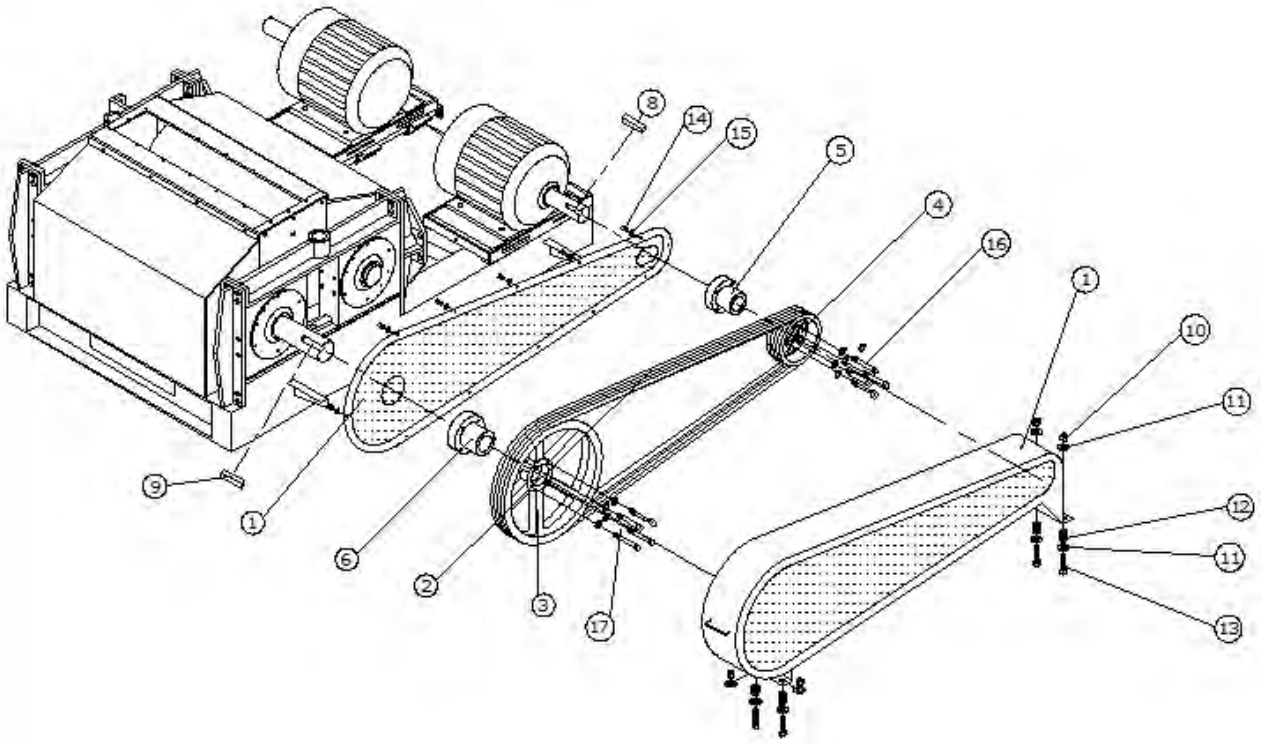
ROLL SHEAVE & BELT ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	GAR24DDB	SMALL DUAL DRIVE GUARD
2	BLTCX195	5 CX195 BELTS
3	SH5C36	5 C36.0 J SHEAVES
4	SH5C10	5 C10.0 E SHEAVES
5	HBE278	E 2 7/8” HUB
6	HBJ3716	J 3 7/16” HUB
8	KY58	5/8” X 3” KEYSTOCK
9	KY78	7/8” X 6” KEYSTOCK
10	N12CTNL	1/2” NYLON NUT
11	WF12	1/2” FLAT WASHER
12	GARSPR80	VIBRATION SPRING
13	BOL12X312	1/2” X 3 1/2” BOLT
14	BOL38X34	3/8” X 3/4” BOLT
15	WL38	3/8” LOCKWASHER
16	BOLHE	BOLT KIT FOR E HUB
17	BOLHJ	BOLT KIT FOR J HUB



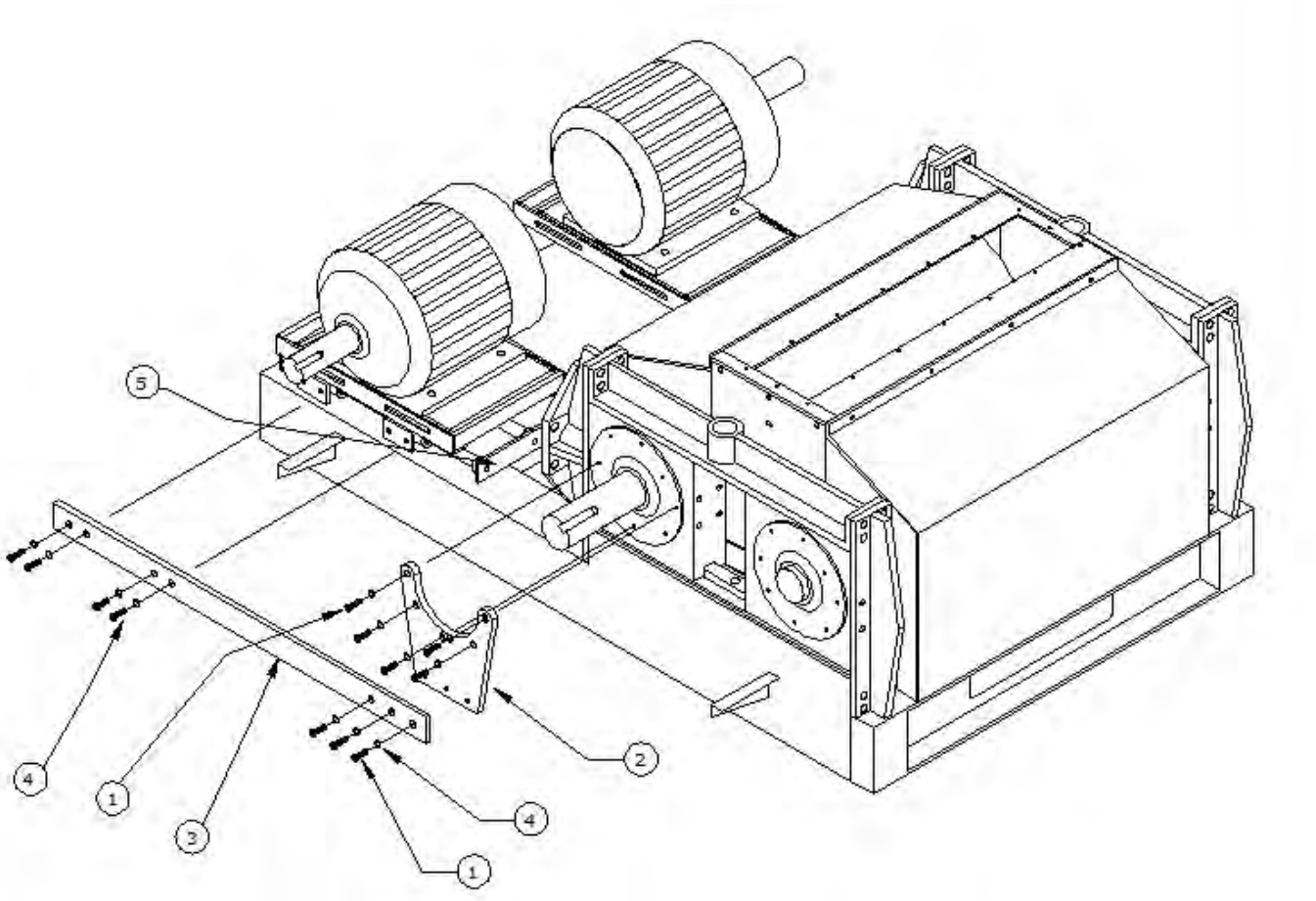
DUAL MOTOR SHEAVE & BELT ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	GAR24DDA	LARGE DUAL DRIVE GUARD
2	BLTCX240	5 CX 240 BELTS
3	SH5C36	5 C36.0 J SHEAVES
4	SH5C10	5 C10.0 E SHEAVES
5	HBE278	E 2 7/8” HUB
6	HBJ3716	J 3 7/16” HUB
8	KY58	5/8” X 3” KEYSTOCK
9	KY78	7/8” X 5” KEYSTOCK
10	N12CTNL	1/2” NYLON NUT
11	WF12	1/2” FLAT WASHER
12	GARSPR80	VIBRATION SPRING
13	BOL12X312	1/2” X 3 1/2” BOLT
14	BOL38X34	3/8” X 3/4” BOLT
15	WL38	3/8” LOCKWASHER
16	BOLHE	BOLT KIT FOR E HUB
17	BOLHJ	BOLT KIT FOR J HUB



DUAL MOTOR YOKE ASSEMBLY

ITEM	ITEM #	PART DESCRIPTION
1	BOL58X112	5/8” X 1 1/2” GR 5 BOLT
2	MTRHY	HOUSING YOKE
3	MTRCS	CONNECTING BAR
4	WL58	5/8 LOCK WASHER
5	MTRSL24	24” GREASABLE MTR MOUNT SLIDE



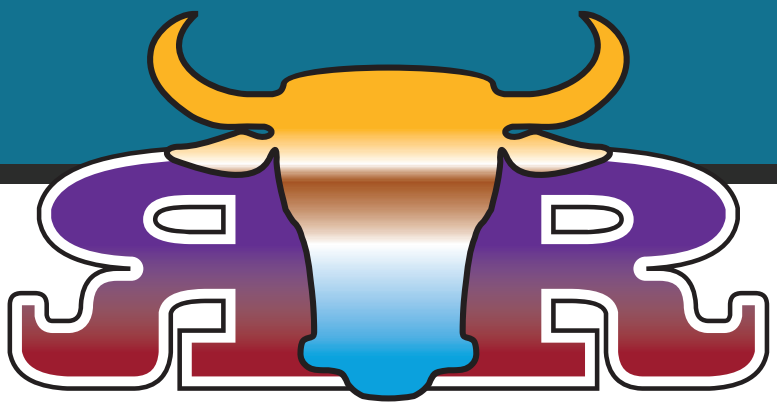
LIMITED WARRANTY

The manufacturer warrants this equipment to the original user against material or workmanship for a period of 30 days from the date of purchase on repair parts and labor. The manufacturers responsibility under this warranty is limited to the repair or replacement of defective part or parts.

The manufacturer reserves the right to determine whether the part or parts failed because of material, workmanship, or other causes. Failure caused by accident, alteration, or misuse is not covered by this warranty.

A DALHART R&R MACHINE WORKS, INC. representative must do all warranty repairs. Any repair to the equipment other than by this authorized facility voids this warranty. The rights under this warranty are limited to the original user and may not be transferred to subsequent owners.

The warranty is in lieu of all other warranties, expressed or implied, including warranties for a particular purpose.



R&R MACHINE WORKS

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