

# TABLE OF CONTENTS

<b>WARRANTY</b>	<b>4</b>
<b>PARTS ORDERING INFORMATION</b>	<b>5</b>
<b>BE A SAFE OPERATOR</b>	<b>6,7,8</b>
<b>FORWARD</b>	<b>9</b>
<b>INSTALLATION INSTRUCTIONS</b>	<b>10</b>
<b>TIPS ON OPERATING YOUR MILL</b>	<b>11</b>
<b>START UP / SHUT DOWN PROCEDURE</b>	<b>12</b>
<b>ADJUSTMENTS</b>	
<b>TO SET FEED RATE</b>	<b>13</b>
<b>TO SET ROLL CLEARANCE</b>	<b>14</b>
<b>TO SET SPRING TENSION</b>	<b>15</b>
<b>VIBRATORY FEEDER</b>	<b>16</b>
<b>ROLL SADDLE</b>	<b>17</b>
<b>MAINTENANCE</b>	
<b>CHECK POINTS</b>	<b>18</b>
<b>TO REPLACE SHEAR PIN</b>	<b>18</b>
<b>TO REMOVE FEEDER ROLL</b>	<b>18</b>
<b>TO REMOVE ROLL CHILL</b>	<b>19</b>
<b>TO REMOVE ROLL CHILL BEARINGS</b>	<b>20,21</b>
<b>INSTALLING RECORRUGATED ROLLS</b>	<b>22-25</b>

## TABLE OF CONTENTS (CONT)

<b>LUBRICATION</b>	<b>26-30</b>
<b>PARTS NEEDING LUBRICATION</b>	
<b>FEED ROLL BEARING</b>	
<b>ROLL CHILL BEARING</b>	
<b>IDLER BEARING FOR V-BELT DIFFERENTIAL</b>	
<b>CHEVRON GREASE</b>	
<b>TENSIONING V-BELT DRIVES</b>	<b>31-33</b>
<b>ILLUSTRATION DRAWINGS</b>	

# WARRANTY

## The A. T. Ferrell Company, Inc. Manufacturer's Warranty for the following product lines:

### FERRELL-ROSS

Roller Mills, Flaking Mills, Cereal Mills, Industrial Mills, Flake and Pellet Coolers, Crumblers, Grain Cleaners, Steam Chests, Roll Feeders, Vibratory Feeders and Conveyers, Loss in Weight Feeders, Mixers and Blenders.

(“FERRELL-ROSS” IS A REGISTERED TRADEMARK OF THE A. T. FERRELL COMPANY, INC.)

The A. T. Ferrell Company, Inc. warrants each new product of its manufacture when purchased from an authorized representative for a period of one year from the date of shipment. This warranty shall apply to all parts and workmanship (except products or components not manufactured by The A. T. Ferrell Company, Inc.), which shall appear to A. T. Ferrell Company to have been defective in manufacture. The A. T. Ferrell Company's sole and entire obligation under such warranty shall be satisfied by shipment to the Purchaser-User, without charge, (except for transportation costs, which shall be paid by the Purchaser-User) of the part or parts returned for inspection and parts intended to replace those acknowledged by The A. T. Ferrell Company, Inc. to be defective.

This warranty shall not apply and shall be void under the following conditions:

1. If the product is transported from original installation site.
2. If any part of the product has been altered, modified, or changed, except at The A. T. Ferrell Company, Inc. factory or is authorized in by The A. T. Ferrell Company, Inc. in writing.
3. If attachments or devices unsuitable to the product have been used on or in conjunction with the product.
4. If the product has not been installed, used, operated, handled, or serviced in accordance with the appropriate instruction manual.

The A. T. Ferrell Company, Inc. reserves the right to make changes in design or improvements in its products without obligation whatsoever to prior Purchaser-User of such products.

The A. T. Ferrell Company, Inc. will pass on to a Purchaser-User only such warranty as it shall receive on products or components not of its manufactured from the manufacturer or supplier thereof.

We will not be liable for any consequential damages, loss or expenses arising in connection with the use or inability to use the product for any purpose whatever. Our maximum liability shall not in any case exceed the cost of replacing defective parts if returned to us within one year from date of shipment. No salesman, manufacturer's representative or other person may make or has the authority to make any guarantees or warranties expressed or implied on behalf of A. T. Ferrell Company, Inc. which are inconsistent with these terms and conditions or any catalogue or other publication of A. T. Ferrell Company, Inc.

Claims for warranty should be directed to our sales department, 1440 South Adams Street, Bluffton, IN 46714 or phone (260)824-3400. The machine serial number and description of the type of failure is required to file a claim. Contact our sales department before returning warranty items for a RMO (Returned Material Order) which must accompany all returned items. All returned items are to be shipped freight pre-paid and credit will be issued after inspection and acknowledgement of warranty defect. A. T. Ferrell Company, Inc. will pass on to the purchaser/user only such warranty as it shall receive on products or components not of its manufacture from the manufacturer or supplier thereof.

# FERRELL-ROSS

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Division of A. T. Ferrell Company, Inc.

## PARTS ORDERING INFORMATION

1. Order replacements parts through your local sales representative or direct from Ferrell Ross.

A. T. Ferrell Company, Inc.  
1440 S. Adams St.  
Bluffton, IN 46714  
Phone: (260) 824-3400 (800) 248-8318  
Fax: (260) 824-5463  
Website: [www.ATFerrell.com/Ferrell-Ross.com](http://www.ATFerrell.com/Ferrell-Ross.com)  
E-Mail: [info@atferrell.com](mailto:info@atferrell.com)

2. To expedite the order process, please have your machine description, model number, and serial number available.
3. Use the part numbers and descriptions furnished in this manual.

# BE A SAFE OPERATOR

## AVOID ACCIDENTS



This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows. Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safe-guarded against without interfering with reasonable accessibility and efficient machine operation. A careful operator is the best insurance against an accident.



Carefully read and understand the operators manual before operating the machine. Do not attempt to install, connect power to, operate or service machine without proper instruction and until you have been thoroughly trained in its use by your employer.



Keep children, visitors and all untrained personnel away from machine while in operation.



Make certain all electric motors and control panels are properly grounded.



**Danger – Do not** attempt to work on, clean or service this equipment or open or remove any protective cover, guard, or grate until power has been turned off and mechanically locked out and the machine has come to a complete stop.



**Danger** – Keep hands, feet and clothing clear from rotating belts, pulleys, rolls and gears when machine is operating. Failure to do so will cause severe injury or death.



**Danger** – Never operate machine without protective covers, guards, or grates properly installed.



**Do not** obscure or remove safety decals from the equipment. Replacement decals are available from the manufacturer.



This equipment was manufactured in compliance with existing OSHA regulations. It is the responsibility of the owner/user to maintain OSHA compliance when operating the equipment.



When performing work on the hydraulic system, check all hoses, ensure that they are in good condition and all connections are tight.



**Never** use your bare hands to locate a hydraulic leak. Use a small piece of wood or cardboard. Hydraulic fluid escaping under pressure can penetrate the skin. Openings in the skin and minor cuts are susceptible to infection from hydraulic fluid.



If injured by escaping fluid, see a doctor at once.



Replace all guards and shields after servicing and before starting up the machine.



**Do not** clean, lubricate or adjust equipment while it is in operation.

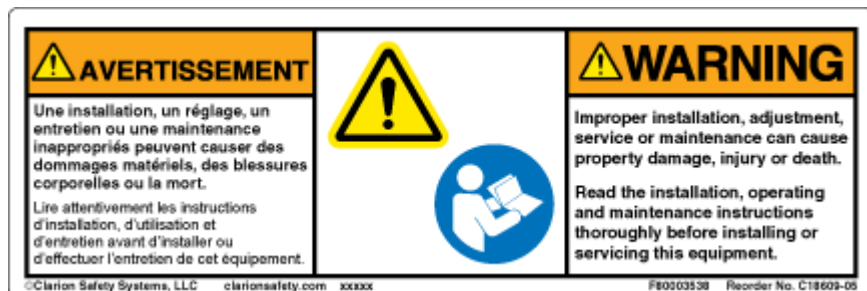
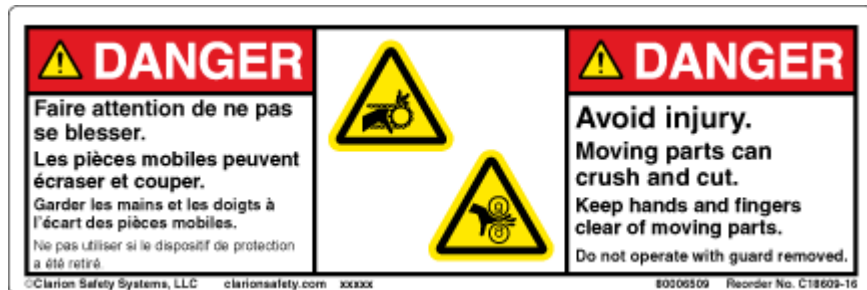
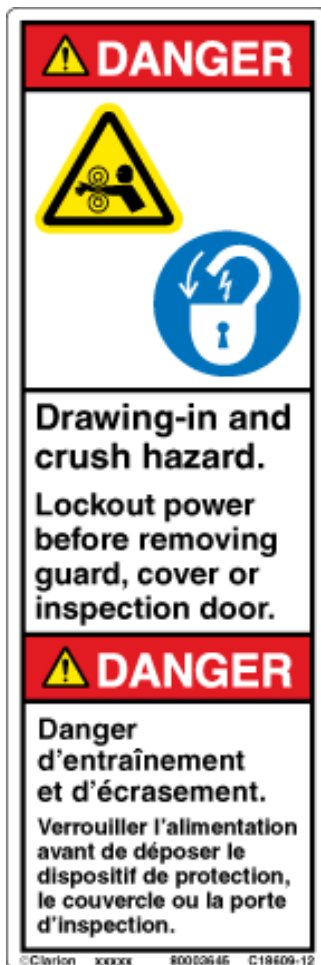
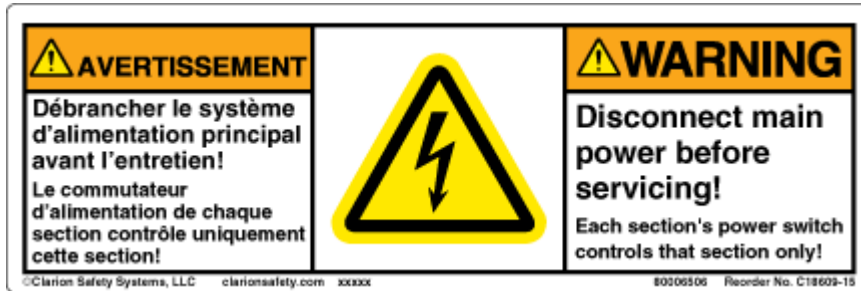


After servicing, make sure all tools, parts and service equipment are removed from the machine.



**Do not** start the machine until you are sure that everyone is clear.

# TYPICAL SAFETY DECALS



## FORWARD

Many years of experience and engineering background have gone into the design of your extremely rugged FERRELL-ROSS flaking mill. Each FERRELL-ROSS mill is a precision built machine, constructed from durable materials to close tolerance specifications. There is not another roller mill in the milling industry that compares with the outstanding features, workmanship, or durability that is built into each FERRELL-ROSS mill.

We prepared this booklet for our 10 inch roll diameter roller mills to help you install, operate and maintain your mill to the highest standard and to obtain the greatest efficiency.

Every mill is thoroughly tested and inspected at the factory before shipment. However, it will be necessary to make minor adjustments to your mill after it has been installed to get the performance you desire.

If a commercial carrier shipped your mill, ensure that you check all parts carefully to see if there is any damage in the shipping. If damage is found, make a notation of such and make certain that your local agent makes a similar note on your freight bill, before you accept shipment. This is necessary to support your claim.

Do not hesitate to accept damaged equipment after the agent has made the notation on the freight bill. You will be reimbursed when you present your claim.

We assume no responsibility for loss or damages after the equipment leaves our dock, but we will gladly render our services to assist you in adjusting your claim.

Determine the parts you require, submit an order to us and we will prepare an invoice. Upon receiving our invoice you will be in a position to file a claim against the shipping company.

There are drawings and parts lists in the back of this booklet to assist you in ordering spare parts. When you order spare parts specify the mill serial number, mill size, part number, description and quantity to assure prompt and correct replacements.

**A.T. Ferrell Co., Inc.**

**1440 S. Adams Street**

**Bluffton, IN 46714 U.S.A.**

**Phone: (260) 824-3400 (800) 248-8318**

**Fax: (260) 824-5463 E-mail: [info@atferrell.com](mailto:info@atferrell.com)**

**Website: [www.ATferrell.com/Ferrell-Ross.com](http://www.ATferrell.com/Ferrell-Ross.com)**



## INSTALLATION INSTRUCTIONS

The mill should be located so that an adequate gravity flow of material is available. If possible, the flow should enter the mill perpendicular to the rolls. This allows a much better distribution across the feeder roll and, consequently, across the mill rolls. If the flow arrives at the mill on an angle to the rolls there is a tendency for the material to mass to one side of the mill and could result in feeding only part of the actual roll surface, thereby reducing the mill capacity.

A strong magnet should be placed in the spouting directly ahead of the mill so that all material entering the mill must pass over it. This is to remove tramp metal that could damage the mill.

In some case it would be desirable to install a scalping screen ahead of the magnet to remove non-metallic foreign objects, such as sticks, stones, etc. This will protect the mill and also eliminate the possibility of these objects lodging against the metal on the magnet, causing a restriction in the spout.

The installation of the mill should be carefully planned and well engineered to obtain maximum in capacity and best quality rolled products.

1. There should be sufficient space around the machine for adjustments, repairs, roll removal, etc.
2. Installation location must insure that rolls will be level for maximum performance.
3. Provisions should be made to adequately feed the mill with the product to be ground.
4. Provisions must be adequate to take the product from the mill. A conveyor or elevator leg to a bin usually does this.
5. Please refer to the appropriate drawings included with this manual for all additional installation instructions and requirements.

## TIPS ON OPERATING YOUR MILL

Ferrell-Ross mills are designed to produce efficiently a high quality of commercial grade rolled product.

The capacity of your mill will be dependant on the following conditions either singly or in combination, in rolling grain or similar products.

1. Plumpness of kernel.
2. Toughness of hull.
3. Moisture content.
4. Amount of conditioning, when steam is used.
5. Thinness of flake or crimped grain desired.
6. Foreign material in grain.
7. Corrugation on rolls.

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 larger kernel size. It may be necessary to adjust the spring tension to obtain your desired final product. This adjustment is explained in this manual.

As the corrugation begins to wear off, you will not notice the decrease in the capacity at first, but as the corrugation becomes duller, the capacity will be greatly reduced from the original corrugation. When this occurs, the rolls should be re-corrugated.

**NOTE:** You should be careful when making adjustments, so as not to allow the rolls to run together. This will cause the corrugation to become dull very rapidly. Please refer to the section on setting of roll clearance in the manual for the correct setting and adjustment.

# FERRELL ROSS ROLLER MILLS START UP / SHUTDOWN PROCEDURE

## Start up

1. Inspect system for proper routing of material.
2. Inspect mill to insure rolls are clear and free of material in the nip. If not, open rolls full and rotate rolls backward until clear.
3. Start dust system.
4. Start product take away system.
5. Start mill with rolls open.
6. Start feeding system. (including vibratory or SCR roll feeder)
7. Close rolls to desired position using the roll release lever or micro handwheel adjustment. When making adjustments, go past setting, then open to it. This will take up slop in keyways and the worm gear on micro handwheel. Rolls will try to open under normal operation, therefore, this is the best way to insure a positive setting.
8. Take a sample under mill to insure proper granulation. Sample three places: left, center, and right. Samples should be relatively the same if feed is uniform. If not, check feed to insure uniformity. If feed is not uniform, rolls may be out of adjustment or not tram. Usually it is non-uniformity of feed that causes this. If it persists, contact production or maintenance to check out roll settings.
9. During operation, periodic visual inspection of the belts and temperature inspection of the bearings should be made to insure proper operation.

## Shut down

1. Shut down feeding system to the mill.
2. Shut down feeder of mill – if vibratory or SCR roll feeder.
3. Check to see no product entering mill.
4. Open rolls and shut down mill.
5. Shut down take away system after it has cleared.
6. Shut down dust system.

If these simple steps are followed each time the system is started and shut down, the whole system will operate smoother and increase the life of the component parts.

## ADJUSTMENTS

Your Roller Mill was shipped assembled and adjusted, but to meet your requirements, certain readjustments may be made, as necessary to control the rate of production and the quality of product.

The following section will aid you with these adjustments to meet your requirements.

### TO SET FEED RATE

On units using a feed roll arrangement, the distance between the feed gate and feeder roll controls the feed rate.

1. Standard Eccentric type lever controlled feed gate.
  - a. To increase flow – loosen lock, move handle up to desired setting and reset lock.
  - b. To decrease flow – loosen lock, move handle down to desired setting and reset lock.
2. **Optional** SCR Drive with Variable Frequency Drive (VFD) controller.
  - a. To increase flow – increase speed of feed roll assembly using VFD.
  - b. To decrease flow – decrease speed of feed roll assembly using VFD.
3. **Optional** Vibratory Feeder.
  - a. Most changes in flow rate may be changed at the controller.
  - b. The flow depth of the material being processed is adjusted by the slide gate in the leading side of the hopper. Access to this gate is obtained by opening the upper inspection door.
  - c. To increase or decrease flow depth on feeder pan – loosen lock nuts on retaining gate and push gate up or down to desired setting.
  - d. Adjust gate to obtain an even depth across width of feeder pan. Always tighten lock nuts to hold desired setting.
  - e. If material flow does not hit at the nip of the rolls, the feeder pan can be adjusted from front to back. This is done by loosening the retaining bolts in the feeder base and sliding the complete feeder assembly until product is flowing evenly into the roll nip. This can be monitored by opening the hinged upper inspection door. Retighten when complete.

**CAUTION:** CARE SHOULD BE TAKEN TO KEEP FINGERS AWAY FROM ALL MOVING PARTS.

## TO SET ROLL CLEARANCE

### 1. To decrease clearance:

- a. Set roll release lever/micro handwheel at zero position. At this setting the key in the roll release lever/micro handwheel should be in line with the tension rod and to the extreme rear of the mill.
- b. Loosen the jam nut from the hex nut behind the front casting. (items 1)
- c. Place feeler gauge of desired clearance between the full length of the rolls – clearance will vary with product and capacity desired.
- d. Turn front hex nut clockwise to desired setting.

**NOTE:** Moving the hex nut toward the tension spring increases roll gap clearance. Moving the hex nut away from the tension spring decreases gap clearance as is required with roll corrugation wear.

- e. Hold front hex nut securely and tighten rear hex nut.

### 2. To increase clearance:

- a. Follow above instructions except for Step “d”. In this step change rotation of the hex nut to counter clockwise.

- NOTE:**
1. Always adjust clearance to the same setting at both ends of the roll.
  2. Never let rolls run together because it will damage them.
  3. NEVER MAKE THESE ADJUSTMENTS WITH MILL RUNNING.
  4. Parts illustrations in the back of this manual should be referenced when locating all parts mentioned in instructions.

ALWAYS ROTATE MICRO HANDWHEEL IN THE SAME DIRECTION WHEN SETTING ROLLS. GO PAST ZERO AND OPEN IT. THIS WILL TAKE UP SLACK IN KEYWAYS AND WORM GEAR. THE ROLLS WILL TRY TO OPEN UNDER OPERATION; THEREFORE, THIS WILL INSURE A POSITIVE SETTING.

## TO SET SPRING TENSION (ROLL PRESSURE)

1. To increase spring tension:
  - a. Loosen hex nuts in front of spring.
  - b. Turn inner spring adjusting nut clockwise to desired setting.
  - c. Hold inner spring adjusting nut securely and tighten outer hex nut.
2. To decrease spring tension:
  - a. Loosen hex nuts in front of spring.
  - b. Turn inner spring adjusting nut counter clockwise to desired setting.
  - c. Hold inner spring adjusting nut securely and tighten outer hex nut.

- NOTE:**
1. At no time should spring pre-load (difference in spring free length and compressed length) be greater than 1".
  2. Adjust springs for equal pressure at each end of the roll.
  3. Parts illustrations in the back of this manual should help in locating all parts mentioned in these instructions

**NEVER MAKE THESE ADJUSTMENTS WITH MILL RUNNING.**

## VIBRATORY FEEDER (Opt.)

1. Most changes in flow rate may be changed at the controller.
2. The slide gate in the leading side of the hopper adjusts the flow depth of the material being processed. Access to this gate is obtained by removing the bolted upper inspection door.
3. To increase flow depth on feeder pan – loosen lock nuts retaining gate and pull gate up to desired setting.
4. To decrease flow depth on feeder pan – loosen lock nuts retaining gate and push gate down to desired setting.
5. Adjust gate to obtain an even depth across width of feeder pan. Always tighten lock nuts to hold desired setting.
6. If material flow rate is great enough that the trajectory of the material off the pan prevents the material from hitting the kip of the rolls the feeder pan may have to be moved back. Loosening the retaining bolts in the feeder base and sliding the complete feeder toward the back of the unit does this. Always tighten retaining bolts to retain required setting.
7. Opening hinged upper inspection door may monitor all adjustments.

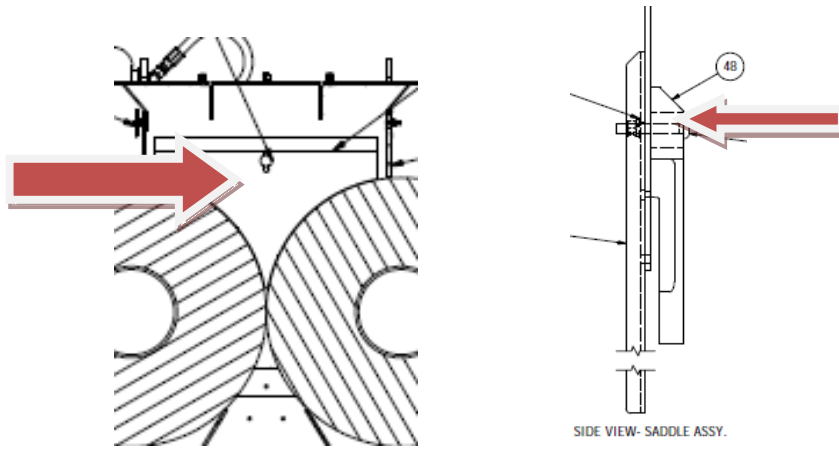
**NOTE:** Parts illustrations in the back of this manual should help in locating all parts mentioned in these instructions.

**CAUTION:** CARE SHOULD BE TAKEN TO KEEP FINGERS AWAY FROM ALL MOVING PARTS.

## ROLL SADDLES

### 3.2 ROLL END BLOCKS (SADDLES)

The roll ends are chamfered during corrugation and remaining chamfer leaves a small opening where material could pass without being crushed. The roll end block effectively seals this opening to prevent anything from getting past the end of the roll unprocessed.



The roll end blocks or saddles are “V” shaped blocks made from aluminum or UHMW polyethylene. These are relatively soft materials and prevent damage to the roll ends should contact take place.

The roll end blocks will require periodic maintenance, as the point of the “V” will wear with use. The roll end blocks are usually serviced when the rolls are corrugated. If wear dictates, service the roll end blocks prior to roll removal.

Use the following procedure to service the roll end blocks.

#### CAUTION

**MAKE SURE THE POWER IS SHUT OFF AND LOCKED OUT to the MILL ROLLS BEFORE SERVICING THE ROLL END BLOCKS.**

Access the roll end blocks on the flaking models by removing the maintenance cover at the front of the mill from above the rolls being serviced. Remove the roll drive covers to gain access to the roll end block bolts on the differential and drive end of the mill.

To adjust the roll end blocks, move the rolls to their fully closed position. Loosen the nut on the roll end block bolt and hold the roll end block directly in the nip as the nut is tightened.

To replace the roll end block, remove the nut from the roll end block bolt and pull the roll end block out. Insert the new roll end block and bolt through the holes in the roll end plate and through the slot in the mill frame. Replace the nut and tighten it.



## MAINTENANCE

The following maintenance checks and services are required to ensure dependable, trouble-free service and quality production from your Ferrell-Ross roller mill:

1. Check feeder roll bearings and lubricate.
2. Check roll chill bearings and lubricate.
3. Check roll chill bearing seals.
4. Check roll corrugations.
5. Check roll clearance.
6. Check roll spring tension.
7. Check roll tension and connecting rod roll and shear pins..
8. Check V-Belt drive tension.
9. Check V-Belt differential or chain tension.

### TO REPLACE SHEAR PIN

1. If part of old shear pin remains in tension rod or eccentric ring, drive it out with a hammer and punch.
2. Align shear pin holes in eccentric ring and tension rod and install new shear pin.

**NOTE:**

1. Use only Ross shear pins for replacements.
2. Do not increase size of shear pin.
3. These shear pins are necessary to protect the rolls from foreign objects passing between them.
4. Parts illustrations in the back of this manual should help in locating all parts mentioned in these instructions.

### TO REMOVE FEEDER ROLL

1. Remove feed roll drive assembly (belt, chain, etc.).
2. Loosen set screws in feed roll bearings.
3. Remove feed roll bearing and feed roll bearing spacers.
4. Slide feed roll out through hole in the side of the roll housing.

## TO REMOVE ROLL CHILL

1. Remove feed roll drive assembly.
2. Remove main drive V-Belts and sheave.
3. Remove differential V-Belts and sheaves or chain and sprockets.
4. Remove front and rear roll housing inserts.
5. Remove adjusting mechanism (both sides).
  - a. Release spring tension by removing nuts forward of spring.
  - b. Remove tension rod position pin.
  - c. Remove bolts from roll release connecting rod couplings and slide couplings together.
  - d. Remove roll release eccentric shafts.
  - e. Remove roll release connecting rod and couplings.
  - f. Lift roll release eccentric ring up and out of rear bearing housing and pull tension rod out of front bearing housing.
6. Remove bolts at base of each bearing housing.
7. Sling roll and remove.

**NOTE:** Parts illustrations in the back of this manual should help in locating all parts mentioned in these instructions.

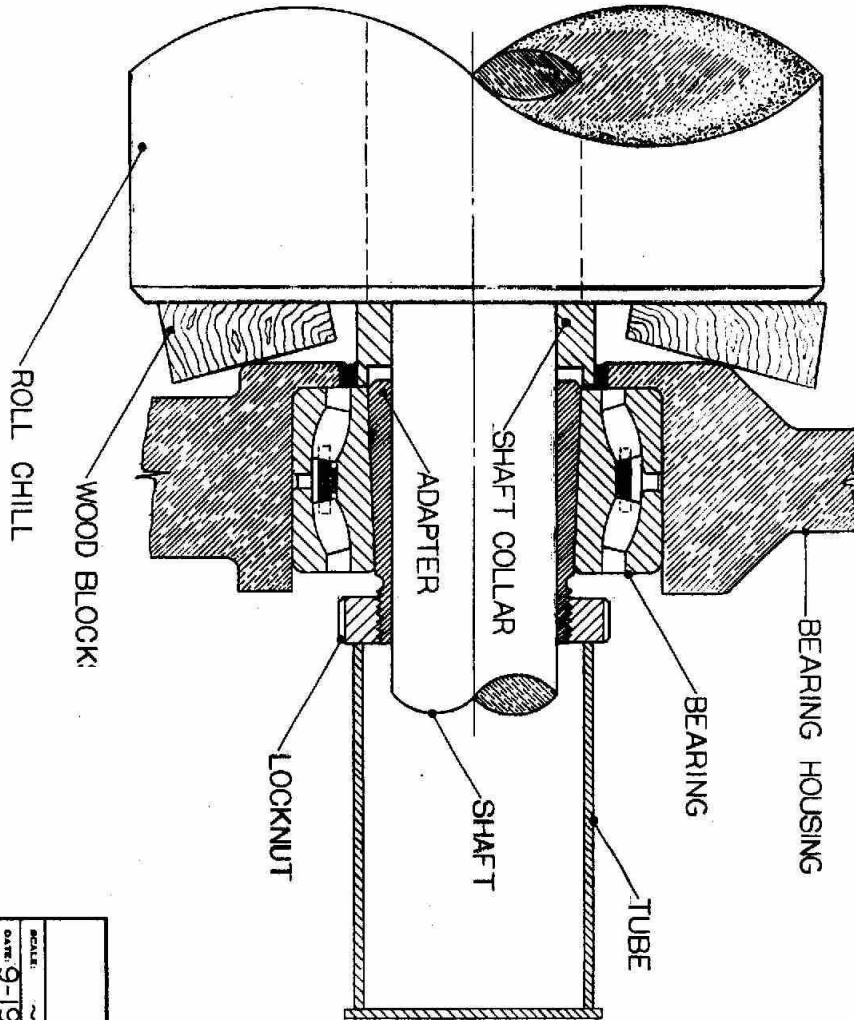
1. Sling or other means of lifting must safely carry 4000#.
2. Wooden blocks should be used between bearing housing and seal to retain bearing housing position and prevent damage to seals.

## TO REMOVE ROLL CHILL BEARING

**CAUTION:** DO NOT USE A STANDARD BEARING PULLER, AS THIS WILL FORCE THE BEARING ON THE JOURNAL TIGHTER.

1. Remove the bearing housing cover plate.
2. Straighten tangs of lock washer so lock nut may be loosened.
3. Loosen nut in the following manner:
  - a. Nut must be loosened in a counter clockwise direction.
  - b. Place spanner wrench in one of nut slots.
  - c. Strike wrench several sharp blows with hammer.
  - d. Loosen nut until approximately  $\frac{3}{4}$  of the threads are still in contact with the adapter.
  - e. Using a piece of pipe that will clear the adapter yet sit squarely on the nut, drive the pipe toward the roll, forcing the adapter inside the shaft collar. A piece of steel plate welded over the end of the pipe facilitates driving the adapter straight back.
  - f. Slide complete bearing and bearing housing off the journal.

**NOTE:** Parts illustrations in the back of this manual should help in locating all parts mentioned in these instructions. See Drive and Driven Roll Assembly drawings.



<b>FERRELL-ROSS</b>	
OKLAHOMA CITY, OKLAHOMA	
SCALE: ~	APPROVED BY: <i>[Signature]</i>
DATE: 9-19-79	REVISION: <i>[Signature]</i>
ROLL CHILL BEARING AND ADAPTER	
REMOVAL	
DRAWING NUMBER 070-00051	

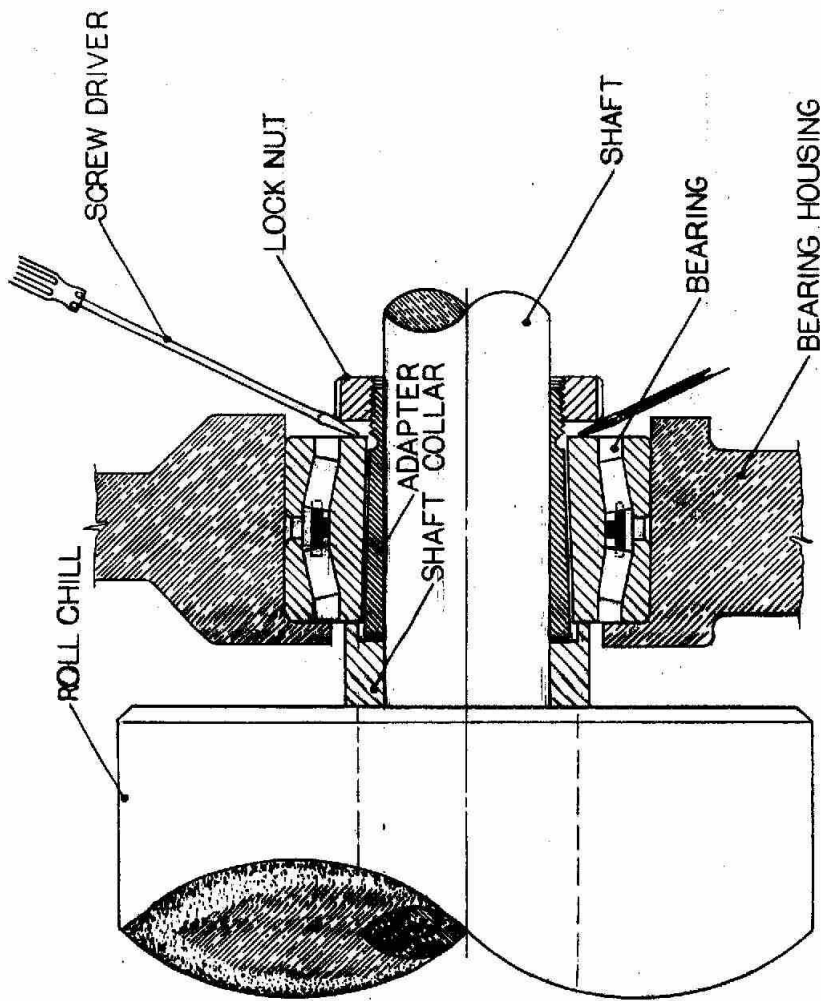
## INSTALLATION OF RECORRUGATED ROLLS

NOTE: Use two (2) 15" long two-by-fours to support the bearing housings while installing bearings.

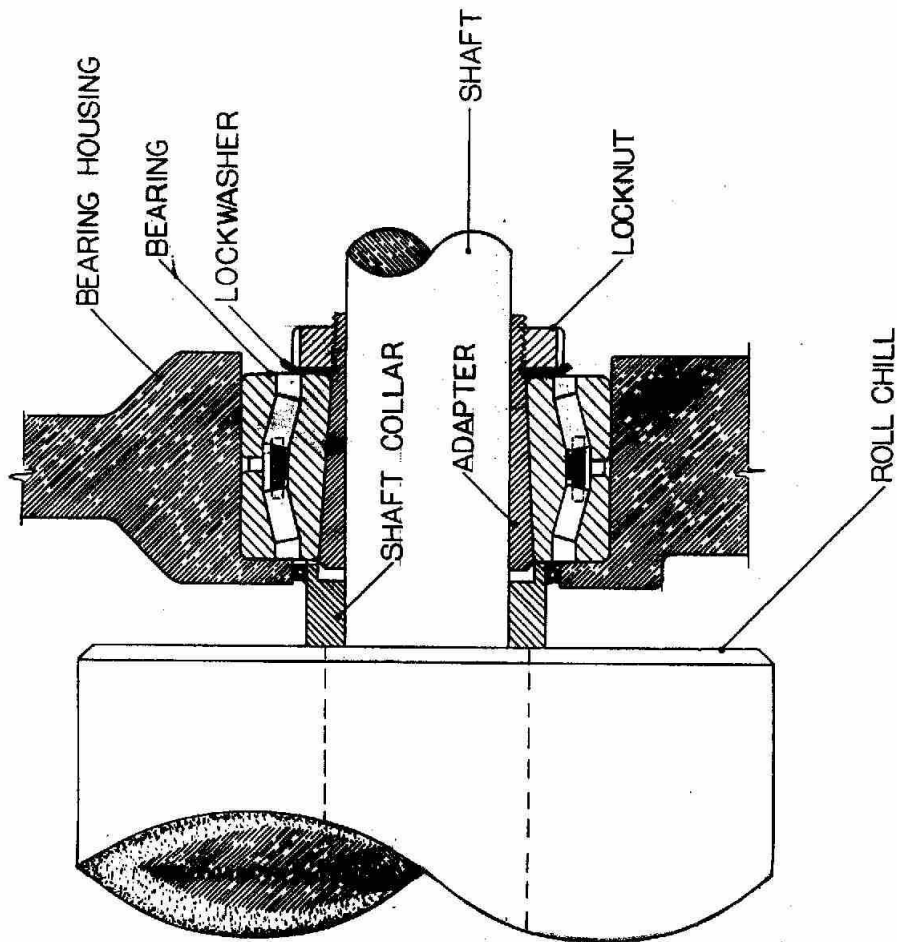
1. Install bearing in bearing housing with large end of tapered toward backside of bearing housing.
2. To ensure proper clearance for the installation of the bearing cap, and to prevent bearing from falling out of bearing housing, washers should be bolted to the bearing housing and hang over to hold the bearing in place.
3. Turn bearing housing facedown and use a grease gun to force grease between the rollers on the backside of the bearing.
4. Install the grease seal on back side of bearing housing.
5. Clean journal, making sure the shaft collar is well cleaned and **Install Dust Seal. Failure to install dust seal at this time will require disassembly of unit.**
6. Install bearing adapter on journal with slotted nut and lock washer removed.
7. Slip bearing and bearing housing over bearing adapter making certain adapter is under the shaft collar. Slip on lock washer then screw on nut snugly, but not tight. (NOTE: The other three journals will be prepared up to this point.)
8. Hoist rolls into base of the mill and secure with bolts. Do not tighten bolts at this point.
9. After both rolls are in place, install roll release connecting rod with tension rods. (This assures alignment of rear bearing housings.)
10. After tension rods and roll release connecting rod are installed, tighten front and rear bearing housing bolts.
11. Install tension springs and pull rods together evenly from end to end.
12. Center the rolls inside the base of mill and then wedge boards on each side of roll to keep them from slipping during the next step.
13. Loosen adapter nuts the distance of three or four threads. Place two screw drivers or 18" nails bars behind the lock rings and pry the adapters out as far as possible. This causes the bearing to be drawn snugly into position and pulls adapter from under the shaft collars. ***\*CAUTION should be exercised at this stage to prevent distortion of the threads on the adapter by the prying tools.***

## INSTALLATION OF RECORRUGATED ROLLS (CONT.)

14. Use a spanner wrench and hammer to tighten slotted nuts, then bend tang of lock washer in lock nut.
15. Remove washers installed in step 2.
16. Pack front side of bearing.
17. Install grease seal in bearing cap and fill concave portion of bearing cap with grease and bolt in place.
18. Remove connecting rod couplings and connecting rod then install front and back roll housing.
19. Install connecting rod couplings and connecting rod.



<b>FERRELL-ROSS</b> OKLAHOMA CITY, OKLAHOMA	
SCALE: ~ DATE: 9-20-79	APPROVED BY: <i>[Signature]</i> DRAWN BY: <i>[Signature]</i> REVISED:
<b>ROLL CHILL BEARING AND ADAPTER</b>	
DRAWING NUMBER: 070400052 <b>INSTALLATION</b>	



<b>FERRELL-ROSS</b> OKLAHOMA CITY, OKLAHOMA	
SCALE: ~	APPROVED BY: <i>[Signature]</i>
DATE: 10-2-79	REVISED
<b>ROLL CHILL BEARING AND ADAPTER</b>	
INSTALLED	
DRAWING NUMBER 070-00055	



## **SECTION –3 MAINTENANCE**

### **3.1 LUBRICATION**

Satisfactory long-term performance of a mill requires proper maintenance and lubrication. The factory filled all gearboxes with the appropriate lubricants, and greased all bearings before shipping the mill.

Use the following lubrication recommendations for proper maintenance of the mill working components.

Use a high quality multipurpose grease, such as Sunoco Prestige, Philube 1B & RB, Mobilux 2, or Gold Pillow Lube. As some additives may not be compatible, do not mix different grease types. When changing grease types, completely flush the unit to prevent cross contamination between the different grease types.

Use care to clean fittings off before applying the grease gun to prevent contamination of the bearings. Use a hand-operated grease gun rather than an air powered unit to reduce the possibility of blown grease lines and seals.

The mill design allows lubrication of all bearings while the mill is in operation. Follow the lubrication schedule, but do not over grease as excess lubricant can get into the belts and cause premature belt failure.

Several of the bearings on the mill employ remote grease fittings and poly grease lines to ease lubrication on the go. Periodically check these lines for integrity to verify that grease is being supplied to the bearings.

Follow the motor manufacturer's specifications for the lubrication of all motors. Motors require less frequent lubrication than other mill components.

On mills with inter-roll drive shaft mounted gear reducers, the use of Mobil SHC 629 synthetic oil is recommended.

#### **NOTE**

**DO NOT SUBSTITUTE ANY PETROLEUM BASED LUBRICANTS FOR THE SYNTHETIC OIL LISTED.**

Follow the lubrication schedule for the shaft mounted reducers.

Flush the gear boxes with kerosene and drain completely before refilling. Do not over fill the gearbox. Over filling will result in oil being discharged through the vent plug.

Drain and refill the roll feeder drive with SAE 80W-90 gear lube

## LUBRICATION CHART

The following lubricants have been recommended for use with the various parts of your roller mill. You should check with your local lubricant supplier to find suitable alternatives.

### FEEDER BEARINGS ROLL/PIN – ROLL ECCENTRICS/ADJ. SCREW – FEED GATE

LUBRICANT	SUPPLIER
Phillube 1B & RP	Phillips Petroleum Co.
Andok 280	Imperial Oil Co.
Amolith #1	Standard Oil Co.
Sunoco 844-X	Sun Oil Co.
F-925	New York & New Jersey Oil
Keystone 44-h	Keystone Lubricating
Lubriko M-21	Masters Lubricant Co.
Nerita 2	Shell Oil Co.
Andok B	Standard Oil (NJ)
Mobilux 2	Mobile Oil Co.
Atlantic 54	Atlantic Refining Co.

These bearings have been greased at the factory, no additional grease should be required to start the machine. Lubricate at intervals suggested on the Lubrication Chart. Grease should be added slowly with shaft rotating if possible, until grease can be seen coming out through the pressure relief hole in the grease fitting. Use caution when using a high-pressure, high volume grease gun.

### ROLL CHILL BEARINGS

LUBRICANT	SUPPLIER
Philube L #1	Phillips Petroleum Co.
Atlantic 62	Atlantic Refining
Amolith #1	Standard Oil Co.
Molibux #1	Mobile Oil Co.
Lubriko M-3 Spec.	Masters Lubricants
Andok 28	Imperial Oil
Sunoco 844-X	Sun Oil Co.

These bearings have been packed with grease before completion of assembly. Re-lubricate according to the Lubrication Chart time interval. Greasing is accomplished through the grease zerk found on the bearing plate cover.

### IDLER BEARING FOR DIFFERENTIAL DRIVE V-BELT

For normal operating conditions a grease should be used which conforms to NLGI No. 2 consistency and is free of any contaminants.

# LUBRICANT CHART

\*\*Suggested starting interval for maintenance program. Check grease condition or oiliness and dirt and adjust greasing frequency accordingly. Watch operating temperatures. Sudden rises may show need for grease or indicate over lubrication on higher speed applications.

Ambient Conditions		Operating Conditions		Bearing Operating Temperature		Suggested Greasing Interval**	Use these greases or equivalent
Dirt	Moisture	Load	Speed	Low	High		
Clean	Dry	Light to Medium	Slow to Medium	0	120	2-6 months	High quality NLGI #1 or Multi-purpose bearing greases are generally satisfactory. Consultation with a reputable lubricant supplier is recommended.
				120	200	1-12 months	
Moderate to Dirty	Dry	Light to Medium	Slow to Medium	0	200	1-4 weeks	
				120	200	1-7 days	
Extreme Dirt	Dry	Light to medium	Slow to Medium	120	200	Daily flushing out dirt	
	High humidity					1-4 weeks	
	Direct water splash	Light to Heavy	Slow to medium	32	300	grease at shutdowns	
		Heavy to very heavy	Slow	0	200	1-8 weeks	Shell Oil Co., Alvania EP2
				-20	120	1-8 weeks	Shell Oil Co. Alvania EP-RO
		Light	High Speed	100	200	1-8 weeks	Imperial Oil & Grease Co., Molub-Alloy # 2 Gulf Oil Corp., Gulfcrown #2 Texaco Inc. Molytex # 2
	Possible frost	Light to heavy	Slow to medium	-65	250	1-4 weeks grease at shutdown	Esso, Beacon 325 Texaci Ubc,m 2346EP Low Temp Shell Oil Co., Aeroshell 7A
Clean to moderate	Dry	Light to medium	Slow to medium	80	250	1-8 weeks	Union Oil Co., Unoba EP2 Texaco Inc., 1999 Hi Temp
Clean to dirty	Dry	Light	Slow	80	300	1-4 weeks	Dow Chemical Co., DC44 Keystone Lubricants Co., No 89



# CHEVRON DELO® GREASES EP

## NLGI 00, 0, 1, 2

### CUSTOMER BENEFITS

Chevron Delo Greases EP deliver value through:

- **Extreme pressure high load carrying capacity**
- **Excellent corrosion and wear protection**
- **Excellent water resistance**
- **Excellent high temperature stability**
- **Outstanding low temperature pumpability**

### FEATURES

Chevron Delo Greases EP are technically advanced, extreme pressure greases for a wide variety of on- and off-road applications.

They are formulated with ISOSYN® base stocks, a lithium complex thickener, rust and oxidation inhibitors, and extreme pressure and tackiness additives. They are blue in color with a tacky texture.

They are engineered to minimize friction and wear with a thick, velvety coating for excellent load carrying protection.

Chevron Delo Greases EP are specially formulated for extreme pressure wheel bearing and chassis applications including the steering drag links, king pins, transmission cross shaft spring pins, shackle pins, brake cam shafts, and fifth wheel faceplates and pivots operating under high and low temperature conditions.

The high viscosity index base oil makes these products perfect for the centralized lubrication systems found on today's mobile equipment.

These products are formulated to perform in unusually demanding conditions of high and low temperatures. The lithium complex thickener in Chevron Delo Greases EP elevates the dropping point to approximately 266°C (510°F). This high dropping point equates to excellent high temperature stability up to 177°C (350°F).

Chevron Delo Greases EP have the proper base oil viscosity to meet NLGI GC-LB requirements for low temperature operation. **NLGI 1** and **2** are recommended for applications operating in the temperature range of -18°C to 177°C (0°F to 350°F).

**NLGI 00** and **0** can be used at temperatures as low as -34°C (-30°F).

Chevron Delo Greases EP exceed the requirements of NLGI GC-LB for EP protection and rust protection, making them well suited for the most severe applications.



### APPLICATIONS

Chevron Delo Greases EP are designed for extreme duty in a wide variety of on- and off-highway vehicle and equipment applications.

**On-highway heavy duty trucks** — These lubricants are perfect for a wide variety of Class 8 trucks in all chassis and wheel bearing applications ranging from automatic centralized greasing systems to wheel bearings operating near the high temperatures of disc brakes. This product is for all applications, from owner/operators to fleets (especially those considering extended service intervals).

**Off-highway vehicles** — Whether the application is in construction, logging, mining, agriculture or utilities, these greases will perform. Use them in haul trucks, loaders, tractors, cherry pickers or any of a number of other off-highway vehicles.

**Medium- and light-duty trucks and buses** — As with their heavy duty counterparts, the Class 7 and Class 6 vehicles and buses require an extreme duty grease. Chevron Delo Greases EP will provide that performance.

**Automobiles** — Chevron Delo Greases EP are exceptional lubricants for high temperature wheel bearings and other high performance automotive applications.

**NLGI 1** and **2** are approved for the NLGI Certification Mark GC-LB.

Chevron Delo Greases EP meet the requirements of the Mack MG-C grease specification.



**TYPICAL TEST DATA**

<b>NLGI Grade</b>	<b>00</b>	<b>0</b>	<b>1</b>	<b>2</b>
Product Number	235212	235211	235209	235208
MSDS Number	6818	6818	6818	6818
Operating Temperature, °C(°F)				
Minimum <sup>1</sup>	-40(-40)	-40(-40)	-40(-40)	-40(-40)
Maximum <sup>2</sup>	132(270)	132(270)	177(350)	177(350)
Penetration (Worked 60 Strokes), at 25°C (77°F)	415	370	325	280
Dropping Point, °C(°F)	n/a	235(455)	255(491)	265(509)
Four Ball Weld Point, kg	400	400	400	400
Four Ball Wear Scar, mm	0.45	0.45	0.45	0.45
Timken OK Load, lb	60	60	70	70
Water Washout, wt%	n/a	15	10	5
Water Spray-off, wt%	n/a	n/a	30	20
Lincoln Ventmeter, psig at 30 s, at				
75°F	—	—	—	—
30°F	50	100	200	250
0°F	50	150	450	700
-22°F	100	450	1250	1400
Copper Corrosion	1b	1b	1b	1b
Bearing Rust, 5% Synthetic Sea Water	Pass	Pass	Pass	Pass
Thickener, % Type	4.0 Lithium Complex	5.8 Lithium Complex	8.0 Lithium Complex	11.0 Lithium Complex
ISO Viscosity Grade Base Oil Equivalent	220	220	220	220
Viscosity, Kinematic*				
cSt at 40°C	189	189	189	189
cSt at 100°C	17.5	17.5	17.5	17.5
Viscosity, Saybolt*				
SUS at 100°F	992	992	992	992
SUS at 210°F	90	90	90	90
Viscosity Index	100	100	100	100
Flash Point, °C(°F)*	274(525)	274(525)	274(525)	274(525)
Oil Separation, wt%	n/a	5	4	2
Texture	Tacky	Tacky	Tacky	Tacky
Color	Blue	Blue	Blue	Blue

Typical test data are average values only. Minor variations which do not affect product performance are to be expected in normal manufacturing.

- <sup>1</sup> Minimum operating temperature is the lowest temperature at which a grease, already in place, could be expected to provide lubrication. Most greases cannot be pumped at these minimum temperatures.
- <sup>2</sup> Maximum operating temperature is the highest temperature at which the grease could be used with frequent (daily) relubrication.
- \* Determined on mineral oil extracted by vacuum filtration.

## TENSIONING V-BELT DRIVES

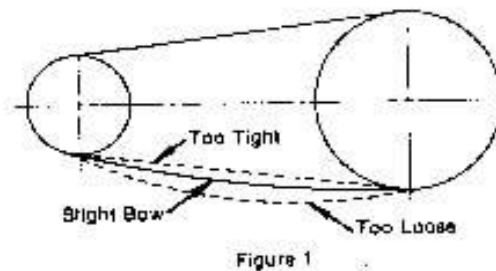
Without exception, the most important factor in the successful operation of a V-belt drive is proper belt-tensioning. To achieve the long, trouble-free service associated with V-belt drives, belt tension must be sufficient to overcome slipping under maximum peak load. This could be either at start or during the work cycle. The amount of peak load will vary depending upon the character of the driven machine or drive system. To increase total tension, merely increase the center distance. Before attempting to tension any drive it is imperative that the sheaves be properly installed and aligned. If a V-belt slips it is too loose. Add to the tension by increasing the center distance. Never apply belt dressing as this will damage the belt and cause early failure.

It is common for belts to stretch over time especially during the initial week or two of operation. Be sure to check and adjust the belt tension during the first week and again the first couple months of operation.

### GENERAL METHOD

The general method for tensioning V-belts should satisfy most drive requirements.

Step 1: Reduce the center distance so that the belts may be replaced over the sheaves and in the grooves without forcing them over the sides of the grooves. Arrange the belts so that both the top and bottom spans have about the same sag. Apply tension to the belts by increasing the center distance until the belts are snug. See figure 1



Step 2: Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive under its highest load condition (usually starting). A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If the belts squeal as the motor comes on or at some subsequent peak load, they are not tight enough to deliver the torque demanded by the drive machine. The drive should be stopped and the belts tightened.

Step 3: Check the tension on a new drive frequently during the first day by observing the slack side span. After a few days' operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust so that the drive again shows a slight bow in the slack side.

## FORCE DEFLECTION METHOD

This method should be used only for tensioning drives on which the grade of belt, rated belt capacity, service factor, design horsepower, etc. are known. If the drive has been designed in strict accordance with the procedures, instructions, and horsepower ratings in Wood's current catalog, the force deflection values are valid. However, if the drive was designed from editions dated prior to 1980 or using information other than that contained in these catalogs, excessive loads on bearings or excessive shaft deflections may result.

Step 1: Install belts per Step 1 of General Method above. Measure span length (t) in inches as shown in figure 2, or calculate using formula.

Step 2: From figure 2 the deflection height (h) is always  $\frac{1}{64}$ " per inch of span length (t). For example, a 32" span length would require a deflection of  $\frac{32}{64}$ " or  $\frac{1}{2}$ ".

Step 3: Determine the minimum, maximum, and initial recommended pounds force using table 1 or calculate based on the required Static Strand Tension (T). Note: The initial recommended force is used only for installing new belts which have not seated themselves into the sheave grooves and where initial belt stretch has not taken place.

### TENSIONING V-BELT DRIVES

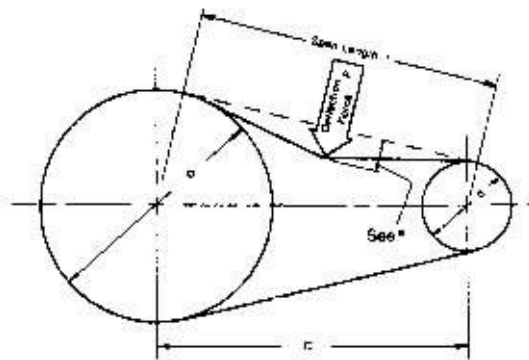


Figure 2

$$t = \sqrt{C^2 - \left(\frac{D-d}{2}\right)^2}$$

$$h = \frac{t}{64}$$

where t = Span length, inches  
C = Center distance, inches  
D = Larger sheave diameter, inches  
d = Smaller sheave diameter, inches

\* Deflection height h =  $\frac{1}{64}$  per inch of span

**Step 4: Using a spring scale, apply a perpendicular force to any ONE of the belts at the midpoint of the span as shown in figure 2. Compare this deflection force with the values found in Step 3.**

- a. If the deflection force is below the minimum, the belts are too loose and the tension should be increased by increasing the center distance.
- b. If the deflection force is higher than the maximum, the belts are too tight and the tension should be decreased.

When new V-belts are installed on a drive the INITIAL tension will drop rapidly during the first few hours. Check tension during the first 24 hours of operation. Subsequent re-tensioning should fall between the minimum and maximum force.

To determine the deflection distance from normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple-belt drives an adjacent undeflected belt can be used as a reference.

Minimum deflection force values shown in table 1 are based on assumed average static tensions for drives having multiple belts or more than one V-band, thus eliminating calculations. (For drives using only one belt or one V-band, deflection force must be determined by use of engineering formulas.)

Find the minimum recommended deflection force for the belt section and type based upon the small sheave diameter, speed and drive ratio. For intermediate sheave diameters and/or drive ratio combinations the minimum deflection force may be interpolated.

**MAXIMUM Deflection Force = Minimum times 1.5**

**INITIAL Deflection Force = Minimum times 2.0**

For Ultra-V Band, Premium V-Band and Torque-Flex banded belts multiply the minimum deflection force from table 1 by the number of belts in the band. Where larger values make use of the Force Deflection Method impractical, use the elongation Method to tension V-bands.

**Table 1 Recommended Minimum Force Per Belt**

Belt Section	Small Sheave		Drive Ratio				
	Speed Range	Dia.	1.0	1.5	2.0	4.0 & over	
Sure-Grip Premium	AP	1800-3600	3.0	2.0	2.3	2.4	2.6
		1800-3600	4.0	2.6	2.8	3.0	3.3
		1800-3600	5.0	3.0	3.3	3.4	3.7
		1800-3600	3.5	3.5	3.7	3.8	4.3
	BP	1200-1800	4.6	3.7	4.3	4.5	5.0
		1200-1800	5.0	4.1	4.6	4.8	5.6
		1200-1800	6.0	1.8	5.3	5.5	6.3
		1200-1800	8.0	5.7	6.2	6.4	7.2
	CP	900-1800	7.0	6.5	7.0	8.0	9.0
		900-1800	9.0	8.0	9.0	10.0	11.0
		900-1800	12.0	10.0	11.0	12.0	13.0
	DP	700-1500	16.0	12.0	13.0	13.0	14.0
900-1500		12.0	13.0	15.0	16.0	17.0	
900-1500		15.0	16.0	18.0	19.0	21.0	
700-1200		18.0	19.0	21.0	22.0	24.0	
Torque-Flex	AX	700-1200	22.0	22.0	23.0	24.0	26.0
		1800-3600	3.0	2.5	2.8	3.0	3.3
		1800-3600	4.0	3.3	3.6	3.8	4.2
		1800-3600	5.0	3.7	4.1	4.3	4.6
	BX	1800-3600	7.0	4.3	4.6	4.8	5.3
		1200-1800	4.6	5.2	5.8	6.0	6.9
		1200-1800	5.0	5.4	6.0	6.3	7.0
		1200-1800	6.0	6.0	6.4	6.7	7.7
	CX	1200-1800	8.0	6.6	7.1	7.5	8.2
		900-1800	7.0	10.0	11.0	12.0	13.0
		900-1800	9.0	11.0	12.0	13.0	14.0
	DX	900-1800	12.0	12.0	13.0	13.0	14.0
900-1800		16.0	13.0	14.0	14.0	15.0	
900-1500		12.0	16.0	18.0	19.0	20.0	
900-1500		15.0	19.0	21.0	22.0	24.0	
DX	700-1200	18.0	22.0	24.0	25.0	27.0	
	700-1200	22.0	25.0	27.0	28.0	30.0	