USNR

Woodland, Washington Division
PO Box 310, Woodland, WA 98674
(800) 458-1181 (360) 225-8267

Welcome to the **USNR** electronic Manual. Electronic manuals contain the same information as the hard copy manuals but offer hypertext links from one section to another. It has been developed using the Adobe Acrobat PDF format and includes the entire manual, as printed in hard copy. This enables you to print individual pages or full copies of the manual on your own printer or by using a service bureau.

Acrobat Reader provides both thumbnail views and links to the pages as well as a sidebar of Bookmarkers. The manual's Table of Contents, Table of Figures, Table of Drawings, Index and Glossary are linked to the page for that subject. You can zoom the page **IN** using the magnifying glass icon to draw a box around the area you want to see. To return to the previous view, right click the mouse and choose **BACK**.

When the mouse cursor turns to a hand indicating a link, click with your mouse to go to the link. For example: In the INDEX you locate Part Number. Move the cursor until the hand appears then click. You will go directly to the table or drawing.

The zoom feature is especially helpful with drawings. Where possible we have included the Installation and Assembly drawings. The index links specific part numbers to the drawing where that part is called out. The Table of Drawings lists the drawing name and number with links to open that drawing. Use the Zoom feature to zoom in on the engineering drawing. This enables you to see layout as well as location of individual parts called out. **NOTE:** The engineering drawings are used in manufacturing and are not primarily designed as part illustrations. They are offered in this manual as valuable reference material only.

May we take this occasion to welcome you as a user of equipment manufactured by US Natural Resources. We have endeavored to produce an equipment manual that is both informative and easy to use. In the following pages you will find warranty, safety instructions, and other information pertinent to your equipment.

It is the policy of **US Natural Resources** to constantly improve its products, whenever it is possible and practical to do so. We, however, reserve the right to make changes or add improvements at any time without incurring any obligation to make such changes on equipment previously sold.

USNR stocks a complete line of those parts that have, through normal usage, a limited life expectancy and periodically need replacement. We will see that all of your orders are filled promptly. Furthermore, you will be advised of any upgrades or modifications that can increase the efficiency of your machine.

If you have other questions not answered in this manual, or, if we can clarify any sections, please do not hesitate to call our Service or Parts departments.

In United States Contact: (360) 225-8267 Woodland, Washington, USA

In Canada Contact: (604) 888-1515 Langley, British Columbia, Canada

To schedule the START UP of your equipment please refer to the entry in this manual entitled "CALLING **USNR** FOR START UP". It will facilitate the Start-Up schedule and could save you money.

The GENERAL SAFETY INSTRUCTIONS found in Section I of this manual should be distributed to all employees. It is the responsibility of the user to adopt and enforce these instructions as company policy.

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1 WARRANTY, INSTALLATION & SAFETY

WARRANTY

POLICY

Seller warrants new equipment of its own manufacture against defective workmanship and materials for a period of one year of single shift operation from the date of shipment (the result of ordinary wear and tear, neglect, misuse, accident and excessive deterioration due to corrosion from any cause is not to be considered a defect); but the Seller's liability for defective parts shall in no event exceed the furnishing of replacement parts F.O.B. the factory where originally manufactured. Material and equipment covered hereby which is not manufactured by the Seller shall be covered only by the warranty of its manufacturer.

Electrical equipment and computer software shall be warranted against defective workmanship and materials for a period of one year of single shift operation from the date of shipment. The liability for defective parts shall be limited to the furnishing of replacement parts F.O.B. the factory where originally manufactured.

We will not be paying the freight on warranty items returned and items shipped unless it is under unusual circumstances.

PROTECTING YOUR WARRANTY

In order to protect your warranty, particularly on major electrical equipment, contact the Service Department before any action is taken regarding repair. The service department will advise you of the proper procedure when repairs are necessary and will make every effort to keep your production down time to a minimum.

WARNING: UNAUTHORIZED WELDING OR BURNING ON THE MACHINE WILL VOID THE WARRANTY

Protection of photo eyes, cameras and sensitive electronic equipment from welding, burning and grinding is the responsibility of the maintenance personnel. Any damage to these components by these activities voids the warranty on these parts. A general guideline for protection of these items is that any activity requiring eye protection should also prompt protection for these sensitive components.

SELLER'S LIABILITY

The Seller will not pay any expenses for work performed by others upon Seller's equipment sold under this contract unless prior written authorization is given by Seller. A detailed accounting together with documentation of the authorized work shall be forwarded to the Seller along with the request for a credit. Any such expenses or potential expenses cannot be deducted from invoices rendered by the Seller, but will be included in the final contract price settlement.

WELDING PRECAUTION

If welding is required on or near machinery containing bearings or other finely machined surfaces, the welding ground cable should be connected as close to the weld as possible and care used to avoid striking an arc on any shafting. A full or partial ground through an anti-friction bearing will destroy or shorten its life.

If you are able to meet the previous conditions, the welding of conduit brackets, etc., **is authorized**.

SHIPPING PROCEDURE

SHIPPING COMPONENTS

Your bandmill is normally shipped in several sections. The number of sections depends on various circumstances such as size of mill, transportation problems, etc. The following is a list showing the preferred shipping packages for your bandmill:

1. **FIXED/LOWER WHEEL ASSEMBLY** complete with Driven Sheave, Arbor and Arbor Clamps (2 arbor clamps per Bandmill).
2. **MOVING/UPPER WHEEL ASSEMBLY** complete with Arbor and Rocker Arm (1 Rocker Arm per Bandmill).
3. **BASE/COLUMN ASSEMBLY** Complete with Arbor and Arbor Clamp Assemblies.
4. **MOVING UPPER SAW GUIDE:** Complete with Air Cylinder.
5. UPPER WHEEL GUARD:
6. **SUB-BASE:** Complete with setworks bracket(s).
7. **MISCELLANEOUS ITEMS:** such as Saw Guide Blocks, Wheel Scraper blades and counterweights, Air hose, Drive Belts, Upper Wheel Guard Air Cylinders, Setworks Cylinders etc. These are packed in crates for shipment

UNLOADING / SETTING THE EQUIPMENT

SHIPPING DAMAGE

Before the equipment is unloaded from the truck inspect for damage. Photograph and document all damage.

CLEAN MACHINERY

The equipment, when shipped, is new, freshly painted and clean. If, during transport it has become dusty, grimy or muddy, it should be thoroughly cleaned. This will aid in detecting shipping damage and prepare for installation.

LIFTING THE EQUIPMENT

Lift by the lifting eyes supplied. Equipment without lifting eyes should be lifted so that there will be no damage. Take care not to “tweak” the equipment by improper lifting, dropping, etc.

DO NOT lift machinery by the lifting eyes attached to the motor(s). These lifting eyes are designed to lift the weight of the motor only.

Call the manufacturer if assistance is required for determining proper lifting points.

STORAGE

Proper storage prior to installation is extremely important. Changes in temperature and humidity, will cause moisture to form on metal surfaces. Within a short period of time bearings and electrical components may be ruined and bright exposed surfaces covered with rust. Exposure to salt air accelerates the corrosion.

STORAGE AREA

1. When storage of your bandmill is required one or both of the following methods should be used:

   A. A covered building.

- A heated storage area is preferred. A second and possible satisfactory choice is storage under shelter which is open on all sides to permit circulation of air over all parts.
  Tight wrappings on equipment stored outside give less protection in most cases than full exposure to the weather.

   B. Tarpaulin (NOT plastic).

2. Items placed in a storage building should be positioned so as not to allow water into the arbor bearings or slide bearings.

3. Lifting lugs, where supplied, are for the protection of the equipment during handling and must be used.

4. EXTREME care should be taken to protect the wheels during shipping and/or storage. If placed in a horizontal position, the arbor must be clear and the wheel supported by both rim and hub. If placed in a vertical position it must be supported by the arbor only.

STORAGE MAINTENANCE

Equipment which is not in service must be set in motion periodically in order to spread the lubricant over all bearing surfaces. Suitable intervals are one to three months, depending on atmospheric conditions, etc. If this cannot be done, the bearings and bright exposed surfaces should be cleaned and packed or coated with petrolatum or other suitable anti-rust agents, according to the advice of a reputable supplier.

EXAMPLE: Areas of priority will be slide ways, arbors with seals around bearing housings and saws with guides.

START UP ASSISTANCE

Most machine centers are purchased with a certain number of start-up time hours included in the contract. Please check your contract for the FREE hours and conditions on your machine center.

The services of an experienced technician are available to supervise and aid in the installation of all mechanical, pneumatic, hydraulic and electrical systems. **This assistance is strongly recommended.** It not only gets the job done correctly, it also trains the mill personnel in maintenance and trouble shooting diagnostics.

BEFORE CALLING FOR START-UP

In order for the bandmill to provide the best possible service, the following site preparation and preliminary installation must be completed by the customer.

In preparation for the actual start up, and to avoid unnecessary charges, please review the following before scheduling the start up:

1. Supply and installation of all foundation and support steel.
2. Installation of all machinery supplied in accordance with the installation documentation provided.
3. Supply and installation of all walkaways, stairways and operator platforms.
4. Supply and installation of all interconnecting hydraulic piping between power units and machinery.
5. Supply of all hydraulic fluid.
6. Supply of air and installation of air piping to machinery.
7. Supply of lubricants for all mechanical components as required before start-up.
8. Supply and installation of all motor starters, contacts and motor control centers.
9. Supply and installation of all drive guards except where noted.

Start up of customer provided equipment is not the responsibility of the manufacturer. Please be certain this equipment is ready BEFORE your scheduled start up date.

10. Check the parts inventory and/or bill of lading to be certain all of

the components of the equipment are together, clean and ready for assembly when the technician arrives.

11. Be certain all subcontractor work is ready: Electrical, foundation, etc.

12. Be ready with the agreed upon mill supplied labor. If your contract reads “three (3) millwrights”, please don't supply 3 laborers, but knowledgeable millwrights. This has the added benefit of giving your maintenance people important experience and factory training.

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SAFETY PROCEDURES

BE SAFE ***Safety is the most important consideration when installing, leveling, aligning or servicing any equipment.***

Before servicing the bandmill, follow all safety procedures.

ESTABLISH LOCK-OUT PROCEDURE

Lock-Out 1. Lock out the Motor Control Center (MCC). Test at control panel by attempting to start the motors.

2. Move the bandmill(s) to the service position and use the two lock restraint devices (one on each side of each bandmill body) to prevent movement of the bandmill body.

3. Activate the pull-back cylinders to separate the two bandmill assemblies.

Lock-Out 4. Use the Pins provided to lock the pullback unit in place.

Lock-Out 5. Lock out the setworks system. Be certain that the control power is shut off and locked out.

6. Open the saw hood.

Lock-Out 7. Lift the table press rolls and use the lock-up restraint device. **Lock out** the pneumatic system.

8. Bleed all pressure from the pneumatic system.

Lock-Out ***Lock out all associated equipment in the vicinity of the repair and/or equipment that could affect personnel in this repair area as per mill designed procedures.***

9. **CLEAN**:

   A. Remove sawdust, chips and wood debris from around and in the bandmill.

   B. Remove excess grease from around the bearings.

   C. Remove pitch from press rolls, feed rolls and saw guides.

   D. Thoroughly clean the machine inside and out.

SAFETY NOTICES

Safety procedures and adequate safety notification is the responsibility of the customer. Typical signs used by customers are shown below. USNR does not provide general mill safety signs.

SAFETY PRECAUTIONS

The Bandmill is a precision piece of equipment designed and built to provide many years of trouble free service to the Forest Industry, with particular attention paid to High Recovery, Accuracy and **SAFETY.**

AUTHORIZED PERSONNEL should be the only operators of this machine. They are trained during the installation of the machine to adhere to all the SAFETY PRECAUTIONS when maintaining and operating the Bandmill.

Permanent instructions are prominently placed with good visibility from the operators station.

BEFORE START-UP

1. All safety guards must be in place.
2. Visual inspection of the enclosure must be made by the start-up Operator.
3. Anyone within a 15 Ft. radius must wear eye and ear protection, with hard hat and steel toe capped boots.
4. Loose clothing that could be caught-up in any machinery must not be worn.
5. Gloves must be worn when handling the bandsaw.
6. Do not crawl within any part of the machine unless all the LOCK-OUTS are made and all safety procedures in place.
7. Pay particular attention to Photocells that can actuate parts of machinery although the power is locked-out.

CUSTOMER'S RESPONSIBILITY

It is the customer's responsibility to protect personnel by providing safety devices.

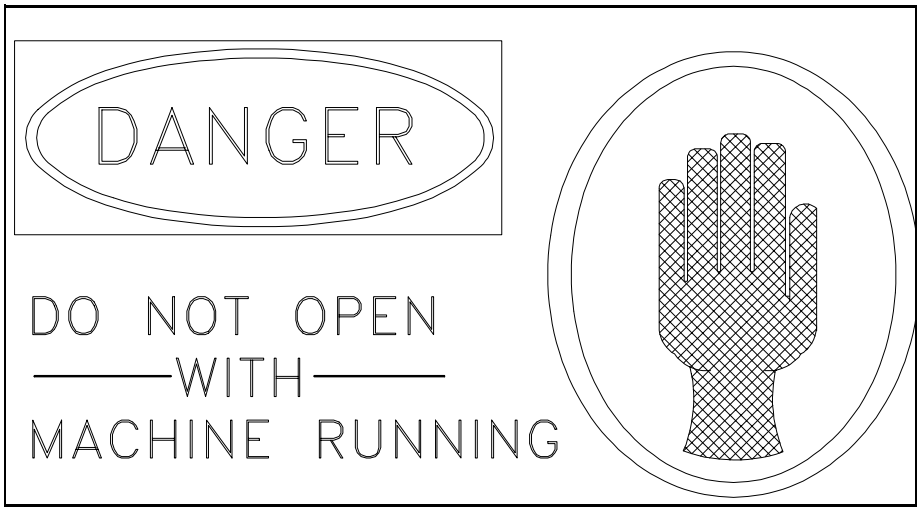
SAFETY PROCEDURES

Development of and compliance with safety procedures of installed machinery is the responsibility of the customer.

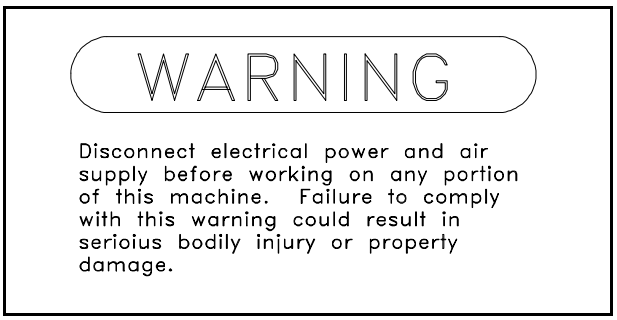
DECALS REQUIRED ON THE MACHINE

There are five (5) - Safety Decals for the Bandmill:

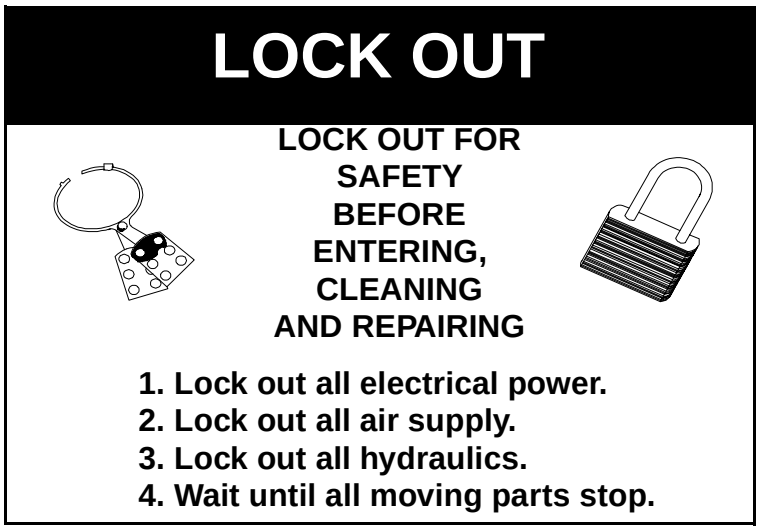
1. DANGER - DO NOT OPEN W/MACHINE RUNNING



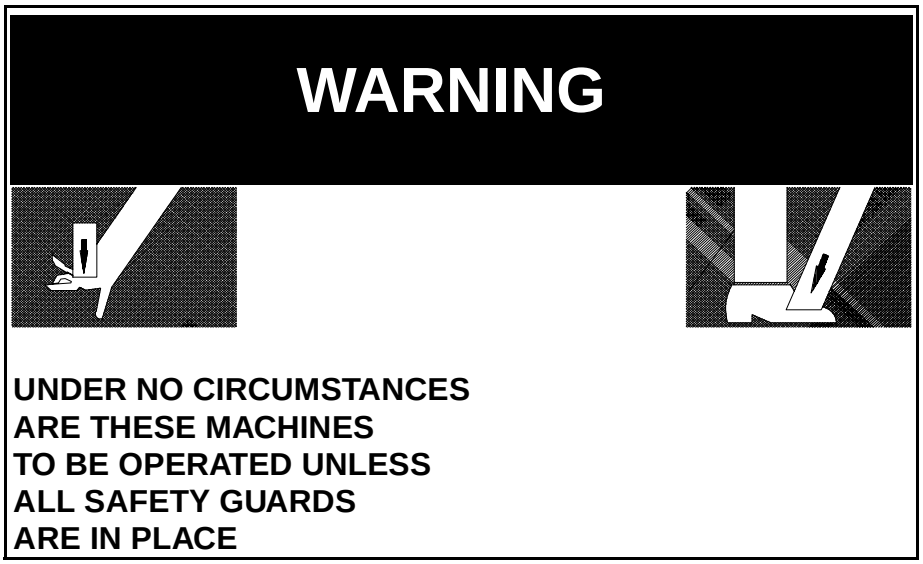
2. WARNING - DISCONNECT ELECTRICAL POWER



3. CAUTION - LOCK OUT



4. WARNING



5. EYE PROTECTION REQUIRED

6. HEARING PROTECTION REQUIRED

7. LOCKOUT/TAGOUT INSTRUCTIONS

LOCKOUT/TAGOUT INSTRUCTIONS

1 Notify all affected employees that a LOCKOUT SYSTEM is going to be utilized and understand the hazards.

2 SHUT DOWN the machine or equipment by normal stopping procedure (depress stop button, open toggle switch etc.).

3 Operate the switch or other energy isolating devices so that the machine or equipment is isolated from its energy source(s). Stored energy (as in hydraulic systems, air systems, elevated machine members, etc.) must be dissipated or restrained by methods such as shut off valves, blocking, repositioning, grounding, etc.

4 LOCKOUT the energy isolating devices with locks & identification tags

5 After ensuring that no personnel are exposed, operate the push button or other normal operating controls to make certain the machine or equipment will not operate. CAUTION: Return operating control(s) to “neutral” or “off” position after this test.

6 The machine or equipment is now locked out.

7 To put the machine or equipment back in service, assure yourself that all personnel are out of the area of exposure, that all TOOLS have been removed and GUARDS have been reinstalled. Remove lockout device, then operate the energy isolating device(s) to restore energy to the machine or equipment.

If you find any of the above items missing or if you would like additional copies of any of the above items, please contact USNR Sales Department: (360) 225-8267.

GENERAL SAFETY INSTRUCTIONS

FOR BANDMILLS

STARTUP PROCEDURE

1. Operators trained in the safe operation of the bandmill should be the only ones authorized to start and operate the Bandmill and associated equipment.

2. A **"SAFETY ZONE"** is to be established around the bandmill. Only authorized personnel are to be allowed inside the safety zone. **NO PERSONNEL ARE TO BE INSIDE THE SAFETY ZONE WHEN THE BANDMILL IS OPERATING**.

3. A visual inspection of the Safety Zone must be made before starting the Bandmill.

4. Check all guards to assure they are properly positioned. NEVER START THE BANDMILL UNLESS THE WHEEL GUARD IS IN POSITION.

5. Make a visual inspection for obstruction(s) and lockout tags.

OPERATING STANDARDS

6. Keep the machine clean and do not allow excessive amounts of refuse to accumulate, particularly in the areas of the wheels, saw guides, wheel scrapers and strain assembly.

7. Report immediately to the foreman any piece of equipment that is unsafe or is functioning improperly.

8. NEVER operate any machinery without all guards being in place. [See Item 4 above]

9. The operator should not leave his station while any machine he is operating is running or capable of automatic operation.

10. In cold climates, saw guide lubrication with water is not recommended. An oil/water soluble mix is an acceptable alternative. If in any doubt please contact a USNR representative.

11. Do not start or operate a bandmill that is not properly lubricated. (See lubrication schedule in maintenance manual).

12. Starting Saw:

    A. Check that all working tools are cleared from the area.

B. Initiate the motor start procedure.

C. Check the strain to confirm that it is running at the desired level. Operation at low saw strain causes large sawing variation and possible loss of the saw from the wheel.

D. The wheel tilt switch and the main drive start/stop buttons must be positioned to allow the operator to observe the saw and the wheel rim at all times.

E. Feed Speed must be set relative to depth of cut and saw capacity.

13. Be aware of changes in noise levels, overheating of bearings and levels of vibration. If something sounds, looks or feels abnormal, shut the bandmill down immediately. Locate and fix the problem.

14. NEVER wear loose or bulky clothing that could get caught in the machinery.

DAILY MAINTENANCE AND REPAIR PROCEDURES

15. To make repairs on the Bandmill, infeed table or related equipment use the following procedure:

A. Identify and push STOP buttons on ALL motors where repair work is to be done.

B. Be sure the air supply valve is shut OFF and all pressure is bled off before working on equipment

C. Push emergency STOP button. This will disconnect the 120 volt control voltage to any valves and photoelectric eyes which might be operating equipment in the area where repairs are being made.

D. Be sure the M.C.C. is locked out and the control power is OFF before working on any part of this system (see lockout/tagout instructions).

E. Manually shut OFF hydraulic supply valves and be certain all pressure is bled off before working on the equipment.

F. Work manual overrides on valves to ensure air or hydraulic pressure is turned OFF. The manual overrides are located on the valves.

G. Physically check & block photoeyes to ensure that no automatic movement may occur before entering the machine for servicing.

H. Engage all motion lock-out safety pins to prevent movement of the shifting bandmill and the pressroll(s) where provided.

16. NEVER attempt to stop the saw blade by feeding wood into it or wedging anything against the wheels or saw blade.

17. Gloves must be worn when handling the bandsaw.

18. NEVER crawl into or on any part of the machinery without all lock-outs being made (See Item 15. above).

19. To make repairs on any air or hydraulic lines, cylinder or valve, use the procedures in Item 15. above as appropriate.

CUSTOMER'S RESPONSIBILITY

20. Be certain all personnel are adequately trained in the safety procedures required when working in the vicinity of this equipment.

21. Be certain a readable copy of the safety decal(s) is properly posted and maintained with good visibility from the operator's station.

22. Guard all sheaves or sprockets. It is the customers responsibility to protect his or her personnel by providing for adequate guards on all sprockets or sheaves. The installation of such guards not specifically requested or otherwise installed by the **USNR** factory is the responsibility of the customer.

23. Use adequate hearing and eye protection.

24. SAFETY FIRST. Compliance with safety regulation of installed machinery is the responsibility of the customer. Safety training of a new operator is a must.

2 INSTALLATION

PRE-INSTALLATION NOTES

These instructions cover all sizes and types of Vertical Bandmill, e.g. 5' and 6', Headrigs, Fixed Resaws, Setting Single and Multiple Bandmills. Therefore, those instructions which do not apply to your particular model should be disregarded.

As the initial installation and alignment of a Bandmill is critical to its efficient operation, the following instructions have been compiled to assist you in attaining a satisfactory installation.

EQUIPMENT CONDITION - SHIPPING

1. All machined surfaces are shop coated with a rust preventative which must be removed with solvent prior to assembly. Particular attention should be given to ensure that all lubrication channels are thoroughly cleaned.

2. Due to conditions beyond our control during transportation, some machined surfaces may receive minor damage such as nicks, scratches, etc. Prior to assembly, all machined surfaces must be checked for damage and if necessary corrected with a fine file or scraper.

INSTALLATION CONDITIONS AND PREPARATION

1. All machined surfaces should be protected from surrounding work such as welding, handling equipment, etc.

2. Extreme care should be taken to protect the wheels during shipping, off-loading and storage.

   A. Wheels should be placed in a horizontal position supported by **both** rim and hub, or…
   B. Wheels can be stored vertically if the arbor is installed and cradled to hold the wheel ***SAFELY*** off the floor.

3. Oil lubricated wheel bearings <u>are packed</u> on shipment but **must be checked before start-up** of the Bandmill. Lubrication specifications are given in the Lubrication section of this manual.

4. All moving parts must be lubricated prior to assembly.

NOTE: ***Before start-up of the Bandmill all lubrication points should be re-checked to ensure that they have all received proper attention.***

INSTALLATION SUPERVISOR

The services of an experienced technician are available to supervise and aid in the installation of our mechanical, pneumatic, hydraulic and electrical systems. For best performance, it is strongly recommended that this service be retained.

STORAGE

1. When storage of your Bandmill is required one or both of the following methods should be employed:
   A. A covered building.
   B. Tarpaulin (NOT plastic).

   Items placed in storage should be positioned so as not to allow water into the arbor bearings or plunger tubes, etc.

2. Lifting lugs are supplied for the protection of the equipment during handling and must be used.

3. All temporary shipping brackets are for shipping purpose only and should be removed after installation of-the individual-item. These pieces are always painted red.

4. Proper tools must be available for a satisfactory installation.

5. Bandmill drive motors usually require an oversized heater in the starters.

6. Installation of the foundation should be completed prior to mounting **USNR** equipment.
   e.g. anchor bolts, grout, refuse bins, all welding and burning to support steel.

7. A final alignment check should be made after all equipment has been attached to the bandmill.

8. All match markings should be noted and mating parts re-assembled correctly.

9. No cutting or welding should be allowed on the Bandmill Assembly without written approval from a **USNR** representative.

10. Prior to the final levelling and grouting or shimming of any equipment all welding and burning to, or adjacent to, the support steel must be completed, due to the distortions and ensuing misalignment caused by burning and welding.

11. Equipment requiring close alignment such as Fixed Bandmills, Bandmill Sub-Bases, Linebar Frames, etc. should use a suitable **epoxy grout** rather than shims.

DO NOT apply pneumatic pressure to the air strain cylinders unless the upper wheel assembly is in place.

12. For component identification, refer to the enclosed arrangement and cross section drawings.

SAFETY NOTE: ***If the bandmill main drive motor is not properly located prior to the assembly of the upper and lower wheel assemblies to the bandmill, or if the main drive motor is removed for any reason, the bandmill may unbalance and could tip over. To avoid this occurrence a hold down bracket is provided and is to be properly positioned. It is very important that this bracket be correctly installed. Bracket is painted Yellow.***

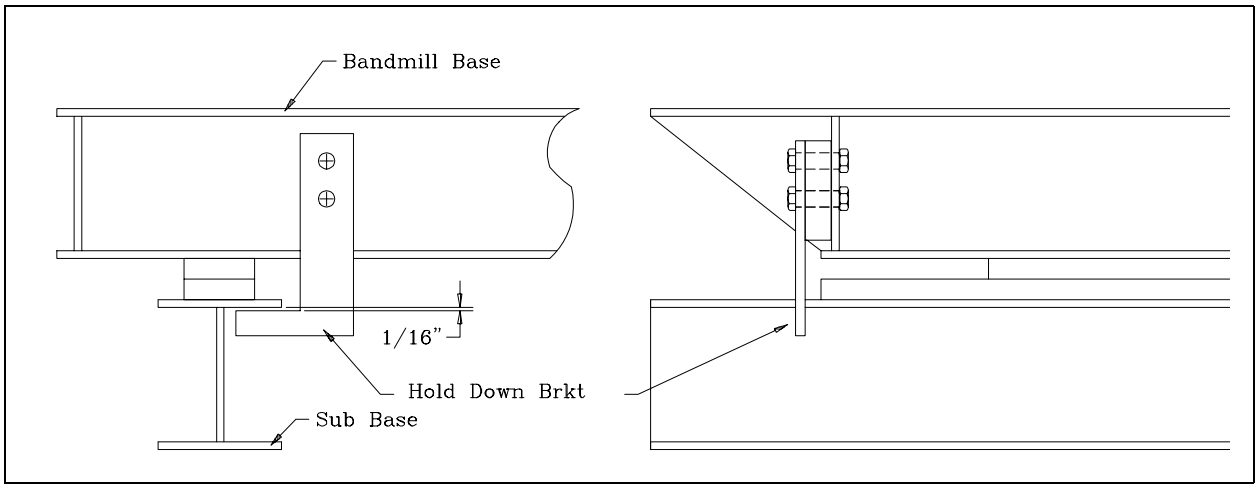


Figure 1: Safety Hold Down Bracket

NOTE: ***Read section "PLACEMENT AND ASSEMBLY OF BANDMILL" on page 16 & ff before proceeding.***

13. It is essential that the sub-base support structure is rigid. Otherwise there will be unwanted deflections when the bandmills are moved along the sub-base. If any doubts exist concerning the support structure, feel free to contact **USNR** for our assistance.

14. The installation, final alignment and grouting of the sub-base should be finished prior to the placing of the bandmill(s).

TOOLS

REQUIRED FOR INSTALLATION

1. Starrett #98 machinist level (e.g. 8" or 12").

2. Alignment line (used to establish the line-of-flow), either piano wire or nylon line.

3. Magnetic base dial indicator and/or inside micrometer.

4. Machined and ground straight edge or equivalent.

5. Emery cloth to clean paint off of machined surfaces.

6. In addition to regular tools: 1 1/8 “and 1 5/16” wrenches.

7. Epoxy Grout - Dayton Sure Grip epoxy grout J-54 available at the following places:

Spokane, Washington(800) 325-1684
Birmingham, Alabama(800) 745-3704
Orlando, Florida(800) 745-3710

8. Plumb bob, 3 required and dash pots filled with oil to dampen sway of the plumb bob.

9. Magnets to assist in mounting the plumb lines required.

10. **SPECIAL TOOLS REQUIRED**:

    A. One pair of sub-base set-up blocks, one “V” and one Flat.

    B. Instrument level and optical target equivalent to the 'Wild N3' graduated in 0.001" increments.
    (Alternate: A Precision straight edge of sufficient length to span across sub-base.)

TEST TOOLS FOR ACCURACY

It is vital that you check the accuracy of your alignment tools before using them.

The machinist's level is very sensitive to temperature. When using a machinist's level it should be at the same temperature as the equipment being leveled. Touching the vial with your finger will cause an inaccurate reading on the level. It may take 30 to 60 seconds before the vial is accurate again.

Before using the level it is necessary to ascertain that the level is accurate. Place the level on a machined surface that is known to be level (or as nearly so as possible). The small vial must show a level condition before an accurate reading can be taken from the larger one. Rotate the level 180 degrees. It should read the same as it did in the previous position.

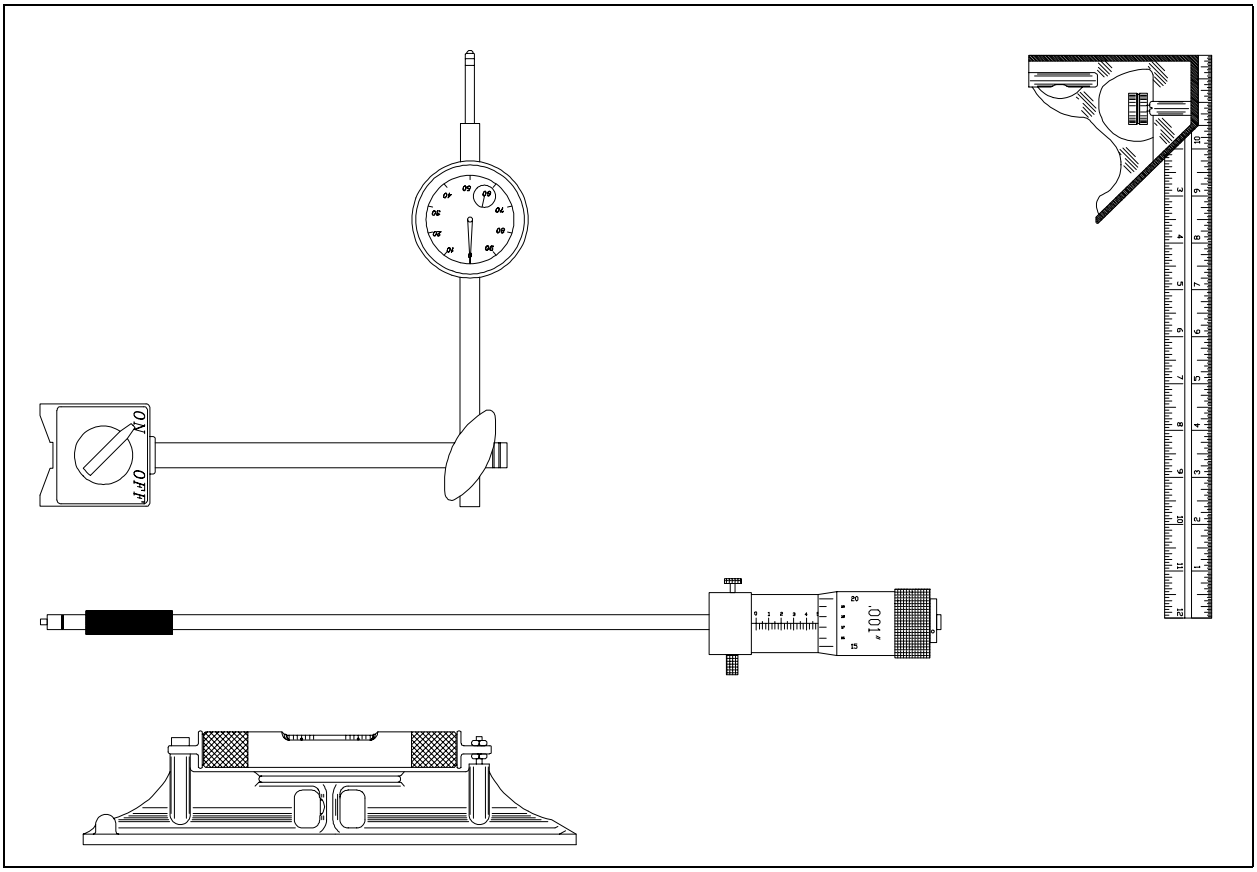


Figure 2: Common Installation Tools

PREVENTING MAINTENANCE PROBLEMS

Some reasons equipment needs to be realigned include:

A. Normal wear and tear.
B. Poor substructure.

- Mounted on wood.

- Not enough concrete.
  For example, a 4" slab floor is inadequate as a foundation.

- A light steel structure.

C. Improper installation of replacement parts.

PRE-INSTALLATION PREPARATION

Examine all components and boxes for damage. Deliver parts and boxes to their proper location.

1. Installation of the foundation should be completed prior to mounting of USNR equipment, e.g. refuse bins, all welding and burning to support steel.

2. Each piece of equipment should be oriented with the lumber flow and mill floor plan. Refer to the machine layout drawings for your machine.

3. All machined surfaces are shop coated with a rust preventative which must be removed prior to assembly. Solvent will remove this coating. Particular attention should be given to ensure that all sliding surfaces and wheel faces are thoroughly cleaned.

4. Due to conditions beyond our control during transportation, some machined surfaces may receive minor damage such as nicks, scratches, etc. Prior to assembly, all machined surfaces must be checked for damage and if necessary corrected with a fine file or scraper.

5. All machined surfaces should be protected from surrounding work such as welding, handling equipment, etc.

6. All moving parts must be cleaned and lubricated prior to assembly.

- NOTE: Before start-up of the bandmill all lubrication points should be rechecked to ensure that they have all received proper attention.

SHIPPING BRACKETS ***All red brackets are for shipping purpose only and are marked "remove for start-up".***

INSTALLATION PROCEDURE

It is essential that the support structure is rigid. Otherwise there will be unwanted movement of the Bandmill during operation. If any doubts exist concerning the support structure, contact USNR for assistance. No cutting or welding should be performed to the bandmill without written approval from a USNR representative.

FIXED SUB-BASE

The bottom arbors are shipped in position in the Sub-Base. ***They should be left mounted to the sub-base frame*** until the bandmill columns are properly positioned and mounted.

The QUAD bandmill has two sub base units. By “fixed Sub-Base” we mean that the base itself is fixed to the foundation. The Bandmill mounted on this base **does** set with respect to the Lumber line. Reference in this section to “V” and “Flat” rails refer to those on top of this base on which the bandmill will set.

WARRANTY: ***The Warranty may be voided if welding is done without approval.***

1. Locate the sub-base assembly on the support structure and secure with finger tightened hold-down bolt

BE CAREFUL TO ALLOW SPACE BETWEEN THE ANCHOR PAD AND THE SUB-BASE FRAME FOR ADJUSTMENT.

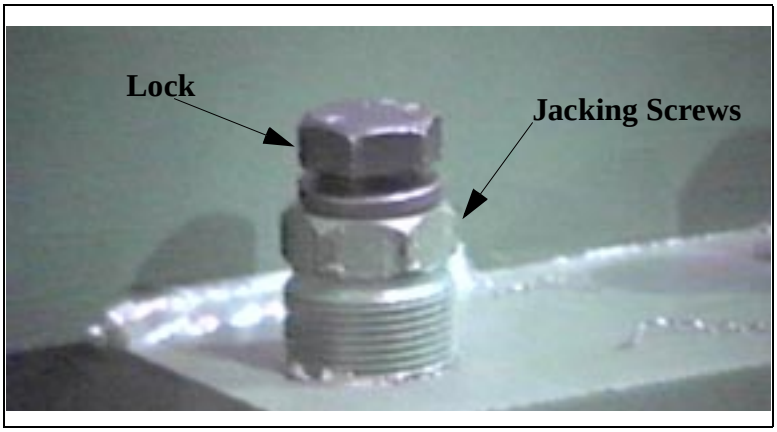


Figure 3: Hold Down Bolt

Complete all welding & burning on or adjacent to support steel before final level, grouting and shimming. Burning and welding may cause distortions and ensuing misalignment. This may force the level & align to be redone.

When equipment requires close alignment, such as fixed bandmills and bandmill subbase, we recommend the use of a suitable epoxy grout rather than shims where possible. The product we find ideal for this application is Dayton Sure Grip epoxy grout J-54.

2. Refer to the assembly drawings to ascertain the correct location of the sub-base with respect to the datum lines as well as the relative elevations between the sub-base and the related equipment.

3. With all hold-down bolts slacked off, adjust Jacking bolts until the sub-base is at the proper elevation and is close to level.

4. Align the sub-base at 90° to the material flow:

   A. Make certain that the shop scribed reference lines on the "V" and flat rails are exactly parallel to and at the proper relative location to the material flow datum line.

   B. The machined side of the “V” rail is at 90° to the material flow.

Proper alignment of the fixed sub-base is important since it plays an important role in the alignment of the shifting sub-base.

5. Tighten the hold-down bolts and at the same time adjust the Jacking screws (see Figure 3:) until all four corners are within .002" of the same elevation. Lock the hold-down bolts and confirm that elevation has not changed.

6. At the intermediate sub-base support points adjust the jacking screws and hold-down bolts until:

   A. Above each point the rail ('V' or flat), is at the elevation determined in step 5. above.

   B. Above each point the cross level of the individual rail ('V' or flat) is correct.

   C. Use the jacking screws and hold-down bolts in conjunction with each other, to adjust the rails as required.

   D. For 'V' rail level readings use the spirit level in conjunction with the set-up block for cross level.

7. Make certain the 'V' rail (on which the Bandmill rides) is straight.

   A. On the inside of the 'V' rail affix a tight line to 1/8" spacers at

each end of the machined perpendicular surface.

B. Using a 1/8" feeler between the line and reference surface, at each intermediate support point, bump the frame with a heavy hammer and block of wood to correct.

NOTE: ***This will probably alter the results obtained above, therefore it will be necessary to re-work the above steps until all alignment requirements are met.***

8. Make sure the flat rail is straight:
   Note - not as critical as the 'V' rail.

9. After all adjustments are finished a final check should be made of all elevation and alignment points on the sub-base.
   Be certain that alignment and elevation is exactly correct!

10. If using Grout:

    A. Construct temporary retaining dams around all sub-base support points and pour epoxy grout.

NOTE: ***ALLOW GROUT TO SET BEFORE PROCEEDING. DO NOT RUSH THE PROCESS!***

11. If using hard shims instead of grout:

    A. Establish the proper elevation and determine the shim required.

    B. Use the jacking bolt to slightly lift the frame and position the shims under the frame.

    C. Lower the frame onto the shims and double check elevation and alignment.

    D. After the elevation is correct, weld the shims into place.

SHIFTING SUB-BASE

The bottom arbors are shipped in position in the Sub-Base. ***They should be left mounted to the sub-base frame*** until the bandmill columns are properly positioned and mounted

By “Shifting Sub-Base” we mean that the base itself shifts or opens to allow maintenance such as saw changes. The Bandmill mounted on this base also “sets” with respect to the Lumber line. Reference in this section to “V” and “Flat” rails refers to those on top of the base on which the bandmill is mounted and will shift. Reference to the “V” and “Flat” rail on which the Sub-Base itself rests and shifts will be referred to as the “Sole Plate” as shown below.

SET SOLE PLATES AND RAILS

1. Position the “flat” and “V” Sole Plates on the support structure and secure with finger tight hold-down bolts and nuts.

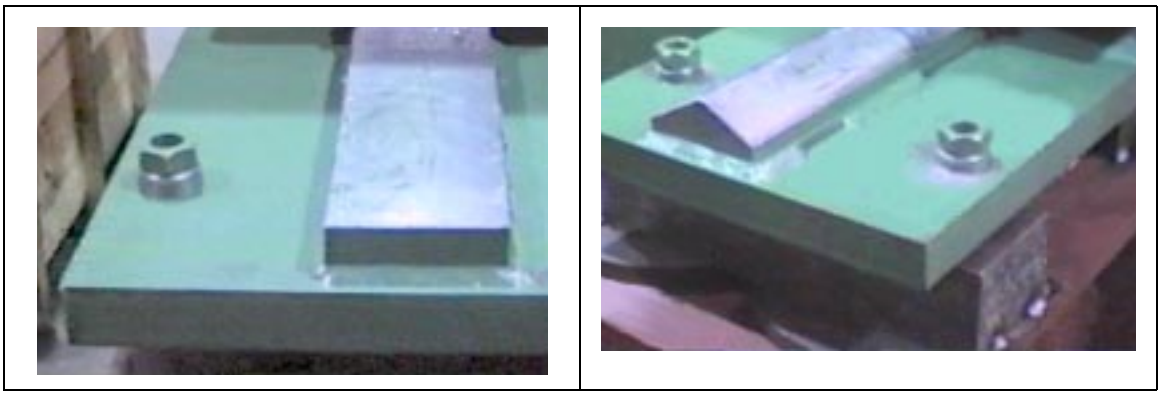


Figure 4: Sole Plates: Rails Attached

2. Verify that the rails are correctly located:

   A. The Sole Plates should be positioned so that the shifting mechanism is on the outfeed side.
   Do NOT position sub-base on slide plates at this time.

   B. Hold-down bolts should be in place through support steel but slacked off to allow the Jacking Bolt room to lift.

   C. Refer to “Sub-Base Assembly (D-085401)” on page 51, to confirm the correct location of the side shift rails with respect to the datum lines.

NOTE: ***The Sole Plates will be attached directly to the Support Steel with a bolt through the center of each Jacking bolt. There must be adjustment space in the mount. Do NOT tighten the mount bolts until after everything is properly leveled and aligned.***

i. Measure from the Datum Line and accurately position the **"V" Rail Sole Plate.**
"Sub-Base Assembly (D-085401)" on page 51.

ii. Adjust jacking bolts until the "V" rail on the Sole Plate is at the proper elevation and until both ends are within 0.002" of the same elevation.

iii. Repeat these steps for the "Flat Rail Sole Plate" and until both ends of the **"Flat" Rail Sole Plates** are within 0.002" of the same elevation.
Double check all rail alignment.

D. After all adjustments are finished a final check should be made of all elevations and alignment points.

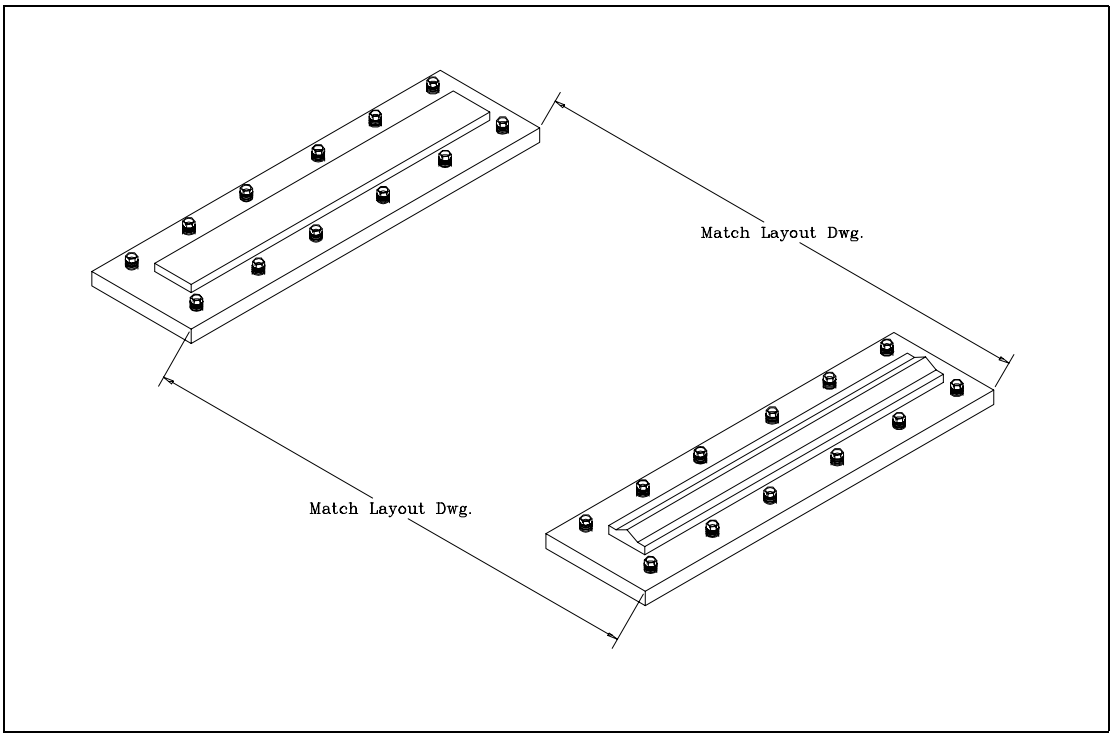


Figure 5: Aligning Sole Plate Rails for Shifting Sub-Base

Final alignment of the Sole Plate Rails will be accomplished with the sub-base in position.

POSITION THE SUB-BASE

1. With the Sole Plates in place **and the mounting bolts loose**, position the sub-base on the rails.
   NOTE: The “V” Rail Block mounted to the bottom of the Sub Base has been positioned at the factory and bolted in place. It will be used to properly position the Sole Plates by aligning the Shifting Sub-Base to the Fixed Sub-Base.

NOTE: Do not connect the shift mechanism at this time.

2. Settle the Sub Base into position on the “V” and “Flat” rails of the Sole Plates.

3. Check that the sub-base is at 90° to the material flow:

   A. Measure the C/L against the shop scribed reference lines.

   B. Measure against the previously aligned Fixed Sub-Base to the “V” rail atop the Sub Base. The “V” Rail must be perpendicular to the line of flow and perfectly parallel to the “V” Rail on the Fixed Base.

4. Should adjustment be required, “bump” the sub-base until the correct alignment is achieved.

5. Tighten the “V” Rail Sole Plate clamping bolts.

6. With a 0.002" feeler gauge check to see that the slide is properly seated on the slide shift 'V' rail. Adjust if necessary.

7. Recheck sub-base alignment and elevation and adjust if necessary.

ATTACH SHIFT CYLINDER COMPONENTS

Install the Anchor Bracket Assembly for the outfeed side shifting sub-base (“Sub-Base Assembly (D-085401)” on page 51).

A. Position the shifting sub-base in the full retracted position.

B. Mount the Retraction Cylinder (Item 8) onto the mount on the Sole Plate (one each on the “V” and the “Flat” Sole Plates).

C. Attach the Clevis at the attachment point on the Sub Base.

WARNING ***Before hooking up hydraulics, be certain the system has been properly flushed.***

Protect the Hydraulic Cylinder (hose attachment points) from contamination.

ADJUST BANDMILL RAILS

The rails on top of both the “fixed” and “shifting” sub-bases must meet two conditions before setting the mills onto the sub-base.

1. **The rails must be level**.
   The surface of the sub-base has been machined. When the rail is bolted to that surface it should be level. Checking the rail is an additional check on the level of the machine.

NOTE ***The “V” Rails mount at the “inside” position on both sub-bases.***

2. The rail is set against a machined edge created when the surface was machined. This edge serves as a “straight edge” to assure the “V” rail is:

   A. Properly aligned with the subbase.

   B. Is “straight” when held against the edge and bolted down.

      i. It is very important that the “V” rails are straight:

      ii. Affix a 1/8” shim to each end of the inside machined vertical surface of the Rail.

      iii. Stretch a wire over the shims in a way that allows you to check the gap between the wire and the machined edge of the rail.

iv. Use a 1/8” feeler to check between the wire and the machined edge.

v. If any difference is found from point to point, the rail mounting bolts should be loosened (near that point) and the rail adjusted.

vi. Position a “C” Clamp where the adjustment must be made.

vii. Tighten the clamp to bring the rail against the machined edge.

viii. When the measurements are consistent the length of the “V” rail, tighten the bolts.

C. The “Flat” rails are not as critical.

i. Make certain that the “Flat” rail tracks parallel to the “V” rail.

ii. Make certain that it is mounted the correct distance from the “V” rail as indicated in the drawing “Sub-Base Assembly (D-085401)” on page 51.

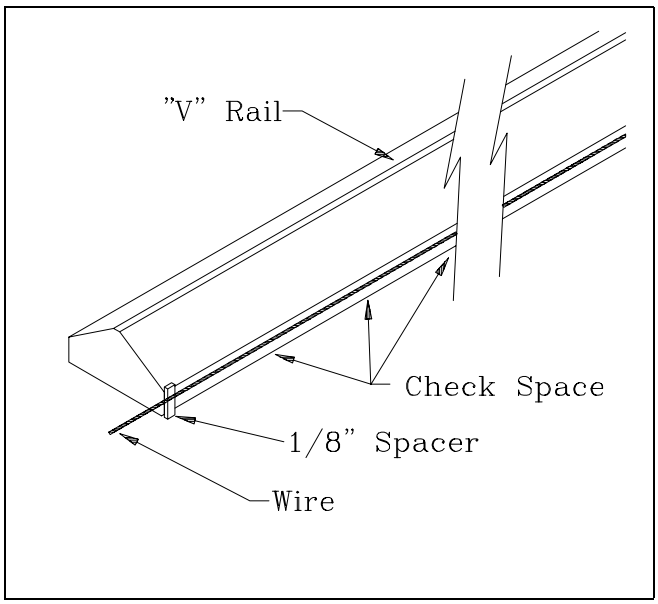


Figure 6: Checking “V” Rails For Straight (Linear Alignment)

PLACEMENT AND ASSEMBLY OF BANDMILL

WHEEL CROWN

There are different approaches to the “crowning” a bandmill wheel. The crown illustrated below is based on the requirements of the original purchaser of this equipment. The apex of the crown is clearly indicated with a painted line around the circumference of the wheel when the equipment is shipped. The “handing”[1] of the crown is as indicated below.

The word “**INFEED**” is stamped on the edge of the wheel to indicate the proper orientation of the wheel to the material flow when mounted.

The wheel is also stamped as to which “MILL” it is to be mounted on.

IT IS IMPORTANT THAT THE WHEEL BE MOUNTED ON THE PROPER MILL AND PROPERLY POSITIONED TO MATERIAL FLOW.

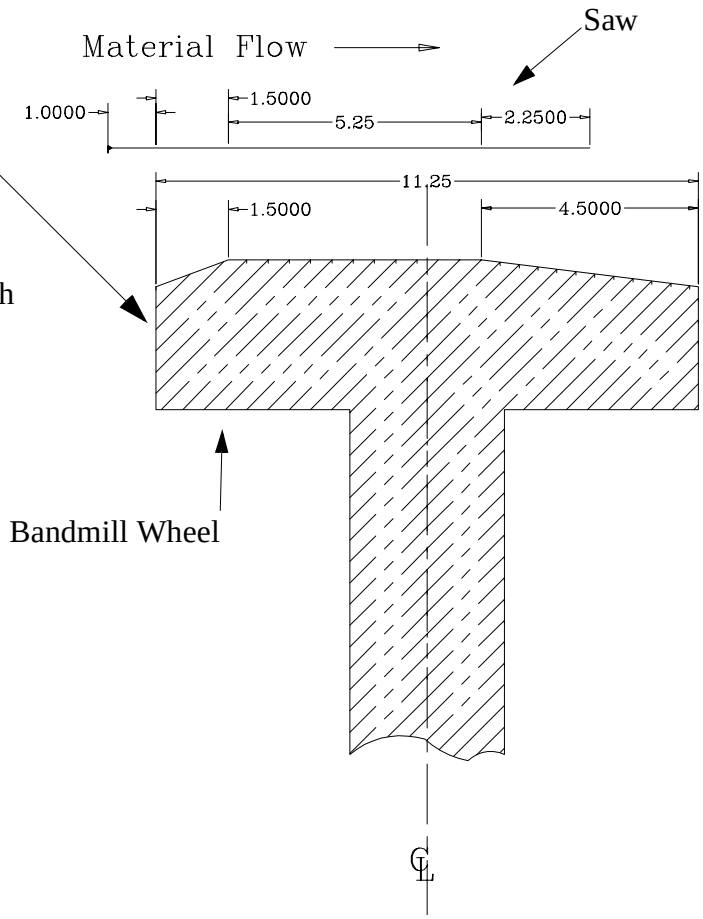


Figure 7: Custom Cut Crown

1. Handing: The direction of material flow relative to the “crown” of the Bandmill wheel.

MOUNT BANDMILL COLUMNS

1. **Fixed Bandmills** - Place the Base/Column Assembly on the sub-base and secure with finger tightened- hold down bolts.

2. **Setting Bandmills** - Place the Base/Column Assembly on the sub-base.

Just prior to lowering the base onto the sub-base, ensure that all sliding surfaces are absolutely clean, then apply a film of oil to the sub-base "V" and flat rails.

SAFETY: ***Do Not allow Personnel to work under or near hanging equipment.***

3. On the **flat rail side** of the bandmill base on the underside is a **hold down bracket**. This bracket is placed in a horizontal attitude for shipping. It should now be bolted securely in a vertical attitude.

4. Mount the main drive motor on the motor mounting plate with finger tightened bolts. Ensure that the correctly handed motor is mounted.
   The conduit box is away from the bandmill saw line.

SAFETY: ***It is important that the motor is mounted and lower arbor assembly is in place before proceeding. Be certain the Hold Down Bracket (step 4 above) is properly mounted. This prevents tipping if the unit becomes unbalanced. The bracket is to remain in place permanently.***

LOWER ARBOR INSTALLATION

The lower arbors are installed after the Bandmill base/column has been mounted atop the sub-base and properly secured.

1. The arbors can be unbolted from their shipping cradles and lifted into position so that the mounting yoke can be attached to the bandmill base. This should be done before the wheels are mounted to the arbor.

NOTE: ***Each lower arbor assembly has been balanced at the factory. Therefore the wheel, bearing housing and bolts are all match marked prior to disassembly.***

2. The lower arbor bearing cap & housing are mounted on the shaft using ring feders. Should it be necessary to remove it, care must be taken with the ring feder locking rings upon re-assembly. The ring feders must be inserted in the correct direction, as shown on the assembly drawing. Otherwise, one will have considerable difficulty

in removing these items once it has been locked on the shaft. See “RINGFEDER, LOCKING ELEMENTS” on page 3-12..

If there is any doubt as to the direction of the rings, method of tightening or torque required, check with **USNR** engineering personnel or a **USNR** installation representative.

Before the sheaves are installed on either the motor or the arbor, the guard backing plate must be mounted in position. Both the arbor and the motor shaft pass through the backing plate. This plate also serves as a mount for the belt guard.

Install Order:

3. Attach the backing plate to the Bandmill frame. Both the motor shaft and the lower arbor will pass through the backing plate which serves as a mount for the belt guard.

4. Attach the driven sheave to the lower arbor assembly with care. Check arbor assembly drawing for the proper torque. ***The drive sheave is mounted to the arbor using a QD bushing*** (not the Ring Feders used on the Wheel end). See “SHEAVE REMOVAL” on page 3-14..

5. Place the lower wheel assembly in the saw pit and support while mounting it to the arbor.

UPPER WHEEL ASSEMBLY INSTALLATION

Refer to “MOVEABLE WHEEL ASSEMBLY” on page 20.

Extra care must be taken during the operation to ensure that the assembly of parts is not forced or abused.

1. Remove pivot pin support (E66).

2. Remove the rocker arm/diaphragm cylinder clamping bolts (E4) and actuator plate (E46).

3. Lift and suspend the upper wheel assembly above the column approximately two inches above its final mounted elevation.

   A. Be sure that the upper arbor assembly is positioned with the crowning on the wheel handed correctly relative to the lumber flow.

   B. See “Custom Cut Crown” on page 2-16. for an illustration of a wheel crown and lumber flow.

4. Continue to lower the wheel assembly very slowly - and at the same time enter the diaphragm cylinder (E17) spigot into the hole in the rocker arm (E108). Again **DO NOT USE FORCE**. If the spigot and the hole will not align, the unpainted shipping brackets can be removed to allow the diaphragm cylinder to float. However, great care must be taken to avoid damage to the diaphragm.

5. Secure diaphragm cylinder to rocker arm with bolts (E4) and replace actuator plate (E46).

6. Replace pivot pin support caps and secure with bolts (E67).

7. Remove shipping brackets (painted red and labeled “Remove Before Start-Up”) from diaphragm ring (El9).

8. Ensure that strain limit switch actuator bracket (E104) is attached to actuator plate (E46).

BANDMILL ALIGNMENT

BANDMILL COLUMN/BASE ASSEMBLY

FIXED BANDMILL

1. Using the Jacking bolts in the base supports, adjust the bandmill to the proper elevation, ensuring that the machined top surface of the strain table (F87) or the top of the bandmill base is level.

2. Align the bandmill so that the vertical machined reference faces on the front of the Bandmill base is exactly parallel to and at the proper distance from the Datum Line. A dial indicator or electric Micrometer should be used.

3. Tighten hold down bolts equally.

4. Re-check Items 1 and 2 and adjust if necessary.

5. Construct temporary retaining dames around all base support points and pour epoxy grout.

NOTE: Allow grout to set before proceeding.

SETTING BANDMILL

1. Align the bandmill so that the vertical machined reference face on the front of the Bandmill base is exactly parallel to the Datum Line. A dial indicator or electric Micrometer should be used whenever possible.

2. Should adjustment be required, loosen the mount bolts on the “V” Slides (where mounted to the Bandmill base) and, with a heavy hammer and block of wood, 'bump' the base until the correct alignment is achieved.

3. Tighten the “V” slide mounting bolts.

4. With a .002" feeler gauge check to see that the slides are seated properly on the "V" rail. Adjust if necessary.

5. Re-check Bandmill/Datum Line Alignment and adjust if necessary.

CAUTION: The bandmill must be properly set and mounted relative to the lumber flow. There is no later “adjustment” to compensate for sloppy insallation.

UPPER WHEEL AND STRAIN MECHANISM

BEFORE PROCEEDING

READ THE OPERATING INSTRUCTIONS.

INSTALL THE AUTOMATIC LUBRICATION SYSTEM.

UPPER WHEEL ELEVATING LIMITS

NOTE: When adjusting limit switch actuators, make initial settings substantially short of the required final setting then repeat adjustments until the requirements are met. This will eliminate the chances of going beyond the designed limits and the ensuing probability of damage.

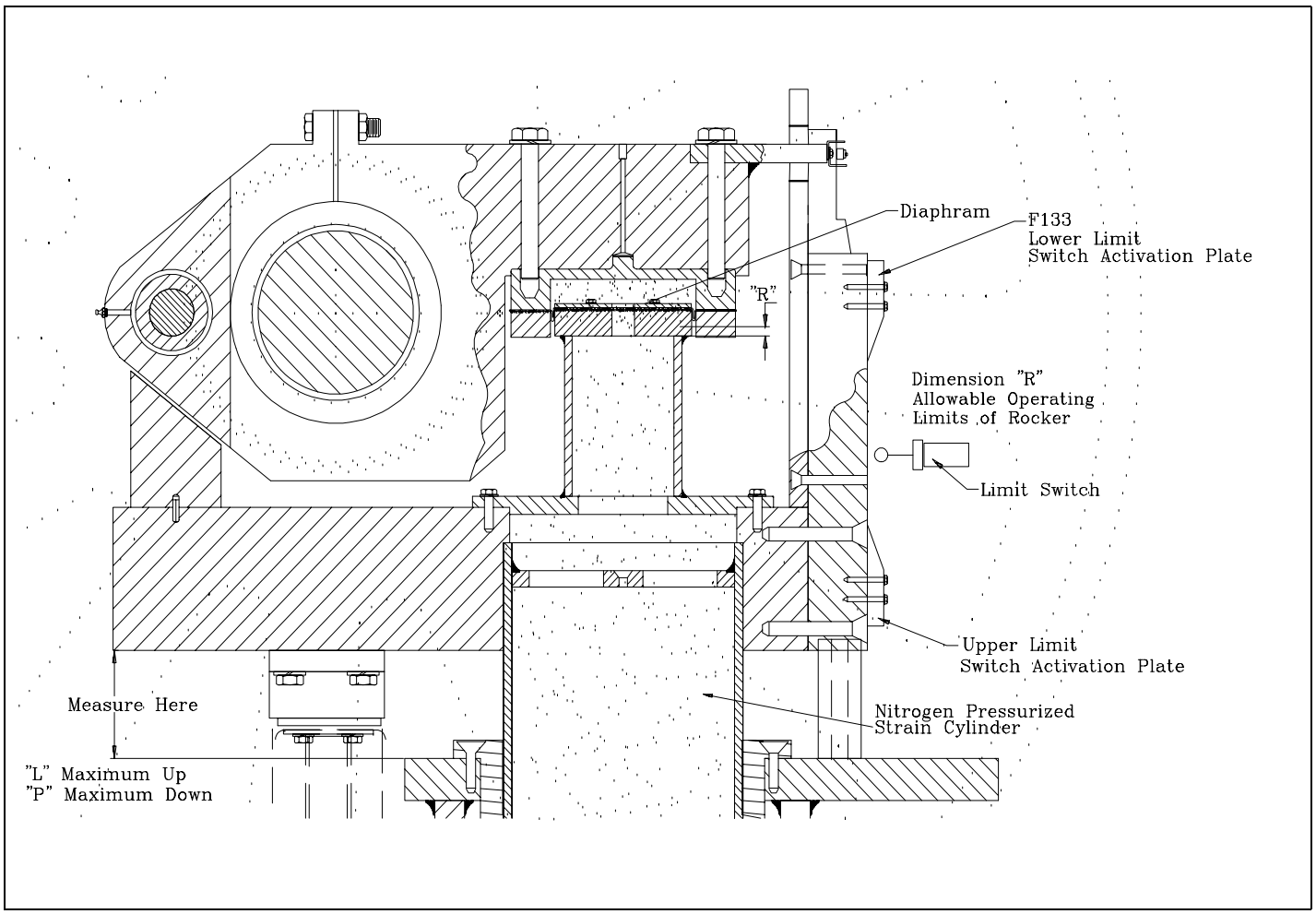


Figure 8: Normal Rocker Arm Operating Position

1. Set the lower limit switch actuating plate so that when the wheel is being elevated by means of the motor, power will automatically be shut off and the assembly will come to rest when the distance between the machined surface of the column and the under side of the upper arbor strain table (F87) is less than dimension 'L'. See “Normal Rocker Arm Operating Position” on page 2-21.

BANDMILL SIZE	DIMENSION 'L' - MAX UP POSITION
6’	9 1/8”

2. Set the Upper limit switch actuating plate so that when the wheel is being lowered by means of the motor, power will automatically be shut off and the assembly will come to rest when the distance between the machined surface of the column and the under side of the upper arbor strain table is greater than dimension 'M'. See “Normal Rocker Arm Operating Position” on page 2-21.

BANDMILL SIZE	DIMENSION 'M' MIN DOWN POSITION
6'	1 1/8"

STRAIN MECHANISM

See Figure 9: Maximum Lower Travel of Rocker Arm.

1. Close the supply line valve to the - strain balance reservoir plunger tube.

2. Connect the pneumatic source to the supply line.

Note: ***Nitrogen is recommended for this application due to its cleanliness, lack of moisture content and its inert characteristic. Dry clean, compressed air can be used as a substitute.***

3. Slowly pressurize the strain balance tank to the required strain. It is extremely important to ensure that the diaphragm cylinder is free to move. The diaphragm can be easily damaged so great care must be taken to avoid any damage to it.

USNR's engineering department can provide recommendations for saws, tooth profiles and operating strain levels to match the customer's particular circumstances.

4. Actuate the wheel lift motor until the wheel lift limit switch de-activates the motor. Care must be taken to ensure that the wheel lift limits are not exceeded during these initial periods of operation.

5. Adjust the upper wheel elevation by hand so that the under side of the diaphragm cylinder diaphragm ring and the under side of the piston are in the same plane. Adjust the limit switch actuating plate accordingly so that this relationship is automatic.

NOTE: ***This is the mid-stroke as well as the optimum operating position of the strain cylinders. This will require further adjustment when mill is running.***

STRAIN INDICATOR AND LIMIT SWITCH

1. Adjust the roller arm on the strain indicating limit switch to midway in the strain limit switch actuator bracket opening.

2. When the underside of the cylinder diaphragm ring is above the underside of the piston by dimension “R” the saw is under strained and the red under strain warning light should be illuminated. The strain limit switch arm will be above its normal position.

3. When the roller arm on the strain indicating limit switch is midway in the strain limit switch actuator bracket opening, the green normal strain light should be illuminated.

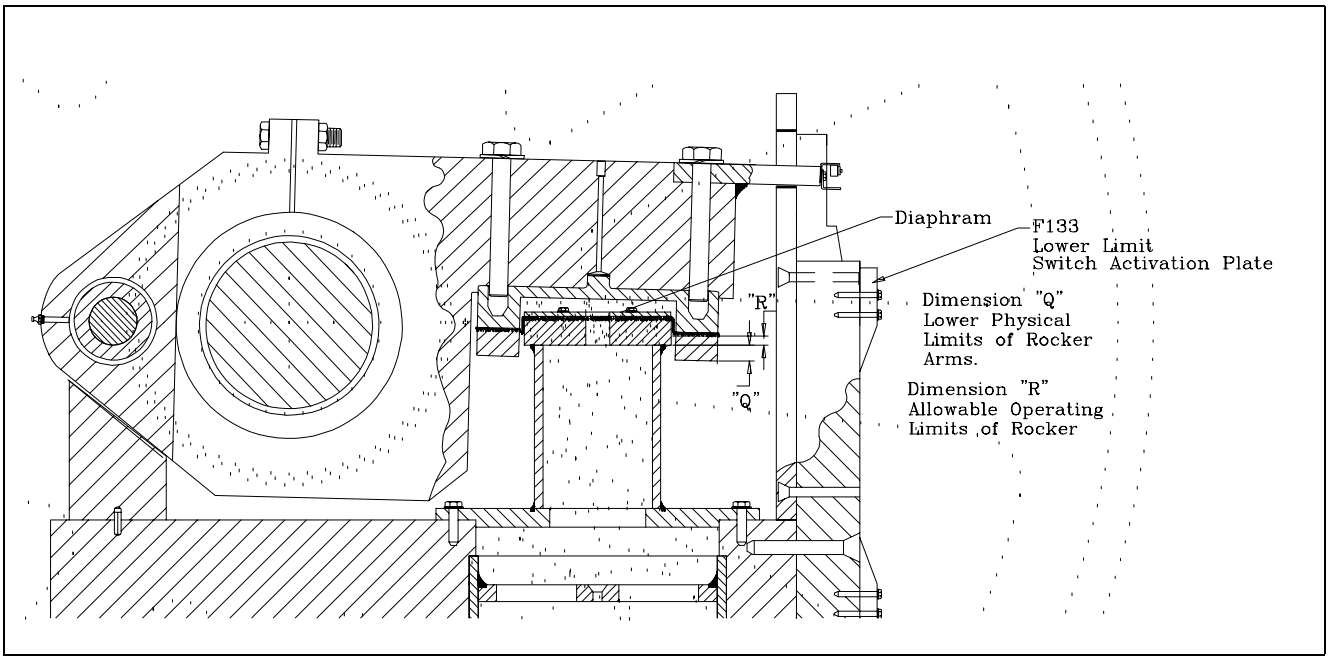


Figure 9: Maximum Lower Travel of Rocker Arm

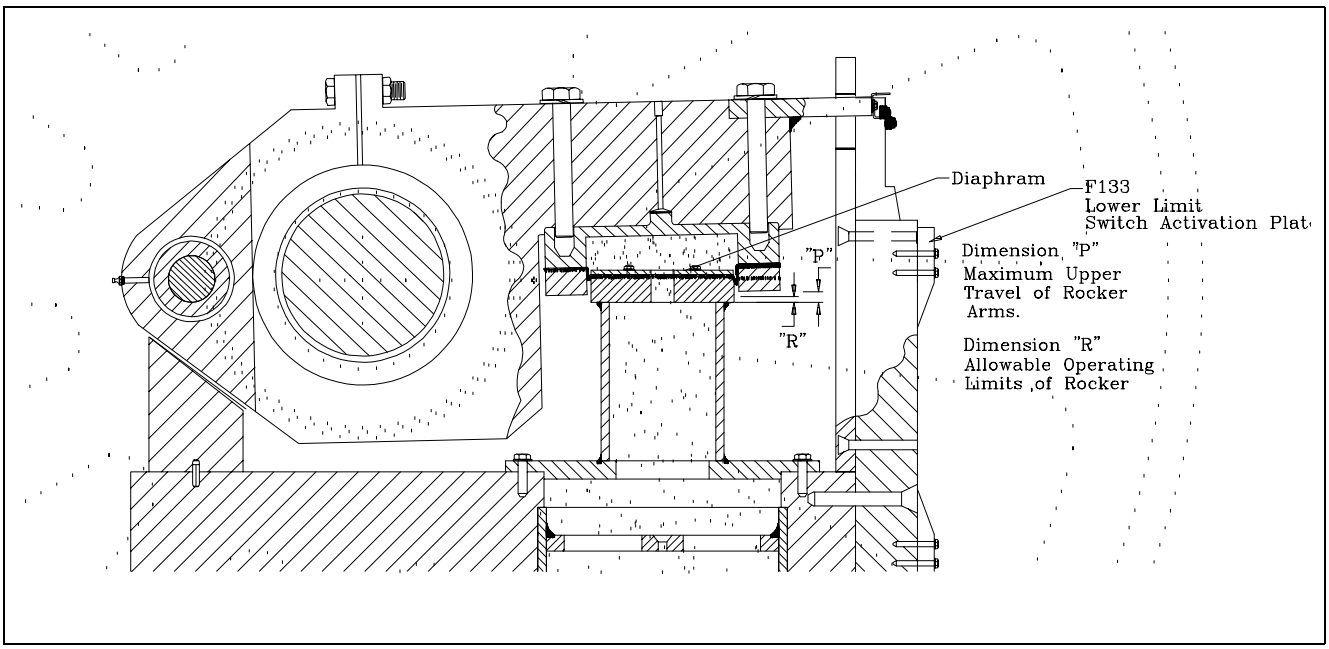


Figure 10: Maximum "UP" Travel Limit

ALIGN WHEELS AND SAW GUIDES

NOTES:

- Measurements for the following steps should be made to a tolerance of + 0.001" maximum.
- Plumb bobs must be immersed in an oil pot to permit accurate measurements to be obtained.
- Alignment of the upper and lower wheels must be done with full operating strain applied. Adjustments are done with strain removed.
- Crossline adjustments must be made with strain removed and upper wheel travel activated to reduce the friction forces on the plunger tube.
- Read the operating instructions before proceeding.

ALIGN UPPER WHEEL - PRELIMINARY

Refer to Figure 11: Preliminary Wheel Alignment

SHIPPING BRACKETS

1. Check to ensure that the **shipping brackets** (painted red) have been removed from the diaphragm cylinder.
2. Remove the upper and lower saw guide blocks, the return saw guide block (if applicable) and the sawdust shear blade.
3. Place a correctly benched saw on each bandmill and apply operating strain. The roots of the gullets should overhang the wheel rims by approximately 1/4".
4. On the inside rim of the upper wheel, drop two plumb lines -from rim to rim located to hang in front of the two machined tabs on the bandmill base and extend below the base. Fixed to the horizontal center line of the wheel, hang a plumb line on the front face of the wheel to extend below the center line of the lower wheel. Hang a fourth plumb line on the outside rim of the wheel as close as possible to the wheel hub.
5. Adjust the wheel tilt hand wheel until the wheel is perfectly perpendicular.
6. Adjust the guide pad adjusting screw (F140) until the plumb lines on the rim are exactly the same distance from the machined pads on the base.

7. Check distance between inside wheel rim and strain table. Adjust the upper arbor axially to suit.

8. Remove the plumb lines from the inside rim of the upper wheel.

9. Secure both guide pad adjusting screws (Item F140) to lock the wheel in position.

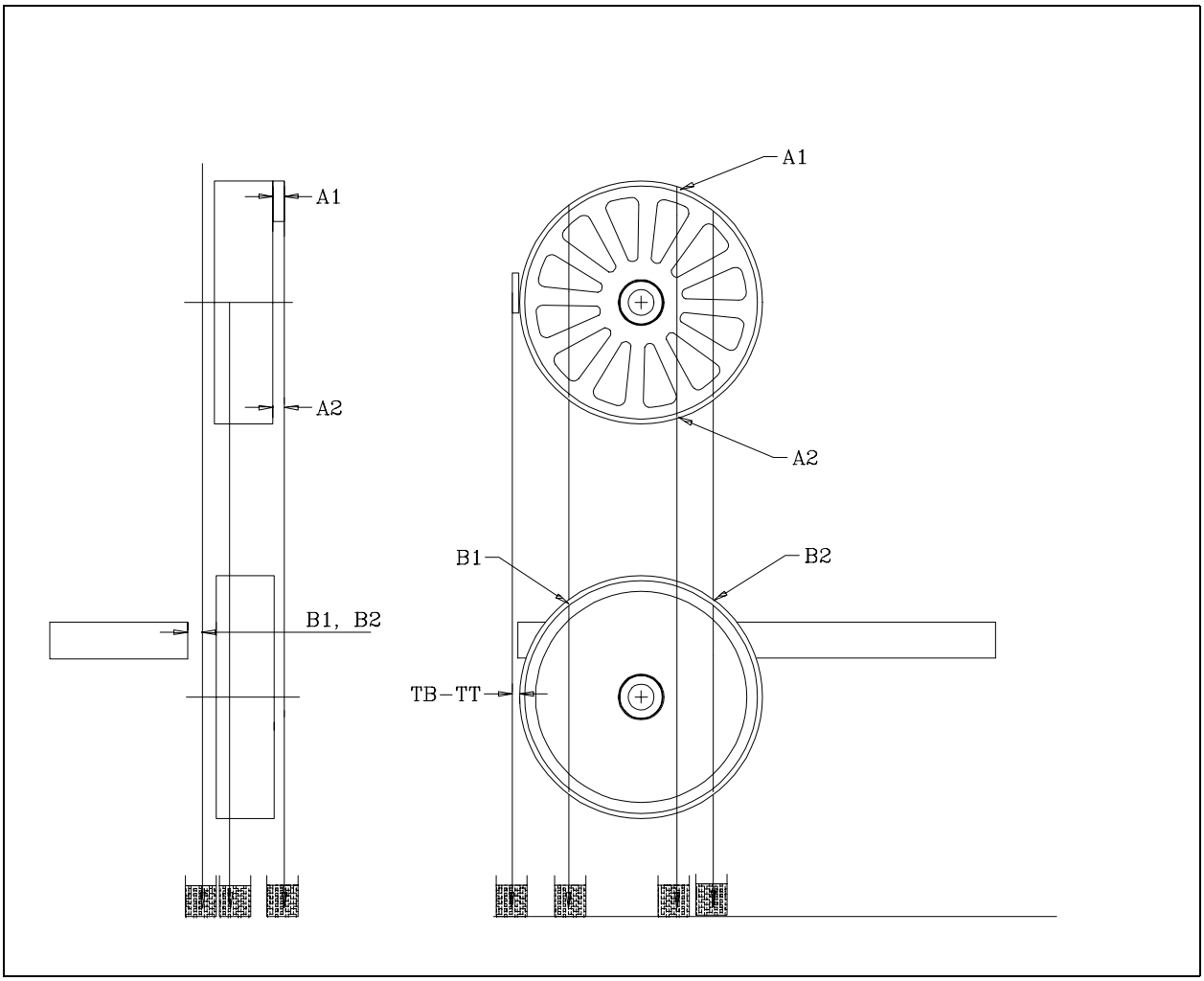


Figure 11: Preliminary Wheel Alignment

ALIGN LOWER WHEEL - PRELIMINARY

(Refer to Figure 12: Preliminary Alignment: Lower Wheel and Figure 13: Aligning Sawguides)

1. Fixed to the horizontal center line of the upper wheel, hang two plumb lines to extend below the lower rim of the lower wheel. Locate one on the rim at the front of the machine and the other on the same rim surface at the rear.

2. With the lower arbor clamp Jacking screws (A3), adjust the lower wheel until it is in the approximate location for correct saw guide pressure (Read “BANDMILL ALIGNMENT” on page 39).

3. Adjust the length of the plumb line on the outside rim of the upper wheel near the vertical center line to extend below the lower rim of the lower wheel.

4. Loosen the lower arbor clamp bolts (A4 & C23) and then adjust lower arbor adjusting screw (C50) and lower arbor clamp Jacking screws (A3) until:

   A. The inside rim is exactly the same distance from the machined pads on the base.

   B. The corresponding points on the rims, at the horizontal center lines of both wheels, are all on the EXACT same plane,

NOTE: This step is very important and should be done with extreme care so

the 'Cross Line', which is most damaging to saws, is absent.

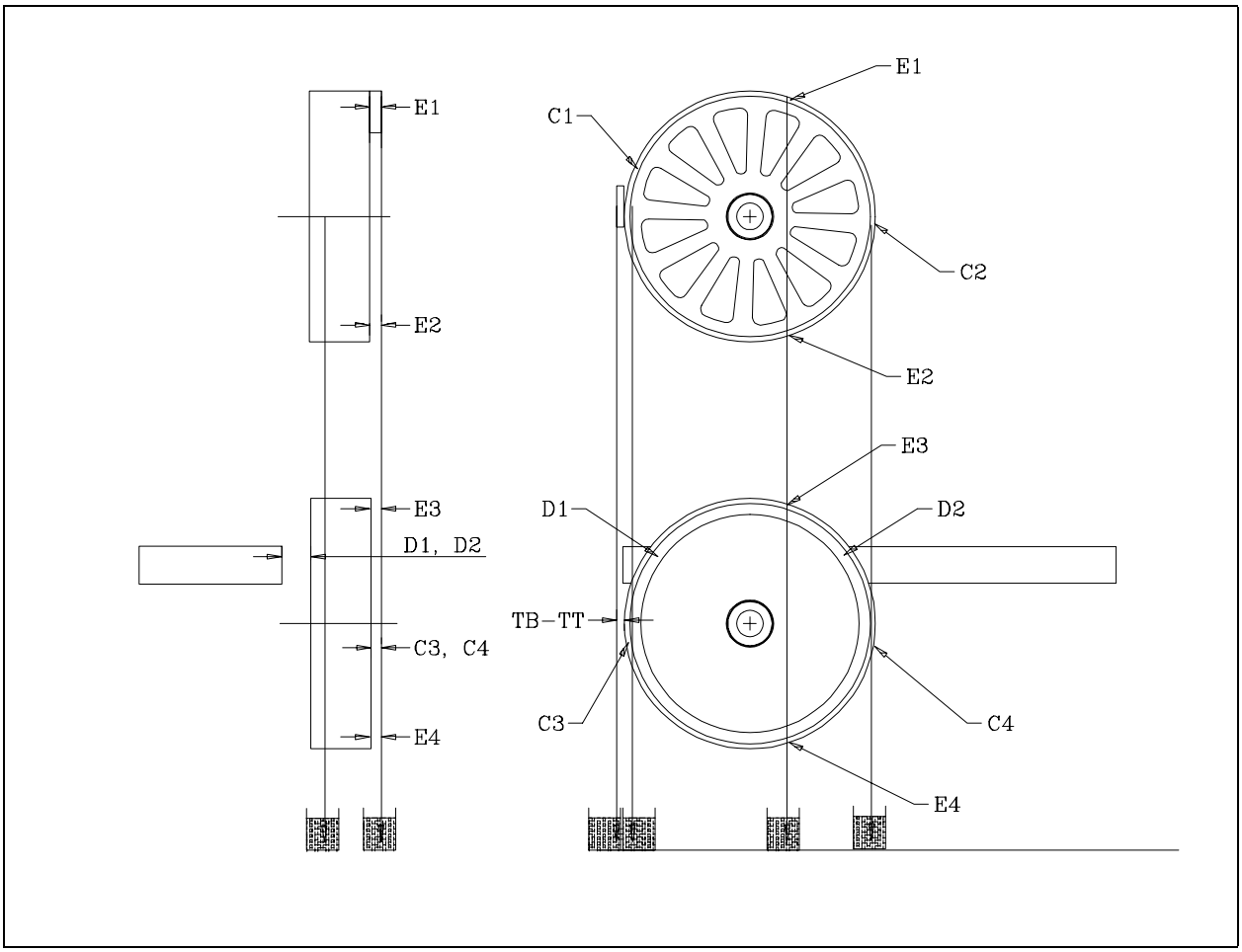


Figure 12: Preliminary Alignment: Lower Wheel

C. The location of the front face of the lower wheel is set for the correct saw guide pressure.

SAMPLE CALCULATIONS

Difference between rim nearest the bandmill centre line and the rim furthest from the bandmill centre line = 0.010"

Distance between measurement points - 60"

Distance between lower arbor clamps - 'A'

Shim required = $\frac{0.010}{60} \times A$

Bandmill Size	Dimension A
6 Ft.	4'-10"

5. Shim the lower arbor clamps nearest the wheel to bring the lower wheel plumb,

6. Remove the strain from the bandsaw.

7. Install split shims at lower arbor nearest the wheel. - The lower wheel has already been aligned square to the system. Therefore the clamp adjusting screw (Item A3) should not be adjusted.

8. Reapply the operating strain and re-check the rim dimensions for equality.

9. Secure all bolts to lock the wheel in position.

10. The upper and lower wheels should now be aligned so that:

    A. The inside rims are the same distance from the - Strain Table.

    B. The corresponding points on the rims of the upper and lower wheel are all in the EXACT same plane.

NOTE: ***This step is very important and should be done with extreme care so the "Cross Line", which is most damaging to saws, is absent.***

    C. The wheels are square to the material flow.

    D. The location of the front face of all wheels is set for correct saw guide pressure.

11. Remove all plumb lines and piano wires.

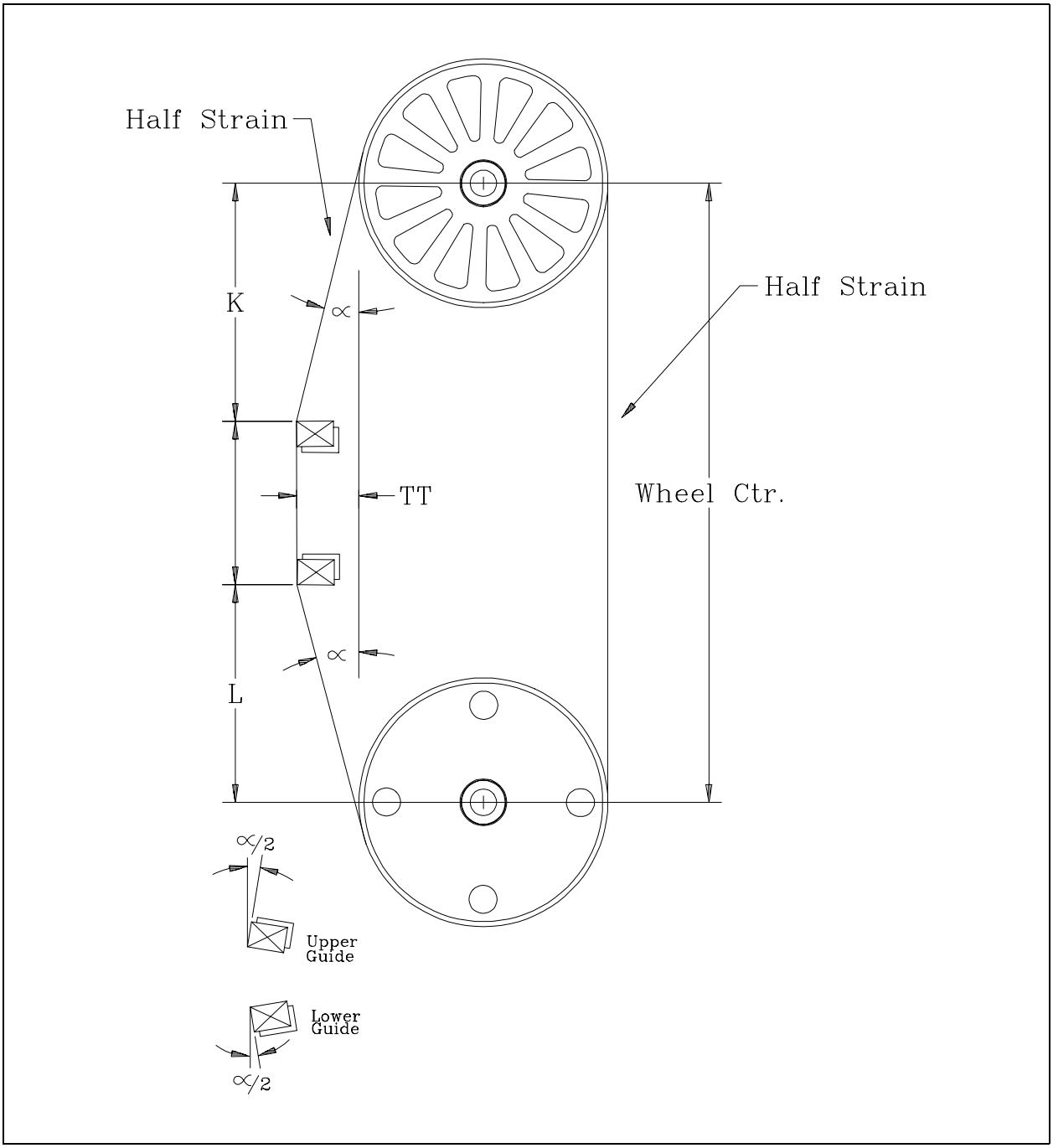


Figure 13: Aligning Sawguides

ELEVATING UPPER SAW GUIDE ASSEMBLY

Refer to Drawing Air Operated Upper Saw Guide (D-085859).

1. If applicable, bolt saw guide assembly to bandmill.

2. Shim if necessary between the saw guide frame and the bandmill column until the front surface of the slide plate is ABSOLUTELY PERPENDICULAR.

3. Ensure also that the edges of the slide plate are perpendicular.

4. Secure firmly, check alignment requirements and adjust if necessary.

READ "BANDMILL ALIGNMENT" on page 39 AND"PRESSURE SAW GUIDES" on page 41 before proceeding.

ALIGN AND SET SAW GUIDES - PRELIMINARY

(Refer to Figure 12: Preliminary Alignment: Lower Wheel, page 28).

1. Hang two plumb lines, as far apart as possible, from the front face of the upper wheel, extending below the top of the base.

2. Place a spacer of the same dimension as that allowed for pressure guides (read "PRESSURE SAW GUIDES" on page 41), at the horizontal center line of the upper wheel, between the wheel face and each plumb line.

The inside surface of the plumb lines should now represent the saw

line. See Figure 14: Aligning Saw Guides, page 32.

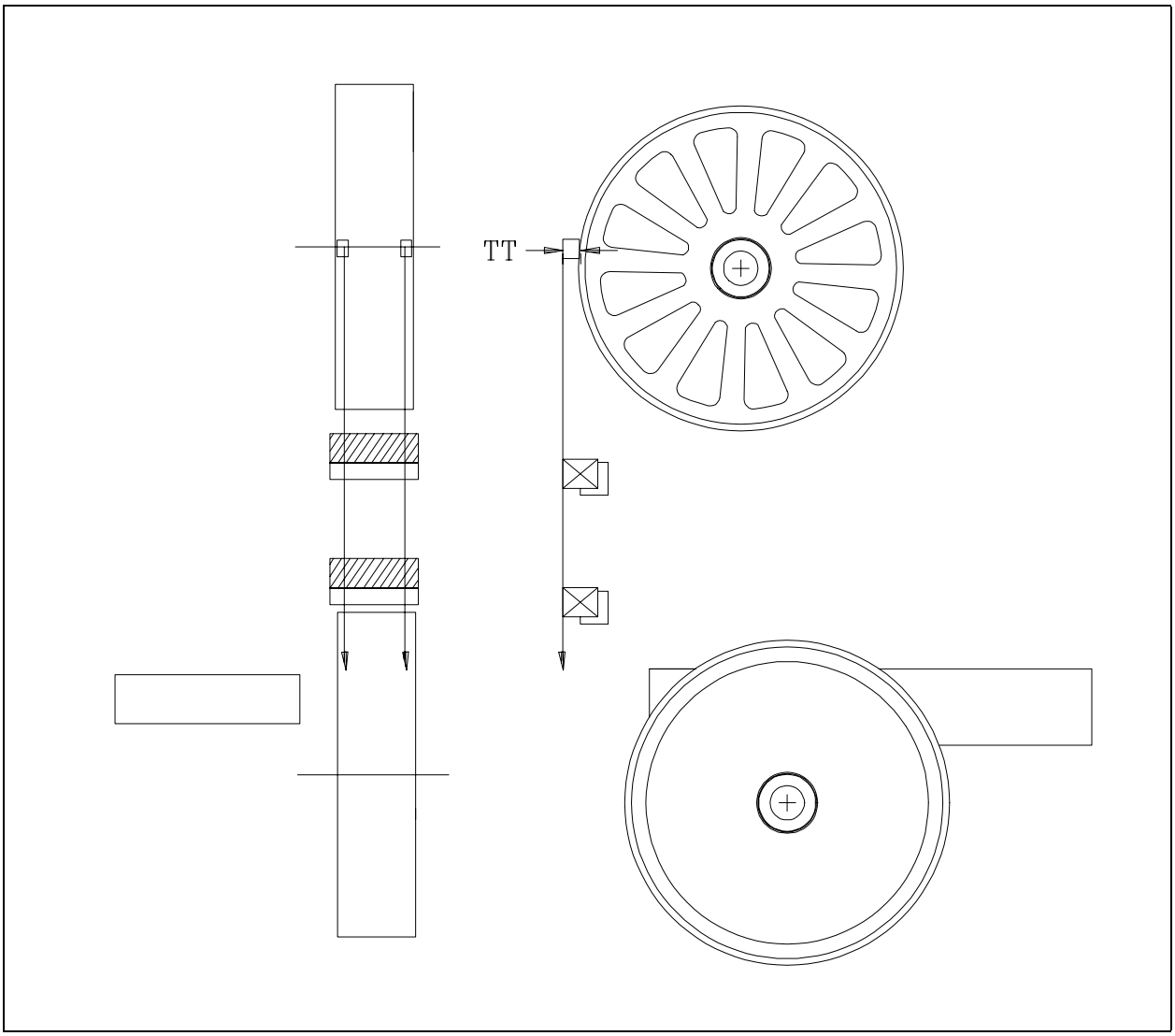


Figure 14: Aligning Saw Guides

FIXED UPPER GUIDE

1. Adjust to the designed operating elevation.

2. Fixed Upper Guide. Adjust so that the front face of the saw guide block mounting bracket is parallel to the saw line.

3. Bolt the lower saw guide support bracket to the base such that the front face is parallel to the saw line.

4. Machine or set the faces of the saw guide blocks such that they are absolutely parallel to and at 4.250" from the back surface of their respective holders.

5. Place a saw guide block assembly in each upper and lower saw guide support bracket. 'Finger' tighten the lock nuts (Item G5).

6. Back off the guide block assembly locating screws (G3, H4), so that both guides are clear of the plumb lines.

7. Adjust the locating screws (G3, H4) in the lower and upper saw guide support brackets such that the working face of the saw guide just touches each plumb line.

8. Remove all plumb lines.

9. With a saw on the wheels, apply full operating strain.

10. In the following steps the saw guide blocks are tilted very slightly moving the face of the guide block from a true vertical position. This is done to ensure total saw guide face contact with the saw. This is necessary when using pressure guides due to the slight bend created in the saw blade at the saw guides. (Refer to Figure 13: Aligning Sawguides, page 30).

LOWER SAW GUIDE

1. Adjust the guide block assembly locating screws (Item G3) such that:

   A. The saw guide block is absolutely parallel to the saw line (material flow datum line).

   B. The saw guide block is tilted to the angle $\alpha/2$.

   C. All locating screws (Item G3) are in contact with the guide block holder (Item G4).

   D. The saw blade is in contact with both edges of the saw guide block. This setting can be confirmed by tapping lightly on the blade at the edges of the saw guide blocks. A hard sound indicated contact, while a hollow sound indicates clearance.

   E. The saw blade is plumb between the guide blocks.

2. Lock the locating screws with the jam nuts provided.

3. Tighten the saw guide block assembly locking nut (Item G5)
   - **DO NOT OVERTIGHTEN** - 30 FT. LB. Torque -

4. Upper saw guide readjust the guide block assembly locating screws (Item G3) so that:

   A. The saw guide block is absolutely parallel to the saw line (material flow datum line).

   B. The saw guide block is tilted to the angle of $\alpha/2$.

   C. All locating screws (Item G3) are in contact with the guide block holder (Item G4).

   D. The saw blade is in contact with both edges of the saw guide block. This setting can be confirmed by tapping lightly on the blade at the edges of the saw guide blocks. A hard sound indicates contact while a hollow sound indicates clearance.

   E. The saw blade is plumb between the guide blocks.

5. Lock the locating screws with the dam nuts provided.

6. Tighten the saw guide block assembly locking nut (Item G5) DO NOT OVERTIGHTEN - 30 FT. LB. TORQUE.

7. Check saw guide alignment and adjust if necessary. The saw guides should be aligned as follows: -

   A. The saw guide block is absolutely parallel to the saw line (material flow datum line).

   B. The saw guide block is tilted to the angle $\alpha/2$.

   C. All locating screws (Item G3) are in contact with the saw guide block holder (Item G4).

   D. All saw guide block assembly locking nuts (Item G5) are tight **but not exceeding** - 30 ft. lb. torque.

   E. The saw blade is in contact with both edges of the saw guide block. This setting can be confirmed by tapping lightly on the blade at the edges of the saw guide blocks. A hard sound indicates contact while a hollow sound indicates clearance.

   F. Each saw guide block is the correct distance from its respective wheel. (Refer to Figure 13: Aligning Sawguides, page 30).

   G. The saw blade between the saw guides is plumb.

NOTE: ***THESE SAW GUIDE SETTINGS ARE ABSOLUTELY CRITICAL. IF CROSS LINE IS PRESENT, DAMAGE WILL RESULT TO THE SAW BLADE. IF THESE SETTINGS ARE NOT ACCURATE MIS-MANUFACTURED LUMBER WILL RESULT.***

8. Install the sawdust shear bar (Item K1) and adjust to clear the saw blade by 0.005" to O.O10".

9. Remove all plumb lines and piano wires.

NOTE: ***The following steps only apply if a return saw guide is provided for the non-cutting side of the saw blade. If no return saw guide is provided, proceed to "AIR OPERATED UPPER SAW GUIDE D-085859" on page 37.***

10. Measure with inside micrometer and set the saw guide locating screws (Item G3) to 4.125".

11. Remove the strain from the bandsaw.

12. Place a saw guide block assembly in the saw guide support bracket. 'Finger' tighten the lock nut.

13. Re-apply the operating strain.

14. Check saw guide alignment and adjust if necessary.
    The saw guide block should be aligned as follows:

    A. The saw guide block is level.

    B. The saw blade is in contact with both edges of the saw guide block.

    C. All locating screws (Item G3) are in contact with the saw guide block holder (Item G4).

15. Lock the locating screws with the Jam nuts provided.

16. Tighten the saw guide block assembly locking nuts
    (Item G5) **DO NOT OVERTIGHTEN** - 30 FT. LB. TORQUE

AIR OPERATED UPPER SAW GUIDE D-085859

COMPLETE THESE ITEMS BEFORE PROCEEDING

1. Complete installation of all equipment to the bandmill base.

2. Install bandmill guard.

3. Complete installation of main drive motor and drive belts, bringing the drive-belts to the proper tension.

4. Install drive guard.

5. Add the lubricating oil to the upper and lower wheel bearings and chipper arbor bearings as called for in the maintenance instructions See “LUBRICATION” on page 3-2..

   Make sure adequate amounts of oil are placed in Chipper Arbor Housing. It must have time to work its way through the rear bearings (about 20 minutes) before oil level can be determined. DON’T RUSH THIS JOB.

6. Lubricate all other points as called for in the Maintenance Instructions.

7. Install the upper and lower wheel scrapers. Fit upper scraper after wheel has been tilted to operating position.

8. Connect the filtered water supply to the upper saw guide and both wheel scraper spray units,

   NOTE: A small inexpensive 1/4 turn valve is required for Volume Control at each point, usually mounted on the side of the column.

9. Prepare the pneumatic source for the air strain reservoir. **DO NOT** connect at this time.

10. Complete all electrical installation.

11. Setworks if applicable may be installed at this time as well as any other accessories.

    NOTE: Read theSetworks manual before installing any Setworks components

12. In some cases, it is advantageous to complete the alignment of the adjacent material feed equipment at this time, in that more positive reference surfaces will then be available for the final saw guide adjustments.

13. Connect and flush all hydraulic system. Refer to power pack manufacturers manuals.

14. Complete all pneumatic installations.

15. Adjust the mechanical stops between bandmills.

BANDMILL ALIGNMENT

FINAL ALIGNMENT AND ADJUSTMENTS

NOTE: READ OPERATING INSTRUCTIONS BEFORE PROCEEDING

WHEELS, GUIDES, SHEAR AND SCRAPERS

There is a varied selection of methods and tools which if applied with care will result in a satisfactory installation.

A. **Bandmill/Carriage** - a dial indicator can be fixed to the carriage via a temporary bracket and each Saw Guide alignment checked by rolling the carriage back and forth.

B. **Bandmill/Log Feed Chain** - Micrometer readings between the lower Saw Guide face and the ground edge surface of the chainway.

C. **Bandmill/Linebar** - Micrometer reading between the saw blade and an extension of the linebar face, -will assist in attaining lineal as well as vertical alignment.

D. **Saw Blade to Linebar Gauge** - This instrument, incorporating a dial indicator, quickly and accurately measures the comparative distance from the saw blade, at any point along the front or back edge, to the linebar face.

E. **A precision level** used in conjunction With a precision square can be used to check the vertical alignment of the saw blade. Another alternative is the use of plumb lines. Both of these procedures are awkward and time consuming.

F. **Electric Micrometer** - Consists of an inside micrometer modified for use in conjunction with ear phones. This instrument is most useful when measuring accurately to a flexible reference such as a tight wire datum.

G. **Pressure Guide Calibration Gauge**.- This instrument incorporates a precision level. It may be used to obtain the desired applied force between the bandsaw and the saw guide in initial installations or to determine the applied force in an existing installation. It may also be used to set the saw guides at the correct angle.

H. **Spider** - This tool consists basically of four fixed reference points set on the exact same plane. It is used to check the saw blade to see if cross line exists between the upper and lower saw guides. A precision level is incorporated into this tool to allow the vertical plumb of the saw blade between the upper and lower saw guides to be checked.

1. With a saw blade in place apply the recommended start-up strain.

NOTE: LEAVE STRAIN APPLIED THROUGHOUT THIS ITEM.

2. While turning the mill over by hand, tilt the upper wheel so the saw blade is tracking properly. The roots of the gullets should overhang the wheel rims by approximately 1/4".

NOTE: BEFORE PROCEEDING, BE SURE THAT ALL WHEEL BEARINGS HAVE BEEN PROPERLY LUBRICATED - SEE MAINTENANCE SECTION ITEM 1.

3. Turn the water on to the saw guide spray units (H53) and the wheel scraper spray units and adjust to the proper volume.

4. Jog the main drive motor and closely observe the tracking of the saw. Make corrections by tilting the upper wheel.

5. Allow the Bandmill to accelerate to approximately half speed while observing the tracking of the saw. Correct tracking if necessary, then allow Bandmill to come to rest.

6. Accelerate Bandsaw to full speed while observing the - tracking of the saw. Correct tracking if necessary, then allow Bandmill to come to rest.

7. Adjust both wheel scraper blades (Item L5) if necessary to where they are in full contact across the wheel faces.

8. A nominal amount of filing may be required to the scraper blades whereby the LEADING edge is in contact with the wheel with a minimum clearance angle.

9. Adjust the location of both wheel scraper blades counter- weight (L3) such that a minimum force exists between the blade and wheel ant yet it is sufficient to eliminate chatter.

PRESSURE SAW GUIDES

Refer to “Aligning Saw Guides” on page 32 & “Force Diagram and Sine Bar Instrument” on page 41.

1. In order to obtain a horizontal force against the saw blade, for greater sawing stability, the saw guide blocks are offset in front of the front face of the wheels.

NOTE:

A. The upper wheel is fixed. Therefore the guides are moved out relative to the upper wheel to attain guide pressure.

B. Guide pressure P remains constant although the strain may vary. Therefore the saw line position relative to the machined reference on the bandmill base changes as the strain is changed.

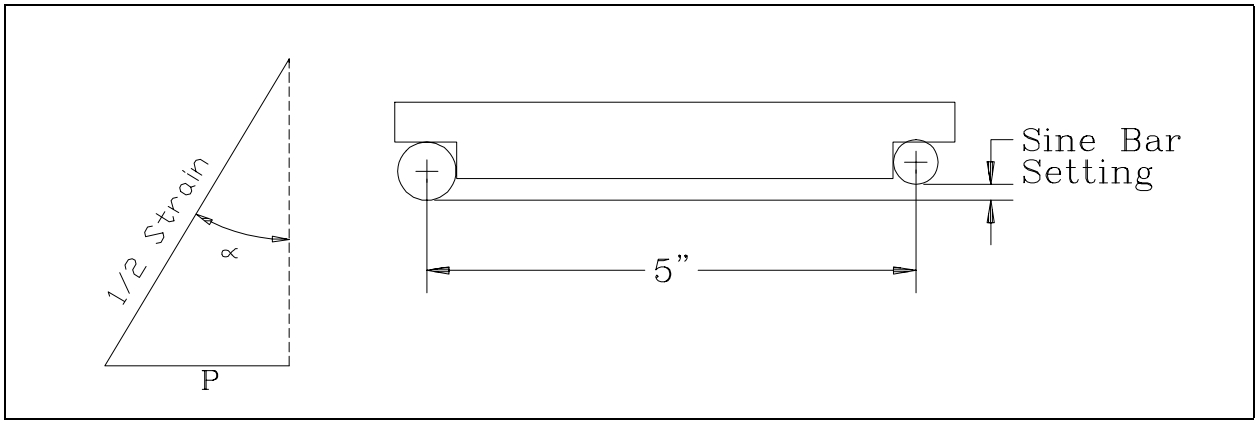


Figure 15: Force Diagram and Sine Bar Instrument

2. **DIMENSION TT** is the distance that the upper saw guide is set set off from the front face of the wheels in order to obtain the desired HORIZONTAL FORCE against the saw guide.

TO CALCULATE DIMENSIONS 'TT'

1. Determine 1/2 Strain - Divide by two, the amount of strain at which the bandmill will be operated.

2. Determine 'P' (Pressure) - The horizontal force applied against the Saw Guide Block.

A reasonable variation of this value is acceptable and will occur whenever the bandmill operating strain is altered and/or Dimension 'K' is changed after final alignment procedures have been completed.

A. The suggested values listed below may be varied to suit the individual application.

BANDMILL SIZE	'P'
6'	110 lbs.

Figure 16: Pressure “P” Force

3. Determine 'F' (Function) - A common function is established by dividing-' P' by 1/2 Strain.

4. UPPER SAW GUIDE OFFSET

   A. Determine Dimension 'K' - The vertical distance from `- the horizontal centre line of the upper wheel, down to the upper saw guide. (Use the average for a movable upper guide.)

   B. Dimension 'TT' = Function 'P' x Dimension 'K'

5. LOWER WHEEL OFFSET

   A. Determine Dimension 'L' - The vertical distance from the horizontal centre line of the lower wheel up to the lower saw guide.

6. EXAMPLE

   A. $\frac{1}{2}Strain = \frac{18000}{2} = 9000lbs$

   B. 'P' (Pressure) = 90 lbs.

   C. $F(Function) = \frac{P}{\frac{1}{2}Strain} = \frac{90}{9000} = 0.010$

7. UPPER WHEEL OFFSET

   A. 'K' = 36"

   B. Dimension 'TT' - 'F' x 'K' = 10 x 36" = .360" = Approx. 23/64"

8. LOWER WHEEL OFFSET

   A. 'L' = 44"

   B. Dimension 'TB' = 'F' x 'L' = .010 x 44" = .440" = Approx. 7/16"

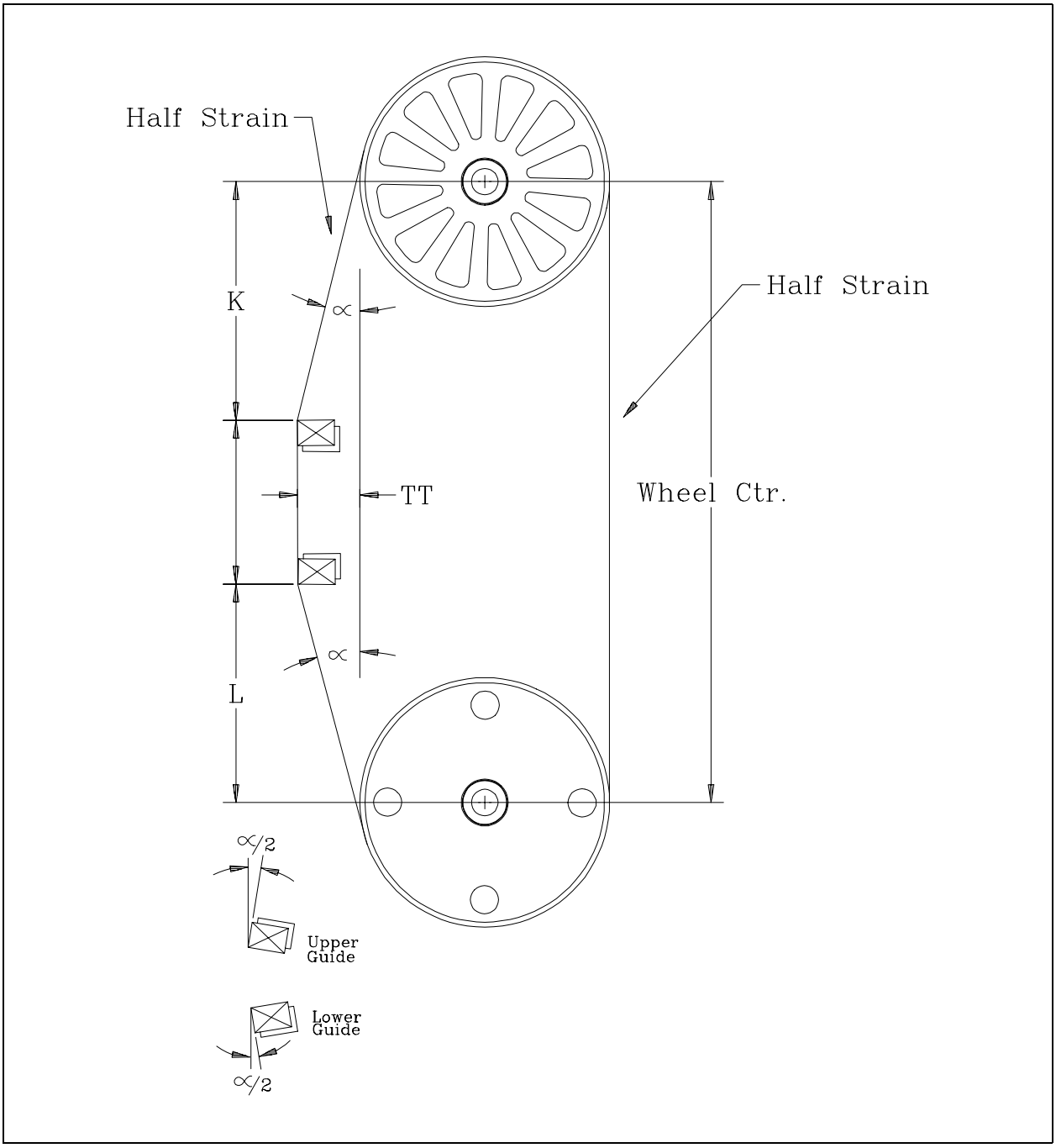


Figure 17: Saw Guides Setting Illustrated

USE OF THE PRESSURE GUIDE CALIBRATION GAUGE

See “Force Diagram and Sine Bar Instrument” on page 2-41..

1. This instrument may be used to obtain the desired horizontal force on the saw guide block in initial installations or to determine the horizontal force in an existing installation. The device is a combination of a precision level and a 5 inch Sine Bar.

2. This instrument may also be used to obtain the desired saw guide block tilt setting to facilitate full contact with the saw blade.

EXAMPLE CALCULATION FOR HORIZONTAL FORCE

1. 1/2 Strain = 18,000 lbs / 2 = 9,000 lbs.

2. 'P' (Pressure) = 90 lbs.

3. Sin α = 90 / 9000 = 0.010

4. Sine Bar Setting = 5 x Sin α = 5 x 0.010 = 0.050"

Place the square position of the instrument against the saw blade and adjust saw guides until the instrument is level. This will now provide the correct horizontal force on the saw guide for the strain being used.

EXAMPLE CALCULATION FOR EXISTING HORIZONTAL FORCE

1. Place the square portion of the instrument against the saw blade and adjust the sine bar.until the instrument is level.

2. Measure the sine bar setting i.e. 0.050"

3. Determine 1/2 strain i.e. 9,000 lbs.

4. P (Pressure) = Sine Bar Setting / 5 x 1/2 Strain
   = 0.050 / 5 x 9,000 lbs. = 90 lbs.

EXAMPLE CALCULATION OF TILT ANGLE OF SAW GUIDE BLOCK

1. The correct tilt angle for the saw guide block is α of /2.

2. Sin $\alpha/2 = \frac{P}{\frac{1}{2}Strain} \times 1/2$

   using figures from Item 7.7c

   Sin $\alpha/2 = \frac{90}{90000} = 1/2 = 0.005$

3. Sine Bar Setting = 5 x Sin α/2 = 5 x 0.005" = 0.025"

4. Place the square portion of the instrument against ' the saw guide block, or an extension of the guide face, and adjust saw guide block assembly locating screws until the instrument is level. This will now provide the correct tilt angle for the saw guide blocks for the strain being used.

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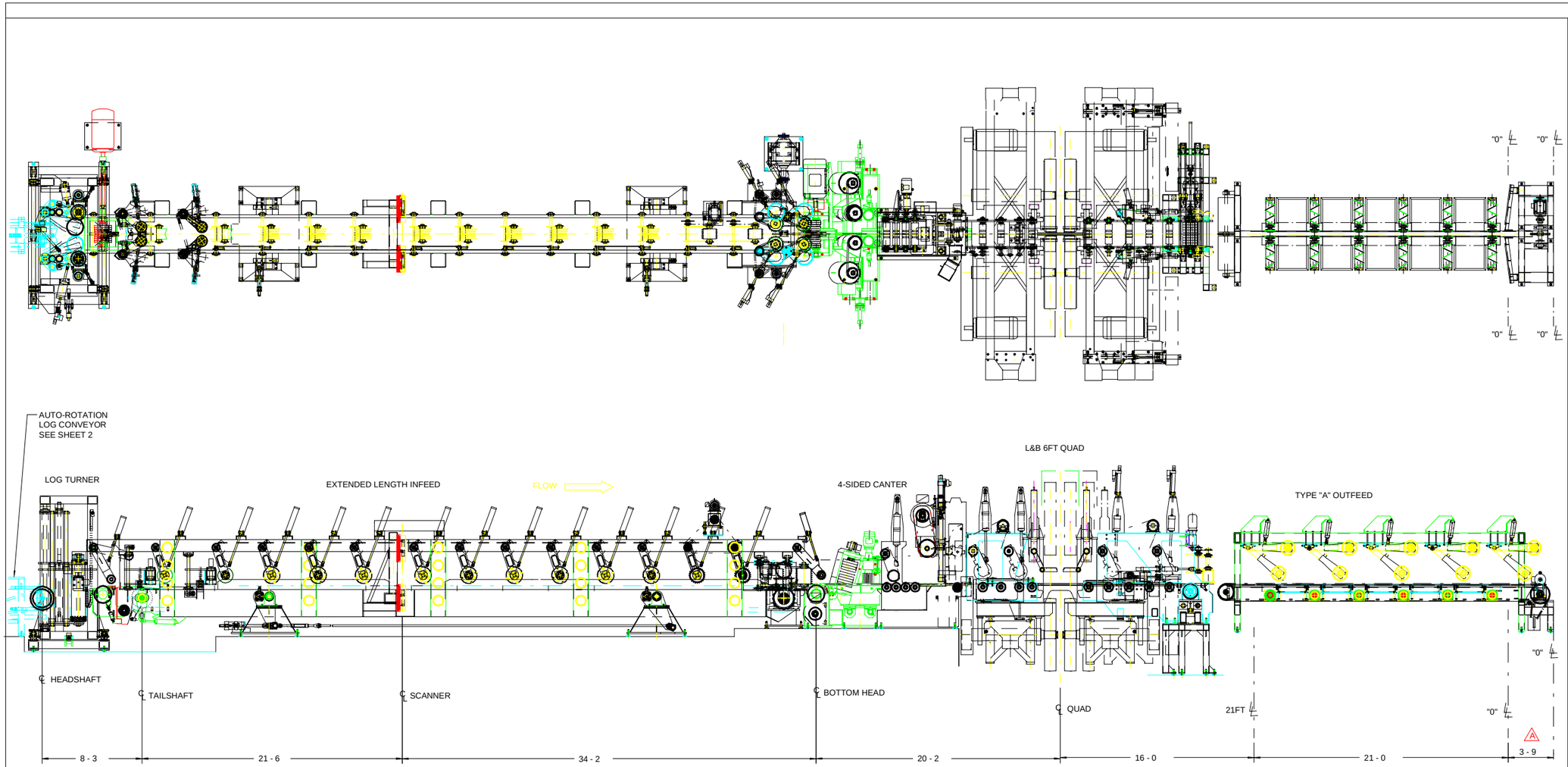


REV.	CHANGE	DATE
A	REVISE TYPE A OUTFEED	PS 26-Aug-97

FROM ASS'Y DRAWING NO.

LIMITS UNLESS NOTED

	MACH.	FAB.
FRACT.	± 1/64	± 1/16
DEC.	± .005	

USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON

SHEET 1 OF 2

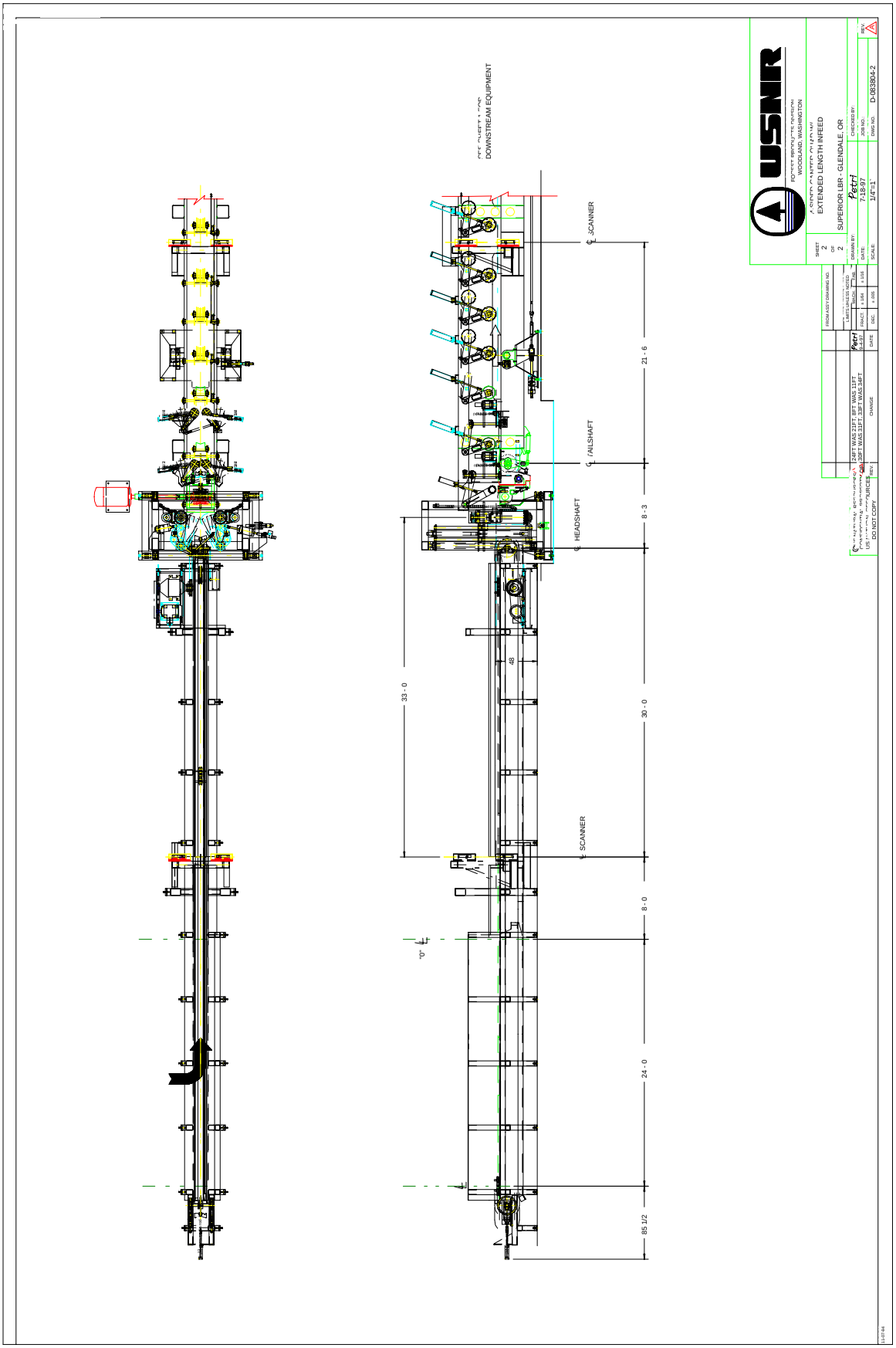
4-SIDED CANTER QUAD W/
EXTENDED LENGTH INFEED

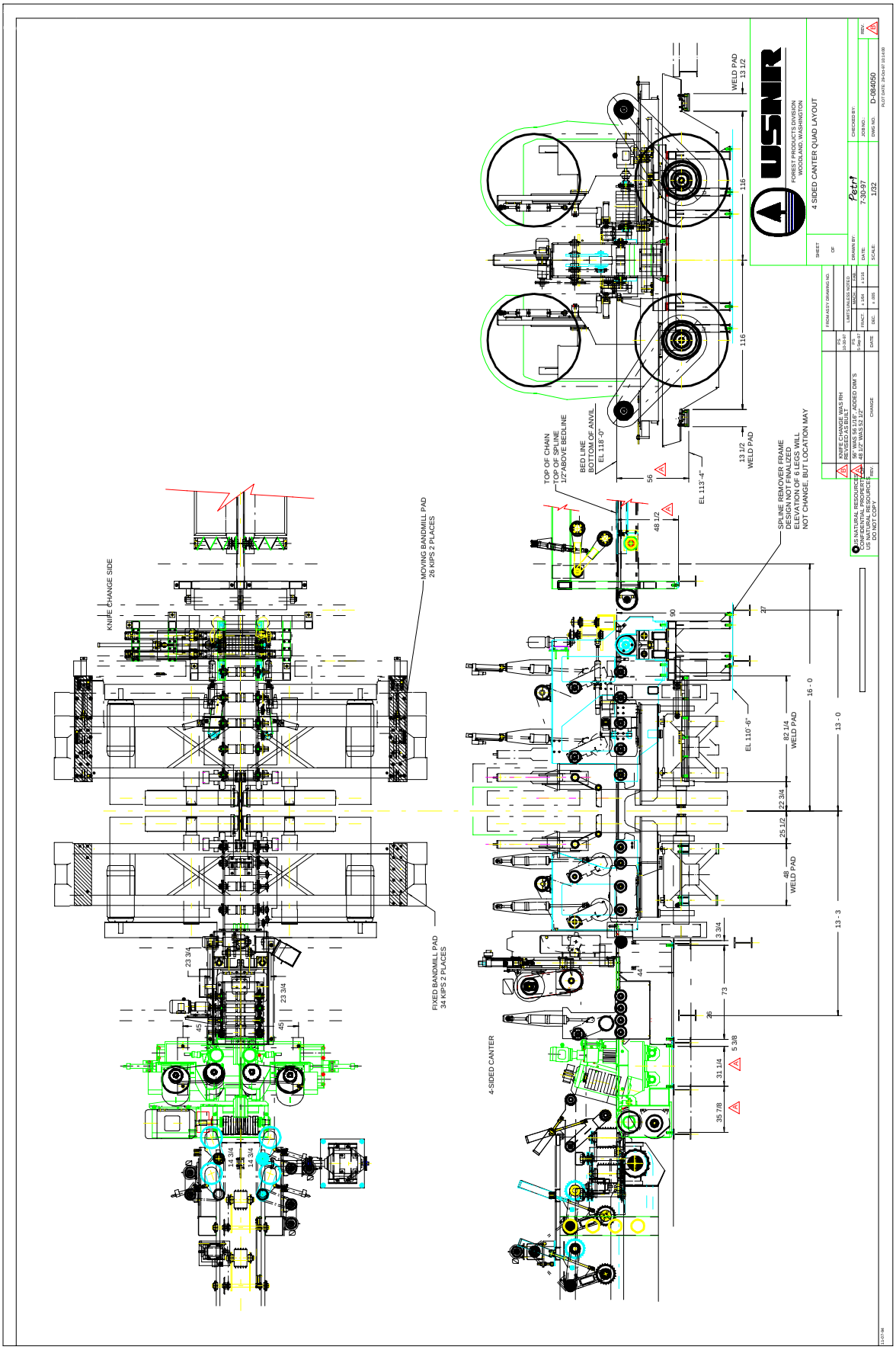
SUPERIOR LBR - GLENDALE, OR

DRAWN BY:	Petri
DATE:	7-18-97
SCALE:	1/4"=1`
CHECKED BY:	
JOB NO.:	
DWG NO.	D-083804-1
REV.	A

11-07-94

PLOT DATE: 26-Aug-97 9:08:35


DOWNSTREAM EQUIPMENT
SCANNER
TAILSHAFT
HEADSHAFT
SCANNER
21 - 6
8 - 3
30 - 0
8 - 0
24 - 0
85 1/2
33 - 0
48
"0"
USNR
EXTENDED LENGTH INFEED
SUPERIOR LBR - GLENDALE, OR
Petri
7-18-97
1/4"=1'
D-083804-2
SHEET 2 OF 2


USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON
4 SIDED CANTER QUAD LAYOUT
D-084050
7-30-97
1/32
WELD PAD
13 1/2
116
TOP OF CHAIN
DON'T COLLIDE
12" ABOVE BEDLINE
BED LINE
BOTTOM OF ANVIL
EL 118'-0"
EL 113'-4"
56
48 1/2
SPLINE REMOVER FRAME
DESIGN NOT FINALIZED
ELEVATION OF 6 LEGS WILL
NOT CHANGE. BUT LOCATION MAY
KNIFE CHANGE SIDE
MOVING BANDMILL PAD
26 KIPS 2 PLACES
FIXED BANDMILL PAD
34 KIPS 2 PLACES
23 3/4
45
14 3/4
4-SIDED CANTER
EL 110'-6"
82 1/4
WELD PAD
16 - 0
13 - 0
13 - 3
25 1/2
22 3/4
48
3 3/4
73
26
5 38
31 1/4
35 7/8
27
90

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SUB-BASE ASSEMBLY DRAWING D-085401

Drawing Sub-Base Assembly (D-085401)

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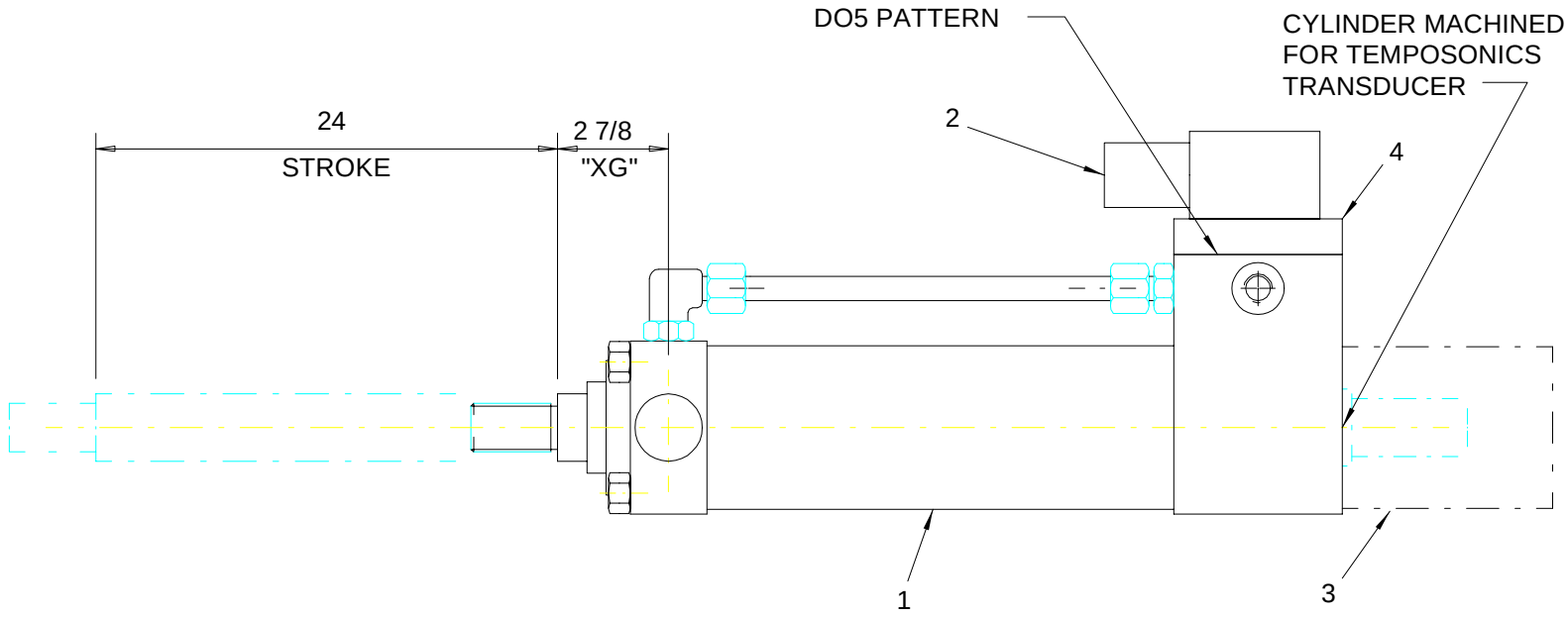
LIMITS UNLESS NOTED		
	MACH.	FAB.
FRACT.	± 1/64	± 1/16
DEC.	± .005	

ITEM	QTY	DESCRIPTION	DWG-P/N
1	1	3 1/4"ø BORE X 24"STR. ATLAS LP CYLINDER PER DWG.# A-085602	C2-01571
2	1	ATCHLEY SERVO VALVE #242-107	B4-00101
3	1	TRANSDUCER COVER	B-044961
4	1	ADAPTER PLATE TO MOUNT ATCHLEY 242 VALVE ON A DO5 PATTERN (COY AT SAS FLUID POWER)	B4-00860



REV.	REVISION	DATE

FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON

LINEAR POSITIONER CYLINDER ASSY.

DRAWN BY: JOE CARTER	DATE: SEPT 97	JOB NO.:
SCALE:	DWG NO.	A-085601

10-20-94

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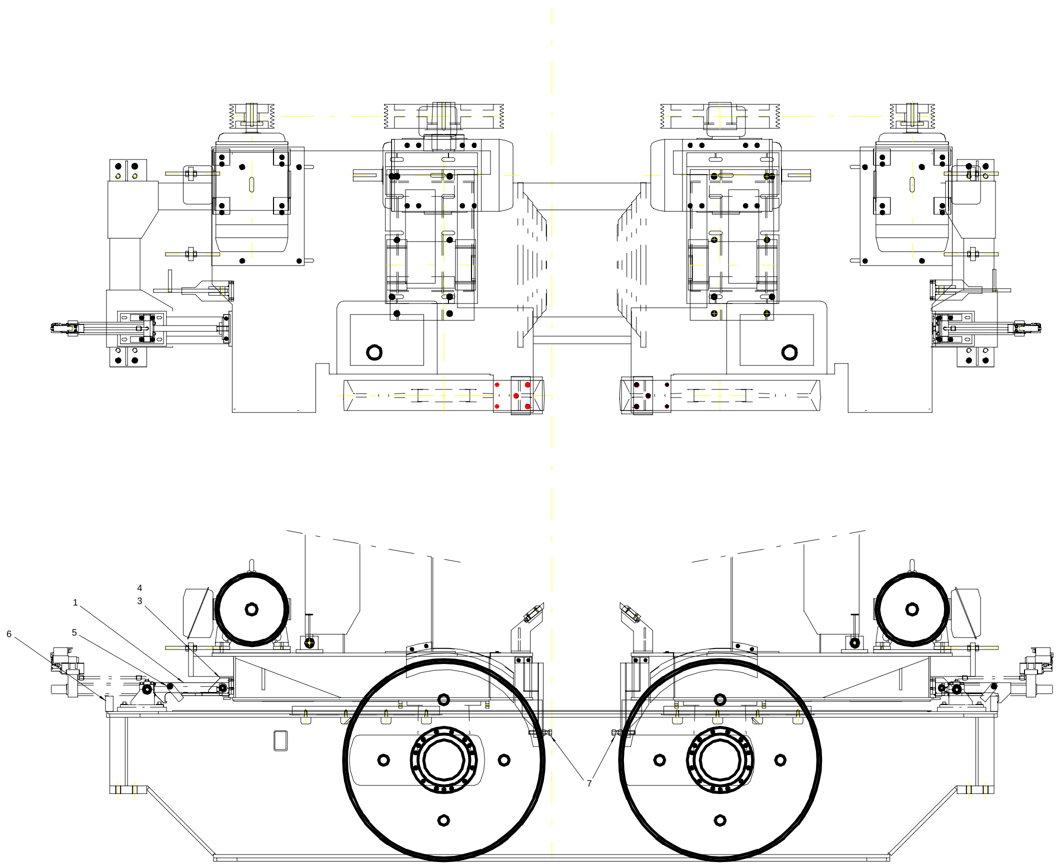
ITEM	QTY	DESCRIPTION	DWG-P/N
1	1	STOP HOOK	B-082792-L
2	1	STOP HOOK	B-082792-R
3	2	MOUNTING BRACKET	B-28099
4	2	COMPANION PLATE	A-28098
5	2	TOGGLE BAR	A-28094
6	2	PL 2" X 4 X 4	T-082791-6
7	2	MECHANICAL STOP	B-080974



3121
D-082791

USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON

SHEET
OF

MECHANICAL STOP ASSEMBLY
5 FT. BANDMILL
-
-

FROM ASS'Y DRAWING NO.

LIMITS UNLESS NOTED

	MACH.	FAB.
FRACT.	± 1/64	± 1/16
DEC.	± .005	

REV.	CHANGE	DATE

DRAWN BY: BILL
CHECKED BY:
DATE: 13-Jun-97
JOB NO.:
REV.
SCALE: 1/16" = 1"
DWG NO. D-082791
PLOT DATE: 18-Jun-97 9:56:59

11-07-94

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LOWER WHEEL GRINDER ASSEMBLY D-412-6192-2

Drawing Lower Wheel Grinder Assembly (D-412-6192-2)

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UPPER WHEEL GRINDER ASSEMBLY D-412-6195-8

Drawing Upper Wheel Grinder Assembly (D-412-6195-8)

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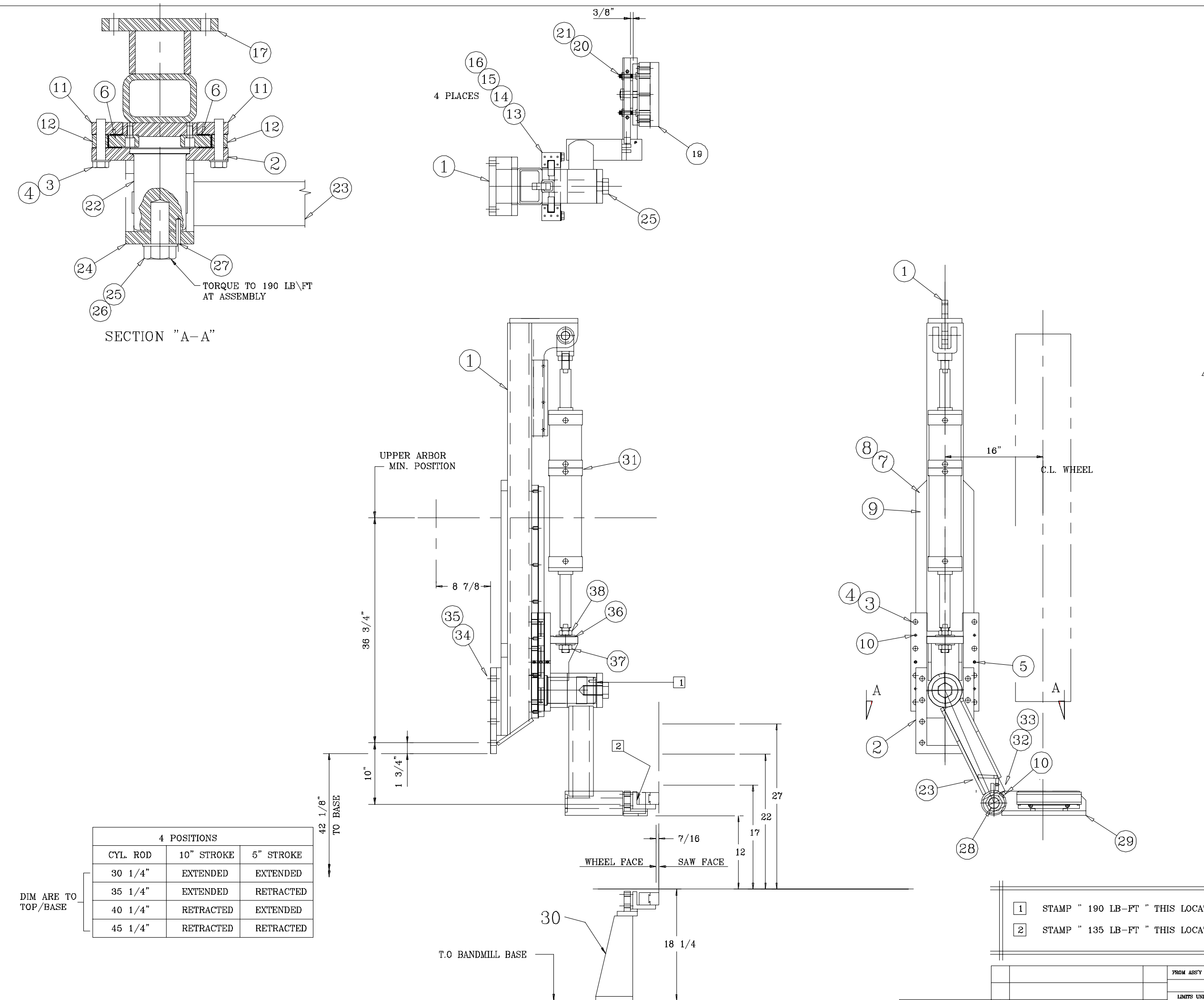

ITEM	QTY	BILL OF MATERIALS DESCRIPTION	DWG NO
1	1	SLIDE SUPPORT	D-086303
2	1	UPPER SAW GUIDE SLIDE PLATE	D-082011
3	8	3/4-10 NC HHCS X 3 1/2"	J2-00444
4	8	3/4" ID FLATWASHER	J2-00090
5	6	SPRING PIN 3/8" X 3"	J2-01295
6	2	UPPER SAW GUIDE RAIL	B-078499
7	14	1/2-13NC SOC HD CAP SCREW X 1"	J2-00162
8	14	1/2" ID SPRING LOCKWASHER	J2-00074
9	8	SPRING PIN 3/8" X 1 1/2"	J2-01293
10	4	1/8" NPT GREASE FITTING	D2-00138
11	2	UPPER SAW GUIDE RETAINER	B-078498
12	2	UPPER SAW GUIDE SPACER	B-078497
13	4	UPPER SLIDE WIPER FELT	A-082254
14	4	UPPPER SLIDE WIPER RETAINING PLATE	296-7518
15	20	1/4-20NC HHCS X 3/4"	J2-00290
16	20	1/4" ID SPRING LOCKWASHER	J2-00080
17	1	CYLINDER HEAD WEAR PLATE	A-082470
18	3	3/8-16NC FHCS X 1 1/4"	J2-00602
19	REF	GUIDE BLOCK ASSEMBLY	411-5691
20	4	ADJ GUIDE SET SCREW	308-1090
21	4	5/8-11NC HEX JAM NUT	J2-00050
22	1	HANGER PIN	B-082059
23	1	PIVOT ARM	D-085965
24	1	HANGER WASHER	411-5377
25	1	1 1/2-12NF HHCS X 3 1/4"	J2-01294
26	1	PLATE FLATWASHER 1 1/2"	J2-00705
27	1	3/8" SPRING PIN X 2"	J2-00329
28 (A)	1	SHOULDER PIN	B-087149
29	1	UPPER SAWGUIDE BRACKET	412-6551
30	1	LOWER SAWGUIDE	C-086271
31	1	ATLAS TANDEM 5"ø x 5" & 10" STK'	B-085849
32	1	3/8-16NC SQ HD SET SCR. X 1 1/2"	J2-00670
33	1	3/8-16NC HEX NUT	J2-00085
34	8	3/4-10NC HHCS X 2"	J2-00438
35	8	3/4" ID LOCKWASHER	J2-00090
36	2	1 1/4" ID SPRING DISK	P2-00497
37	1	1 1/4-12NF ESNA NUT HEAVY	J2-01267
38	2	1 1/4-12NF HEX JAM NUT	J2-00662

DIM ARE TO TOP/BASE

4 POSITIONS		
CYL. ROD	10" STROKE	5" STROKE
30 1/4"	EXTENDED	EXTENDED
35 1/4"	EXTENDED	RETRACTED
40 1/4"	RETRACTED	EXTENDED
45 1/4"	RETRACTED	RETRACTED

1 STAMP " 190 LB-FT " THIS LOCATION

2 STAMP " 135 LB-FT " THIS LOCATION

LEFT HAND SAWGUIDE DWG D-085859-L
RIGHT HAND SAWGUIDE OPP D-085859-R

LEFT HAND SAWGUIDE SHOWN
HANDED BY ITEM (23) & (29)

USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON

SHEET OF

AIR OPERATED UPPER SAW GUIDE
6' BANDMILL L.H. ASSEMBLY
4 POSITION,4 SIDED CANTER

REV.	CHANGE	DATE
A	REVISE ITEM 28	PS 19-Nov-97

FROM ASS'Y DRAWING NO.

LIMITS UNLESS NOTED	MACH.	FAB.
FRACT.	± 1/64	± 1/16
DEC.	± .005	

DRAWN BY: JOE CARTER
CHECKED BY:
DATE: OCT 97
JOB NO.:
SCALE:
DWG NO. D-085859
REV. A

REF DWG D-078494

PLOT DATE: 9-Oct-97 14:43:43

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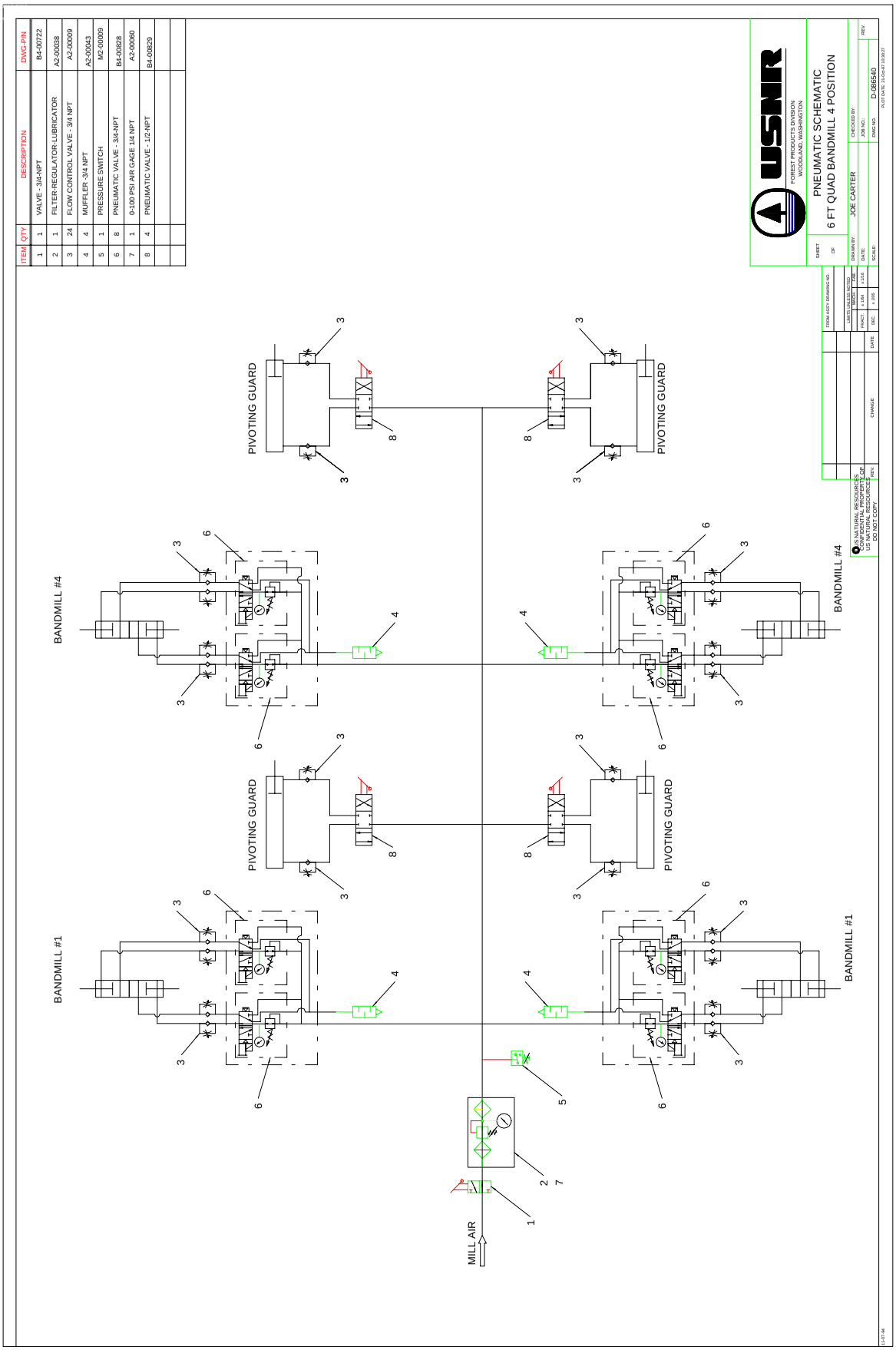
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3 24 FLOW CONTROL VALVE - 3/4 NPT A2-00009
4 4 MUFFLER -3/4 NPT A2-00043
5 1 PRESSURE SWITCH M2-00009
6 8 PNEUMATIC VALVE - 3/4-NPT B4-00828
7 1 0-100 PSI AIR GAGE 1/4 NPT A2-00060
8 4 PNEUMATIC VALVE - 1/2-NPT B4-00829
USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON
PNEUMATIC SCHEMATIC
6 FT QUAD BANDMILL 4 POSITION
JOE CARTER
D-086540
PIVOTING GUARD
BANDMILL #4
BANDMILL #1
MILL AIR

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LOWER SAW GUIDE ASSEMBLY 200935

Drawing Lower Saw Guide Assembly (200935)

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SAWDUST SHEAR AND LOWER SAWGUIDE C 412 6183-5

Drawing Sawdust Shear & Lower Sawguide (C 412 6183-5)

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LOWER WHEEL SCRAPER ASSY A1 412 6177-4

Drawing Lower Wheel Scraper Assy (A1 412 6177-4)

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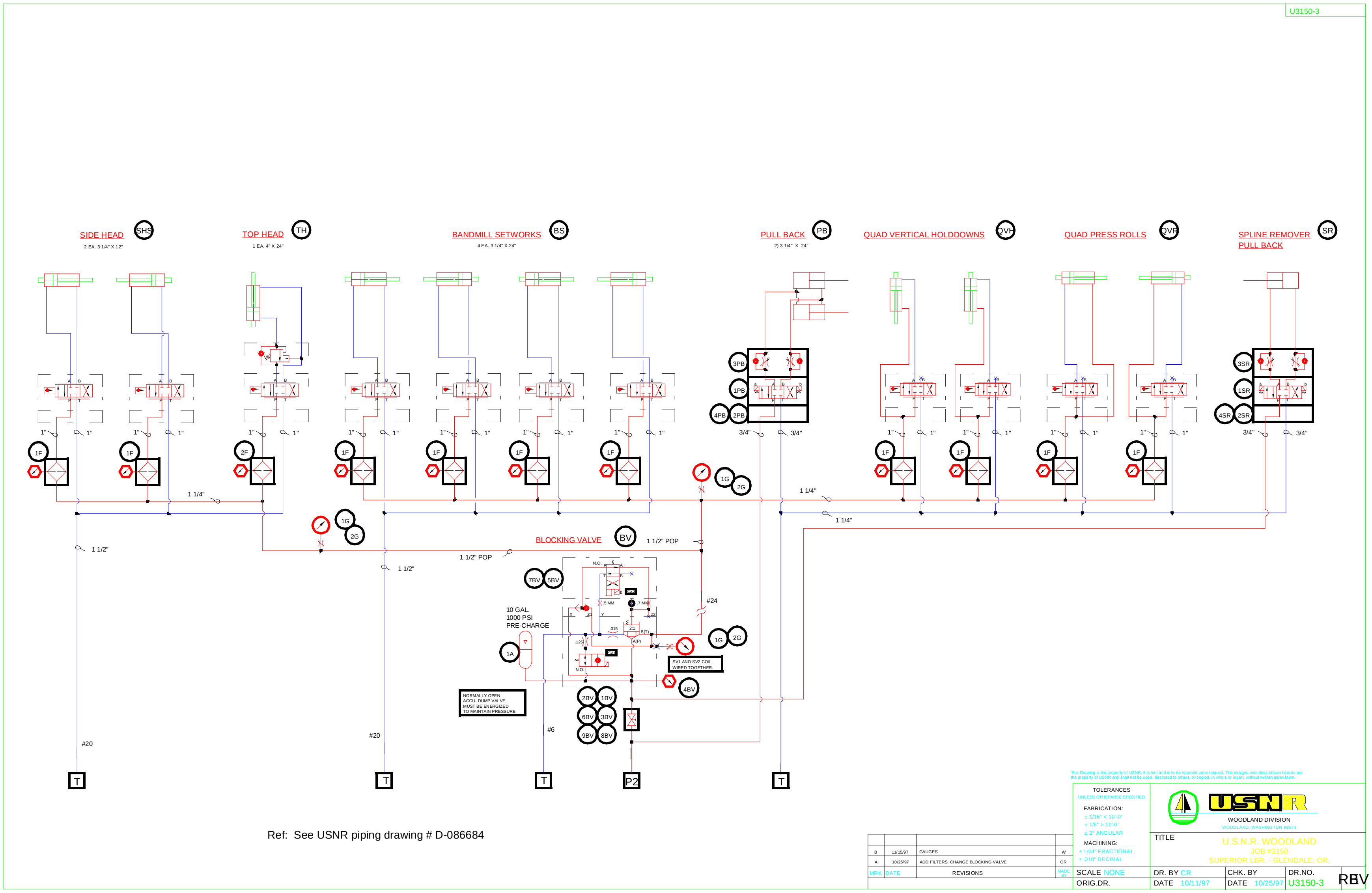

Ref: See USNR piping drawing # D-086684

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U3150-4

LCT — LOG CONVEYOR TENSIONER

Item	Qty	Part Number	Description	Source
LCT1	1	BKDGFNL-694	Bolt Kit, 10-24 x 2.75 Length	VICKERS
LCT2	1	DG17V3-6N-60	Valve, manual directional, DO3	VICKERS
LCT3	1	DGMX2-3-PA-CW-S-40	Stack Valve, Pressure Reducing,	VICKERS
LCT4	1	M-0026	Manifold, sharp chain	PROTO
LCT5	1	NMF20-10S	Gauge, Pressure, Stem Mount, 0-1000 PSI	DELTROL
LCT6	1	PGL-A-63-N-B-1000-S	Gauge, Pressure, Stem Mount, 0-1000 PSI	LHA
LCT7	1	SV1-10-0-O-115AP	Solenoid Valve, 2 Way Normally OPEN	VICKERS

BV — Accumulator Blocking Valve

Item	Qty	Part Number	Description	Source
1BV	4	MANIFOLD	970713-A	SAS
2BV	4	INSERT	LC32A05D6X	REXROTH
3BV	4	COVER	LFA32GW-A6X/A07T05	REXROTH
4BV	4	GAUGE	9767150	WIKA
5BV	4	DIRECTIONAL VALVE	4WE6D6X/EW110N9DAL	REXROTH
6BV	4	UNLOADING VALVE	SV08-21-0-N-115AP	HYDRAFORCE
7BV	4	BOLT KIT	US00-833-365	REXROTH
8BV	4	ACCUM. BRACKET	Z-67R	ZEMARK
9BV	4	ACCUM. MOUNT	ZMB-89	ZEMARK

LTL — RECIPRICATING LOG TURNER LIFT

Item	Qty	Part Number	Description	Source
LTL1	2	REF. USNR DWGS	SERVO VALVE	ATCHLEY

TS — TURNER SQUEEZE

Item	Qty	Part Number	Description	Source
TS1	1	REF. USNR DWGS	SERVO VALVE	ATCHLEY

SS — SIDE SHIFT

Item	Qty	Part Number	Description	Source
1SS	1	REF. USNR DWGS	SERVO VALVE	ATCHLEY

FR — FLAIR REDUCER LIFT

Item	Qty	Part Number	Description	Source
1FR	1	DG4S4-L-012A-B-60	Valve, direct solenoid, DO5	VICKERS
2FR	1	DGSME-01-20-T8	Sub Plate, D05	VICKERS
3FR	1	DGMFN-5-Y-A2W-B2W-41	Stack Valve, Flow Control, D05, Dual Function	VICKERS
4FR	1	SHOP	Bolt Kit	VICKERS

T — TENSION

Item	Qty	Part Number	Description	Source
1T	1	M-0026	MANIFOLD	B.F.P.
2T	1	2S-1000	GAUGE	SUN
3T	1	NMF20-10-S	NEEDLE VALVE	VICKERS
4T	1	DG17V3-6N-60	MANUAL VALVE	VICKERS
5T	1	SHOP	BOLT KIT	VICKERS
6T	1	DGMX2-3-PA-BW-S-41	PRESS. REDUCING VALVE	VICKERS
7T	1	SV3-10-C-0-115AP	SOL. VALVE	VICKERS

DD — DLI DRIVE

Item	Qty	Part Number	Description	Source
1DD	1	0811-404-770	PROPORTIONAL VALVE	BOSCH
2DD	1	9-000-010-175	SUBPLATE	BOSCH
3DD	1	953-576	BOLT KIT	BOSCH
4DD	1	FD31BBYED101FED101	FLOW DIVIDER	SAS
5DD	4	ME12-0105-AAAA	HYD. MOTOR	ROSS

L — LIFT CYLINDER

Item	Qty	Part Number	Description	Source
1L	1	M-0394	MANIFOLD	B.F.P.
2L	1	CBEA-LHN	COUNTER BAL. VALVE	SUN
3L	1	REF. USNR DWGS	SERVO VALVE	ATCHLEY

SSA — SIDE SHIFT ACTUATORS

Item	Qty	Part Number	Description	Source
1SSA	2	REF. USNR DWGS	SERVO VALVE	ATCHLEY

SRS — SRS

Item	Qty	Part Number	Description	Source
1SRS	4	REF. U.S.N.R. DWG'S	SERVO VALVE	ATCHLEY

SHS — SIDE HEAD

Item	Qty	Part Number	Description	Source
1SHS	2	REF. U.S.N.R. DWG'S	SERVO VALVE	ATCHLEY

TH — TOP HEAD

Item	Qty	Part Number	Description	Source
1TH	1	REF. U.S.N.R. DWG'S	SERVO VALVE	ATCHLEY
2TH	1	REF. U.S.N.R. DWG'S	COUNTER BALANCE VALVE	SUN

BS — BANDMILL SETWORKS

Item	Qty	Part Number	Description	Source
1BS	4	REF. U.S.N.R. DWG'S	SERVO VALVE	ATCHLEY

PB — PULL BACK PB

Item	Qty	Part Number	Description	Source
1PB	1	DG4S4-L-012C-B-60	Valve, direct solenoid, DO5	VICKERS
2PB	1	DGSME-01-20-T8	Sub Plate, D05	VICKERS
3PB	1	DGMFN-5-Y-A2W-B2W-41	Stack Valve, Flow Control, D05, Dual Function	VICKERS
4PB	1	SHOP	Bolt Kit	SHOP

QVH — QUAD VERTICAL HOLDDOWNS

Item	Qty	Part Number	Description	Source
1QVH	2	REF. U.S.N.R. DWG'S	SERVO VALVE	ATCHLEY

QPR — QUAD PRESS ROLLS

Item	Qty	Part Number	Description	Source
1QPR	2	REF. U.S.N.R. DWG'S	SERVO VALVE	ATCHLEY

SR — SPLINE REMOVER

Item	Qty	Part Number	Description	Source
1SR	1	DG4S4-L-012C-B-60	Valve, direct solenoid, DO5	VICKERS
2SR	1	DGSME-01-20-T8	Sub Plate, D05	VICKERS
3SR	1	DGMFN-5-Y-A2W-B2W-41	Stack Valve, Flow Control, D05, Dual Function	VICKERS
4SR	1	SHOP	Bolt Kit	SHOP

F — FILTERS

Item	Qty	Part Number	Description	Source
1F	20	HH9651A20DPSWPT	FILTER	PALL
2F	2	HH9651A20DPUWPT	FILTER	PALL

G — GAUGES

Item	Qty	Part Number	Description	Source
1G	6	PGL-A-63-NB-3000-S-2.5	GAUGE	LHA
2G	6	NMF20-10S	SHUT OFF	DELTROL

A — ACCUMULATOR

Item	Qty	Part Number	Description	Source
1A	2	850670	ACCUMULATOR (10 GAL.)	GREER
2A	2	849392	ACCUMULATOR (5 GAL.)	GREER

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FABRICATION:
± 1/16" < 10'-0"
± 1/8" > 10'-0"
± 2° ANGULAR
MACHINING:
± 1/64" FRACTIONAL
± .010" DECIMAL

MFR	DATE	REVISIONS	MFG ENG
B	11/15/97	UPDATE B OF M	W
A	10/25/97	ADD FILTERS, CHANGE BLOCKING VALVE	W

USNR
WOODLAND DIVISION
WOODLAND, WASHINGTON 98674

TITLE
U.S.N.R. WOODLAND
JOB #3150
SUPERIOR LBR. - GLENDALE, OR.

SCALE NONE | DR. BY CR | CHK. BY | DR.NO.
ORIG.DR. | DATE 10/11/97 | DATE 10/25/97 | U3150-4 | REV B

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3 VERTICAL REDUCER QUAD

GENERAL OPERATING INFORMATION

These instructions cover all sizes and types of **vertical bandmills** e.g. 5' & 6', headrigs, fixed resews, setting single and multiple bandmills.

NOTE: There is a different set of instructions for horizontal overhung wheel bandmills.

These bandmills are precision machine tools and therefore should be treated accordingly, but don't be over protective. They have been designed and manufactured to withstand the rigors of a continuous high production rate while maintaining a highly accurate lumber output. There are however, a number of points which should be given your continuing consideration.

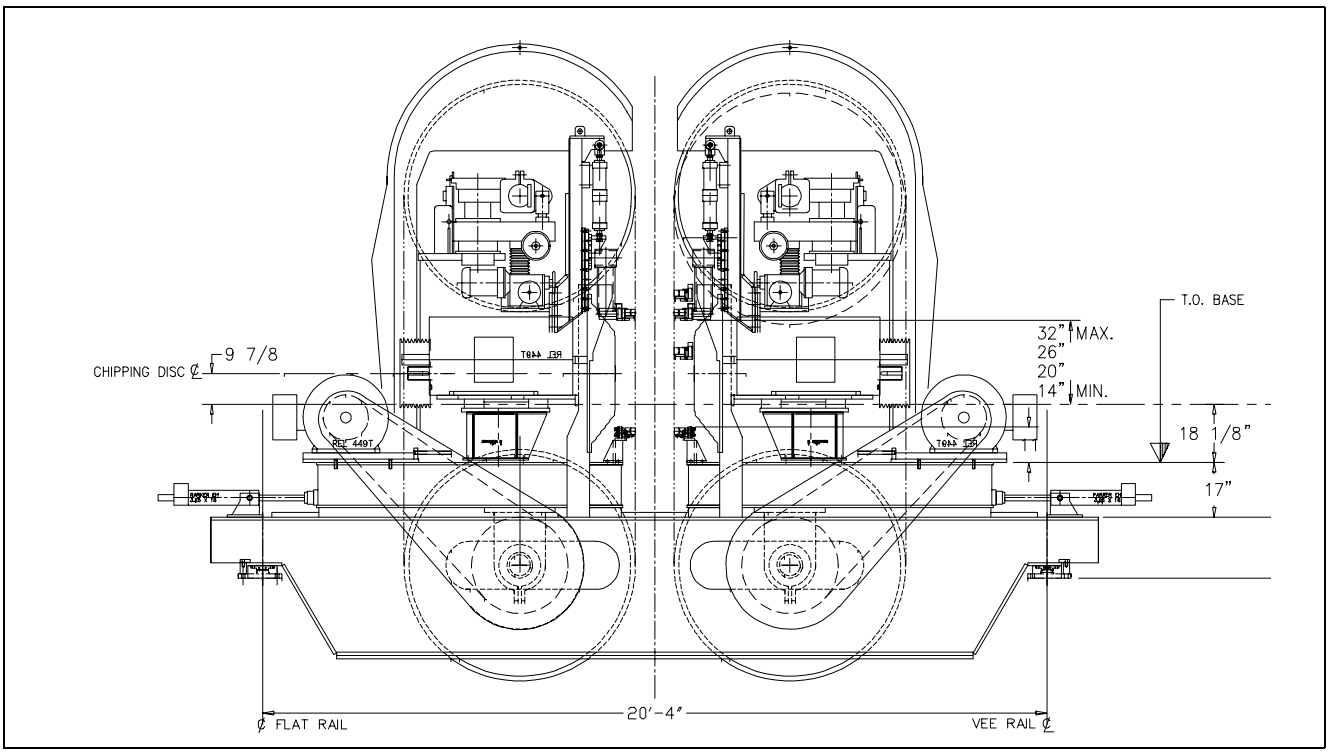


Figure 18: Vertical Reducer Quad: Lumber Line View

The above is intended for illustration purpose only and may not exactly represent your equipment.

REGULARLY CLEAN EQUIPMENT

Keep your machine clean, DO NOT ALLOW excessive amounts of refuse to accumulate. Particular attention should be given to the areas in the vicinity of the wheels, saw guides, upper wheel rocker arms, lower wheel scraper and the internal areas of any slat or belt bed conveyors.

NOTE: DO NOT DIRECT A 'BLOW DOWN HOSE' TOWARDS THE UNDER SIDES OF THE AIR STRAIN DIAPHRAGM CYLINDERS.

COOL SAW GUIDES

In order to avoid burning the saw guides, it is a wise rule to have the water spray on whenever the saw blade is in motion. It is sometimes possible to burn the guides during the slow down period after the band-mill motor has been de-energized.

LUBRICATION

Do not start or operate a machine that is not properly lubricated.

BE OBSERVANT

Your eyes and ears are a very important part of the operation and preventative maintenance of the system. Watch for conditions that could cause a problem and suggest corrective action. Listen for unusual sounds, a different pitch than normal, etc. Sounds can be an early indicator of a mechanical problem. Catching it early can save down-time and money. Watch for conditions that might allow abuse, e.g. lubrication lines that are exposed to traffic, etc.

Notify the proper authority immediately should a mechanical malfunction is indicated or visual evidence of potential problems is evident:

1. Increased operating temperatures of bearing housings or any hydraulic lines.
2. Increased vibration.
3. Any change in the noise level or it's characteristics.
4. Do not abuse any hydraulic, pneumatic, electrical or lubrication lines. (Standing on these lines will lead to problems.)

BANDMILL COMPONENTS AND THEIR FUNCTION

SUB-BASE

The sub-base is used in conjunction with setting bandmills only. The bandmill(s) rest on precision ground and aligned “V” and flat rails which are bolted into place on the sub-base. By means-of a positioning device (setworks), the bandmill can be shifted along the rails to the required sawing dimension.

NOTE: ***Avoid standing on, or abusing the exposed portions of the rails, any damage which does occur, even minor, must be corrected before the position of the bandmill is changed.***

BASE/COLUMN ASSEMBLY

As a unit it is the main frame to which all other parts are mounted. This Assembly is mounted atop the rails

LOWER WHEEL ASSEMBLY

Is the band saw driving wheel which incorporates the driven 'at" sheave as a single unit. The wheel is designed with a very heavy cross section in order to develop a 'Fly Wheel' effect for a stable saw blade speed.

UPPER WHEEL ASSEMBLY

Is the idler, which is designed with a light cross section in order to eliminate the possibility of 'Over-Run'. This assembly is adjustable up or down and can be tilted for tracking the saw blade.

AIR STRAIN SYSTEM

Consists of one strain level indicating gauge, one diaphragm cylinder and one strain balance reservoir system. This is a closed pneumatic system, that is, once it has been pressurized to where the required strain level is obtained, the supply line valve is closed and the pneumatic source may be removed until such time that the system pressure needs 'Topping Up' or an increase in strain level is required. Working in conjunction with the above there is a strain application indicator.

STRAIN GAUGE

Readings show the amount of air strain being applied to or available for application to the saw blade. The strain gauge reading remains constant whether or not the saw blade is 'Strained Up'.

NOTE: Strain **IS NOT** applied to the saw blade by changing the pressure in the strain balance tank; it **IS** applied by elevating the upper wheel thereby compressing the diaphragm cylinder.

STRAIN BALANCE RESERVOIR

The Strain Balance Reservoir, which is the plunger tube within the bandmill column, is pressurized with an inert gas to obtained the recommended strain level.

NOTE: Under no circumstances should the pressure in the tank exceed the maximum designed strain of the bandmill.

Bandmill	Maximum Strain	Maximum Tank Pressure
6'	32,000 lbs.	160 P.S.I.

Figure 19: Maximum Strain and Tank Pressure

STRAIN APPLICATION INDICATOR

Shows when the strain is properly applied to the saw blade for operating conditions. The indicator consists of one green and two red lights, mounted in line on the operator's console. The bandmill is operational when the GREEN light only is on, but should either RED light go on, the appropriate correction must be made. In addition, while the lower red light is on, indicating over strain, the upper wheel cannot be elevated electrically.

UPPER WHEEL LIFT AND TILT CONTROL ASSEMBLY

Consists of a drive motor and handwheel assembly for wheel lift and a separate handwheel assembly for wheel tilt.

WHEEL LIFT

The upper wheel is normally raised or lowered electrically, the control station is mounted on the bandmill column. The same function however, may be accomplished by manually rotating the handwheel.

NOTES:
1. Never operate the wheel lift motor when the saw blade is in motion. Make any necessary adjustments manually.

2. Before activating the wheel lift motor BE SURE EVERYONE IS CLEAR of the wheel lift handwheel.

WHEEL TILT

Tilting the upper wheel for the purpose of tracking the saw blade is accomplished by rotating the wheel tilt handwheel MANUALLY in the required direction. Only the upper arbor support farthest from the wheel changes elevation causing the wheel to tilt.

HANDWHEEL ROTATION: WHEEL LIFT

When the handwheel is in front of you; rotating the handwheel CLOCKWISE will RAISE the upper wheel. This applies for either hand of bandmill.

WHEEL TILT

When facing the handwheel and the front of the bandmill is on your RIGHT; rotating the handwheel COUNTER-CLOCKWISE will move the saw blade AWAY from you. In other words the rocker arm farthest from the wheel will RISE.

When the front of the bandmill is on your LEFT; rotating the hand-wheel CLOCKWISE will move the saw blade AWAY from you. In other words the rocker arm farthest from the wheel will RISE.

SAWGUIDE DESCRIPTION & FUNCTION

The purpose of the sawguide is to stabilize the saw blade within the sawing area to produce accurate lumber. It is imperative that the sawguides be maintained in the best possible condition at all times.

1. They should be changed at least at each saw change.

2. They should b changed whenever damage is suspected.

Failure to maintain the sawguides will cause inaccurate sawing, slower production and, or saw blade damage may result. Sawguide condition can deteriorate over a period of time (2 - 4 hours) due to normal wear or almost instantly due to any number of sawing problems.

WHEEL SCRAPERS

The Wheel Scrapers ensure that the upper and lower wheel faces are kept clean. They are continually wearing therefore their condition should be checked periodically and adjusted or replaced as required.

SPRAY UNITS

UPPER SAWGUIDE AND BOTH WHEEL SCRAPERS

Serve to lubricate, cool and clean the saw blade, sawguides, wheels and wheel scrapers. Care should be taken to adjust each spray to the correct volume output. An inadequate volume will not do the necessary Job, particularly, lubricating and cooling the saw blade and guides.

On the other hand an excess volume needlessly soaks the surrounding area and material as well as creating the possible condition whereby the saw blade could literally be 'Floated' off the wheels.

SAWDUST SHEAR

Prevents the sawdust from going between the saw blade and lower wheel. Here again, the shear blade must be maintained in good condition, otherwise undue wheel wear or possible saw blade damage will result.

MOVABLE UPPER SAWGUIDE

Is used in an application where the depth of cut varies to any great degree. In order to obtain the best possible sawing accuracy, the distance between the upper and lower saw guides is to be kept to the minimum the material depth will allow; therefore, the height of the upper saw guide is adjusted, if necessary, to suit each piece about to be sawn. Electric controls are placed in the appropriate location for each particular type of system.

SETWORKS

Are used for accurately re-positioning a setting type bandmill permitting a variety of lumber sizes to be cut.

UPPER WHEEL GUARD

Must enclose the non-working portions of the Saw Blade, above the Base, whenever the Bandmill is running.

CONTROL STATION

Is located on the bandmill column adjacent to the Handwheel. It captains four electrical push-buttons:

1. MAIN DRIVE MOTOR - 'START'
2. MAIN DRIVE MOTOR - 'STOP'
3. UPPER WHEEL - 'RAISE'
4. UPPER WHEEL - 'LOWER'

CHIPPER

The chipper is located on the bandmill base and provides a smooth face on the outside of the log by converting the outside slabs to chips. The chipper incorporates a Ring Saw on the face of the chipper disk to provide the smoothest possible finish.

See the Chipper manual for details and parts.

START UP PROCEDURE

PRESSURIZE THE STRAIN SYSTEM

1. Pressurize the Strain System to the required operating strain as read directly on the Strain Gauge.

2. Allow enough time for the temperature of the Strain Balance Reservoir to stabilize.

3. Check the Strain Gauge reading for the required Operating Strain. Make adjustments if necessary.

POSITION BAND BLADE

1. Place a band blade on the mill such that the roots of the gullets overhang the Upper and Lower Wheel Rims by approximately 1/4 inch.

CAUTION: Extreme care must be taken so THAT THE SAW TEETH WILL NOT BE DAMAGED.

2. Elevate the Upper Wheel electrically, only to where all the slack is removed from the Saw Blade.

3. Continue elevating the Upper Wheel manually with the hand wheel until the roller arm on the strain indicating limit switch is midway in the strain limit switch actuator bracket opening.

TURN ON SPRAY UNITS

1. Turn on the Saw Guide and Wheel Scraper Spray Units and adjust to the proper volume.

JOG THEN START MOTOR

1. Jog the Main Drive Motor and at the same time, adjust the tilt of the Upper Wheel so that the saw blade tracks evenly with the roots of the Gullets overhanging the Wheel Rims slightly.

2. While maintaining the proper tracking of the Saw Blade allow the Bandmill to accelerate to full speed.

3. Check to see that the roller arm on the strain indicating limit switch is midway in the strain limit switch actuator bracket opening. Manually adjust the elevation of the Upper Wheel if necessary.

CAUTION: ***Whenever changing the tilt of the Upper Wheel ensure that the roller arm on the strain indicating limit switch remains midway in the bracket.***

DURING OPERATION

THINGS TO REMAIN ALERT CONCERNING

1. Maintain the green Strain Application Indicator light on at all times.

2. Be aware of the Saw Blade Tracking Position. Due to heat or damage the blade may change its tracking position on the wheels.

3. When feeding material through the Saw, the Feed Speed selected must be relative to the depth of cut as well as the material characteristics.

   A. A Feed Speed which is too fast will over-fill the Saw Blade Gullets, causing excessive heat generation, inaccurate sawing and a tendency to push the Blade off the Wheels.

   B. A Feed Speed which is too slow will cause excessive heat generation, premature dulling of the Saw, a higher power consumption ratio and a low production output.

4. Start a cut at the intended feed speed, it is not necessary to enter slowly then speed up.

5. Unless absolutely necessary do not reverse material through the Saw.

6. Watch for slivers or pieces of wood that may become stuck in the vicinity of the Lower Guide and bind against the Saw Blade.

FIXED WHEEL ASSEMBLY

DESCRIPTION

This is the Bandsaw drive wheel. It transmits motive force, through belts, from the motor to the saw. The “fixed wheel” is designed with a very heavy cross section in order to develop a 'fly wheel' effect for a stable saw blade speed. It can be readily identified by its solid web (as opposed to the spoked web on the moveable wheel).

LUBRICATION: The bottom (fixed) wheel is lubricated by grease on the drive (sheave) end and by oil on the Wheel end.

ROUTINE SERVICE

1. Grease the drive (sheave) end bearings.
2. Check and maintain oil level in the wheel end bearings.

Failure to properly lubricate the bearings on a regular basis will result in shortened life and badly damaged components.

FIXING THE WHEEL TO THE ARBOR

Because the fixed wheel is the drive wheel, it must be locked to the arbor. Two issues must be addressed:

1. The wheel must be locked to the wheel in a way that it does not slip.
2. The wheel must be perfectly concentric with the axis of the arbor.

The method of fixing the wheel to the arbor is with ring style interlocking rings. There are two rings to each element, an inner and an outer ring as shown in the illustration. When mated under pressure, the outer ring expands into the wheel hub and the inner ring compresses to grip the arbor.

The following section describes these interlocking rings and is provided by the manufacturer of these devices. Please review the procedures in preparation for installation and/or removal of the fixed wheel.

IMPORTANT ***The arbor bearings are the most critical component in a bandmill. Extreme cleanliness and responsible workmanship must be exercised at all times during maintenance.***

RINGFEDER® LOCKING ELEMENTS

The RINGFEDER® Locking Element is a keyless shaft-hub connector providing mechanically the same characteristics as a shrink fit. It is, however, easily adjustable and removable facilitating assembly and disassembly. Since torque is transmitted by contact pressure and friction between functional surfaces, condition of contact surfaces and proper tightening of the locking screws are of great importance.

INSTALLATION

1. Carefully clean the shaft, hub bore, spacer sleeves and Locking Elements: lightly oil these parts.

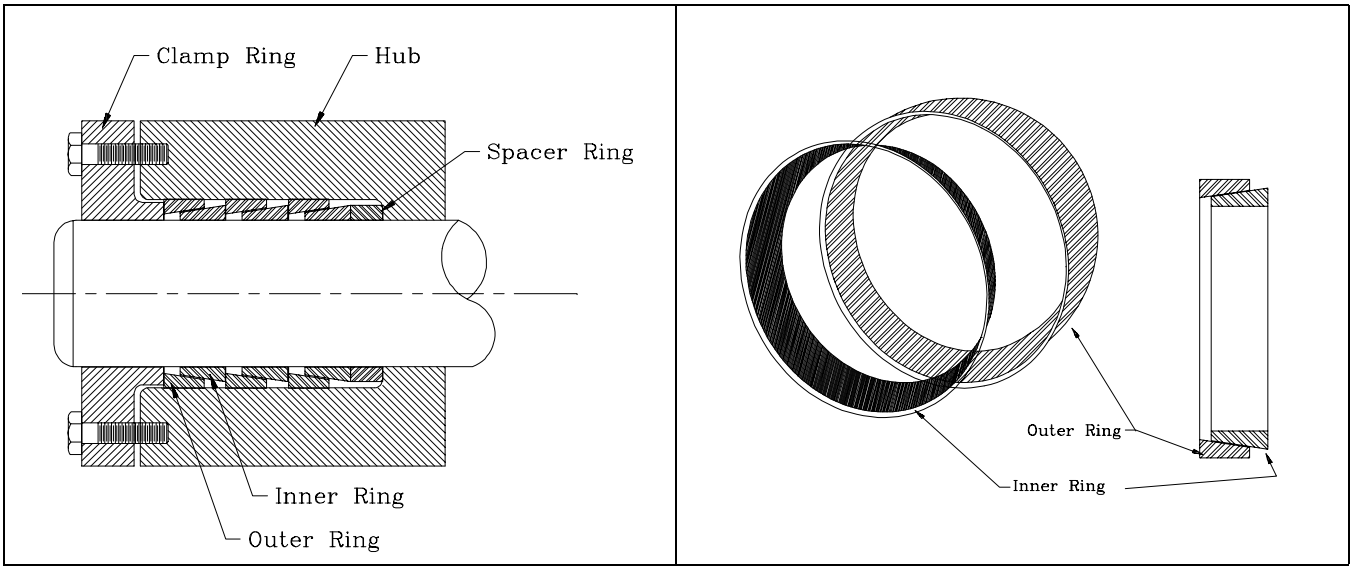


Figure 20: RINGFEDER® Locking Elements

2. Fit the parts in the following order:

   A. Hub (the play between hub bore and shaft affects the true running of the hub).

   B. Spacer sleeve to bridge the undercut (need not be used if no undercut was made on the part).

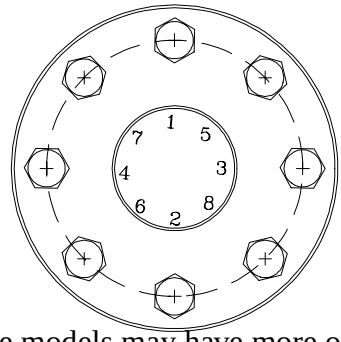
   C. Outer ring/inner ring (both parts must have an easy sliding fit - they must not jam).Where more than one Locking Element is used, we recommend that the inner ring be fitted first (clamp ring pressure on the outer ring).

Because of the large horsepower and the weight of the wheels, several elements are used.

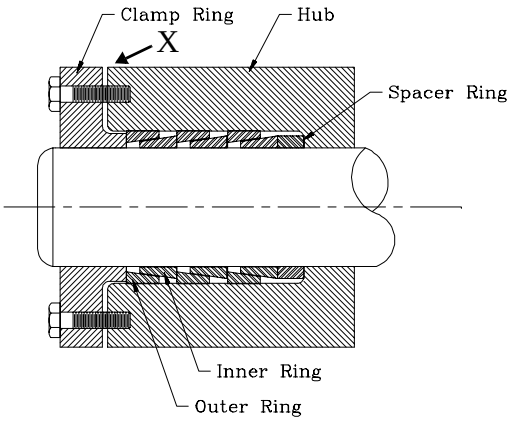
D. Check the clearance: sleeve and thrust ring or thrust ring with collar. Ensure that both parts have an easy sliding fit.

E. Locking Screws:
Carefully oil or grease the locking screws before fitting. This applies in particular to the screw head seat. Do not use molybdenum disulfide. The screws must turn easily and to an adequate depth. Do not use spring washers or serrated locking washers.

3. Tighten locking screws evenly and in several stages following diametrically opposite sequence as illustrated below.



Some models may have more or less bolts.



Stage 1: Tighten by hand (20 ft/lb) until a slight positive contact is established. Make final alignment and adjustment to connection.

Stage 2: Using an extended key or a torque wrench, continue to tighten the bolts in 15 ft/lb increments. Repeat this process until 90 ft/lb torque has been reached.

Stage 3: Tighten screws to full tightening torque (95-98 ft/lb) using a torque wrench.

Stage 4: Check and make sure that no screw will turn any more by applying specified torque.

Stage 5: Check distance X.
The clamp ring must never contact the face of the hub. The gap between the clamp ring and the hub face should be as uniform as possible.

Figure 21: Tightening Sequence

REMOVAL

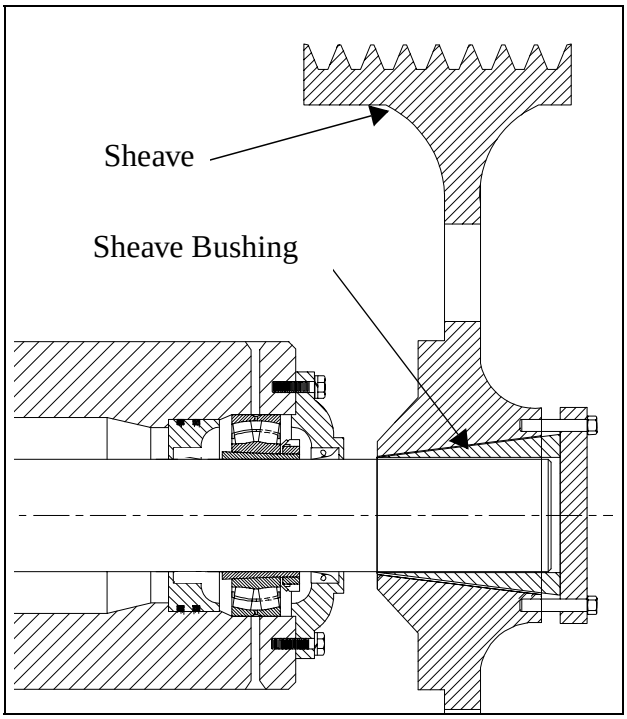
RINGFEDER®Locking Elements are not self-locking.

1. Clean connection from accumulated contamination.
2. Loosen locking screws in several stages following diametrically opposite sequence.
3. Remove hub and Locking Elements from the shaft (either together or individually).

MAINTENANCE

SHEAVE REMOVAL

SAFETY ***Follow all safety and lock-out procedures. See "GENERAL SAFETY INSTRUCTIONS" on page 1-14.***



To remove the sheave from the drive end of the arbor:

1. Loosen the drive motor so the belt is slack.
2. Remove the belt from the arbor sheave and hang it on the motor sheave.
3. Thoroughly clean the sheave.
4. Remove sheave bushing retainer
5. Use the jacking bolts to break the bushing apart from the sheave.
6. Remove the bushing and the sheave from the shaft.

Figure 22: Sheave & Bearing Assembly

DRIVE END BEARING DISASSEMBLY

1. Remove the cap using the jacking points if supplied.
2. Remove the seal and discard.
3. Clean the cap.
4. Install a new seal.
5. Unlock the taper locking nut washer.
6. Loosen the nut.
7. Drive the nut toward the bearing until the adapter is loose.
8. Remove the bearing and adapter from the tube and shaft.

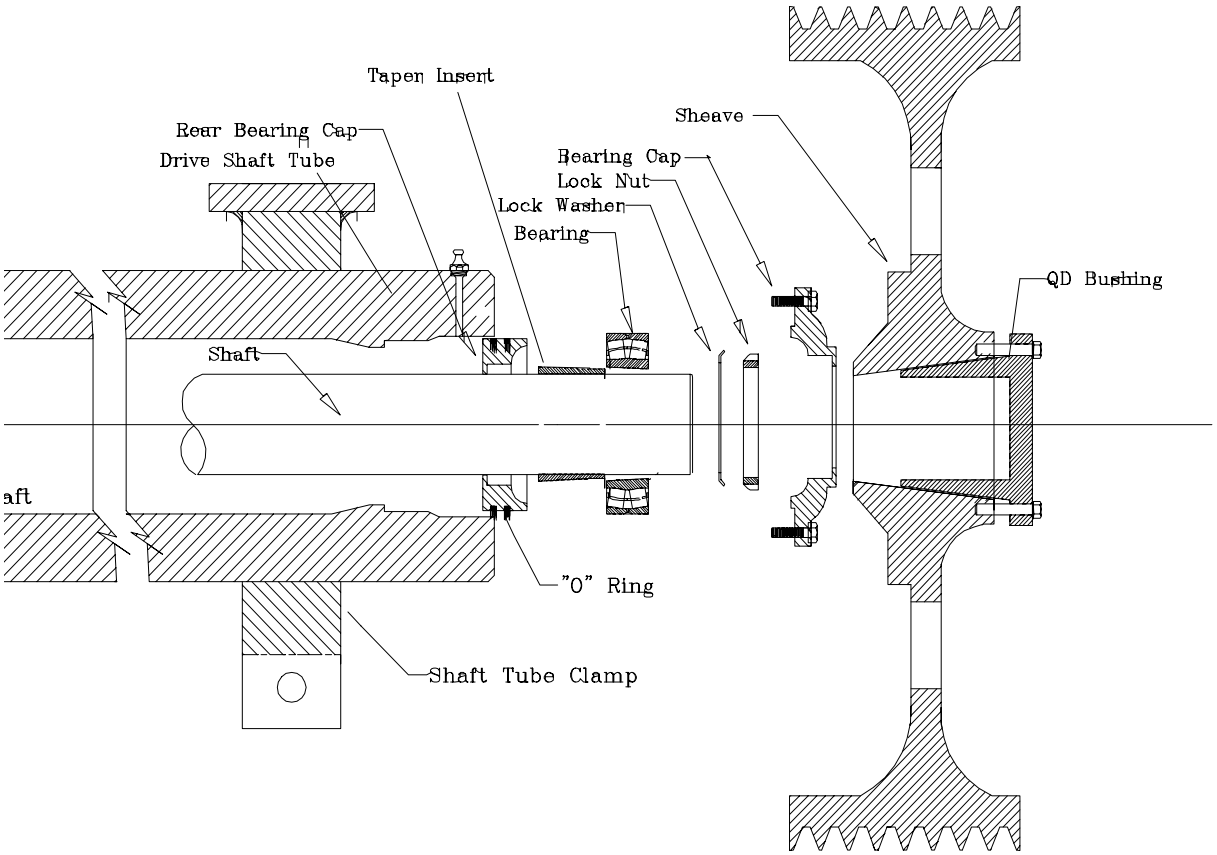


Figure 23: Fixed Arbor Drive Side Components

9. Clean lubricant and debris from the tube assembly.

10. Inspect the shaft and tube for damage. If damage to the tube and/or shaft is evident, remove the shaft and check diameter of the shaft and tube.

WHEEL END BEARING REMOVAL - FIXED WHEEL

Maintenance of the wheel hub assembly usually consists of the replacement of bearings and/or oil seals. The illustration below shows a blown-up illustration of the components. This procedure assumes that the saws have been removed and the system prepared for maintenance.

SAFETY ***BE CERTAIN TO FOLLOW ALL LOCK-OUT AND SAFETY PROCEDURES.***

Be certain that the wheel is properly supported, blocked and under control at all times.

DRAIN OIL FROM BEARING HOUSING

1. Rotate the Wheel so that the oil drain plug is at the lowest point and drain the oil from the system.

2. Remove the Ring Feders cap loosening each bolt a little at a time.

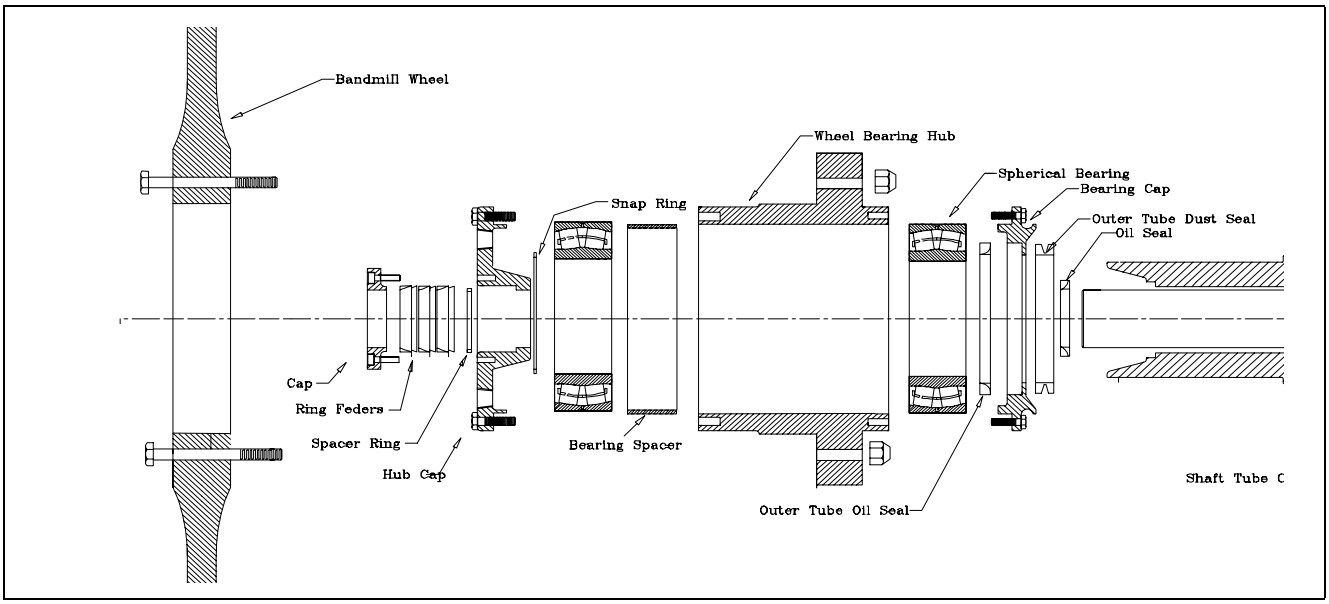


Figure 24: Fixed Arbor Wheel Side Components

3. Use a hoist to support the wheel. Unbolt the outside hub cap and the Ring Feder Locking Elements. Remove them from the hub.

4. Remove the Inner Bearing Cap Bolts.

5. Remove the Tru-Arc lock ring.

6. The bearings are press-fit into the hub on their outer race.

7. The entire wheel and hub assembly can be removed from the Arbor Tube and placed on the floor in a clean work area.

Safety: Be certain to block the wheel so that it cannot roll and support it so that it cannot fall.

8. A puller can be used to remove the bearings from the wheel hub.

Do not reuse bearings removed with a puller. Always replace both bearings as a set, never just replace a single bearing.

9. When the components have been removed, check the assembly for damage and foreign material. Clean out all excess lubricant and insure that the assembly is in good condition.

INSTALLING BEARINGS IN FIXED WHEEL HUB

1. The bearing spacer should be positioned into the approximate center of the hub.

2. Thoroughly clean and then lubricate the bearings to be installed.

3. Position the bearing at the hub entrance and gently tap (with a soft hammer using a soft block) **the outer race** of the bearing into the hub.

Never tap or put pressure on the inner race.

4. Use the Bearing Cap to pull the bearing into the hub. Repeat for the other side.

5. Confirm that both bearing caps close tightly on the hub.

6. Remove the bearing cap(s) and confirm that the bearings are pulled up snug against the bearing spacer.

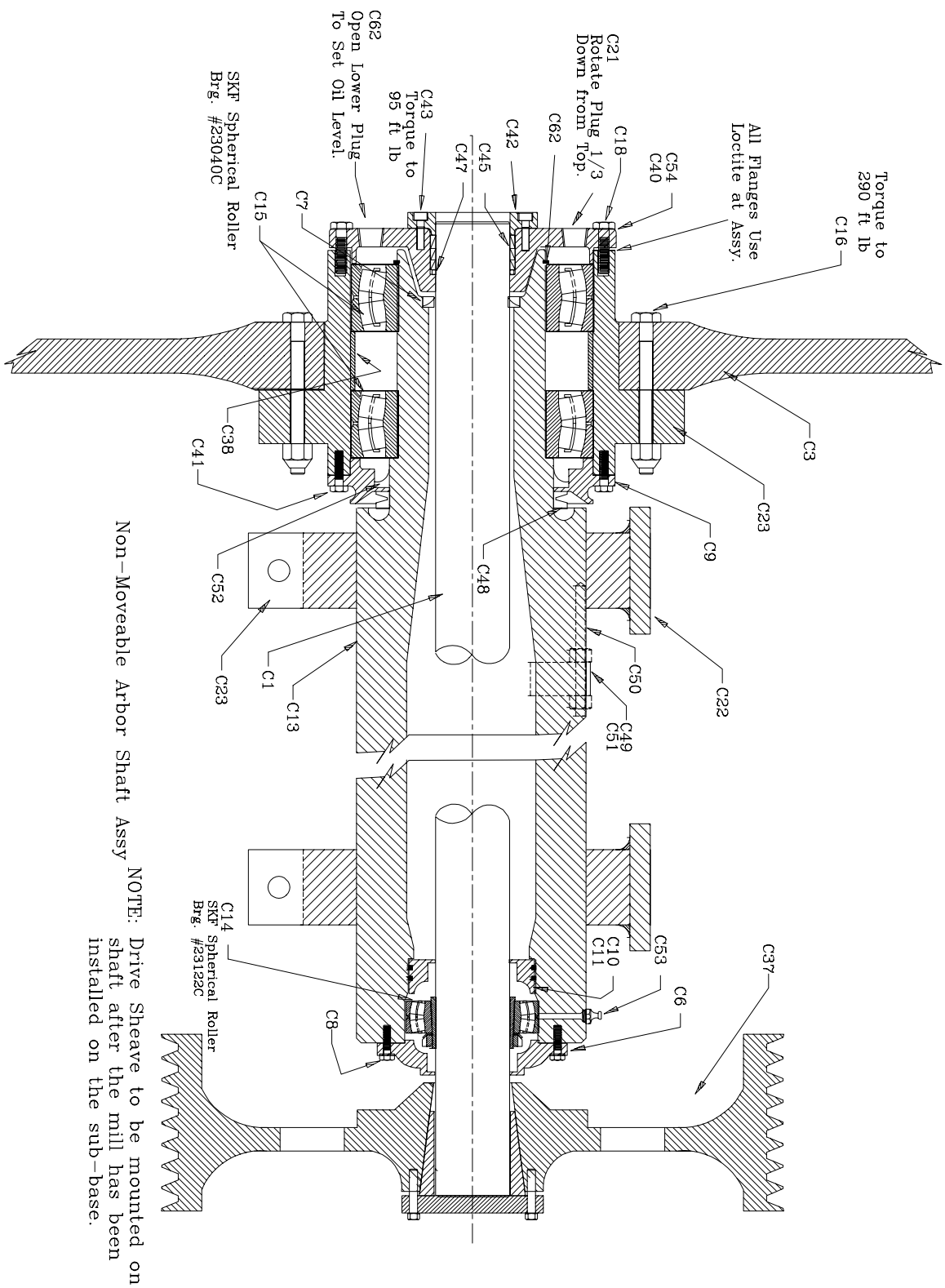
If they are not snug, the bearing spacing is too wide and you may mis-align the inner ring and damage the assembly.

7. Install wheel onto tube in reverse order as removal.

8. Install clean oil of the proper kind to proper level
(Position plug at bottom then rotate it 1/3 up. Fill through the upper plug until oil is running out of the bottom plug.)

FIXED ARBOR ASSEMBLY PARTS LIST

Item:	Description:	Qty:	Part Number:
C1	*Fixed Wheel Drive Shaft - Arbor*	*1*	*A-082330*
C3	*Fixed Wheel (72" Cast)*	*1*	*412-6120*
C5	*Arbor Bearing Housing*	*1*	*412-6121*
C6	*Arbor Bearing Cap*	*1*	*412-6003*
C7	*Oil Seal*	*2*	*D2-01051*
C8	*Hex Head Capscrew*	*6*	*Common Part*
C8	*Lock Washer*	*6*	*Common Part*
C9	*Bearing Cap*	*1*	*412-6122*
C10	*Bearing Seal Housing*	*1*	*412-6005*
C11	*"O" Ring*	*2*	*132-1439*
C13	*Bearing Housing*	*1*	*D2-01052*
C14	*Roller Bearing*	*1*	*H2-00608*
	Taper Adapter	*1*	*H2-00611*
C15	*Roller Bearing*	*2*	*H2-00609*
C16	*Hex Head Cap Screw (.750" NC 84135)*	*12*	*Common Part*
C16	*Nut-ESNA, LGT, Full (0.750 NC 84135)*	*12*	*Common Part*
C18	*Hex Head Cap Screw GR 8 (0.50" NC x 2.0")*	*8*	*Common Part*
C18	*Lockwasher*	*8*	*Common Part*
C21	*Pipe Plug (.750" NPT)*	*1*	*Common Part*
C22	*Arbor Clamp*	*2*	*412-6124*
C23	*Hex Head Cap Screw GR5 (1.00" NC x 5.50")*	*2*	*Common Part*
C23	*Hex Nut, ESNA Light Full 1.00NC*	*2*	*Common Part*
C37	*Sheave - 33.2" dia, 8 Grv*	*1*	*E4-00359*
	Sheave Bushing	*1*	*H4-00252*
C38	*Bearing Spacer*	*1*	*412-6125*
C40	*Bearing Cap*	*1*	*412-6126*
C41	*Hex Head Capscrew GR8 (.500" NC x 1.5")*	*8*	*Common Part*
C41	*Lockwasher*	*8*	*Common Part*
C42	*Thrust Ring*	*1*	*412-6011*
C43	*Socket Head Capscrew*	*12*	*Common Part*
C45	*Locking Ring (Ringfeder)*	*3*	*P2-00397*
C46	*Lock Ring Spacer*	*1*	*412-6042*
C47	*Back Up Spacer, Lock Ring*	*2*	*412-6032*
C48	*Seal - Vee Ring (7.8" ID")*	*1*	*P2-00397*
C49	*Adjustment Lug*	*1*	*412-6127*
C50	*Threaded Rod - MS 5/16"*	*12.75*	*Common Part*
C50	*Hex nut, Full (1.000"NC)*	*2*	*Common Part*
C51	*Hex Head Capscrew (.750" NC x 1.5")*	*2*	*Common Part*
C51	*Spring Type Lock Washer (.750")*	*2*	*Common Part*
C52	*Oil Seal (8.5" x 10.0")*	*1*	*D2-01053*
C53	*Pipe Plug (Socket Head, STL 1/4" NPT)*	*2*	*Common Part*
C62	*Retainer Ring, External (8.00")*	*1*	*Common Part*


Torque to 290 ft lb
C16
All Flanges Use Loctite at Assy.
C54
C40
C21
Rotate Plug 1/3 Down from Top.
C18
C62
C42
C45
C47
C43
Torque to 95 ft lb
C62
Open Lower Plug To Set Oil Level.
SKF Spherical Roller Brg. #23040C
C15
C7
C38
C41
C3
C23
C9
C48
C52
C23
C1
C13
C50
C22
C49
C51
C14
SKF Spherical Roller Brg. #23122C
C8
C10
C11
C53
C6
C37
Non-Moveable Arbor Shaft Assy
NOTE: Drive Sheave to be mounted on shaft after the mill has been installed on the sub-base.

MOVEABLE WHEEL ASSEMBLY

DESCRIPTION

This wheel serves as the idler, and is designed with a light cross section in order to eliminate the possibility of 'Overrun'. This assembly is moveable to compensate for changes in saw length due to expansion and wear and for saw installation and saw removal. This wheel can be tilted to adjust for tracking the saw blade.

MAINTENANCE

IMPORTANT ***The arbor bearings are the most critical component in a bandmill. Extreme cleanliness and responsible workmanship must be exercised at all times during maintenance.***

The lower wheel rotates on two spherical roller bearings of the same size. Since the shaft is non-rotating, the outer ring of the bearing rotates and is a press fit in the wheel housing. The inner race is a slide fit on the arbor. To replace the bearings, proceed as follows.

1. Turn the wheel so that the filler plug is at the bottom. Remove the plug and drain oil.
2. Remove outer bearing cover by removing capscrews. Clean thoroughly.
3. Secure the wheel with appropriate lifting apparatus and raise slightly to take the weight of the wheel.

CAUTION ***Make sure the wheel is lifted properly and securely.***

4. Apply a small amount of lateral pressure and remove the wheel from the arbor. Bearings should remain intact with the wheel.
5. Lower wheel to the floor and position vertically. Shim wheel on either side to prevent it from rotating.

WARNING ***For your own safety, the wheel should be supported by a lifting device throughout the replacement procedure.***

6. Remove the rear bearing cap, clean thoroughly and replace existing oil seal with a new one.
7. Existing wheel bearings may now be removed from the wheel housing using either a bearing puller, or a hammer and drift.

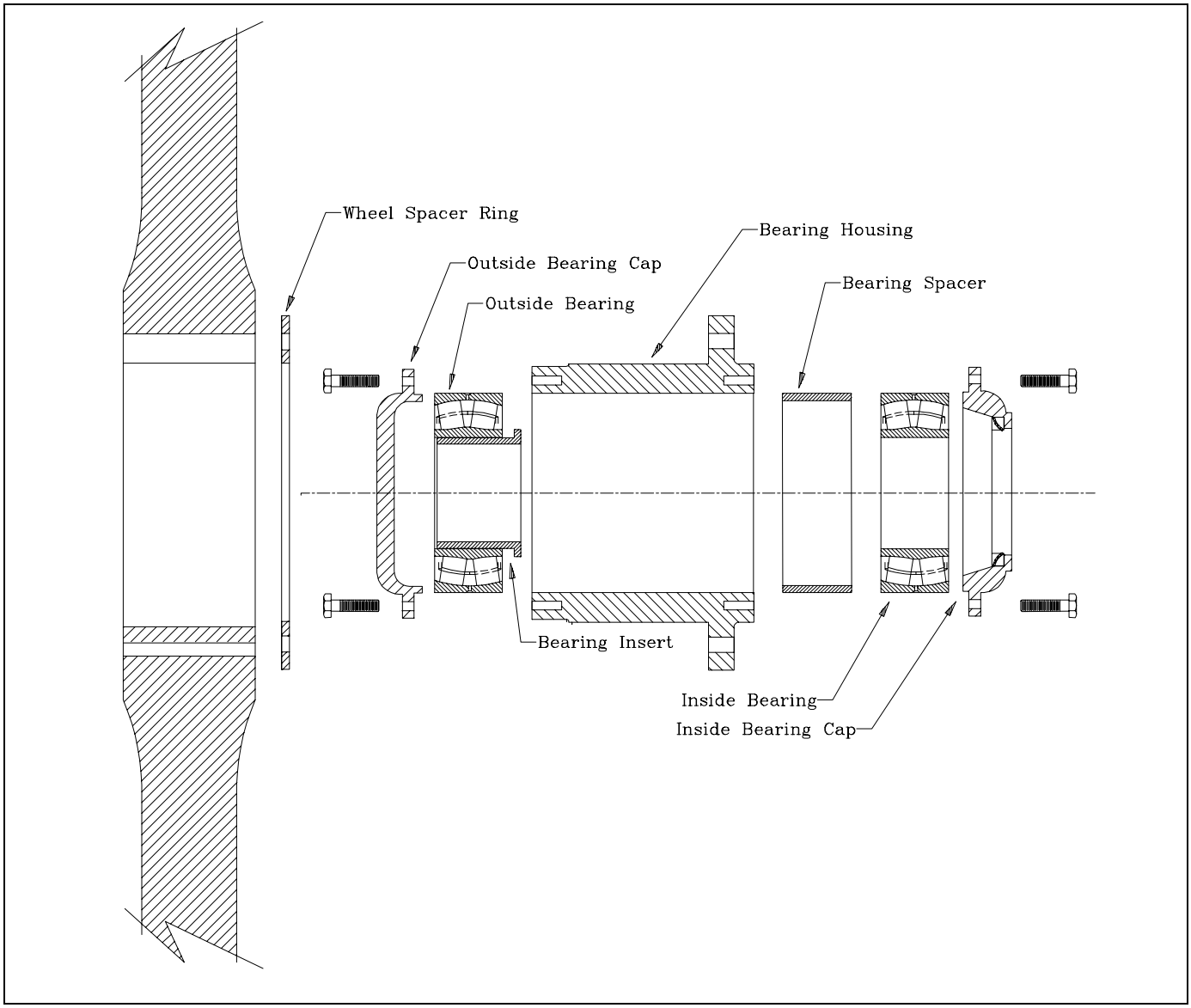


Figure 25: Moveable Arbor Parts Assembly

DIAMETRICAL CLEARANCE

This is the clearance between the outer race (ring) of the bearing and the bearings. Two measurements will be taken. The first is the unmounted clearance as shown below. The bearing is pressed into a housing which compresses the outer ring reducing the internal radial clearance. Proper reduction of the clearance is vital. If the clearance is not reduced enough, the inner race may spin in the housing. If the clearance is reduced beyond minimum tolerances the bearing will overheat with the result of a significantly shortened life.

1. The running clearance in these bearings is critical because of the loads imposed and the running speed (**rpm**). The internal clearance must be checked carefully with a feeler gauge.

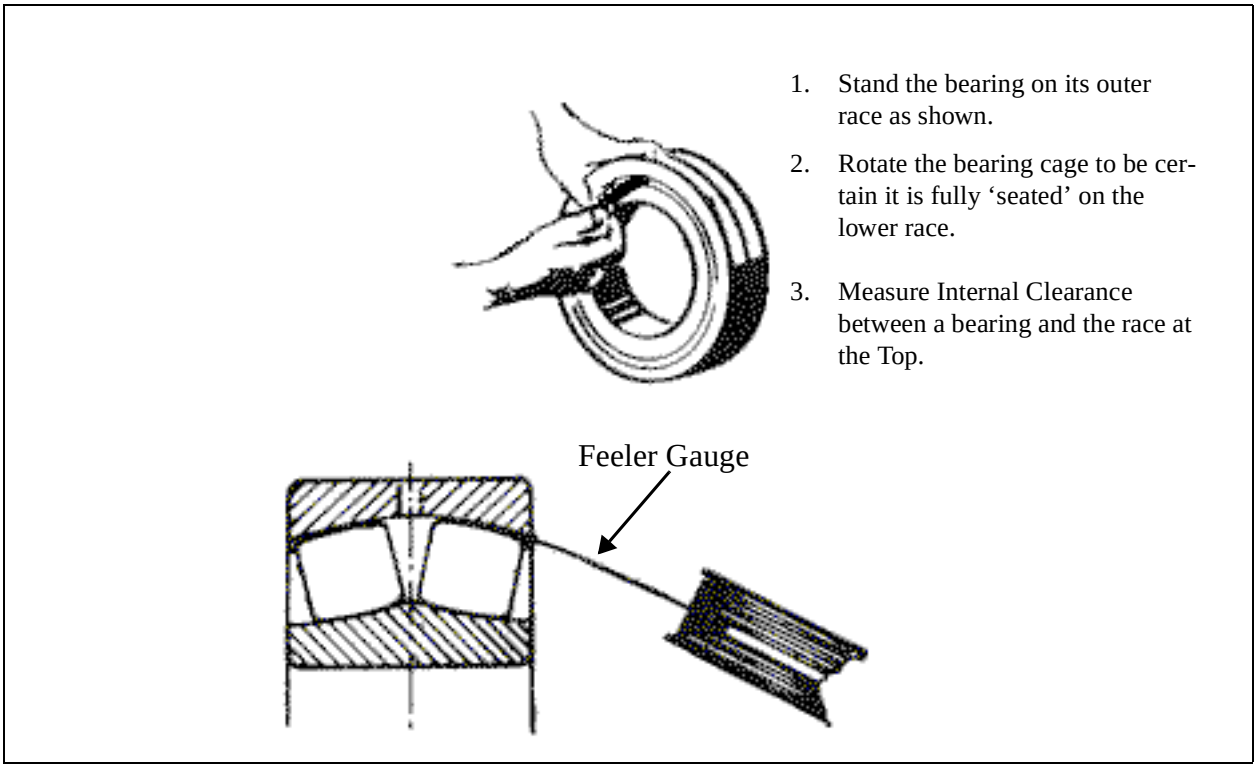


Figure 26: Determining <u>Unmounted Internal Radial Clearance</u>

A. To determine the unmounted radial clearance,[1] place the bearing on a bench in an upright position with the side surfaces of both rings parallel.

B. The clearance between the uppermost rollers and the outer ring sphere is then measured by inserting the feeler gauge between the two rollers on one side of the bearing.

1. This is the clearance measured on the radius of the bearing.

Note that the inside end of the feeler should be slightly beyond the inner face of the rollers. This is of importance in the case of the "C" type spherical roller bearing to prevent endwise dislocation of the rollers by the gauge.

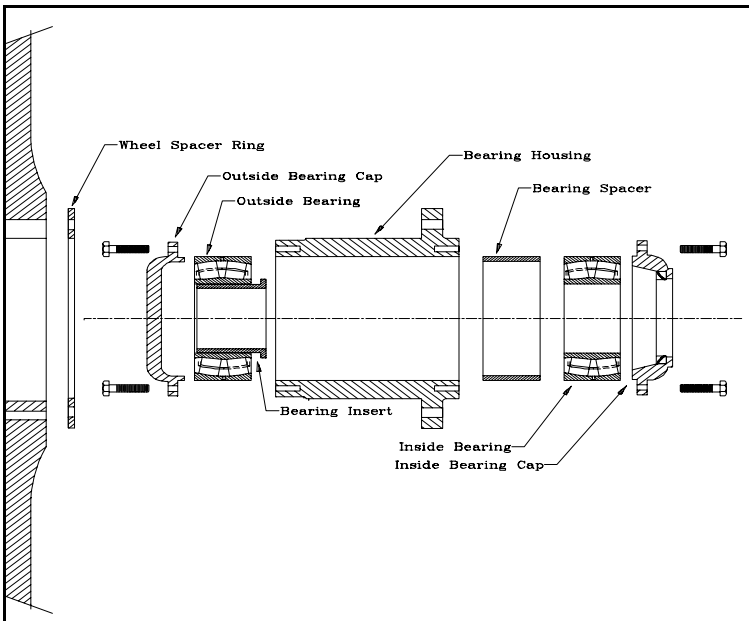
C. The gauge is then carefully moved in between the outer ring sphere and the uppermost roller. **It must not be forced and the bearing should not be rotated.** If the gauge goes through, the same procedure is repeated with a thicker gauge until one is found which barely goes through.
This is the Unmounted Internal Radial Clearance (UIRC).

4. Thoroughly clean the wheel housing in preparation for the new bearings. Locate one bearing in position and tap around the edge of the outer race until the bearing is perfectly square in the housing.

IMPORTANT ***Never replace a single bearing - always a pair.***

5. If using a lead or brass hammer or drift, be sure no loose fragments contaminate the bearings. **Do not, at any time, apply any force to the inner race.** This can damage the bearing significantly.

The bearing O.D. will be an interference fit with a mean tightness of **.001"**. Assemble bearing using a pulling jig as shown below.



1. Make certain all parts are clean.
2. Lightly tap the first bearing into the wheel housing. Be certain it is square.
3. Pull the bearing tight against the spacer using the bearing cap.
4. Install the bearing spacer.
5. Install the second bearing making certain the bearing insert is in place as shown.
6. Pull the bearing tight against the bearing spacer using the bearing cap.
7. Be certain the bearings are pulled up tight against the spacer and that both bearing caps pull tight against the housing.
8. Check the Mounted Internal Radial Clearance using the same procedure as before.
9. The clearance should have been reduced by .001” from the UIRC previously measured.

Figure 27: Installing Bearings: A Summary

IMPORTANT ***Remove all sawdust and/or debris from parts and work area to eliminate contamination of the bearing.***

BEARING	CLEARANCE
Upper Arbor Bearings:	*.0038 to .0057 before assembly*
	.003 to .005 after assembly
Lower Wheel Bearings:	*.0063 to .0088 before assembly*
	.005 to .007 after assembly
Sheave Side Bearing:	*.0047 to .0063 before assembly*
	.0025 to .0035 after assembly

A. Alternately tighten the nut and lightly tap the jig plate near its outer diameter at 90^{o} increments to ensure the bearing is entering squarely.

B. Periodically check around the circumference using a machinist's square. If the bearing is square, all dimensions will be the same.

Important

1). An indication that the bearing is not square is a sharp increase in the resistance to entry. **Do not force.**

C. Double check that the outer race is hard against the shoulder of the spacer.

Note:

1). Because of the interference fit, the bearing will close in slightly thus reducing the internal clearance. Check with a feeler gauge at the top of the bearing between the top of the roller and the inside of the outer race. Clearances are as indicated in table I. If the internal clearance is less than recommended, please contact the USNR service representative.

Repeat for additional bearings.

Important ***Keep bearings covered until final assembly to prevent contamination.***

ASSEMBLE WHEEL ONTO ARBOR

When the bearings are properly installed in the wheel hub, proceed as follows to install the wheel onto the arbor:

1. Clean the arbor thoroughly and place the rear bearing cap over the arbor.
2. Raise the wheel to the correct elevation and slide it over the arbor until the bearing against the insert and the insert against the shoulder.
3. Use the retaining cap to 12 ft/lbs of torque. Put a lock wire through the retainer cap bolts.
4. Release the lifting apparatus.
5. Slowly rotate the wheel, pushing it toward the shoulder at all times.
6. There should be some Axial[1] clearance between the inner race and the inner face of the retaining ring.

Important A zero clearance can result in axial pre-loading of the bearing. Minimum clearance must be .005" with the maximum clearance up to .015".

Once the axial clearance is set, replace the bearing caps as follows.

A. Position the rear bearing cap and tighten capscrews.

B. Fit the front bearing cap and slide into position. Tighten capscrews.

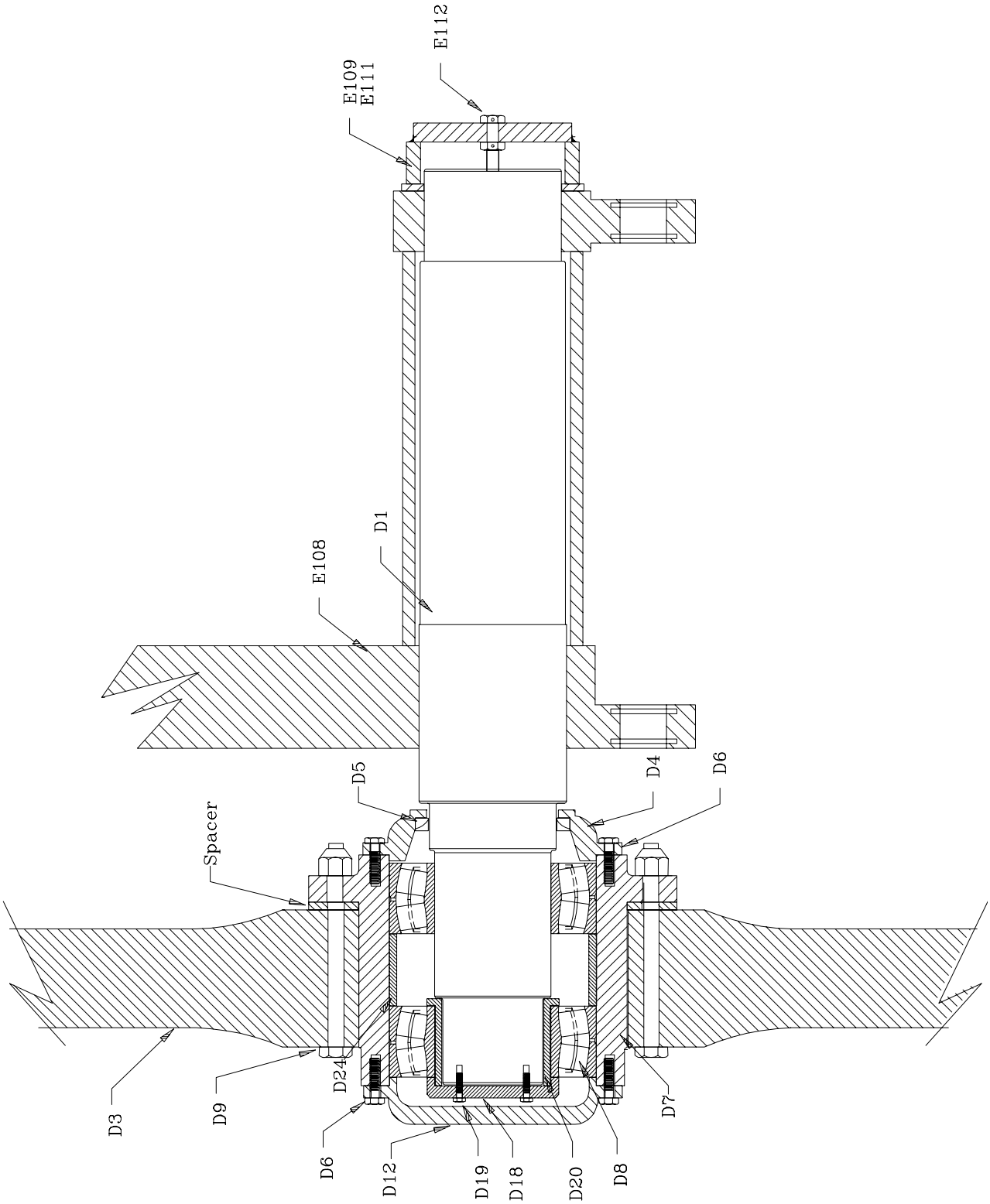
7. Rotate the wheel so that the oil filler plug is at the top. Fill with oil to the level indicated on the sight gauge. See “RECOMMENDED LUBRICANTS” on page 4-11.
8. Replace filler plug, rotate wheel by hand and recheck level after oil has settled. Top off if necessary.

---

1. Axis: A straight line about which a body or geometrical object rotates or may be conceived to rotate.
Axial clearance is the clearance measured between two points along the axis. The center of the arbor represents the axis of the bearing.

MOVEABLE ARBOR ASSEMBLY

Item:	Description:	Qty:	Part Number:
D1	*Moveable Wheel Arbor Assembly*	*1*	*412-6792*
D3	*Moveable Wheel (72” Cast, Spoked, 11.25” Face, Heavy Rim)*	*1*	*412-6132*
	Arbor Bearing Housing	*1*	*412-6121*
D4	*Arbor Bearing Cover*	*1*	*412-6013*
D5	*Oil Seal*	*1*	*D2-01041*
D6	*Hex Head Capscrew(5/8” NC x 1.5”)*	*12*	*Common Part*
D6	*Lock Washer (5/8”)*	*12*	*Common Part*
D7	*Moveable Arbor Bearing Housing*	*1*	*412-6130*
D8	*Spherical Roller Bearing*	*2*	*H2-00595*
D9	*Hex Head Cap Screw (.750” NC x9)*	*8*	*Common Part*
D9	*Nut-ESNA, LGT, Full (0.750 NC)*	*8*	*Common Part*
D12	*Pipe Plug (.750” NPT)*	*1*	*Common Part*
D17	*Arbor Bearing Outer Cover*	*1*	*412-6014*
D18	*Arbor Bearing Retainer*	*1*	*412-6019*
D19	*Hex Head Cap Screw (0.50” NC x 1.50”)*	*3*	*Common Part*
D20	*Bearing Sleeve*	*1*	*412-6018*
D24	*Bearing Spacer*	*1*	*412-6133*


E112
E109
E111
D1
E108
D5
D4
D6
Spacer
D3
D9
D24
D6
D12
D19
D18
D20
D8
D7

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AIR STRAIN SYSTEM

Consists of one strain level indicating gauge, one diaphragm cylinder and one strain balance reservoir system. This is a closed pneumatic system, that is, once it has been pressurized to obtain the required strain. the supply line valve is closed and the pneumatic source removed until the system pressure needs 'Topping Up' or an increase in strain level is required.

STRAIN APPLICATION INDICATOR

A series of three lights indicate the position of the strain table assembly: one green and two red lights, mounted on the operator's console.

Green Light The Bandmill is operational when the GREEN light only is on.

Red Light ***If either of the red lights are illuminated, the table is not properly positioned! In addition, while the lower red light is on, indicating over strain, the upper wheel cannot be extended electrically.***

The strain gauge shows the amount of air strain being applied to or available for application to the saw blade. Since there is always pressure in the strain reservoir, the strain gauge will always show a strain value, even if the wheel is not positioned against the saw.

The strain gauge reading is only accurate if the wheel has been properly positioned against the saw i.e. when the strain table travels to its operating strain position. Be certain the "NORMAL STRAIN" light is on.

NOTE: ***Strain is NOT applied to the saw blade by changing the pressure in the strain balance tank; it IS applied by moving the strain table to its operating position compressing the rocker assembly against the air in the strain piston.***

STRAIN CYLINDER COMPONENTS

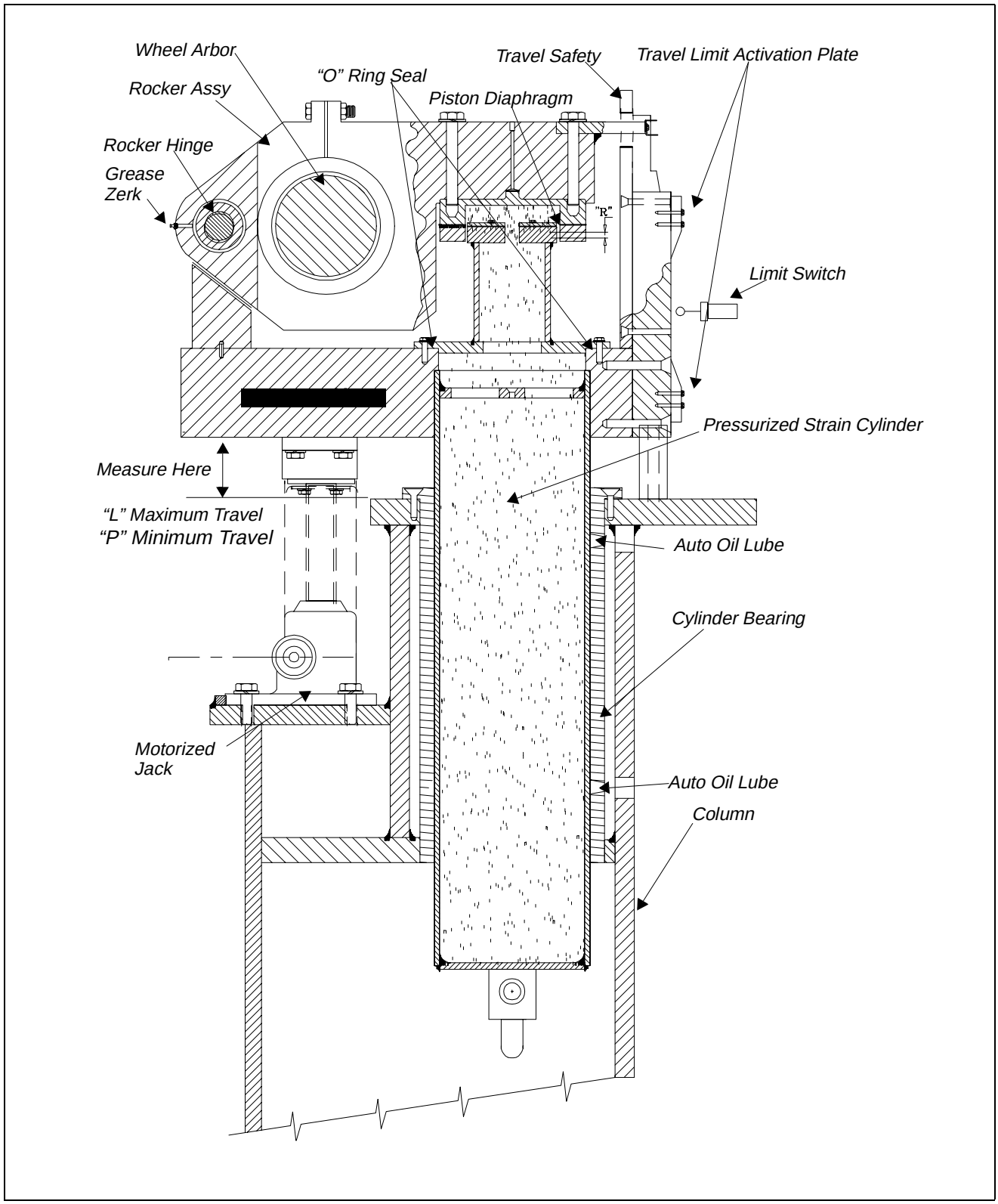

Figure 28: Horizontal Strain Table Components

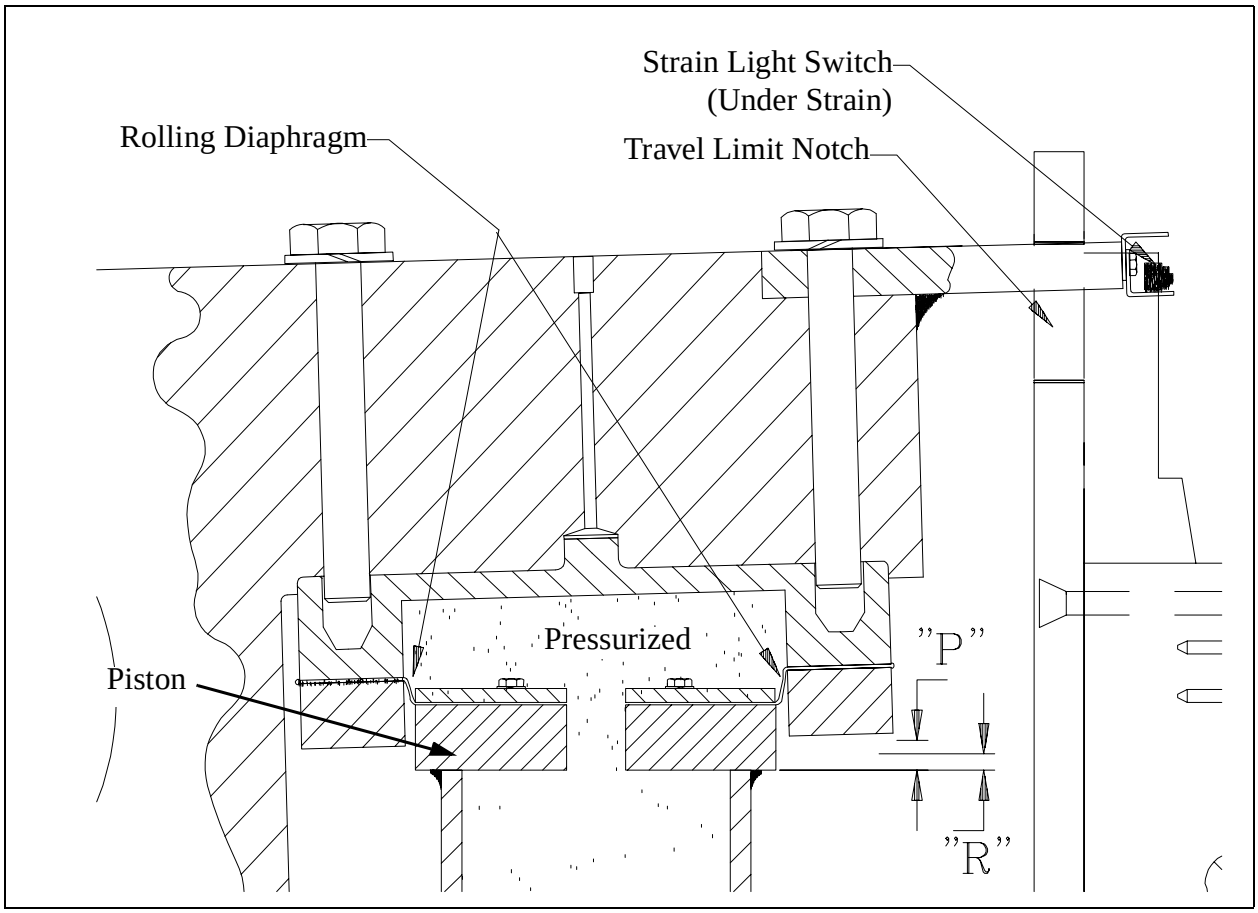

Figure 29: Effect Of A Pressurized Cylinder on the Rocker Arm

Under no circumstances should the pressure in the tank be sufficient to exceed the maximum designed strain of the Bandmill.

Table 30: Maximum Pressure & Strain 6 ft. Bandmill

Maximum Strain	Maximum Tank Pressure
32,000 lbs	160 psi

PRESSURIZING THE RESERVOIR

Close the supply line valve to the strain balance reservoir - plunger tube. Connect the pneumatic source to the supply line.

Note: ***Nitrogen is recommended for this application due to its cleanliness, lack of moisture content and its inert characteristic. Dry clean, compressed air can be used as a substitute.***

DESIRED TANK PRESSURE

The following table shows the required strain tank pressure to achieve a specific strain on the saw. This table assumes a **Vertical Bandmill with OHW (Over Hung Wheel) and 2900 upper arbor assembly balance weight**.

1. Select the saw strain you desire for your application (See Note below).

Table 31: 6’ Vertical OHW Pressure/Strain

TANK PRESSURE psi	SAW STRAIN lbs
14.5	0
100	17100
110	19100
120	21100
130	23100
140	25100
150	27100
160	29100
170	31000
174.5	32000

Table 32: 6’ Horizontal OHW Pressure/Strain

TANK PRESSURE psi	SAW STRAIN lbs
0	0
80	16000

Table 32: 6' Horizontal OHW Pressure/Strain

TANK PRESSURE psi	SAW STRAIN lbs
90	19000
100	20000
110	22000
120	24000
130	26000
140	28000
150	30000
160	32000

2. Slowly pressurize the strain balance tank to the proper psi or until the strain gauge reads the required strain.

   A. It is extremely important to ensure that the diaphragm cylinder is free to move. The diaphragm can be easily damaged. Great care must be taken to avoid any damage to it.

Note: The engineering department can provide recommendations for saws, tooth profiles and operating strain levels to match the customer's particular circumstances.

3. Actuate the wheel lift motor until the wheel lift limit switch deactivates the motor.

Care must be taken to ensure that the wheel lift limits are not exceeded during these initial periods of operation.

4. Adjust the moveable wheel elevation by hand until the under side of the diaphragm cylinder diaphragm ring and the under side of the piston are in the same plane.

   A. Adjust the limit switch actuating plate accordingly so that this relationship will be attained automatically. See "STRAIN MECHANISM" on page 2-23.

NOTE: THIS IS THE MID-STROKE AS WELL AS THE OPTIMUM OPERATING POSITION OF THE STRAIN CYLINDERS. THIS WILL REQUIRE FURTHER ADJUSTMENT WHEN MILL IS RUNNING.

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STRAIN ASSEMBLY - HIGH STRAIN 412-6793-6

Drawing Strain Assembly - High Strain (412-6793-6)

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STRAIN SYSTEM: PNEUMATIC COMPONENTS

Table 33: Strain System: Pneumatic Components
Item #100 on General Assembly Drawing
See "Strain Gauge Pneumatic Layout (D412-5417-7)" on page 3-39.

Item:	Description:	Qty:	Part Number:
53	Reducer Bushing, Pipe M/F (.375" x .250")	1	A4-00254
53	Tee, Female (.375")	1	A4-00170
53	Hydraulic Needle Valve	1	B4-00708
53	Connector, Male	1	A4-00537
53	Hose End, 37 Deg. Female Swivel	1	A4-00490
53	Hose End, Male Pipe Rigid	1	A4-00607
53	Hose End, 37 Deg. Female Swivel	1	A4-00403
53	Connector, Male	1	A4-00390
54	Elbow, 90 Deg. Male	1	A4-00762

STRAIN GAUGE PNEUMATIC LAYOUT D412-5417-7

Drawing Strain Gauge Pneumatic Layout (D412-5417-7)

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PARTS RELEASE: 3150 QUAD BANDMILL

BANDMILL WHEELS AND CASTINGS

Table 34: Release 3150-R1
Bandmill Wheels and Castings

Description	QTY	Part Number:
Lower/Fixed Wheel	4	412-6120
Upper/Moveable Wheel	4	412-6132
Plunger Bearing	4	412-6148
Arbor Shaft Housing - Lower	4	412-6121
Arbor Bearing Housing - Lower	4	412-6123
Bearing Spacer, Wheel Side	4	412-6125
Bearing Cap - Lower	4	412-6126
VEE Wear Plate	10	412-6158
Flat Wear Plate	6	412-6173

BASE & COLUMN ASSEMBLY

Table 35: Release 3150-R2 & R3
RH/LH Base Column Assembly
Note: These are Primarily Assembly Parts, Not Maintenance

Description	Qty	Part Number
LH Base Column Assembly 412-6812		
LH Base Column Assy Fabrication	1	260-2883
Spacer Plate	1	316-9369
LH Vertical Base Assembly	1	412-6813-L
Take-Up Bracket, LH Motor Plate	1	214-1863
Take-Up Bracket, LH Motor	1	214-1862
Adjusting Lug, Lower Arbor	4	412-6835
Guide Assembly, Strain Table, LH	1	213-9616
VEE Rail Wiper	4	412-5611
FLAT Rail Wiper	2	412-5612
VEE'd Wear Plates, Adj. & Lock	8	286-3669

Table 35: Release 3150-R2 & R3
RH/LH Base Column Assembly
Note: These are Primarily Assembly Parts, Not Maintenance

Description	Qty	Part Number
003 RH Base Colulmn Assembly 4112-6812-R		
RH Base Column Assy Fabrication	1	260-2882
Spacer Plate	1	316-9369
RH Vertical Base Assembly	1	412-6813
Take-Up Bracket, LH Motor Plate	1	214-1862
Take-Up Bracket, LH Motor Plate	1	214-1863
Adjusting Lug, Lower Arbor	4	412-6835
Guide Assembly, Strain Table, RH	1	213-9615
VEE Rail Wiper	4	412-5611
FLAT Rail Wiper	2	412-5612
VEE'd Wear Plates, Adj. & Lock	8	286-3669

STRAIN ASSEMBLY PARTS

Table 36: Strain Assembly (3150 R-4)

Item:	Description	Qty:	Part Number:
LH STRAIN ASSEMBLY #1 998-1564			
E3A	Hex Head Capscrew (GR 4 0.750” NC x 4.00”)	2	103-0196
E3B	Spring Style Lock Washer (.750”)	2	124-5119
E3C	Hex Nut, Full (.750”)	2	122-0019
E4A	Hex Head Capscrew (.750” NC x 4.5”)	2	103-0197
E4B	Spring Style Lock Washer (.50”)	2	124-5119
E4C	Hex Nut, Full (.750”)	2	122-0019
E5A	Hex Head Capscrew (.750” NC x 3.0”)	2	103-0192
E5B	Spring Style Lock Washer (.750”)	2	124-5119
E11	Zerk Fitting	2	D2-00138
E12	Spherical Ball Bearing	2	H2-00605
E14	Internal Retainer Ring	4	H2-00606
E15	External Retainer Ring	4	H2-00607
E17	Diaphragm Cylinder	1	411-8013
E18	Rolling Diaphragm	1	411-8000
E19	Diaphragm Ring	1	411-8014
E20A	Hex Head Capscrew (.375”)	16	217-3109
E20B	Flat Washer (Hard, SAE, 0.375”)	16	124-0114
E21A	Hex Head Capscrew (.375” NC x 1.0”)	6	217-3110
E21B	Flat Washer (Hard, SAE, 0.375”)	6	124-0114
E22	Diaphragm Retainer Plate	1	411-8017
E23	Pressure Cylinder Diaphragm Piston (10.75” LIP)	1	412-6159
E28A	Socket Head Capscrew (750” NC x 2.0”)	4	103-6229
E28B	Spring Style Lock Washer (.750”)	4	124-5119
E32	Plate-Face, Gauge	1	412-5525
E33	Pneumatic Pressure Gauge (200 PSI)	1	P2-00395
E43	Limit Switch Mounting Plate	1	296-7175
E45A	Slot Head Screw	2	110-0114
E45B	Lock Washer	2	124-5109
E45C	Nut-ESNA	2	123-0109
E46	Plate-Actuator	1	412-6138
E52A	Slot Head Screw	3	110-1066
E52B	Lock Washer	3	124-5109
E63	Pin-Pivot (Rocker Assy Hinge)	2	412-5060
E64	Support Bracket (Rocker)	1	412-6139
E65	Support-Tilt Arm (Rocker)	1	412-6140
E66	Support Cap	4	412-5420

Table 36: Strain Assembly (3150 R-4)

Item:	Description	Qty:	Part Number:
E70A	Socket Head Capscrew 3/4 NC x 2 1/2”	4	J2-00648
E70B	Washer, Lock-Spring, (.750”)	4	124-5119
E83A	Hex Head Capscrew (Gr 5 0.750” NC x 4.0”)	1	103-0196
E83B	Spring Style Lock Washer (.750”)	1	124-5119
E83C	Hex Nut (.750” NC)	1	122-0019
E84A	Hex Head Capscrew, 0.50” NC X 2.00”	8	103-0130
E84B	Lockwasher, 0.500”	8	124-5116
E85	O-Ring, 11.25” OD x 11.0” ID x 1/8” wd	1	D2-01050
E86	Capscrew - SOCFH, 0.750” NC, 3.00”	2	103-6533
E87	Keeper Angle	1	412-6142
E88	Capscrew - Socket Head	1	103-6208
E89A	Hex Head Cap Screw (1/2”)	8	103-0130
E89B	Lockwasher (1/2”)	2	124-5116
E90	Pin-Dowel, 0.250”, 0.750”	2	J2-01200
E94A	Tilt Arm Bushing-Supp	1	412-6143
	Bronze Bushing		H4-00490
E94B	Grease Fitting	1	D2-00138
E95	Socket Head Setscrew (.375” NC x .750”)	1	113-0138
E96	Nylon Round Bar (3/8” Dia.)	1	032-0005
E97	Strain Gauge Support	1	412-5521
E98A	Hex Head Capscrew (1/2” NC x 3/4”)	2	103-0124
E98B	Lockwasher (1/2”)	2	124-5116
E102	Pin-Spring 0.500”, 1.500”	1	127-4250
E103	Control Box Mounting Bracket	1	412-5617
E104	Limit Switch Actuator Bracket	2	412-5637
E105	Socket Head Capscrew (.250” NC x 1/2”)	2	103-6098
E105	LockWasher (1/4”)	3	124-5112
E108	Pivot Arm, Rocker/Tilt Assy	1	348-0315
E109	Bracket (Moveable Arbor, Adj)	1	412-6790
E110	Threaded Rod - Arbor Adj. Screw	5	7/8-REDI-9-B7
E110	Pin-Spring	2	J2-00923
E110	Nut - Hex	2	122-0020
E111	Hex Head Capscrew (GR5, 1/2” NC x 1.25”)	4	103-0127
E111	Lockwasher	4	124-5116

Table 37: Strain Assembly 3150-R5

Item:	Description	Qty:	Part Number:
	RH STRAIN ASSEMBLY #2 #998-1563		
E3A	Hex Head Capscrew (GR 4 0.750” NC x 4.00”)	2	103-0196
E3B	Spring Style Lock Washer (.750”)	2	124-5119
E3C	Hex Nut, Full (.750”)	2	122-0019
E4A	Hex Head Capscrew (.750” NC x 4.5”)	2	103-0197
E4B	Spring Style Lock Washer (.50”)	2	124-5119
E4C	Hex Nut, Full (.750”)	2	122-0019
E5A	Hex Head Capscrew (.750” NC x 3.0”)	2	103-0192
E5B	Spring Style Lock Washer (.750”)	2	124-5119
E11	Zerk Fitting (Grease Fitting)	2	D2-00138
	Spherical Ball Bearing	2	H2-00605
E14	Internal Retainer Ring	4	H2-00606
E15	External Retainer Ring	4	H2-00607
E17	Diaphragm Cylinder	1	411-8013
E18	Rolling Diaphragm	1	411-8000
E19	Diaphragm Ring	1	411-8014
E20A	Hex Head Capscrew (.375”)	16	217-3109
E20B	Flat Washer (Hard, SAE, 0.375”)	16	124-0114
E21A	Hex Head Capscrew (.375” NC x 1.0”)	6	217-3110
E21B	Flat Washer (Hard, SAE, 0.375”)	6	124-0114
E22	Diaphragm Retainer Plate	1	411-8017
E23	Pressure Cylinder (10.75” LIP)	1	412-6159
E28A	Socket Head Capscrew (750” NC x 2.0”)	4	103-6229
E28B	Spring Style Lock Washer (.750”)	4	124-5119
E32	Plate-Face, Gauge	1	412-5525
E33	Pneumatic Pressure Gauge (200 PSI)	1	P2-00395
E43	Limit Switch Mounting Plate	1	296-7174
E45A	Slot Head Screw	2	110-0114
E45B	Lock Washer	2	124-5109
E45C	Nut-ESNA	2	123-0109
E46	Plate-Actuator	1	412-6138
E52A	Slot Head Screw	3	110-1066
E52B	Lock Washer	3	124-5109
E63	Pin-Pivot (Rocker Assy Hinge)	2	412-5060
E64	Support Bracket (Rocker)	1	412-6139
E65	Support-Tilt Arm (Rocker)	1	412-6140
E70A	Unbrako Socket Head Capscrew 3/4 NC x 2 1/2”	4	J2-00648
	Support Cap	4	412-5420
E70B	Lock Washer - Spring	4	124-5119

Table 37: Strain Assembly 3150-R5

Item:	Description	Qty:	Part Number:
E83A	Hex Head Capscrew (GR5 0.750” NC x 4.0”)	1	103-0196
E83B	Spring Style Lock Washer (.750”)	1	124-5119
E83C	Hex Nut (.750” NC)	1	122-0019
E89A	Hex Head Cap Screw (1/2”)	8	103-0130
E84B	Lockwasher (1/2”)	8	124-5116
E85	“O” Ring (11.25” OD x 11” ID x 1/8” WD)	1	D2-01050
E86	Socket Head Cap Screw	2	103-6533
E87	Keeper Angle	1	412-6142
E88	Socket Head Capscrew	1	103-6208
E89A	Hex Head Capscrew (1/2” x 1.1/2”)	2	103-0128
E89B	Lockwasher (1/2”)	2	124-5116
E90	Pin-Dowel (.250”, .750”)	2	J2-01200
E94A	Tilt Arm Bushing-Supp	1	412-6143
E94B	Grease Fitting	1	132-5001
E95	Socket Head Setscrew (.375” NC x .750”)	1	113-0138
E96	Nylon Round Bar (3/8” Dia.)	1	032-0005
E97	Strain Gauge Support	1	412-5521
E98A	Hex Head Capscrew (1/2” NC x 3/4”)	2	103-0124
E98B	Lockwasher (1/2”)	2	124-5116
E102	Spring Pin (.5”, 1.5”)	1	127-4250
E103	Control Box Mounting Bracket	1	412-5617
E104	Limit Switch Actuator Bracket	2	412-5637
E105	Socket Head Capscrew (.250” NC x 1/2”)	2	103-6098
E105	LockWasher (1/4”)	3	124-5112
E108	Pivot Arm, Rocker/Tilt Assy	1	348-0316
E109	Bracket (Moveable Arbor, Adj)	1	412-6790
E110	Threaded Rod - Arbor Adj. Screw	5	7/8-REDI-9-B7
E110	Pin-Spring	2	127-4148
E110	Nut - Hex	2	122-0020
E111	Hex Head Capscrew (GR5, 1/2” NC x 1.25”)	4	103-0127
E111	Lockwasher	4	124-5116

WHEEL LIFT ASSEMBLY PARTS

Table 38: Release 3150 R-7
RH Wheel Lift Assembly W Motor

Item:	Description	Qty EA	Part Number
F1	Plunger Tube	1	412-6145
F8	Handwheel Assy - Strain	1	269-6010
	Hand Wheel	1	P2-00402
	Flat Washer	1	343-4002
	Hex Head Capscrew, Gr 5, 0.375 NC x 2”	1	103-0090
F43	Upright Worm Gear Screw Jack	1	P2-00401
F87	Upper Arbor Support - RH	1	321-9514
F87	Upper Arbor Support - LH	1	321-9515
F88	Wormgear Reducer	1	P2-00399
F88A	Electric, 5HP Motor, 1800 rpm, 184TC	1	L2-00419
F92	Coupling, Urethane-Flex	1	G8-00129
F93	Post-Guide, 16.75” Long	1	412-6147
F94	Socket FH Capscrew, 0.750” X 3.50”	2	103-6535
F128	Screw Jack - Inverted	1	P2-00400
F133	Striker Plate, Aluminum	2	412-5438
F135	SCR-SlotRH, 1/32, 1.500	2	110-1073
F135A	Lock Washer, SPG#10	2	124-5109
F140	Pad-Slide, Adj. Screw	2	294-5153
F140A	Back Plate Adj. Screw	2	296-5808
F140B	Setscrew - Adj. 0.750 NC x 4” Lg.	2	308-1309
F143	Hex Head Capscrew, .375” NC x 1.250	4	103-0087
F143A	Lock Washer, .750”	4	124-5119
F144	Hex Head Capscrew, GR 5, 0.75” x 1.750	4	103-0187
F144A	LockWasher - Spring	4	124-5119
F145	Hex Head Capscrew, Gr 5, 1.0 NC x 3.00	4	103-0226
F145A	Lock Washer - SPG	4	124-5121
F147	Pin-Spring, .250”, 2.00”	1	127-4188
F148	Handwheel Assembly	1	269-6009
	Wheel for above	1	P2-00402
F150	Hex Head Capscrew, 0.50” NC x 1.75	2	103-0129
F150A	Lockwasher	2	124-5116
F152	SocHd Capscrew, .250” NC x .625”	2	103-6099

Table 38: Release 3150 R-7
RH Wheel Lift Assembly W Motor

Item:	Description	Qty EA	Part Number
F153	Mounting Block, Joyce Jack	1	412-6187
F154	Hex Head Capscrew, .750” NC x 2.0”	4	103-0188
F159	Hex Head Capscrew, K248	2	103-0136

UPPER ARBOR PARTS

Table 39: Release 3150 R-12
Bandmill Upper Arbor Assembly 998-1562

Description	Qty EA	Part Number
Upper Arbor Shaft	1	B-084779
Bearing Cap, Upper	1	412-6013
Bearing Cap - Outer	1	412-6014
Oil Seal	1	D2-01041
Capscrew - Hex Head 5/8 NC x 1.5”	12	103-0168
5/8” Lock Washer	12	124-5118
140MM Spherical Roller Bearing	2	H2-00595
Capscrew - Hexhd, 3/4 NC x 9	8	103-0951
Nut - ESNA, Heavy 3/4” NC	8	123-2019
Plug - Pipe, 3/4” NPT, 044-06	4	135-4104
Cover, Bearing, Outer, - Casting	1	412-6014
Bearing Retainer, Moving Arbor	1	412-6019
Capscrew - HexHd 1/2” NC x 1.5”	3	103-0128
Bearing Sleeve	1	412-6018
Bearing Spacer	1	412-6133

LOWER ARBOR PARTS

Table 40: Release 3150-R13
Bandmill - Lower Arbor Assembly

Description	Qty	Part Number
Lower Arbor Solid Shaft, Fixed	1	A-082330
Bearing Cap, Fixed Arbor	1	412-6003
Bearing Cap, Fixed Arbor	1	412-6122
Housing Seal, Fixed Arbor	1	412-6005
Clamp, Fixed Arbor	2	412-6124
Thrust Ring, Fixed Arbor	1	412-6011
Spacer Ring - Fixed Arbor	1	412-6032
Adjusting Lug	1	412-6127
Oil Seal	2	D2-01051
O-Ring	2	D2-01052
110MM Spherical Roller Bearing	1	H2-00608
Bearing Adapter, 3.937 Bore	1	H2-00611
200MM Spherical Roller Bearing	2	H2-00609
“RingFeder” Locking Ring	3	P2-00396
Seal-VEE Ring	1	P2-00397
Redi Rod - Arbor Adj.	1	1-REDI-8-B7
Oil Seal	2	D2-01053
Retainer Ring, External 8.0”	1	130-0800
8V 8Groove 30.0” Dia. QD Sheave	1	E4-00144
Split Taper Sheave Bushing	1	H4-00467

SAWDUST SHEAR ASSEMBLY PARTS

Table 41: Release 3150-R14
Sawdust Shear & Scraper Assembly

Description	Qty EA	Part Number
Sawdust Shear Assembly, RH, #2 Mill		
Sawdust Shear Bar	1	205-1011
Mounting Bar, Sawdust Shear, RH	1	232-7017
Lower Wheel Cover, RH	1	226-9365
Lower Wheel Sawdust Guard, RH	1	226-9367
Sawdust Shear Assembly, RH #3 Mill		
Sawdust Shear Bar	1	205-1011
Mounting Bar, Sawdust Shear, RH	1	232-7017
Lower Wheel Cover, RH	1	226-9365
Lower Wheel Sawdust Guard, RH	1	226-9369
Sawdust Shear Assembly, LH, #1 Mill		
Sawdust Shear Bar	1	205-1011
Mounting Bar, Sawdust Shear, LH	1	232-7018
Lower Wheel Cover, LH	1	226-9366
Lower Wheel Sawdust Guard, LH	1	226-9368
Sawdust Shear Assembly, LH #4 Mill		
Sawdust Shear Bar	1	205-1011
Mounting Bar, Sawdust Shear, LH	1	232-7018
Lower Wheel Cover, LH	1	226-9366
Lower Wheel Sawdust Guard, LH	1	226-9370
Scraper Assembly, Upper & Lower Wheel		
Scraper Assembly	1	201674
Counterweight, (Upper Wheel)	1	411-5099
Scraper Blade	1	412-6168
Spray Nozzle	1	D1-01056
Scraper Bracket, (Upper Wheels)	1	412-6169
Scraper Bracket (Lower Wheel)	1	412-6170
Scraper Mounting Bar (Upper Wheel)	1	412-6171

UPPER SAW GUIDE ASSEMBLY PARTS

Table 42: Release 3150-R15
Upper Saw Guide LH D-085859-L

Description	Qty Ea:	Part Number
Slide Support	1	D-086303
Slide Plate	1	D-082011
Rulon Slide Material	2	P2-00038
Slotted Spring Roll Pin	6	J2-01295
Saw Guide Rail	2	B-078499
Slotted Spring Roll Pin	8	J2-01293
Zerk Fitting (Grease)	4	B-078498
Saw Guide Spacer	2	B-078497
Rulon Slide Material	2	P2-00038
Felt Wiper	3	A-082254
1/8” Plate Aluminum	4	296-7518
Anti-Rotation Wear Strip UHMW	1	A-082470
Saw Guide Block	1	998-4066
Holder- Saw Guide Block	1	411-5690
Dovetail Guide Block	1	211-4451
Dovetail Guide Block Adapter	1	201-2086
Adjusting Screw	4	308-1090
Hex Socket Head Cap Screw	4	J2-00177
Hanger Pin, Upper Saw Guide	1	B-082059
Pivot Arm, RH	1	348- 0320
Hanger Washer	1	411-5377
Shoulder Pin	1	B-082060
Holder Support	1	213-9618
Spray Nozzle, Assy	2	D2-01056
Spray Nozzle Support	2	411-5518
TEE, Female .25” NPT	2	A4-00025
Plug, Socket Head, .25” NPT	2	A4-00630
Spring Disc	2	P2-00497
Hex Jam Nut, Self-Locking	1	J2-01267
Clevis, Female Rod w/Pin	1	C2-01331
Pivot Pin	1	C2-01190
Duplex Cylinder	1	C2-01347

Table 43: Release 3150-R16
Upper Saw Guide LH D-085859-R

Description	Qty Ea:	Part Number
Slide Support	1	D-086303
Slide Plate	1	D-082011
Rulon Slide Material	2	P2-00038
Slotted Spring Roll Pin	6	J2-01295
Saw Guide Rail	2	B-078499
Slotted Spring Roll Pin	8	J2-01293
Saw Guide Spacer	2	B-078497
Rulon Slide Material	2	P2-00038
Felt Wiper	3	A-082254
1/8” Plate Aluminum	4	296-7518
Anti-Rotation Wear Strip UHMW	1	A-082470
Saw Guide Block	1	998-4066
Holder- Saw Guide Block	1	411-5690
Dovetail Guide Block	1	211-4451
Dovetail Guide Block Adapter	1	201-2086
Adjusting Screw	4	308-1090
Hex Socket Head Cap Screw	4	J2-00177
Hanger Pin, Upper Saw Guide	1	B-082059
Pivot Arm, RH	1	348- 0320
Hanger Washer	1	411-5377
Shoulder Pin	1	B-082060
Holder Support	1	213-9618
Spray Nozzle, Assy	2	D2-01056
Spray Nozzle Support	2	411-5518
TEE, Female .25” NPT	2	A4-00025
Plug, Socket Head, .25” NPT	2	A4-00630
Spring Disc	2	P2-00497
Hex Jam Nut, Self-Locking	1	J2-01267
Clevis, Female Rod w/Pin	1	C2-01331
Pivot Pin	1	C2-01190
Duplex Cylinder	1	C2-01347

DRIVE ASSEMBLY PARTS

Table 44: Release 3150-R17
LH Drive Assembly Parts

Description	Qty EA	Part Number
Drive Assembly, LH D-085426-L (2 Each)		
8V 8 Groove 14.0” Dia. QD Sheave	1	E4-00056
QD Bushing	1	H4-00081
8V, 8 GRV Powerband Belts	1	E2-00301
Motor Slide Plate	1	B-082448
Take-Up Bracket	1	B-082449
Guard, LH Main Drive Motor	1	D-086227
Guard Support Bar	6	A-082667

Table 45: Release 3150-R18
RH Drive Assembly Parts

Description	Qty EA	Part Number
Drive Assembly, RH D-085426-R (2 Each)		
8V 8 Groove 14.0” Dia. QD Sheave	1	E4-00056
QD Bushing	1	H4-00081
8V, 8 GRV Powerband Belts	1	E2-00301
Motor Slide Plate	1	B-082448
Take-Up Bracket	1	B-082449
Belt Guard, LH Main Drive Motor	1	D-086227
Guard Support Bar	6	A-082667

WHEEL GRINDING COMPONENTS

Table 46: Release 3150-R21
Wheel Grinding Bracket Assy

Description	Qty Ea	Part Number
Lower Wheel Grinding Assembly	1	998-5171
Lower Wheel Grinder Support	1	412-6193
Wheel Grinder Support Bar	1	412-6194
Upper Wheel Grinding Assembly	1	998-1572
Upper Wheel Grinder Support	1	412-6196

SAWGUIDE BLOCK PARTS

Table 47: Sawguide Block

Description	Qty Ea	Part Number
Sawguide Block Assembly	16	411-5691

REMOTE TILT ASSEMBLY PARTS

Table 48: Release 3150-R23
Remote Tilt Assembly

Description	Qty Ea	Part Number
.5 HP Gearmotor, Remote Tilt	1	L4-00212
Bracket, Motor Slide Base	1	214-2461
QD Sprocket, bored for SF QD Bushing	1	G4-00440
QD Sprocket, bored for SH QD Bushing	1	G4-00439
QD Bushing SF w/1.0” Dia Bore	1	H4-00502
60 Roller Chain, Import	76	G2-00018
60 Connecting Link & Cotter Pins	1	G2-00016
QD Bushing SH w/1.0” Dia Bore	1	H4-00501

LUBRICATION ASSEMBLY PARTS

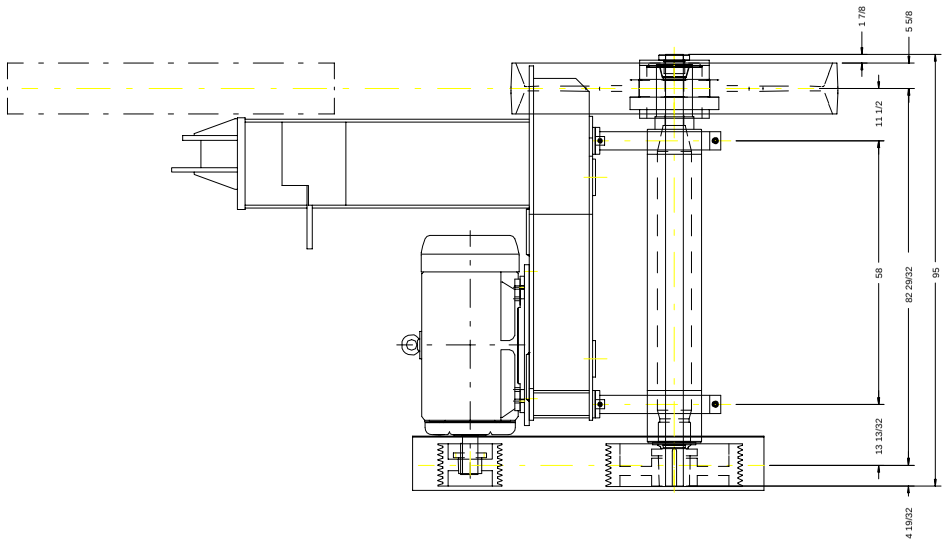
Table 49: Release 3150-R24
Auto-Lubrication Assembly

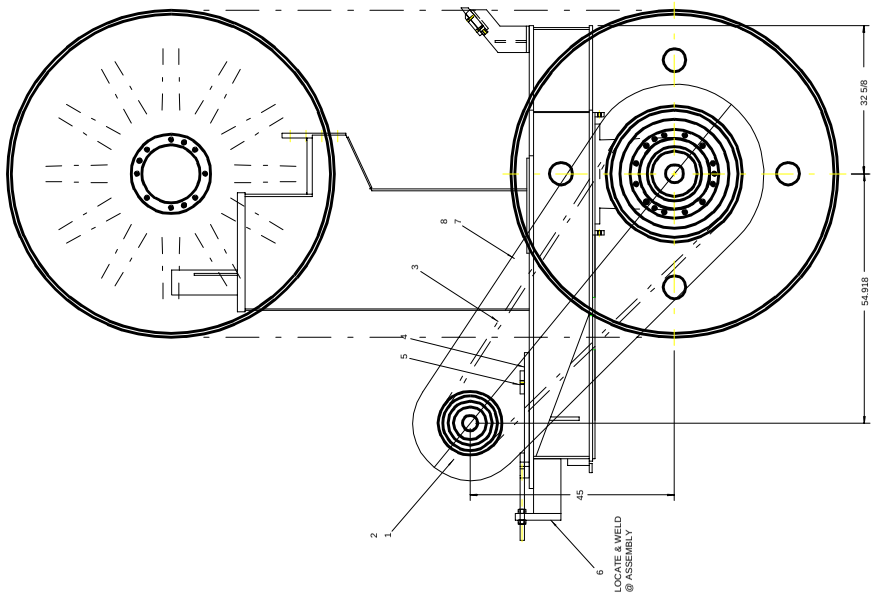
Description	Qty Ea	Part Number
.5” Regulator w/Gauge	1	A2-00269
Directional Control Valve, .25”	1	B4-00721
Oil Pump, 15 Pint Capacity	1	D2-01120
Lincoln Timer	1	M2-02663
Pressure Gauge	1	B2-00467
Zerk Fitting	1	D2-00138
Injector	12	D2-01091
Injector Manifold - 2 Unit	8	D2-01117
Injector Manifold - 3 Unit	8	D2-00533
Cross, Female, .25 NPT	1	A4-00171
Elbow, 90 deg Male .375OD JIC Tube to .125 Pipe	3	A4-00813
Elbow, 90 deg Male, .375OD JIC Tube to .375 Pipe	1	A4-00762
Tee, Male, .375” OD Tube	13	A4-00815
Connector, Male, .375” OD JIC Tube to .25” Pipe	12	A4-00495
Cross, Female, .375” NPT	4	A4-00172
Nipple Pipe, .25” x 2.5” Long, sch 40	4	A4-00021
Spray Mist, 32 OZ Reservoir, 4 Nozzles, Pipe	4	D2-01119

ITEM	QTY	DESCRIPTION	DWG-P/N
1	1	8V, 8 GRV, 14.0 DIA SHEAVE	E4-00056
2	1	QD-J BUSHING, 3 3/8 DIA	H4-00081
3	1	8V-2120, 8 GRV, POWERBAND	E2-00301
4	1	MOTOR SLIDE BASE	B-082448
5	4	MOTOR PADS	A-042652
6	2	TAKE-UP BRACKETS	B-082449
7	1	ARBOR DRIVE GUARD	D-086227
8	6	GUARD SUPPORT BAR	A-082667

DRIVE SPECIFICATIONS:

MOTOR: 200 HP, 1200 RPM, 449T, BALDOR GOLD, TEFC
DRIVE SHEAVE: 8V, 8 GROOVE, 14.0 DIA
DRIVEN SHEAVE: 8V, 8 GROOVE, 30.0 DIA
ARBOR SPEED: 560 RPM (NOMINAL)
SAW SPEED: 10,555 FPM (NOMINAL)





THIS DRAWING USED FOR BOTH LEFT & RIGHT HAND ASSEMBLIES.
WHEN ORDERING PARTS, BE CERTAIN TO SPECIFY LEFT OR RIGHT HANDED VERSIONS.

USE P/N D-085426-L FOR LEFT HAND ASSEMBLY (SHOWN HERE)
USE P/N D-085426-R FOR RIGHT HAND ASSEMBLY (OPPOSITE FROM SHOWN)

USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON

DRIVE ASSEMBLY - LH
6 FT BANDMILL

SHEET
OF

DRAWN BY: TLS
DATE: 2-Jun-97
SCALE: 1/12" = 1"
CHECKED BY:
JOB NO.:
DWG NO. D-085426
REV.

PLOT DATE: 6-Oct-97 11:44:53

FROM ASSY DRAWING NO.
LIMITS UNLESS OTHER SPECIFIED
FRACT. ± 1/64 DEC. .x ± .010 .xx ± .005
DATE
CHANGE
REV.

US NATURAL RESOURCES
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11:07:44

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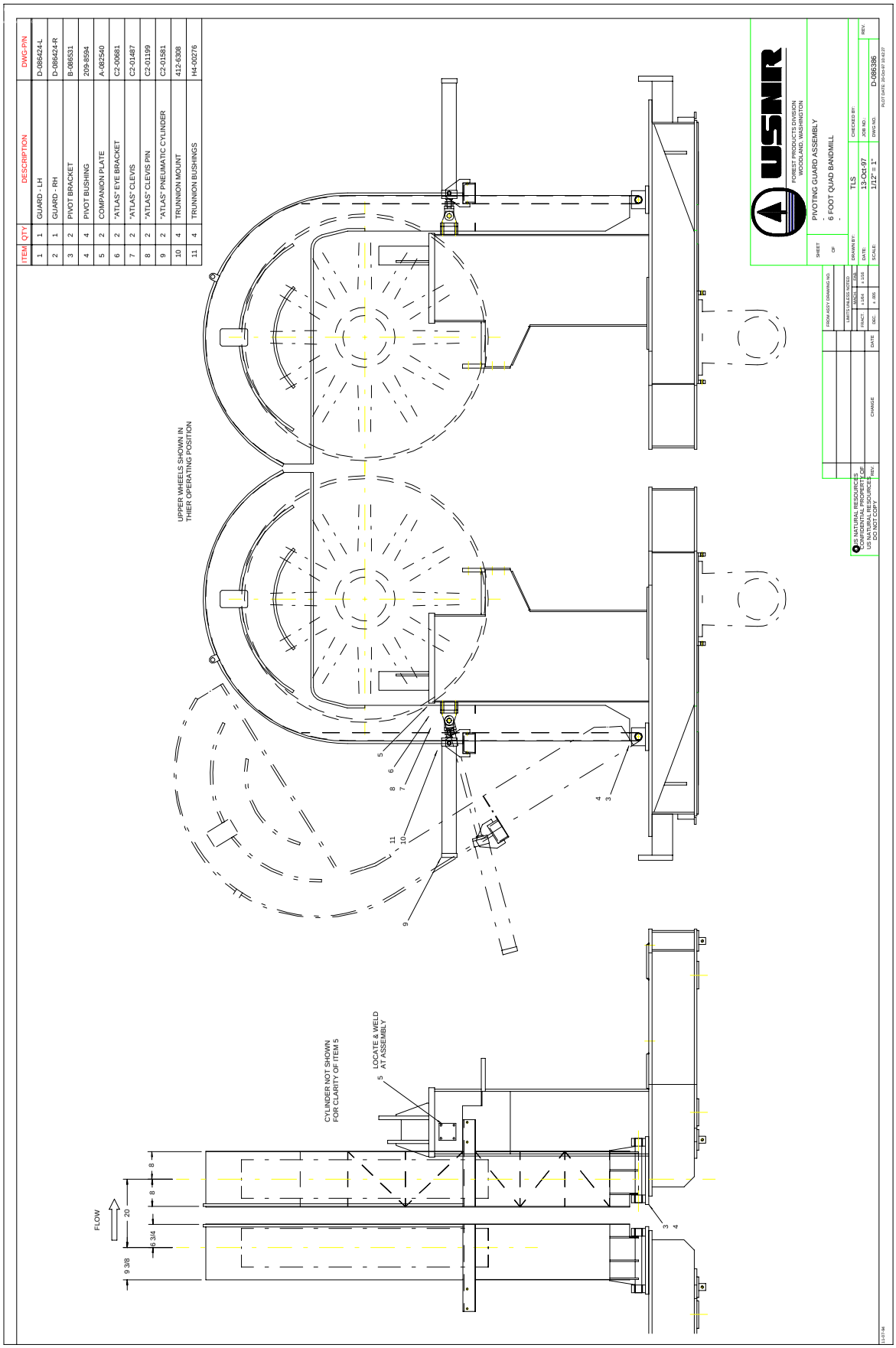
ITEM QTY DESCRIPTION DWG-P/N
1 1 GUARD - LH D-086424-L
2 1 GUARD - RH D-086424-R
3 2 PIVOT BRACKET B-086531
4 4 PIVOT BUSHING 209-8594
5 2 COMPANION PLATE A-062540
6 2 "ATLAS" EYE BRACKET C2-50681
7 2 "ATLAS" CLEVIS C2-01487
8 2 "ATLAS" CLEVIS PIN C2-01199
9 2 "ATLAS" PNEUMATIC CYLINDER C2-01581
10 4 TRUNNION MOUNT 412-6308
11 4 TRUNNION BUSHINGS H4-00276
UPPER WHEELS SHOWN IN THEIR OPERATING POSITION
CYLINDER NOT SHOWN FOR CLARITY OF ITEM 5
LOCATE & WELD AT ASSEMBLY
FLOW
USNR
FOREST PRODUCTS DIVISION
WOODLAND, WASHINGTON
PIVOTING GUARD ASSEMBLY
6 FOOT QUAD BANDMILL
DRAWN BY: TLS
DATE: 13-Oct-97
SCALE: 1/12" = 1"
CHECKED BY:
JOB NO.
DWG NO. D-086386
REV.
SHEET OF
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4 LUBRICATION

CENTRALIZED LUBRICATION SYSTEM

The function of the centralized lubrication system is to allow for the lubrication of the bandmill components from one central position in a minimum time period and to ensure that no lubrication points are missed.

NOTE: ***For details on the Central Lubrication System see your lubrication supplier's manual(s).***

The bandmill wheel bearings are however not lubricated by this system for several reasons. Wheel bearings will overheat if over or under lubricated. They only need to be checked and lubricated periodically.

UPPER AND LOWER WHEEL

The upper and lower wheel bearings are lubricated with grease in the factory. However, if wheel assemblies are stored for long periods of time the wheel bearing covers should be removed and the bearings inspected.

The prime areas of concern regarding the bearings is the volume of grease in the bearing housing, and contamination of the grease. The housing should be filled to, one third of its capacity with a premium multipurpose grease.

After start-up and one hour of running, the bearings should be warm to the touch. If it is hot to the touch then the bearing cover should be removed and the quantity of grease should be checked. Too much or too little grease can over heat a bearing.

IT CANNOT BE OVER-STRESSED THAT EVERY PRECAUTION BE TAKEN TO MAINTAIN A THOROUGHLY CLEAN SYSTEM.

The wheel bearings should be checked during the first week of operation and again after the first month. If there is no leakage, annual checks are adequate.

The other points of lubrication are shown on the lubrication chart following. Grease these points at the stated frequency.

Available to the customer are many options for Lubrication such as manually or air operated grease pumps, and if oil is used, air hydraulic or electrically operated systems are available. More sophisticated systems have programmable timers with system alarms and recorders.

TYPES OF LUBRICANTS

GREASE

Use a premium multipurpose grease, extreme pressure, with good mechanical stability and water resistant NLGI grade 2 Lithium Soap Grease with rust and oxidation inhibitors, (Base oil viscosity of approximately 500 SUS at 100^{o}F.). Wheel bearings were greased at assembly with Keystone NLGI No. 2 EP grease (call 1-800-344-2241 for local keystone distributor).

If in any doubt as to what lubricant should be used please consult with our engineering office and we will make the recommendation for your particular system. A lubricant chart is included on page 5. It includes those lubricants found to work well in USNR equipment.

HYDRAULIC POWER PACK OILS

Hydraulic power pack oils are available in four viscosity grades. Consult your local supplier for the grade that should be used, keeping in mind the following.

A. Working temperature range and pressure.

B. Low pour point.

C. Resistance to oxidation.

D. Wear resistance and load carrying qualities.

E. Anticorrosive additives

F. Foam inhibited requirements.

G. Compatibility with seal material.

GENERAL LUBRICATION

FUNCTION

Anti-Friction bearing lubricants serve the following Primary functions:

1. To lubricate the sliding contact which exists between the retainer and other parts of the bearing.

2. To lubricate any contact between the races and rolling elements.

3. To lubricate both the sliding contact and the guiding elements in roller bearings.

Secondary functions are:

4. To protect the highly finished surfaces of rolling elements and races from corrosion.

5. To help seal housings against foreign matter. Grease contributes towards that end.

SELECTING THE PROPER LUBRICANT

The friction torque in a ball bearing lubricated with grease consists essentially of two components. One of these is a function of the bearing design and the load imposed on the bearings, and the other is a function of the viscosity and the quantity of the grease and the speed of the bearing.

With so many factors influencing the friction torque, energy loss, and temperature rise in a bearing lubricated with grease, it is evidently not possible to give definite recommendations for selection of grease for all bearing applications.

OPERATING TEMPERATURE

Bearing operation results in certain temperature rises. Bearing size, type, speed, load and external heat are the factors. Each application will exhibit a characteristic operating temperature. If the bearing selection, assembly and lubrication have been performed correctly, the observed operating temperature is the normal level. A departure from this level is cause for investigation. Normal operating temperature should not exceed 180°.

SERVICE INTERVAL

The amount and frequency of greasing should be 0.3 to.0.5 oz. (3 to 5 pumps on a hand grease gun) every 200 operating hours or sooner if subject to moisture as in sawing applications.

The reason for lubrication at regular intervals is the breakdown of the grease into the oils and the thickening agents. After the separation, oil is broken down by oxidation or lost to evaporation. Due to the absence of oil on the rolling surfaces, new grease must be injected to bleed out the old grease.

REASONS FOR BEARING FAILURE

1. Mixing of lithium base grease with calcium base can cause a chemical reaction. This turns to a tan powder or sometimes crystallizes (sugar texture).

2. Running beyond recommended lube interval. Grease without oil turns to a clay compound texture.

3. Overfill of bearing housing or not changing at recommended interval. This can cause an overheating (above 250 degrees F.) causing oil to evaporate from grease in contact with rolling elements usually turning black or smelling burnt.

LUBRICATION CHART

A carefully designed lubrication program will help to lengthen the operational life of your equipment. See "RECOMMENDED LUBRICANTS" on page 9 for lubricants recommended for use on **USNR** Equipment. Please note that they are intended as a guide only and equivalent lubricants from other suppliers are acceptable. See "Bandmill Lubrication Frequency Chart" on page 4-6. for intervals of lubrication.

Note: For operational conditions outside the norm, please consult your **USNR** service representative or your lubricant supplier for information.

Note: When replacing reducers on your machine, remember that units are shipped without oil. When filling these units, it is essential that the oil level corresponds to the marking on the dipstick. Overfilling causes excessive heating and the possibility of leakage.

CAUTION: ***It takes about 20 minutes for the oil to pass through the bearings and find "level" in the chipper arbor housing. Only then can you obtain an accurate reading on the oil level. Do not rush this procedure!***

See the Chipper / Reducer Manual for additional details.

BANDMILL LUBRICATION

FREQUENCY CHART

Table 50: Bandmill Lubrication Frequency Chart

Component:	# Of Pts.	Type[a]	Application:	Frequency[b]
Rocker Arm Pivot Bearings	2	B	2 Shots Grease Gun	2 Weeks
Upper Wheel Lift Jack	1	B	2 Shots Grease Gun	2 Weeks
Upper Wheel Tilt Jack	1	B	2 Shots Grease Gun	2 Weeks
Plunger Bearing:				
Manual Lube Auto Lube Reservoir	2 2	B C	Grease Gun Automatic	8 Hours ✓ Level @ 8 hrs
Wheel Tilt Arm Bushing	1	B	Grease Gun	2 Weeks
Slide Ways (Setting Bandmill Ways)				
Manual Lube Auto Lube Reservoir	3 3	B C	Grease Gun Automatic	8 Hours ✓Level @ 8 Hrs
Elevating Upper Saw Guide				
Pneumatic - Manual Lube	8	B	2 Shots Grease Gun	8 Hours
Pneumatic - Auto Lube	4	C	Automatic	✓Level @ 8 Hrs
Arbor & Bearing Assembly				
Bandwheel Bearings			Inspect Oil Level	2 Weeks
Lower Arbor Outboard Bearing			3 Shots Grease Clean Out Grease	2 Weeks 6 Months
Upper Wheel Tilt Jack			2 Shots Grease	2 Weeks
Tilt Bushing			2 Shots Grease	2 Weeks
SLIDEWAYS & TABLES				
(Manual)			2 Shots Grease	8 Hours
(Automatic Lube)			Check Reservoir Lvl	8 Hours
CHIPPER ARBOR TUBE BUSHING				
(Manual)			2 Shots Grease	8 Hours
(Automatic Lube)			Check Reservoir	✓Level @ 8 Hrs
Chipper Arbor Bearing Allow 20 min for oil to level.			Check Oil Level	✓ Weekly
MOTORS & DRIVE SYSTEMS				
Electric Motors			See Manufacturer Manual	
Reducers/Gear Boxes			As Per Manufacturer	

a. **Type A**: Hydrualic Oil which must have a foam inhibitor, a low viscosity for better penetration and a high viscosity index to ensure minor changes in the temperature related characteristics of the oil and anti-wear additives.
Type B: Premium multi-purpose grease, extreme pressure, good mechanical stability, water resistance, pumpable at -20° F.
Type C: Premium quality way oil containing E.P., rust and oxidation inhibitors and tackiness additives, high film strength as well as having a high quality mineral oil base.

b. Frequency assumes a single eight (8) hour shift. Adjust lubrication frequency for longer operations.

MANUAL LUBRICATION

Not every component is lubricated automatically. The bearings in electrical motors, some idlers, some sliding surfaces and other parts may require manual lubrication. Be sure to locate all points requiring manual lubrication.

ARBOR MOTOR SERVICE INTERVAL

The motors which power this equipment should be lubricated as directed by the manufacturers instructions.

Typically, electric motors are furnished with grease fittings. Before greasing, be sure the fittings are clean and free from dirt. Remove the grease relief plug or plate and, using a low pressure grease gun, pump in the required grease until new grease appears at the relief hole. After lubricating, allow the motor to run for 10 minutes before replacing the relief hardware.

IMPORTANCE OF REGULAR SERVICE INTERVALS

If the motors are used in Standard operation (8 hours each day) they should be lubricated every 210 days. If they are used for periods exceeding that, they should be lubricated every 70 days.

The reason for lubrication at regular intervals is breakdown of the grease into oils and thickening agents. After the separation, oil is broken down by oxidation or lost to evaporation. The remaining compound lacks the ability to lubricate the bearing and seal out abrasive. For this reason, all old grease must be pumped out through the relief port to insure proper bearing lubrication.

TYPICAL LUBRICATION CHECK LIST

SERVICE TO PERFORM	HOURS				
	8	**40**	**200**	**1000**	**DATE:**
AIR LINE FILTERS	*C & D*				
AIR LINE LUBRICATORS		*C & F*			
BEARINGS [TABLE ROLL- IDLERS - ALL SHAFTS - ETC.]		*G & C*			
CHAIN OIL MANIFOLD/LINES	*C*				
CHAIN TENSION		*C & T*			
*CHAIN OIL TANK **(DO NOT OVERFILL)***			*CF*		
AUTO LUBE GREASE SYSTEM		*C & R*			
GREASE ELECTRIC MOTOR				*G*	
CHIPPER ARBOR BEARINGS (ALL CM&E MODELS)			*G*	*CR*	
CLAM SHELL LOCK DEVICE	*CL*				
*TABLE FEED DRIVE CHAIN **[FAST SPEEDS]***	*O*		*CT*		
*TABLE FEED DRIVE CHAIN **[SLOW SPEEDS]***		*O*	*CT*		
HYDRAULIC HEAT EXCHANGER	*CL*				
HYDRAULIC TANK OIL LEVEL	*C*				
HYDRAULIC FILTERS			*CR*		
HYDRAULIC TANK OIL TEMP.	*C*				
OIL RESERVOIR			*C & F*		
PRESS ROLL BEARINGS [TABLE]		*G*			
SWING SHAFT BEARINGS [TABLE]			*G*		
SET SCREW IN BEARINGS			*T*		
SPOTTING CHAIN LUBRICATION		*O*			
SPOTTING CHAIN:HEAD & TAIL SHAFT BEARING		*G*			
TRUNION MOUNTS - PINS - FLIPPERS - ETC.		*G*			
SIGNATURE OF MAINTENANCE PERSONNEL:					

C= CHECK, CLEAN & ADJUST AS NEEDED
CF= CHECK & FILL
CD= CHECK & DRAIN
CL= CHECK & CLEAN
CR= CHECK & REPLACE
CT= CHECK & TIGHTEN
G= GREASE
0= OIL

RECOMMENDED LUBRICANTS

Table 51: Recommended Oil Lubricants By Application

SAW GUIDE, ARBOR BEARING, AND DRIVE CHAIN[a]		Pour Pt. °F[b]	I.S.O.	Max Brg Temp. °F
Mobil	***Almo 525***	*-20°*	*#46*	*135°*
Mobil	***Almo 529***	*-10°*	*#150[c]*	*190°*
Fuchs Lubricants	*Sawmaster 68*	*-34°*	*#68*	*160°*
Fuchs Lubricants	*Sawmaster 100*	*-23°*	*#100*	*170°*
Fuchs Lubricants	*Sawmaster 150*	*-22°*	*#150*	*190°*
Shell	*Rock Drill 150*		*#150*	*190°*
Texaco	*1541 Rock Drill*		*# 46*	*135°*
Exxon	*Arox EP 46*		*# 46*	*135°*
Exxon	*Arox EP 150*		*#150*	*190°*
Golden Eagle	*Ultra Rock 68*		*# 68*	*160°*
BIODEGRADABLE LUBRICANTS[d]				
Fuchs Lubricants	*Plantosaw[d] 68*	*-23°*	*#68*	*160°*
Fuchs Lubricants	*Plantosaw[d] 100*		*#100*	*170°*
Fuchs Lubricants	*Plantosaw[d] 150*	*-30°*	*#150*	*190°*
INFEED, OUTFEED FEED CHAINS, RACES & WAYS		**AIR LINE OIL**		
Mobil	***Vactra Oil 2***	***Chevron***	***Handy Oil***	
Shell	*Tonna T 68*	*Arco Co.*	*Duro*	
Shell	*String Oil A (B Wntr)*	*Shell*	*Tellus*	
Gulf	*Gulf Way 52*	*Mobil*	*Almo 525*	
Texaco	*Way Lube 68*		*DTE 24,*	
Exxon	*Febis K 68*		*Velocite Oil No. 10*	
Unocal	*Marok 68*	*Amoco*	*American Industrial*	
Chevron	*Chevron Way 68*	*Unocal*	*CP22*	
Chevron	*Vistac Oil 100K (68K Wntr)*	*ATF*	*Type F/Dextron 2*	
Chevron	*Vistac 220X*			
Fuchs Lubricants	*Plantosaw[d] 68, 100 & 150*	*Chevron*	*AW Hydraulic Oil 32*	
MOTOR BEARINGS - Oil Type				
Shell	*Tellus T37*			
Chevron	*AW Hydraulic Oil Mv*			

a. Lubricants in bold print are preferred by USNR for their consistent quality.

b. Temperatures near or at the pour point will require a tank heater.

c. Oil with an ISO rating of 150 or higher should be used in ambient temperatures that exceed 90° F.

d. Biodegradable Lubricants are gaining in popularity as pollution and waste disposal become a greater issue. They are more expensive to purchase than petroleum but may be cost effective when other factors are considered.

CYCLO REDUCER MOTOR OIL				
Shell	*Omala 150*			
Mobil	***Mobilgear 629***			
Texaco	*Meropa 150*			
Unocal	*NL Gear Lube 4 EP*			
Radicon Gear Reducer				
Shell	*Omala Oil 200 (SAE 80W-90)*			
Chevron	*NL Gear Comp 220 (SAE 80W-90)*			
Planetgear Speed Reducer				
Manufactuer	***Lubricant***	***Grade 3***	***Grade 4***	
Amco Oil Co.	*American Ind. Oil*	*#100*	*#150*	
Chevron U.S.A. Inc.	*AW Machinen Oil*	*100*	*150*	
Exxon Company, U.S.A.	*Teresstic*	*100*	*150*	
Gulf Oil Corp.	*Harmony*	*100*	*150 D*	
Gulf Canada Limited	*Harmony*	*66*	*77*	
Imperial Oil Ltd.	*Teresso*	*100*	*150*	
Mobil Oil Corp	*DTE*	*Heavy*	*Xtra Heavy*	
Shell Oil Co.	*Morlina*	*100*	*150*	
Shell Canada Limited	*Tellus*	*100*	*150*	
Standard Oil Co. (Ohio)	*Industron*	*66*	*80*	
Texaco Inc.	*Regal Oil R&O*	*100*	*150*	
Texas Canada Inc.	*Regal R&O*	*100*	*150*	
HYDRAULIC SYSTEM FLUID[a]				

a. See your Hydraulic System Manufacturer for Hydraulic System Fluid, Filters, Flushing Procedure & Fluid Type required on your system.

Table 52: Recommended Type B Grease Lubricants By Application

CENTRAL GREASE SYSTEM BEARINGS	
Shell	*Alvania EP 0*
Mobil	*Mobilux EP 0 or Mobilith AW 0*
Gulf	*Gulf Crown EP 0*
Texaco	*Molytex EP 0*
Exxon	*Lido EP 0*
Unocal	***Unoba EP 0***
Chevron	*Polyurea EP 0*
MANUAL GREASE LUBRICATION - BEARINGS	
Shell	*Dolium-R Hi-Temp Grease (for SAOL Bearings)*
Shell	*Alvania R2 (SKF LGMT2)*
Chevron	*Dura-Lith Grease ET2*

5 EQUIPMENT MAINTENANCE

WHY DO MAINTENANCE?

1. To reduce Down Time.

2. To eliminate mis-manufactured lumber.

In short, to make more money!

PRIMARY MAINTENANCE OBJECTIVE

It is very important to understand the primary objective of your equipment and the investment in maintenance required to maintain that primary objective. Different objectives require different machine design requirements. High piece counts are often sacrificed when an ultra thin kerf is used.

The degree of maintenance that a mill is willing to put into a machine center will also determine whether it can support high speed or ultra thin kerf equipment. It is often advisable for a mill to increase the kerf size in order to reduce the amount of maintenance that must otherwise be invested.

A high speed or ultra thin kerf edger is like a race car. If one expects the machine to operate at its best, quality maintenance routines must be practiced. Every successful race car has a team of maintenance people that work out problems together. They know what is required in maintenance to win the race. This is the only attitude that will deliver success.

TYPES OF MAINTENANCE & THEIR EXPENSE

For most mill situations there are at least four kinds of maintenance. Each of these types carry a specific expense with it. The philosophy of the mill management and their commitment to maintenance will determine both the types of maintenance routinely performed and the expense to the mill in down production time, faulty lumber, etc. We rate these kinds of maintenance “expenses” on a 1 to 10 basis, with 10 being the most expensive.

BREAK DOWN MAINTENANCE

Also known as D.I.N. (Do It Now), this is maintenance done because production is stopped by a breakdown. Everyone drops whatever else they are doing to get the mill productive again. It has a very high expense. We give it a 10!

1. Personnel are standing around waiting for equipment to get back on line.

2. Lumber is not being produced and the company is deprived of the income they would otherwise have received. In a worst case situation you may miss a deadline and lose a customer!

3. It may be necessary to work personnel on an overtime basis increasing the expense even more.

UNEXPECTED MAINTENANCE

This is really the same kind of maintenance as the first except it doesn't halt the production of lumber immediately. Something breaks or begins to deteriorate (bad bearings, etc.) during the shift. It can be delayed for awhile but not long. This is the second most expensive maintenance. We give it an 8!

1. It often requires overtime.

2. It may have other unexpected expenses:

   A. Higher prices for parts that must be had NOW!

   B. Wages to locate and obtain parts/tools

3. It may not reduce production but is unscheduled and unbudgeted for expense.

CONVERSIONS AND UPGRADES

This often does require production lines to be shut down during otherwise productive times. There is a significant benefit to the mill to upgrade their equipment, gain accuracy, reduce maintenance time, etc. We give it a 6!

1. It may require overtime.

2. It can be scheduled to minimize impact on production.

3. As a scheduled repair, purchases and outside service technicians can be obtained with a minimum of expense.

SCHEDULED MAINTENANCE

This is major maintenance required because of normal deterioration of equipment. Every mill should have the majority of major repairs in this category. We give it a 4!

1. It is significantly less expensive than the first two since it generally does not require downtime and overtime.

2. Parts can be ordered in a timely way allowing for the best price to be obtained.

3. Personnel can be scheduled to minimize the impact on wages, etc.

PREVENTATIVE MAINTENANCE

This is a regular, systematic schedule of equipment examination and adjustment. It usually involves a specific group of maintenance personnel who specialize in this field. This is the least expensive of all maintenance and produces better operating equipment which lasts longer. We give it a 1!

1. All maintenance is done at scheduled times.

2. It includes testing tension on chains, checking for proper lubrication, checking for loose set screws, bolts, etc.

3. Only minor items are repaired which can easily be completed during the lunch break and/or between shifts. Everything else has a “request for service” form completed to schedule it to be done.

   •*The P.M. crew will probably locate most of the needed repairs and will generate the Work Orders for nearly all scheduled repairs.*

TROUBLE SHOOTING PROCEDURES

INVOLVE ALL RESOURCES

1. Get people involved, management should encourage mill workers including operators, filers, millwrights, electricians and shift foreman to report, as soon as possible, any changes in machine operation or lumber quality, to the proper personnel.

2. Management should assign a person to make the necessary changes or repairs as soon as possible.

3. Management should encourage comments and listen to all input from people offering possible solutions for any given problem.

4. Adopt a formal trouble shooting procedure to be used when the problem is hard to solve.

    A. The first step is defining what the problems are. This should be done in a meeting with all those involved: Operator, quality control, and the head of each maintenance department. They should review the problem together going over reports and, perhaps, a video of the equipment in operation.

        i. Write down only the facts of the problems when working toward a definition.

        ii. Do not assume the problems to be someone else's responsibility until your area of expertise has been completely checked.

    B. Have each of those listed above make a written description of the problem as they see it. Remember, only the facts.

    C. Then they should write down a list of things that could cause the problem.

IDENTIFY AND LIST THE PROBLEM(S)

Some possible edger problems might be:

1. Lumber mis-sized.

2. Snaking saw.

3. Tapered lumber (top to bottom - end to end).

4. Snipe.

5. Lumber finish.

6. Sweep in lumber.

LIST SYMPTOMS OF EACH PROBLEM

1. What seems to happen differently when the problem arises, or is the problem present all the time?

   A. Lumber feeding, jerky, drifts sideways, pulling rapidly to one side.

   B. Watch arbor amps to see if the motor is being over worked.

   C. Listen for any strange noise while the cant is being cut.

2. List all possible cures for each symptom, be sure to get input from anyone that may have any contact with the machine center.

3. After this list is made, prioritize it from most likely to least likely.

4. Assign each possible cure to the proper department and set a date for them to report with what they have found and what action has been taken.

SAMPLE WORK SHEET

PROBLEMS BEING EXPERIENCED
Feeding is jerky.
Only on thick cants (over 8" thick).
The cant drifts away from the line bar on the trailing end.
Saws always lay over away from the line bar. Filers have to flatten saws after every run.
First (4) saws near line bar are worse than others.
The lumber finish is poor on the trailing end.

TROUBLE SHOOTING FORM 2 IDENTIFY PROBABLE CAUSE FOR SYMPTOMS				
SYMPTOM:		**LUMBER FEEDS "JERKY"**		
SIGN OFF	**PRIORITY:**	**DATE DUE:**	**ASSIGNED TO:**	**PROBABLE CAUSE**
			Millwright	*Drive chains loose.*
			Millwright	*Drive belts loose.*
			Millwright	*Feed roll sprockets worn badly.*
			Millwright	*Bearings bad on feed rolls or press rolls.*
			Millwright	*Key out of feed roll sprocket.*
			Millwright	*Press roll speed is not the same as feed roll (some-one installed the wrong sprocket)*
			Electrical	*Press roll valve.*
			Millwright	*Press roll cylinder seals bad.*
			Millwright	*Press roll cylinder rod broken (piston end)*
			Millwright	*Swing shaft bushing bad*
			Millwright	*Feed rolls misaligned*
			Millwright	*Press roll misaligned*
			Millwright	*Press roll frame sprung so that the roll is not in true line with the swing shaft.*
			Electrical	*Press roll sequencing needs to be adjusted.*
			Electrical	*Photo eye set at wrong elevation or adjustment.*
			Electrical	*Wiring connections: P.C.*
			Electrical	*Wiring connections: Press Roll Valves*
			Electrical	*Wiring connections: Junction Box*
			Electrical	*Wiring connections: Control Console<+>*
			Millwright	*Arbor misaligned*
			Millwright	*Guides misaligned*
			Millwright	*Feed rolls worn or tapered.*
			Millwright	*Press rolls worn or tapered.*
			Millwright	*Non-powered press rolls not rolling freely.*
			Saw Filer	*Saws are dull.*
			Saw Filer	*Saws are improperly sharpened.*
			Saw Filer	*Carbide insert is off center.*
			Saw Filer	*Wrong angle on carbide face.*
			Saw Filer	*Improper grinding.*
			Saw Filer	*Mishandling of saws during saw change.*

TROUBLE SHOOTING FORM 2 **IDENTIFY PROBABLE CAUSE FOR SYMPTOMS**				
SYMPTOM:				
SIGN OFF	*PRIORITY:*	*DATE DUE:*	*ASSIGNED TO:*	*PROBABLE CAUSE*

KEEP A LOG BOOK

A daily log is a very helpful record to insure that problems are caught at their earliest possible moment, especially when more than one operator uses the machinery. A simple record is best since it is more apt to be used than a more complicated one. Following is a sample OPERATOR'S REPORT LOG.

Date: 11/9/92 Shift: Days Machine: Schurman 12" Gang
Operator's name: *John Good Operator*
Problems or unusual events during the shift:
Changed saws 4 times in 8 hours. May be bad logs
Cant appears to be moving sideways after the press roll comes down. Does not happen all the time. Changed saws three times today.
The saw filer found that the cants were tapered from side to side and that when he cants were not tapered they feed straight. Found the
problem on the headrig carriage. Edger ran O.K. after fix.
Person(s) notified about the problem(s): Maintenance: *Saw Filer:* *Supervisor:*
Maintenance scheduled for end of shift. Replace #3 feed roll sprocket completed @4:45 pm.

See the next page for a master sample to photo copy.

OPERATOR'S 8 HOUR REPORT LOG
Date: *Shift:* *Machine:*
Operator's Name:
Problems or unusual events during the shift:
Person(s) notified about the problem(s):
Maintenance:
Saw Filer:
Supervisor:
Action Taken:

COMMON PROBLEMS & FACTORS

EDGERS

A POOR SAW LINE

- ❑ Saw guide accuracy.
- ❑ Saw guide to saw clearance.
- ❑ Alignment of guides.
- ❑ How clean the guides are.
- ❑ The condition of bearings and bushings.
- ❑ The condition of feed rolls and press rolls.
- ❑ The condition of the line bar on the infeed table.
- ❑ Stacked air cylinders worn out.
- ❑ Elevation of the infeed table.
- ❑ Elevation of the outfeed table.
- ❑ Roundness of the infeed and outfeed rolls.
- ❑ Cleanliness of the edger, outfeed and infeed.
- ❑ The speed of the outfeed, the edger and the infeed.
- ❑ The alignment of arbors, guides, guide bars and rolls.
- ❑ Drive chains.
- ❑ Inadequate horsepower.
- ❑ The speed of the edger, press roll and feed roll speeds must be the same.
- ❑ Press roll sequencing.
- ❑ Saws (face grind must be square to the saw plate).
- ❑ The condition of the cant.

A. Tapered. B. Twisted.

- ❑ Saw lubrication system (e.g. low water pressure).
- ❑ Type of oil used in the saw lubrication system.

PRESS ROLL TIMING PROBLEMS

The press roll timing should be observed each day. If the timing is not consistent then you should determine why.

Possible causes:

- ❑ The speed of the edger has been altered.
- ❑ The speed of the infeed has been altered.
- ❑ The air pressure is too high or too low.
- ❑ Flow controls are adjusted improperly.
- ❑ Muffler is plugged.
- ❑ Cushions are improperly adjusted.
- ❑ Operator momentarily stopping or slowing the piece after it has been seen by the photo eye.
- ❑ Air line lubricator. Inadequate oil.
- ❑ Cylinder seals.
- ❑ Valves sticking or leaking.
- ❑ Press roll timing in the PLC may have been altered. Partial memory problem, etc.
- ❑ Natural cylinder and seal wear can cause slight changes to timing if the roll timing is real close to begin with.
- ❑ Faulty or improperly adjusted photo eye.

QUALITY: BOARD SIZE IS IMPROPER:

- ❑ The saw guides have excessive clearance.
- ❑ Bent arbor.
- ❑ Press roll timing is incorrect.
- ❑ Improper saw guide adjustment.
- ❑ Improper saw guide alignment.
- ❑ Saw guides not tight on the guide bar.
- ❑ Guides or guide bar is dirty, rusty, dented or the guides have been resurfaced improperly.
- ❑ The guide bar is out of parallel.
- ❑ The WaterMizer system is not operating at the proper air or water pressure.

- ❑ The saw is bent, saws dished.
- ❑ The gang is out of level or alignment.
- ❑ The saws are dull.
- ❑ The side clearance is not the same on both sides of the saws.
- ❑ The face of the saw teeth are not ground square.
- ❑ The top of the teeth are not ground square.
- ❑ The gang is out of level.
- ❑ Water manifold leak.
- ❑ The infeed guide way elevation is incorrect (chip-n-saw only).
- ❑ The outfeed table is out of level.
- ❑ The outfeed table roll elevation is incorrect.
- ❑ The outfeed press roll timing is incorrect.
- ❑ There is excessive wear in the arbor splines.
- ❑ There is excessive saw eye wear.
- ❑ Press roll sequencer is incorrect.
- ❑ The press roll swing shaft bearings are worn.
- ❑ The press roll bearings are worn or damaged.
- ❑ The press roll itself is worn.
- ❑ Improper air/water mixture for the guides.
- ❑ The saws are not fitted properly.
- ❑ The feed speed is incorrect.
- ❑ The guide clearance is incorrect.
- ❑ There are dirty or damaged saw guides.
- ❑ There are dirty or damaged guide bars.
- ❑ Check resurfaced guides for parallel (refer to resurfacer manual).
- ❑ Check the guide to saw clearance (.002 to.004 per side.)
- ❑ Check the cants to see that both top and bottom faces are parallel.
- ❑ Check the cants to be certain there is no twist in them.

CROOKED MATERIAL FEED

- ❑ Possible bent arbor.
- ❑ The gang is out of level.
- ❑ The press roll is out of level.
- ❑ The saws are dull.
- ❑ The side clearance is not the same on both sides of the saw.
- ❑ The face of the saw teeth is not ground square.
- ❑ The top of the saw teeth is not ground square.
- ❑ The top and bottom surfaces of the board are not parallel
- ❑ Bent saw guides.
- ❑ Dirty surfaces where the guide fits against the support.
- ❑ Rusty or dinged surfaces where the guide fits against the support.
- ❑ Bad bearings on feed rolls, press rolls or swing shafts.

FEED MODULE

MATERIAL SLIPPING WHEN FEEDING

- ❑ Low press roll pressure (should be about 30 PSI).
- ❑ Chipping anvils at wrong elevation.[Should be .040" to .060" below the lumber line.]
- ❑ Bed rolls worn out. [Replace].

CROOKED OR BOWED BOARDS

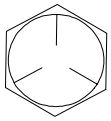
- ❑ Feed modules not aligned to chipping head.
- ❑ Press roll timing is off. (Roll is dropping ahead of board, causing skewing.)
- ❑ Press rolls are not holding material allowing the chipping heads to pull sideways.
- ❑ Bed roll or press roll bearings worn out. [replace].
- ❑ Chip knives behind face plate, or bent knife chipper head.

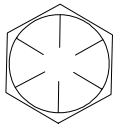
BOARDS ARE CRACKING OR SPLITTING

- ❑ Excess hold down roll pressure (should be about 30 PSI).
- ❑ Press rolls dropping too fast - readjust cylinder flow control to eliminate harshness, then reset sequence timing.
- ❑ Boards are already split from dry decking or shear type of harvesting before processing.

BOLT TORQUE SPECIFICATIONS

TOLERANCES AND SPECIFICATIONS





	GRADE 5 STEEL TENSILE STRENGTH: 120,000 LBS 1/4 -1" 05,000 LBS 1"-1 1/2 "			GRADE 8 STEEL TENSILE STRENGTH: 150,000 LBS 1/4-1"			
COARSE, NC, UNC, U.S.S. THREAD							
FASTENER THREAD SIZE	PROOF LOAD (LBS.)	TORQUE (LB.FT)			PROOF LOAD (LBS)	TORQUE (LB.FT)		
		1	2	3		1	2	3
1/2-20	2700	11	8	7	3810	16	12	10
5/16-18	4450	23	17	14	6290	33	25	20
3/8-16	6580	41	31	25	9290	58	44	35
7/16-14	9030	66	49	40	12750	93	70	56
1/2-13	12060	101	75	60	17020	142	106	85
9/16-12	15460	145	109	87	21830	205	153	123
5/8-11	19200	200	150	120	27120	283	212	170
3/4-10	28420	255	266	213	40130	502	276	301
7/8-9	39240	572	429	343	55400	808	606	485
1-8	51480	858	644	515	72680	1211	909	727
11/8-7	64870	1216	912	730	91590	1717	1288	1030
11/4-7	82370	1716	1287	1030	116290	2423	1817	1454
13/8-6	98160	2250	1687	1350	138580	3176	2382	1905
11/2-6	119440	2986	2240	1792	168630	4216	3142	2529

1.Unplated
2.Plated
3.Lubricated

COMMON MEASUREMENTS

WOOD AND WEIGHT BY VOLUME

One unit of loosely piled chips occupies 200 cu ft and is produced from 72 cu ft of solid wood. One unit = 72 cu. ft (solid wood) = 200 cu ft Chips. Weight per unit = (species) wt per cu ft x 72.

WEIGHTS OF AMERICAN WOODS

Species	Green	Airdry	Species	Green	Airdry
Alder - red	*46*	*28*	*Hickory - pecan*	*62*	*45*
Ash - black	*52*	*34*	*Hickory - true*	*63*	*51*
Ash - commercial white	*48*	*41*	*Honey Locust*	*61*	.
Ash - Oregon	*46*	*38*	*Larch - western*	*48*	*36*
Aspen	*43*	*26*	*Locust - black*	*58*	*48*
Basswood	*42*	*26*	*Maple - big leaf*	*47*	*34*
Beech	*54*	*45*	*Maple - black*	*54*	*40*
Birch	*57*	*44*	*Maple - red*	*50*	*38*
Birch - paper	*50*	*38*	*Maple - silver*	*45*	*33*
Cedar - Alaska	*36*	*31*	*Maple - sugar*	*56*	*44*
Cedar - eastern red	*37*	*33*	*Oak - red*	*64*	*44*
Cedar - northern white	*28*	*22*	*Oak - white*	*63*	*47*
Cedar - southern white	*26*	*23*	*Pine - lodgepole*	*39*	*29*
Cedar - western red	*27*	*23*	*Pine - northern white*	*36*	*25*
Cherry - black	*45*	*35*	*Pine - Norway*	*42*	*34*
Chestnut	*55*	*30*	*Pine ponderosa*	*45*	*28*
Cottonwood - eastern	*49*	*28*	*Pines - southern yellow:*		
Cottonwood - northern black	*46*	*24*	*Pine - loblolly*	*53*	*36*
Cypress - southern	*51*	*32*	*Pine - longleaf*	*55*	*41*
Douglas fir - coast region	*38*	*34*	*Pine - shortleaf*	*52*	*36*
Douglas fir - Rocky Mt. region	*35*	*30*	*Pine - sugar*	*52*	*25*
Elm - American	*54*	*35*	*Pine - western white*	*35*	*27*
Elm - rock	*53*	*44*	*Poplar - yellow*	*38*	*28*
Elm - slippery	*56*	*37*	*Redwood*	*50*	*28*
Fir - balsam	*45*	*25*	*Spruce - eastern*	*34*	*28*
Fir - commercial white	*46*	*27*	*Spruce - Engelmann*	*39*	*23*
Gum - black	*45*	*35*	*Spruce - Sitka*	*33*	*28*
Gum - red	*50*	*34*	*Sycamore*	*52*	*34*
Hemlock eastern	*50*	*28*	*Tamarack*	*47*	*37*
Hemlock - western	*41*	*29*	*Walnut - black*	*58*	*38*

HYDRAULIC CONTAMINANTS & FLUSHING

NATURE OF CONTAMINANT

Contaminant can be either particle contaminant or the product(s) of fluid degradation.

PARTICLE CONTAMINANT

These contaminants can be metal, rubber, plastic, dirt, dust, fibre, sand. paint, etc.; several types may be present at any time.

FLUID DEGRADATION

Fluid Degradation results in:

1. Oxidation and/or the formation of gummy deposits and sludge from the combined effects of high temperatures, air, water and particle contamination. These can increase viscosity, cause gummy deposits to coat moving parts, clog orifices and small passages, thus impairing smooth mechanical movements, and form sludge.

2. Unstable emulsions of poor lubricity formed when water accidentally emulsifies with oil. These impair smooth movements and promote wear.

3. Aeration or air bubbles in the fluid, particularly at low pressure. In excess, they cause noise in pumps and valves leading to erratic or spongy machine movements, premature wear and failure.

CONTROL OF CONTAMINATION

The following table prescribes measures relative to the different common types and causes of contamination.

PREVENTATIVE MEASURES

CONTAMINATION AND FLUSHING

		FLUID DEGRADATION BY-		
For hydraulic systems	**SOLID CONTAM.**	**HIGH TEMP**	**WATER**	**AIR**
Provide fluid filter(s) in location(s) that assure the required protection.	4			
Whenever possible use filters having element condition indicators. Pressure filter location is also important. The recommended practice is to locate the filter as close as possible to the servo valve pressure port.	4			
Vented systems must be fitted with an air breather appropriate to the environment(s) in which the machine is to be operated and the requirements of the system.	4		4	4
Prevent air entering the system particularly through pump inlet lines. Ensure airtight joints in any subatmospheric zone or pump inlet lines. Also make sure that those lines and all return and drain lines terminate below the minimum fluid level in the reservoir; pump inlet lines should be sufficiently below to prevent air entering through a vortex at low fluid levels.				4
Locate or screen hydraulic systems away from high temperature sources (e.g. furnaces).	4	4		
Assemble system in clean conditions using clean practices.	4		4	
Pre-clean pipes and reservoir immediately before installation. Cap any ends that cannot immediately be connected to mating components (e.g. between shifts).	4		4	
Remove protective caps only just before connecting mating components.	4		4	
Use a portable filtration and transfer unit to fill the reservoir system. Fill through reservoir return filter.	4			

		FLUID DEGRADATION BY-		
Flush new systems and those that have undergone major repairs before starting up. Temporarily remove actuators and replace with flushing manifolds or valves for flushing operations. Make sure that actuators are clean internally before connecting to the system. ***Operation**: The amount of contaminant removed during flushing depends not only on the effectiveness of the filter used but also the velocity of the flushing fluid. Unless high velocities are attained much of the contaminant will not be dislodged until the system is in operation with component failure the almost certain result.* *Most servo components need protection from silting by very small particles. We recommend an ISO cleanliness code of 15/11 which defines fluid contamination particle count of less than 320 per milliliter greater than 5 micrometer size and 20 per milliliter greater than 15 micrometer. For non-servo high reliable systems we recommend 16/13 (640>>5UM and 80>>15UM).*	4			
Pressure filter location is also important. The recommended practice is to locate the filter as close as possible to the servo valve pressure port.				
Make sure that air breathers and reservoir covers are at all times properly installed and tightly secured.	4		4	
Stop any leakage of water into the system from coolers or other sources. Make a leak-tight repair.			4	
By planned maintenance ensure that clean filter elements are applied (or metallic elements cleaned when appropriate) when indicators or visual inspection shows this to be necessary.	4	4	4	
Take fluid samples periodically and analyze to determine whether effects of particle contaminant heat water and air indicate need for more control of those factors or replacement of the fluid.	4	4	4	4
Whenever the reservoir is emptied clean it out thoroughly and remove all residual contaminant. If necessary restore protective paint or other finishes. On completion cap all openings unless the system is to be refilled immediately.	4		4	

PREVENTATIVE MAINTENANCE CHECK LISTS

Preventative maintenance is of primary importance in solving costly down time and poor quality production. Tests have proven that every industry which depends upon equipment and buildings (and the sub-systems such as air, hydraulics, water, etc.) benefit from systematic preventative maintenance.

The lumber industry is no exception, especially in these days of declining supply and increasing expenses. Those mills which are able to avoid unscheduled break down and poor quality product will have the competitive edge required to remain healthy and profitable.

Depending on barely qualified and poorly motivated maintenance personnel always results in high maintenance costs. A well supported and motivated P.M. team which performs daily weekly and extended period checks and tests produce lower maintenance costs and increased profits.

We recognize that these Checklists will not meet every circumstance. They are provided to inspire your crew to design better more complete lists. Our hope is that they will help you become more efficient and more profitable.

CHAIN MAINTENANCE

1. Improper chain tension causes premature chain and sprocket wear.

   A. Allow approximately 1/4” sag for every foot of chain.

BEARING CHECK

1. Check the bearings using a pinch bar or pry bar on the bearings' shaft. Measure the resulting deflection with a magnetic based dial indicator.

   A. Deflections should be less than .006".

2. If the shaft has a “spun bearing”, check the shaft for wear. Undersized shafts should be repaired or replaced.

NEVER PUT A NEW BEARING ON AN UNDERSIZED SHAFT.

40 HOUR CHECK

AFTER THE MACHINERY HAS BEEN IN OPERATION FOR 40 HOURS

- ❑ Check all set screws in all shaft bearings to insure that they are still tight. If the set screws are not tight the race will rotate on the shaft causing wear to the shaft as well as to the bearing.
- ❑ Check all tapered keys to insure that they are tight.
- ❑ Check for any bolts that may have come loose during operation.
- ❑ Check the chains to insure that they are at proper tension for safe and accurate operation.
- ❑ Do a safety check:
  - ❑ Be certain that all guards are in place.
  - ❑ Check that all covers on electrical junction boxes are in place.
  - ❑ Repair any broken or damaged cables.
  - ❑ Repair any air leaks in the air system.
  - ❑ Repair any hydraulic leaks.

☞ ***Be sure the M.C.C. is locked out and the control power is <u>off</u> before working on any part of this system.***

Be sure the air supply valve is shut off and all pressure is bled off before working on the equipment.

MILLWRIGHT CHECK LIST

- ❑ Inspect all lube and oil lines for bent or broken segments or parts.
- ❑ Inspect bearings to locate grease coming out of seals.
- ❑ Inspect the roller chains to see that they have a coating of oil.
- ❑ Check the in-line air oilers to see that they are working.
- ❑ Inspect press roll bearings for damaged or broken housings and bolts.
- ❑ Check press roll and clevis for wear, bends or breaks. Adjust when necessary to 0.5" when the rolls are in the closed position.
- ❑ Inspect the chain tension.
- ❑ Check all guards to see that they are in place.
    - ❑ Inspect the roller chain drives for tension. Adjust chain idlers when slack in the chain exceeds 1".
    - ❑ Check the air supply pressures to the edger
    - ❑ Mill supply air must be a minimum of 80 lb.
    - ❑ The pressure gauge at the regulator (machine side) must read 70 to 80 lb.
    - ❑ The pressure gauge on the press roll valve indicates the “down” pressure and should be set to 50 - 60 lb.

OILER CHECK LIST

- ❑ Fill in-line air oilers at the start of each shift.
- ❑ Locate and grease all zerk fitted bearings on the edger weekly.
- ❑ Check the grease supply lines weekly.
- ❑ The grease supply lines to the press roll are inside the frame. These must be checked daily.
- ❑ Grease all motors per factory directions.

SAW FILER CHECK LIST

- ❑ Inspect the arbor for foreign matter before installing new saws. A light coat of oil will make it easier to remove and install saws.
- ❑ Check each saw for the following:
  - ❑ Sharpness.
  - ❑ Proper angles are ground on the teeth.
  - ❑ Side clearance of the teeth are the same on both sides of the saw.
  - ❑ Proper back clearance for the saw teeth.
  - ❑ Face of the teeth are ground square.
  - ❑ Back of the teeth are ground square.
  - ❑ Total run of the saw plate is not excessive.

SHARP CHAIN

Performed by: *Date:*

Equipment Location: *I.D. Number*

EVERY 8 HOURS

O.K.	Schedule Maintenance	
❑	❑	:Clear away debris from the photo eyes and the scanner. Also blow debris away from the strain drives before using them.
❑	❑	Do a walk by inspection of the hydraulic units. Look for leaks, correct oil level, cooling fan operation, motor/pump couplings. Report anything out of the ordinary.
❑	❑	Check for air leaks in the pneumatic system.
❑	❑	Check for hydraulic leaks on the machine.
❑	❑	Check the saw cooling water system for leaks or stoppages.
❑	❑	Make sure the chain tensioning system has the correct pressure setting.
❑	❑	Make sure all guards are in place and working properly.
❑	❑	Do a walk around inspection of the machine. Look for anything out of the ordinary and report it.
❑	❑	Grease slides on the turning rolls up/down, pins in the stop and loaders, bearings on the thumper roll, and overhead hold downs.
❑	❑	Make sure saws are put on properly and knives are set and torqued correctly. Clean out knife pockets when changing knives.
❑	❑	Blow chips and sawdust off the machine and check buildup on the saw wheels **TWICE EVERY 8 HOURS**.
❑	❑	Clean photo cells with a dry rag.
❑	❑	Clean the scanner with 409 daily.

Comments

EVERY 40 HOURS

- ❑ ❑ Check for wear on Valon Kone stop loader, turning roll bushings and slides.
- ❑ ❑ Sharpen dull spikes as needed on the sharp chain.
- ❑ ❑ Check all cylinder pins and clevis' for wear. Check the machine over for loose or missing bolts.
- ❑ ❑ Clean out the slabber head knife pockets.
- ❑ ❑ Check for wear and misalignment on the outfeed roll drive chains and sprockets.
- ❑ Check the Twin Band Saw Unit for:
- ❑ ❑ Tightness of wheel bearing bolts, nuts, etc.
- ❑ ❑ Drive belts.
- ❑ ❑ Wear on the strain chains and sprockets.
- ❑ ❑ Saw carrier condition.
- ❑ ❑ Saw guide wear, Lube & Coolant operation.
- ❑ Check the CM&E Slab Chippers for:
- ❑ ❑ Drive belts.
- ❑ ❑ Wear on the ways (slides).
- ❑ ❑ Inspect the heads for wear and cracks.
- ❑ ❑ Grease all pins and bushings, slides, and all Alemite fittings except motor bearings and bottom wheel bearings.
- ❑ ❑ Check the sharp chain spikes for damaged or missing micarta wear pads and center guiding blocks.
- ❑ ❑ Clean photo cells with 409 EVERY 40 HOURS.

COMMENTS:

MAXIMIZER INFEED

Performed by: *Date:*

Equipment Location: *I.D. Number:*

EVERY 8 HOURS

O.K.	Schedule Maintenance:	
❑	❑	Check limit switches for missing, loose or damaged Wands.
❑	❑	Clear away debris from the photo eyes and the scanner. Also blow debris away from the strain drives before using them.
❑	❑	Do a walk by inspection of the hydraulic units. <R>Look for leaks, correct oil level, cooling fan operation, motor/pump couplings.
❑	❑	Check for air leaks in the pneumatic system.
❑	❑	Fill in-line air oilers at the start of each shift.<R>Drain and clean as necessary.
❑	❑	Check for hydraulic leaks.
❑	❑	Inspect the roller chains to see that they have a coating of oil. Check the time and air regulator to insure proper chain lubrication.
❑	❑	Make sure the chain tensioning system has the correct pressure setting. Adjust if slack in the chain exceeds 1".
❑	❑	Make sure all guards are in place and working properly.
❑	❑	Do a walk around inspection of the machine. Look for anything out of the ordinary and report it.
❑	❑	Grease slides on the positioning pins, bearings on the rolls, and overhead hold downs.
❑	❑	Blow chips and sawdust off the machine **TWICE EVERY 8 HOURS**.
❑	❑	Clean photo cells with a dry rag.
❑	❑	Clean the scanner with 409 daily.

Comments

EVERY 40 HOURS

- ❑ ❑ Infeed Press Rolls wear and alignment.
- ❑ ❑ Loose bearing set screws.
- ❑ ❑ Sprocket bearings, Idler wear, alignment, etc.
- ❑ ❑ Press Roll, swing shaft, transfer chain drive shaft & bearings.
- ❑ ❑ Pan up/down roller and shaft wear.
- ❑ ❑ Trunnion Mounts and position pins wear, loose bolts, etc.
- ❑ ❑ Centerline feed sprockets and chain wear and tightness.
- ❑ ❑ Check for wear on bushings and slides.
- ❑ ❑ Check all cylinder pins and clevis' for wear.
- ❑ Check for loose or missing bolts
- ❑ ❑ Tightness of bearing bolts, nuts, etc.
- ❑ ❑ Drive belts
- ❑ ❑ Wear on the drive chains and sprockets.
- ❑ ❑ Saw carrier condition.
- ❑ ❑ Check the sharp chain and center wear plate for wear and damage.
- ❑ ❑ Clean photo cells with 409 EVERY 40 HOURS

BANDMILL

Performed by: *Date:*

Equipment Location: *I.D. Number:*

EVERY 8 HOURS

O.K.	Schedule Maintenance:	
❑	❑	Air and hydraulic leaks.
❑	❑	Do a walk by of the hydraulic unit. Check for leaks, Oil level, motor/pump couplings and cooling fan.
❑	❑	Guard condition
❑	❑	Clear debris away from the photo eyes and scanner
❑	❑	Blow out the debris around the strain drive before each operation.

EVERY 40 HOURS

❑	❑	Wheel bearing tightness.
❑	❑	Condition of the drive belts.
❑	❑	Wear of the ways (slides).
❑	❑	Saw cooling water condition.
❑	❑	Grease all fittings except motors and the bottom wheel bearings.

COMMENTS

COMMENTS

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