

**“NO STRINGS ATTACHED”**

**Bandmill Alignment**

for

**Vertical and Slanted Headrig Bandmills  
and  
Vertical and Horizontal Resaws**

and

**Linebar, Edger, Gang Saw  
and Trimmer Alignment**

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## **Preface**

This paper was originally written to be used as a handout for a hands-on workshop presented by the writer to a group of saw filers at the Lake States Saw Filers Educational Association Annual meeting held in Munising, Michigan in October of 1985. This presentation, held at Cliff's Forest Products Co. (now Timber Products of Michigan), was part of a two-part workshop. Jim Shubert, a long-time friend and Head Saw Filer at Cliff's, presented a hands-on circular saw hammering workshop and I presented the alignment workshop which was intended to teach headrig bandmill alignment. Since that time, I have made some refinements and additions to some of the procedures in this alignment method and have picked up some tips from other filers. In addition, procedures for aligning resaw bandmills, linebars, edgers, gang saws, and trimmers have been added.

As you use this alignment guide, make notes of your results and let me know how you do. I am always looking for new tips and ideas to improve upon the original "No Strings Attached". Input and contributions from many saw filers have made this revision possible. For this, I am ever grateful. Thanks to all who have contributed.

## **The "Need"**

For years, filers and mill maintenance people have been aligning bandmills using an expanded version of the same basic, time-honored method first developed for circular mills. Of course, I refer to setting up a "spider web" of plumb lines and piano wire, laying out right angles with a trammel rod, scribe and prick-punch, and measuring from piano wire to plumb line. I have no doubt that many filers are very proficient at this task. Even those who are so lucky as to not have someone trip over their piano wire are limited to the bounds of accuracy which can be obtained by measuring between two round lines which intersect at right angles with a flat rule, probably done while the plumb bobs are in constant motion. Under ideal conditions and with great care, it is possible to align a bandmill and rails to 1/64th of an inch per foot (or 1/4" over the length of a 16' log). More often than not, a far less accurate job is obtained. This statement is easily justified when you consider that this method aligns the edges of the bandwheels to a relatively short section of V-rail. (Sometimes, to satisfy your curiosity, dial indicate the edges of the wheels on your bandmill. In many mills, the results will raise the question if aligning by eye wouldn't be just as close.)

With increased emphasis on accuracy, improving sawing deviation, reducing target sizes, and, of course, cost control, it has become increasingly necessary to maintain bandmills in top condition at all times. When you think about it, why grind your cartridge guides to a thousandth of an inch if they are installed in a guide holder that is misaligned by 1/64th of an inch or more per foot? Why spend hundreds of thousands of dollars for a carriage and setworks system, which is capable of setting repeatedly to .001"?

By this time, I'm sure you are saying to yourself, "If there is a better way, what is it?" Well, "I'm here to tell you" there is a far more accurate method and it is easier and faster to boot! This method, which I call "*No Strings Attached Bandmill Alignment*", employs the use of the same things we saw with: the bandmill, the saw, the carriage, and, of course, several hand tools. As you become familiar with this method, it will make more and more sense because we don't saw lumber with strings on the wheel edges anyway. We saw with the bandmill, saw, and carriage.

When first being introduced to this method of bandmill alignment, many of you may think it is quite complex. I can assure you that with a little practice, it will become second nature to you. I also can assure you that even your first attempt will yield results **many** times more accurate than the plumb bob and piano wire method.

Although there is a multitude of different styles of resaws, with a little ingenuity, this basic "No Strings Attached" method can be adapted to almost any type of machine center. The two types of resaws that I will address are the vertical linebar resaw and the horizontal resaw.

Slanted headrig bandmills are aligned in much the same manner as vertical mills. Actually, once the "No Strings Attached" method is learned, you will find it to be easier with slants. As with slanted headrig bandmills, slanted resaws are aligned with little deviation from the described method.

Alignment in edgers and gang saws is equally important. Poorly maintained edgers have been the cause of much wasted lumber, greatly reduced grade recovery and much heart ache to saw filers. Unguided gang saws with wide kerf and thick plated strobe saws were a little forgiving but, as technology has turned towards the thin kerf guided gangs, alignment has become increasingly critical.

## **Responsibility**

Some employees take only the responsibility that is given to them. Some employees do just what they have to do to "get their job done". These types of employees have no place in the filing room. I admit that each company divides responsibility differently but I feel that the saw filer's job doesn't end at the filing

room door. The maintenance and alignment of all sawing machine centers throughout the sawmill not only affects the mill's productivity, lumber quality, and overall profitability but has a profound effect on the saw performance and even on the saw filer's sanity. In order to be a good saw filer, you will have to be responsible for more than just the saws. You will have to take responsibility for all sawing machine centers. By responsibility, I don't mean to imply that the saw filer has to "do it all himself". I do mean that he has to see that all sawing machine centers are properly maintained.

Sawing machine center alignment has as great an effect on saw performance as the condition of the saws themselves and has a tremendous affect on sawing accuracy and lumber quality. I feel that when it comes to alignment, the saw filer must take the reins and do it himself. This is the only way to assure that the saws and the machine centers can perform as near perfectly as possible. Machine alignment is tedious work and takes time and concentration but, get a good helper and take the bull by the horns. It really pays off!

## **Tools**

Most of the tools you will need are commonly found in every filing room but, since accuracy is the name of the game, they must be in top-flight condition. The list includes:

- 1 - 12" machinist level
- 1 - dial indicator set with magnetic base
- 1 - inside spring calipers - micro adjust type
- 1 - 9" machinist bench level
- 1 - 6" machinist rule
- 1 - (set) wrenches for adjusting bearing box, guide holder, rolls etc.
- 1 - pencil
- 1 - (set) permanent magnets
- 1 - (set) spring clamps
- 1 - 4', I-beam style, aluminum level
- 1 - 2', I-beam style, aluminum level
- 1 - 2' carpenters square
- 1 - lumber crayon or similar marker
- 1 - (roll) piano wire - size 7 (.018" dia.)

Those of you that have read the original version of this paper will notice a difference. For some time I used a straight edge that was made from a piece of (1-1/2" x 48" long) square mechanical tube which I had milled and ground straight and true. I found this straight edge to be a little hard to handle and shortened it to 24". In 1992, I was working on a bandmill with Melvin Dawson from Salem Equipment and was introduced to the idea of using a 4' aluminum carpenter's

level for a straight edge. Since then, I have done some testing and found this to be a good tool, which yields accurate results. There is one important prerequisite: it should be a high quality level, which is kept in excellent condition. I suggest purchasing a new level and keeping it locked in the filing room to be used exclusively for alignment. Remember, accuracy is the name of the game.

## **Safety**

Equipment alignment, like other sawmill maintenance procedures, can be dangerous work. All safety practices that normally would be followed for other maintenance jobs should be used when working on machinery alignment. All mechanical, electrical, hydraulic, and air safety hazards should be considered. Particular attention should be given to the use of **personal protective apparel** (i.e. safety glasses, hearing protection, hard hats, leather work gloves, etc.) and to **Safety Lock-Out Procedures** for the machine you are working on and for all associated equipment.

As always, **SAFETY FIRST!!!**

## **Your Notes**

I can't stress enough the importance of keeping a good notebook. This is important in most maintenance areas but it is especially important in the filing room. All good saw filers keep extensive notes on all of their filing room equipment maintenance, their saws, and on machine center alignment. If you don't keep a good notebook and you think that you are a good filer, you're fooling yourself!

## **Getting Started With Bandmill Alignment**

Throughout this discussion on bandmill alignment I will make reference to Allowable tolerances, which I consider acceptable. These Allowable tolerances should be considered as a "minimal" guideline only. Each filer must determine for himself what he considers acceptable for the condition of the equipment he is working on, the tools and resources he has to work with, and for his particular skill level. Let me pass on some advice that Gus Clark gave me quite a few years ago when I was in "hot water" and called him for help. "When aligning a bandmill, keep on adjusting and rechecking until your efforts are no longer yielding an improvement." In other words, keep on trying until you have achieved "dead nuts" alignment, or as close as you can for your ability and for the condition of your equipment. This is good advice for all of us to follow no matter what we are endeavoring to accomplish throughout life. Never be satisfied with anything less than your best effort!

For the sake of this discussion on alignment, it is assumed that the bandmill has been installed properly. This would mean that: The main bandmill frame is level in all directions, the bottom saw arbor is level, the upright frame assembly (top wheel support), the top wheel columns, and the top guideways are all exactly plumb and the mill was installed with the top and bottom arbor bearings in the center of their adjustments.

Enough emphasis cannot be placed on the importance of having the top (or moveable) guideways perfectly parallel to the surface positioning the log or cant being sawn! In the case of a carriage, this would, of course, be the knee faceplates. In the case of a linebar resaw it would be the linebar itself and in the case of a horizontal resaw, the bottom feed rolls. If these surfaces are not parallel there will be no escaping problems with beveled lumber and out of square cants!

There are various methods for checking this condition. I feel that it can't be checked accurately enough with the use of a level. Instead, I have had accurate results using a dial indicator or an inside micrometer. The following is an outline of the basic procedure utilizing a dial indicator, but the configuration of each machine may dictate modifying this procedure to fit the conditions:

1. Make a "jig" or fixture that will extend down from the top guide holder to the lowest part of the carriage knee faceplate (or linebar) when the moveable guide is in its lowest position.
2. Mount a dial indicator on the fixture so that it will contact the faceplate (or linebar) near the bottom.
3. Adjust the dial indicator to mid-range and tighten securely.



4. Move the top guide up and down throughout the length of its travel and observe the dial indicator.

It is very important that these surfaces be in alignment with each other. If they are not, a determination will have to be made as to what can be moved to correct the mis-alignment while attempting to keep the components of the machine center plumb, square and level. Correcting this problem may be as simple as shimming the top guide-way assembly or may be more involved. Some other procedures that may be required are:

- Re-leveling the bandmill frame.
- Re-leveling the carriage rails.
- Shimming all of the carriage headblock assemblies.
- Re-leveling the complete linebar and feed roll assembly.

Whatever course of action that you take to correct this problem should be well thought out. Taking a short cut to solve this problem could create other problems. An example of this would be: Shimming the knee faceplates or the linebar instead of re-leveling the complete assembly. This would cause the knee faceplates to be out of square with the headblocks or the linebar to be out of square with the feed rolls.

If the bandmill has been properly installed or if any of the above-mentioned problems have been identified and corrected, you are ready to proceed with *"No Strings Attached Bandmill Alignment"*.

## **Checking and Correcting Bandmill Cross-Line**

1. With no guides in the holders and normal strain, run the saw in. It is not necessary to run it up to full speed but, if you do, any braking device should be disconnected and the saw should be allowed to coast to a stop.
2. Holding the 9" machinist level against the back of the saw, draw a fine vertical pencil line on the top guide holder. Match-mark the saw and a stationary object, like the top guide holder, with a lumber crayon or felt tipped marker. Then roll the saw, one revolution backwards, by hand, stopping on the match marks.
3. Check the location of the saw by placing the 9" level against the back and drawing a second fine pencil line. With no cross-alignment, the saw will not have moved forward or backward and the lines will overlap perfectly.

4. If the saw has moved forward or backward on the wheels, the top wheel bearing housings may be adjusted and Step 2 through Step 4 repeated. Before moving the top wheel, check the saw for plumb. This will indicate which end of the top arbor should be moved to better plumb the saw or if both bearings must be moved (one forward and one backward). When adjusting to eliminate cross-alignment **MOVE THE FACE OF THE TOP BANDWHEEL** (which you are looking at while standing on the carriage rails) **IN THE SAME DIRECTION THAT THE SAW MOVED ON THE BACKWARD ROTATION**. Of course, if you find it necessary to move the bottom wheel, move it in the opposite direction.

Allowable tolerance in cross-alignment: the thickness of a pencil line (1/64") back - **NONE** ahead!

### **Vertical Headrig Bandmill Alignment**

1. Using the 12" machinist level, check the bottom arbor. Allowable tolerance - A few thousandths of an inch per foot but if it is out of level at all, it should be high on the infeed end - never the reverse.
2. With the wheels at zero cross-line and the saw plumb, we are ready to check the alignment between the bandmill and the V-rail. It is assumed that the rails have been installed properly and are straight and level. There are several methods for checking this. I have found the sliding "T" frame and piano wire method to be acceptable. I have also used an instrument called a Brunson jig transit, which is designed for aligning heavy equipment. Another tool that I have used for this purpose is the Montgomery Rail Alignment Tool, which I developed by improving on the design of the old Salem Rail Alignment Gauge.
3. Using your spring clamps, attach the 2' level to the saw with equal overhang on both ends of the level. The level should be in a horizontal position, perpendicular to the saw, with one straight edge against the saw and the other facing towards the carriage. Be sure the saw is clean, free from grinding burs, and that the straight edge isn't on a tooth or swage clamp screw marks.
4. Start overstraining and observe the straight edge pivoting "into the log". Continue overstraining until the straight edge stops pivoting. What you are actually doing is stretching the front of the saw until it is equal in length to the back of the saw, thus simulating the actual position of the saw when in the cut. Clamp or lock the strain in this position. I find that the strain required to accomplish this is about 1-1/2 to 2 times the normal strain. On air strain mills,

I usually just turn the air pressure up to 2 times normal. **WARNING: NEVER START OR RUN THE BANDMILL WITH IT OVERSTRAINED!**

5. Move the carriage up to the saw so that a faceplate on knee #1 is directly in front of the infeed end of the level. Set the knees to approximately 1" away from the level.
6. Roll the saw by hand until the end of the level is at or near the top of the faceplate.
7. Adjust the spring caliper to fit between the faceplate and the level. You can develop a "soft touch" when doing this and can use the spring caliper like a feeler gauge.
8. Move the carriage until the faceplate is at the opposite end of the level and check with the spring caliper. Do not re-adjust the caliper, just check the distance between the faceplate and the saw.
9. Roll the saw down until the level is close to the head block and check both ends of the level with the spring caliper. Remember; don't re-adjust the spring caliper at each location. What you are doing is comparing all locations with the first place you checked. All four (4) places should check out to be the same distance. If they are not and the misalignment is up and down, the saw is not plumb and the top wheel will have to be moved. If the misalignment is from right to left, the bandmill and the v-rail are not in alignment and BOTH wheels will have to be moved.

**NOTE:** A very good alternative to using the spring caliper method is using a dial indicator mounted on the saw and indicating along the length of the straightedge by moving the carriage.

Allowable tolerance - up and down is less than .005" per foot.

Allowable tolerance - in v-rail alignment is less than .006" per foot out of the log - **NONE** into the log. This is .012" over the length of a 2' level and is easily identified with the dial indicator or when using the spring caliper as described.

10. Remove the straight edge and reset the strain to normal.
11. If adjustment to correct up and down misalignment is necessary, attempt to move both ends of the top saw arbor the same exact amount.
12. If adjustment to correct right to left misalignment is necessary, move one or both ends of the bottom arbor to correct the misalignment. Now move the top wheel the same amount that you moved the bottom wheel. After doing this once or twice you will develop a feel for how much to turn the adjusting bolts.
13. **Make sure everything is clear of the saw.**

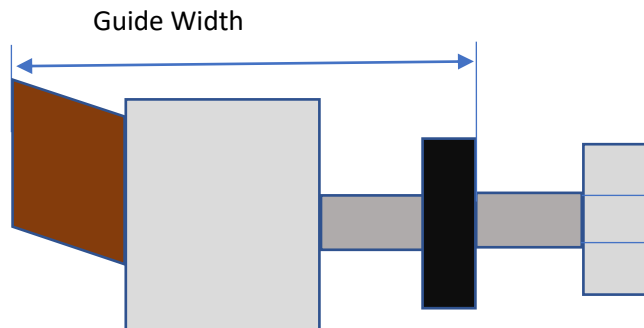
14. If it was necessary to move one or both bandwheels:

- Repeat the steps in **Checking and Correcting Bandmill Cross-Line**
- Repeat the steps in **Vertical Headrig Bandmill Alignment**
- Continue this process until you are satisfied with the results.

Setting the pressure guides is covered in the next section and is basically the same for every bandmill configuration.

## **Setting Saw Guide Pressure**

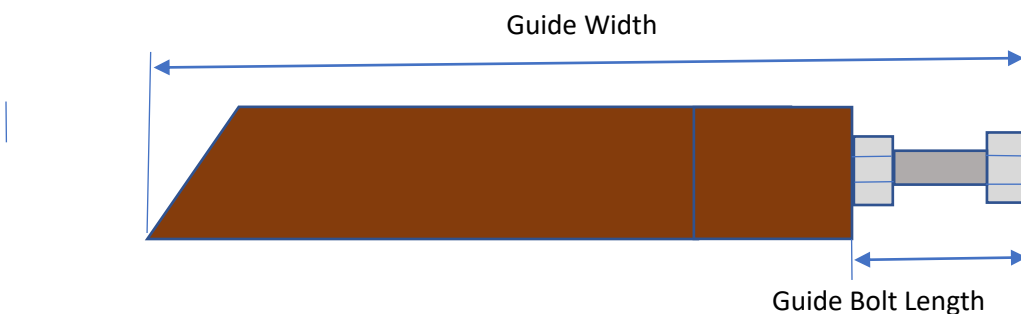
### **McDonough Style**



1. Confirm that there is no cross-line in the bandmill and the carriage travel is perfectly parallel to the saw and the saw is parallel to the carriage knee face plates (up and down).
2. Dress a pair of guides on your Guide Grinder.
3. Measure the Guide Width of one of these 'Normal Saw Guide Blocks'.
4. Determine the desired offset 'pressure' that you want.
5. Subtract the desired offset from the measurement that you just got for the freshly dressed guide in step 2. This will be the 'Zero Block Guide Width' that you will use for setting guide pressure on your bandmill.
6. Loosen the allen set screws in the lock rings and screw both lock rings in closer to the aluminum block. While adjusting, carefully measure this Guide Width and tighten the set screws to lock the ring to the calculated 'Zero Block Guide Width'.
7. Set the second guide block using the above method. You should now have two identical Zero Blocks (guide blocks set to zero guide pressure)
8. Now, with the Zero Blocks installed in the bandmill guide holders and not touching the saw... Strain up your bandsaw to about one and a half your normal operating strain pressure. This will make your saw blade nice and tight.
9. Using a feeler gauge, adjust the guide holders (with Zero Blocks installed) so that there is .005" clearance between the Zero Blocks and the saw. This will ensure that neither Zero Block is pressing against the saw.
10. Tighten the guide holder locking bolts.
11. Then..... Release the strain and remove the Zero Blocks

12. Install a set of freshly ground Normal Saw Guide Blocks
13. Re-set the strain pressure to your normal setting.
14. Strain up the saw. You will now have your desired offset pressure on your saw.
15. In some bandmills, I have found a slight deflection (.005" to .008" out of the log) in the top guide assembly when the saw is tightened to normal operating strain pressure, especially mills where the top guide is supported from one side only.
16. To correct for this, lower the top guide to approximately  $\frac{1}{2}$  stroke (or lower) and check the saw with you saw spider gauge between the top guide and the top wheel.
17. Correct the deflection by tweaking the top guide holder adjustment while re-checking the saw using your spider gauge both between the top and bottom saw guides and between the top guide and the top wheel.
18. Now, confirm that the carriage travel is still parallel to the saw and that the carriage knee surfaces are parallel to the saw (up and down).
19. Using a permanent marker, write the words **ZERO BLOCK** on the surface of your Zero Blocks and lock them up in the saw filers tool cabinet. These blocks can now be used for a quick check of your guide pressure or for re-adjusting the holders if anything has dislodged them from their proper location.

### Drop-In Style



1. Confirm that there is no cross-line in the bandmill and the carriage travel is perfectly parallel to the saw and the saw is parallel to the carriage knee face plates (up and down).
2. Dress a pair of guides on your Guide Grinder.

3. Using a depth gauge, measure the Guide Bolt Length on both bolts on one of these 'Normal Saw Guide Blocks'.
4. Determine the desired offset 'pressure' that you want.
5. Subtract the desired offset from the measurement that you just got for the freshly dressed guide in step 2. This will be the 'Zero Block Guide Bolt Length' that you will use for setting guide pressure on your bandmill.
6. Loosen the lock nuts and screw in both guide bolts. While adjusting, carefully measure this Guide Bolt Length and tighten the lock nuts with the guide bolts adjusted to the calculated 'Zero Block Guide Bolt Length'.
7. Set the second guide block using the above method. You should now have two identical Zero Blocks (guide blocks set to zero guide pressure)
8. Now, with the Zero Blocks installed in the bandmill guide holders and not touching the saw... Strain up your bandsaw to about one and a half your normal operating strain pressure. This will make your saw blade nice and tight.
9. Using a feeler gauge, adjust the guide holders (with Zero Blocks installed) so that there is .005" clearance between the Zero Blocks and the saw. This will ensure that neither Zero Block is pressing against the saw.
10. Tighten the guide holder locking bolts.
11. Then..... Release the strain and remove the Zero Blocks
12. Install a set of freshly ground Normal Saw Guide Blocks
13. Re-set the strain pressure to your normal setting.
14. Strain up the saw. You will now have your desired offset pressure on your saw.
15. In some bandmills, I have found a slight deflection (.005" to .008" out of the log) in the top guide assembly when the saw is tightened to normal operating strain pressure, especially mills where the top guide is supported from one side only.
16. To correct for this, lower the top guide to approximately ½ stroke (or lower) and check the saw with your saw spider gauge between the top guide and the top wheel.
17. Correct the deflection by tweaking the top guide holder adjustment while re-checking the saw using your spider gauge both between the top and bottom saw guides and between the top guide and the top wheel.
18. Now, confirm that the carriage travel is still parallel to the saw and that the carriage knee surfaces are parallel to the saw (up and down).

19. Using a permanent marker, write the words **ZERO BLOCK** on the surface of your Zero Blocks and lock them up in the saw filers tool cabinet. These blocks can now be used for a quick check of your guide pressure or for re-adjusting the holders if anything has dislodged them from their proper location.

Allowable tolerance - Your goal should be "0" but a few thousandths of an inch per foot, out of the log **-NONE** in, is acceptable if you can't get it perfect.

**Return the strain to its normal setting when you are finished.**

### **Slanted Headrig Bandmill Alignment**

In order to align a slanted headrig bandmill, it is important to keep the entire machine center (bandmill, carriage rails and carriage) in the proper prospective. Remember the slant angle (17 degrees, or whatever angle) is irrelevant! The only important thing is that the bandsaw, the bandmill top guideways, and the carriage knees must be parallel to each other and the v-rail must be straight and parallel to the bandsaw.

When aligning slanted headrig bandmills follow the **Vertical Headrig Bandmill Alignment** procedure but forget about the word "plumb". The end result must be a bandsaw that is parallel to the face of the knees and to the v-rail.

There is one distinct and **extremely important difference** that cannot be over emphasized. As with all bandmills it is critical that the heavy wheel arbor is perfectly level and the bandmill, with all cross-line removed, is in horizontal alignment with the carriage v-rail. If after the bandmill wheels and guides are in perfect alignment it will be time to check the mill to v-rail (carriage travel) alignment as described in the section on **Vertical Headrig Bandmill Alignment**.

If the mill and v-rail are not perfectly horizontally aligned (parallel), either the rail **or** the entire bandmill will have to be moved into alignment. You cannot align the wheel assemblies and rail to each other as in a vertical or horizontal mill by moving one or both bottom wheel bearings and then removing the cross-line that this step has created. Since the bottom wheel bearings are mounted on a slant, moving them forward or back will also result in moving them up or down the slant which will result in an out of level bottom wheel and arbor. This will create a nightmare of alignment problems.

Allowable tolerance - up and down is less than .005" per foot.

Allowable tolerance - in v-rail alignment is less than .006" per foot out of the log - **NONE** into the log. This is .012" over the length of a 2' level and is



easily identified with the dial indicator or when using the spring caliper as described.

Setting the saw guide pressure is the same as with a vertical bandmill as described in the section titled **Setting Saw Guide Pressure**.

## **Double-cut Headrig Bandmill Alignment**

Very few experienced filers will disagree with the statement that “there is no bandmill where alignment is more critical than with a double-cut headrig”. The alignment procedure for a double-cut is the same as for a single-cut headrig bandmill except that since there is no “long back” involved and both edges of the saw will be sawing lumber, there can be absolutely no lead into or out of the log! For this reason, any “*Allowable Tolerances*” in alignment (in the direction of carriage travel) referred to in the **Vertical Headrig Bandmill Alignment** procedures must be reduced virtually to zero! Any lead or mis-alignment in the direction of carriage travel will result in different thicknesses being sawn in each direction of carriage travel.

Setting the saw guide pressure is the same as with a vertical bandmill as described in the section titled **Setting Saw Guide Pressure**.

## **Vertical Linebar Resaw Alignment**

1. Check the bottom feed rolls to make sure that they are level.
2. Using the 2' carpenters square, check the linebar to be sure that it is perpendicular to the bottom feed rolls. This is accomplished by holding the “long” end of the square against the bottom feed roll and holding the “short” end of the square vertically and against the linebar. All of the rolls in the linebar area should be checked.
3. Eliminate cross-alignment in the bandmill by following Steps 2 through 5 from the section on vertical headrig bandmill alignment.
4. With the wheels at zero cross-line and the saw plumb, we are ready to check the alignment between the bandmill and the linebar. It is assumed that the

linebar assembly has been installed properly and the linebar rails are straight and level.

5. If you have moved either or both wheels, it will be necessary to run the saw in again before proceeding further. With no guides in the holders and normal strain, run the saw in. It is not necessary to run it up to full speed but, if you do, any braking device should be disconnected and the saw should be allowed to coast to a stop.
6. Using your spring clamps, attach the 4' level to the saw with one end even with the back of the saw and the other end overhung past the tooth edge of the saw. The level should be in a horizontal position, perpendicular to the saw, with one straight edge against the saw and the other facing towards the linebar. Be sure the saw is clean, free from grinding burs, and that the straight edge isn't on a tooth or swage clamp screw marks.
7. Start overstraining and observe the straight edge pivoting "into the log" (away from the bandmill). Continue overstraining until the straight edge stops pivoting. What you are actually doing is stretching the front of the saw until it is equal in length to the back of the saw, thus simulating the actual position of the saw when in the cut. Clamp or lock the strain in this position. I find that the strain required to accomplish this is about 2 times the normal strain. On air strain mills, I usually just turn the air pressure up to 2 times normal.  
**WARNING: NEVER START OR RUN THE BANDMILL WITH IT OVERSTRAINED!**
8. String a piano wire along the entire length of the resaw infeed roll case, the bottom feed rolls, and along the length of the outfeed roll case with the wire a few inches over the top of the bottom rolls and about 3/4" away from the level.
9. Adjust the wire to make it perpendicular to the rolls in the direction of the lumber flow. This is done by attaching the "vee" side of a dial indicator magnetic base, with a dial indicator post mounted on it, to one of the feed rolls. The roll is then slowly rotated back and fourth. Observe the distance between the wire and the post as the post travels past (and close to) the wire in an arc. Adjust the wire so that this arc is parallel to the wire. As the wire is being adjusted, move the base so that the post barely touches the wire.
10. Check all of the other feed rolls to verify that they are "square" to the wire. This assures you that the rolls are all parallel to each other and that the cants will travel in a smooth, straight line.
11. Check the distance between the wire and the linebar and adjust the linebar as required. The linebar and rolls are set in perfect alignment by the manufacturer and provisions are usually made to ensure that they don't move out of alignment.

12. If you desire, the infeed roll case and the outfeed roll case can be checked at this time.
13. If the wire is not in your way, it should be left in place while you continue.
14. Set the linebar so that it is approximately 1" from the level, being careful not to run it into the wire.
15. Roll the saw by hand, until the end of the level is at or near the top of the linebar.
16. Adjust the spring caliper to fit between the linebar and the end of the level. If the linebar is the roller type and has rolls in it, the measurements should be made between the level and the roll that is closest to the end of the level. You can develop a "soft touch" when doing this and can use the spring caliper like a feeler gauge.
17. Check the distance between the level and the linebar (or roller) closest to the saw. Do not re-adjust the caliper, just check the distance between the linebar and the level.
18. Roll the saw down until the level is close to the bottom of the linebar and check both ends of the level with the spring caliper. Remember; don't re-adjust the spring caliper at each location. What you are doing is comparing all locations with the first place you checked. All four (4) places should check out to be the same distance. If they are not and the misalignment is up and down, the saw is not plumb and the top wheel will have to be moved. If the misalignment is from right to left, the bandmill and the linebar are not in alignment and BOTH wheels will have to be moved.  
  
Allowable tolerance - up and down is less than .005" per foot.  
Allowable tolerance - in the direction of lumber flow, is less than .008" per foot out of the log - **NONE** into the log. This is .032" over the length of a 4' level and is easily identified when using the spring caliper as described.
19. Remove the straight edge and reset the strain to normal.
20. If adjustment to correct up and down misalignment is necessary, attempt to move both ends of the top saw arbor the same exact amount.
21. If adjustment to correct right to left misalignment is necessary, first move one or both ends of the bottom arbor to correct the misalignment. Now move the top wheel the same amount and in the same direction that you moved the bottom wheel. After doing this once or twice you will develop a feel for how much to turn the adjusting bolts

**22. Make sure everything is clear of the saw.**

**23. If it was necessary to move one or both bandwheels:**

- Repeat the steps in **Checking and Correcting Bandmill Cross-Line**
- Repeat the steps in **Vertical Headrig Bandmill Alignment**
- Continue this process until you are satisfied with the results.

24. Before removing the piano wire, make some reference marks where the wire is mounted at the ends of the roll cases and record their location in your notebook. This will come in handy the next time you want to check the alignment of the entire machine center. Remounting the wire to these reference marks may not seem very accurate but, an error of as much as 1/8" in remounting the wire to the marks is less than .003" per foot over a 50' long machine center!

25. The bandmill, the rolls, and the linebar are now aligned and the wire can be removed. This process is quite involved and fortunately doesn't have to be done very often. In most cases, this complete procedure is only done at installation, after a disastrous "wreck", or in the case of unidentifiable saw and/or lumber problems. At other times it is normally only necessary to check the bandmill for cross alignment, check the alignment between the bandmill and the linebar and adjust the guide block holders into alignment.

Setting the saw guide pressure is the same as with a vertical bandmill as described in the section titled **Setting Saw Guide Pressure**.

**Always remember to return the strain to its normal setting when you are finished!**

## **Horizontal Resaw Alignment**

It may seem like an over simplification but a horizontal resaw is no more than a bandmill laying horizontally with a feed roll case under the saw. I know that you didn't need me to tell you that but I want to emphasize the simplicity of the situation. The alignment of the horizontal resaw is very similar to that of a headrig bandmill or a vertical linebar resaw.

1. Check the heavy wheel arbor with your machinist level. The bandmill and feed roll case should have been installed level but this is the best place to start with a horizontal. I keep my 9" machinist level close at hand whenever I am working on any alignment job and use it often to confirm that something

that I think is level really is! Being this meticulous reminds me about what they say about a man who continually smokes a pipe, "It gives a wise man time to think and a fool something to stick in his mouth."

2. Eliminate cross-alignment in the bandmill by following Steps 2 through 5 from the section on **Vertical Headrig Bandmill Alignment**.
3. It may be a little more difficult to find a place to make your pencil marks but, if you use a little ingenuity, you can find a convenient place.
4. With the wheels at zero cross-line, we are ready to check the alignment between the bandmill and feed rolls. It is assumed that the feed roll case assembly has been installed properly and the rolls are level in both directions. Of course, the more critical consideration is that, when we are done, the bandsaw and the rolls are in alignment with each other. It isn't critical that the bandmill, bandsaw, and roll case are level in all directions but it makes is a lot easier to check and to keep things in perspective when you are working on the resaw.
5. Using your spring clamps, attach the 4' level to the bottom of the saw with equal overhang on both ends of the level. The level should be in a vertical position, perpendicular to the saw, with one straight edge against the saw and the other facing towards the feed rolls. Be sure the saw is clean, free from grinding burs, and that the straight edge isn't on a tooth or swage clamp screw marks.
6. Overstrain the saw to about 2 times normal as in Step 8 of Vertical Headrig Bandmill Alignment. **WARNING: NEVER START OR RUN THE BANDMILL WITH IT OVERSTRAINED!**
7. Set the resaw networks so that the level is approximately 1" from the feed rolls.
8. The method for checking the alignment between the bandsaw and the feed rolls will vary from resaw to resaw. I have made my measurements directly between the level and the rolls on some resaws and, on others, have had to lay a straight edge on the rolls to get a place to measure to due to the knurling on the rolls. This would also be the case with a horizontal resaw with a slat bed feed. For the sake of this instruction I will proceed assuming that the measurements can be made directly to the rolls.
9. Roll the saw by hand so that the level is close to one side of the feed roll case.
10. Adjust the spring caliper to fit between a feed roll and the infeed end of the level. You can develop a "soft touch" when doing this and can use the spring caliper like a feeler gauge.

11. Check the distance between the level and a feed roll on the outfeed end of the level. Do not re-adjust the caliper, just check the distance between the feed roll and the level.
12. Roll the saw until the level is close to the other side of the feed roll case and check both ends of the level with the spring caliper. Remember; don't re-adjust the spring caliper at each location. What you are doing is comparing all locations with the first place you checked. All four (4) places should check out to be the same distance. If they are not, the bandmill and the feed roll case are not in alignment and depending on the direction of the misalignment; either the roll case or ONE or BOTH wheels will have to be moved.  
Allowable tolerance in the direction of saw travel is less than .005" per foot.  
Allowable tolerance in the direction of lumber flow is less than .010" per foot out of the log - **NONE** into the log. This is .040" over the length of a 4' level and, with a little care, is easily identified.
13. Remove the straight edge and reset the strain to normal.
14. If only the "top" wheel is to be moved to correct misalignment in the direction of saw travel, attempt to move both ends of the arbor the same exact amount.
15. If both bandwheels are to be moved to correct misalignment in the direction of lumber flow, move the heavy or "bottom" wheel first and then move the light or "top" wheel, attempting to move them both the same amount. Move one or both ends of the bottom arbor to correct the misalignment first. Now move the top wheel the same amount and in the same direction that you moved the bottom wheel. After doing this once or twice you will develop a feel for how much to turn the adjusting bolts.
16. **Make sure everything is clear of the saw.**
17. If it was necessary to move one or both bandwheels:
  - Repeat the steps in **Checking and Correcting Bandmill Cross-Line**
  - Repeat the steps in **Vertical Headrig Bandmill Alignment**
  - Continue this process until you are satisfied with the results.

Setting the saw guide pressure is the same as with a vertical bandmill as described in the section titled **Setting Saw Guide Pressure**.

## **Edger and Gang Saw Alignment**

Although all edgers and gang saws are similar, each individual machine center has it's own unique characteristics. For this reason, the alignment procedure for

each will be different. For the sake of instruction, I will outline a general alignment method but each filer will have to make the necessary modifications to these procedures to make them fit their own particular circumstances.

During Edger and Gang Saw alignment it will be necessary to raise and lower press rolls at different times. For this reason you should pay particular attention to Safety Lock-Out procedures.

1. Raise the top press rolls and block them open.
2. Check the machine and particularly the saw arbor to confirm that the saw arbor is perfectly level. If it isn't level, the machine will have to be leveled before proceeding.
3. String a piano wire through the machine and extend it the full length of the infeed and outfeed roll cases. The wire should be as close to the saw arbor as practical.
4. Adjust the wire to make it perpendicular to the saw arbor in the direction of the lumber flow. This is done by attaching the "vee" side of a dial indicator magnetic base, with a dial indicator post mounted on it, to the saw arbor. The arbor is then slowly rotated back and fourth. Observe the distance between the wire and the post as the post travels past (and close to) the wire in an arc. Adjust the wire so that this arc is parallel to the wire. As the wire is being adjusted, move the base so that the post barely touches the wire.
5. The face of the guides in guided gang saws can be checked by using the dial indicator on the base and post while it is mounted on the arbor. Slowly rotating the arbor back and forth will allow you to check an arc across the guide face and moving the dial indicator on the post will allow you to check the guide face at different arc distances.
6. Read through the remaining steps and check the alignment of all feed rolls, press rolls and roll cases before doing any adjusting. Sometimes it is easier to move an entire roll case than to move each roll individually. I have also found a machine center that had the infeed and outfeed aligned with each other and the entire edger installed at an angle. By checking the entire machine center before making adjustments, you can determine the easiest and best way to proceed.
7. If you have determined that the saw arbor is going to be used as the point of reference, you can proceed. Using the magnetic base and post, check each bottom feed roll for alignment to the wire and check them with the machinist level. Adjust as required.

8. Using the magnetic base and post, check each top press roll for alignment to the wire and check them with the machinist level. Adjust as required.
9. Using the same procedure, check the infeed and outfeed roll cases. Adjust as required.
10. If the machine center has a linebar or straight edge, it should be aligned to the wire and checked to assure that it is perpendicular to the rolls.
11. If the machine center has laser lines associated with the saws, they can be checked at this time. Turn on the lasers and using a tape measure, check to see that they are parallel to the wire. Adjust as required.
12. If the machine has saws on the arbor, measurements from the saws to the wire and from the wire to the laser lines can be used to align the laser lines to the saws. Make sure to keep the lines parallel to the wire.
13. Make a prick punch mark on the infeed table frame at either end of one of the laser lines. This will give you a easy-to-use permanent reference for checking to see if the lines are perpendicular to the saw arbor.
14. While the wire is in place, it is a good idea to check outfeed tailing devices for alignment.
15. Before removing the piano wire, make some reference marks where the wire is mounted at the ends of the roll cases and record their location in your notebook. This will come in handy the next time you want to check the alignment of the entire machine center.
16. Remove the wire and blocking and make sure that the machine is clear before removing your Lock-Outs.

## **Trimmer Alignment**

There are probably as many ways to align a trimmer as there are trimmers. I have tried quite a few methods including using a plumb bob on the saws and a piano wire to square the saws to the lumber flow. Of all the methods that I have tried, none stand out as being noticeably more accurate than the others. One does stand out as being easier and faster! Besides being easier and faster, this method aligns the saws to the lumber flow rather than to the machine frame or the infeed chain structure. This method is as follows:



1. Find a long, straight, perfectly parallel edged board. This should be easy if you have maintained the alignment of your edger and have taken good care of the edger saws!
2. Turn off and drain the air supply to the trimmer.
3. Place the board on a set of infeed lugs and roll the infeed drive by hand until the board is very close to contacting the saws.
4. Check the distance from saw to saw, making sure to maintain the spacing designated by mill management.
5. Using the 2' carpenters square, adjust each saw so it is square to the lumber flow and square to the board vertically. You can check the saws with a plumb bob but I find that they can be aligned properly with only a square. If the saws are plumbed with a plumb bob and the trimmer infeed table isn't perfectly level from end to end, the saws won't be square to the lumber flow anyway.