Formula Sheet

Saw and Tooth Shape

d	Circular saw diameter or bandmill wheel dia.(inch)
P	Tooth pitch (inch)
n	Number of teeth
k	Kerf
h	Thickness of saw plate
s	Side clearance (inch)
s_{MIN}	Minimum recommended side clearance (inch)
a	Gullet area (square inch)

Operating Conditions

N	Shaft speed (rpm)
c	Blade (or rim) speed (sfpm)
b	Bite per tooth (inch)
D	Depth of cut (inch)
f	Feed speed (fpm)
f_{MAX}	Maximum recommended feed speed (fpm)
f_{MIN}	Minimum recommended feed speed (fpm)

Performance Prediction

GFI	Gullet Feed Index
GFI_{MAX}	Maximum allowable Gullet Feed Index 0.3 for circular saws 0.7 for bandsaws

Power Consumption

E	Estimated power required (hp)
C	Energy factor depending on wood properties C = 35 for North American softwoods 40 for dry fir 70 for hardwoods

Evidence from the Wood

X	Distance taken by ‘m’ bites on the board
m	The number of bites in distance X

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Measuring Instruments & Tools

- **Machine Alignment**
- **Saw Filing**

Thin Kerf Technologies is your best source for instruments and practical solutions for sawing, feeding and chipping problems. We have the mill experience, the professional skills, training, and can access the latest developments in sawing and chipping technology. TKT provides your people with training, advice, and instruments to improve the operation of your mill.

This catalogue describes the instruments needed to align Edger systems. It also outlines the principles of alignment using these instruments.

These instruments, and the procedures for using them were developed during TKT's consulting work and from the feedback of our customers.

We design and build our products to:

- **be easy to use**
- **withstand the sawmill environment**
- **be accurate and repeatable**

if you can't feed it STRAIGHT

you can't cut it STRAIGHT

Machine alignment requires the proper tools so that it can be done accurately and quickly. The benefits of good alignment are:

- **Correctly sized lumber**
- **Less down-time due to jamming**
- **Reduced maintenance costs because all parts are carrying their designed load.**
- **Fewer unscheduled saw changes**
- **Faster trouble-shooting**

To achieve these benefits, ***Thin Kerf Technologies*** promotes the concept of Maintenance for Accuracy, in the same way that Preventive Maintenance ensures mechanical reliability.
To increase the speed of trouble-shooting, we developed the ***BoardRunner*** - an advanced Q.C. and diagnostic tool for measuring and analyzing boards. This product is now marketed by ***Simonds Industries Inc.*** The information from the ***BoardRunner*** pin-points the exact cause of mis-manufactured lumber - no guessing.

Guarantee: If you are not satisfied with the performance of a TKT product, return it for a full refund.

$c =$

$= \frac{s \times c}{P}$

$s = \frac{k - h}{2}$ *or* $k = h + 2 \times s$

$E = \frac{C \times k \times f \times D}{144}$

For Circular Saws Only

$P = \frac{3.14 \times d}{P}$ *or* $n = \frac{3.14 \times d}{P}$

$b = \frac{12 \times f}{N \times n}$ *or* $f = \frac{b \times n \times N}{12}$

Plan View Measurements

Setting up the Tight Wire

The first step is to run a wire through the system from the start of the infeed section through to the end of the outfeed of the outfeed section of the edger. This wire should be tight and roughly level. Ideally, the wire should run from a winch for quick installation, but a come-a-long or strap winch can also be used. Hanging weights to tension the wire is awkward and dangerous. If there is a line bar section on the infeed, the wire should positioned by eye about about 6 - 8 inches from the face, and about 4 - 6 inches above the bed rolls.

> **Tip** Use downrigger wire (150 lb. test) rather than piano wire. It does not kink like piano wire and it lays flat when there is no tension.

Use adjustable supports, as shown on page 3, to locate the wire. Avoid using a notch filed into a bar because there will inevitably be other notches, and no one will remember which is correct. Secondly, the adjustable support is designed for making quick and accurate positioning of the wire.

These supports should be bolted and dowel pinned to a substantial frame that, ideally, connects to the foundation. Also, the wire set up will be less sensitive to movement of the supports over time if these points are as far apart as possible. With this set of tools consisting of the supports located by dowel pins, and a winch, the wire should be accurately in place within 20 minutes.

Positioning ("Bucking-in") the Wire

Set the **Telescopic Sensing Head** on the arbour and rotate the arbour so that the sensing head pointer can be adjusted to touch the wire. Rotate the arbour and adjust the pointer until the LED just flickers on one side of the arc. Set the dial indicator to zero. Rotate the arbour until the pointer once again passes the wire. Adjust the pointer and note the change in dial indicator reading. See page 4 for illustration

Measure the arc distance along the wire that the pointer makes at it's two contact points.

Measure the distance between the two wire support jigs (the total length of the wire).

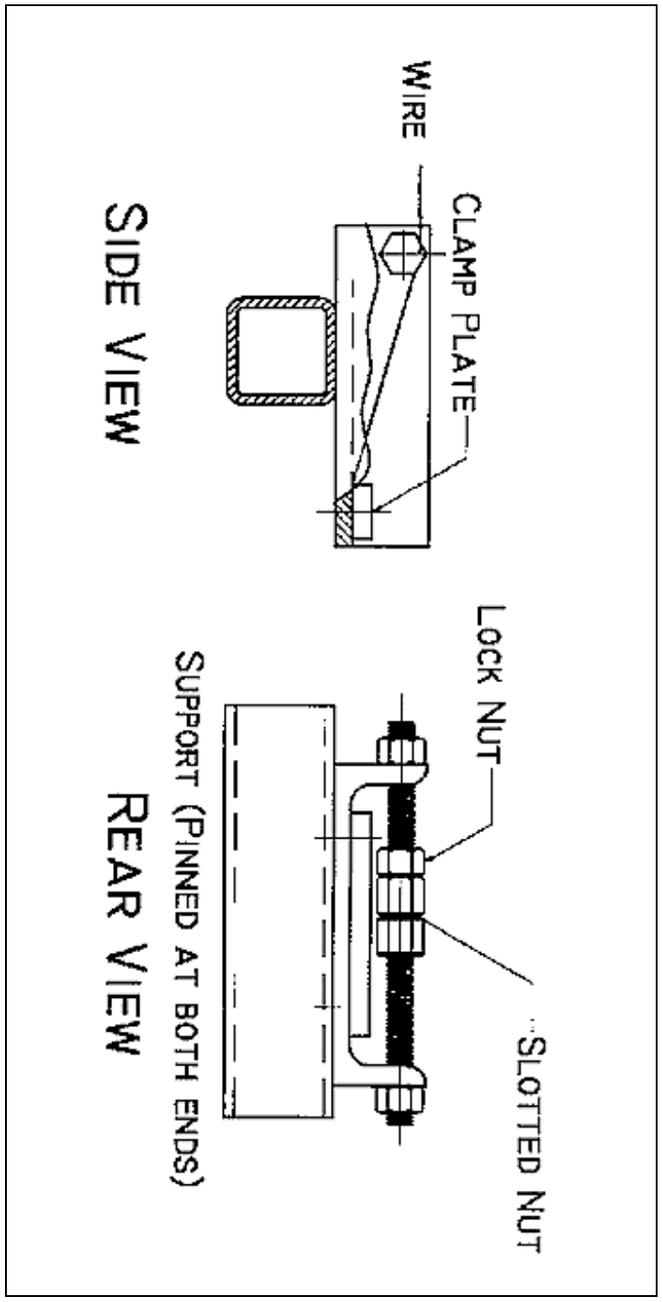
> **Tip** Make sure that the edger door is firmly closed and that the arbour is in it's normal operating location when taking these measurements.

New Product

Saw Centering Adaptor

Centers saws accurately for top, face and side grinding of splined circular saws

Wire Mount



Maintenance for Accuracy

Method

This manual is developed using the information gathered from the “Machine Audit” and it defines:

How to check alignment
When to check alignment
Alignment working tolerances
Special alignment tools
Saw specifications
Saw preparation
Guide tolerances
Filing room equipment checks
Saw change schedules
Knife change schedules
Cutting accuracy monitoring
Knife preparation
Chip quality monitoring.

BandSel and SawSel are supplied with this package

Objectives

To set up work sheets, schedules and tolerances that are realistic and achievable to keep the machine running for optimum cutting acuracy and performance level.

MEASURING TO THE WIRE

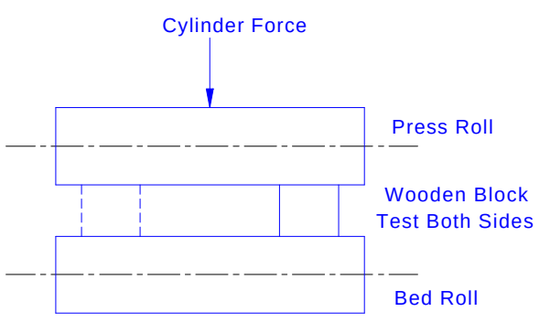
Checking the Edger Bed Rolls

Reduce the T**elescopic Sensing Head** arm length until it will reach the wire when mounted on the edger bed rolls. Set the pointer until it just touches the wire and the LED just flickers. Set the dial indicator to zero. Rotate the bed roll until the pointer makes it's second contact with the wire on the opposite side of the arc of contact. Adjust the pointer until the LED just flickers. Make a note of the new dial indicator reading on a work sheet. Also make a note of the swing distance. Complete this procedure for all bed rolls .

Press Roll Frames

Attach the **Telescopic Sensing Head** to the press rolls and complete the same procedure as for the bed rolls. Make sure that the wire is high enough off the bed rolls to allow the sensing head dial indicator to clear.

Check all press roll frames for cracked and broken joints. Check cylinder mounts and clevises. Check press roll frame bearings for end play before using the sensing head. Check for press roll frame rigidity by placing a 4" x 4" on one side of the press roll as shown below. Activate the press roll cylinder and check the level of the press roll using the **Cradle Level** on page 9 before and after the placement of the block.



Testing rigidity of press rolls

Consulting Services

Machine Center Audit

TKT provides specialized consulting services dedicated to improving machine center performance. We believe that before any improvements can be made to an existing system, there has to be a meaningful analysis done about how good a job the machine center is doing at present. Quality and cutting accuracy has to be related to the existing maintenance and alignment procedures. To do this TKT provides a **Machine Center Audit** consulting service as follows.

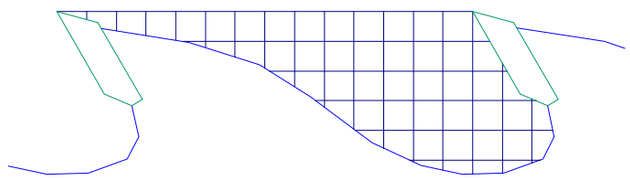
Method

Establish existing:

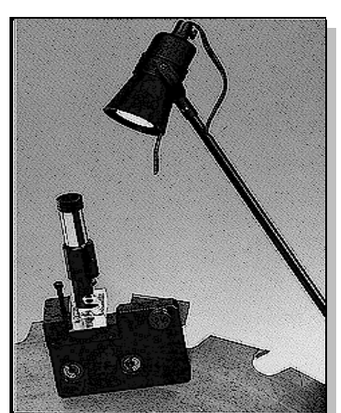
- Alignment
- Saw preparation
- Saw specifications
- Feed system functions
- Performance of setworks
- Machine controls
- Feeds and speed analysis
- Condition of the wood

Recommend:

- Priority of changes



44 squares in gullet
Grid is 6 squares per inch
Area = 44/36 = 1.22 sq. in.



Tooth Inspector

Objectives

Once it has been clearly identified how well the machine operates in its present condition, plans can be developed to:

- Reduce sawing variation
- Reduce Kerf
- Increase production
- Reduce maintenance

Elevation Measurements

The **Hydro-Level** can be used to measure elevations relative to a chosen datum. The unit consists of a base, the hose, and a vial. The operating principle of the **Hydro-Level** is that the elevation of the fluid at each end of the hose are equal. It can be used to measure elevations of the vertical arbor saw guide support pads.

We recommend that the machine is level, and does not run up or down hill. This allows you to use a machinist's level when installing or checking a part.

The following sections describe how to measure the elevation of some of the more important components. The elevation and straightness of all components that support the piece while it is being machined must be measured - from the infeed rollcase through to the end of the outfeed rollcase.

Important

Any high points or kinks in the feed will affect lumber size accuracy.

There will also be more down-time because:

- ***the wood jams or***
- ***the saws are damaged by the wood leaning on them.***

Edger Infeed System

Before checking the level of these rolls, check each individual roll for roundness, wear, and for bearing end play.

1. Set up the **Hydro-Level** base in a convenient location so that all the rolls in the complete system can be accessed.

2. Place a piece of flat bar such that it will span two rolls and position the vial directly over the first roll to be recorded.

3. Repeat this procedure for all the rolls in the system. Plot the results to get a complete profile of the machine's independent components.

Tip: The elevation of the infeed system and outfeed system bed rolls should be approximately 1/16" below the edger bed rolls. This will ensure that once the piece has entered the edger, it will not be influenced by either of these systems.

Saw Damage

Gullet cracks are usually caused by over filling the gullets. Check the saw specifications using **TKT's SawSel.**

Blue spots and burn marks on saws can be caused by any of the following :

1. Operating the saw at or close to one of it's natural frequencies. Check the saw specs using **SawSel**

2. Bent Guide Post or Guide Bar causing the guides to be out of alignment with the feed system and the saw arbour. Check the straightness of these components using a machinist's level, **Sine Bar,** or the **Telescopic Sensing Head.** To use this jig to check this parallelism of the guide bar to the arbour, first attach the jig to the arbour. Rotate the sensing head pointer 90º such that it will point to the guide bar. **A**djust the sensing head pointer until it just contacts the guide post. Set the dial to zero and rotate the arbour to make sure the pointer just contacts the guide bar and the LED just flickers. Take readings across the width of the edger to check for parallelism to the arbour.

3. Bent saw arbour. Check the straightness of the arbour by taking a series of level readings along the length of the arbour. Make a mark on the arbour where these readings are taken. Rotate the arbour 180 º and take the readings again at the same locations as before. If the readings are equal, then the arbour is straight. If the readings are different, then the the arbour is bent.

4. Incorrectly machined babbitt. Check the flatness of the machined babbitt using a granite block and a depth dial indicator.

5. Guide spacers with high spots, nicks and burrs. Check these also on the granite block for flatness.

6. Guide to saw plate clearances are too tight.

7. Saw guide lubrication system not operating correctly.

8. For vertical edgers, the bottom guide support pad may not be parallel to the guide bar. Check these relative elevations using the **Hydro Level** and a machinists level.

9. For vertical edgers, the saw arbour may not be parallel to the guide post. Check this by using the **Sine Bar.**

10. For vertical edgers, the feed rolls may not be parallel to the guide post. Check this by using the **Sine Bar.**

Sine Bar

The **Sine Bar** is a level mounted on a square so that the slope of a vertical surface can be measured. Rather than using the divisions on a vial to measure deviations from plumb, a micrometer adjustment is used to set the bubble to zero. The amount of off-plumb over a 5 inch distance is read directly off the micrometer. Measurements should be recorded in units of inches per 5 inches.

This instrument can be used to check the plumb of the

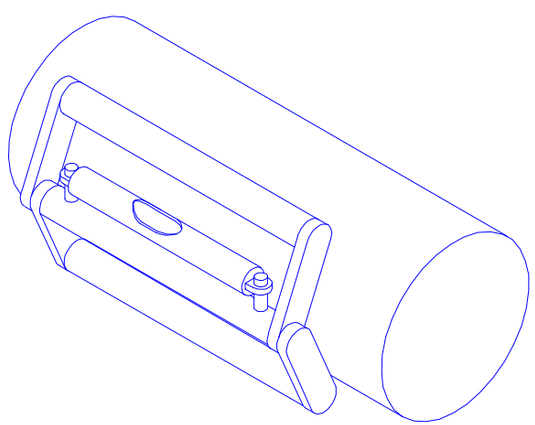
Saw arbours
Feed Rolls (vertical and horizontal)
Line bars
Guide Posts (shifting saw edgers)
Any vertical or horizontal surface

One degree corresponds to 0.087 in. on the **Sine Bar** micrometer

Some of the difficulties that could be encountered when measuring level or plumb:

1. Measuring the level or plumb of press roll faces because of their knurling or coleman inserts. The new **Cradle Level** makes it easier for doing this job as the cradle self centers on the roll, and the magnets lock it into place for easy hands off recording. As these surfaces are difficult to get a one time true reading, change the location of the cradle on the roll and take two or three different readings.
2. The shaft of a bed roll might be bent. Check by measuring the tilt at points 180º apart on the roll. If the readings are equal, then the shaft is straight. If the readings are different, then the shaft is bent. Check at both ends of the roll.
3. The face of a roll or line bar may not be straight. Take readings where most of the contact with the wood takes place. Make a note of the wear on a work sheet.

Cradle Level being used to check a bed roll level

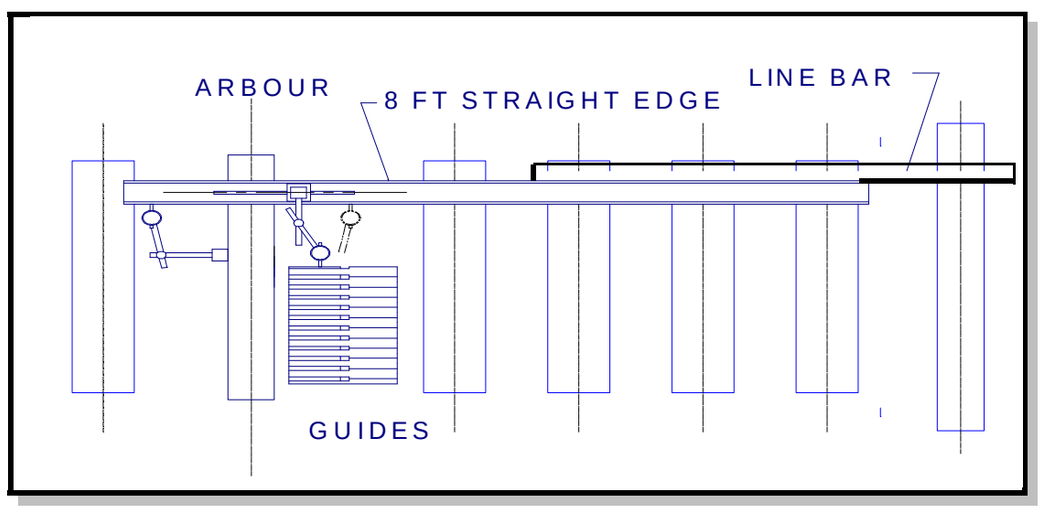


Quick Checks and Fixtures

TKT supplies custom made straight edges. These incorporate a linear bearing that is perfectly aligned with the edge of the straight edge. Place this straight edge against the line bar so that the end of the straight edge is cantilevered into the edger far enough to reach the guides as shown in the diagram . Use the dial indicator to check for parallelism of the guides to the straight edge.

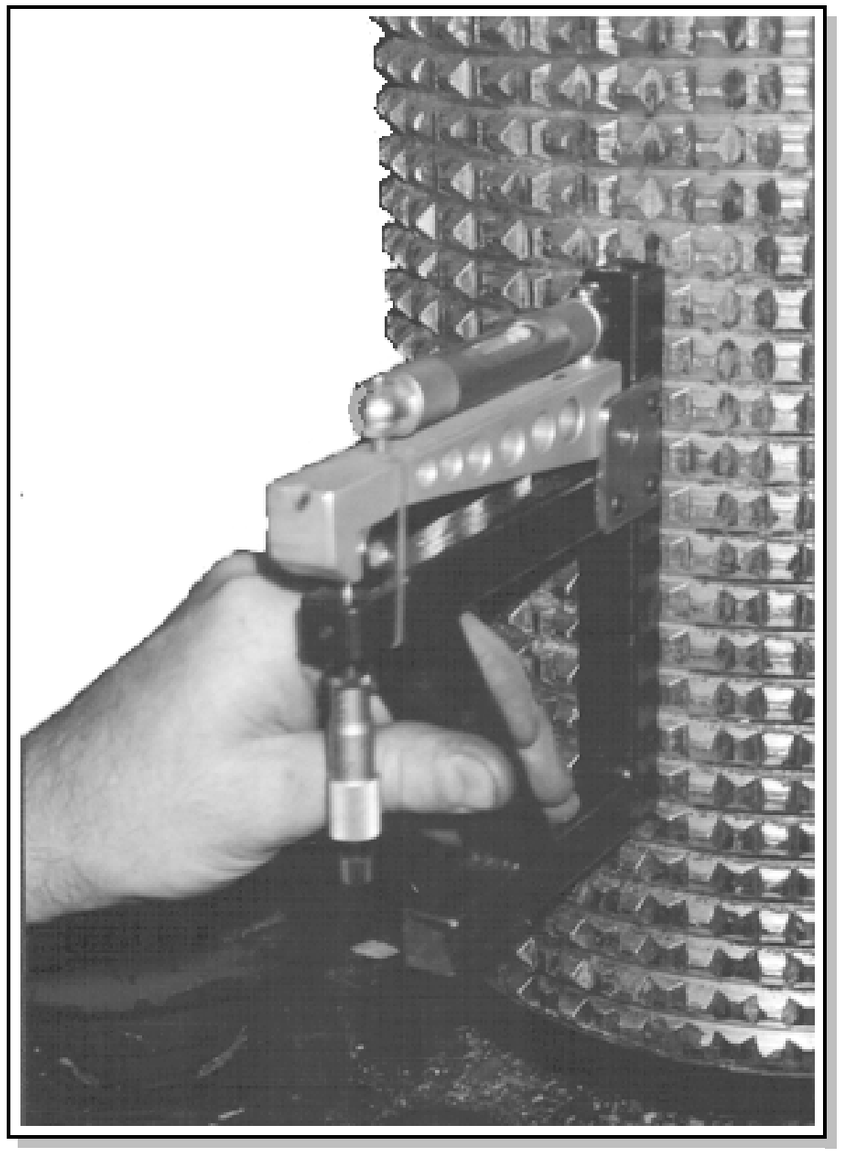
Using the infeed line bar as a datum, place the straight edge against the line bar as discussed above, and check for lead in the edger bed rolls by using the **Telescopic Sensing Head** attached to the bed roll. Touch the straight edge with the pointer and set the dial to zero. Rotate the roll until the pointer touches the straight edge on the opposite side of the arc of contact. Adjust the pointer until it touched the straight edge and make a note of the difference on a work sheet.

Another use of the straight edge is to check for the level of the edger bed rolls relative to those of the infeed and outfeed systems. Place the straight edge on the edger bed rolls with the press rolls in the up position and cantilever the end out over the infeed rollcase. Check to see if the top of the rolls in the in feed rollcase are below those of the edger. Do the same for the edger out feed rolls.



To check if the saws are aligned to the guides, use the **“Edger Guide Alignment Jig”.** To check for wear on the door locating pins, tapered sleeve, or arbour bearings, check the guides using this jig and note the findings. Open the door and close it again and re take the guide reading.They should be the same, if they are not, there is either wear in the pins, the bearings, or the taper sleeve.

Use the **Sine Bar** to make quick checks for all plumb and level components and surfaces.



SINE BAR USED ON VERTICAL FEED ROLLLS

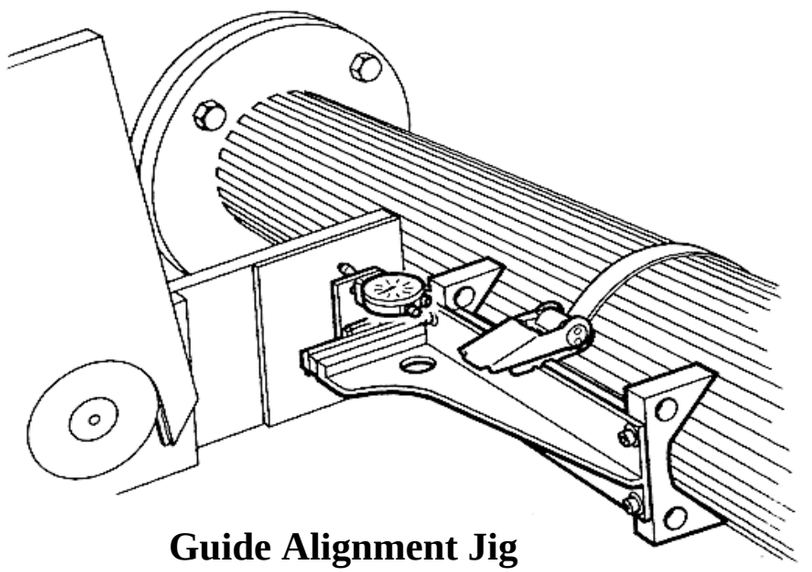
Saw Guides

It is critical that the saw guides are correctly aligned to the feed system. To check this, use the **Edger Guide Alignment Jig.**

This jig is designed to to create a perfect right angle between the machined V blocks in the base, and the rail and linear bearing. Attach this jig to the arbour and take readings along the length of the guide using the linear bearing with the guide clamped in position. Rotate the arbour and take plumb measurements down the depth of the guide.

Attach an extension bar to the linear bearing mounting plate and insert the dial indicator. The extension bar allows the dial indicator to reach the vertical shifter guide posts in shifting saw edgers. Take readings across the post width without the guide attached to it Use a **Sine Bar** on the same face to check for plumb.

The guides and guide spacers should be checked for flatness using a granite block, and for thickness consistency using dial callipers.

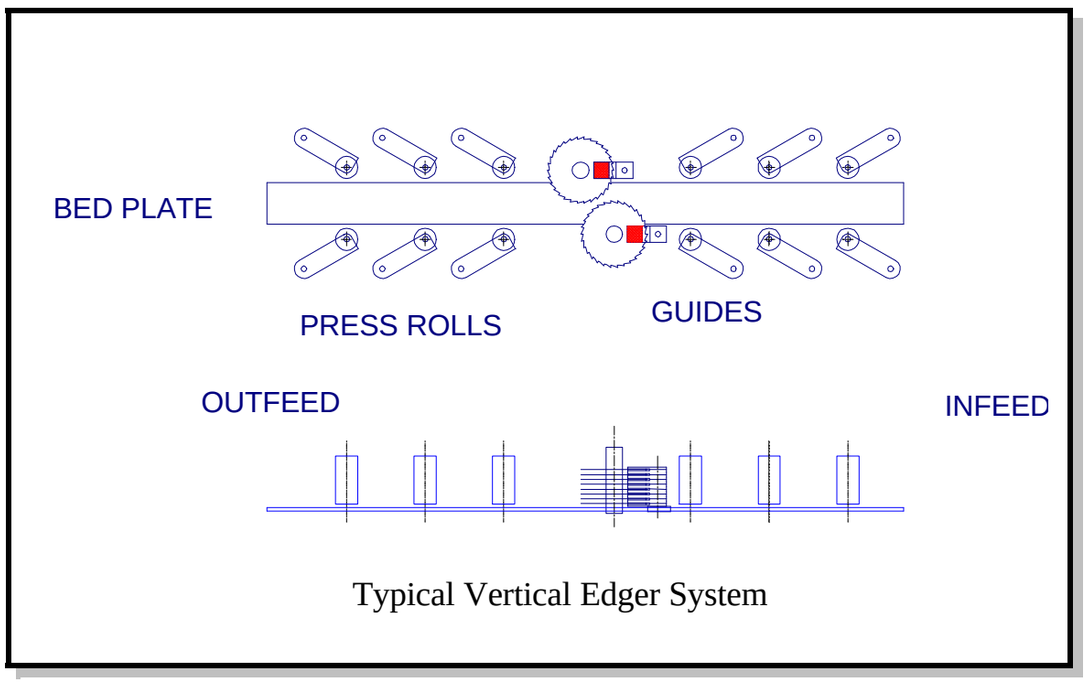


Guide Alignment Jig

Vertical Edgers:

For vertical edgers mounted in line in a Chip-N-Saw or a Canter, see the TKT's "Alignment Procedures and Instruments For Chip-N-Saws and Canter Lines"

These notes are for the vertical edgers systems which are a complete stand alone machine center where the edger is either a single or double arbour type with in feed and out feed banks of bed and press rolls as shown typically below



Typical Vertical Edger System

Use the "**Hydro-Level"** to establish a datum and check the elevations of the bed plates relative to the guide pad. Check for cross level of the system by using the a machinist's level, or the **"Sine Bar"** set up on the bed plates.
Use the **"Sine Bar"** to check that the angle of the lead of the infeed rolls is uniform.. These rolls have to be tilted forward in the direction of the feed to make sure that the piece is forced down onto the bed plates. The outfeed rolls should be plumb.

Note:
A tilt of 0.5° corresponds to a Sine Bar reading of 0.042"/5"

Check the plumb of the arbours and the guide posts using the **"Sine Bar"**.

Level, Plumb, Alignment and Elevation Table

Item	Level	Plumb	Alignment	Elevation
Infeed system bed rolls	Cradle Level or Sine Bar		Telescopic Sensing Head	Hydro-Level, Strtaight Edge & Machinist's Level
Infeed system crowder rolls		Cradle Level or Sine Bar		
Infeed system Line Bar		Sine Bar	Magnetic Based Sensing Head	
Edger Press Rolls	Cradle Level or Sine Bar		Telescopic Sensing Head	
Internal edger line bar		Sine Bar	Magnetic Based Sensing Head	
Edger Arbour	Machinist's level		Telescopic Sensing Head	Hydro-Level
Edger Bed Rolls	Cradle Level or Sine Bar		Telescopic Sensing Head	Hydro-Level, Straight Edge & Machinist's Level
Edger Press Rolls	Cradle Level or Sine Bar		Short Sensing Head	
Edger Guide Posts		Sine Bar	Guide Alignment Jig	
Edger Guide Bars	Machinist's Level		Telescopic Sensing Head	
Edger Shifter Bars	Machinist's Level			
Outfeed System Bed Rolls	Cradle Level		Telescopic Sensing Head	Hydro-Level, Straight Edge & Machinist's Level
Vertical Edger Guide Pad	Machinist's Level	Sine Bar		Hydro-Level
Vertical Edger Guide Bar	Machinist's Level			Hydro-Level
Vertical Edger Guide Posts		Sine Bar		
Vertical Edger Arbour		Sine Bar		
Vertical Edger Feed Rolls & Anvils		Sine Bar		

TROUBLE-SHOOTING GUIDE

Sawn Surfaces

Snaking
Snaky lumber is usually caused by overheated saws. Check the Gullet Feed Index (see formula page 24), the side clearances, the guide clearances and the lubrication system.

Bevel or Mismatch
Usually caused by saws deflecting in the cut due to incorrect saw specifications or feed speeds (see ***SawSel*** on page 22 to check the Saw Load Index). Check guides and spacers for flatness and parallelism.
Check kerf widths and saw plate thickness for consistency.

Poor Surface Finish
Back cutting marks can easily be identified. Back cutting is caused by the saw guides not being perfectly parallel to the feed system, or the saw is snaking.

EXAMPLE If the saw guides are are out of alignment with the feed system by 0.006" over the length of the saw guide (say 6") the piece will be back cutting if the saw is, say 22" in diameter, and has a kerf to plate side clearances of 0.015" per side.

Rough surfaces can also be caused by the bite/tooth being too large. When the bite/tooth exceeds 0.055", sawn surfaces get rough to the touch.

Pieces pulling away from the line bar
This can be caused by the piece being sawn has two non-parallel surfaces. The surface which is in contact with the edger bed rolls is not parallel with the surface which is in contact with the top press rolls.
It could also be caused by the edger bed rolls not being perfectly parallel with the edger press rolls.
Unequal pressures on the cant will tend to lift one edge and drive the piece in an arc. Make checks to see if the piece has parallel surfaces.

Tip If the cant surfaces are parallel, the problem is usually the edger press rolls. Remove the saws and guides from the edger. Raise the press rolls. Run pieces through and see if they pull away from the line bar. If they do, the problem usually is related to the infeed section feed rolls being worn and dished. If the piece doesn't pull away, bring down one press roll at a time and run pieces through the edger. This way, when a piece pulls away, you have identified the problem roll.

Hydro Level System

Hydro Level being used to check bed roll elevations

Level and Plumb

The new **Cradle Level,** machinist's level and **Sine Bar** are the effective alignment tools. Most control surfaces of a feed system should be either plumb or level. Many alignment problems can be found with a few quick checks with these instruments. They are also needed when parts are replaced.

Machinist's Level

Only a precision quality machinist's level should be used for alignment work. The lines on the vials are calibrated for direct reading of the slope. From the slope the amount of shim needed to level a part can be quickly calculated.

Cradle Level
This instrument incorporates a machinist's level into a self-centering frame. It is designed to allow level and vertical plumb measurements to be taken for rolls and arbours.

Measuring Lumber

Regular Quality Control programs give you adequate information about the average thickness of the wood. As a maximum of six measurements per edge are taken, it is not possible to get a true picture of what is actually happening to the wood as it passes through the machine.

BoardRunner can take as many as 256 measurements per edge at a walking pace. The display is on board the instrument and gives a picture of the thickness profile of the wood.

Wherever a piece changes thickness, either it has moved in the machine, or the saws or chipping heads have moved. If there is any consistency in these changes in thickness, the **BoardRunner** will identify exactly where the change takes place.

Graph of two edges of a board

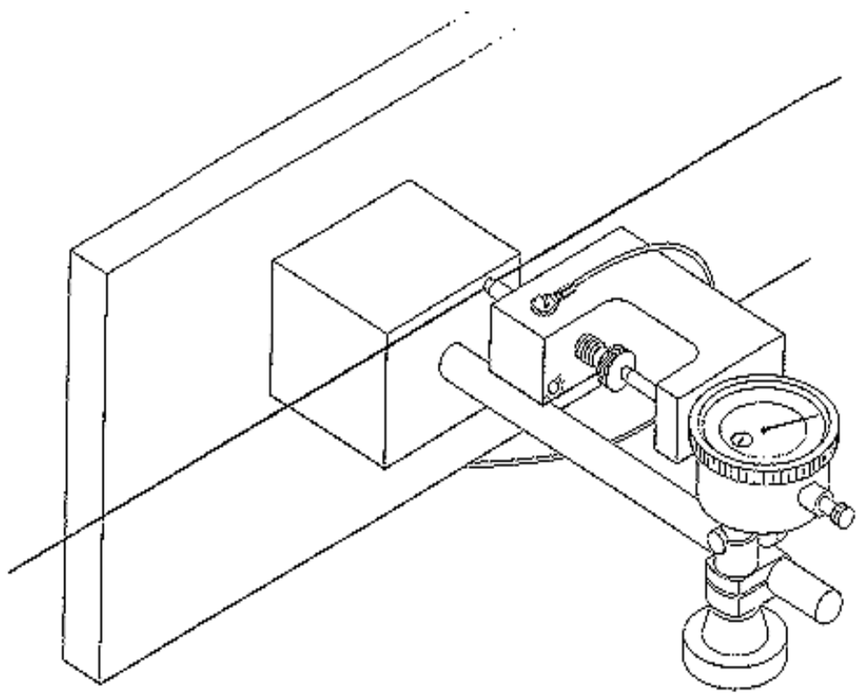
BOARDRUNNER

The ***BoardRunner*** not only tells you that there is a problem with lumber sizes....
.....it tells you what caused the problem so you can fix it

Tip : Check arbour and bed roll bearings for end play before using the Telescope Sensing Head. If there is excessive end play in these bearings, the readings taken with the sensing head may be inaccurate. Check all rolls for roundness using a magnetic based dial indicator.

Infeed System Line Bar

Check the run out of the line bar relative to the wire using the sensing head. First, remove the sensing head from the telescopic frame and add a ground wire. Attach the sensing head to a magnetic base as shown in the picture below. Take measurements along the length of the line bar to check for parallelism to the wire.
Use the same procedures for checking any line bars mounted inside the edger.



Checking a line bar

Team Training

As machines get more complex, it takes teams of individuals working together to get the best performance from a machine center. A typical machine center will need input from an alignment specialist, millwright, electrician, saw filer, Q.C. personnel, and a machine operator.

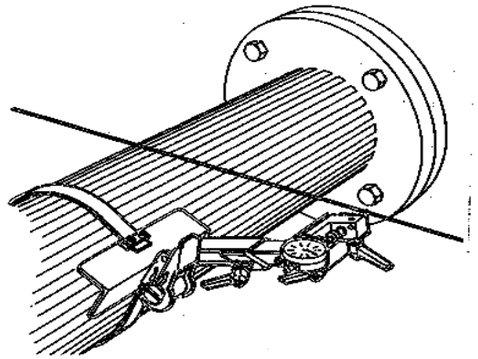
Each person in the team must understand how different team members' input effects the performance of a machine center. TKT provides "In House" seminars covering the following issues:

Quality Control
How to read the wood and measure accuracy performance.

Saw Preparation and Performance
Understanding the basics of saw preparation and saw selection.

Alignment

Understanding the issues of alignment and how to use the instruments



Telescopic Sensing Head set up on arbour

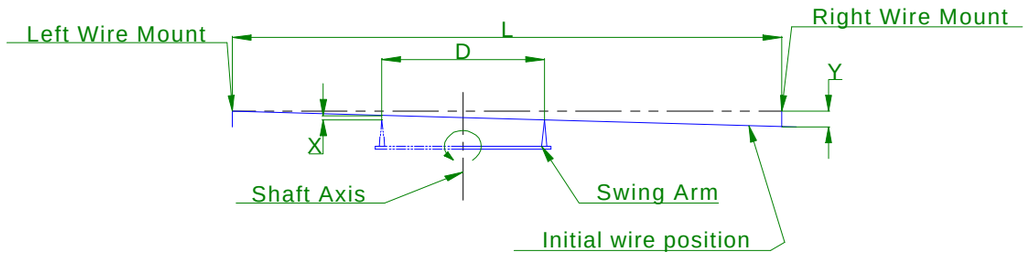
If the decision is made to move the wire, the folllowing example gives the distance one end of the wire has to be moved to make the perfect right angle to the saw arbour

To move the wire quickly, set digital calipers from the slotted nut to a fixed point. Zero the calipers. Move the slotted nut and watch the calipers until they are at the proper setting.
Now that the wire has been moved, recheck the new location by using the telescopic sensing head on the arbour once again. Move the wire again if necessary until the sensing head dial reads zero at both arc point locations.

Example:

Length of wire = L = 46ft = 55".
Distance between arc points = D = 2 ft = 24"
Difference in readings = X = 0.041"

$$Y = \frac{\text{Reading x Length}}{\text{Distance between}} = \frac{(0.041") \times (552")}{(24")}$$



Distance to move wire = Y = XL/D

Saw Selection Software

If the machine alignment is good and the machine feeds the wood straight, there is the possibility of reducing kerf or increasing feed speeds, or both. **SawSel** is designed to make circular saw specification changes relative to feed speeds, depths of cut and wood species. Just insert the disk and follow the on screen instructions.

SawSel is.....

a tool for sawfilers, maintenance managers, quality control personnel and production supervisors for making decisions about saw design and operations. *SawSel* includes the tried-and-true rules of circular saw design and incorporates the latest developments in sawing technology. *SawSel* is unique. It uses a computer model of the blade to estimate blade stiffness, which is the most important factor affecting cutting accuracy.

Uses for *SawSel*

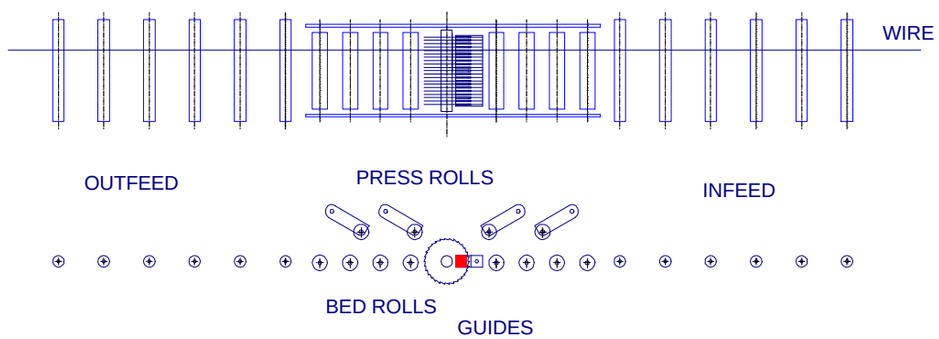
- Assess how a change in operation affects sawing performance
- Investigate trade-offs between production and recovery
- Give warning when operations are outside accepted conditions
- Trouble shoot sawing problems
- Select saw design and feed speeds for new installations or for rebuilds
- Calculate feeds and speeds
- Teaching aid about saw operation and design
- Print out reports

Calculations

- Required gullet area
- Bite per tooth
- Recommended arbor speed
- Recommended number of teeth
- Power requirement

Uses results from sawing research to calculate:

- ***Load Index (L.I.)*** - A measure of sawing accuracy that considers blade stiffness and cutting forces.
- ***Critical Speed*** - The maximum speed to run the saw before vibration instability occurs.



Typical Edger System Diagram

Formula Sheet

Saw and Tooth Shape

d	Circular saw diameter or bandmill wheel dia.(inch)
P	Tooth pitch (inch)
n	Number of teeth
k	Kerf
h	Thickness of saw plate
s	Side clearance (inch)
s_{MIN}	Minimum recommended side clearance (inch)
a	Gullet area (square inch)

Operating Conditions

N	Shaft speed (rpm)
c	Blade (or rim) speed (sfpm)
b	Bite per tooth (inch)
D	Depth of cut (inch)
f	Feed speed (fpm)
f_{MAX}	Maximum recommended feed speed (fpm)
f_{MIN}	Minimum recommended feed speed (fpm)

Performance Prediction

GFI	Gullet Feed Index
GFI_{MAX}	Maximum allowable Gullet Feed Index 0.3 for circular saws 0.7 for bandsaws

Power Consumption

E	Estimated power required (hp)
C	Energy factor depending on wood properties C = 35 for North American softwoods 40 for dry fir 70 for hardwoods

Evidence from the Wood

X	Distance taken by ‘m’ bites on the board
m	The number of bites in distance X

- Bandsaw Saw Selection Software (BandSel)
- Saw Centering Adaptors
- Chip-N-Saw and Canter Alignment Equipment(See Alignment Procedures and Instruments for Chip-N-Saws & Canter Lines)
- Special Purpose Straight Edges
- Tooth Inspector
- Saw Lubrication Systems

TKT Other Products

Sales Agents and Distributers in Canada, USA, Australia and New Zealand

Thin Kerf Technologies Inc.
Surrey, B.C. Canada
Phone: (604) 576-9455
Fax: (604) 576-8449
Email: info@thinkerf.com
Web: www.thinkerf.com

Akhurst Machinery
(Sole distributor in Canada)
Delta B.C. Canada
Phone : (604) 540 1430
Fax : (604) 540 1780

Missoula Saws
Missoula Montana
Phone : (406) 721 2580
Fax : (406) 728 2557
email : mislasaws@centric.net

Smith Sawmill Services
Timpson, Texas USA
Phone: (409) 254-3161
Fax: (409) 254-3975

Menominee Saw
Menominee, Michigan USA
Phone: (906) 863-2609
Fax: (906) 863-1147

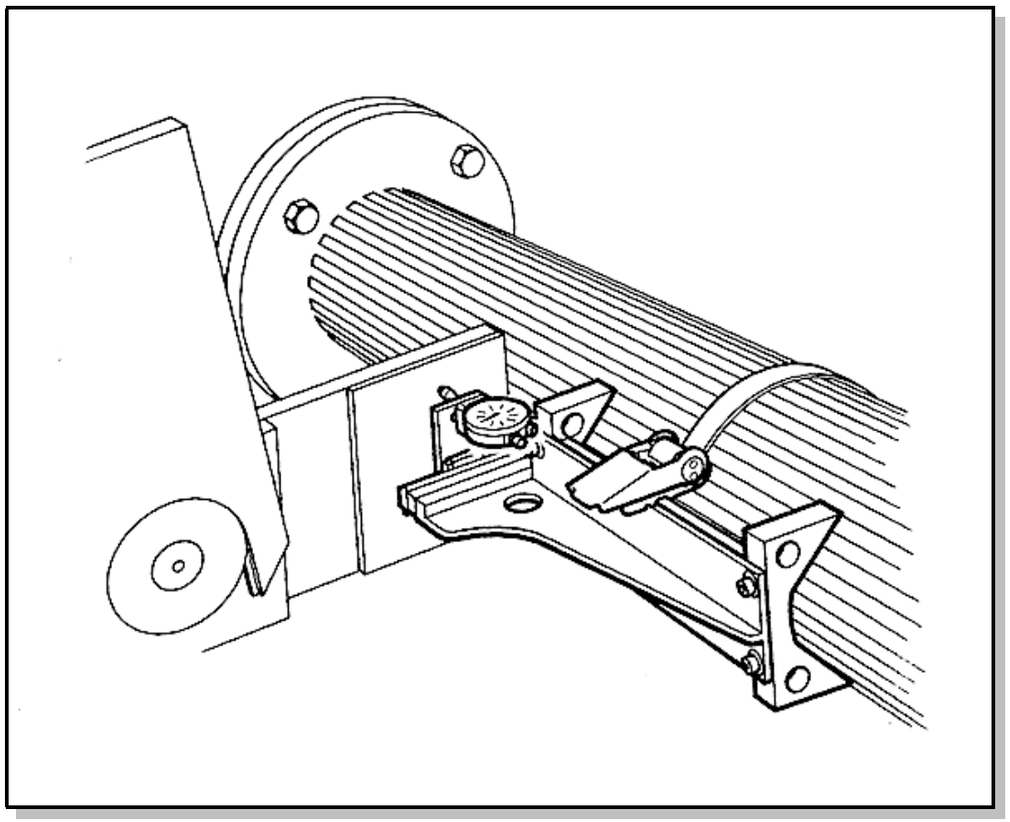
Oregon Select (Australasia) Pty.
Auckland, New Zealand
Phone: (649) 360 7016
Fax: (649) 376 8220

Keymatic (Australasia) Pty Ltd.
Coffs Harbour NSW - Australia
Phone : 61- 2- 6651 8123
Fax : 61 -2 - 6651 8133

Thin Kerf Technologies Inc.

ALIGNMENT PROCEDURES AND INSTRUMENTS FOR EDGERS

Publication # 2



PRECISION ALIGNMENT TOOLS