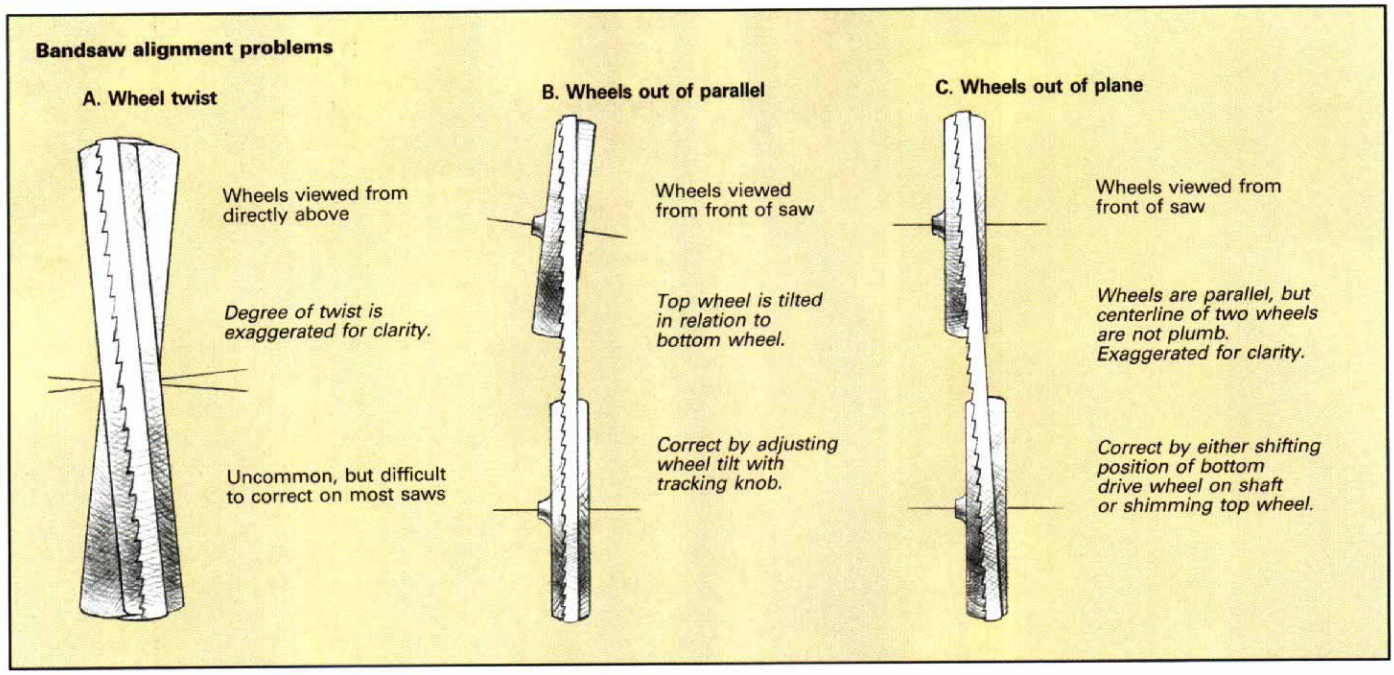


Adjusting Bandsaw Wheels

Small alignment changes improve performance

by Mark Duginske

The bandsaw can be one of the most useful tools in the shop: It can resaw thick stock or slice off thin veneer and cut curves, circles, tenons, dovetails and more. But don't expect it to do all these jobs well straight from the factory. For top performance, you must fine-tune the saw, paying special attention to wheel alignment. This takes no special tools, gadgets or miracle blades, just a little time and attention, and a shim or two.

In the course of my travels in the past 10 years, teaching classes and giving seminars on woodworking tools and techniques, I've adjusted at least 100 different bandsaws, Most of these were poorly tuned, and many were miserably out of adjustment. Unfortunately, when a bandsaw doesn't work correctly, people tend to blame the machine, the blade or themselves rather than alignment or any other adjustment. Some workers seem almost afraid to mess with the machine, but the method I'll describe here is simple and virtually foolproof, if you follow the steps properly. But before getting into the "how to," I'll explain a bit about the dynamics of a bandsaw and why misalignment can be such a complex problem.

Good alignment- For any blade to cut accurately, the wheels of the bandsaw must drive it smoothly and continuously. Proper wheel alignment is essential for this to happen, just as correct wheel alignment is necessary for a car to travel in a straight line without excessive vibration. For top performance, the wheels must line up with each other in three ways, as shown in the drawing above. The wheels must align in the vertical axis, be in the same plane and be parallel to each other. When the wheels are aligned all three ways, I refer to them as being "coplanar." With poor wheel alignment, the blade can hop around on the wheel, yielding an erratic cut. These undesireable movements will shorten the life of the blade and the thrust bearing, as well as wear the guides unevenly.

Because bandsaw wheels have no rims, the only thing that holds the blade on the tire covering the wheel is proper tracking. To adjust the tracking, you must alter the angle of the bandsaw's nondriven wheel while the blade is running. On most saws, this adjustment is made by screwing a knob in or out. This tilts the arbor supporting the top wheel, which in turn causes the blade to run or track on a different section of the tire. The goal is to keep the blade riding evenly on the wheel: A properly tracked blade will run without rubbing hard against the thrust bearing or coming off the wheel.

Blade tracking is also enhanced by the crowned wheels found on most small American and Taiwanese bandsaws, like the Delta, Sears and Grizzly. The wheels' convex profiles tend to automatically center the blade in the middle of the wheels, just as the crowned front roller on a belt sander tends to center the belt. This natural centering occurs because the blade wants to equalize the tension

Drawing: Bob La Pointe

With the table tilted out of the way, the author uses a strip of plywood with a straightedge jointed on it to check the wheels of a Delta 15-in. bandsaw for plane and parallel alignment.

on its inner and outer edges. Crowned wheels also buffer many wheel-alignment problems and even compensate for irregularities in the blade's thickness and width.

Variables of poor tracking-Despite the crowned wheels and tracking adjustment, there are several variables that constantly work against good tracking and often make even a high-quality bandsaw perform poorly. First, bandsaw blades are rarely perfect: Each blade has its own performance characteristics or "personality." If the weld joining the ends of the blade is uneven, the front and back edges of the blade won't be the same length, and the blade may track poorly and tend to hop around on the wheels. Blade straightness is also affected by the manufacturing process: When the front of the blade is heat-treated to harden the teeth, it often contracts, making the back of the blade longer than the front.

Other variables include wheels that are out of round, causing the blade to loosen and tighten on every revolution, or tires that are worn unevenly. Even the self-centering quality of crowned wheels can be a disadvantage with misaligned wheels: The two crowns compete for control of the blade, rocking the blade back and forth, producing a crooked cut. This is similar to what happens when you drive down a rutted dirt road: The car will jerk from side to side as the wheels slip into one rut, then the other.

Tension and tracking-Even though we can't always change the variables described above, we can cure the biggest cause of tracking problems: misalignment of the bandsaw wheels. If poor alignment isn't remedied, an excessive amount of wheel tilt, via the tracking adjustment, may be needed to keep the blade tracking properly. In extreme cases, it's nearly impossible to keep the blade on the wheel or to keep it from riding so hard against the thrust bearing that it prematurely wears the bearing and the blade.

If wheel alignment is so critical, why don't manufacturers take care of it? In fact, the wheels *are* aligned at the factory, but before a blade is installed. This presents yet another variable: blade tension. Wheels that are coplanar under no tension can be forced out of alignment when the blade is mounted and brought up to proper running tension. Also, a saw that is coplanar at normal tension can become misaligned under excessive tension. When a wide blade that runs at a higher tension than a narrow one is installed, the misalignment may become even greater. That is why a saw that runs fairly well with narrow blades can perform poorly with wide blades. For this reason, bandsaw wheels should be aligned while a wide blade is fully tensioned on the saw. This will ensure that the wheels are coplanar when the relationship is the most critical.

Some authors claim that many bandsaw problems can be cured by drastically increasing blade tension beyond the manufacturer's specifications (see *FWW* #63, pp. 62-69). This is something I am strongly against, because I think it reduces the quality of cut and can eventually damage the saw. Handsaws, as well as bandsaw blades, are designed to work at specific tension settings; higher blade tensions unduly stress the saw and make the blade much more susceptible to harmonic flutter, a rhythmic vibration that results in poor cuts. In contrast, blades will run truer and last longer on a bandsaw with coplanar wheels, because there is no binding or twisting of the blade. You will notice more accuracy and power, with less vibration and less blade wander.

Checking wheel alignment-This simple procedure only takes about half an hour. As already mentioned, the alignment should be checked with a blade in place. Tension the widest blade you use on your saw according to the gauge on the saw. In my opinion, a ½-in. blade is the largest practical size for a consumer bandsaw. If your saw is old, or if you do not habitually release the tension after using the saw, the spring may be compressed and not give you a true tension reading. You can check this by raising the upper guide assembly for a 6-in. cut and pushing sideways on a ½-in. blade: The blade should only deflect about ¼ in. If it's a lot more, you should increase the tension until the deflection is right. If you're using a wide blade, you may need to increase the tension slightly past the highest mark, but not to the point where you're at the end of the adjustment screw. When the spring is compressed completely (you can see if it's squashed all the way down), it loses its ability to function as a shock absorber, which is its secondary purpose.

Use a straightedge, a board or a piece of plywood with a true edge on it to check if the wheels are parallel and in plane with each other. Hold the straightedge vertically and lay it across the middle of the wheels, as shown in the photo on this page, but avoid the hubs if they protrude. If the straightedge touches on the top and bottom rims of both wheels, the wheels are parallel and in the same plane. If this is the case, rest easy: The wheels are aligned and you're ready to check for twist, as described at the top of the next page.

If the wheels are out of alignment, the straightedge will touch at two or three points. In most cases, only the top wheel or only the bottom wheel will touch the straightedge. In either case, one of the wheels will have to be moved to make both wheels coplanar.

It is important to know exactly how far to shift the wheels. This eliminates a lot of trial and error in adding and subtracting washers from behind the wheel. The measurement is made at two points: at the top and bottom edge of the wheel not touching the straightedge. The distances between the straightedge and the two points should be exactly the same; if they're not, tilt the top wheel with the tracking adjuster until they are. This will make the top wheel parallel to the bottom wheel. The distance from the straightedge to the wheel

is the amount the wheel must be shifted to be in the same plane.

Finally, you need to check the wheels for twist by laying the straightedge diagonally across the wheels, as shown in the lower photo at right. Check both diagonals. You may have to tilt or remove the saw table to accomplish this. The straightedge should contact each wheel on both rims; if it doesn't, the wheels are twisted. Don't worry if your saw doesn't have an adjustment for wheel twist; it is very uncommon and doesn't affect the saw's performance nearly as much as the other misalignments. Some old bandsaws and European saws have top wheels that tilt from side to side, allowing the blade to find its alignment in this vertical plane (twist).

All the above procedures can be done on a three-wheel bandsaw as well: Just check the relationship of the drive wheel to one nondriven wheel, then the other. Finally, check the two nondriven wheels to each other. One or two wheels may need to be shifted to get them into plane with each other.

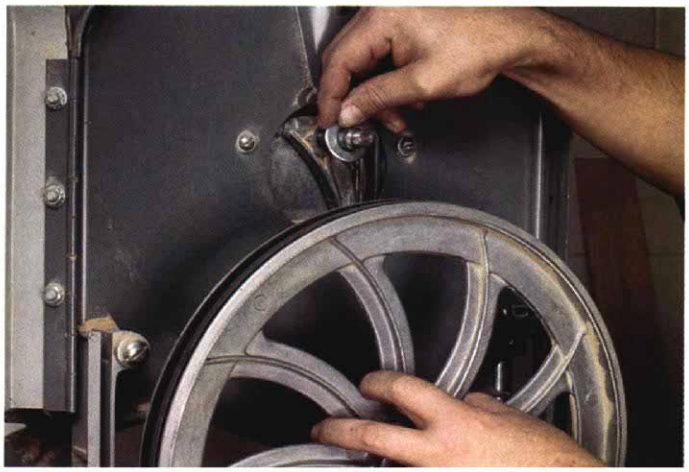
Shifting the wheels -Each bandsaw will require a slightly different method for shifting the wheels to get them coplanar. Some manufacturers, such as Sears and Inca, allow for an adjustment with a movable bottom wheel. This is the easiest kind of saw to adjust. The bottom wheel is mounted on a shaft with a keyway and locked in place with a setscrew. To adjust the wheel, loosen the screw and slide the wheel the desired amount, then tighten the screw.

Delta and some Taiwanese saws must be adjusted by shifting the top wheel, which is mounted on a threaded shaft and held secure with a nut. Unscrew the large nut and remove the wheel, as shown in the top photo at right. The wheel is shifted by either adding or subtracting the shims or washers on the axle behind the wheel. Some saws won't have any shims to remove, but it's almost always necessary to add shims, so this isn't a problem. The Delta bandsaw has a ⅝-in. axle that standard hardware-store washers will fit. If a smaller adjustment is necessary, you can make shims from sections of an aluminum can. Replace the wheel and tighten the nut snugly.

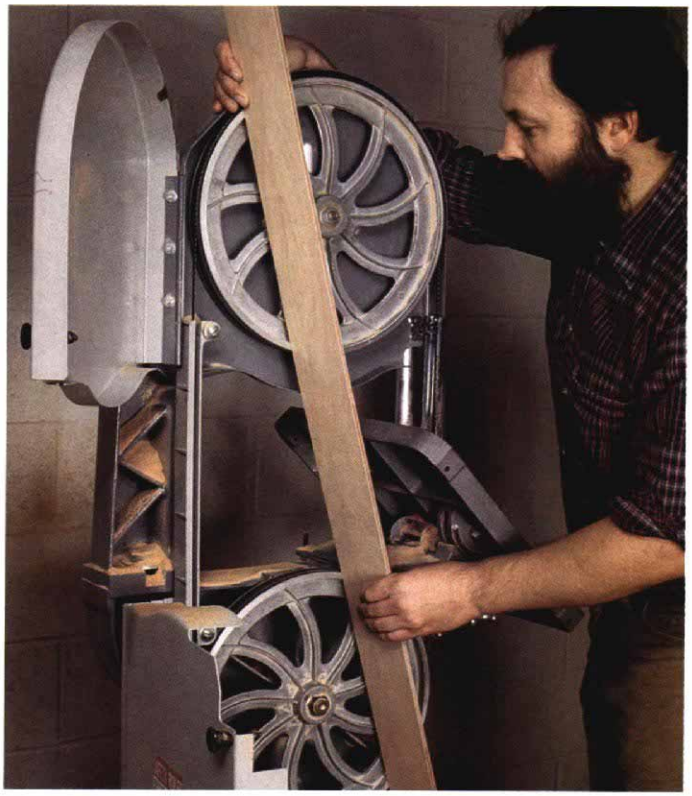
After you make adjustments, rotate the wheels several times to make sure die blade is tracking properly. On machines with crowned wheels, the blade will often find a new equilibrium that's not in the middle, so don't worry. Recheck the plane and parallel alignment one more time. It is a good idea to mark the original wheel positions relative to the straightedge so the reading won't be thrown off by an uneven section of the wheel's rim. Use a pencil or magic marker to mark the wheels.

Don't be afraid to realign your saw often—think of it as part of your regular maintenance. If you plan on doing much work with one blade, it's not a bad idea to align the saw for that blade. It is important to continually monitor the performance of your saw. New blades often stretch, and any blade will expand as it gets warm from sawing, and this may affect blade tracking. Remember, wheel alignment is the best adjustment. You can still use the top-wheel angle to fine-tune the running blade, but don't depend on it too much. After you align your saw a couple of times, it will become very quick and easy to do. The minute it takes to align the wheels is a small price to pay for good performance.

Final tricks-There are two more things you can do to make your bandsaw a pleasure to use. With the blade running, gently round the blade's back corners. This simple modification makes an enormous difference. I use a diamond hone, but you can use a fine sharpening stone or even 100-grit sandpaper on a block. A blade with rounded corners catches less at the back of the cut, especially in tight turns, and tends not to dig into the thrust bearing during curved cuts, preventing excess heat and wear. The second trick is to exchange your saw's stock guide blocks for a new type of block made from graphite-impregnated phenolic. The replacements, called "Cool Blocks," can be set tight to the blade, for more cutting control and accuracy, without heating up the blade or wearing down excessively fast. They're made to fit most popular bandsaws and are available from Garrett Wade Co., Inc., 161 Ave. of the Americas, New York, N.Y. 10013; (800) 221-2942 or (212) 807-1155 in New York. Custom block sets can also be ordered to fit practically any saw. □



Slipping a regular ⅝-in. hardware-store washer on the axle of the Delta bandsaw's top wheel shifts its position sideways to put it in plane with the lower wheel.



Laying a straightedge diagonally across the handsaw's wheels allows the author to check the wheels for twist. This often requires the bandsaw table to be tilted out of the way.

Mark Duginske is a woodworker and author. He also teaches woodworking at his shop in Wausau, Wis. He has written a book on the bandsaw that's due to be out in the fall of this year (Sterling Publishing Co., Inc., 2 Park Ave., New York, N.Y. 10016).