Power Tool
Safety and Basic Use

Version 1.3

Colophon

These materials were created electronically using Microsoft Word®. Art was produced using Adobe Illustrator®, Adobe PhotoShop® and SnagIt® for screen captures. The Arial® family of typefaces is used throughout these materials. Written by Lynne Angeloro.

Course Synopsis

In this class, you will learn how to use most of the tools that require electric power to work. This will include the Table Saw, Band Saw, Scroll Saw, Compound Miter Saw (Chop Saw), Drill Press, Router and Router Table, Jig Saw, and Circular Saw. This class is a survey of the most common tools used in any project. Please take notes on this handout – if you see a picture of an item you are unfamiliar with, please ask and let's get it identified.

Time Required: 3 Hours

- ☐ General Safety
- ☐ Drill Press
- ☐ Jig Saw
- ☐ Circular Saw
- ☐ Table Saw
- ☐ Compound Miter Saw
- ☐ Vertical Band Saw
- ☐ Router and Router Table
- ☐ Scroll Saw
- ☐ Compressor

SAFETY

General Safety

◊ Take the Safety class and get a sign-off by the Shop Manager BEFORE using any of the tools in the shop

◊ NEVER loan your shop key to anyone! If someone wishes to tour the shop, you can escort her into and out of the shop. Visitors may not use any of the shop equipment

◊ Always sign in and out of the shop

◊ Know where the fire extinguisher is and how to use it. Also, know where the First Aid kit and eye wash are located.

◊ Cell phones do not work in the shop.

◊ Safety equipment – ear and eye and breathing protection is your responsibility, use them when in the shop. Wood dust is an irritant and over time can produce or exacerbate respiratory problems, protect yourself by wearing at minimum a dust mask, or purchase a personal respirator that can provide a positive seal and allows you to change to the appropriate canister when working with different harmful vapors or irritants

◊ For your protection, please wear long-sleeved shirts when working with chemicals, short-sleeved shirts for anything with a rotary motor (saws, lathes, etc.) and closed-toe shoes in the shop. Remove jewelry, tie back long hair, and remove loose clothing that may get caught in machinery

◊ Do not operate any tools while under the influence of drugs, alcohol, medication, or lack of sleep

◊ NEVER work with power tools alone in the shop – **buddy up**

◊ If you broke it, log it so it can be repaired (Repair/Request/Removal Form, near the entry door)

◊ Clean up after yourself – leave the shop cleaner than you found it. Attaching the shopvac to the power tools will significantly cut down on the sawdust (table saw, Miter saw, band saw, router)

◊ Wipe down all tools you use and put them back where they go

◊ Need a tool that we don't have (or the one we have isn't working) – let the Shop Manager know on the Request/Repair/Removal Form, near the entry door)

◊ Supplies and materials are your responsibility. Need paint, sand paper, drill bits – these are considered disposable, so, you should bring your own

◊ If something isn't cleaned up, is broken, or not functioning properly when you come to use the shop, please let the Shop Manager know

◊ There is limited space behind the stairs for storage of your project in process, please remove your stuff when your project is finished. Personal property is not to be stored anywhere in the shop

◊ Use all tools as designed to avoid possible injury or damage to the tool

◊ Use push sticks when working close to the blade and make sure the tool's safety features are in place

◊ **Be sure your work is properly held down/supported**

◊ Think Before You Cut – The most powerful tool in your shop is your brain, use it. Thinking your cuts and movements through before acting can help save both fingers and wood. In particular, check to see if there is enough room to complete the cut. Ripping an 8-foot plywood sheet on a table saw means you need 16 feet of space. Airline pilots always do a 'pre-flight check.' You should too!

◊ Measure twice, cut once

◊ Never leave a machine running unattended

◊ Never turn your back on a moving machine, even if it's just winding down. Keep your eyes on it until you see it stop completely

◊ Let the tool do the work, if it's smoking where you are cutting, you are pushing harder than the tool can cut

◊ Let the tool stop – Giving the power tool time to wind down after a cut is an often-overlooked safety mistake. Even without power, the spinning blade can still do a lot of damage. Don't take your eyes off of it until you see it stop

◊ Don't Rush – Keep in mind that this is just a hobby and take a break when you feel rushed or frustrated with a project. Mistakes happen when we rush to complete a job

- ◊ Don’t Force It – If your saw is resisting the cut, stop and see what’s wrong. A misaligned rip fence or improperly seated throat plate can sometimes cause a board to get stuck in mid cut. Forcing the board in these situations may cause kickback or contact with the blade. Take a moment to evaluate the situation and determine the problem

- ◊ Unplug power tools - When changing blades, adjusting, or cleaning

SAFETY FIRST – SAFETY ALWAYS!

Any time you are cutting, sanding, hammering etc, you should be using eye protection. If there is a tool in your hand there should be safety glasses on your nose. Use ear protection if your work is noisy and a mask if the work is dusty. If you don’t know how to use it, DON’T – Ask someone for a quick tutorial, find the manual in the shop, look up the manual online, or check it out on YouTube.com.

Drill Press

Central Machinery (Harbor Freight) 3-speed Drill Press model 884

Standard drill sizes (English) are given in fractional or decimal inches, like ¼" or .25" Common sizes would be 1/8, 1/4, 3/8, ½, etc.

- Twist drills can be used in both wood and metal. Brad point, spade and Fostner bits are for wood.
- Drilling hard metals like steel may require setting the proper speed, pressure and cooling/lubrication for cutting a clean hole.

Metric and numbered drills are used for precise machine work, usually when tapping (making a threaded insert) is involved.

Safety

- Make sure your drill bits are sharp and do not have any burs on them. These are considered consumable, so, you should have a set of your own if you plan to do any significant work in the shop
- Secure your work to the platform with vice grips or clamps to ensure that your work will not slip or move
- Adjust the platform so that the drill bit will pass thru the hole in it, and that it's at the correct height to drill partially or fully thru your material
- BE SURE your fingers are nowhere near the drill bit as you lower it to your material, use clamps or vice grips to hold your work, not your fingers
- Make sure you know where the on/off switch and the power cord plug are in case of emergency

Additional Resources

Drill Press Basics: https://www.youtube.com/watch?v=WH4hA9bHmRs

CUTTING WOOD

Types of cuts with any saw

There are two types of cuts when working with wood: crosscuts and rip cuts. Crosscuts go across the grain and rip cuts go with the grain.

Rip Cut

To make a rip cut:

1. Set the blade to height.
2. Raise the blade until the gullets are just above the top of the board.
3. Position the rip vents and lock it down.

Crosscut

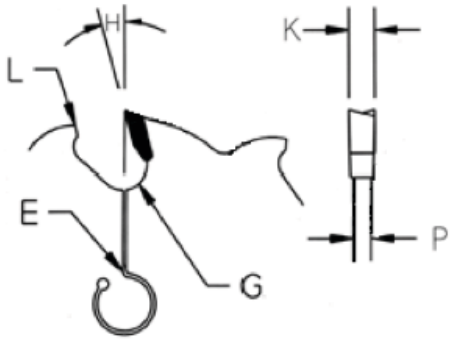
To make a crosscut:

1. Position the miter gauge.
2. Set the blade height and position the work piece.
3. The miter gauge allows for an even clean cut as you slide the workpiece through the blade.

Blade Teeth

Blades with more teeth are able to cut smoother cuts. For instance, a blade with only 24 teeth will make quick, rough cuts. When rip-cutting large sections of lumber that will later be cut into smaller sections, a blade with 24 teeth will work just fine. For molding or trim, finer cuts are necessary, so a blade with 50 or 100 teeth will be more effective. Be sure to check the saw blade to be sure all teeth are there. Remove and discard any sawblade that is not complete.

Makeup of a Saw Blade



E - Expansion Slots - Laser cut expansion slots in some saw blades that make room for blade plate expansion caused by heat from friction.

G – Gullets - The space cut out from blade plate between the teeth of a saw blade. The gullets provide room for chips and waste to exit the cut.

H - Hook Angle - The amount that a saw blade tooth either tips toward or away from the direction of the blade rotation. A zero degree hook angle means that the face of the teeth are in line with the exact center of the blade.

K - Kerf - The slot a saw blade cuts into a material. A 10' "full kerf" saw blade usually has a kerf width of around 1/8'. A 10' "thin kerf" will typically have a kerf width of approximately 3/32' (.094').

L - Kickback Limiters - Some blades have kickback limiting tabs positioned behind the saw blade teeth to help keep the blade from over-feeding.

P - Blade Plate - Saw blade plates are usually made of hardened steel, which is tensioned to prevent the blade from becoming "floppy" due to centrifugal force at high rotation speeds.

Quality of Cut

The smoothness of any cut depends on a number of variables. Things like material being cut, blade type, blade sharpness and rate of cut all contribute to the quality of the cut. When smoothest cuts are desired for molding and other precision work, a sharp 60 tooth or greater carbide blade and a slower, even cutting rate will produce the desired results.

Jig Saw

The jigsaw is a very versatile tool. You can make straight, curved, and angle cuts and you can use it on lots of different materials – wood, laminate, acrylic, light metals, to name a few.

Safety

- Make sure you always wear glasses, a dust mask and hearing protection.
- Never have loose clothing, or dangling jewelry.
- Always make sure to clamp what you're cutting.

Installing or Removing a Blade

1. Unplug the saw.
2. Tip the saw up on its back and loosen the screw at the base of the blade with a flat blade screwdriver.
3. Slide the blade out, noticing that the teeth are forward in the saw.
4. Slide in the new blade and tighten the screw.

Cutting with the Jig Saw

1. Place your workpiece on a flat surface and be sure that you won't cut the table or saw horse below.
2. Clamp your work down for safety.
3. Place the saw close to the edge of the material and pull the trigger, or flip the on/off switch.
4. For differently shaped cuts, mark your wood with a dark line so you can see and follow it.
5. Move SLOWLY when cutting curves and circles to avoid twisting or breaking the blade.
6. You can use a carpenter square or straight edge which helps keep you on track. The pivoting foot allows you to create angles in your cuts.

Additional Resources:

Jig Saw Basics: https://www.youtube.com/watch?v=FNoNeOswCt8

Circular Saw

Circular Saws work much like Table Saws, but they are much more portable. Hold-downs and guides are essential when using a Circular Saw, to ensure that your cut is straight.

Safety

- Wear eye and ear protection
- Do not wear gloves when using this tool
- Remove jewelry, loose clothing, tie long hair back, and wear a short sleeved shirt
- Adjust the blade so it's only ¼" below the material you are going to cut

- Check the blade guide to be sure it is attached and working smoothly
- Clamp your material to the work table so your hands are free to use the saw properly
- Use both hands to guide the saw
- Start the saw and then move it into the material you are cutting
- Use a guide to help make your cut accurately

Changing the blade on the Circular Saw

1. Unplug the saw.
2. Turn it on its side, so you can see the blade nut.
3. Loosen the wing nut and slide the foot of the saw as close to the saw as possible. Retighten the wingnut.
4. Using a wrench, release the nut holding the blade in place.
5. Slide the blade off of the blade shaft, noting the direction of the blade.
6. Insert the new blade and replace and tighten the nut to hold the blade in place.

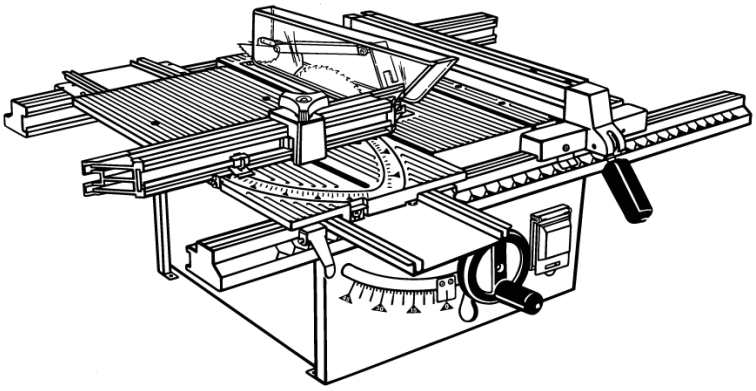
Cutting with the Circular Saw

1. Place your workpiece on a flat surface and be sure that you won't cut the table or saw horse below.
2. Clamp your work down for safety.
3. Clamp a straight piece of wood to your workpiece to act as a guide so your cut will be straight and even.
4. Place the saw close to the edge of the material, press the trigger release button and pull the trigger. The blade guard may stick at first, give it a push to move it above the piece of wood.
5. Make your cut, using both hands on the saw.
6. Make sure the blade has stopped before setting the saw down.

Additional Resources:

Circular Saw Basics: https://www.youtube.com/watch?v=zmY3Q2r_XWg or https://www.youtube.com/watch?v=1APf46AhM4g

Table Saw



Ryobi 10” Table Saw System, Model BT3100 with stand

A Table Saw is simply a circular saw mounted under a table or bench so that the blade projects up through a slot. The Table saw can quickly make straight cuts, joint cuts and groove cuts, providing the flexibility to handle many different projects. At its core, woodworking is about cutting and joining rectangular pieces of wood--and no machine makes accurate workpieces better than the table saw.

Safety

- Wear eye and ear protection
- Do not wear gloves when using this tool
- Remove jewelry, loose clothing, tie long hair back, and wear a short sleeved shirt
- You are responsible for the saw, and all that it does, so long as you are the one who is operating it. Take this seriously!
- Check the blade to be sure it has all of it’s teeth. Missing teeth can cause the saw to cut incorrectly and can cause damage to your material or injury to you
- Make all adjustments with the blade stopped
- Check all wood for any conductive items, such as staples or screws before cutting
- Use push sticks, push blocks and other safety devices to help guide and control work pieces when necessary
- Do not try to force the saw to do something it was not designed for. Do not try to cut wood faster than the motor can handle, and use the correct blade for the job
- Turn the saw off, and unplug it before removing the guard, or making any adjustments other than blade depth/angle or the fence
- Always cut AGAINST the rotation of the blade. This keeps the blade from grabbing the wood out of your hands. Feeding work in the direction of rotation may cause the work to be thrown by the blade and could result in serious

personal injury

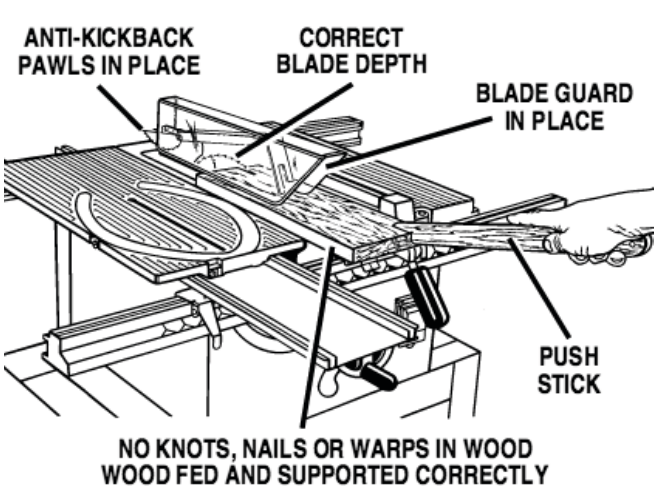
- Let the saw blade do the cutting! Do not push the wood too fast or the wood will burn or bind or could kick back at you
- Never operate the table saw without the upper guard in place. The one exception to this rule is when you saw part way through a board--cutting a dado, groove or rabbet, or using the cross cut sled--then you must remove the upper saw guard. Whenever you remove the upper saw guard, work with extreme caution and replace it as soon as possible. Use safety devices – a push stick or push block - to move the stock past the blade
- If you remove the guard, you must either replace it or unplug it before you let the saw out of your sight for any reason
- If you stop cutting for more than a few moments with the guard removed, you must unplug it while not cutting
- Never stand directly in front of or in back of the blade; always stand to one side or the other. Material that is kicked back is more likely to miss you if you're off to the side
- Let the blade get up to full speed before cutting
- Use the miter gauge, crosscut sled or rip fence to guide your work. Free-hand cuts are extremely dangerous, inaccurate and not recommended.
- Never reach over the blade while it's running, even with the upper guard in place.
- Do not rip large sheets of plywood or similar materials by yourself. Get at least one helper
- Turn off the power and let the machine come to a full stop before you remove work pieces or clear scraps away from the blade
- NEVER leave the saw running unattended. Wait until the blade comes to a complete stop and then unplug it

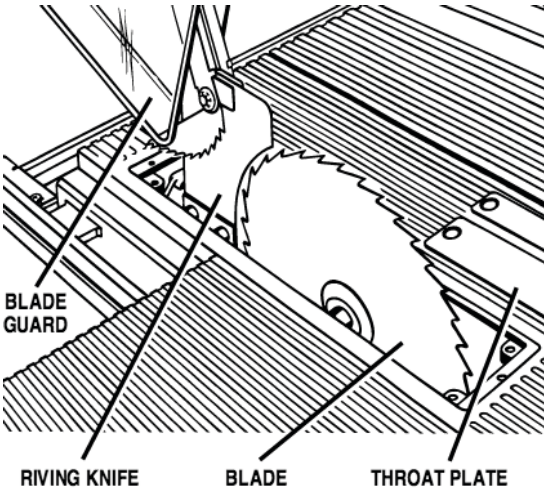
Blade Guard

Using the Blade Guard is one of the most important steps you can take to prevent injury when using your saw. The only time you would not use the blade guard is for dado cuts, rabbet cuts when using the crosscut sled, or extremely narrow cuts.

Anti-kickback pawls - Their job is to try to dig into the wood during a kickback to prevent it from flying off the saw at high speed.

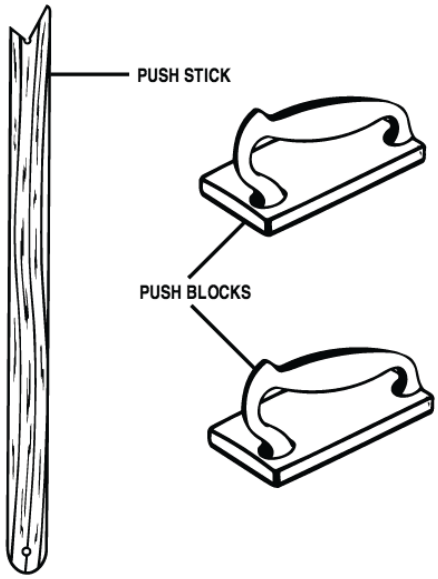
Riving Knife - A splitter that sits behind a table saw blade. Its job is to prevent kickback that results from stock distortion — a not uncommon event that can occur during ripping operations.





Push Sticks and Push Blocks

These are used to push smaller pieces of wood thru the Table Saw, to avoid putting your fingers and hands close to the moving blade.



TO AVOID KICKBACK:

Kickback can occur when the blade stalls or binds, kicking the workpiece back toward the front of the saw with great force and speed. Kickback can cause serious injury.

Use these guidelines to avoid kickback:

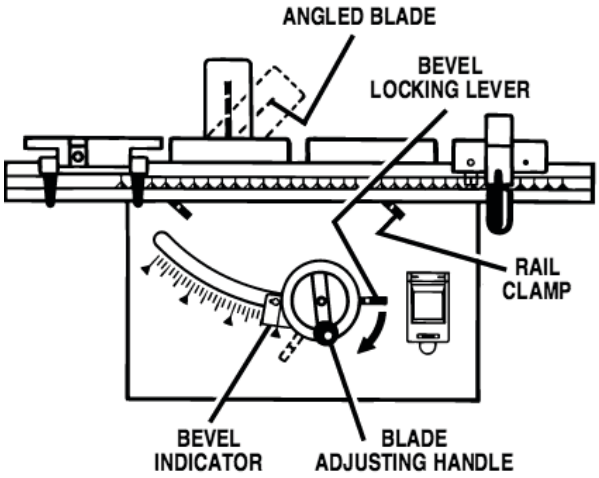
1. Always use the correct blade depth setting. The top point of the blade teeth

should clear the workpiece, 1/8 inch to 1/4 inch.
2. Inspect the work for knots or nails before beginning a cut. Knock out any loose knots with a hammer. Never saw into a loose knot or nail.
3. Make straight cuts. Always use the rip fence when rip cutting. This helps prevent twisting the wood in the cut.
4. Always use clean, sharp, and properly set blades. Never make cuts with dull blades.
5. To avoid pinching the blade, support the work properly before beginning a cut.
6. When making a cut, use steady, even pressure. Never force cuts.
7. Do not cut wet or warped lumber.
8. Always hold your workpiece firmly with both hands or use push blocks, push sticks, and featherboards to keep your body in a balanced position to be able to resist kickback should it occur. Always use push blocks, push sticks, or featherboards when making dado and other non-through cuts to avoid the risk of serious injury.

Changing the Blade on the Table Saw

1. UNPLUG THE SAW!!
2. Push the bevel locking lever to the left for height adjustment mode.
3. Turn the Blade Adjusting Handle to raise the saw blade to the upmost position.
4. Using the 2 Table Saw Blade tools, lock the spindle by sliding the forked end of the tool behind the blade.
5. Check that the blade spindle locked by trying to turn the blade – it should NOT turn.
6. Use the other tool to turn the nut holding the blade onto the shaft.
7. Be careful not to drop the nut or outer washer once the nut is loose enough to remove.
8. Slide the blade off of the spindle, noting the direction of the teeth. Be careful not to drop the inner washer, behind the saw blade.
9. Place the new blade onto the spindle.
10. Replace the outer washer and nut and tighten the nut firmly.
11. Remove the spindle locking wrench.
12. Check that the blade spindle unlocked by trying to turn the blade – it should now turn.

Adjusting the Blade Tilt Angle



The tilt (bevel) angle of the blade can be adjusted between 0 and 45 degrees. This is useful to cut 2 pieces to butt together, using a 45° angle cut.

1. Push the bevel locking lever to the right for angle mode.
2. Angle the blade by turning the blade adjusting handle until the bevel indicator shows the correct angle.
3. Return the bevel locking lever securely to the left to lock the angle, while holding the blade adjusting handle in place.

Locking the Miter Table

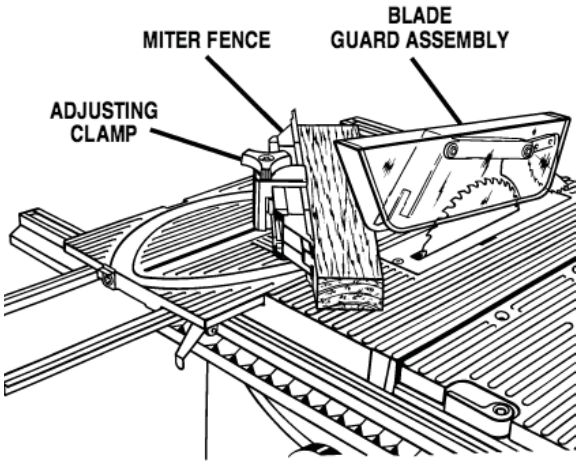
The miter table slides to let the operator slide the workpiece across the saw. A miter slide lock is mounted on the front of the miter table to lock it in place. The miter slide lock is placed in a slot on the base to align the miter table with the front edge of the saw table. The sliding miter table should be locked for any cut in which the operator prefers a fixed table.

- To lock the miter table **with the base projecting to the front**, place miter slide lock in the back slot on the base.

- To lock the miter table **with the base projecting to the back**, place miter slide lock in the front slot on the base.

Making a Miter Cut

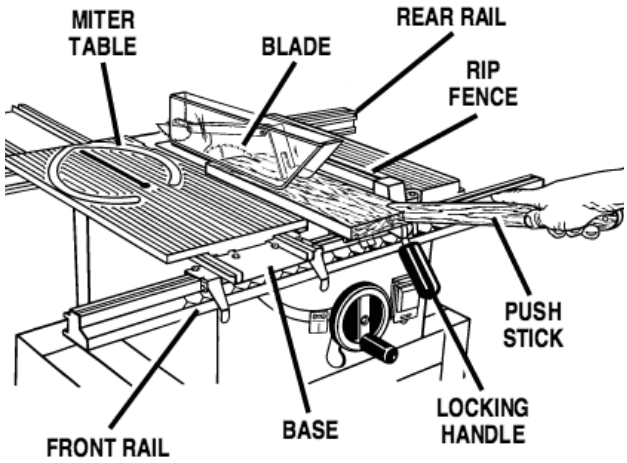
It is recommended that you make test cuts on scrap wood.



1. Remove the rip fence by lifting the locking handle.
2. Loosen the adjusting clamp to set the desired angle of the miter fence. Place the miter indicator on the miter fence to the desired angle on the miter table. Retighten the clamp.
3. Place a support (the same height as saw table) behind the saw for the cutwork. There are 2 adjustable supports available for attaching to saw horses for support large or long pieces of wood.
4. **Make sure the miter fence will not contact the blade** while feeding the wood. Make a trial pass of the miter table. The miter fence should not contact the blade. Loosen the adjusting clamp to move it away from the blade if needed.
5. Make sure the wood is clear of the blade before turning on the saw.
6. Let the blade build up to full speed before moving the miter table to feed the workpiece into the blade.
7. Hold the work firmly against the miter fence with both hands, keeping well clear of the blade, and push the miter table to feed the work into the blade.

Making a Straight Rip Cut

It is recommended that you make test cuts on scrap wood.



1. Remove the miter fence. Position the sawhorse and sliding miter table to provide the support necessary for the cut being performed. Securely lock the rip fence with the locking handle.
2. Don't leave one side of saw unsupported.
3. Position the rip fence the desired distance from the blade for the cut and securely lock the handle. Adjust the scale to zero at the cutting edge of the blade
4. Place a support (the same height as saw table) behind the saw for the cut work. There are 2 adjustable supports available for attaching to saw horses for support large or long pieces of wood.
5. Use a push block or push stick to move the wood through the cut past the blade.

NEVER PUSH A SMALL PIECE OF WOOD INTO THE BLADE WITH YOUR HAND, ALWAYS USE A PUSH STICK. Keep your hands at least 6” from the saw blade.

6. Stand to the side of the wood as it contacts the blade to reduce the chance of injury should kickback occur.

NEVER STAND DIRECTLY IN THE LINE OF CUT!

7. Make sure the wood is clear of the blade before turning on the saw.
8. Let the blade build up to full speed before feeding the workpiece into the blade.

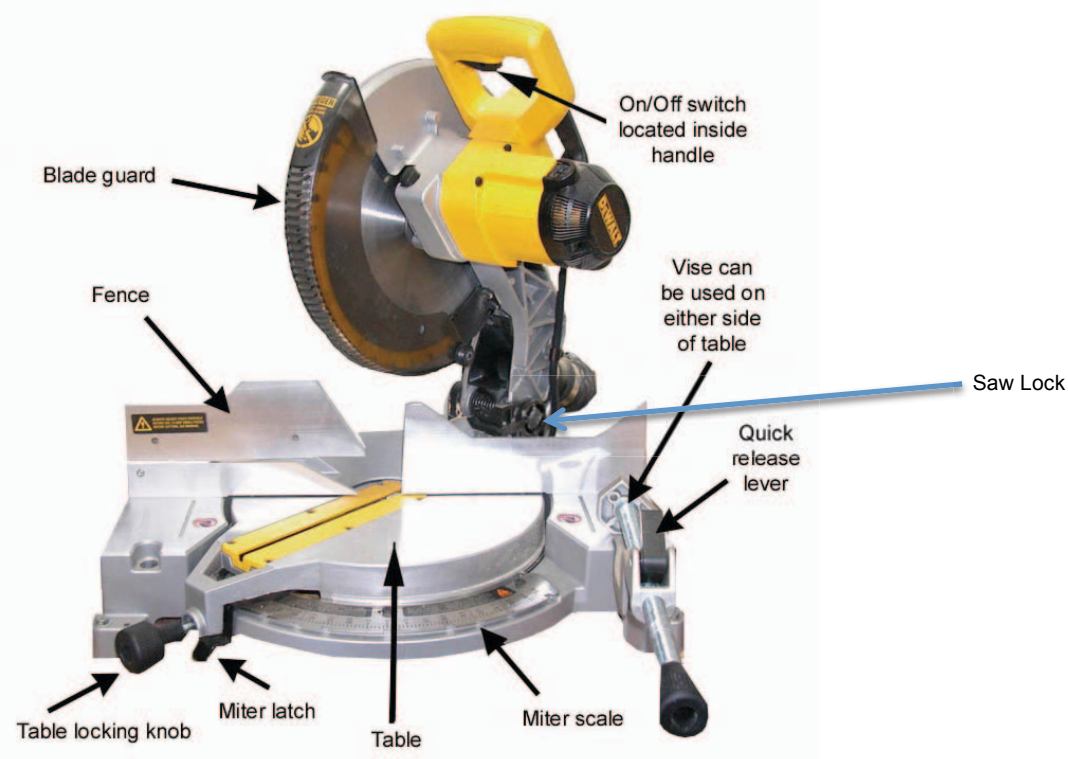
Additional Resources:

Using a Table Saw, Part 1: https://www.youtube.com/watch?v=GUMif8_XQRE

Using a Table Saw, Part 2: https://www.youtube.com/watch?v=L4-MztOKl2M

Miter Cuts on a Table Saw: https://www.youtube.com/watch?v=qpKlueS9-nk

Miter Saw



DeWalt Compound Miter Saw Model DW705/ Craftsman Compound Miter Saw

Often called a Chop Saw or Compound Miter Saw, the Miter Saw is a quick, easy and precise saw to use when cutting boards to length for either straight cuts or angled cuts for home improvement projects. A miter saw is used to make exact angle cuts in wood, masonry, metal or even concrete. The exact degree angle cuts are necessary for joining two or more pieces of material together in a flush manner. So a power miter saw is simply a combination of the miter box and a circular power saw. It can provide amazing and exacting results in a very simple-to-use yet powerful way. Making faster, easier cuts is simple by placing a guide against the fencing of the saw with some double-sided tape. Once in place cut through it. This will make it easier to cut future boards so you do not have to check your blade every time. For longer boards, use the adjustable stand to make quick even cuts. For angled cuts, adjust the angle gauge on your saw and make your cut.

Safety

- Wear eye and ear protection
- Do not wear gloves when using this tool
- Remove jewelry, loose clothing, tie long hair back, and wear a short sleeved shirt
- Keep hands 6 inches from the blade and off the turntable
- Do not cross your arms as you cut
- Support your work with a feed support or stand

- Before powering up, bring the blade down to ensure you are still on your mark. Bring the blade up to the top position, power it up and bring it back down, into the wood.
- Start the saw and then move it into the material you are cutting
- Use a guide to help make your cut accurately

Using the Compound Miter Saw

1. Unlock the saw – pull the Lock Down Pin on the right side of the saw.
2. Place your board firmly on the base and against the fence.
3. Lower the blade and align the teeth with the board.
4. Press the trigger switch and lower your arm to where you want to make the cut.
5. Release the trigger, but before you raise the blade, make sure it has stopped spinning to prevent any injury.
6. Adjust the angle by pulling the miter latch and turning the table to the desired angle on the miter scale. Release the miter latch to lock the table in place.

On and Off Switch

- To turn the saw ON, press the safety lock on the top of the handle and then pull the trigger switch.
- To turn the tool OFF, release the trigger switch. There is no provision for locking the switch ON, but a hole is provided in the trigger for insertion of a padlock to lock the saw OFF.

Cutting with the Compound Miter Saw

NOTE: Although this saw will cut wood and many non-ferrous materials, we will limit our discussion to the cutting of wood only. The same guidelines apply to the other materials. DO NOT CUT FERROUS (IRON AND STEEL) MATERIALS OR MASONRY WITH THIS SAW. Do not use any abrasive blades.

Crosscuts

A crosscut is made by cutting wood across the grain at any angle. A straight crosscut is made with the miter arm at the 0° position.

1. Set the miter arm at 0 by turning the knob on the front of the saw and pressing the thumb lock set the angle and tighten the miter clamp knob.
2. Hold the wood on the table and firmly against the fence, or use the vise grips on the table.
3. Turn on the saw by squeezing the trigger switch.
4. When the saw comes up to speed (about 1 second) lower the arm smoothly and slowly cut through the wood.
5. Let the blade come to a full stop before raising arm.

Miter crosscuts

Miter crosscuts are made with the miter arm at some angle other than 0°.

1. This angle is often 45° for making corners, but can be set anywhere from 0° to

48° left or right.
2. Set the miter arm at 22.5 by turning the miter clamp knob on the front of the saw and pressing the thumb lock, push the knob so that the mark is on 22.5 and then tighten the miter clamp knob.
3. Make the cut as described above.

Bevel Cuts

A bevel cut is a crosscut made with the saw blade at a bevel to the wood.

1. To set the bevel, loosen the bevel clamp knob on the back of the saw and move the saw to the left as desired. (It may be necessary to move the left side of the fence to allow clearance.)
2. Once the desired bevel angle has been set, tighten the bevel clamp knob firmly.
3. Bevel angles can be set from 3° right to 45° left and can be cut with the miter arm set between 0° and 45° right or left.

Body and Hand Position

- Proper positioning of your body and hands when operating the miter saw will make cutting easier, more accurate and safer.
- Never place hands near cutting area.
- Place hands no closer than 6" from the blade.
- Hold the work piece tightly to the table and the fence when cutting.
- Keep hands in position until the trigger has been released and the blade has completely stopped.
- ALWAYS MAKE DRY RUNS (UNPOWERED) BEFORE FINISH CUTS SO THAT YOU CAN CHECK THE PATH OF THE BLADE. DO NOT CROSS.
- Keep both feet firmly on the floor and maintain proper balance.
- Sight through the guard louvers when following a pencil line.

Clamping the Work Piece

- Turn off the saw.
- ALWAYS clamp the wood to the saw if possible and always clamp if your workpiece puts your hand within 6” of the blade.
- You can clamp to either side of the saw blade and remember to position your clamp against a solid, flat surface of the fence.
- The left fence may be adjusted to aid clamping.
- Support long work pieces using sawhorses or similar devices to keep the ends from dropping.

Additional Resources:

Miter Saw Basics: https://youtu.be/8yRHZ3YOvJc or
https://www.youtube.com/watch?v=yQSeNzaa96c or
https://www.youtube.com/watch?v=015ET8ioHjg

Vertical Band Saw

Craftsman 12” Band Saw – Sander model 113243310

The vertical band saw is the most versatile of the big power saws. It can make either straight or curved cuts, in stock that is much thicker than the 1can handle. The drawback to this versatility is that long straight cuts are not as straight as those possible with the table saw, and that the thicker the stock gets, the less accurate the cut. On the other hand, the table saw cannot cut curves at all. With that in mind, the vertical band saw is best used for curved cuts that cannot be done with a table saw, or for stock that is too thick for the table saw.

The vertical band saw is a simple machine. It consists of a pair of large wheels, with a loop of steel saw blade wrapped between them. As the wheels turn, they spin the blade, which rolls down through a slot in the saw’s table, cutting the stock.

The vertical band saw only has a few adjustment points:

1. **Blade Guard Height** - This is the primary adjustment made for every cut, and is the only adjustment you can make to the saw. There is a knob on the rear of the upper part of the saw, directly above the guard. This loosens it so that it can be raised or lowered. Adjust it so that it sits 1/8” above your stock, and then clamp it tight again. The purpose of this is twofold:
    a. The guard contains guides that keep the saw blade cutting straight. They need to be as close to the stock as possible.
    b. The guard protects your fingers from the saw blade.

2. **Blade guides:** The guard carries a set of guides that keep the saw blade cutting straight ahead, rather than wobbling off to the side in a curved cut. There is a pair of either black plastic blocks, or steel rollers that press in on the sides of the

blade. The black plastic blocks should be just barely clear of the sides of the blade, while the rollers (if the saw is equipped with them) should be touching the blade, and rolling with it. They should **NOT** be caked up with sawdust and sitting still. If they are, turn the saw off, and roll them by hand a few times. If they don't resume rolling with the blade, contact facilities to have them cleaned and adjusted correctly. **Do NOT attempt to free them with the saw running!** There is also a large ball bearing roller that sits sideways behind the blade. This supports it against the pressure of the cut, and prevents the blade from being pushed off the back of the wheels. It should be adjusted so that it sits just barely behind the blade when there is no cut going on. During a cut, the blade will move rearward slightly, into contact with the roller. The roller should spin as the blade moves across it. If it doesn't, contact facilities to have them adjust it correctly. Do not attempt to adjust this yourself.

There is an identical set of guides and rollers upside-down under the steel table of the saw. They perform the same job as the upper guides, and should be adjusted identically. Remember to check them from time to time.

3. **Blade tracking** - The blade needs to be adjusted to ride in the middle of the wheels. If it keeps falling off the wheels, or seems to be rubbing against the sheet-metal covers, the tracking is out of adjustment.

4. **Blade Tension** - Blade tension and tracking are adjusted from the same area, and usually get out of alignment together, although the blade tension very rarely goes out of spec. Insufficient blade tension will also present as the blade falling off the wheels, or very wobbly, inaccurate cuts.

Using the Vertical Band Saw

1. Adjust the blade guard so that it sits no more than 1/8" above the top of your material.
2. Turn the saw on, and let the blade come up to full speed. Begin your cut by placing the wood flat against the table, and then feed it slowly into the blade. Continue cutting until the cut is finished, and the blade clear of the stock. Do **NOT** attempt to back up in a deep (+2") cut, especially a curved one. You will very likely pull the blade off the wheels, with unpredictable (bad) results.
3. To stop a cut in the middle of a board, or to get the blade out of an incomplete cut, stop the motor, and wiggle the blade out backwards with the motor stopped.
4. To end a cut in the middle of a board, or simply to clear scrap, it is possible to make relief cuts. These are cuts straight in from the edge of the board to the cut line. Your real cut will intersect them as you go, allowing the scrap to fall away in sections. It's better to make many relief cuts, rather than trying to fight the blade through a tight turn, or long curved cut.
5. Cut radius. The radius of the curve that the saw will cut is a function of the width of the blade from front to rear. The wider the blade, the larger (wider) the minimum radius it will cut. The trade-off being that it will do better with straight cuts. Narrow blades will turn on a dime, but can't cut a straight line. The 1/2" blades that TechShop normally keeps in the band saw will cut about a 2" radius.

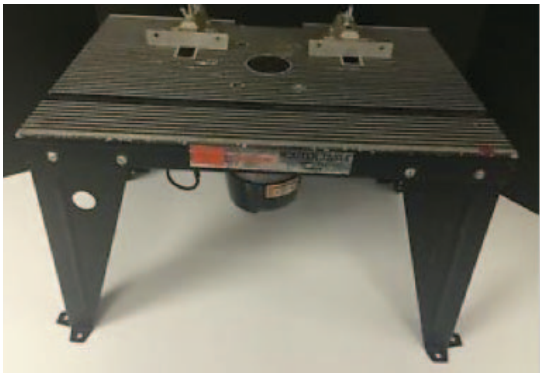
6. Crumbs & scraps: As you cut, there will be small bits of wood that are trimmed away from your stock. These can collect on the table in the area around the blade, or even get stuck in the slot in the throat plate. Do NOT attempt to flick these away with your hands. Stop the blade before removing them. Most band saw injuries are from experienced operators trying to flick these crumbs out of the way without stopping the blade.

Router & Router Tables

Routers are often used to create a decorative profile on a board. There are different styles like a roundover, chamfer or an ogee. Routers can also be used for making signs and other decorative pieces.

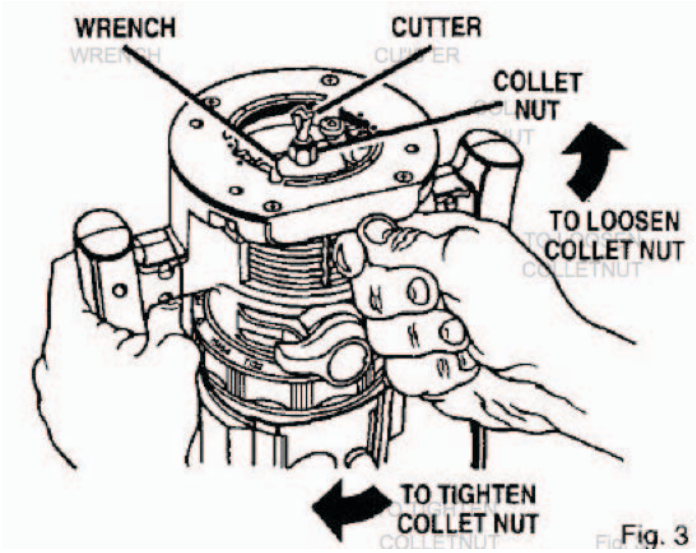
Bit Depth Adjustment Dial

1½ HP Craftsman Router model 315.174321



Craftsman Router Table model 25444

Installing and Removing Router Bits



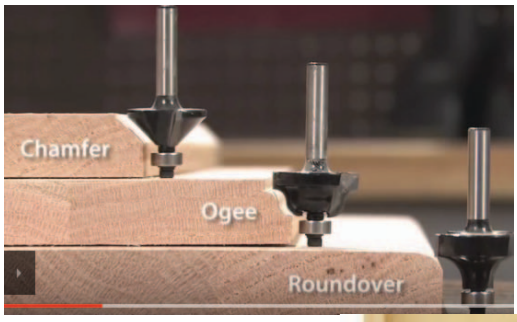
Router removed from Router Table in this image so you can see the Router

1. Unplug the Router.
2. Push and slide the Shaft Lock switch, at the bottom of the router, to the Lock

position. Test the shaft by attempting to turn the collet nut with your fingers – it should not turn.

3. Using the collet wrench, on the hook above the Router Table, turn the collet nut to the right (counterclockwise) to release the collet nut.
4. Lift the router bit out of the collet and insert the new bit.
5. Adjust the depth of the router bit to the bottom edge of your piece of wood. Raise the bit so the straight cutting edge is above the board.
6. Turn the collet nut left (clockwise) with the collet wrench to tighten the collet nut.

Different Router bits and cuts:



In some instances, several router bits can be applied to different edges of your wood to create more detailed cuts.

Examples of different Router projects:

Using the Router on the Router Table

1. Put on safety glasses and ear protection – the Router is VERY NOISY when cutting!
2. Adjust the fences so that the wood moves along the front of the bit.
3. Turn on the router and press the small button on the side of the handle to lock it on.
4. Place the wood against the fence and move the wood to the left until it touches the bit.
5. Slide the wood SLOWLY across the bit until you get to the other end of the workpiece.
6. If you move too fast for the bit, the wood will burn.
7. Using different bits can add a decoration to a piece of wood.

Additonal Resources:

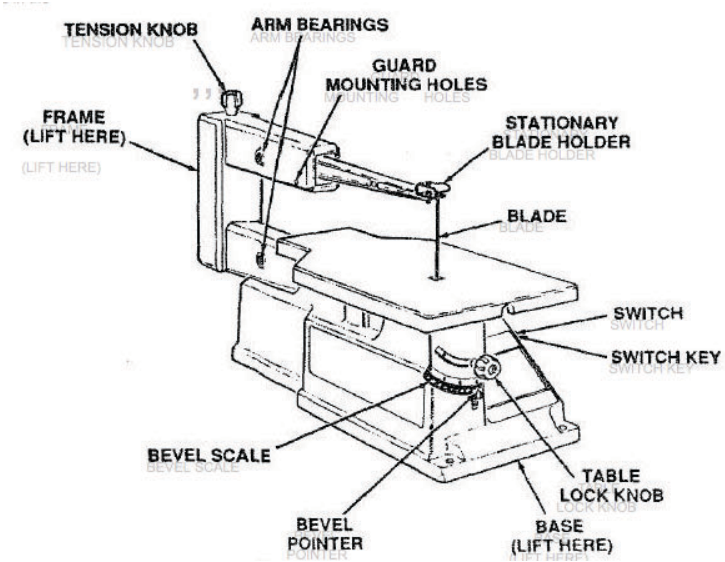
Router Basics: https://www.youtube.com/watch?v=t0zDxXOX8gw
Routers 101, Part 1: https://www.youtube.com/watch?v=W6zpxFpjRnM
Routers 101, Part 2: https://www.youtube.com/watch?v=e34fnSKLzcw

Scroll Saw

Sears Craftsman 16” Direct Drive Scroll Saw, Model #113.235501
Dremel Scroll Saw & Hand Router

A scroll saw is a small machine with a fine blade well suited for working with thin wood. Mechanical scroll saws have been available since the 1860s, and today more than 50 models are available with options including variable-speeds models and different throat capacities. Scroll saws are usually either parallel arm or C-arm, types and are used in the freehand cutting of intricate wood patterns, which is also called fretwork. Scroll saws can be used to create such items as nametags, miniature furniture, clocks, and may other designs.

Scroll Saw blades are considered consumable, so, you should have a set of your own if you plan to do any significant work in the shop.



Clamping the Scroll Saw to a Bench

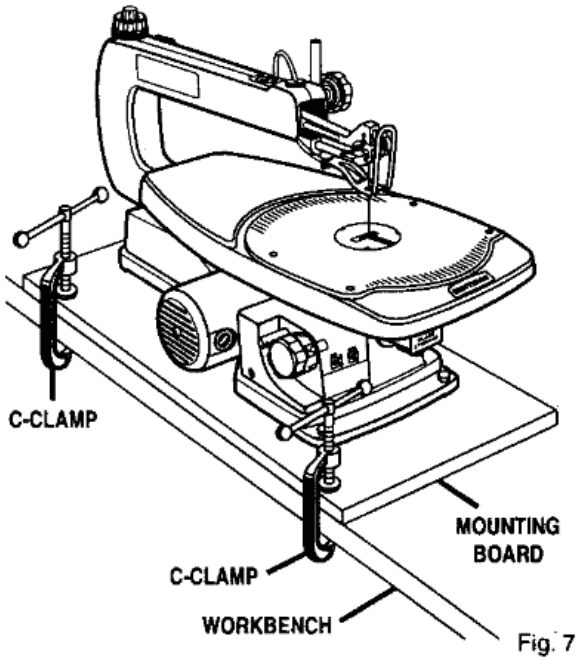


Fig. 7

The Scroll Saw is a fairly portable tool - Use C-clamps or Quick Grip clamps, clamp the saw to a workbench or tabletop.

Installing and Removing Blades on the Scroll Saw

Use 5" pin end type blades ONLY. Scroll Saw Blades are available from many sources, including Amazon.com and Home Depot, to name a few.

1. Turn of the Scroll Saw and unplug it.
2. Losen the tension on the blade by turning the tension knob counterclockwise (left) about 3 full turns.
3. Remove the blade by pulling forward on the blade and lifting the blade through the access hoole in the table.
4. Slight downward pressure against the upper arm may be helpful when removing the blade from the upper holder.

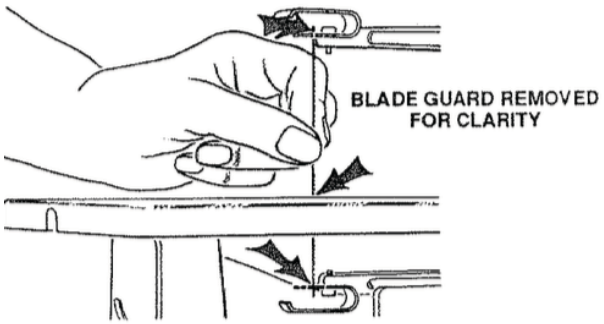
Look closely at the blade holder and notice the blade slots and pin recesses in the blade holder. The blade holder is made so you can position the blade for cutting from the front or one side of the saw.

Cutting from the side of the saw will be necessary when your workpiece exceeds 16" in length. For 0° bevel angle only.

The teeth of the blade should always point down when installed. This will avoid uncontrollable lifting of the workpiece.

5. Install the blade by inserting one end of the blade throught the slot in the blade

guard, then the access hole in the table, until you can hook the blade pin in the pin recess in the bottom of the blade holder.



6. Slide the top blade pin into the pin recess of the top blade holder.
7. You may need to press down lightly on the arm to install the blade.
8. Carefully tighten the blade tension by turning the tension know clockwise (right) just until you feel the slack in the blade is removed, about 3 full turns.
9. Double check to see that the pins are properly located in the slots.
10. Turn the tension knob an additional 2 full turns clockwise.

Over or under tensioning of blades will cause them to break more often. The thicker, harder or more abrasive the wood you are cutting, the more blades you will use.

Adjusting the Blade Tension

1. Turn the Tension Adjusting knob, on the back of the saw arm, to the right (clockwise) to increase the tension.
2. Turn the knob to the left (counterclockwise) to decrease the blade tension.
3. Adjustments of the blade tension can be made at any time.

Using a Scroll Saw

1. Using spray glue, spray the pattern and stick it onto the work piece, or print your pattern on 8.5”x11” label paper.
2. Turn the scroll saw on, and roughly cut around the pattern. Depending upon the type of wood you're using, you may want to use a blade with few teeth for this part.
3. Adjust the speed of the blade if you are using a variable-speed model. For hard wood, use a slower speed. Soft woods, such as maple or popular, can take faster speeds.
4. Aim the scroll saw blade toward the first line to be cut.
5. Use both hands to gently guide the wood into the blade.
6. Use your forefingers of both hands and the thumb of 1 hand to move the work through the blade. Hold down the piece, and push it forward along the cut line.
7. As you push the piece forward, lift 1 finger at a time out of the way. Do not lift 1 hand or both fingers, or the piece may jump and create a jagged cut.

8. Adjust the feed rate into the scroll saw to what feels right to you. Watch the blade, and listen to the saw to determine if you need to slow down.

9. Go back through the cut line and remove the wood from the saw once you reach a turning point.
10. Make gradual turns with the scroll saw by slowing turning the wood as needed.
11. Continue cutting all of the edges, and work your way around the piece until all outside lines have been cut.
12. Use a piece of fine-grit sandpaper to soften any rough edges you created.

Interior Scroll Cutting

One of the features of a scroll saw is that it can be used to make scroll cuts on the interior of a board without cutting throught the edge or perimeter of the board.

1. Turn off the power and unplug the saw.
2. Remove the scroll saw blade.
3. Using a drill, cut a ¼" hol in the board where you wish to make an interior cut (i.e. an eye or the mouth on a pumpkin).
4. Place the board on the saw table with the hole in the board over the access hole in the table.
5. Install the blade through the hole in the board and adjust the tension as needed.
6. When finished making the interior cut, remove the blade and move on to the next interior cut.

Tips

- Test the speed and blades on a scrap piece of wood before you work on your pattern piece.
- To change the thickness of a cut, change your saw blades
- Practice with different scroll saw techniques, speeds, and wood to get the desired effects.

Additional Resources

Scroll Saw 101: https://www.youtube.com/watch?v=hIuF5O7SfCQ
Scroll Saw Blades Part 1: https://www.youtube.com/watch?v=06Kf9h2CXJ0
Ins and Outs of Scroll Saws: https://www.youtube.com/watch?v=OsbqPFOHq_o
Some FREE Scroll Saw Patterns: http://www.scrollsawartist.com/free-scroll-saw-patterns/

Air Compressors

An air compressor is a device that forcefully pushes air through a hose. Because they serve so many functions, they can be useful to have around. You can inflate basketballs, footballs, soccer balls, air mattresses and tires. But you can also attach a blowgun to remove sawdust from your woodworking projects, apply paint or stain with an airbrush, and power a surprising array of tools. Air-powered tools (sometimes called pneumatic tools) include nail guns, palm nailers, staplers, drills, screwdrivers, grinders, cutting tools, sanders, polishers, socket wrenches, impact wrenches and paint sprayers, among many others.
Note: these tools are accessories for an air compressor and we don't have any of them in our shop. We do have a blowgun, tire pump attachment, and several other small accessories with quick release fitting for easy changeout.

26 Gallon Husky Compressor

IMPORTANT SAFETY NOTE:
It is important to always let the air and water (condensation) out of the tank when you are finished using the Compressor. There is a small stopcock on the bottom of the tank, between the wheels that needs to be turned to open and let air out of the tank. When ALL of the air and water is out of the tank, be sure to close the stopcock. This avoids rusting of the inside of the tank, which compromises the strength of the tank walls, and it could explode.

HOT TIPS:

Screw not holding in a wood hole?
Get a few round wooden toothpicks (they're made of hardwood) and some wood glue. Dip the toothpicks into the wood glue and push them into the stripped hole until it's full and tap with a hammer to ensure that they are set all the way into the bottom of the hole. Let the glue dry overnight. Use a hammer and hit the side of the toothpicks that are sticking out of the hole and they will break off at the top of the hole. Tap the top of the hole to flatten any toothpicks that didn't break off smoothly. Reinsert your screw and carefully screw it back in place.

Screw not holding in a metal hole?
Get some braided wire (coated or uncoated) the same diameter as the screw hole that is stripped. Press the wire into the hole, tapping with a hammer to ensure that it's as deep in the hole as possible. Clip the wire off at the top of the hole. Tap the top of the hole to flatten any wires that didn't cut off smoothly. Reinsert your screw and carefully screw it back in place.

Is it square?
When cutting a piece of wood or assembling something like a picture frame, it is often easiest to check if it is perfectly square by measuring the diagonal directions – they should exactly match or it's NOT square.

Cleanup Checklist

- ❒ Wipe off and put all tools back where they belong
- ❒ Check the Compressor to be sure the tank is empty
- ❒ Sweep up or vacuum any debris on the floor or workbenches
- ❒ Dispose of any left over pieces and trash
- ❒ Sign out (sheet is on the inside of the door)
- ❒ Check that the rolldown door is locked down
- ❒ Turn out the lights
- ❒ Close and lock the door

Shop Etiquette

- If it's not yours, please don't mess with it! If you need to use the bench space that someone else has their project on, carefully move their project and put it back when you are done using the space.
- Wood inside the shed is NOT for general use, it belongs to someone else
- If you don't know how to use it, DON'TPLEASE ASK someone!
- If you broke it, please report it on the forms on the shop bench, near the door – stuff happens, accidents or mistakes – don't let someone else find the broken equipment, they could get hurt using it
- Use the correct tool for the job
- Monkey tight, not Gorilla tight

Blades:

Jig Saw Blades

Band Saw Blades

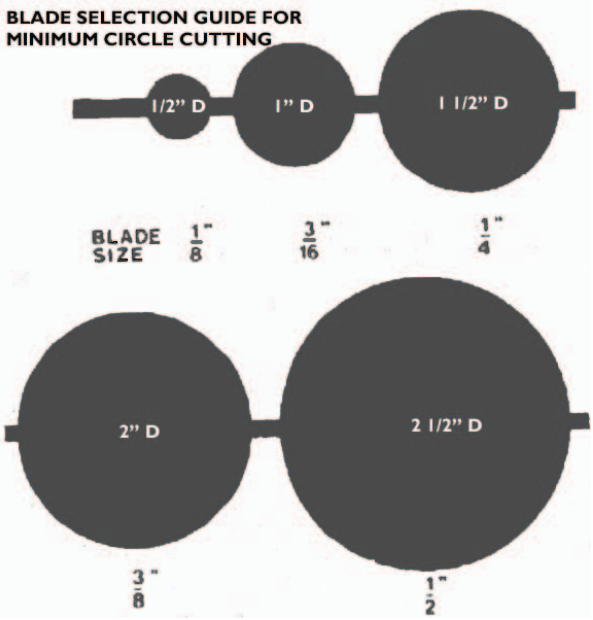


Table Saw Blades

Job	Blade Choices	Comments
Ripping solid wood	24-tooth FTG	This "rip" blade cuts fast but coarse. It's good for initial rough-sizing of pieces.
	40-tooth ATB or 50-tooth ATBR combination blade	Cuts slower but cleaner. Premium-quality blades require little or no cleanup.
Crosscutting solid wood and general plywood sawing	40-tooth to 80-tooth ATB or 50-tooth ATBR combination blade	Blades with more teeth generally cut cleaner, but a top-quality 40-tooth blade may cut better than a mediocre 80-tooth blade.
Joinery	40-tooth ATB or 50-tooth ATBR combination blade	A premium-quality blade will create glue-ready joints cutting across or with the grain.
Sawing MDF, melamine, and particleboard	40-tooth to 80-tooth ATB or TCG	ATB blades tend to cut cleaner but dull faster than TCG blades.
Sawing plastic laminate, nonferrous metal, and plastics	80-tooth TCG	ATB blades can be used instead but may blunt quickly in these dense materials.

FTG, flat-top grind; ATB, alternate-top bevel; ATBR, alternate-top bevel with raker; TCG, triple-chip grind.

LOCAL RESOURCES

Places near DBR to get materials and supplies:

- Home Depot, 1145 W Washington St, Sequim, WA, 98382
  (360) 582-1620
- Thomas Building Center, 301 W Washington St, Sequim, WA 98382
  (360) 683-3393
- Clallam CO-OP, 216 E Washington St, Sequim, WA 98382
  (360) 683-4111
- Harbor Freight, 1940 E 1st Street, Suite 168, Port Angeles, WA 98362
  (360) 457-2042
- Swain's General Store, 602 E 1st St, Port Angeles, WA 98362
  (360) 452-2357
- Thurman Supply, 1807 E Front St, Port Angeles, WA 98362
  (360) 457-8591
- JoAnn's Fabrics & Crafts Store, 150 Port Angeles Plaza, Port Angeles, WA 98362 (360) 452-9498
- Henery DO It Best Hardware, 218 W Sims Way, Port Townsend, WA 98368
  (360) 390-5603
- Arrow Lumber & Hardware, 8457 State Route 20, Port Townsend, WA 98368
  (360) 385-9474

There are also many of these stores in Silverdale, including Lowe's, Home Depot, JoAnn Fabrics & Craft Store, and Michael's Craft Store, to name a few.

COOL LINKS

http://www.harborfreight.com/ A good place in Port Angeles to get inexpensive tools

http://woodworkerszone.com/wiki/index.php?title=Harbor_Freight_Gems: Good tools at Harbor Freight

http://www.toolcrib.com/blog/2008/08/buyer-beware-a-harbor-freight-buying-guide-the-good-enough-the-bad-and-the-abysmal: Good, Bad, and Abysmal tools from Harbor Freight

http://www.homedepot.com/b/Tools-Hardware/N-5yc1vZc1xy Tools from Home Depot

http://www.youtube.com Use the Search Tool in YouTube to find out how to use a specific tool and how to build almost anything!

http://www.Google.com Search for documents on the tool or project you are working on