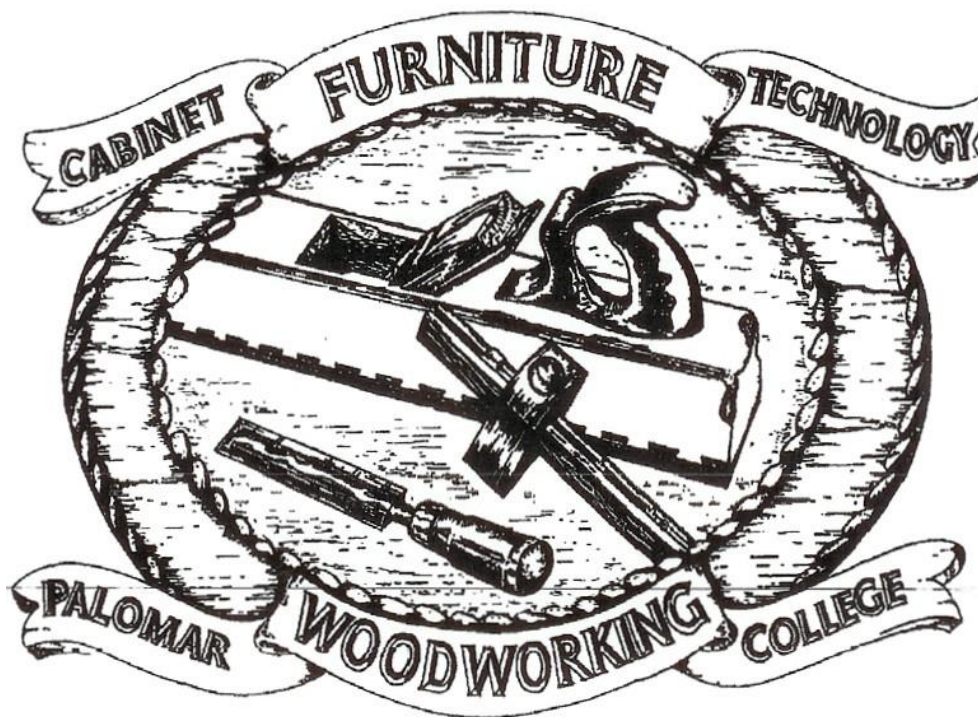


PALOMAR COLLEGE
CABINET & FURNITURE
TECHNOLOGY
SAFETY MANUAL



PALOMAR COLLEGE
CABINET AND FURNITURE TECHNOLOGY
SAFETY INSTRUCTION MANUAL

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
General -----	01
Common Safety Devices -----	05
Power Miter Box (Chop Saw) -----	06
Belt Sander -----	06
Table Saw -----	08
Jointer -----	11
Planer -----	14
Radial Arm Saw -----	17
Disc Sander -----	19
Oscillating Spindle Sander -----	19
Drill Press -----	21
Band Saw -----	23
Router -----	25
Shaper -----	27
Wood Lathe -----	30
Spindle Turning -----	31
Faceplate Turning -----	31
Edge Belt Sander -----	33
Boring Machine -----	33
Mortiser -----	33
Wide Belt Sander -----	34

PALOMAR COLLEGE

CABINET AND FURNITURE TECHNOLOGY

SAFETY INSTRUCTION MANUAL

GENERAL INTRODUCTION

Hand tools and power driven machine tools have been developed to save time and to do more accurate work. A hand tool or power tool is built to perform a specific operation. Tools will do the same operation thousands of times without a mistake if they are properly used, cared for, and understood. In nearly all cases the person using the tools makes the first mistake. Whether the tools are helpful or harmful depends upon you. In woodworking, the tools and machines that are involved in most accidents are listed below (the most dangerous first in each area). The illustrations of machines in this manual are for your reference only. Our program does not necessarily have the exact brand of manufacture of machine shown in many cases. The illustrations are therefore included as generic reference material for all machine types. They are intended to help you visualize the knobs, fences, blades, knives, etc. referenced in the instructional text.

HAND TOOLS	POWER DRIVEN TOOLS	
<i>chisel</i>	shaper	grinder
<i>saws</i>	table saw	sander
<i>knives</i>	jointer	band saw
<i>planes</i>	radial arm saw	jig saw
<i>hammers</i>	wood arm saw	drill press
	power miter box	planer

GENERAL CAUSES OF ACCIDENTS

1. Ignorance
2. Carelessness
3. Lack of judgment
4. Rushing a job
5. Making too heavy a cut
6. Overconfidence
7. Talking while working
8. Inadequately guarded machinery
9. Using a dull tool
10. Using an improperly set or adjusted tool
11. Fatigue
12. Using unlabeled material
13. Absent-mindedness
14. Working in a disorderly shop
15. Improper position of feet and body while working at a machine
16. Improper clothing
17. Using unsafe material
18. Eye strain

SPECIFIC CAUSES OF ACCIDENTS

1. Startling a person while he or she is working at a machine.
2. Crowding or hurrying a person at a machine.
3. Failing to stop machinery for adjustments.
4. A guard not being replaced after it has been removed.
5. Fingers dropping into moving parts or cutters.

6. Failing to stop machinery for measurements.
7. Students not starting and stopping their own machine.
8. Operating machinery without receiving instructions on its use.
9. Operating machinery while the instructor is out of the room.
10. Showing off while operating machinery.

GENERAL SAFETY RULES IN WOODWORKING

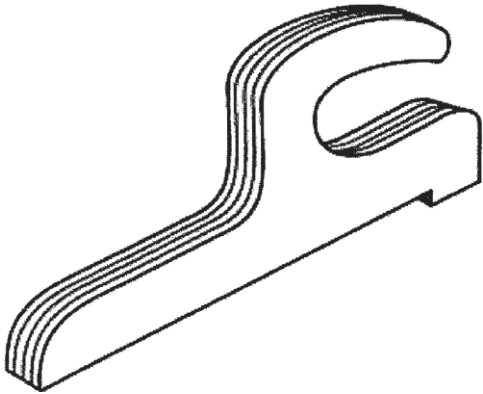
1. You are not compelled to use any power-driven machinery. You may be excused from using any machine by consulting your instructor.
2. Safety glasses or a face shield must be worn while using any power-driven tool.
3. All work to be done in the shop must have the instructor's approval.
4. The instructor must check all special set-ups before the power is turned on.
5. All accidents and injuries, no matter how slight, must be reported to the instructor immediately.
6. If you feel ill, report to your instructor.
7. Only the operator and the teacher (if helping student) are permitted within the working area around any machine. This is for the protection of the operator, the instructor, as well as others nearby the machine.
8. Only the operator may start and stop a machine and, after the machine is turned off, he/she should stand by until it has stopped running.
9. If you are engaged in any activity where eye hazards from flying particles or corrosive substances exist, use suitable eye protection.
10. Wear safe clothing when working in a shop. Fasten or remove loose clothing before you operate any machine. Roll long sleeves above the elbows. Apron fastenings should be such that they will break if the apron becomes entangled in a machine.
11. Long, loose hair can easily be caught in revolving machinery and be ripped out, causing serious scalp lacerations. Have your hair under control by keeping it tied back or tightly covered.
12. Wearing gloves is forbidden when you are working with power-driven machinery.
13. Remove jewelry (bracelets, rings chains, beads) and other accessories that, in the judgment of the instructor, are hazardous.
14. In any level of the woodworking program, you are under no obligation to use power tools or machinery. Hand tool operations can be substituted for any and/or all machine operations.
15. Keep machines guards in proper position at all times.
16. Report all breakage or damage to tools, instruments or machinery to the instructor immediately.

17. Overloading or forcing in any manner any hand-operated or power-driven machine is dangerous. Use only the material or stock furnished or approved by your instructor.
18. Keep rags away from machines that are in operation.
19. Rags that have absorbed any amount of oil, linseed oil, gasoline, alcohol, shellac, paint, varnish or lacquer must be put in an approved covered metal container as a precaution against spontaneous combustion.
20. Nothing should be hung on fire extinguishers, and the area around them should be kept clear so that they may be reached without delay if fire breaks out.
21. If a machine makes an unusual sound or is found to be out of adjustment, or in need of repair, it should be reported to your instructor immediately. Only machines in good repair may be operated.
22. You must avoid distracting the attention of student using machines. Likewise, you must not allow your attention to be diverted while you are using a machine. Such distractions can cause the operator to make serious mistakes.
23. Machines must come to a dead stop and be unplugged before oiling, cleaning, or adjusting.
24. If you see oil or grease on the floor, wipe it up immediately. By doing so, you may prevent someone from slipping and/or falling down.
25. The floor, aisles and passageways should be kept clear of large pieces of wood, products, tools, and materials. Objects on the floor may cause someone to slip or fall into an operating machine.
26. Remove all protruding nails, screws, staples, and the like from boards.
27. Always sweep scraps from your workbench or table with a brush or piece of wood, rather than with your hands. There may be sharp or jagged particles, even glass shards among the scraps.
28. Always carry long objects such as metal rods and long boards, in a vertical fashion to avoid striking anyone.
29. Report any odor of gas fumes in the room to your instructor. Gas fumes may make you ill or cause an explosion.
30. All portable electric tools and appliances must be disconnected when not in use, when making adjustment, inserting cutters, bits, blades, etc.
31. When disconnecting an electric tool from a circuit, remove the attachment plug from the receptacle by pulling on the plug instead of the wire.
32. Be sure your hands are dry before touching electrical switches plugs or receptacles. If your hands are wet, you may receive a severe shock and serious burns.

33. If it is necessary to use an extension cord, see that it lies flat on the floor. Cords should never be stretched across in such a way as to cause someone to trip.
34. When using air under pressure, be sure that the air stream is not directed toward you or any other person. Compressed air should be used for cleaning the shop and the equipment therein only.
35. Use the proper tool for the job.
36. It is good safety practice to be courteous and considerate of others.
37. If you have prescription eyeglasses, wear them. Eyestrain is a frequent cause of accidents.
38. The instructor should be notified if a violation of safety instructions is observed. You may thus save yourself or others from a serious injury.
39. If you are in doubt about the use of any tool or machine, or about any shop procedure ask your instructor for help.
40. Dull tools are dangerous to work with because you must apply extra force to make them cut. Always use sharp (power or hand) tools.
41. The term “margin of safety” refers to the **minimum** distance that the operator’s hands and fingers should be from the cutter, blade, bit, etc.
42. When entering another shop, report to the instructor of that shop immediately.
43. CO₂ extinguishers should be used on gasoline, most chemical and electrical fires. Do not use water on these types of fires.
44. Sharp edges or points of tools should be directed away from the body.
45. Only portable circular saws equipped with riving knives and for use on tracks are allowed.
46. Students must be instructed in the correct and safe use of any machine before any work can be done with or on that machine.
47. Do not attempt to lift anything in the shop that is too heavy for you. Seek help. We will either use more personnel, or preferably, employ mechanical help such as a lever, dolly, jack, forklift, etc. Incorrect lifting is a common cause of injury. When lifting, lift with your legs and do not have your back straight. Rather, you should crouch down, with your chin “out” and your “rear end” out. This keeps your spine correctly aligned. Again, only lift as a last resort.
48. To enroll for advanced woodworking courses, you must have the ability to safely operate all power machinery. Whether or not you use power driven machinery is your decision—you may substitute hand operations for power driven operations. However, you must have the **ability** to safely operate the power equipment.

- 49. When doing chisel work of any type, the work must be clamped down with clamps, held in a vice or secured with other devices. Never hold work with one hand and cut with the other.
- 50. When using a chisel, keep both hands on the chisel, or use a mallet with the chisel (never a metal hammer). Never allow your free hand to be in front of the chisel blade.

COMMON SAFETY DEVICES:



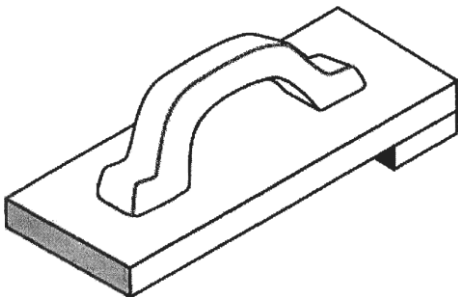
PUSH STICK:

Commonly used on either the edge or face of stock to push stock safely on the table saw, jointer or other machines. Usually made of Plywood.

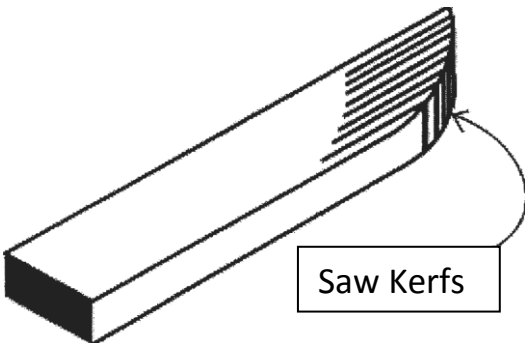


PUSH BLOCK:

Commonly used on the face of stock to hold the stock down to the table or against a fence when surfacing on the jointer. If the push block has an angled handle, use it with the handle angled away from the fence. Usually has a resilient layer on the bottom for good grip.



A push block may also have a heel to aid in pushing stock forward while holding it down.



FEATHER BOARD:

Used to apply pressure to stock to keep it firmly against a table or fence as the stock is pushed forward on the table saw, router table or other machines. Various clamps are used as required for proper positioning.

NOTE: The term “margin of safety” as used on all machinery/tool instructions refers to the **minimum** safe distance the operator’s hands should be from the blade, cutter, knives, etc.

POWER MITER BOX (Often called a “chop saw”)

GENERAL INFORMATION

The power miter box is one of the most accurate, specialty machines found within the woodworking facility. It has taken the place of most of the operations previously done by a hand miter box or picture frame miter box. It is extremely useful for making 90° and 45° cuts on drawer, door and face frames. The power miter box is not intended to be used to cut rough lumber.

1. Keep protective guards in place at all times.
2. Remove all wrenches, tools and other foreign matter from the machine before operating the saw.
3. Do not force the tool into the work. Make sure the blade is properly set and sharpened at all times. If you are in doubt, check with the instructor.
4. Wear safety glasses at all times.
5. Secure work with clamps as necessary.
6. Do not leave the area of the machine until the blade has come to a full and complete stop.
7. Maintain a 4” margin of safety at all times.
8. When adjusting the power miter box or changing the blade, make sure the power cord is unplugged.
9. Remove loose clothing, coats, loose jewelry, ties, etc.
10. Remove loose pieces, chips, etc. only with a piece of scrap wood.
11. The blade should come to a complete stop before lifting it out of the work piece..

BELT SANDER SAFETY

GENERAL INFORMATION ~ PORTABLE ELECTRIC BELT SANDER

The belt sander features a continuous abrasive belt that works over pulleys at either end of a main sanding table. Adjustments are provided for tensioning and tracking the belt. The size of the sander is commonly designated the same as the width of the sanding belt which it uses.

1. Excessive pressure against the belt should be avoided. The designed weight of the machine should be the only pressure necessary.
2. Be sure the belt is properly tensioned and tracking true.

3. All adjustments other than tracking are made when the sander is at a dead stop and unplugged.
4. Small stock (2" x 6" or less) should not be sanded on the belt sander.
5. Be sure the work is held firmly against the dog or stop on the table.
6. Use the belt sander in a consistent pattern, always moving away from the power cord.
7. Belts should be installed with the arrow in the direction of motor rotation.
8. The belt sander should be used at top (full) speed at all times.
9. When carrying the machine to and from the work area, always use both hands. Since certain parts of the belt sander can come off easily when initially picked up, particularly the dust bag and dust chute, it is best to move the belt sander with two hands.
10. Wear safety glasses when belt sanding.
11. Work to be belt sanded should always be held securely with a clamp, vise, etc.
12. When first plugging in the machine, make sure the switch is off. Either lay the machine on its side or securely hold the machine off of the work surface.
13. Always use two hands when operating the machine.
14. Tracking adjustment is made only when the machine is running.

TABLE SAW SAFETY

GENERAL INFORMATION

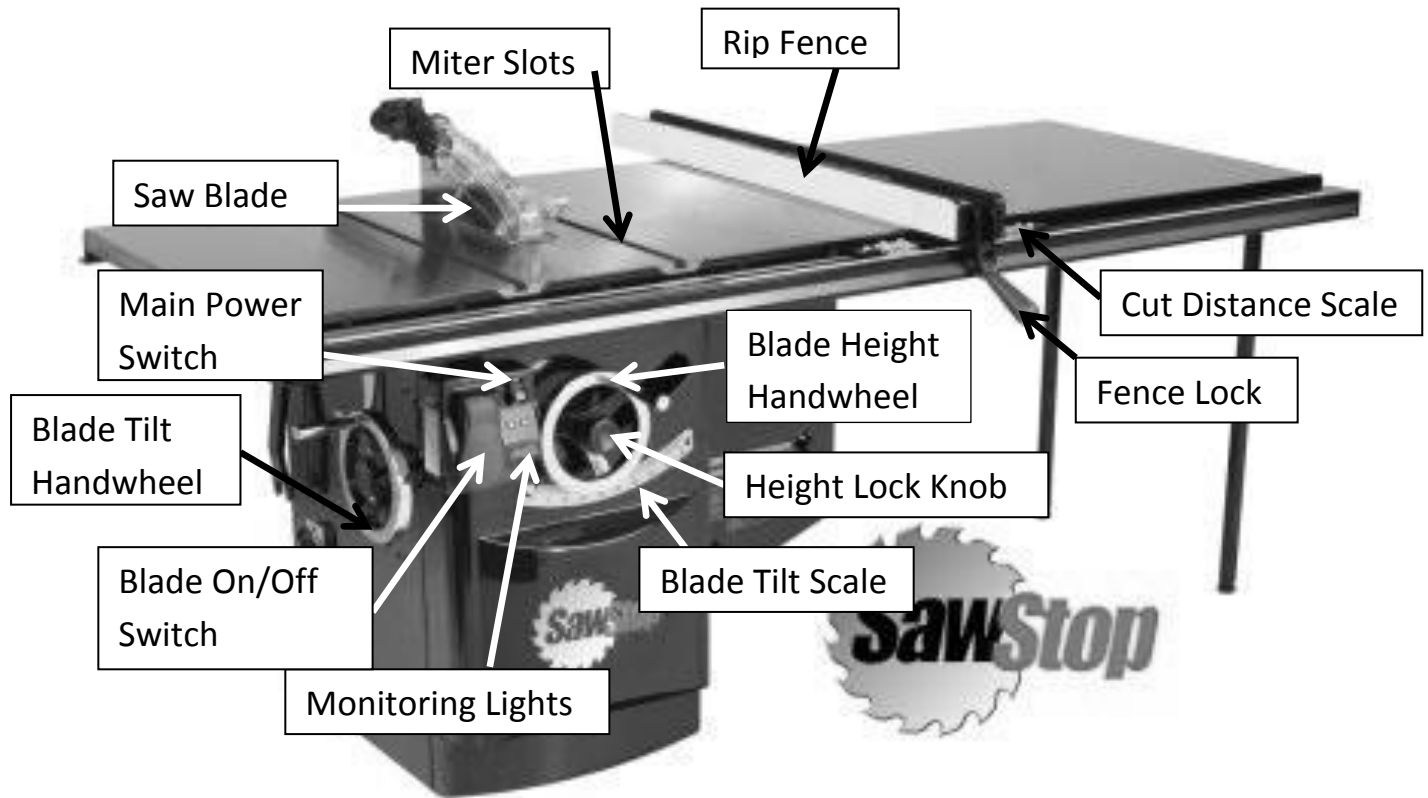
The table saw has the potential to be one of the most dangerous machines when used improperly. The table saw should not be operated by a careless person or one who has not made a study of its capabilities and limitations. Specific instructions should be obtained from the instructor before special work is done or special set-ups made.

1. Do not use a blade that is not properly sharpened or set. Lack of set will cause pieces to be thrown back or overheat the saw, causing the saw to warp or become slightly convex on one side.
2. On-edge resawing requires special permission from the instructor.
3. You must never lower pieces of stock directly down over the saw blade. This operation is dangerous and may result in kick back.
4. A splitter must be in place for rip cuts and should be left in place whenever possible.
5. When cutting, the saw blade should project $\frac{1}{4}$ ", or enough to clear the minor gullets, above the stock you are cutting.
6. All adjustments are to be made only while the saw is at a complete stop.
7. After completing a cut, lift your free hand up from the table. Bring your hand around the backside of the fence. Do not drag your hand across the table.
8. You must use a push stick when ripping (cutting with the grain) narrow pieces that are 6" or less in width.
9. Freehand cutting, ripping or crosscutting, without using the fence or miter gauge is **absolutely forbidden**. This rule applies also to dado head work.
10. Normally, when you are ripping wood, the scrap wood must be to the outside of the blade to reduce the possibility of a kickback.
11. When you are using the table saw, you must stand to the left or right of the saw blade, never directly behind it. Your pushing motion should be in a diagonal fashion against the fence.
12. Your fingers must be kept clear of the track of the saw, and your hands should never cross the saw line while the machine is in operation. Arch your fingers when you are feeding instead of laying your hands flat.
13. Reaching over the saw blade or passing wood over the saw blade while the saw is in motion is extremely dangerous and therefore forbidden.
14. When you are crosscutting a number of pieces to the same length a clearance block (at least $\frac{3}{4}$ " thick) should be fastened to the rip fence at least 6" in front of the saw blade.

15. When helping to “tail-off”, the helper must remember their only purpose is to support the stock. The operator pushes the stock through the machine. The person “tailing-off” should not attempt to control or take control of the operation whatsoever.
16. If it is necessary to clear the table of scraps of lumber, make sure the blade is stopped or completely lowered. Use a brush, push stick, or scrap of stock to clear scrap. Do not use your hands.
17. The instructor must inspect all special set-ups and dado heads before the power is turned on.
18. Cylindrical stock should be cut on the table saw with a V-block.
19. Backing the wood away from the blade while the saw is running will throw the wood toward you. If it is necessary to remove the wood, always stop the saw first and wait until the saw blade comes to a complete stop.
20. Work should always be held firmly against the fence or miter gauge.
21. The fence is used for ripping **only**.
22. The miter gauge is used for crosscutting **only**.
23. The fence and miter gauge are never used both at the same time for through cuts, except when multiple cuts of the same size are made, and this is accomplished by means of a clearance block and must be approved by the instructor.
24. Large panels, pieces of plywood, etc., should be cut with the special cross-cutting jig.
25. Never use the fence as a cut-off gauge when crosscutting.
26. Maintain a minimum 4” margin of safety.
27. Stock should always have a jointed or surfaced face and/or edge against the table, miter gauge, or fence. Similarly stated, a rough, warped or uneven surface should NEVER be placed against the table, fence, jig or miter gauge. Doing so will cause a kickback.
28. Stock should be free of knots, splits, defects, or warp. Tight knots are OK but care must be taken when cutting through knots.
29. Obtain permission of instructor for all set-ups using the dado head.
30. Push stock completely through and clear of blade when ripping or a kickback will result. Stock must completely clear the back of the blade by at least 4 inches.
31. When ripping on the table saw, it is imperative that the longest dimension of the board is held tight against the fence.
32. When ripping with the table saw, exert pressure (either with a push stick or your hand, dependent on the size of the stock). Pressure should be down “into the table” while simultaneously exerting pressure against the fence while pushing the stock forward.
33. When using a SawStop saw, you should first test the sensing circuitry by touching your stock to the blade with the blade on/off switch in the off position. Only proceed if the monitoring light is green.

SAWSTOP TABLE SAW

The SawStop table saw has a built-in sensor that automatically stops and drops the saw blade when contact with skin is detected to prevent injury. When the main power switch is turned on, the sensing circuitry self-calibrates and will indicate it is safe to operate by displaying a “green” monitoring light.



JOINTER SAFETY

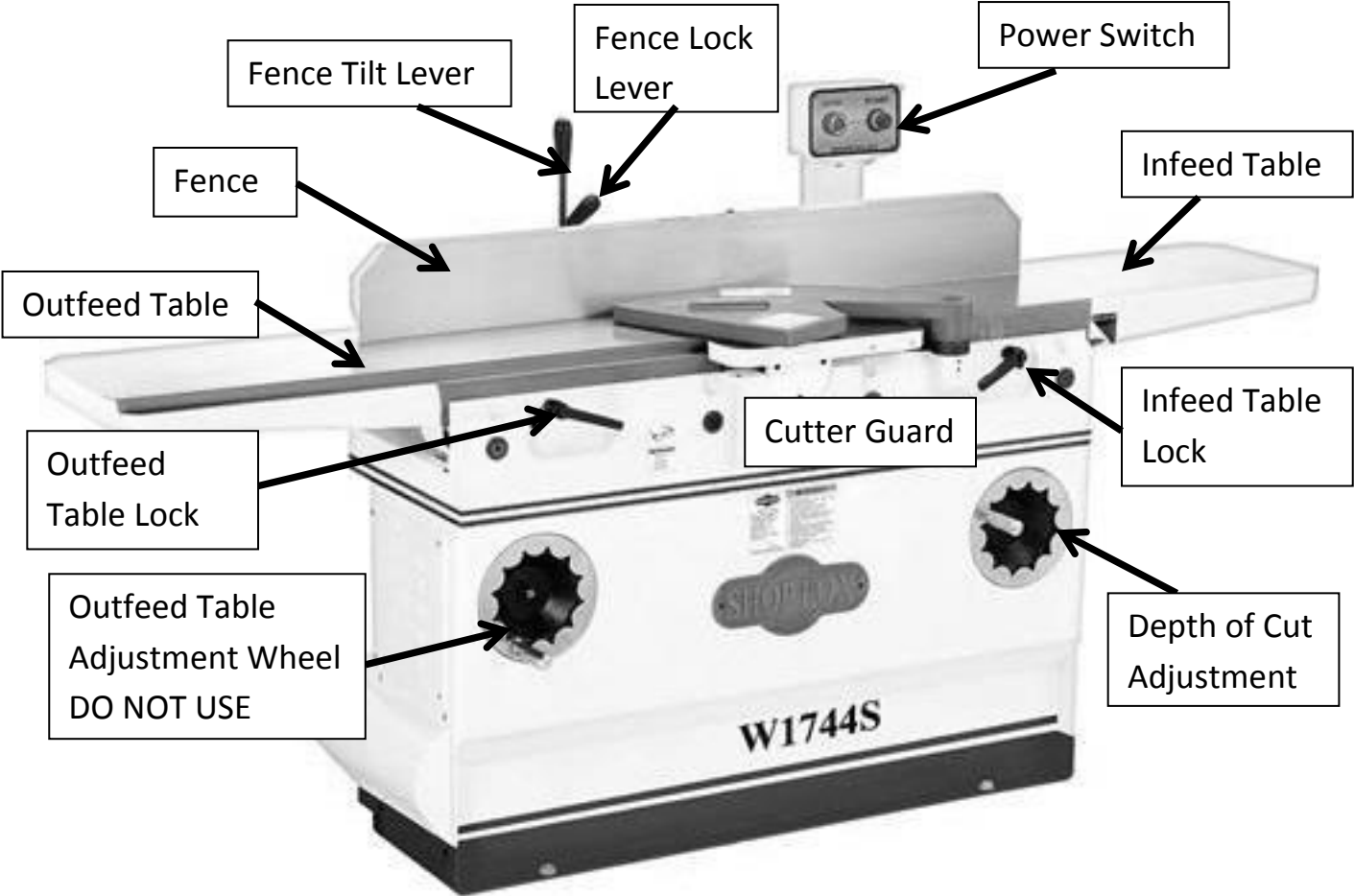
GENERAL INFORMATION

The jointer is, next to the table saw, the most necessary and useful machine in woodworking. Jointers take the place of the hand plane, are used in production work, and are useful in straightening the faces of boards, jointing edges of boards to be glued, rabbeting, squaring, beveling, and tapering. The most common use of the jointer is jointing face and edge grain. Kickbacks are rare but can occur on the jointer.

1. The guard must be kept over the knives at all times while the jointer is being operated.
2. The depth of the cut must be adjusted and locked before power is turned. Depth of cut is adjusted on the in-feed table only, and should be limited to 1/32 inch.
3. Any jointer must not be used to joint any stock less than 12" long.
4. Both a push stick and a push block must be used when jointing. **At no time may hands be placed directly on the board when face jointing.**
5. The jointer must not be used to edge stock less than 1" wide.
6. Never joint the face of stock less than 1/4" thick on a jointer.
7. The instructor must check set-ups on the jointer for special operations such as rabbeting, beveling, chamfering, tapering, etc.
8. The rear out-feed table must be at the same level as the knives.
9. The rear table (out-feed) of the jointer is never to be adjusted except by the instructor, and this is usually only done after the knives have been resharpened.
10. Since end grain jointing is dangerous, especially on narrow pieces, and because the jointer tends to splinter the work at the end of the cut, do not joint end grain.
11. For most cuts, the jointer should be set for 1/32" cuts.
12. Examine stock for knots and splits and avoid these if possible, before taking a cut.
13. Operations involving "stop cuts" or "drop cuts" require that the stock is held in place by a stop or clamp, and the instructor must approve these operations.
14. The exposed knives on the backside of the fence should be covered at all times with a guard.
15. Always turn the concave side of stock toward the table and cut with the grain, not against it.
16. Never attempt to run a piece of wood across the jointer until the machine is running at full speed.
17. Maintain at least a 4" margin of safety.
18. The jointer is used only for new clean lumber, not recycled or previously finished lumber. A wire brush should be used to clean all surfaces.

19. For facing cuts, the depth of cut must be light, and use a push block.
20. Any adjustment to the out-feed table will severely affect not only the depth of cut, but the safety of the operator as well. Do not adjust the out-feed table.
21. On stock that is severely warped, the best procedure is to band saw the stock into smaller pieces, if possible. This automatically eliminates much of the warpage. Then joint the faces—concave side down.
22. In facing stock, place both hands on stock, well clear of the knives, protected by the push block.
23. Make sure that all stock is pushed clear of the knives, and the guard has returned over the throat before picking up stock.
24. When beginning to face stock, your hands should be on the stock that would be located on the in-feed table, far in front of the cutter head. On long stock use a push block in your left hand and a push block with a heel in your right hand to move the wood past the cutter head.
25. When jointing the edge of stock, a push block should be used to hold a jointed face against the fence. If the stock is wider than the height of the fence, it is OK to push the stock with your hand. If the stock is narrower than the height of the fence, use a push stick to move the stock forward.
26. The jointer is not used for planing stock to even thickness, nor is it used to make stock parallel in width.

SHOPFOX 12" JOINTER



PLANER SAFETY

GENERAL INFORMATION

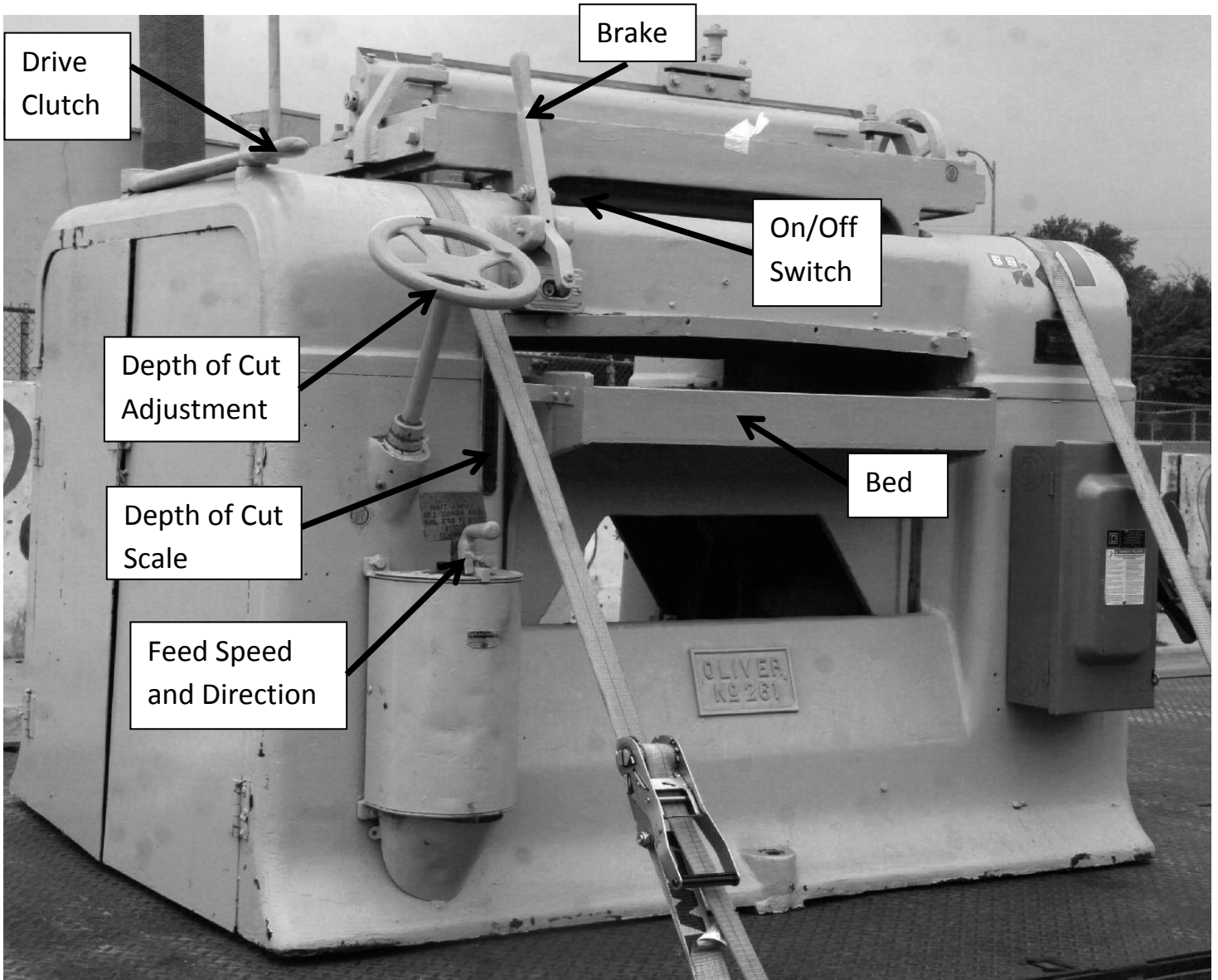
The planer is a machine which planes boards smooth and to an even thickness. Single planers have the cutting head above the table. When thicknessing boards, always place the flattest surface on the table for the first cut.

1. Do not remove more than 1/16" of wood at one time, in any single pass through the planer. Simply stated, the actual hardness of the wood and the width of the stock to be planed will largely determine the amount to be removed. However, never remove more than 1/16" under any circumstance.
2. Planers should not be adjusted to plane stock less than ¼" thick. Thinner stock than this should be run through the planer on thicker boards. For this operation, the instructor's permission must be obtained.
3. Stock less than 18" long cannot be run through the large planer. The distance from centerline to centerline of the lower feed and delivery rolls determines the minimum length of stock that can be surfaced.
4. When operating the planer, students must not allow their hands to come near the feed rollers.
5. Students must not attempt to move or shift boards after the boards have been gripped by the feed rollers. This is dangerous, as the fingers are likely to be pinched between boards and the bed of the planer. Release your hold on the stock and it will feed automatically into the machine.
6. Never change depth of cut (by use of the hand wheel) after stock has been started through the planer. To do so will spring the planer head.
7. Make sure the stock has no large crack(s), loose knots, nails, dirt or paint on any of its surfaces.
8. The wood should always be planed with the grain.
9. Old, used, or painted lumber may not be planed.
10. Always start the cutter head and make certain that the motor has reached maximum speed before entering the wood.
11. Plane pieces of varying thickness in progressive order, the thickest or the largest first.
12. Looking into the planer bed while the machine is in motion is forbidden because of the possibility of flying particles. Stand in an upright position and to one side while you are operating the machine.
13. For most hardwoods, the depth of cut should be limited to 1/32", which is one full turn of the wheel on the Oliver planers. On denser hardwoods one-half turn (1/64") would be preferable. Do not reduce thickness less than ½ turn to prevent drive roller marks on the wood surface.
14. There is no maximum length of stock that can be planed.

15. A planer will only produce two parallel faces when the surface that was put on the table (or “down” side) was flat to begin with. It will not produce two flat surfaces if the bottom face that was put on the table was warped.
16. If material does not want to feed into the machine, check the following:
 - A. A gentle push on the stock may be needed. Do not overly force material.
 - B. Sometimes it is necessary to shift the stock at a slight angle.
 - C. If none of these procedures work, lower the table to the point where knives are no longer cutting and then shut off machine. Ask instructor for assistance. Do not shut power off when cutter head is still in contact with wood!
17. Kickbacks are infrequent, but possible on a surface planer.
18. Stand out of the line of the stock as it enters the surface planer.
19. On a planer, it is impossible to plane “across” the grain. The machine will shred the wood.
20. Remove chips and sawdust only with the power shut off and the rollers at a complete stop.
21. Each turn of the depth adjustment wheel on the two Oliver planers results in a cut of 1/32” (.032).
22. Due to the manner in which our planers are constructed, the speed of the infeed rollers (“rate of feed”) can be adjusted with the machine running, as well as after it has been started.
23. The drive clutch can be used to raise or lower the table bed rapidly. The drive direction can be changed with the machine running.

Planer/Thicknesser

Oliver 30" Planer



RADIAL ARM SAW SAFETY

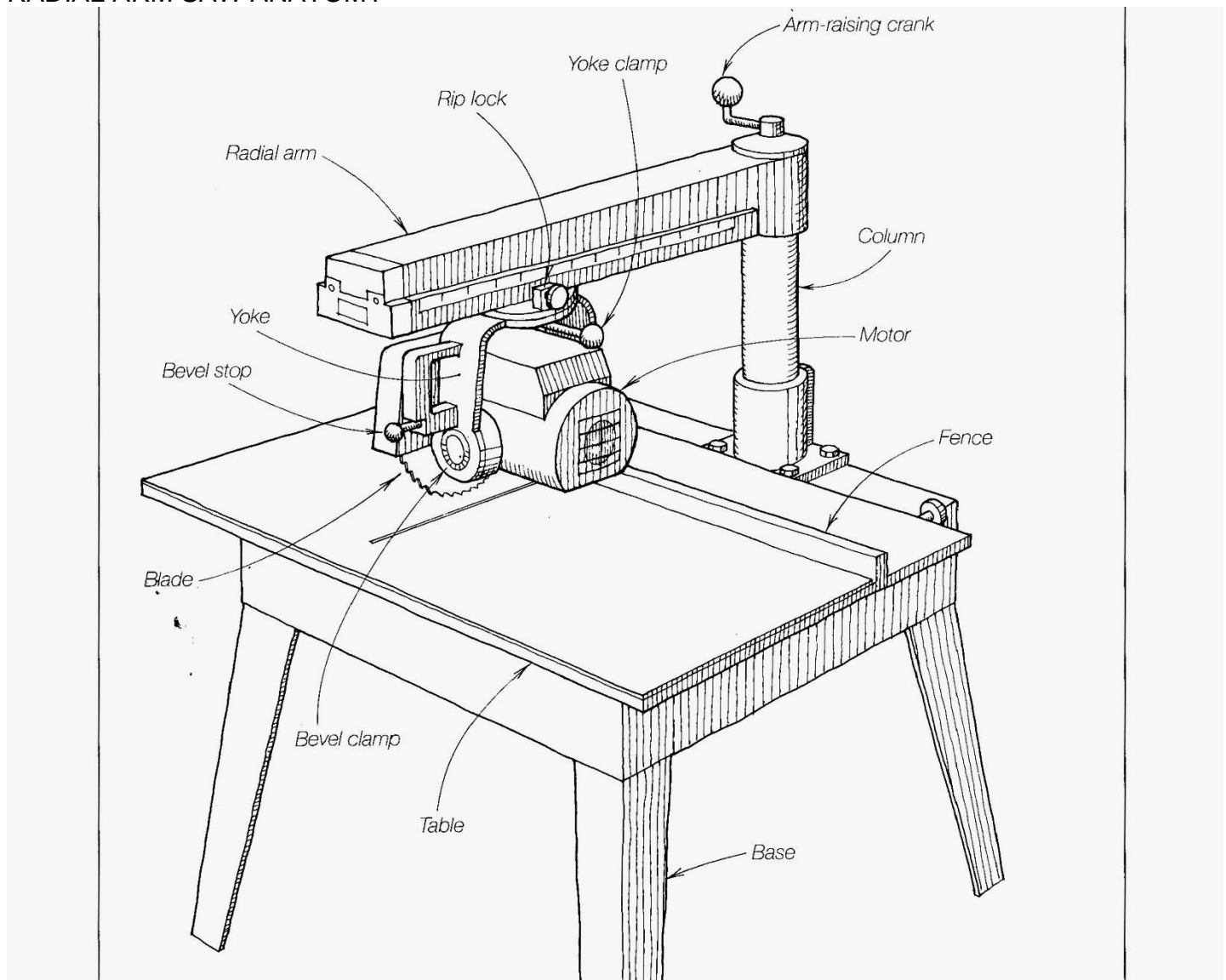
GENERAL INFORMATION

The radial arm (or cut-off saw) is one of the machine tools found less frequently in woodworking shops. In proportion to its use it will be found to outrank the circular saw in hazards. The chief claim to glory of saw over the table saw is in handling long boards. The saw moves and the stock remains in one position. This prevents the use of an outer support or an assistant who might throw the kerf out of line. The motor is 2 H.P. or greater, direct drive which turns a 14" or greater diameter blade approximately 6,000 R.P.M. The main use of the radial arm saw at Palomar College is for crosscutting rough stock to length.

1. In making a cut on the saw, the stock must be held solidly against the fence.
2. When crosscutting, the saw should not be forced into the material any faster than it can cut with ease. Because of the direction of rotation of the saw blade, it has a tendency to "climb" into the wood and stall. Keep control of the rate of cut.
3. Hands should be kept to one side of the direction of the saw cut in the event the saw plows forward because of overfeeding. The hands should be minimum of 6" from the blade at all times. (Margin of safety)
4. Only one piece at a time should be cut on the saw because of the difficulty in securely holding more pieces.
5. The saw is for cutting across the grain of the stock and should not be used for ripping.
6. The machine should not be used to cut short length of stock because the hand may be drawn into the saw.
7. Extreme care must be exercised in cutting off warped or winded/twisted stock, as there is a tendency for the kerf to close in this type of defect. To avoid this difficulty, a partial cut should be made; the saw should be backed out of the cut and started again. This process should be repeated as long as a tendency to bind is observed.
8. While the dado head may be used on the radial arm saw, the instructor's permission must be obtained. In general, we do not use the dado head for any operations on the radial arm saw at Palomar College.
9. In our setting at Palomar College, **the radial arm saw is never used for ripping.**
10. Always give the saw blade clearance and let it reach full speed before pulling the blade into the wood being cut.
11. Never use this saw without properly adjusted safety guard.
12. The blade should project only 1/16" into the table for most operations.
13. Because of the tendency of this saw to plow forwards when crosscutting, the operator should keep a firm grip on the handle, and control the rate at which the blade passes through the stock.

14. Before turning on the motor, be certain that all clamps and locking devices are tight and the depth of cut is correct.
15. Always return the saw to the rear of the table after completing a crosscut or miter cut. Never remove stock from the table until the saw has been returned.
16. Any unusual noise or vibration should be brought to the immediate attention of the instructor. This could be caused by a blade with the wrong size arbor hole and/or a blade that is “out of round”.
17. Make adjustments on the saw only when the saw blade is at a dead stop.
18. When crosscutting on the radial arm saw, the saw should be returned gently but firmly to its rear stop immediately after the stock has been cut (but without moving the stock).
19. When crosscutting on the radial arm saw, hold stock firmly against the fence.

RADIAL ARM SAW ANATOMY



DISC SANDER SAFETY

GENERAL INFORMATION – DISC SANDER

The disc sander comprises a circular plate that operates in a vertical position. A cloth or paper-backed abrasive disc is cemented to the plate. The diameter of the disc indicates the size of the machine. A common size disc would be twelve inches.

1. Only the operator may turn the power on or off.
2. Hold the work securely.
3. Always sand on the down travel side of the disc.
4. Make adjustments only when sander is at a dead stop.
5. Keep fingers away from the abrasive surface on the sander.
6. Feed stock into the abrasive material at a moderate rate of feed and pressure.
7. Excessive pressure against the disc should be avoided.
8. Be sure work is held firmly against the table.
9. Small Stock 1" or smaller in length should not be sanded.
10. Use the disc sander for sanding outside curves or angles only.
11. The disc sander is NOT to be used for joinery, squaring stock, etc.
12. The table should be adjusted so that it is not more than 1/8" from the disc.
13. Make sure the disc is on properly. A dull or loose disc should be replaced or repaired immediately.
14. A 2" margin of safety should be maintained at all times.
15. Any disc that is loose should be repaired or replaced immediately. Notify instructor when the disc is loose.

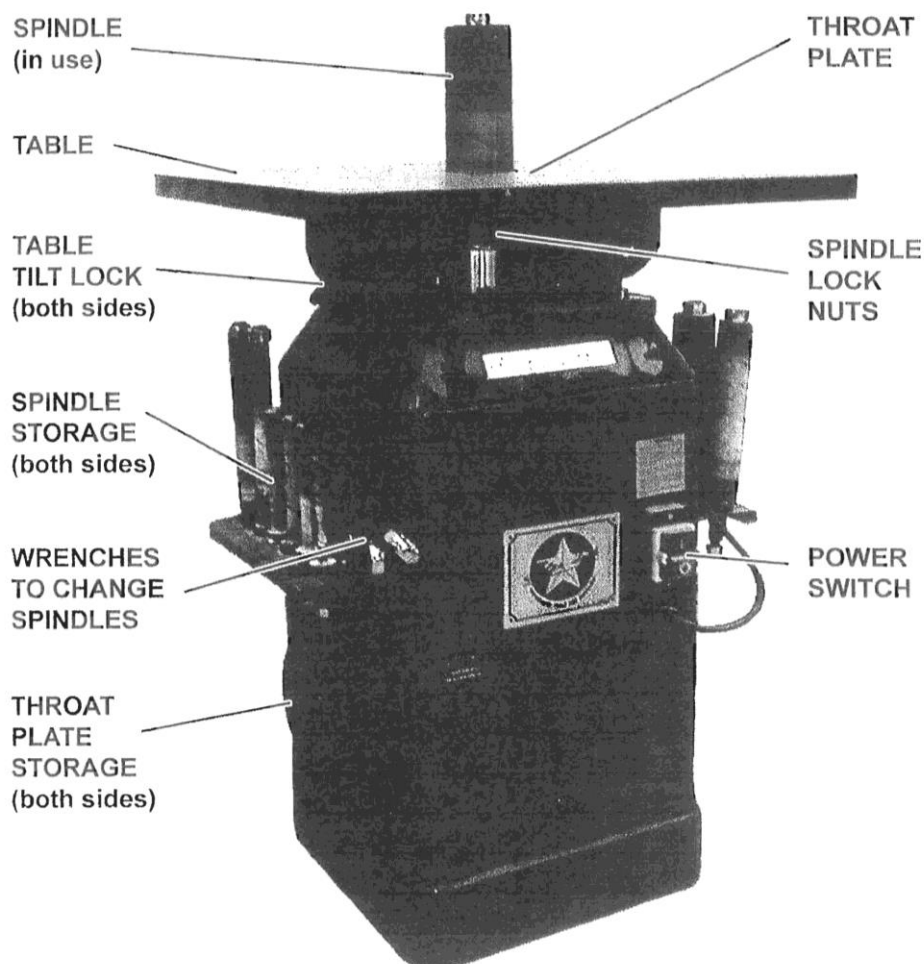
OSCILLATING SPINDLE SANDER

One of the most timesaving machines in the shop, the oscillating spindle sander is used to sand inside curves of stock. The spindle travels in a circular motion as well as oscillating up and down.

1. Always use the largest spindle that will do the job.
2. Using a small spindle does a poor job on your stock (it leaves a non-fair curve), will often burn your wood, takes longer and wears out the spindles faster.
3. Always feed against the direction of spindle rotation.

4. Wear eye protection.
5. Use the appropriate throat plate to leave the minimal opening around the spindle.
6. Every component of the spindle sander has a “place to be” on the tool rack. Do not leave spindles, throat plates, etc. lying loose. Be neat and courteous to your fellow students.
7. Notify instructor when spindles are excessively worn.
8. Make sure exhaust bag is not full.
9. Work on the side of spindle that will allow as much dust as possible to enter the self-contained sawdust collector.
10. When removing or installing the sanding spindles, make absolutely certain that all wrenches are removed before turning on the power to machine. Failure to do so will result in the wrench(es) flying out as well as damage to the machine.
11. The spindles need to be secured reasonably tight by use of the two wrenches that are provided with each machine. Care must be exercised to not over tighten.

OSCILLATING SPINDLE SANDER



DRILL PRESS SAFETY

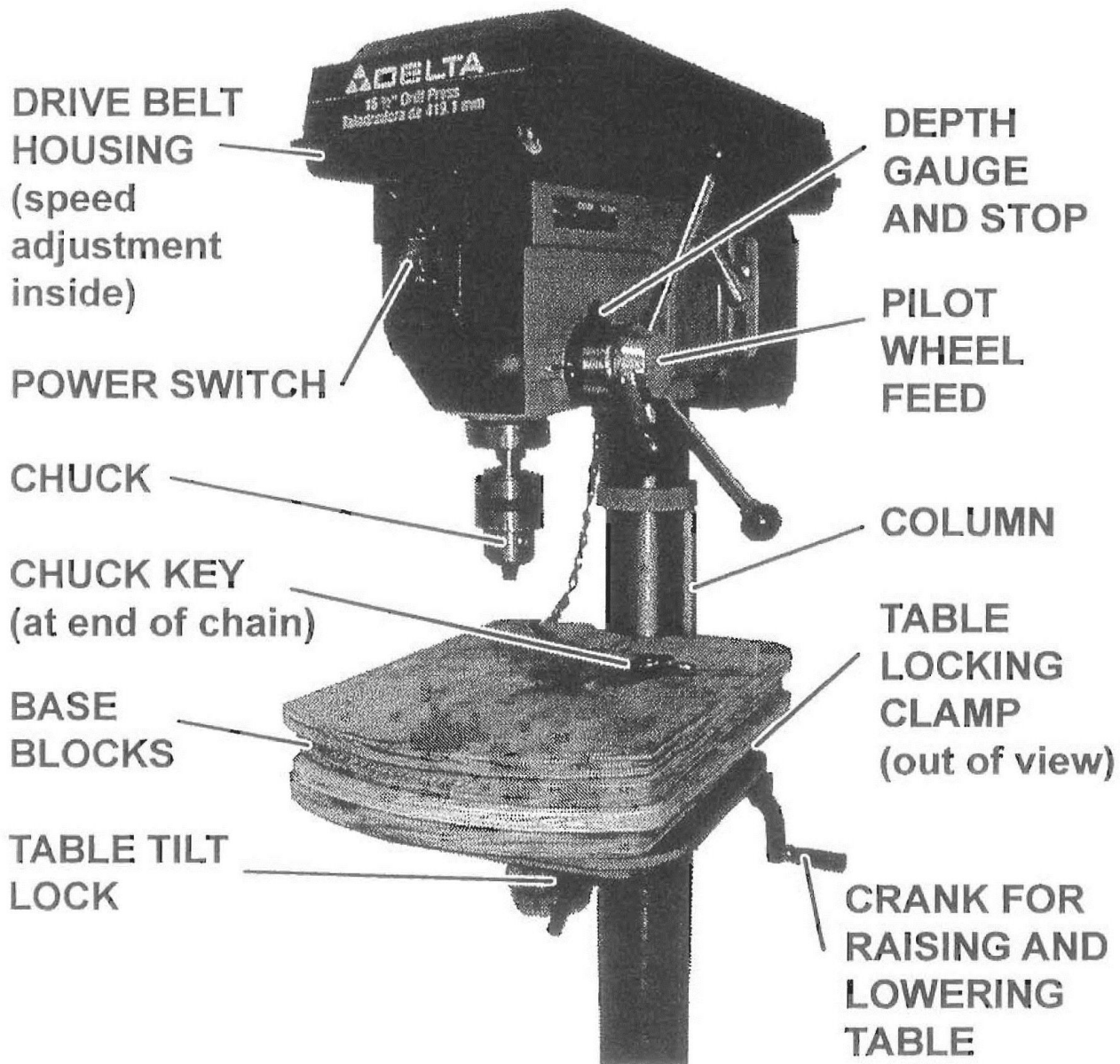
GENERAL INFORMATION

The drill press, in industry and in the home shop, is one of the most versatile of all modern power-driven machines. This tool can be used to perform such varied operations as drilling, sanding, mortising, shaping and grinding with equal efficiency.

1. Select spindle speed when power switch is turned off on the drill press. Speed is adjusted with the power on.
2. See that the belt guard is in place.
3. Be certain that the table and head of the drill press are secure.
4. Select proper drill bits (avoid dull drills). Make sure that the correct speed is used for the bit selected. If uncertain, check with the instructor.
5. Insert the drill bit in the chuck properly and tighten it securely before starting the drill press.
6. Remove chuck key before power is turned on. If the chuck key is not removed it will be thrown out from the chuck at tremendous speed when the power is turned, which could cause injury to the operator or other individuals in the lab.
7. Use drill press vice or clamps(s) whenever necessary to firmly secure the work.
8. Use a base block under work or be sure drill is over the center hole in table when boring completely through wood. This base block should be of $\frac{1}{2}$ " to $\frac{3}{4}$ " thickness and be approximately the size of the drill press table. Sheet material (plywood) is ideal.
9. Make sure that no one but you is inside the safety zone.
10. Turn on Power.
11. Keep hands away from revolving spindle.
12. Operate feed handle so that drill cuts evenly into work.
13. Ease up on feed pressure when drill begins to break through.
14. Back the drill out as soon as the hole is drilled.
15. When boring to depth, use the lock nut on depth adjustment.
16. Stop the drill press before attempting to remove work.
17. Keep floor clean around drill press.
18. If work comes loose and is seized by the drill press, shut off power immediately if possible without endangering yourself. If it is impossible to shut power off, move away from the machine and also move others away.
19. The drill bit should be backed out occasionally to clear shavings and cool the bit.

20. Obtain approval of instructor for any special set-ups on the drill press before beginning the operation.
21. Always wear eye protection when using the drill press.

DELTA DRILL PRESS



BAND SAW SAFETY

GENERAL INFORMATION

The band saw is almost indispensable in making furniture and works where many curves need to be cut. The band saw is also used for re-sawing operations.

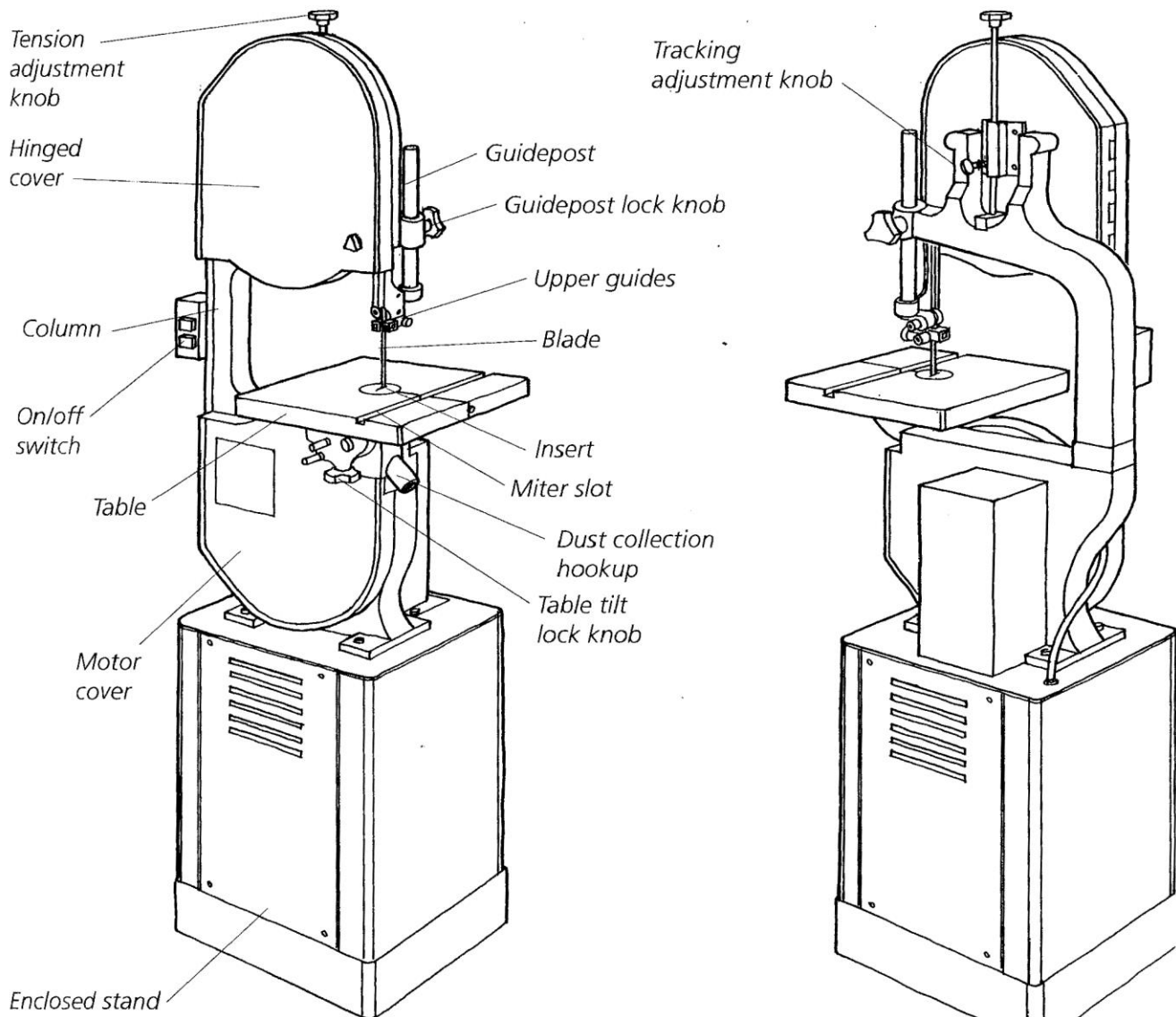
Twisting, binding, or pulling the saw blade off the wheels while backing out of a cut is the usual cause of a broken saw blade. Placing a new saw blade on the band saw and tracking the saw to run in the proper place should only be done by a Palomar TA.

1. Cutting cylindrical or irregular stock on the band saw may be done only with a special jig, such as V-blocks.
2. Adjust the guard to about ¼" above thickness of the stock, with the machine at a full stop.
3. Plan cuts carefully; layout and make "relief" cuts before cutting long curves and curves of small radii. Turning holes should be made when possible. Plan work so that the majority of all cuts will be made in the forward direction.
4. If the stock binds or pinches the blade, do not attempt to back out until power has been shut off and machine stops.
5. When removing scrap material from and saw table, always be aware of the blade. Use a piece of scrap stock to remove scrap pieces. Do not use your hands.
6. Keep floor area surrounding saw clear of scraps.
7. If blade breaks, stand clear, shut off power if possible and keep others clear until machine stops completely. Notify instructor.
8. Make all cuts under power—never while machine is coasting.
9. Leave the machine only after power is turned off and the blade has been covered by a guard.
10. Never adjust the saw while it is running.
11. Students must not allow their fingers to come dangerously close to the saw when cutting stock. A 2" margin of safety should be maintained.
12. If it is necessary to back the saw out of long cuts, turn the power off first and allow the machine to come to a dead stop.
13. When applying the brake, do not exert too much pressure on the pedal. Use the brake for emergencies only.
14. When re-sawing, make sure the fence is securely clamped to the table.
15. The instructor should approve all re-sawing set-ups first.
16. Use a push stick when re-sawing.

17. When re-sawing (which is cutting a board “in-half” through its thickness—e.g.: making a 2” thick board into two 1” pieces), make sure that face of the stock to be re-sawn has a flat, reference face (typically done with the jointer). This flat, reference face will be placed against the fence of the band saw. Likewise, the edge of the stock to be re-sawn must also be true and flat, and is placed on the table of the band saw.
18. Keep upper and lower doors closed and all guards in place
19. Use a push stick or guide for cuts near the saw blade.
20. Allow the saw to reach full speed before starting to feed the work.
21. If you hear a clicking noise, turn off the machine at once. This indicates a crack in the blade, as it passes through the guides.

The Parts of a Bandsaw

This is the prototypical 14-in. bandsaw made by Delta. Many other companies make similar saws.



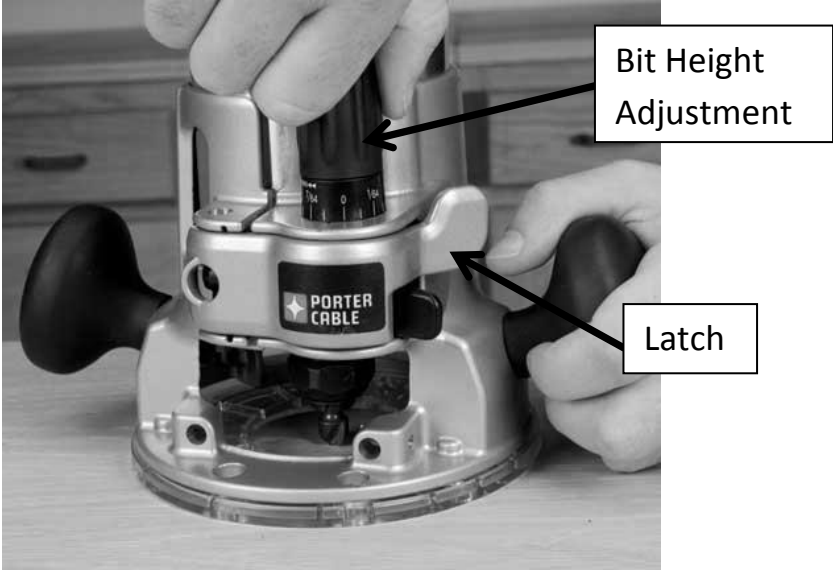
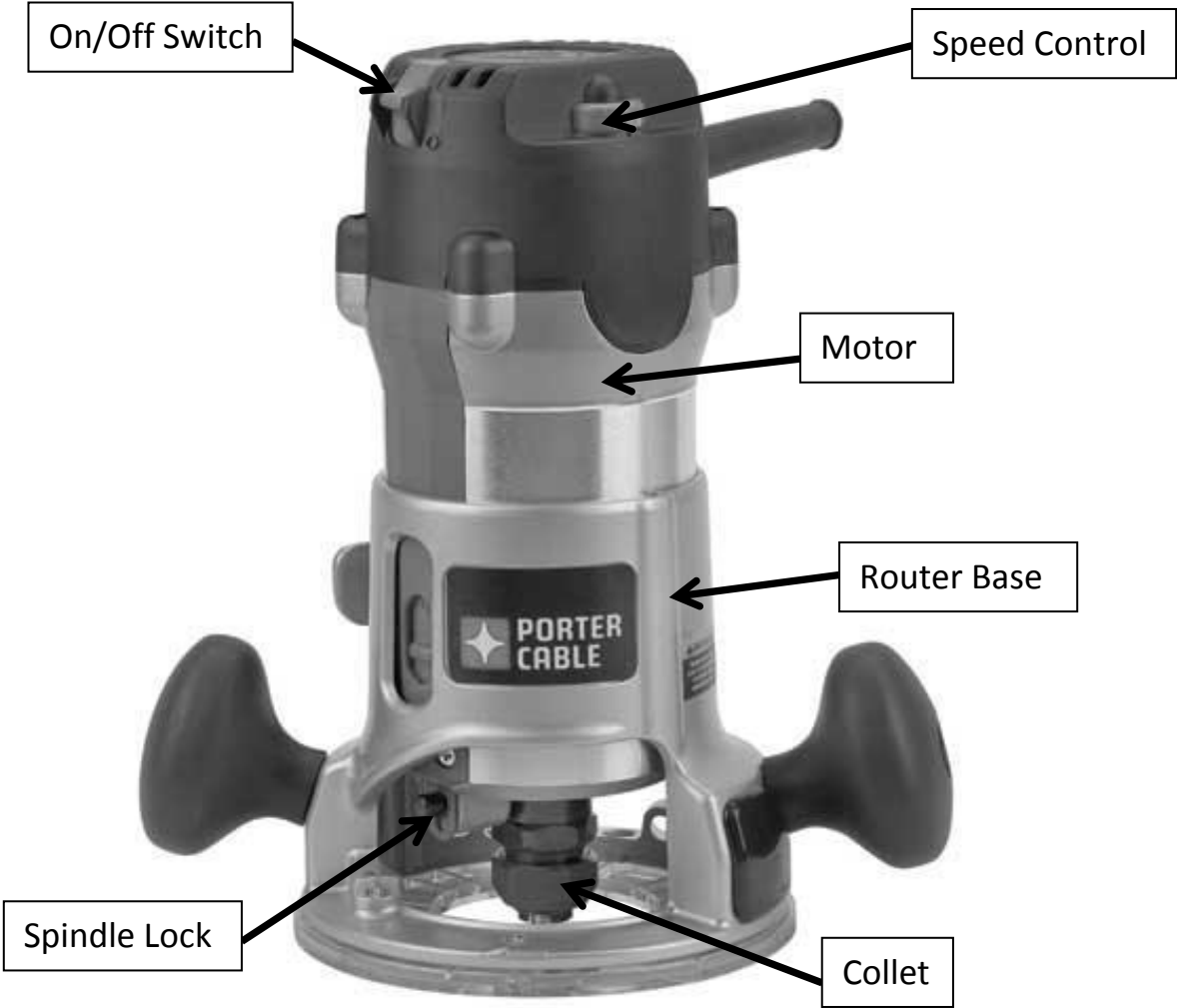
ROUTER

GENERAL INFORMATION

The router is a simple, relatively safe portable electric tool that is extremely versatile. Its use is limited only by the imagination of the operator. The router consists mainly to two pieces; a motor with a collet (chuck) mounted on one end of the armature, and a base that holds the motor upright. A bit or cutter is mounted in the collet and protrudes below the surface of the base to do the cutting. The depth of cut can be adjusted with an adjustment knob or by rotating the motor and locking it at the desired depth setting.

1. Only use accessories that are specifically designed for operation in high-speed routers.
2. Always disconnect the plug from the electrical outlet before changing bits or making adjustments. This also applies to special set-ups where the router is mounted in a “shaper” stand or router table.
3. Be sure the router is properly grounded.
4. Make sure the bit is firmly secured in the chuck before starting work.
5. Make sure the router motor is secured to the router base before the power is turned on.
6. When starting the router make sure the bit is not in contact with the work.
7. Hold the router firmly, when turning on the power, to overcome the starting torque of the motor.
8. Keep hands and loose clothing away from revolving bits and cutters.
9. Operate router in proper direction, e.g. into or against cutter rotation.
10. Set the motor speed based on the diameter of the bit, slower speeds for larger bits. Do not overload or “bog down” the speed of the router.
11. Make several light cuts where large amounts of material are to be removed.
12. Always make sure the bit is sharp. If unsure, check with the instructor. Never use a dull bit.
13. At least ½” of the router bit shank must be in the collet.
14. The work to be routed must be securely clamped or otherwise secured.
15. Before starting, check to be sure bit is sharp, clean, and unobstructed.
16. When using multi-piece router bits, double check to make sure that all nuts and bearings are tightened properly.
17. Insert router bits fully into the collet and then withdraw them approximately 1/8” before tightening in the collet so bit is not bottomed out.
18. Some routers have a spindle lock and require a single wrench to tighten the collet. Others require two wrenches.

ANATOMY OF A ROUTER



SHAPER SAFETY

GENERAL INFORMATION

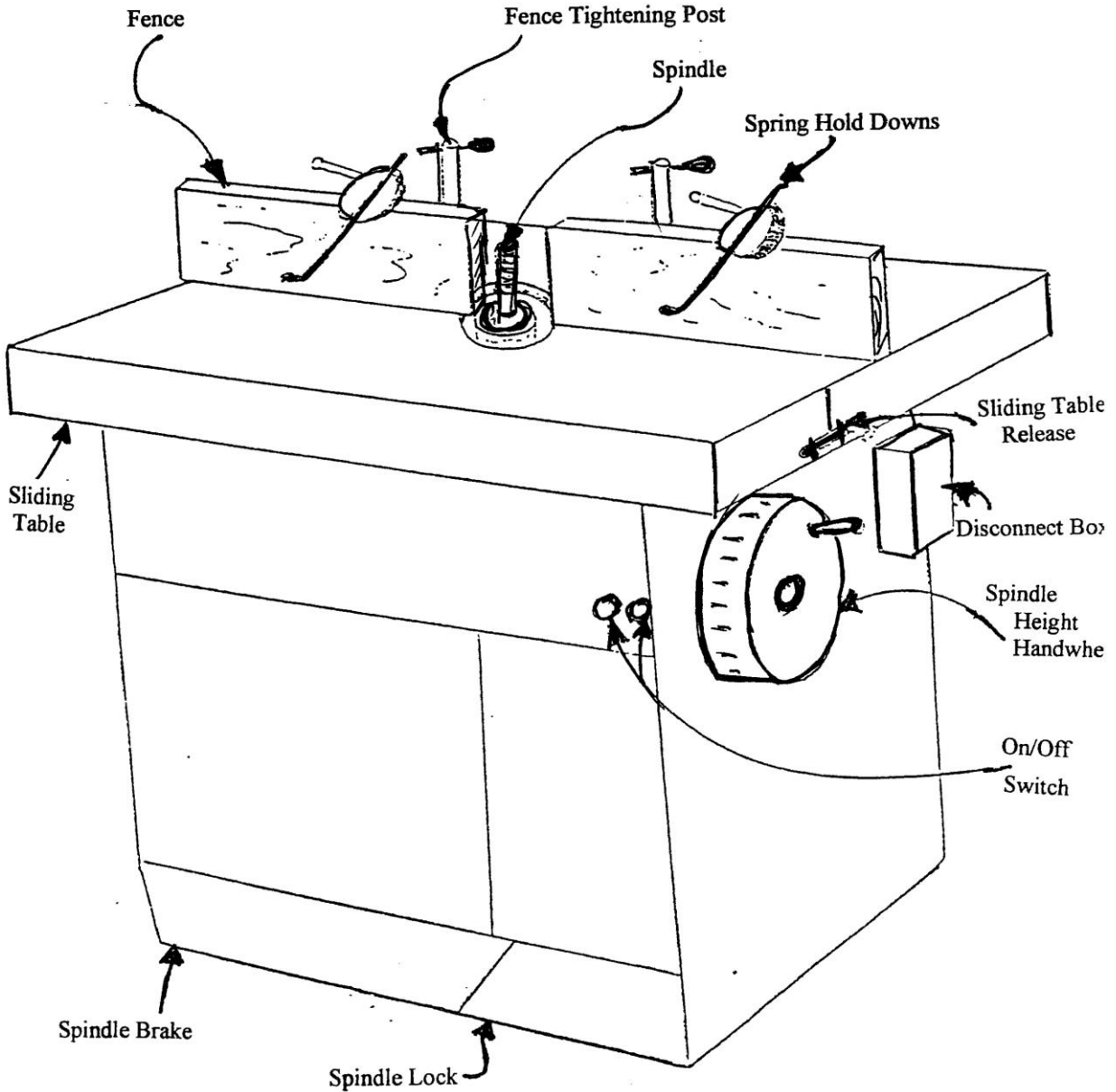
The shaper is designed to produce high quality work in furniture, cabinetwork and production work. The spindle speed is 2,000 R.P.M. to 10,000 R.P.M., depending on the motor pulley you select. If you are not thoroughly concentrating on what you are doing, the shaper becomes the most dangerous machine in the shop.

1. The shaper is not to be turned on without direct permission from the instructor. Never run the shaper unless the instructor is present and/or has specifically authorized you to proceed.
2. Whenever making any adjustments or when you turn off the machine, both the main switch and the reversing switch must be in the "off" position.
3. The shaper has been designed with as many safety features as possible, however, always remember that a shaper is only as safe as its operator!
4. Before starting the machine be sure to check the following:
 - A. Table for foreign matter.
 - B. Spindle for possible damage.
 - C. Spindle nut for possible damage and tightness. Spindle nuts (or "locking nuts") must be in good condition.
 - D. Cutters for sharpness.
 - E. Cutter head for tightness under the nut.
 - F. Spindle rotation.
 - G. There must be two nuts, one of which is a special top-locking nut, placed on top of the last cutter, spacer or bearing.
 - H. The spindle should turn freely.
5. Make certain spindle nuts are in good condition. Rounded corners prevent locking of head securely.
6. As material is fed into knives stand well to right front (unless reverse rotation of spindle is being used), and then push stock, with proper push sticks and safety procedures, to the left.
7. Safety goggles/glasses must be used at all times.
8. Never wear long or loose sleeves, neckties, or jewelry when operating the shaper.
9. "Good Housekeeping" is essential for safety. Keep working area free and clean at all times.
10. The stock must be sound, free of knots, splits, warp and other defects.
11. A trial cut should be made on scrap stock of sufficient size and length to be safe.
12. No piece of stock shorter than 12" should be run through the shaper.
13. Never back stock out (or "back up" the material) when using the shaper.
14. Never step on the spindle lock when operating the machine.

15. Verify speed selection with instructor.
16. When doing spindle or rub collar spindle work, always use a starting pin.
17. When doing rub collar or spindle shaping, a holding device must be used. Instructor should approve this.
18. All set-ups, jigs, and guards must be double-checked, first by the student and then by the instructor.
19. Do not leave the shaper until it is completely stopped.
20. Ring guards, hold down devices, feather boards, and other guards must be used whenever possible.
21. Work is always fed "into" or against the rotation of the cutters.
22. Rotation of the cutter should be with the direction of wood grain whenever possible:
23. Whenever possible, cutters should always be placed under the stock, not on top.
24. Keep area clear of all persons while using the shaper.
25. Never run stock between the fence and the cutter(s)
26. For long, continuous runs of items such as linear molding, it is advisable to use the power feeder. See your instructor for assistance with the power feeder. The use of the power feeder is always preferred to the hand feeding of stock whenever possible.

Shaper

9 H.P. , 5-Speed SCM Shaper



WOOD LATHE SAFETY

1. Obtain permission from your instructor before using lathe.
2. Roll loose sleeves above elbows and remove or fasten any loose clothing.
3. Make sure the stock is free from checks, loose knots or other defects.
4. Make certain that all glued work is properly glued and dry.
5. Be sure stock is correctly mounted in lathe.
6. Clamp tool rest holder firmly.
7. Be certain tool rest is adjusted between 1/8" below center and center for most operations.
8. Make adjustments of tool rest only when lathe is at a dead stop.
9. Concave cuts inside a cylinder are made with a round nose tool.
10. Wear face shield or goggles.
11. Check sharpness of turning tools and condition of handles. Sharp tools permit greatest control.
12. Start lathe at lowest speed when beginning operation, until stock is balanced and does not vibrate. Unbalanced stock may break apart or fly out of lathe at high speeds.
13. Stand to left side when power is first turned on.
14. Grasp turning tool firmly with both hands while cutting stock.
15. Hold turning tool firmly against the rest.
16. Hold turning tool flat against the rest.
17. Keep hands away from stock while it is revolving.
18. Use correct amount of tool pressure against stock.
19. Stop lathe when using inside or outside calipers.
20. Maintain the tool rest as close as reasonably possible to the stock, by making frequent adjustments, with machine at full stop.
21. Remove tool rest when sanding and finishing.
22. For polishing use a small rag folded into a pad to back the abrasive paper.
23. Concave cuts on a cylinder can be made with either a round nose tool or a gouge.

24. Sanding or polishing is to be done only after the tool post has been completely moved out of the way.
25. When sanding or finishing on the lathe, completely remove the tool rest and tool holder.
26. Always revolve the lathe before turning on power to make certain that no wood strikes any part of the lathe.
27. Sanding and polishing must be done on the underneath side of objects only.
28. The gouge is primarily used only for roughing spindles to round shape.
29. Before the duplicating jig is used, the instructor must approve the set-up.
30. Do not operate the speed selector with the power off.
31. Glued up stock should cure at least 24 hours.
32. Tools must be kept sharp. Dull tools are dangerous because they are hard to control and require too much pressure by the operator.

SPINDLE TURNING INSTRUCTIONS:

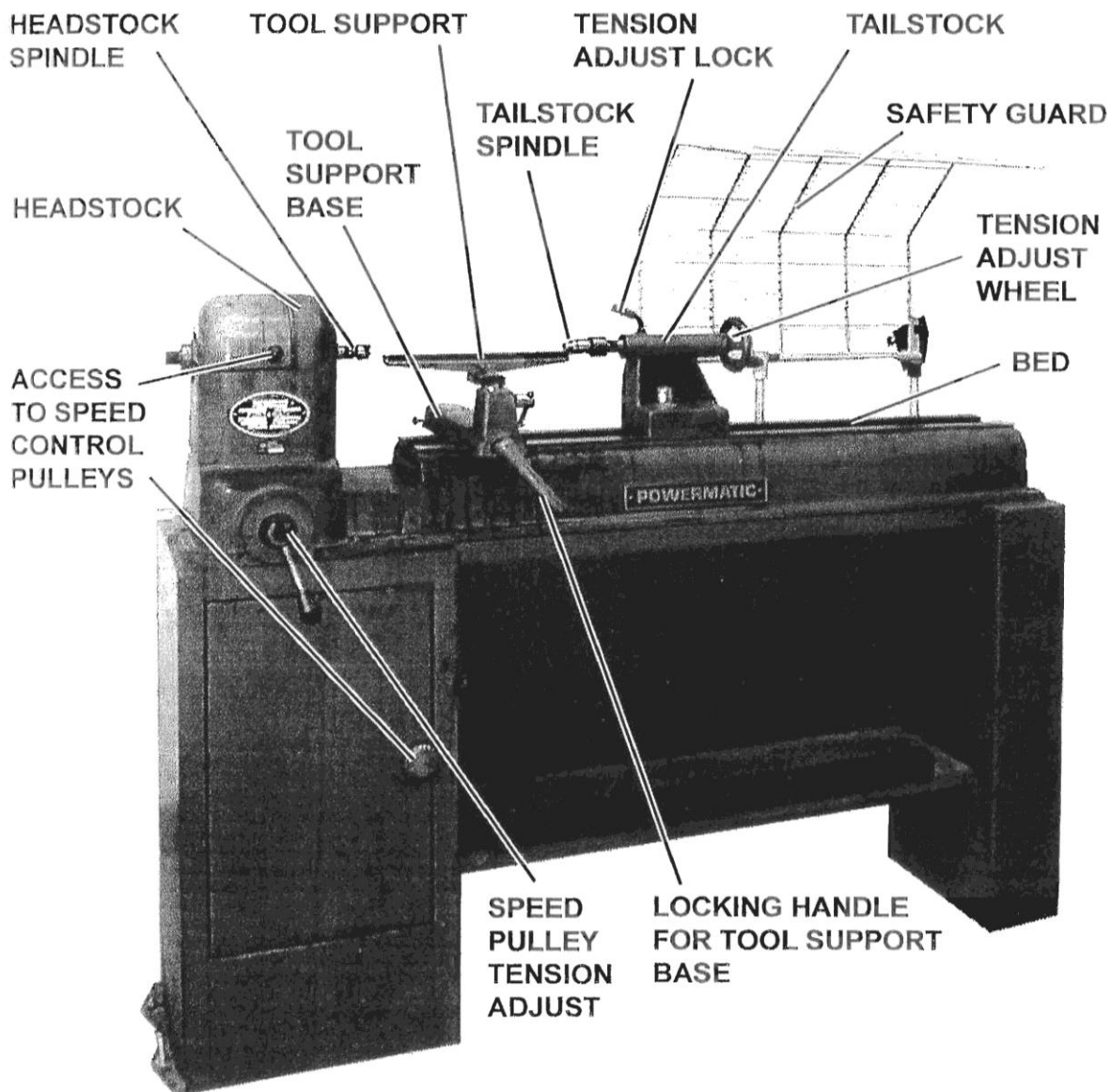
1. See that the live and dead centers are properly embedded in the stock; otherwise the stock could fly off the lathe.
2. Use oil or beeswax on the dead center.
3. Clamp tailstock firmly in place and tighten nut.
4. Before turning on power to lathe, check clearances by turning spindle (rough stock) one revolution by hand.
5. Start lathe at lowest speed when beginning operation.
6. Rough stock down to cylindrical form before using a higher speed. Maintain correct tool rest clearance by frequent adjustment.
7. Govern speed according to the diameter of the work.

FACEPLATE TURNING INSTRUCTIONS:

1. Cut stock circular on band saw or back saw (a back saw is a reinforced cross cut saw).
2. Select proper size and number of screws according to design of work. A screw should be in each hole provided in the faceplate.
3. Choose the proper size and style of faceplate. Make sure the faceplate is large enough.
4. Fasten stock, or sub-base glued to stock, to the faceplate with screws.
5. Be sure screws are tight.

6. Have the instructor check fastenings and adjustments.
7. Keep an accurate check on depth of cut in work to avoid striking screws.
8. Be certain that tool rest adjustment is correct and is correctly maintained.
9. Revolve work once by hand.
10. Use the lowest speed when beginning operation.
11. Use correct speed in relation to diameter of stock.
12. Make frequent inspection of screws to be sure they do not loosen.

LATHE



EDGE BELT SANDER

This sanding machine will save hours of tedious edge sanding if used properly. Used improperly and it can make your stock out-of-square in rapid fashion.

1. The exhaust system must be on.
2. Eye protection must be worn.
3. Use the side of the belt traveling into the stop and exhaust scoop. This will avoid contaminating the shop with fine sawdust and help control the stock.
4. The sander is to be used for edge sanding only. It is not a planer, jointer, shaper, disc sander, or spindle sander. Do not sand face or end grain or use the sander for shaping.
5. Sanding pieces less than 2" wide is dangerous, therefore do not attempt it.
6. Make sure the belt is tracking properly and is not rubbing on any metal surface.
7. When adjusting the table height, make sure locking knobs are loose.

HORIZONTAL BORING MACHINE

The boring machine is used in the horizontal drilling of holes for making dowel joints.

1. Wear Eye protection.
2. Never use your finger to brush away chips and dust from the reference line. Use compressed air, a brush, or simply blow it off yourself.
3. As simple as it may seem, do not clamp your hand down with cam lever.
4. Also, as simple as it may seem, be careful with the foot feed lever. Operators often get over anxious and over confident and stomp on the foot feeder prematurely and drill their own hands.

HOLLOW CHISEL MORTISER SAFETY

1. Obtain permission from instructor before using the mortiser.
2. Clamp all stock securely on table.
3. Make adjustments only when machine is at a dead stop.
4. Check with instructor for correct method of installing mortiser bit and chisel. The chisel and bit must have proper clearance and the chisel must be properly aligned.
5. Make adjustments for depth stops and lateral travel.
6. Make sure that only you are inside the operator's safety zone.
7. Turn on power (after permission is given). Make sure that hands are away from bit and chisel.
8. Keep hand away from chisel when the machine is turned on.

9. Feed chisel only as fast as machine will easily cut.
10. Turn off power immediately if cutting is difficult or the chisel chatters or burns.
11. Lift bit clear of the mortise before moving table.
12. Turn off power after using mortiser and stand by until machine has stopped.
13. Clean off mortiser table with brush or scrap stock.
14. Material to be machined on the mortiser must be clamped securely to the table. Do not attempt to hold the material with your hands, regardless of material size.

WIDE BELT SANDER

1. The minimum length of stock to be sanded is posted on each machine.
2. Before turning on the machine, make sure that both the exhaust system is on and that there is adequate air pressure (80 psi) to the machine to tension the belt.
3. The minimum width of stock to be sanded is 3".
4. Minimum stock thickness is posted on each machine. If thickness less than this minimum is required ask your instructor for assistance with a special set up.
5. In feeding stock into the machine, place your hands on the edges and top of the stock, not underneath the stock. Should the machine grab the stock from you, the board will thereby readily release from your hand.
6. Before turning on the wide belt sander, insure that the out-feed area of the machine is clear of people, stock, projects, etc.
7. To avoid damage to the belt, make only shallow cuts. Do not sand oily woods such as teak and resinous woods such as pine through the sander.