Table Sawing Operations

TABLE SAWING SPEED CHART]

Operation	Hardwood	Softwood
General Sawing	R (3500 rpm)	R (3500 rpm)
Heavy Ripping	O (2800 rpm)	P (3000 rpm)
Trim Cuts	S (3800 rpm)	S (3800 rpm)

Safety

WARNING

Before performing table sawing operations:
- Read and understand, and follow the SAFETY section, especially for the table saw mode.
- Complete ALL the Assembly and Alignment procedures.
- Set up the table saw mode according to the instructions found in your Mark V Model's section.
- Secure locks.

Table Sawing Speeds

NOTE

The speeds designated on the speed charts are suggested speeds.

Before you begin any table saw operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of stock you're sawing. To determine the right speed for the job, refer to the Table Sawing Speed Chart.

NOTE

Adjust the speed dial only when the motor is running.

Crosscutting

General Crosscutting

1. Place the miter gauge in the slot on the same side of the saw blade where you'll be standing. Position the miter gauge square to the blade.

2. Mark the board where you want to cut it. Set the stock against the protractor face. Adjust the stock so the blade cuts on the waste side of the line. Adjust the quick clamp to the thickness of the stock.

3. Set the stock against the miter gauge face, so that the blade cuts on the waste side of the line.

4. Squeeze the safety grip and turn on the Mark V. Set to the correct speed, then guide the stock past the blade. Use your free hand to help keep the stock against the miter gauge face. See Figure C-1.

NOTE

When crosscutting stock resulting in narrow scrap, move the blade close to the table insert on the scrap side of the blade. This will help keep small pieces of stock from falling through the insert.

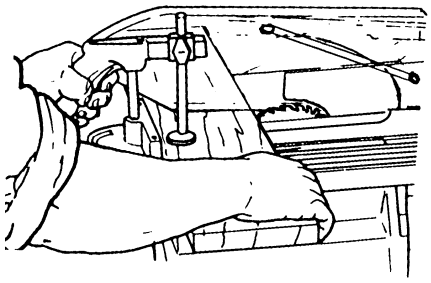

Figure C-1

5. Don't feed the stock any faster than the saw will cut. If the machine bogs down, slow your feed rate and let the saw get back up to running speed.

6. When you've finished the cut, turn the speed dial to "Slow" and turn off the Mark V. Let the blade come to a complete stop, then remove the stock from the miter gauge and brush away scraps.

WARNING

Always let the blade come to a complete stop before removing stock or scrap. Also, if you need to actually touch the blade, make sure the Mark V is turned off and unplugged.

Crosscutting Long Stock

7. Mount an extension table in the power or base mount located at either end of the Mark V. Use a miter gauge extension to help keep the stock square to the blade. Start by cutting long stock in the middle. This gets it down to a manageable length. See Figure C- 2.

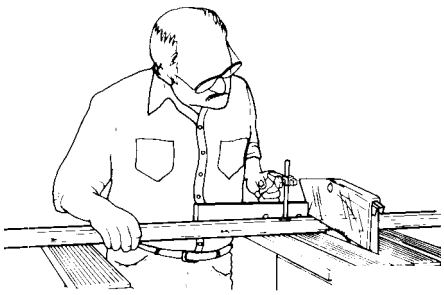

Figure C-2

Crosscutting Duplicate Lengths

8. To cut short lengths, use a miter gauge stop rod. See Figure C-3. Or clamp a stop block to a miter gauge extension. See Figure C-4.

9. To cut long lengths, mount the extension table on either side of the headstock, then mount the rip fence on the extension table. Clamp a stop block to the rip fence. Position the stop block ahead of the blade.

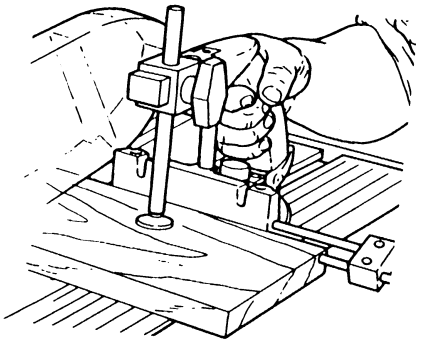

Figure C-3

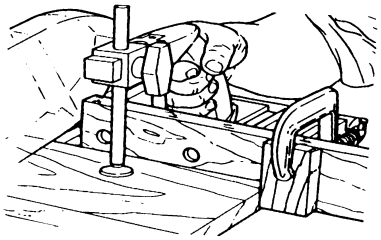

Figure C-4

WARNING

Never use the rip fence for crosscutting unless you clamp a stop block to it. If the stock contacts the rip fence as it passes the saw blade, the stock will bind and be kicked back.

10. Move the headstock and carriage so that the saw blade is the proper distance from the stop block. Make fine adjustments with the quill feed. Then butt the stock against the stop block and clamp the stock with the safety grip. See Figure C-5.

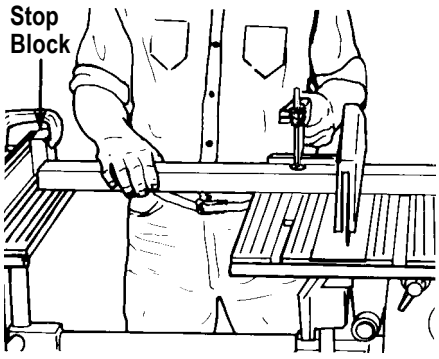

Figure C-5

Ripping

WARNING

When ripping, make sure the rip fence is parallel to the blade and that the edge of the stock against the fence is straight. Otherwise you're likely to get a kickback.

Also, never reach over or around the blade to catch your stock, even with the upper saw guard in place. A kickback can drag your hand back under the guard and into the blade.

General Ripping

1. Mount the rip fence to the worktable. Move the fence the desired distance away from the saw blade, then lock it. Use the quill feed to make fine adjustments. See Figure C-6.

NOTE

When properly aligned, the rip fence automatically sets itself parallel to the blade. However, on critical setups, it's wise to check this. Measure the distance from the rip fence to the tip of a saw tooth (that is set toward the fence) at both the front and back of the machine.

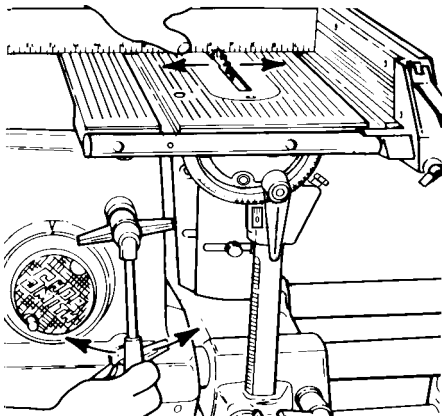

Figure C-6

2. Mount a feather board in front of the blade to help hold the stock against the fence.

WARNING

Always mount the feather board in front of the blade. Otherwise you could create a kickback.

3. Turn the machine on and set the correct speed. Feed the stock into the blade while keeping it pressed firmly against the fence. Use a push stick or push block to finish the cut. See Figure C-7.

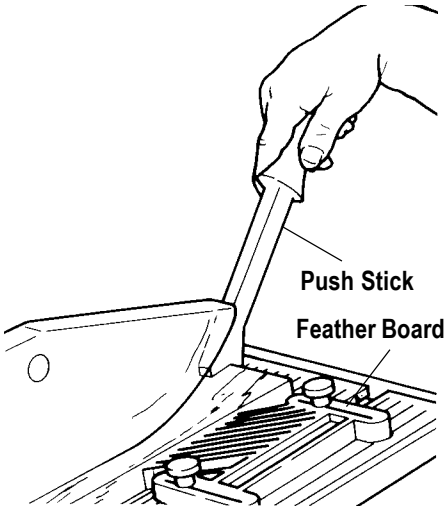

Figure C-7

Ripping Long Stock

4. Position roller stand(s) 1' to 4' out from the back and/or front of the table. Adjust the stand(s) so the stock rests flush on the table, then lock the roller stand(s). You can also use it as a support table. See Figure C-8.

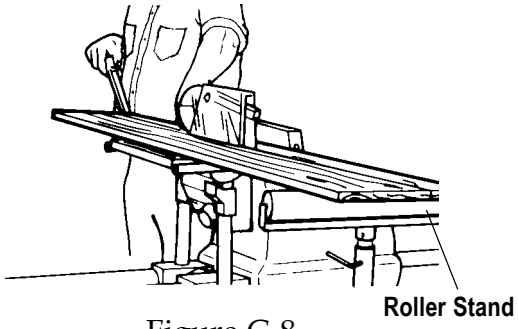

Figure C-8

Ripping Narrow Stock

5. When ripping stock less than 1-1/2" wide, use the fence straddler to finish the cut. See Figure C-9.

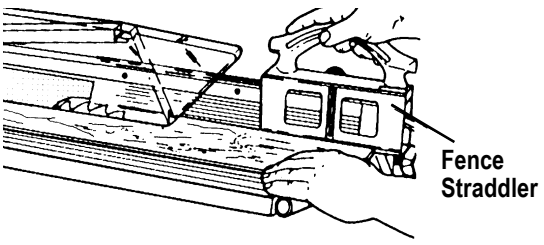

Figure C-9

WARNING

Always use a push stick or fence straddler when ripping narrow stock. Keep your fingers out of the danger zone.

6. When ripping extremely narrow stock, clamp a spacer (no higher than the thickness of the stock) to the side of the rip fence so that the fence doesn't interfere with the saw guard. Use a piece of narrow stock to complete the cut.

NOTE

When ripping narrow stock, move the blade close to the table insert on the side of the blade where the stock is being cut. This will help keep small pieces of stock from falling through the insert.

Ripping Wide Stock

WARNING

DO NOT rip large sheets of plywood or similar materials by yourself. Use roller stands and get at least one helper.

7. To rip stock 8-3/4" to 10-3/4" wide (Mark V) , you'll have to mount the rip fence so it straddles the extension table and the worktable.

8. To rip wider stock or sheet materials, mount the extension table on either side of the headstock and mount the rip fence on the extension table. Move the headstock and the carriage until the blade is the desired distance away from the rip fence. Use the quill feed to make fine adjustments.

9. Feed the stock as you would normally. If the stock you're cutting is extremely large — such as a sheet of plywood — get some help. See Figure C-10.

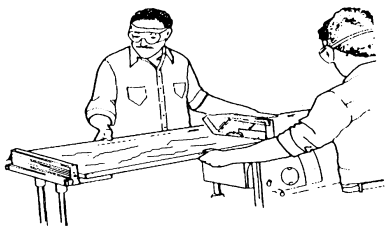

Figure C-10

Angles

Cutting a Miter

1. Set the miter gauge at the desired angle, and secure the lock knob. Place the miter gauge in one of the slots so that the protractor face is angled toward the blade.

2. Mark the stock where you want to cut it. (It's easiest to measure from the outside corners of the miter.) Clamp the stock in the miter gauge and line it up with the blade. From this point on, the procedure is similar to crosscutting. See Figure C-11.

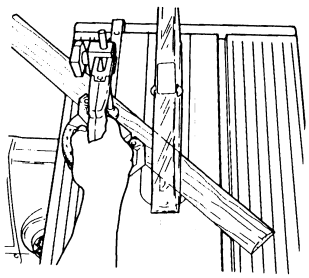

Figure C-11

Cutting a Bevel

WARNING

Mount the miter gauge or the rip fence on the down side of the table. This will provide better support for the stock, help eliminate kickbacks, and keep your hands out of danger. When cutting a bevel, mounting the miter gauge on the up side of the blade could result in the protractor casting coming in contact with the saw blade.

3. Slide the carriage and the headstock all the way to the right and set the table at the desired angle. If you're crosscutting a bevel, mount the miter gauge on the down side of the table.

See Figure C-12. If you're ripping a bevel, mount the rip fence on the down side of the table. See Figure C-13.

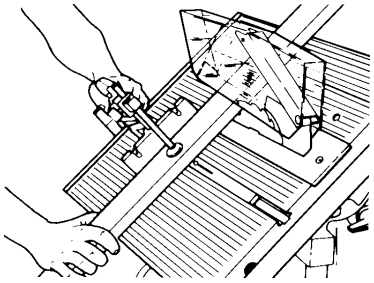

Figure C-12

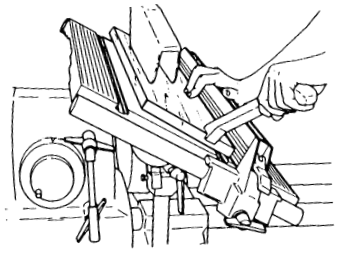

Figure C-13

4. When ripping a bevel in stock narrower than 1-1/2" wide, you'll need to mount an appropriately thick piece of stock to the rip fence. This fence extension will position the ripping face closer to the blade for narrower cuts.

5. When ripping a bevel in wide stock, you may not be able to mount the rip fence on the extension table. In this case, clamp a long, straight board to the underside of the stock and rest this board over the upper edge of the table. When properly positioned, the board will guide the stock. See Figure C-14.Mount the rip fence on the floating table.

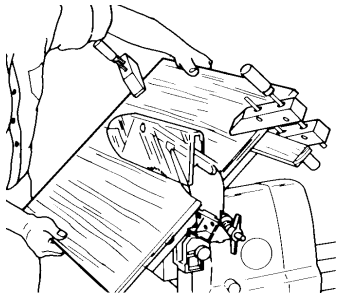

Figure C-14

Cutting a Compound Miter

6. To cut a compound miter, adjust both the table and the miter gauge to their desired angles.

Rabbets and Dadoes

WARNING

Rabbets and dadoes are made with the upper saw guard removed. Whenever you remove the upper saw guard, keep the lower guard in place and make sure the lock knob is secured. Always use a push stick, push block, or other safety equipment to help keep your hands out of danger. NEVER put hands over the blade even if the blade is covered by the stock.

Cutting a Rabbet

1. Remove the upper saw guard, adjust the table height, and mount the rip fence to the table the desired distance away from the blade. Make fine adjustments with the quill feed.

2. Rabbet cuts require two passes. Cut the surface of the stock first. See Figure C-15. Then reposition the fence if necessary and turn the stock on edge. Make the second cut so that the waste is on the opposite side of the blade from the rip fence. Use a fence extension or feather board to support the stock. See Figure C-16.

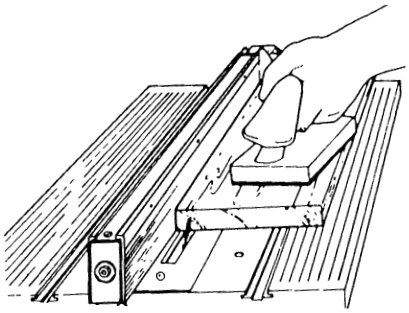

Figure C-15

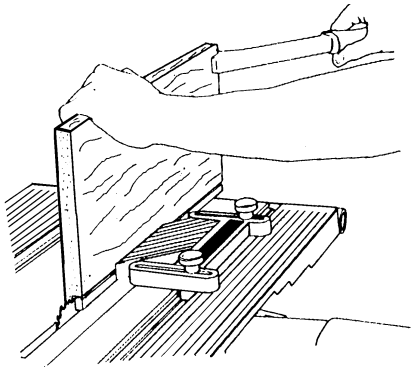

Figure C-16

Cutting a Dado

3. Remove the upper saw guard and adjust the height of the table.

WARNING

Make sure the next step is done with the machine turned offf.

4. To determine where to start and stop cutting, first find the right and left sides of the dado. Mark the dado on the stock and place it in the miter gauge. Grip stock in the safety grip and move it up to the blade. With a pencil, mark the right and left sides of the kerf on the worktable surface. These marks will serve as a temporary guide.

5. Line up the right side of the dado with the right kerf mark and make your first pass. Move the stock to the right the width of one kerf and make another pass. Continue until the left side of the dado lines up with the left kerf mark, then make your last pass over the blade. See Figure C-17.

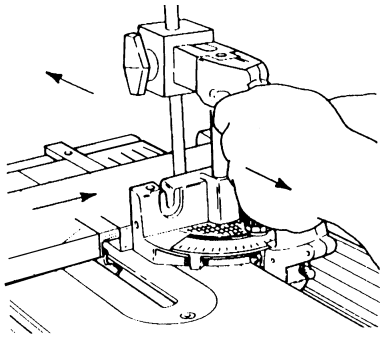

Figure C-17

Disc Sanding Operations

DISC SANDING SPEED CHART

Grit	Hardwood	Softwood
Coarse (60#)	D (1050 rpm)	E (1150 rpm)
Medium (80#)	F (1300 rpm)	G (1450 rpm)
Fine (100#)	G (1450 rpm)	H (1600 rpm)

Grinding or Sharpening Metal Tools — Slow (700 rpm)

Safety

WARNING

Before performing disc sanding operations:

- READ, UNDERSTAND, and FOLLOW the SAFETY section, especially for the disc sander mode.
- Complete ALL the Assembly and Alignment procedures.
- Secure locks.

Disc Sanding Speeds

NOTE

The above mentioned speeds are reccommended speeds.

Before you begin any disc sanding operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of material you're sanding. To determine the right speed for the job, refer to the Disc Sanding Speed Chart.

General Sanding

Position the carriage so that the table is no farther than 1/16" away from the disc (if you're not using the quill feed), or 1/2" (if you are using the quill feed). Maintain these clearances during sanding. Position the table surface near the center of the disc. Maintain these clearances during sanding. Always sand on the downward motion side of the disc with the disc either through the insert or next to the table.

End-Grain Sanding

1. Mount the miter gauge in the left slot and position it so that it will guide the stock against the downward side of the disc. Then lock the gauge in the slot. Turn on and set the Mark V speed.

NOTE

When end-grain sanding, set the speed a little slower than you would for other types of sanding. End grains "burn" easily.

2. If you're feeding the stock into the disc, place the stock against the miter gauge and feed it toward the disc until it contacts the abrasive. Hold it there for a few seconds, back it off, then feed it forward again. See Figure C-18.

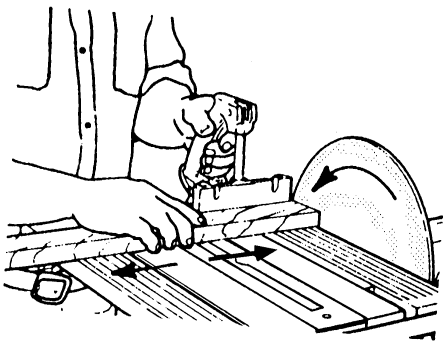

Figure C-18

`3. If you're using the quill feed, advance the disc until it contacts the stock. Hold it there for a few seconds, back it off, and feed it forward again. See Figure C-19.

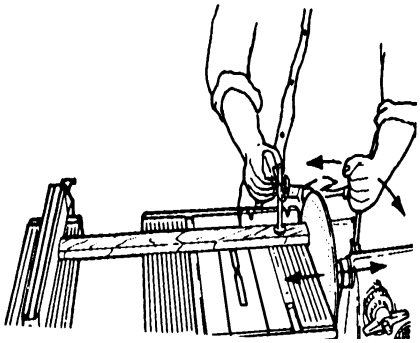

Figure C-19

Sanding to Length

1. Mount the rip fence to the table or the extension table to use as a backstop. Position the backstop so it holds the end of the stock about 1/2" away from the sanding disc when the quill is completely retracted.

2. Adjust the quick clamp to the thickness of the stock. Mount and lock the miter gauge in the left slot. Set the depth control. Position the stock against the miter gauge and the rip fence, so that it overhangs the table slightly. Be sure the stock doesn't contact the sanding disc.

3. Squeeze the safety grip with one hand, then turn on and adjust the Mark V speed.Feed the disc forward with the quill until it just contacts the stock. Back it off, then advance it again. Don't extend the quill all the way at this time, just sand until the end is smooth. Then, turn the stock and sand the other end. This time, advance the disc until the depth control stops it. See Figure C-20. Repeat this procedure as needed with the other boards you need to sand. When finished, they will all be exactly the same length.

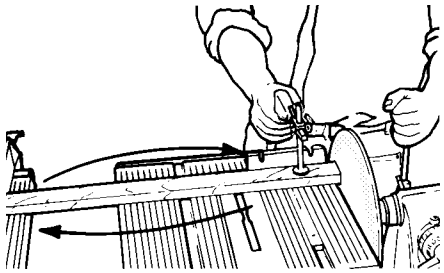

Figure C-20

Sanding Bevels, Chamfers and Miters

1. After sawing a miter, bevel or chamfer, don't change the table tilt or the miter gauge angle. Instead, use these angles for the sanding setup.

2. Remove the upper saw guard, raise the table and remove the saw blade from the lower guard. Mount a sanding disc in the guard, then re-adjust the table height and position for sanding. Clamp the stock in the miter gauge or guide it against the rip fence, and sand it at the same angle that you cut it.

NOTE

When sanding angles, position the disc through the insert.

WARNING

The following section can only be done with the Mark V Standard Fence System.

Edge Sanding

WARNING

To avoid kickback of stock when using the disc sander with the Mark V, always offset the fence and feed the stock from the back of the machine to the front.

NOTES

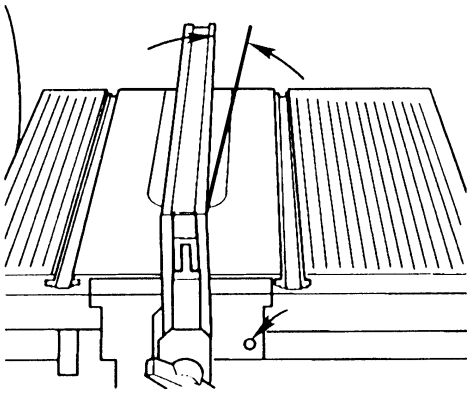

Figure C-21

1. Move the carriage so that the table edge is no farther than 1/16" away from the disc.

2. Mount the rip fence on the table, but don't lock it yet. With a 5/32" Allen wrench, adjust the setscrew in the base to offset the fence. See Figure C-21. When properly adjusted, the rip fence should be 1/32"-1/16" closer to the disc at the front of the table than at the back.

3. Position the rip fence so that the edge of the stock just touches the downward side of the disc. Make fine adjustments with the quill feed.

4. Turn on the machine, and feed the stock slowly from the back of the table toward the front. See Figure C-22.

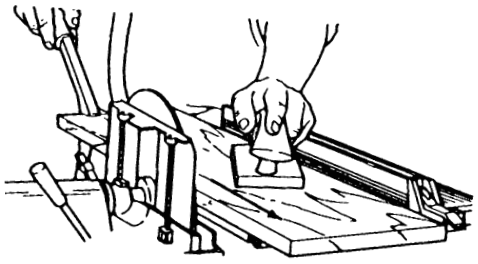

Figure C-22

Vertical Drilling Operations

VERTICAL DRILLING SPEED CHART

Size of Hole	Hardwood	Softwood
1/4" and less	H **(1600 rpm)**	I **(1750 rpm)**
1/4" to 1/2"	F **(1300 rpm)**	G **(1450 rpm)**
1/2" to 3/4"	D **(1050 rpm)**	E **(1150 rpm)**
3/4" to 1"	B **(850 rpm)**	C **(950 rpm)**
Over 1"	Slow **(700 rpm)**	A **(750 rpm)**

Drilling metals (twist bits only) — Slow (700 rpm)

Safety

WARNING

Before performing vertical drilling operations:

- Read the SAFETY section, especially for the drill press mode.
- Complete ALL the Assembly and Alignment procedures.
- Set up the drill press mode according to the instructions found in your Mark V Model's section.
- Remove the key from the chuck.
- Secure locks.

Vertical Drilling Speeds

NOTE

The above referenced speeds are suggested speeds.

Before you begin any vertical drilling operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of material you're drilling. To determine the right speed for the job, refer to the **Vertical Drilling Speed Chart.** This chart is intended as a general guide when using **brad-point bits** and **twist bits.** If you use other bits, follow the manufacturers recommendations.

General Drilling

There are two basic types of holes: holes that you drill completely through the stock, and holes that only go part way through the stock.

Drilling Through

1. Mount the rip fence on the table to use as a backstop. (If there's no room for the rip fence, use the miter gauge).

2. Clamp a scrap of wood on the table to keep the drill bit from drilling into the table and the stock from splintering where the drill bit exits. This scrap should be wider than the stock.

3. Mark the holes on the stock, and lay it on top of the scrap. Adjust the rip fence to position the hole where you want it. Make fine adjustments with the table height crank. See Figure C-23.

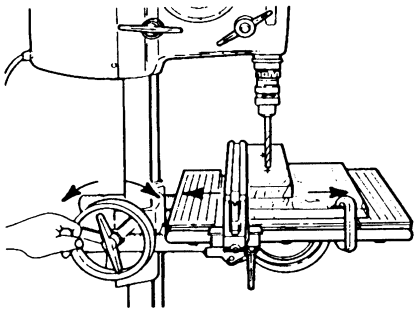

Figure C-23

4. To position the table assembly on the way tubes, hold the carriage so that it won't drop against the base mount, then loosen the carriage lock. Adjust the table height so that the tip of the drill bit is 1/4"-1/2" above the stock, and tighten the lock.

5. Remove the stock and extend the quill so that the cutting flutes of the drill bit touch the scrap wood. Set the depth control to 1/8" and tighten the depth control lock. See Figure C-24. Then let the quill retract. Position the stock under the drill bit. Hold it against the table and rip fence. Extend the quill with the machine off to check where the drill bit will drill.

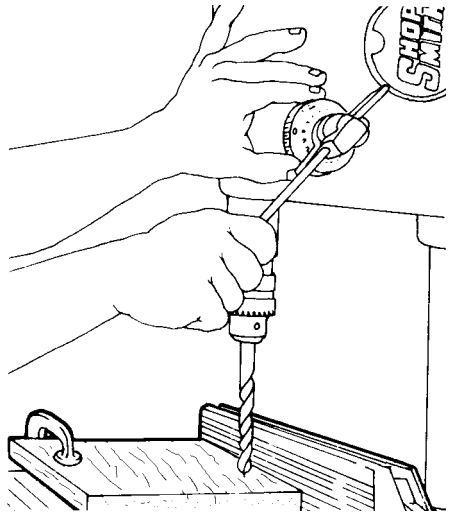

Figure C-24

6. Turn on the Mark V, adjust the speed, and feed the drill bit into the stock slowly. See Figure C-25. When drilling deep holes, retract the drill bit now and then to clear chips from the hole. When you feel the depth control stop the quill, retract the drill bit. Turn the speed dial to "Slow" and turn off the machine. Let it come to a stop, then remove the stock.

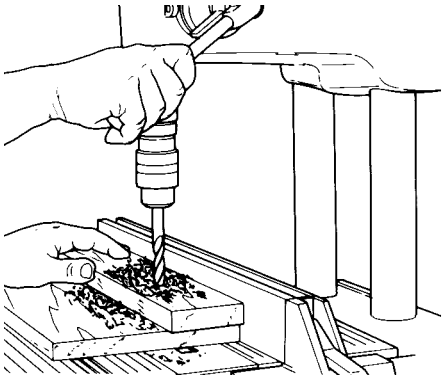

Figure C-25

Drilling Part Way

1. Same as "Drilling Through" except extend the quill until the cutting flutes of the drill bit just touch the stock. Then set and lock the depth control. See Figure C-26.

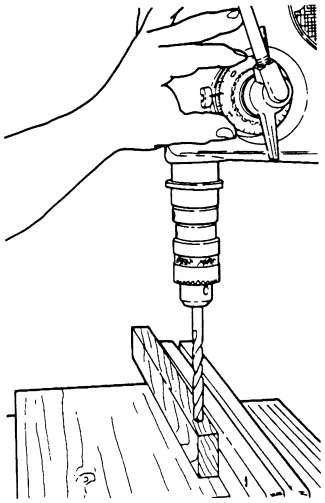

Figure C-26

2. Then drill the holes you need. The depth control will stop the quill when the drill bit reaches the proper depth in the stock. All the holes you drill at any one depth control setting will be exactly the same depth.

Avoiding Tear-Out

1. Prevent rough, splintery edges where the drill exits the stock by moving the scrap block every time you drill a new hole– this way there's always a firm surface to back up the stock. Or, if you're using brad-point drill bits, you can use the depth control to avoid tear-out.

2. With the Mark V turned off, extend the quill until the pilot of the brad point drill bit touches the scrap wood. Lock the quill. Set the depth control to "0" and lock it in place. Unlock the quill and let it retract.

3. Drill the holes you need, letting the depth control stop the quill. Set the speed dial to "Slow", turn off the Mark V, and turn the stock over. There will be a tiny pinhole where the pilot started to come through the stock. Use this pinhole to line up the drill bit, then finish drilling the hole from the other side. Since brad-point drill bits have spurs that cut the wood grain smoothly when they enter the wood, there will be no tear-out on either side of the stock.

Drilling at an Angle

1. Mount the rip fence on the downside of the table, then tilt the table. This will give the stock maximum support. If the angle is acute, place scrap blocks on the table and rip fence. See Figure C-27.

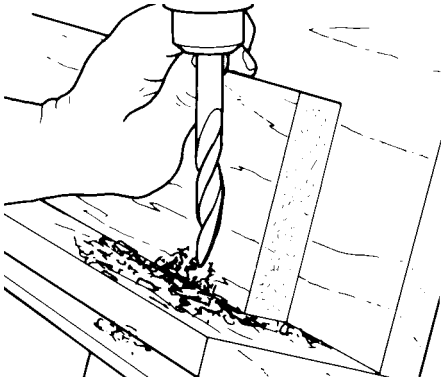

Figure C-27

Drilling Round Stock

WARNING

Make sure that the stock is held securely.

1. Position the rip fence in the middle of the table and tilt the table at 45 degrees. This will create a 'V' to cradle the stock.

2. If you're going to drill through the stock, protect the table and the rip fence with scrap wood. If you perform this operation often, you may want to make a V-support by gluing two scrap boards together, then bolt one side of the support to the rip fence. See Figure C-28.

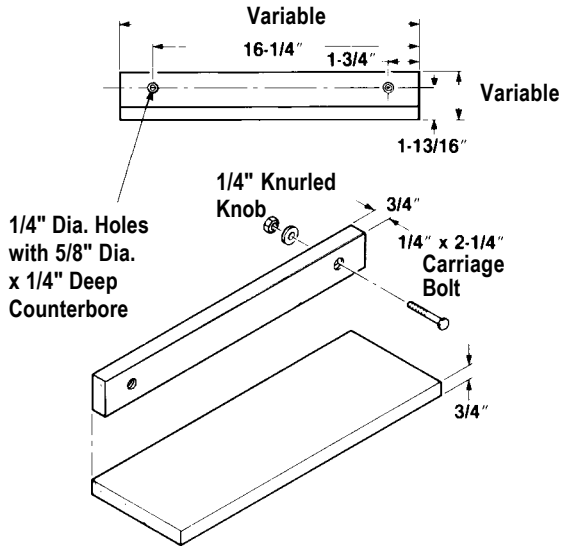

Figure C-28

3. Extend the quill so that the drill bit just touches the 'V.' With the table height crank, move the table so that the pilot of the drill bit points to the bottom of the "V." See Figure C-29. Lock the table. Place the stock in the "V" and set the depth control. Drill the hole, holding the stock down firmly. See Figure C-30.

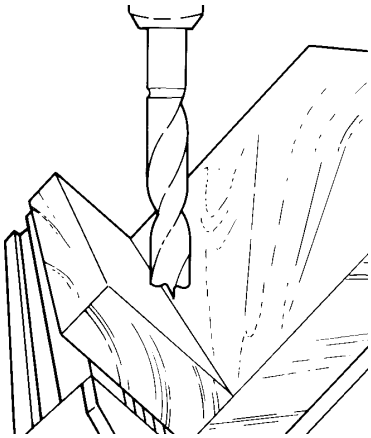

Figure C-29

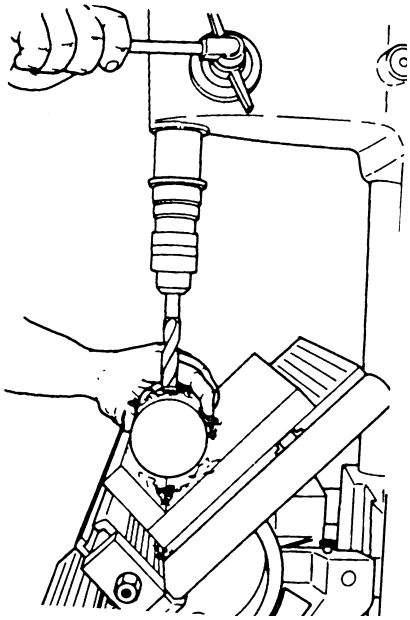

Figure C-30

Drilling Duplicates

WARNING

Make sure that the stock is held securely.

1. The rip fence and the miter gauge can be locked on the table in a variety of different configurations to drill duplicate holes in duplicate pieces of stock. See Figs. C-31 through C-33.

2. To set up for this, first be sure that all your stock is sawn and sanded exactly the same dimensions. Mark the position of the hole you want to drill on one piece of stock, then set the rip fence and the miter gauge to hold the stock while you drill. Tilt the table and set the miter gauge angle. Once the setup is properly adjusted, you can drill duplicate holes in all the stock.

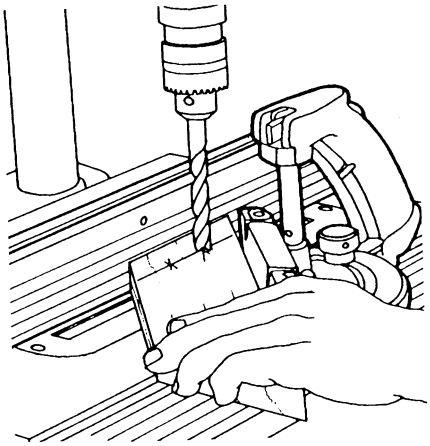

Figure C-31

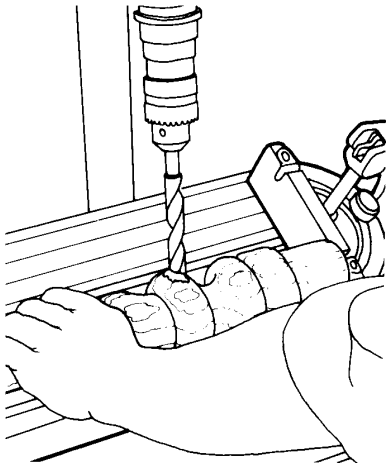

Figure C-32

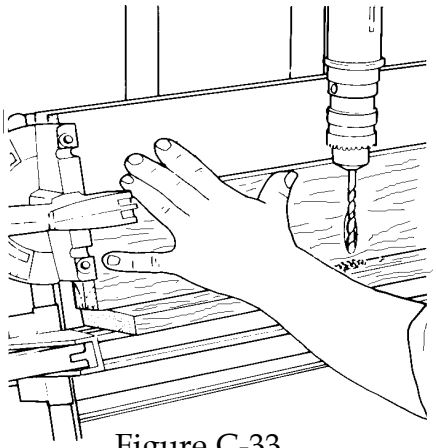

Figure C-33

Drilling Plastic

1. When drilling plastic, work at "Slow" speed. The larger the hole, the slower the speed should be. If you go too fast, the drill bit will heat up and melt the plastic.

2. Don't use brad-point drill bits; you may dull them. You can use a twist drill bit, but you risk splintering certain types of plastic. The best drill bit is a special **plastic-drilling bit.**

Drilling Metal

1. When drilling metal, clamp it to the worktable or rip fence and work at "Slow" speed. Use a sharp, high-quality **twist-bit.**

WARNING

Never drill metal freehand. Always clamp the metal to the worktable and the back-up stock, or the rip fence and the back-up stock.

2. Feed the drill bit very slowly into the metal and apply plenty of oil to the tip of the drill bit. This will keep the drill bit from dulling quickly.

3. If the drill bit catches, back it out quickly; then feed it more slowly with less pressure. If the drill bit stalls completely and the quill won't retract, quickly turn off the Mark V. Back the drill bit out of the hole, turning it counterclockwise by hand. Once the drill bit is free, turn on the machine and feed the drill bit slowly back into the metal. Once the drill bit goes through the metal, turn off the Mark V and let it come to a complete stop before you unclamp the metal.

4. After you drill metal, be sure to wipe off the Mark V. The excess oil from the operation could mix with sawdust and impede the movement of parts. Also, metal shavings could scratch the tubes or get inside the headstock.

Horizontal Boring Operations

HORIZONTAL BORING SPEED CHART

Size of Hole	Hardwood	Softwood
1/4" and less	**H** (1600 rpm)	**I** (1750 rpm)
1/4" to 1/2"	**F** (1300 rpm)	**G** (1450 rpm)
1/2" to 3/4"	**D** (1050 rpm)	**E** (1150 rpm)
3/4" to 1"	**B** (850 rpm)	**C** (950 rpm)
Over 1"	**Slow** (700 rpm)	**A** (750 rpm)

Boring metals (twist drill bits only) — Slow (700 rpm)

Safety

WARNING

Before performing horizontal boring operations:

- Read the SAFETY section, especially for the horizontal boring mode.
- Complete ALL the Assembly and Alignment procedures.
- Set up the horizontal boring mode according to the instructions found in your Mark V Model's section.
- Remove the key from the chuck.
- Secure locks.

Horizontal Boring Speeds

Before you begin any horizontal boring operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of material you're boring. To determine the right speed for the job, refer to the Horizontal Boring Speed Chart.

General Boring

There are two basic types of holes: holes that you bore through the stock, and holes that only go part way through the stock.

Boring Through

1. Mount the rip fence on the table to use as a backstop. (If there's no room for the rip fence, use the miter gauge.)

2. Clamp a scrap of wood on the fence to keep the bit from boring into the fence and the stock from splintering where the bit exits. This scrap should be taller than the fence.

3. Mark the holes on the stock, and lay it against the scrap. Make fine adjustments with the table height crank. See Figure C-34. Clamp the stock to the table.

4. Extend the quill so that the cutting flutes of the bit touch the scrap wood. Set the depth control to 1/8" beyond and tighten the depth control lock. Then let the quill retract. Position the stock in front of the bit and hold it against the table and rip fence. Extend the quill with the machine off to check where the bit will drill.

5. Turn on the Mark V, set the speed, and feed the bit into the stock. See Figure C-35. When boring deep holes, it will be necessary to retract the bit now and then to clear chips from the hole. When you feel the depth control stop the quill, retract the bit. Set the speed dial to "Slow" and turn off the machine. Let it come to a stop, then remove the stock.

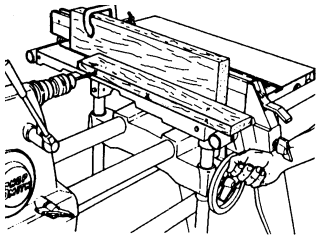

Figure C-34

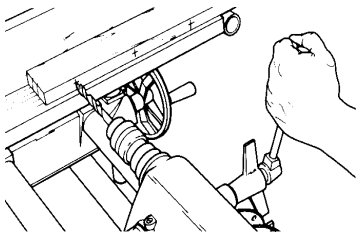

Figure C-35

Boring Part Way

1. This operation is similar to boring through, except you should extend the quill until the cutting flutes of the bit just touch the stock. Then set the depth control and lock it. The depth control will stop the quill when the bit reaches the proper depth.

2. All the holes you bore at any one depth control setting will be exactly the same depth. When you need to bore a number of holes all at the same height, such as when doweling stock edge-to-edge, hold the stock down with equal pressure at each hole.

Avoiding Tear-Out

1. Prevent rough, splintery edges where the drill exits the stock— by moving the scrap block every time you drill a new hole– this way there's always a firm surface to back up the stock. Or, if you're using brad-point bits, you can use the depth control to avoid tear-out.

2. With the Mark V turned off, extend the quill until the pilot of the brad point bit touches the scrap wood. Lock the quill. Set the depth control to "O" and lock it in place. Unlock the quill and let it retract.

3. Bore the holes you need, letting the depth control stop the quill. Set the speed dial to "Slow", turn off the Mark V and turn the stock over. There will be a tiny pinhole where the pilot started to come through the stock. Use this pinhole to line up the bit, then finish boring the hole from the other side. Since brad-point bits have spurs that cut the wood grain smoothly when they enter the wood, there will be no tear-out on either side of the stock.

Boring End Grain

1. Use the miter gauge to align the stock with the bit and adjust the safety grip to the thickness of the stock. If the stock is less than 30" long, mount the rip fence on either the worktable or extension table and use it as a backstop. If the stock is more than 30" long and you have to work without a backstop, clamp the stock to the table to keep it from slipping. Adjust the table height and depth control as desired. See Figure C-36.

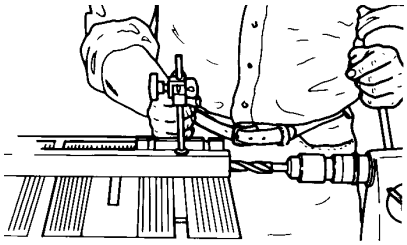

Figure C-36

2. Set the speed dial to "Slow" and begin boring. As you feed the quill, don't be alarmed if it takes more pressure than usual. End grain is hard to cut.

Boring at an Angle

1. Mount the rip fence on the table to use as a backstop. Tilt the table toward the headstock and clamp the stock to the table. See Figure C-37. If the angle is acute and you're boring through the stock, place scrap wood on the table and the rip fence.

2. You can also use the miter gauge as a backstop. Be sure to clamp the stock to the table. Otherwise the bit will push the stock out of alignment. See Figure C-38.

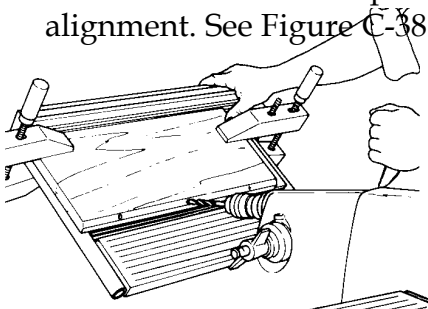

Figure C-37

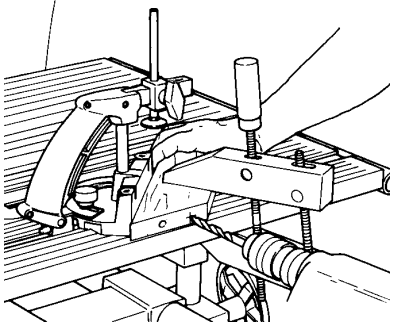

Figure C-38

Lathe Turning Operations

LATHE TURNING SPEED CHART

Size of Stock	Rounding	Shaping	Sanding
Up to 2" dia	C (950 rpm)	F (1300 rpm)	K (2050 rpm)
2" to 4"dia	B (850 rpm)	E (1150 rpm)	J (1900 rpm)
4" to 6"dia	A (750 rpm)	D (1050 rpm)	H (1600 rpm)
Over 6"dia*	Slow (750 rpm)	A (750 rpm)	B (850 rpm)

* Large heavy stock requires slower speeds.

Safety

WARNING

Before performing lathe turning operations:

- Read the SAFETY section, especially for the lathe mode.
- Complete ALL the Assembly and Alignment procedures.
- Secure locks.

Lathe Turning Speeds

NOTE

The speeds in the speed chart are only suggested speeds.

Before you begin any lathe turning operation, know the correct speed at which to set the speed dial. The speed is determined by the operation and the type of material you're turning. To determine the speed for the job, refer to the Lathe Turning Speed Chart.

Turning Know-How

Spindle Turning

This type of turning is done with stock mounted between the drive and cup centers.

Faceplate Turning

This type of turning is done with stock mounted to a faceplate.

Scraping

This technique uses the cutting edge of the tool to scrape the stock. See Figure C-39. Position the tool rest just below the axis of rotation of the stock so the chisel cuts on center. Slowly feed the chisel toward the stock. The chisel should point directly at the center of the stock.

Shearing

This technique uses the cutting edge of the tool to pare away the stock. See Figure C-40. Position the tool rest 1/4"-1/2" below the top of the stock, and feed the chisel at an angle.

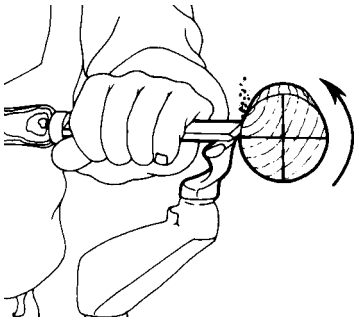

Figure C-39

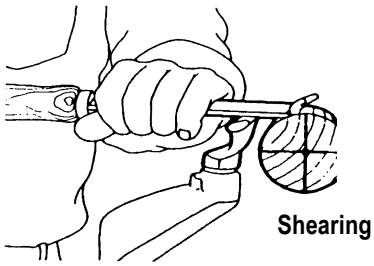

Figure C-40

Lathe Tools

Gouges round the stock and make coves; roundnose chisels make coves; skew chisels make beads and cut cylinders; parting tools size and part.

Balance

1. This is extremely important when turning glued-up stock, long stock and stock more than 3" in diameter. Check the balance of your spindle and faceplate stock after you've marked the centers.

2. To do this, drive a standard 8-penny nail straight into each center. Use suitable string to hang the stock in a level position from the front bench tube of the Mark V or a saw horse. The ends of the string should be looped around the nails. See Figure C-41. Gravity will pull the heavy side down. Use a jointer, bandsaw or hand plane to remove no more than 1/32" at a time from the heavy side until the stock remains stationary when rotated to three positions 90 degrees apart.

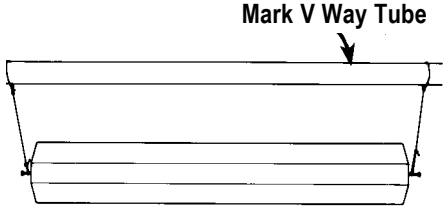

Figure C-41

Spindle Turning

Follow these steps for spindle turning operations:

1. **Mounting** - This is an extremely important operation.

NOTE

Improperly mounted stock is dangerous and difficult to turn.

WARNING

- Make sure the workpiece is not cracked or split.

- When turning glued up stock, make sure the glue joints are strong. Glue the stock and leave it clamped for at least 24 hours prior to turning.

- Cut stock that's more than 3" square into an octagon. This removes excess stock which makes turning safer and easier.

a. With a straightedge, draw two diagonal lines corner-to-corner on each end of the stock to find the center.

b. Position the points of the drive and cup centers at the center marks and hit the centers sharply with a nylon or rawhide mallet. Do not use a metal hammer.

-- If you're using a live center, avoid damaging the live center bearing by using the cup center for this procedure. The hole left by the cup center will accommodate the live center.

-- To help seat the centers when working with hardwood, drill 1/8" dia. by 1/2" deep holes in both ends of the stock, and/or saw diagonal kerfs 1/8" deep.

-- When properly seated, the drive center will leave a hole and four slots and the cup center will leave a hole and a small circle 1/16"-1/8" deep. .

WARNING

The spurs of the drive center and the cup of the cup center must penetrate at least 1/16" into the stock. Do not use a drive center, cup center or live center if the point is damaged. The stock could be thrown from the lathe.

c. Cut stock larger than 3" square into an octagon using the bandsaw.

d. Mount the drive center on the main spindle and the cup center in the tailstock. Mount the tailstock in the base mount. Position the headstock so that the centers are about 1" farther apart than the length of the stock, then lock the headstock.

WARNING

Wax or soap the end of the stock that mounts to the cup center. This lubrication helps keep the center from wearing into the stock and causing the stock to loosen on the lathe.

e. Hold the end of the stock against the cup center, then extend the quill and mount the other end on the drive center. Press hard against the quill feed lever, then lock the quill. See Figure C-43.

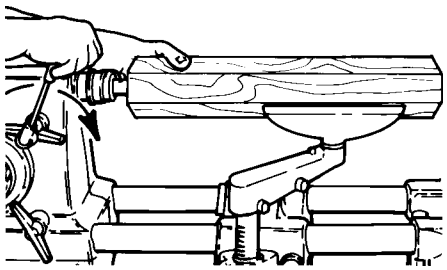

Figure C-43

f. Adjust the height of the tool rest and align it parallel to the stock and not more than 1/4" away.

g. Turn the stock by hand to make sure it clears the tool rest. Make sure speed is set at "Slow". Then turn on the machine briefly to test that the stock rotates smoothly. If the stock vibrates significantly, the center holes must be relocated and/or the stock balanced.

2. **Rounding** -- This turns the stock down to a rough cylinder.

WARNING

During turning, periodically turn off the Mark V and readjust the tool rest to maintain a 1/4" distance between the tool rest and the stock. Also, adjust the quill to keep the stock secure between the centers.

a. Lay a gouge on the right end of the tool rest with the cup facing up and tilted slightly toward the left. Angle the handle slightly toward the right end of the tool rest so that the bevel is almost parallel to the stock.

b. Gently feed the cutting edge toward the stock until the tip just touches the stock. Then draw it slowly and steadily along the tool rest, removing a little bit of stock.

c. Turn the gouge so the cup still faces up, but slightly toward the right. Angle the handle to the left.

d. Feed the gouge into the stock and draw it back along the tool rest. Repeat this procedure until the stock is completely round. See Figure C-44. Turn off the Mark V.

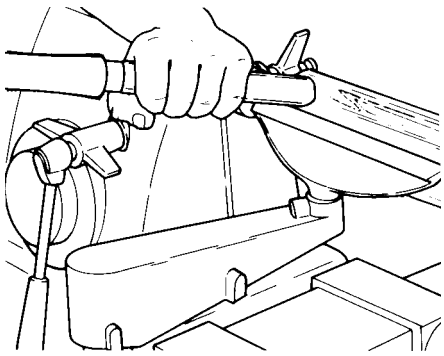

Figure C-44

3. **Sizing** -- this marks the approximate diameters of the shapes.

a. Use a pencil to mark the beads and coves.

b. Turn on the machine and increase the speed slightly. With a parting tool, cut grooves in the stock. See Figure C-45. Use calipers to check the diameters.

4. **Shaping** -- This forms the beads and coves in your design. Turn the large diameters first to avoid weakening the stock for the rest of the turning.

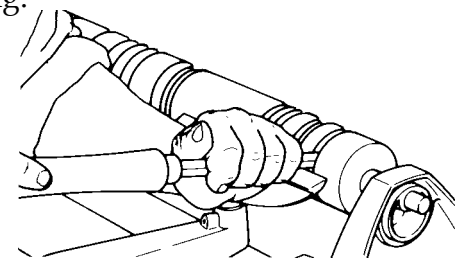

Figure C-45

a. Cut the beads first. Feed the edge of a skew chisel slowly into the stock, then move the handle of the skew from side to side as needed to shape the beads. See Figure C-46.

b. Cut the coves. Feed a gouge slowly into the stock, then move the handle of the tool from side to side to shape the cove. See Figure C-47.

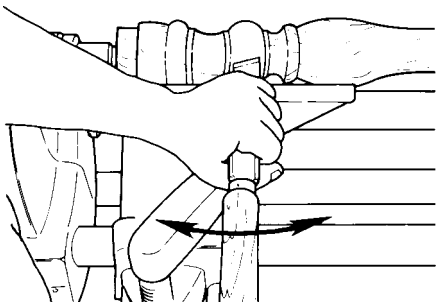

Figure C-46

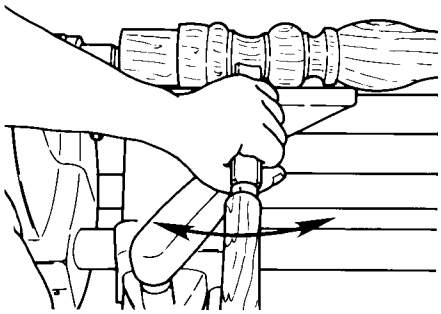

Figure C-47

5. **Sanding --** It's much easier to sand a turning on the lathe than it is to remove it and hand sand it.

WARNING

Always remove the tool rest before sanding the turning on the lathe.

a. Remove the tool rest and increase the speed slightly.

b. Start with medium sandpaper. Double the sandpaper over several times to protect your fingers. Begin to sand by holding the sandpaper lightly against the stock. Work your way through progressively finer grits. See Figure C-48.

c. Sanding causes feathers on the stock. To remove these: Wet the stock with a damp rag, wait a few minutes for the water to raise the grain and evaporate, then final sand with a very fine grit. Or, dismount the spindle, turn it end for end, remount it, then final sand.

6. **Parting** -- Use a parting tool, turned on its edge to scrape away stock from the ends of the spindle. See Figure C-49. Always leave 1/8 the thickness of the diameter. For example: if the diameter is 2", leave 1/4"; if 3", leave 3/8"; if 4", leave 1/2". Remove the spindle from the lathe and cut off the waste stock.

WARNING

DO NOT part the turning completely or turn it down to such a small diameter that it snaps on the lathe.

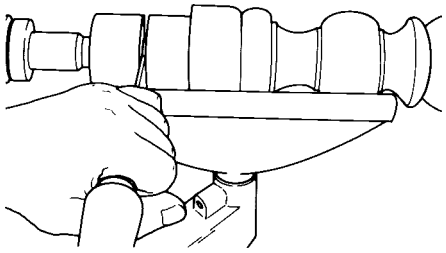

Figure C-49

Faceplate Turning

1. **Mounting** -- This is an extremely important operation. Improperly mounted stock is dangerous and difficult to turn.

WARNING

- Make sure the stock is not cracked or split.
- When turning glued up stock, make sure the glue joints are strong. Glue the stock and leave it clamped for at least 24 hours prior to turning.
- Cut the stock round using a bandsaw, or cut off the corners using a bandsaw or table saw. This removes excess stock which makes turning safer and easier.
- Large, heavy stock should be turned only at very low speeds, AND with the extra support of the tailstock, as seen in Figure C-49a.

a. Find the center of the stock by drawing diagonal lines from corner to corner. Then use a compass to mark the outside diameter of your turning. Cut the stock round.

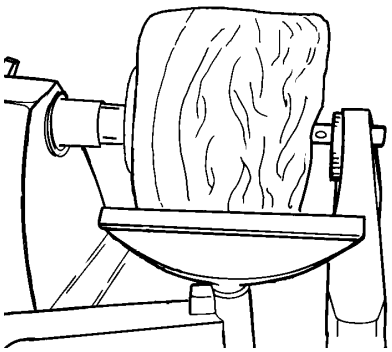

Figure C-49a

-- If you don't want screw holes in the bottom of your finished turning, mount the stock to a block of wood. Select a block at least 1" thick and about the same diameter as the faceplate. Find the center of this block, then glue the block to the stock, center to center. Put a piece of newspaper in between the block and the stock when you glue them up. Leave clamped at least 24 hours. See Figure C-50.

b. Mount the turning stock to the faceplate with three #12-by-1 1/4" wood screws. The screws must sink into the block at least 3/4". For large, bulky turnings use longer screws and a thicker block.

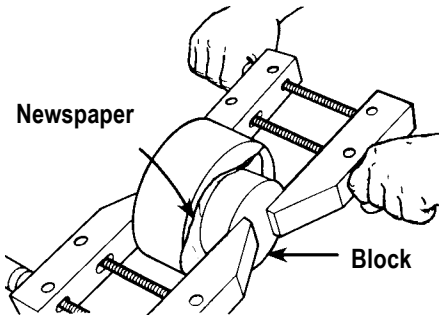

Figure C-50

WARNING

If the screws are being driven into end grain, the screws must sink into the block at least 2". Use #12-by-2 1/2" long wood screws.

c. Mount the faceplate on the main spindle. Tighten the setscrew against the flat of the spindle.

d. Turn the outside first. Adjust the height of the tool rest and align it parallel to the stock and not more than 1/4" away. When turning heavy stock mount the tool rest in the center position. Support the stock with both the main spindle and the tailstock, as shown in Figure C-49a.

e. Turn the stock by hand to make sure it clears the tool rest. Then turn on the machine briefly to test that the stock rotates smoothly, with no excessive vibration.

2. Rounding -- Round the outside, using a roundnose or gouge, just as you would for

spindle rounding. See Figure C-51. If the wood grain is perpendicular to the axis of rotation, do not shear.

WARNING

During turning, periodically turn off the Mark V and readjust the tool rest to maintain a 1/4" distance between the tool rest and the stock.

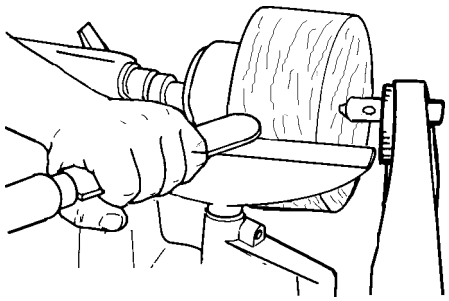

Figure C-51

3. Shaping the outside -- Make the beads and coves in the same manner as for spindle shaping. See Figure C-52. If the wood grain is perpendicular to the axis of rotation, do not shear.

4. Shaping the inside -- Position the tool rest not more than 1/4" from the stock and adjust the height so that it's about 1/4" below the center of the stock.

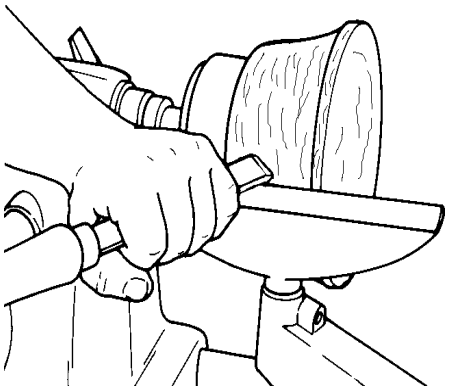

Figure C-52

a. Scraping is one way to shape the inside. Turn on the machine, set the speed, and feed a roundnose chisel against the downward side of the stock. See Figure C-53. As you work, periodically check the inside diameter with inside calipers.

5. Sanding -- Sand the turning as you would a spindle. (Refer to "Spindle Turning" Step 5.) Remove the tool rest.

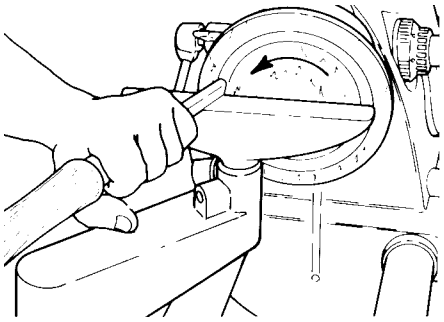

Figure C-53

a. Remove the feathers either by wetting the wood or by dismounting the faceplate from the main spindle and remounting it on the upper auxiliary spindle.

6. Parting -- Dismount the faceplate from the main spindle and unscrew the faceplate. If a block was glued to the stock, clamp the block in a vise and place a chisel between the block and the turning. Hit the chisel with a mallet, driving it between the block and the turning. Sand the remains of the newspaper and any excess glue off the turning.

NOTES

Shopsmith Mark V Speed Charts

(For all motors)

Setting the Mark V to Run at the Proper Speed

After you turn on the Mark V, but before you begin woodworking, set the Mark V on the correct speed for the operation you are about to perform. **This is important!** It is unsafe to run the lathe at table sawing speeds, and time-consuming to run the table saw at lathe speeds. To find the proper speed for any given operation, consult the charts to the right.

To adjust the speed of the Mark V, **first turn on the machine.** Let it get up to running speed, then turn the speed dial.

To **increase** the speed, turn the dial clockwise, as shown in Figure A.

Figure A

To **decrease** the speed, turn the dial counter-clockwise, as shown in Figure B.

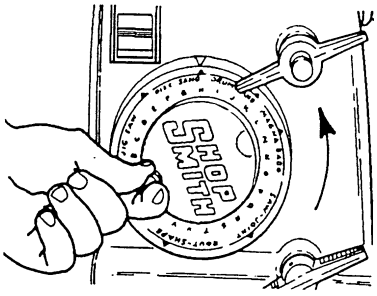

Figure B

ONLY turn the speed dial when the Mark V is running. Otherwise, you will damage the speed changing mechanism.

TABLE SAWING SPEED CHART

Operation	Hardwood	Softwood
General Sawing	**R** (3500 rpm)	**R** (3500 rpm)
Heavy Ripping	**O** (2800 rpm)	**P** (3000 rpm)
Trim Cuts	**S** (3800 rpm)	**S** (3800 rpm)

DISC SANDING SPEED CHART

Grit	Hardwood	Softwood
Coarse (60#)	D (1050 rpm)	E (1150 rpm)
Medium (80#)	F (1300 rpm)	G (1450 rpm)
Fine (100#)	G (1450 rpm)	H (1600 rpm)

Grinding or Sharpening Metal Tools — Slow (700 rpm)

VERTICAL DRILLING SPEED CHART

Size of Hole	Hardwood	Softwood
1/4" and less	H **(1600 rpm)**	I **(1750 rpm)**
1/4" to 1/2"	F **(1300 rpm)**	G **(1450 rpm)**
1/2" to 3/4"	D **(1050 rpm)**	E **(1150 rpm)**
3/4" to 1"	B **(850 rpm)**	C **(950 rpm)**
Over 1"	Slow **(700 rpm)**	A **(750 rpm)**

Drilling metals (twist bits only) — Slow (700 rpm)

HORIZONTAL BORING SPEED CHART

Size of Hole	Hardwood	Softwood
1/4" and less	**H** (1600 rpm)	**I** (1750 rpm)
1/4" to 1/2"	**F** (1300 rpm)	**G** (1450 rpm)
1/2" to 3/4"	**D** (1050 rpm)	**E** (1150 rpm)
3/4" to 1"	**B** (850 rpm)	**C** (950 rpm)
Over 1"	**Slow** (700 rpm)	**A** (750 rpm)

Boring metals (twist drill bits only) — Slow (700 rpm)

LATHE TURNING SPEED CHART

Size of Stock	Rounding	Shaping	Sanding
Up to 2" dia	C (950 rpm)	F (1300 rpm)	K (2050 rpm)
2" to 4"dia	B (850 rpm)	E (1150 rpm)	J (1900 rpm)
4" to 6"dia	A (750 rpm)	D (1050 rpm)	H (1600 rpm)
Over 6"dia*	Slow (700 rpm)	A (750 rpm)	B (850 rpm)

* Large heavy stock requires slower speeds.