



DOUBLE-TILT BASE UPGRADE

556210

INTRODUCTION

The parts in this upgrade kit will allow you to convert your Shopsmith Mark-V models 505, 510 and 520 to a double-tilting machine. After completing this upgrade your machine will tilt to the right, as usual for vertical drilling, but will also tilt to the left. This left-tilt is excellent for under-table operations such as Shaping, Routing and Drum Sanding.



PARTS LIST	
522836	Base Assembly 2
522837	Pivot Arm Assembly 2
522797	Tie Bar Post 2
522838	Hardware Pack 1
522876	Lock Knob 2
501286	Accessory Mnt Handle 2

TOOLS REQUIRED

- ◆ 9/16" Socket and Ratchet
- ◆ 5/16" Pin Punch
- ◆ Ball-Peen Hammer
- ◆ Large Flat Screwdriver
- ◆ #3 Phillips Screwdriver
- ◆ #2 Phillips Screwdriver
- ◆ 7/16" open-end Wrench
- ◆ 5/32" (Shopsmith) Allen Wrench
- ◆ Paste Wax
- ◆ A piece of corrugated cardboard approximately 24" x 30"
- ◆ Tube Support (make before disassembly, see drawing)
- ◆ Headstock Support 3/4" x 3-3/4" x 10" (make before disassembly)

SAFETY

WARNING

READ, UNDERSTAND AND FOLLOW ALL THE INFORMATION IN THIS OWNER'S MANUAL.

The meanings of **WARNINGS, CAUTIONS, AND NOTES** are:

WARNING

A WARNING is given when failure to follow the directions could result in injury, loss of limb, or life.



A CAUTION is given when failure to follow the directions could result in temporary or permanent damage to the equipment.

NOTE

A NOTE is used to highlight an important procedure, practice or condition.

NOTE

It is important to provide adequate lighting in your shop area.

Eye Protection

- Always wear eye protection when you use power equipment. Use goggles, safety glasses or a face shield to protect your eyes.
- Goggles completely surround and protect your eyes. Many goggles will also fit over regular glasses. Be sure your goggles fit closely, but comfortably.
- Safety glasses don't fog as easily as goggles and can be worn all the time. Regular eyeglasses normally have only impact resistant lenses. They are not safety glasses.
- A face shield protects your entire face. And you can flip it up out of the way when you don't need it. A face shield can be used with regular glasses.

Ear Protection

- Prolonged exposure to high noise levels from high speed power equipment can damage your hearing.
- Hearing protectors screen out noise that can damage your ears. Wear hearing protection when you are exposed to high intensity power equipment noise.

WARNING

- ◆ Read, understand and follow the Mark V/7 Owner's Manual and the manual for every power tool you use.

◆ Additional warnings, cautions and instructions and operating techniques are provided in the Shopsmith book, Power Tool Woodworking for Everyone. (A copy is included with your new Mark V/7, and is also available from Shopsmith.)

- ◆ Wear proper eye and ear protection. Also, wear a dust mask.
- ◆ Plan every operation before you begin. If you are in doubt about how to perform an operation safely, do not attempt it. Consult your Owners Manuals and Power Tool Woodworking for Everyone textbook for proper, safe technique. If you are still unsure about performing the operation, contact a Shopsmith Customer Service associate.

MAKE THE TUBE SUPPORT & HEADSTOCK SUPPORT

The Tube Support is used to hold the positions of the bench tubes while each end is being disassembled. In the drawing (Attachment A) it is shown made from two pieces of $\frac{3}{4}$ " thick wood with a 2-1/4" wide base to stabilize it between the Bench and Way Tubes. Test fit the Tube Support before taking apart your machine. Make sure it slips between the Bench and Way Tubes on both ends of the machine.

The Headstock Support is a single piece of $\frac{3}{4}$ " thick wood that will support the weight of the Headstock, taking some of the load from the Worktable.

MACHINE SET-UP, DISSASSEMBLY AND REASSEMBLY

WARNING

TURN OFF AND UNPLUG THE MARKV DURING THIS CHANGEOVER. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL STARTING OF THE MOTOR, WHICH COULD CAUSE SERIOUS BODILY INJURY.

During disassembly and reassembly of the machine base, you will be working on the machine up-side-down and because of this, we want you to keep several items in mind while you make this change over:

- During this process the ends of the machine will be identified as either left or right. This is the same no matter whether the machine is upright or up-side-down. The left and right ends of the machine are always on your left or right as you face the Headstock switch.
 - You will need a helper to turn the machine up-side-down. It is heavy, do try to do this yourself. If you do try to turn the machine over by yourself, there is a good chance you will hurt yourself and damage your machine.
 - The Main Worktable and a piece of wood under the Headstock will support the weight of the machine while you are working to remove the old parts and install the new parts. Be sure the table is securely locked in position.
 - To prevent the machine from tipping when the ends are removed, follow the Headstock and table positioning instruction precisely and make sure all locks are secure.
- Because the Main Worktable top will be setting on the floor, place a piece of corrugated cardboard on the floor, under the table to prevent it from being scratched.
 - You will be using your old bolts, lock washers and Bench Tube Lock Bars to mount you new Base Assemblies to your Bench Tubes. Please take care to keep them together and within easy reach.
 - You will be working about 22" from the floor. To prevent bending over the whole time during this process or working on your knees, pull up a chair and have a seat. If the chair has wheels, that's even better.

Machine set-up

1. Remove all accessories and tables from the Mark-V. All that is left is the bare Headstock and Carriage on the Way Tubes. Then slide the Headstock all the way to the right end of machine. Secure the Headstock and Carriage locks. Set the machine up in the vertical drill press position. Secure the Base Lock.
2. Remove the Lift Assist gas cylinder Disconnect one end of the gas cylinder from the mounts. See the Lift Assist Owners Manual for this procedure. Next, loosen, but do not remove, the eight nuts and bolts that hold the Lift Assist's upper and lower assemblies to the way tubes and bench tubes. These assemblies must be able to slide out of the way.
3. Loosen the Setscrews in the Way Tube Tie Bar. Look up at the underside of the Way tube Tie Bar. It is located at the end of the way tubes that are up in the air. You will find two setscrews holding this casting to the Way Tubes. Use the 5/32" Allen Wrench to loosen these setscrews. Do not

remove the Way Tube Tie Bar from the Way Tubes at this time. See Figure 1.



Figure 1

4. Loosen the two setscrews that secure the Base Arm to the Way tubes.

- a. If your machine was made before December 1993, these setscrews are inside the pivot arm casting. You must look past the pivot pin deep in the casting to find them. Use the long end of the 5/32" Allen Wrench to reach in and loosen them, as shown in Figure 2.



Figure 2

- b. If your machine was made after December 1993, these setscrews are on the top of casting, now at the right end of the machine. Use the 5/32" Allen Wrench to reach in and loosen them, as shown in Figure 3.

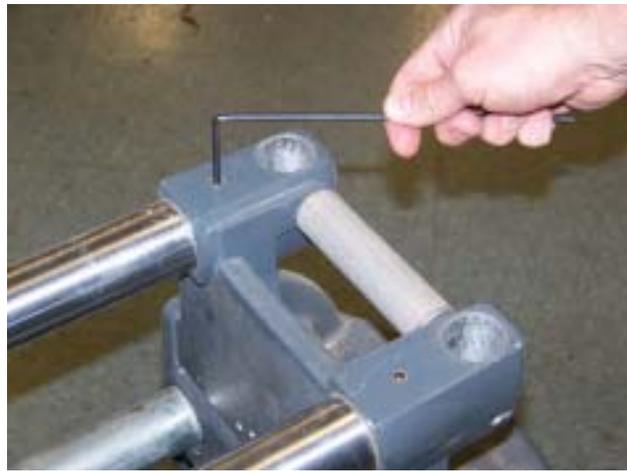


Figure 3

5. Pivot machine from the vertical drill press position. Loosen the Base Lock and lay the machine down in the horizontal position. Secure the Headrest Lock on the left end of the machine.
6. Unlock and slide the Headstock. Position it 14" from the left end of the way tubes. The Carriage and the Carriage Stop Ring must be positioned next to the Headstock. Secure the Headstock lock and the Carriage lock.
7. Install the Main Worktable in the Carriage. Position the table top 3/4" above the Headstock and lock it securely in place. You can use the Headstock Support Board as a gauge to position the table. See Figure 4.



Figure 4

Turning the machine over

1. Ask your helper to join you. You will need help turning the machine up-side-down.
2. Place the cardboard on the floor to align with the table as the machine is turned up-side-down. Then place the Headstock Spacer next to the Cardboard near its center, as shown in Figure 5.



Figure 5

3. Lay the Mark-V on it's back, with the switch up. The back edge of the table must be on the corrugated cardboard to prevent damage. The table edge overlapping the Headstock, must align with edge of the cardboard so that when the machine is sitting on the table, the spacer board is under the Headstock See Figure 6.



Figure 6

4. Continue to turn over the machine until the table is resting on the cardboard and the top of the Headstock is on the Spacer board. See Figure 7.



Figure 7

5. At this time the machine should be relatively stable. If not, make sure the table is flat on the cardboard, the Headstock is on the wooden spacer and all locks are secured.

Left End Disassembly

1. Remove the Leg from the left end of the machine. Loosen and remove the 5-screws and nuts that secure the sheet metal Leg to the Headrest Casting. Depending on the age of your machine, you will find either square nuts or hex nuts, slotted screws or Phillips screws. This hardware can be discarded. It will not be used again.

NOTE

If your machine has Retractable Casters, do not remove them from the Legs. They will actually help with reassembly of the legs to the Pivot Base at the end of this procedure.

2. Repeat Step 1 above. Remove the Leg from the Base on the right end of the machine.
3. Return to the left end of the machine. Release the Headrest Lock.
4. Place the Tube Support between the way tubes and bench tubes. With the Headrest Lock released, it will easily slip between Way Tubes and the Bench Tubes. See Figure 8.



Figure 8

5. Loosen the Way Tube Lock Bar. Use the 9/16" Socket and ratchet to loosen (but not remove) the two bolts that hold the Bench Tube Lock Bar against the Bench tubes. See Figure 9. You should now be able to slip the Headrest from the bench tubes and then slip the Way Tube Tie Bar from the Way tubes.



Figure 9

NOTE

If you have never removed the Way tube Tie Bar from the way tubes before, you may need to tap it with a rubber or rawhide mallet to loosen it. Gently tap in the center of this casting, between the Way tubes only. See Figure 10. Use only light taps to loosen. Then pull it straight off the Way Tubes.



Figure 10

6. Remove the bolts, washers and Bench Tube Lock Bar from the Headrest you just removed. You will use them to clamp the new Base to the Bench Tubes.

Left End Reassembly

1. Assemble the Base and Pivot Arm. Slip the Base on the Bench tubes and the Pivot Arm on the Way Tubes. If the tube holes seem too close together to slip in the tubes, loosen the Horizontal Lock Knob on the pivot arm (located between the tubes). See Figure 11. This will allow the two castings to slip apart slightly, giving you more room to operate.
2. Slide the Pivot Base on to the Bench tubes. Notice that there are stop ribs in this casting to limit the distance the Bench Tubes can slide into this casting. Slip the Pivot Base casting onto the Bench Tubes only.



Figure 11

until it hits the stop ribs for each bench tube. See Figure 12.



Figure 12

3. Install the Bench Tube Lock Bar. Slip the Bolts with Lock Washers through the holes in the flat side of the lock bar. Thread each bolt in the tapped holes in the bottom of this Pivot Base Assembly. See Figure 13.



Figure 13

4. Tighten the Bench Tube Clamp Bolts. Use the 9/16" Socket and ratchet to tighten these bolts securely following the procedure below. Make sure the ends of both Bench Tubes are touching the stop rib in the base casting. (See Figure 14) check this at each tightening step below.



Figure 14

NOTE

The stop ribs in the Base Casting and the equal length of the Bench tubes assure that the Base assembly is square when assembled. Each end of both Bench Tubes must touch each end of the stop ribs after the Clamp Bolts are tightened. Failure to tighten the Bench Tube Clamp Bolts when the ends of the bench tubes are not in contact with the stop ribs in the Base casting will create Arm-slot to Pivot Pin catching and alignment problems when the machine pivoted to the vertical positions.

Tighten the Bench Tube Clamp Bolts following the steps below:

- Finger-tighten both bolts.
- Tighten each bolt one-half revolution.
- Tighten each bolt one-half revolution again.
- Tighten each bolt one-half revolution a third time.
- Tighten each bolt one-quarter revolution. This will be tight enough.

5. Tighten the Horizontal Lock Knob. If you needed to loosen the Horizontal Lock Knob on the pivot arm (located between the tubes) tighten it at this time. The setscrews to secure the Pivot Arm to the Way Tubes will be tightened after turning the machine right-side-up.
4. Remove the bolts, washers and Bench Tube Lock Bar from the Headrest you just removed. You will use them to clamp the new Base to the Bench Tubes.

Right End Reassembly

Right End Disassembly

1. Loosen the Way Tube Lock Bar. As you did on the left end of the machine, use the 9/16" Socket and ratchet to loosen (but not remove) the two bolts that hold the Bench Tube Lock Bar against the Bench tubes on the underside of the old Pivot Base.
2. Place the Tube Support between the way tubes and bench tubes. With the two bolts loose, it will easily slip the Support between Way Tubes and the Bench Tubes.
3. Slip the old Pivot Base from the bench tubes. As you do this, slip the old Pivot Arm from the Way tubes.

NOTE

If you have never removed the Pivot Arm from the Way Tubes before, you may need to tap it with a rubber or rawhide mallet to loosen it. Gently tap in the center of this casting, between the Way tubes only. Use only light taps to loosen. Then pull it straight off the Way Tubes. See Figure 15.



Figure 15

1. Assemble the Base and Pivot Arm. Slip the new Base on the Bench tubes and the new Pivot Arm on the Way Tubes. If the tube holes seem too close together to slip in the tubes, loosen the Horizontal Lock Knob on the pivot arm (located between the tubes). This will allow the two castings to slip apart slightly, giving you more room to operate.
2. Slide the Pivot Base on to the Bench tubes. Notice that there are stop ribs in this casting to limit the distance the Bench Tubes can slide into this casting. Slip the Pivot Base casting onto the Bench Tubes only until it hits the stop ribs for each bench tube.
3. Install the Bench Tube Lock Bar. Slip the Bolts with Lock Washers through the holes in the flat side of the lock bar. Thread each bolt in the tapped holes in the bottom of this Pivot Base Assembly.
4. Tighten the Bench Tube Clamp Bolts. Use the 9/16" Socket and ratchet to tighten these bolts securely by following the tightening procedure below. Make sure the ends of both Bench Tubes are touching the stop rib in the base casting. Check this at each tightening step below.

NOTE

The stop ribs in the Base Casting and the equal length of the Bench tubes assure that the Base assembly is square when assembled. Each end of both Bench Tubes must touch each end of the stop ribs after the Clamp

Bolts are tightened. Failure to tighten the Bench Tube Clamp Bolts with the ends of the Bench Tubes in contact with the stop ribs in the Base casting will create Arm-slot to Pivot Pin alignment problems.

Tighten the Bench Tube Clamp

Bolts following the steps below:

- Finger-tighten both bolts.
 - Then tighten each bolt 1/2 revolution.
 - Then tighten each bolt one-half revolution again.
 - Then tighten each bolt one-half revolution a third time.
 - Then tighten each bolt one-quarter revolution. This will be tight enough. Do not over tighten or you will strip-out the threads in the casting.
5. Tighten the Horizontal Lock Knob. If you needed to loosen the Horizontal Lock Knob on the pivot arm (located between the tubes) tighten it at this time. The setscrews to secure the Pivot Arm to the Way Tubes will be tightened after turning the machine right-side-up.

Reinstall the Legs

1. Install the leg into the Pivot Base. Place the small end of the leg into the pivot base. You will have to squeeze it slightly to get the ends to slide inside the bottom of the Base Casting.
2. Push the Leg into the Pivot Base. This may take twist and wiggle back and forth, but it will slide in past the ribs in the casting. Align the screw slots in the Leg with the holes in the Base Casting. See Figure 16.
3. Install the new screws. Slip the new Leg Mounting Screws through the holes in the Pivot Base and through the slots in the Leg.



Figure 16

Start with the center screw, then the end screws then the remaining screws.

4. Install the Nuts. Thread the nuts on the screws you just installed. Tighten them only finger tight. They will be fully tightened after the machine is set upright.

Turn the Machine Right-Side-Up

1. Ask your helper to join you. You will need help setting the machine right-side-up.
2. Lift the machine. You and your helper must lift the machine and turn it over by holding on to the Way Tubes.



Even though the Way Tubes are installed in each pivot arm, their setscrews are not yet secured and the tubes will slide and twist. This may make the machine difficult to lift.

3. Tighten the Leg Mounting Nuts and Screws. Use a #3 Phillips screwdriver and 7/16" wrench to tighten this hardware securely. Tightening this hardware at this time helps to level the legs to the floor.
4. Release the Headstock and Carriage Locks. Slide the Carriage and Headstock

back and forth on the way tubes. They should be no more difficult to slide now than before you changed the end castings.

5. Center the Way Tubes in the Pivot Arms. You probably noticed that you will be able to slide the Way Tubes Left-to-right about $3/8''$. Follow the steps below to center the Way Tubes:
 - Slide each way tube completely into one Pivot Arm.
 - Draw a pencil line where the way tube and the casting meet. (See Figure 17)



Figure 17

- Slide each tube completely into the opposite end Pivot Arm Casting.
- Draw a second pencil line on the same end as the first where the Way Tube meets the Pivot Arm Casting. (See Figure 18)



Figure 18

- Mark a third line half way between these two lines. (See Figure 19)
- Slide each Way Tube into the Pivot Arm Casting until the center line is at the casting.



Figure 19

- Securely lock the setscrews in the top of both Pivot Arms against the Way tubes. Use the long arm of the $5/32''$ Shopsmith Allen Wrench to tighten these setscrews. Tighten these setscrews **ONLY** one-quarter revolution past the point where the setscrew touches the Way Tube.



DO NOT tighten these setscrews too tight or you will strip the threads in the Pivot Arm Casting.

6. Check that the Headstock and Carriage slide well. Slide from on end of the machine to the other. If they bind, loosen the setscrews in the top of the Pivot Arm on both ends of the front way tube. Rotate this tube one-quarter revolution and lock it in position. Slide the Headstock and see if this made an improvement. Repeat until the Headstock and Carriage slide easily across the Way Tubes.

Changing the Tie Bar Tubes

1. Remove the Table Assembly from the Carriage. Loosen the Table Height Lock. Turn the Table height Crank until the table disengaged from the Pinion Gear in the Carriage. Remove the table assembly and set it up-side-down on a workbench with



Figure 20

the Table Stop Bolts for the Drill Press facing toward you.

2. Remove the Table Tilt Indicator. Use a #2 Phillips to loosen and remove the two screws that hold the Table Tilt Indicator to the Tie Bar. (See Figure 20)



Figure 21

3. Drive-out the two Table Post, Cross Pins. Place the tip of the pin punch on the end of the pin on the inside of the Tie Bar. Drive the pin from inside out. (See Figure 21) Repeat for the other Cross-Pin in the second Table Tube.
4. Remove the two Tie Bar Tubes. These tubes fit very closely in their holes in the Tie Bar casting. You will need to grip and twist the tube to remove it.



Figure 22

5. Install the new Tie Bar Tubes. Place the end of one tube with the cross-drilled hole in it over one hole in the Tie Bar. Align the cross-holes in the tube with the cross-holes in the Tie Bar. (See Figure 22) Slip the tube down into the Tie Bar. You may need to twist the tube back and forth as you push it into the hole. When the tube almost bottoms out in the Tie Bar, the holes in the tube should align with the holes in the Tie Bar. (See Figure 23)



Figure 23

6. Wax the Cross-Pins. Examine the Cross-Pins. They are larger at one end than the other. Smear a generous amount of paste wax on the small of the pins. Working

from the outside of the Tie Bar in, slip this small, waxed end of the Cross Pin through the cross-pin hole in the Tie Bar and into the Table Post.



Figure 24

7. Drive the Cross-Pin through the Tie Bar. Use the hammer to drive the Cross-Pin into and through the table Post and the Tie Bar, see Figure 24. To avoid marring the paint, use the pin punch to drive the pin flush with outside of the Tie Bar Casting. (See Figure 25)



Figure 25

8. Reinstall the Table Tilt Indicator. Slip a screw through the end hole in the Table Tilt Indicator. Use the #2 Phillips screwdriver to thread it into it's hole. Repeat for the second screw. Make sure the table is set to 90-degrees. Align the zero-line on the indicator with the zero on the Trunion. Tighten both screws securely.

9. Wax the Table Posts. Use a rag to wax the Table Posts, then buff the excess wax from these posts. Use a stiff bristle brush to remove excess wax from the teeth in the post.
10. Reinstall the main Work Table in the Carriage. Place the ends of the Table Posts into the Carriage. The table should drop into place just as it did before.

Install the Lift Assist (if removed)

1. Position the Headstock and Carriage 6" from the right end of the Way Tubes. Set the machine up into the Vertical Drilling Position.
2. Assemble, install and align the Lift assist to your machine following the instructions in the Lift Assist Owners Manual.

Check and adjust all alignments to your Mark-V:

1. Review alignment procedures in your Owners Manual. Check and adjust all table, blade and center alignments to your machine.

WARNING

- ◆ **Changing the base castings may effect the alignment of your machine. For your own safety check and confirm all alignments as identified your Mark-V Owners manual.**

NOTE

If you have further questions or need additional assistance, please contact Customer Service Toll Free 800/762-7555. Or visit our website: www.shopsmith.com

