

## Cluster #11 – Shaper

### Primary Use

The shaper is a highly valuable and versatile tool. It requires more care and a longer learning curve than other tools, and may also demand the ability to make jigs and fixtures to fully exploit its versatility. In addition to a quiet, vibration-free cut, the shaper allows you to surpass the capabilities of the router by offering wider, deeper cuts and custom moldings. While most of its work is done on the edge of stock, the shaper can also be used for face shaping.

### Important parts

The shaper is a machined table that has a heavy-duty motor mounted underneath, allowing a bit or spindle to extend above the work surface of the table.

The following are the key parts of the Shaper:

- Fence assembly and its associated adjustment and locking knobs.
- Infeed and outfeed fences, and their associated adjustment and locking knobs.
- Spindle height adjustment hand wheel.
- Spindle lock.
- Router collet and nut assembly.
- Spindle assembly.
- Spindle draw bar.
- Powerfeeder.
- Powerfeeder On/Off switch.

### Operating Controls

#### Safety Key

The start/stop switch on the Powermatic Model 2700 comes equipped with a magnetic safety key. To operate the shaper, place the key on the switch cover, lining up the arrow on the key with the REMOVE arrow on the cover. Then rotate the key so the arrow lines up with the LOCK arrow. This will prevent the safety key from coming loose from vibration when the machine is in use.

**Start/Stop Power Indicator Light** – The start switch has a power indicator lamp (green), which is on **whenever there is power connected to the shaper**, not just when the shaper is running.

**Do not trust that no light means no power to the machine. Always check for power first. Failure to comply may cause serious injury!**

**Start** – Press the green start switch.

**Note:** The switch on the digital readout must be set to forward (FOR) or reverse (REV) and the cabinet door must be closed and locked. **Stop** – Press the red switch to stop.

## Digital Readout

The digital readout is used for making incremental spindle height adjustments if multiple shaping/cutting passes are to be performed on a given workpiece.

- Set the digital readout as follows:
- Set the desired spindle height for the workpiece to be cut.
- Supply power to the machine so the digital display is lit.
- Select inch or mm by momentarily depressing the respective button.
- Press the "0" SET button for approximately two seconds. The digital display resets to zero. If this feature is used, the display should be reset to zero for each new cutting operation.

## Spindle Attachment Installation

**INSTALLING THE SPINDLE WILL ONLY BE ACCOMPLISHED BY A FOREMAN QUALIFIED TO PERFORM THIS FUNCTION. IF THE SPINDLE IS NOT INSTALLED CORRECTLY, DAMAGE TO THE SPINDLE COULD RESULT.**

Unplug the machine.

Raise the spindle all the way using the hand wheel located on the front of the cabinet.

### *Locking the Arbor*

Locate the spindle lock accessible through the door on the right side of the cabinet. Pull out and rotate 90° right or left, resetting the knob into the indent. Attempt to turn the spindle by hand to verify it is locked and will not rotate. Leave the door open.

### *Installing the Spindle Attachment*

CLEAN THE TAPER ON THE SPINDLE AND ON THE ATTACHMENT PRIOR TO INSERTING. Place the spindle into the opening, aligning the mark on the spindle with the mark on the threaded area. Place the large spindle nut onto the spindle with the larger threaded opening down. Touching only the spindle nut, tighten by hand until the nut and spindle turn together. This indicates the spindle is "seated" in the opening. (If the nut becomes snug and the spindle has not turned along with the nut, loosen the nut, re-align the two marks and tighten by hand until the nut and spindle turn together.) Continue to tighten by hand until about 1/4" of thread shows above the large nut and then use the shaper wrench to snugly tighten the assembly. Do not turn the nut in the reverse direction once the spindle seats as this could result in cross threading.

Insert the draw bar from the bottom through the opening in the spindle shaft just below the drive belt. Turn the draw bar counter-clockwise securing the spindle, and tighten with the large wrench. Re-tighten the spindle nut.

### *Installing the Shaper Cutter*

Place the steel spindle spacer on top of the large spindle nut. Place the shaper cutter onto the spindle, oriented in the proper direction.

Place the remaining spacers and keyed collar tightly onto the spindle. Note: spacers come in several thicknesses and the stacked selection must be such that the top of the keyed collar sits above the top of the spindle. This will ensure sufficient pressure to properly secure the shaper cutter when installation is complete.

### *Unlocking the Spindle*

Pull out the lock knob accessible through the door on the right side of the cabinet. Rotate 90° right or left, resetting the knob into the detent. Turn the spindle by hand to verify that it turns freely. Close the door after freedom of movement is verified.

**DO NOT START THE MACHINE WITH THE CUTTER HEAD LOCKED.**

### **Adjusting for the cut**

- Set the spindle to the correct height using the front hand wheel located under the table.
- Using the fence lock knob, adjust the opening between the two faces of the fence. The opening should never be larger than is required for the cut, and care should be taken so the fence does not contact the cutter bit. As a rule of thumb, ensure the fences do not extend inside of the opening created by the smallest insert ring used. • The entire fence can be adjusted forward and back using the fence adjustment knob.
- In-feed and out-feed fences may also be adjusted, giving you the ability to make very precise changes in horizontal depth. The fences should be set to their midpoint adjustment (eight turns), using the two calibrated knobs behind each fence.
- One complete revolution of the infeed/outfeed Ram adjust dials moves the fence 1/16". Take up slack in the knobs when making adjustments.
- Use a straight edge to ensure Co-planer Alignment between the fences.
- Expose only as much of the bit in front of the fence as you plan to cut on the first pass. If more than one pass is necessary (heavy or deep cuts), take two or more cuts with the final cut no more than 1/16" deep.
- Whenever possible use the featherboards to keep the work against the table and against the fence. The shaper has two featherboard hold-downs.
  - Use a push stick, or push sticks, to feed the work across the cutting bit.

### **End Grain Routing**

When shaping narrow stock, it is essential to use a "sled," a scrap piece of wood tightly clamped to the workpiece, or the miter gauge, to support the stock during the operation. If the sled is used, the workpiece must be clamped securely in the sled.

## **Moving the Wood in the Correct Direction**

In "FOR," the cutting bit revolves in a counterclockwise direction. Therefore, the work should always be fed across the cutter and along the fence from right to left.

**Always feed against the cutting action, that is, feed the work into the cutters in the direction opposite to the cutting rotation.**

## **Powerfeeder**

The Powermatic Powerfeeder features a continuous-duty motor that transfers power from the gearbox to the four feed rollers providing safe, positive feeding for all types of materials. The fully adjustable support columns feature moveable universal joints and heavy locking mechanisms that lock the feeder in horizontal, vertical, or angle feed positions.

1. After the desired cutterhead is installed and set, adjust the infeed and outfeed fences to the inner edge of the smallest insert ring used. Ensure no portion of either fence will contact any part of the cutterhead.
2. Adjust the outfeed fence so it does not extend into the path of the stock as the stock is moved past the cutterhead by the Powerfeeder. In some cases, the outfeed fence should be set forward to accommodate any stock removed by the cutterhead.
3. Swivel the drive unit into position in front of the cutterhead. The space between the second and third rollers should be located directly in front of the cutterhead. Ensure the unit is parallel with the Shaper table surface.
4. Angle the drive unit slightly toward the out-feed fence about 1/8". This will press the stock tightly against the shaper fences and the table.
5. After angling the drive unit, place a test piece between the rollers and the tabletop. The test piece need not be the same material as the final material, but the thickness must be the same. With the hand crank at the end of the support column, reduce the space over the test piece so the rollers will compress and hold the stock as it passes through the cutter heads. After all adjustments have been made, tighten all locking levers firmly. Re-install the dust cover if removed.
6. Test the setup with the Powerfeeder on, the on/off switch set at one stop in the forward position. Ensure the rollers are not slipping, the Powerfeeder is holding the stock against the fence and table throughout the entire cut and the outfeed fence is set to accommodate the stock as it passes through the cutter heads.
7. When all bits and fences have been set as desired, accomplish the final cut(s) using the instructions in the remainder of this book.

## **Safety**

- **Always Wear Eye Protection or a Face Shield.**
- Never shape a piece of wood shorter than 12" without the use of a support block or feather board. Whenever practical, shape longer stock and cut to size.
- Never allow your hands to come closer than 12" to the cutters.

- Be sure to check the direction of spindle rotation before use.
- Keep the floor around the shaper free of scrap material and debris.
- Whenever possible, install the cutting bit so the bottom of the stock is shaped. In this way the stock will cover most of the cutter and act as a guard.
- Make sure the cutting bit is locked securely to the spindle.
- Always position the left fence so it will support the work that has passed the cutting bit.
- After adjusting the cutter for correct height, check to make sure it clears the fence.
- Examine the stock carefully before cutting to ensure it is free of defects.
- Never cut through a loose knot or stock that is cracked or split.
- Keep hands clear of the cutter area. Do not reach past the cutter to clear parts or scrap with the shaper running. Avoid awkward operations and hand positions where a sudden slip could cause your hand to contact the cutter.
- Cover the bit with a guard whenever possible.
- Use featherboards and push stick(s) to keep your fingers away from the bit.
- Move workpieces from right to left against the fence.
- Never position the fence so the workpiece may get pushed between it and the bit.
- Roll sleeves above the elbow and don't wear loose clothing, loose jewelry.
- Unplug the machine when making adjustments, doing clean-up or performing maintenance.

## **SHAPER, MEMBER DEMONSTRATION**

Have each member perform the following using scrap boards:

- Install a rail bit on the spindle.
- Set the depth of the cut as required.
- Perform a rail cut.
- Remove the rail bit and install a stile bit, then install a raised panel bit on the spindle.
- Set the depth of cuts as required.
- Perform a stile cut, then a raised panel cut.

If a member is unsure or uncomfortable with these operations, repeat the hands on portion of the cluster.