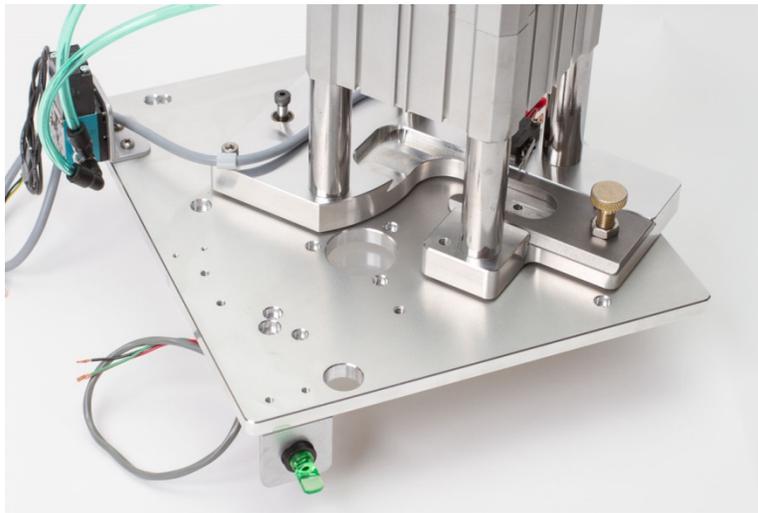


Power Drawbar Little Machine Shop 5500 Installation and Operations Guide



What's Included

The following major components and their associated parts are included with the Power Drawbar.

1. Pneumatic cylinder
2. Base plate
3. Cylinder plate
4. Actuator plate
5. Pneumatic valve
6. Electrical system
7. Drawbar assembly





## Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

### Tools Required

1. 3mm, 4mm, and 12mm hex key wrenches
2. 7/64, 1/8, 9/64, and 5/32 hex key wrenches
3. #1 and #2 Phillips screwdrivers
4. 3/8" and 7/16" open-end wrenches
5. 15mm combination wrench

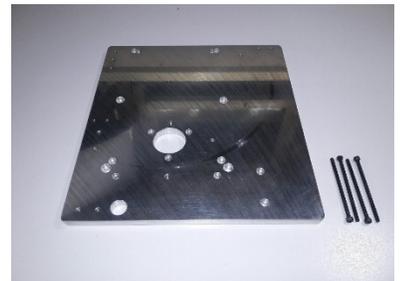
Refer to the Owner's Manual for your mill and the page titled Power Drawbar Base Plate Legend throughout these instructions.

### Prepare Mill

1. Remove power and all tooling.
2. Lower mill head until the spindle is about 4" above the table.
3. Remove any accessories on top of the belt (mill head) cover.
4. Clean the top of the belt cover with a soft cloth.

### Install Base Plate

1. Remove spindle cover and spindle cover base.
2. Remove the 4 socket cap screws which secure the belt cover to the mill head (use a small round magnet to pull the screws up through the counterbored holes).
3. Place the Power Drawbar base plate on top of the belt cover aligning the spindle hole and belt cover holes (4) of the base plate with the corresponding holes in the belt cover.
4. Thread the 4 supplied M4x75mm socket cap screws through the base plate into the belt cover. Do not tighten yet.
5. Check the alignment of the base plate by measuring the offset of the left edge of the base plate to the belt cover from front to back. Gently adjust the position of the base plate so that the left edge is parallel to the belt cover. Make sure that the belt cover is aligned with the mill head. With the mounting holes aligned and left edge of the base plate parallel to the belt cover, tighten the mounting screws.



### Assemble Cylinder

1. Place the cylinder on a flat work surface with the ram facing up.
2. Thread the supplied M16-1.5x20mm hex cap screw into the cylinder ram. Hand tighten only.
3. Position the cylinder with the air ports facing up and the ram to the right.
4. Remove the protective covers from the ports.
5. Install the following parts into the cylinder's air ports from right (ram-end) to left. Tighten firmly, but do not over-tighten.
  - a. 90° flow control (with the knurled knob)
  - b. 90° elbow
  - c. Muffler
  - d. Tee



## Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

6. Cut 5.25" from the supplied 1/4" air supply tubing and connect one end of the Tee connector with the 90° elbow. These are Push-To-Connect components. Align the tube with the connector and gently insert the tube. Once the tube is started into the component, then press the tube firmly into the connector until the tube bottoms-out into the connector. Gently tug on the tube to make sure it is fully inserted into the connector.



### Install Cylinder Plate

1. Place the cylinder plate on a flat surface with the dove-tail slot facing down.
2. Thread the four supplied Nylon socket cap screws into the corresponding holes of the cylinder plate. Use a snug fit but do not over-tighten.
3. Remove the 3/8" center of the supplied UHMW tape rings and apply centered to the top each of the 1/4-20" Nylon socket cap screws.
4. Place the cylinder with the ram up into a vise or secure the cylinder on a work surface so that it will not rotate. If using a vise, use soft jaws or protective shims to protect the cylinder. Make certain the air ports and their components are not facing the vise jaws.
5. Position the cylinder spacers over the four mounting holes of the cylinder.
6. Gently place the cylinder plate onto the spacers with the dove-tail slot facing down and the linear bearing that is press-fit into the cylinder plate on the same end as the air ports of the cylinder.
7. Thread the four supplied M14x110mm socket cap screws down through the cylinder plate and spacers, into the cylinder mounting holes. Use a 12mm hex key wrench to thread the M14 socket cap screws into the body of the cylinder. Before final tightening, make sure that the spacers are centered on the cylinder mounting holes and slightly away from the outer edges of the cylinder walls. Tighten each 14mm cap screw evenly with the other screws in a "crisscross" pattern to make sure the cylinder is mounted flush with the spacers. Then perform a final tightening to secure the cylinder and spacers to the plate.
8. Using good body mechanics, rotate the cylinder and cylinder plate so that the cylinder is up and the plate down. Gently place this assembly on top of the base plate and align the bearing in the cylinder plate with the receiving hole in the base plate. Gently insert the supplied 1/4x1 1/4" shoulder screw down through the bearing and thread into the base plate. Make fine adjustments to the position of the cylinder plate so the shoulder screw threads easily, without binding, into the base plate. Tighten the shoulder screw.
9. Thread the supplied 3/8-16 spring plunger with the black phenolic knob into the designated hole in the cylinder plate. Extend the plunger in the open position (tip retracted) and swivel the cylinder plate back and forth. The cylinder plate should move freely across 90 degrees from forward and parallel to the left edge of the base plate (Power Drawbar engaged position) to perpendicular to the left edge of the base plate (Power Drawbar fully disengaged position).



## Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

10. With the spring plunger released (tip extended), the spring plunger should engage with two holes in the base plate: with the cylinder plate facing forward in the Power Drawbar engaged position, and with the cylinder plate rotated 90 degrees to the right, in the Power Drawbar fully disengaged position.

### Electrical Parts List

1. 12VDC AC adaptor
2. Relay assembly
3. Toggle switch assembly
4. Limit switch assembly
5. 2-position (2), 3-position, and 5-position lever nuts
6. 4-40x1/2" socket cap screws (2)
7. 8-32x3/8" pan machine screws (4)
8. 1/4-20x1/4" socket cap screw
9. 1/4" cable clips: 1 with 1/4" hole; 1 with 3/16" hole, and a 5/8" cable clip



### Install Limit Switch

1. Install the supplied limit switch on the cylinder plate using a 7/64" hex key and the two supplied 4-40x1/2" socket cap screws. The switch should be mounted with the printed side facing down, and the actuator arm facing forward extending out over the dovetail channel of the cylinder plate. Use care tightening these small screws.
2. Make a small half-loop and secure the flex-cable with the supplied cable clip (with 3/16" mounting hole) and 8-32x3/8" pan machine screw to the threaded hole in the cylinder plate adjacent to the limit switch.
3. Secure the flex cable to the back left corner of the cylinder plate with the supplied cable clip (with the 1/4" mounting hole) and 1/4-20x1/4 socket cap screw. Leave some slack in the cable between the cable clips so it is not taught.
4. Swivel the cylinder plate 90 degrees to the right so that the long edge of the cylinder plate is parallel with the back edge of the base plate.
5. Run the flex cable back over the left rear edge and under the base plate and let it hang there for now.



### Install Pneumatic Valve

1. Remove the supplied pneumatic valve from the box and place printed-side up on a flat work surface.
2. Install the following push-to-connect fittings in the valve:
  - a. Extended elbow to lower left port
  - b. Elbow to upper left port
  - c. Muffler to upper right port
  - d. Straight fitting to lower right port
3. The valve and installed fittings should look as shown in the picture.
4. Mount the valve with the printed side to the outside angle side (back) of the supplied valve bracket using the supplied 4-40 screws and washers (2).



## Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

5. Mount the valve bracket to the back-left corner of the base plate as shown in the picture using a #2 Phillips screwdriver and the supplied 8-32x3/8" pan machine screws (2). The 2 elbow connectors should be facing to the front and the muffler and straight connector to the back.

For using push-to-connect tube and connectors, gently insert the tube into the connector to get started, then firmly push the tube all the way in making sure that the tubing is seated firmly in the connector. After making the connection, gently tug on the connection to ensure it is seated correctly.

6. Cut a 9" length of 1/4" Push-To-Connect tubing from the supplied roll. Connect one end to the lower left port of the MAC valve (long elbow) and the other end to the flow-control tee (bottom port) on the air cylinder.
7. Cut an 11 length of 1/4" Push-To-Connect tubing from the supplied roll. Connect one end to the upper left port of the MAC valve (short elbow) and the other end to the tee connector (top port) on the air cylinder.
8. Insert one end of the remaining 1/4" Push-To-Connect tubing into the lower right port of the MAC valve with the straight connector.
9. When ready to test and operate the Power Drawbar, connect the other end to a 1/4" tube Push-To-Connect connector (not supplied) to connect to the air compressor. Installing a ball valve with a 1/4" tube push-to-connect fitting at the air compressor is recommended to be able to enable and disable air flow to the Power Drawbar system.

### Install Toggle Switch

1. Mount the supplied toggle switch bracket to the underside of the front left corner of the base plate using 2 supplied 8-32x3/8" pan machine screws. Let this wire bundle hang near the back of the control box for now.

### Assemble Electrical Components

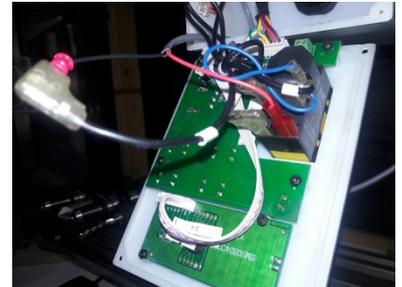
1. Make sure power to the mill is turned off.
2. Unscrew the 4 small Phillips head screws securing the control panel to the front of the control box.
3. Facing the front inside of the control box, drill and chamfer a 1/2" hole near the upper right corner as shown in the picture.
4. Run the following wires through this hole:
  - a. Limit switch
  - b. MAC valve
  - c. 12VDC adaptor
  - d. Toggle switch
7. Carefully peel the layer of film from the back of the 3/4" Snap-Together Mushroom-Head Fastener Disc mounted to the relay and mount the relay to the upper-left wall inside the control box. Press firmly to ensure a good bond. One-half of this disc pair is shown in the picture.
5. Wire these components according to the table below. Each row of the table represents a separate connection of 2 or more components with the designated size lever nut.



Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

<u>A/C Adaptor 12VDC</u>	<u>Limit Switch</u>	<u>Toggle Switch</u>	<u>MAC Valve</u>	<u>Relay</u>	<u>Connection</u>
12VDC+ (dashed wire)	NO3 (Yellow/Green wire)				2X lever nut
12VDC-		Ground (Green wire)	Wire-1	Wire-1	5X lever nut
	COM1 (Wire #1)	Power (Red wire)		Wire-2	3X lever nut
		ACC (Black wire)	Wire-2		2X lever nut

- Place the wires coming from the back of the base plate to the back of the control box into the supplied split-loom tubing. Push the 5/8" cable clip onto the split-loom tubing and attach the cable clip using the supplied 8-32x3/8" pan machine screw into the left-rear hole in the base plate.
- With the mill un-plugged and the control box front panel removed and hanging down, locate the wire connected to the top of the mill Start/Stop switch with the insulated angled quick disconnect labeled "1". Disconnect this wire and plug it into the 1/4" male quick disconnect coming from the relay. Plug the insulated 1/4" female connector of that wire pair coming from the relay into the mill Start/Stop switch lug from which the angle connector was just removed. When completed, these connections should like the picture shown.
- Replace the control panel on the front of the control box.



Assemble Actuator Plate

- Thread 10-24x1/4 socket cap screw into designated hole.
- Thread 3/8-16 hex nut onto spring plunger.
- Thread spring plunger onto actuator plate making sure that, when retracted, the nose is slightly recessed from the bottom of the actuator plate.
- Tighten the 3/8-16 hex nut to secure the spring plunger to the actuator plate.



Assemble and Install PD Drawbar Assembly

- Swivel the cylinder plate to the right out of the way.
- Remove the existing drawbar from the mill.
- This part gets a little messy. Place a bead of supplied anti-seize under the head of the supplied drawbar.
- Slide one of the supplied Belleville spring washers up the drawbar shaft with the convex face up against the underside of the drawbar head.
- Place a bead of anti-seize around and under the edge of the washer (concave side).
- Slide another Belleville washer onto the drawbar shaft with the convex side toward the convex side of the first washer.
- Place a bead of anti-seize around the washer hole and the drawbar shaft.
- Repeat the previous 3 steps until all the Belleville washers are mounted onto the drawbar shaft.



## Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

9. Apply a bead of anti-seize on the broad flat surface of the drawbar flange. Slide the flange onto the drawbar up to the last spring washer. Apply anti-seize around the end of the flange collar and drawbar shaft.
10. When completed, the side view of the drawbar assembly should look like this  

11. Place a light coating of anti-seize on the taper only of the supplied 3/4" R8 collet. Take great care in not getting any anti-seize on the face, inside or spring cuts of the collet. If any anti-seize gets into the inside of the collet, the tool will slip and it will not work.
12. Holding the face of the collet with a paper towel, insert and thread the collet onto the drawbar. Place a 3/4" shaft into the collet and finger tighten as much as possible.
13. Thread the supplied 1/4-20x1/4" socket cap screw into the designated hole in the front center of the base plate.
14. Mount the supplied hook-spanner wrench onto a spline of the spindle and resting on the surface of the base plate. Rotate the spindle clockwise by hand until the handle of the hook spanner contacts the head of the 1/4" socket cap screw. The spindle should now be "locked" from turning so that the load can be applied to the Belleville spring washers.
15. Make a mark on the drawbar head with a grease pen to know how many revolutions have been made. Tighten the drawbar 2 1/4 revolutions. The compression force at this tension results in approximately 40 foot-pounds of holding torque on the tool. Review the Drawbar Tension Adjustments section below for further information.
16. Remove the hook spanner and 1/4" socket cap screw.

### Operating the Power Drawbar System

1. Swivel the cylinder plate into place with the long edge of the cylinder plate parallel to the right and left edges of the base plate and release the spring plunger with the black phenolic knob so the tip snaps into the designated hole in the base plate. The dovetail channel should be facing front.
2. Slide the actuator plate (with the beveled edges) into the dovetail channel on the cylinder plate.
3. Release the spring plunger on the actuator plate so that it indexes into the front hole in the dovetail channel in the cylinder plate. The front edge of the actuator plate should be flush with the front edge of the cylinder plate.
4. When ready to change a tool, lift the spring plunger knob on the actuator plate and slide the actuator plate forward a bit and release the knob of the spring plunger so that the tip of the plunger is out of the first hole and resting on the bottom of the cylinder plate dovetail channel. Do not rotate and lock the spring plunger open.
5. Slide the actuator plate forward until the spring plunger engages with the second hole in the dovetail channel. With the actuator plate forward and engaged and the limit switch pressed: (1) power is enabled to the Power Drawbar system, and (2) power is disabled to the mill.
6. Place one hand on the tool in the collet and flip the green toggle switch up. The cylinder ram comes down and compresses the spring assembly and the tool is released from the collet.
7. Remove the tool from the collet and replace it with the next tool. **Keep your fingers away from where the side of the tool meets the bottom surface of the collet as this is a severe pinching hazard.**
8. Flip the green toggle switch down and the cylinder ram retracts into the cylinder and the drawbar spring assembly grips the tool in the collet.



## Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

9. If the quill will be used in the next operation, lift the knob on the actuator plate spring plunger and pull the actuator plate toward the front of the cylinder plate so the tip of the spring plunger clears the back (second) indexing hole in the cylinder plate. Continue to slide the actuator plate toward the front of the cylinder plate with the spring plunger released until the spring plunger engages with the front (first) hole in the dovetail channel of the cylinder plate.
10. The operating cycle of the Power Drawbar system is now complete.

The Power Drawbar may be easily swiveled out of the way for manual drawbar operations which are not suitable for the Power Drawbar by lifting the spring plunger with the black phenolic knob and swiveling the cylinder plate to the right and back out of the way.

### Drawbar Tension Adjustments

The compression force of the Belleville spring washers and resulting tool holding torque may be adjusted. Use the supplied hook spanner wrench and thread the 1/4-20 socket cap screw into the front center hole in the base plate to lock the spindle when tightening (increasing) and loosening (decreasing) the load of the drawbar spring assembly. The recommended loading includes 2 1/4 clockwise turns (from finger-tight) of the drawbar which results in approximately 40 foot-pounds of holding torque on the tool in the collet at 90 PSI. The air compressor used to operate the Power Drawbar should provide 90-120 PSI of pressure. This load can be increased by further tightening the drawbar spring assembly. When the load is increased beyond the capacity of the air cylinder to compress the spring washers, then the tool being held in the collet will not release. The load must then be reduced to the point where the force of the air cylinder can release the tool from the collet.

### Maintenance

The drawbar, spring washers, and R8 collet used in the power Drawbar system are regular wear items and should be replaced periodically depending on frequency of use. These items should be disassembled, cleaned, inspected, and a fresh application of anti-seize applied as described above periodically.

Power Drawbar Little Machine Shop 5500 Installation and Operations Guide

Power Drawbar Pictures

