

# **POWERMATIC®**

## **Operating Instructions and Parts Manual 22-inch Thicknesser Model 201HH**



**Powermatic**  
427 New Sanford Road  
LaVergne, Tennessee 37086  
Ph.: 800-274-6848  
[www.powermatic.com](http://www.powermatic.com)

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# Warnings

## Warning

1. Read and understand the entire owner's manual before attempting assembly or operation.
2. Read and understand the warnings posted on the machine and in this manual. Failure to comply with all of these warnings may cause serious injury.
3. Replace the warning labels if they become obscured or removed.
4. This thicknesser is designed and intended for use by properly trained and experienced personnel only. If you are not familiar with the proper and safe operation of a thicknesser, do not use until proper training and knowledge have been obtained.
5. Do not use this thicknesser for other than its intended use. If used for other purposes, Powermatic disclaims any real or implied warranty and holds itself harmless from any injury that may result from that use.
6. Always wear approved safety glasses/face shields while using this thicknesser. Everyday eyeglasses only have impact resistant lenses; they are not safety glasses.
7. Before operating this thicknesser, remove tie, rings, watches and other jewelry, and roll sleeves up past the elbows. Remove all loose clothing and confine long hair. Non-slip footwear or anti-skid floor strips are recommended. Do not wear gloves.
8. Wear ear protectors (plugs or muffs) during extended periods of operation.
9. Do not operate this machine while tired or under the influence of drugs, alcohol or any medication.
10. Make certain the machine is properly grounded.
11. With the exception of feed rate adjustment, make all machine adjustments or maintenance with the machine disconnected from the power source. A machine under repair should be RED TAGGED to show it should not be used until the maintenance is complete.
12. Remove adjusting keys and wrenches. Form a habit of checking to see that keys and adjusting wrenches are removed from the machine before turning it on.
13. Keep safety guards in place at all times when the machine is in use. If removed for maintenance purposes, use extreme caution and replace the guards immediately after completion of maintenance.
14. Check damaged parts. Before further use of the machine, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
15. Provide for adequate space surrounding work area and non-glare, overhead lighting.
16. Keep the floor around the machine clean and free of scrap material, oil and grease.
17. Keep visitors a safe distance from the work area. Keep children away.
18. Make your workshop child proof with padlocks, master switches or by removing starter keys.
19. Give your work undivided attention. Looking around, carrying on a conversation and "horse-play" are careless acts that can result in serious injury.
20. Maintain a balanced stance at all times so that you do not fall or lean against moving parts. Do not overreach or use excessive force to perform any machine operation. Stand to the side out of line with the table and make sure no one else is standing in line with the table.
21. Use the right tool at the correct speed and feed rate. Do not force a tool or attachment to do a job for which it was not designed. The right tool will do the job better and more safely.


22. Maintain tools with care. Keep knives sharp and clean for the best and safest performance. Dull tools increase noise levels and can cause kickbacks and glazed surfaces. Broken gibs/knives that are not securely locked in the cutterhead can be thrown out of the thicknesser causing severe or fatal injury as well as severe damage to the machine. Follow instructions for lubricating machine and changing accessories. Use recommended accessories; improper accessories may be hazardous.
23. Do not attempt to plane boards shorter than 254mm (10") in length without butting a board of equal thickness behind it to help it through the thicknesser. Be sure the last board of a butted sequence is 10" (254mm) or longer.
24. Do not feed stacked boards through a thicknesser; a kickback may occur causing severe or fatal injury.
25. Do not plane a board with loose knots or with nails or any foreign material on its surface. Twisted, warped, or wind-in stock should first be jointed on one surface before attempting to plane a parallel surface on the thicknesser. Serious stock flaws cannot be removed by use of a thicknesser alone.
26. If the board being planed stops feeding, disengage or turn the feed off and turn the power off. Wait until the cutterhead comes to a complete stop before lowering the table to remove the board. Never lower the table with the power on and the stock still in the machine, as a kickback can occur.
27. Keep hands outside of the machine. Never reach under the guards to try to clear stock that has stopped feeding. When starting a cut, do not have any part of the hands under that part of the board that is over the table; the infeed roller will engage the board and force it down against the table causing a pinching action.
28. Disconnect machine from power source before cleaning. Use a brush or compressed air to remove chips or debris — do not use your hands.
29. Do not stand on the machine. Serious injury could occur if the machine tips over.
30. Never leave the machine running unattended. Turn the power off and do not leave the machine until it comes to a complete stop.
31. Remove loose items and unnecessary work pieces from the area before starting the machine.


 **WARNING:** This product can expose you to chemicals including lead which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to <http://www.p65warnings.ca.gov>.

 **WARNING:** Drilling, sawing, sanding or machining wood products generates wood dust and other substances known to the State of California to cause cancer. Avoid inhaling dust generated from wood products or use a dust mask or other safeguards for personal protection.

Wood products emit chemicals known to the State of California to cause birth defects or other reproductive harm. For more information go to <http://www.p65warnings.ca.gov/wood>.

**Familiarize yourself with the following safety notices used in this manual:**

 **CAUTION** This means that if precautions are not heeded, it may result in minor injury and/or possible machine damage.

 **WARNING** This means that if precautions are not heeded, it may result in serious injury or possibly even death.

**- - SAVE THESE INSTRUCTIONS - -**

# Introduction

This manual is provided by Powermatic covering the safe operation and maintenance procedures for a Powermatic Model 201HH Thicknesser. This manual contains instructions on installation, safety precautions, general operating procedures, maintenance instructions and parts breakdown. This machine has been designed and constructed to provide consistent, long-term operation if used in accordance with instructions set forth in this manual. If there are any questions or comments, please contact either your local supplier or Powermatic. Powermatic can also be reached at our web site: [www.powermatic.com](http://www.powermatic.com).

# Specifications

Model Number.....	201HH
Stock Number (7.5HP, 3Ph, 400V) .....	1791268-RU
Working Width (mm.).....	560
Maximum Depth of Cut (mm.).....	6
Maximum Thickness (mm.).....	235
Segmented Infeed Roller Diameter (mm.).....	76.2
Steel Outfeed Roller Diameter (mm.) .....	76.2
Feed Speeds (MPM).....	6.1 and 9.1
Bed Rollers, Front Adjustable .....	2
Minimum Length Workpiece (mm.) .....	254
Cutterhead Style.....	helical
Cutterhead Diameter (mm.) .....	87
Number of Knives.....	125 four-sided inserts
Number of Cutterhead Rows.....	5
Cutterhead Speed (RPM) .....	4800
Table Size (LxW)(mm.).....	826 x 610
Table Support.....	2-column
Manual Table Height Adjustment (mm.) .....	1 turn = 1.59
Readout Scale.....	mm/in
Dust Port Diameter (mm.).....	127
Shipping Weight, approximate (kg.) .....	650
Net Weight, approximate (kg.) .....	615
Overall Dimensions (LxWxH)(mm.).....	1067 x 1245 x 1500

The above specifications were current at the time this manual was published, but because of our policy of continuous improvement, Powermatic reserves the right to change specifications at any time and without prior notice, without incurring obligations.

## Receiving

Open shipping crate and check for shipping damage. Report any damage immediately to your distributor. Read the instruction manual thoroughly for assembly, maintenance and safety instructions.

### Contents of crate:

- 1 thicknesser
- 1 dust chute w/ fasteners
- 4 screws w/ hex nuts (for leveling feet)
- 4 leveling feet
- 2 star point screwdrivers
- 1 set of 10 knife inserts
- 10 knife insert screws
- 1 3mm hex wrench
- 1 4mm hex wrench
- 1 6mm hex wrench
- 1 8mm hex wrench
- 1 8mm & 10mm wrench
- 1 12mm & 14mm wrench
- 1 17mm & 19mm wrench
- 1 22mm & 24mm wrench
- 1 Reversible Screwdriver
- 1 Operating Instructions and Parts Manual

## Installation

Remove the screws holding the base of the machine to the skid. Use the lifting eyes on front and back of the thicknesser for hoisting it off the skid. See Figure 1. Make sure the hex nuts are tightened before lifting. The lifting eyes can be removed once the thicknesser is situated.

Place the thicknesser on a solid foundation, preferably a concrete floor. The four leveling feet should be placed beneath the corners, and the screws and hex nuts used for leveling adjustments. See Figure 2. Alternatively, you can secure the machine to the floor by using lag screws through the holes in the base.

The machine area should be clean, dry, well ventilated, and well lighted. Since thicknessers can create noise problems, the site selection should be one which minimizes reverberant sound from walls, ceilings and other equipment. Electricals should be installed so that they are protected from damage and exposure.

Exposed metal parts have been given a protective coating at the factory. This should be removed with a soft rag and kerosene or a good commercial solvent. Do not use an abrasive pad, as it may scratch polished metal surfaces.

**IMPORTANT: All knife inserts on the cutterhead should be checked for tightness before operating the thicknesser.**

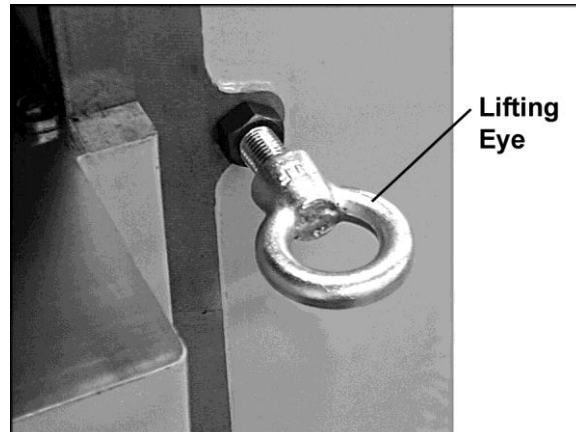


Figure 1

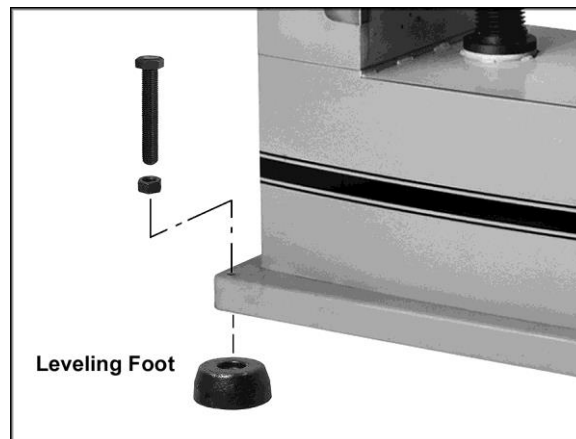


Figure 2

## Installing Dust Hood

Mount the dust hood with the eight M6 x 10mm hex screws, eight spring washers, and eight flat washers. See Figure 3.

It is strongly recommended that a dust collection system be connected to the 127mm (5") port on the thicknesser's dust hood. The system should be of sufficient volume for this size thicknesser. If a dust collection system is not used, the user is cautioned against the health hazard and the limitations in the OSHA regulation for employee or student exposure to dust particles.

Contact your dealer or visit [waltermeier.com](http://waltermeier.com) for a line of available dust collectors.

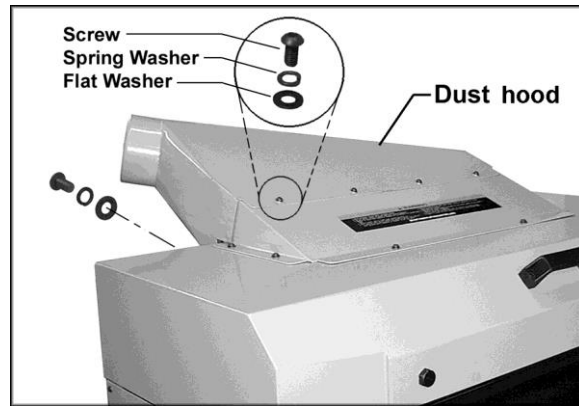


Figure 3

## Grounding Instructions

**⚠WARNING** Electrical connections must be made by a qualified electrician in compliance with all relevant codes. This machine must be properly grounded to help prevent electrical shock and possible fatal injury.

This machine must be grounded. In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock.

Improper connection of the equipment-grounding conductor can result in a risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes, is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal.

Check with a qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the tool is properly grounded.

Make sure the voltage of your power supply matches the specifications on the motor plate of the Thicknesser. The machine should be connected to a dedicated circuit.

You may either install a plug or "hard-wire" the Thicknesser directly to a control panel. If the Thicknesser is to be hard-wired to a panel, make sure a disconnect is available for the operator. During hard-wiring of the Thicknesser, make sure the fuses have been removed or the breakers have been tripped in the circuit to which the machine will be connected. Place a warning placard on the fuse holder or circuit breaker to prevent it being turned on while the Thicknesser is being wired.

## Inspection

Before putting power to the machine, check that all screws are tight, that all mechanical functions work freely and that the cutterhead turns freely without knife contact with the chipbreaker or pressure bar. On the helical cutterhead model, check that all knife inserts are properly torqued.

## Adjustments

### Tools required:

- Philips screwdriver
- Hex wrenches (provided)
- Open-end wrench (provided)

### Depth of Cut

Depth of cut is controlled by raising or lowering the table. This is done by using the handwheel (A), shown in Figure 4.

1. Loosen the lock knob (B, Figure 4).
2. Raise or lower the table to the desired position (clockwise to raise). One revolution of the handwheel equals 1.59mm (1/16"). The distance can be read on the scale (C, Figure 4).
3. Retighten lock knob (B, Figure 4).
4. The pointer (D, Figure 4) can be adjusted slightly if the scale should ever need recalibrating.

### Feed Rate Adjustment

The Model 201HH is equipped with selectable feed speed rollers that feed stock at 6.1 and 9.1 meter per minute (20 and 30 feet per minute). To adjust speed, turn lever shown in Figure 5, *while the thicknesser is running*.

**CAUTION** Always change speeds while the thicknesser is running to avoid damage to the gearbox.

### Belt Tension

1. Disconnect machine from power source.
2. Remove lower rear cover of machine, and use the hex nuts to adjust tension. See Figure 6. Adjust motor plate up or down until correct belt tension is achieved. To lower motor plate, loosen lower nuts and tighten upper nuts. To raise motor plate, do the opposite.
3. Correct tension is obtained when there is approximately 6.35mm (1/4") deflection in the center span of the belts using light finger pressure.

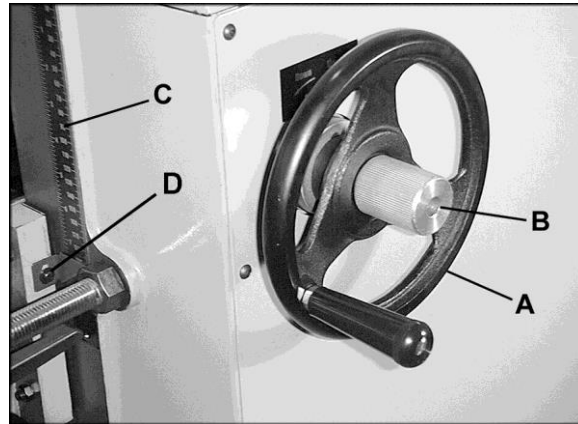


Figure 4

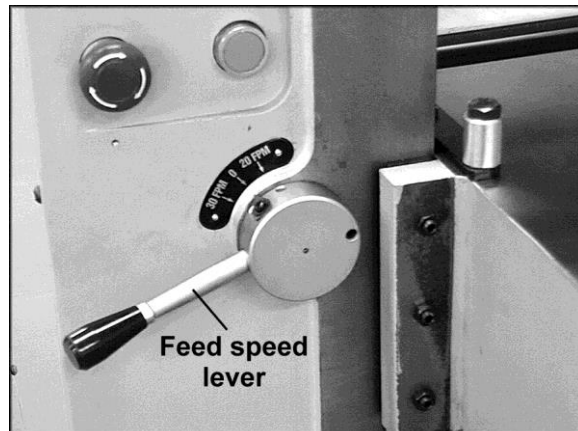


Figure 5

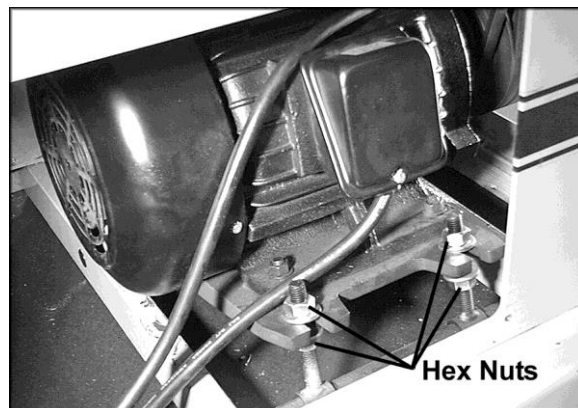


Figure 6



4. Re-tighten the nuts and re-install cover.

## Opening Hood

To open the hood for access to the cutterhead, remove the two hex screws with the 22mm wrench provided. See Figure 7.

## Replacing or Rotating Knife Inserts

The knife inserts on the model 201HH are four-sided. When dull, simply remove each insert, rotate it 90° for a fresh edge, and re-install it.

No set-up gauge is necessary for the inserts. Use the provided star point screwdriver to remove the knife insert screw. See Figure 10. It is advisable to rotate all inserts at the same time to maintain consistent cutting. However, if one or more knife inserts develops a nick, rotate only those inserts that are affected.

Each knife insert has an etched reference mark so that you can keep track of rotations.

**IMPORTANT:** When removing or rotating inserts, clean saw dust from the screw, the insert, and the cutterhead platform. Dust accumulation between these elements can prevent the insert from seating properly, and may affect the quality of the cut.

Before installing each screw, lightly coat the screw threads with machine oil and wipe off any excess.

Securely tighten each screw which holds the knife inserts before operating the thicknesser!

**⚠WARNING** Make sure all knife insert screws are tightened securely. Loose inserts can be propelled at high speed from a rotating cutterhead, causing injury.

## The Thicknesser's Feed System

(Refer to Figure 11)

1. Anti-kickback fingers
2. Infeed roller
3. Chipbreaker
4. Cutterhead
5. Pressure bar
6. Outfeed roller

### Anti-Kickback Fingers

Anti-kickback fingers help prevent stock from being thrown from the machine. These fingers operate by gravity and should be inspected for pitch or gum buildup before each day's use. The fingers must operate freely and move independently for correct operation.

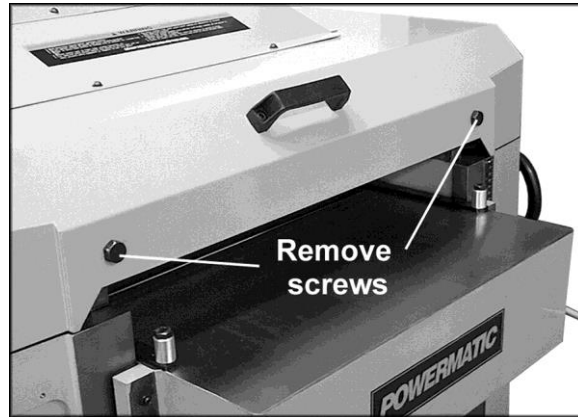


Figure 7

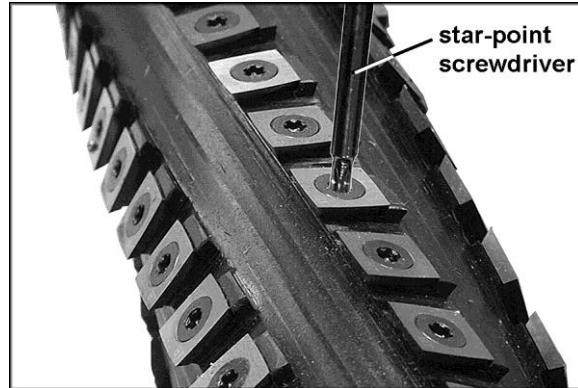


Figure 10 – Model 201HH

## Infeed Roller

The function of the infeed roller is to feed the material into the machine. It is a corrugated, sectional roller with approximately 6.35mm (1/4") independent movement of each section to accommodate multiple board surfacing.

To provide proper drive, the infeed roller should be set so that the bottom of its arc is 0.81mm (0.032" ) below the arc of the cutterhead knives. The infeed roller is under spring tension and this tension must be sufficient to feed the stock uniformly through the thicknesser without slipping but should not be so tight that it causes damage to the stock. The tension should be equal at both ends of the roller.

### To adjust the infeed roller:

1. Disconnect machine from power source.
2. Place a dial gauge (not provided) under a knife in the cutterhead. If a dial gauge is not available, use a finished block of wood with notches cut out for the table rolls, in conjunction with a feeler gauge. See Figure 13 for an example of a wood block you can make and use as a gauge.
3. Raise the table with the handwheel until the gauge contacts a knife at the apex of its curve. Zero the gauge at that position.
4. Move the gauge to the extreme left end of the infeed roller and check the measurement. It should be 0.81mm (0.032") below the knife measurement.
5. If it is not 1.59mm (1/16") below the knife, correct by loosening the hex nut and turning the adjustment screw (A, Figure 14) with a hex wrench.
6. Move the gauge to the extreme right end of the infeed roller and check. Make similar adjustments if needed.
7. Tighten hex nuts (A, Figure 14) when finished.

**IMPORTANT:** The setting on both ends of the infeed roller must be the same to avoid skewing of the material as it is fed through the machine.

## Chipbreaker

The chipbreaker is a sectionalized type made of spring-loaded sections mounted on a bar, which complements the sectional infeed roller. The functions of the chipbreaker are to break chips into small pieces, help avoid splintering of the wood, help avoid board bounce on thinner boards, to direct the flow of chips out of the machine, and to permit multiple board surfacing.

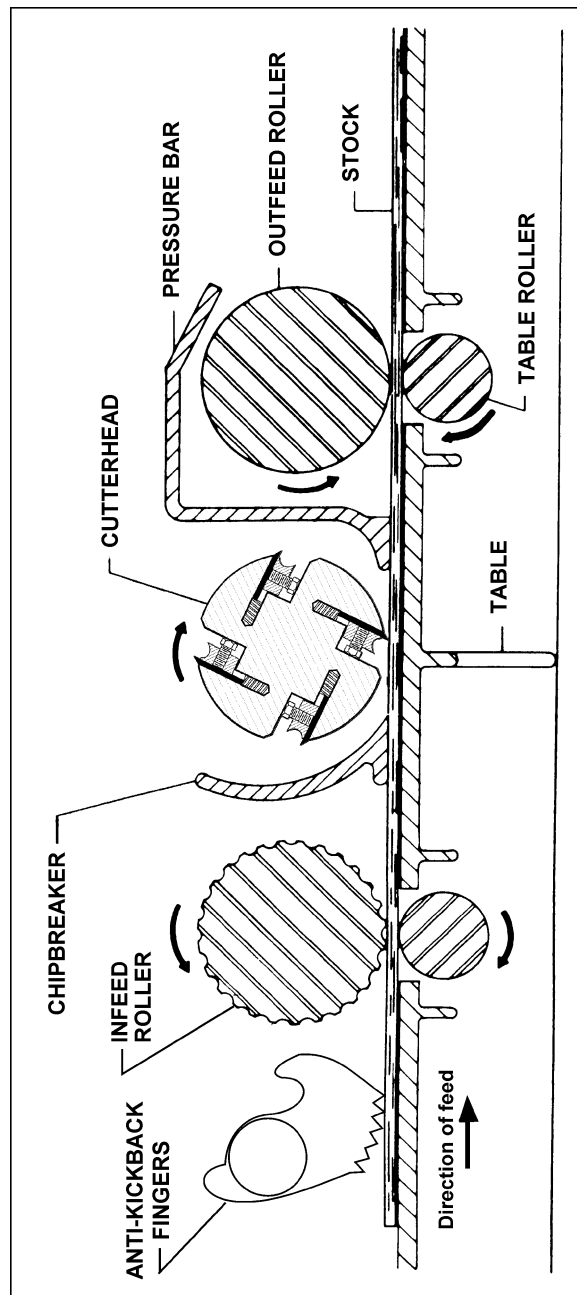


Figure 11

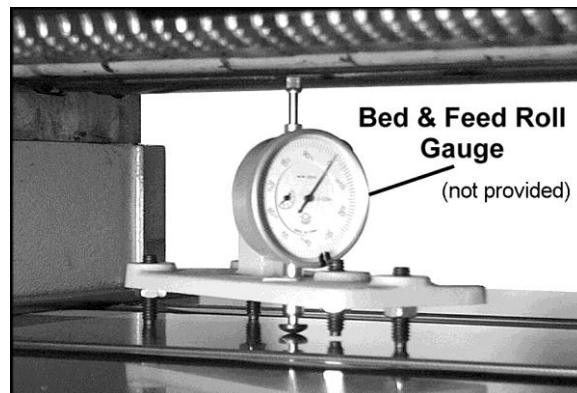


Figure 12

The chipbreaker has been factory set at the same height as the cutting arc of the knives, and has been spring-tensioned properly.

**CAUTION** A chipbreaker set too low or with excessive tension may prevent stock from feeding into the machine.

### Pressure Bar

Most planing problems can be traced to improper setting of the pressure bar. Its function is to hold down the material after it passes under the cutterhead and throughout the remainder of the cut. Its basic setting is to be in line with the arc of the cutterhead knives.

If the pressure bar is too high, a shallow "clip" will occur at each end of the board. If it is too low, stock will not feed through.

Use a gauge to set the full length of the pressure bar to be 0.20mm (0.008") above the arc of the cutterhead.

Figure 15 shows the height adjustment screw (C) and the spring tension adjustment screw (D) for the pressure bar. Loosen the hex nut and rotate the screw as needed. Make sure the setting on both ends of the pressure bar is the same. Tighten the hex nuts when adjustment is complete.

This initial setup is a starting point and final adjustment may have to be made during a test cut.

### Outfeed Roller

The outfeed roller is of smooth, one-piece construction to help avoid marring the finished surface of the material being cut. It is spring tensioned, and its function is to continue to feed the material through the machine after it leaves the infeed roller. The correct free position setting is 0.81mm (0.032") below the arc of the cutterhead knives.

Use a gauge, such as a bed and feed roll gauge or wood gauge block (see Figure 13) to check the outfeed roller in the same manner as for the infeed roller. Adjust as necessary using the screws (E, Figure 15). When finished adjusting, tighten the hex nuts on the screws.

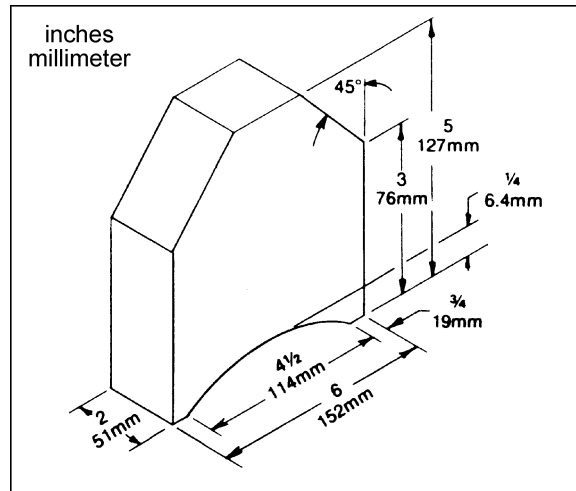


Figure 13  
User-made Gauge Block

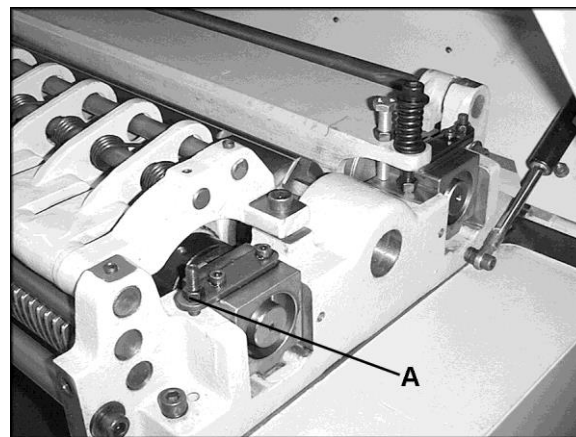


Figure 14

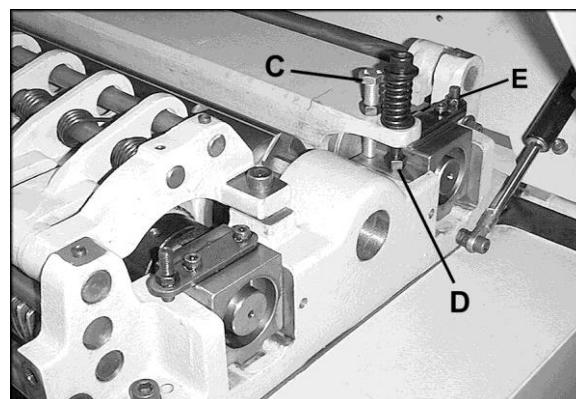


Figure 15

## Table Rollers

The Thicknesser has two table rollers which help reduce friction of the stock on the table as it feeds through the machine. It is not possible to give exact height setting of the table rollers because each type of wood behaves differently. As a general rule, however, the table rollers should be set high when planing rough stock, and set low for finish cuts.

The thicknesser is equipped with a quick set table roller adjustment. With a single lever, you can raise the rolls from their finishing board height to a roughing board height. The range is 0.00 to 1.27mm (0.05").

To adjust the height of the table rollers, loosen the handle (A, Figure 16) and move the quick-set lever (B, Figure 16) until the indicator is at the desired setting on the scale. Re-tighten the handle (A, Figure 16) to lock the setting.

NOTE: The handle (A) is adjustable. To re-position it, simply lift out on the handle, rotate it on the pin and release, making sure it seats itself properly on the pin.

The table rollers are adjusted at the factory. If they should need further or "fine" adjustment:

1. Disconnect machine from power source.
2. Loosen lock handle and position the quick-set lever (Figure 16) to zero.
3. Use a dial gauge (not provided) to find the distance from table top to the apex of the table roller. Zero the gauge at this position.
4. Place the gauge over the extreme right side of the table roller and find the high point of the table roller arc. The gauge should still read zero.
5. If the gauge reading is greater or less than zero, reach beneath the table with a wrench and loosen the hex nut (C, Figure 17) which is above the cam (D, Figure 17) near the end of the roller that needs adjusting. Rotate the hex cap screw (E, Figure 17) until the gauge reads zero.
6. Repeat the process for the left side of the table roller, and then re-check the right side. It is important that both ends of the table roller be the same height to help prevent skewing of the board as it feeds through the machine.
7. Re-tighten the hex nuts (C, Figure 17) on both ends of the table roller.
8. Repeat the procedure for the second table roller.

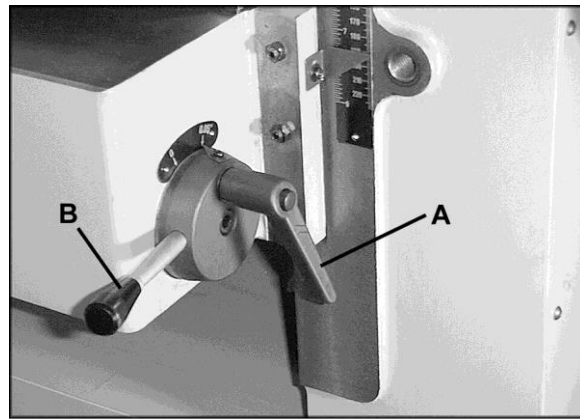


Figure 16



Figure 17

## Table Adjustments

The thicknesser table is raised and lowered by twin screws supported on bearings, and is guided by machined surfaces on the side panels. The fit-up to prevent the table from rocking is controlled by two gibs in front. See Figure 18. These gibs are pre-set at the factory and require no attention. If, after extensive use of the thicknesser, some looseness in the table develops, these gibs can be adjusted individually using the gib screws provided so that the ways are lightly contacting on all four surfaces. The gibs should be tight enough to prevent rocking or movement of the table when the thicknesser is in operation.

To perform accurate planing, the table must be parallel with the cutterhead. Lack of parallelism results in a taper over the width of the board. To check parallelism do the following:

1. Place a gauge on the table and contacting a knife at the apex of its arc. Do this at each end of the cutterhead and compare the measurements.
2. If the table is not parallel to the cutterhead, place the gauge at the end that needs to be raised.
3. Loosen the three socket head cap screws (A, Figure 19) beneath the table.
4. Place a rod-like object (such as a hex wrench) into one of the open holes (B, Figure 19) and turn the shaft (C, Figure 19) to raise the table until the gauge reads the proper measurement. Or, the same effect can be achieved by lowering the other side of the table.
5. Re-tighten the screws (A, Figure 19).

NOTE: This adjustment may generate the need to recalibrate the table height pointer.

## Operating Controls

The stop button is a mushroom style button which is convenient for “emergency” shutdowns. After being pushed, the stop button remains engaged. To re-start the thicknesser, twist the stop button clockwise until it pops back out.

## Test Cutting and Troubleshooting

Using a piece of semi-finished stock, set up for a 1.59mm (1/16") deep cut with the quick-set table roller adjustment (shown in Figure 16) set at zero. Start the machine and, standing to one side of the table, begin feeding the stock into the machine.

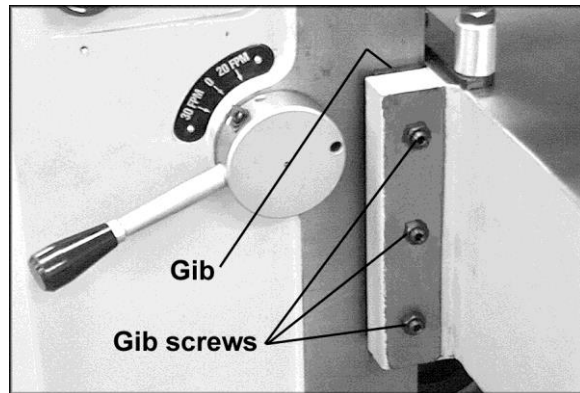


Figure 18

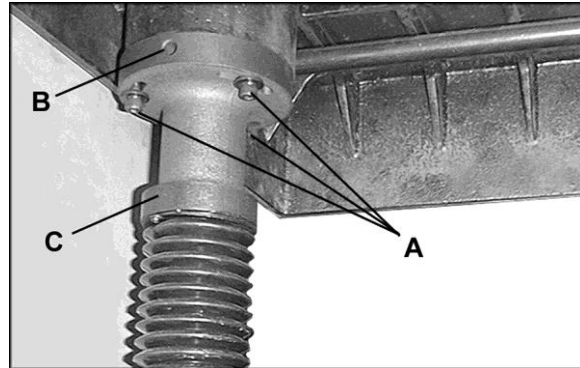


Figure 19

**⚠WARNING** Never stand directly in line with stock or allow anyone else to do so, and do not bend down to see how stock is feeding. Should a kickback occur, serious or fatal injury could result.

The infeed roller should take the material and force it under the chipbreaker and cutterhead. If the material feeds through effortlessly, examine the finished cut carefully for imperfections. Learning to read a board for imperfections will save hours in adjusting a thicknesser to operate properly.

Following are some problems that may arise and their probable remedies. The Figure illustrations are exaggerated for clarity. (Pages 16-19 also contain Troubleshooting remedies).

### Washboard Finish

A very pronounced washboard finish down the full length of the board results from one knife being too high and forced to do all the cutting. See Figure 20. Re-set the high knife accordingly.

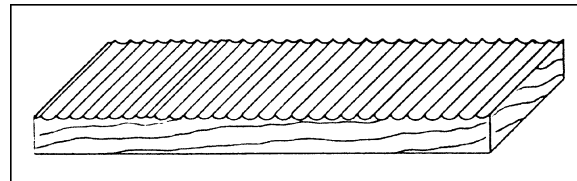


Figure 20  
(washboard)

### Clip Marks

If "clip" marks occur 152mm (6") in from each end of the board, the pressure bar is too high. See Figure 21. Turn both right and left hand adjusting screws (see Figure 15) the same amount, 6.35mm (1/4") turn clockwise or less, and take another 1.59mm (1/16") deep cut. Re-examine the board.

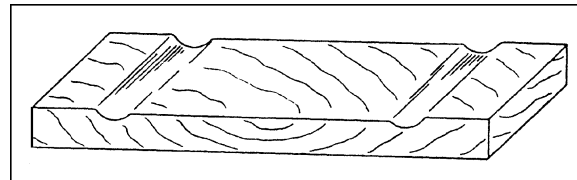


Figure 21  
(clip marks)

Continue the operate-adjust procedure until the clip marks disappear. Should the board fail to feed through, back off slightly on both adjusting screws until feeding is smooth and the imperfections do not re-appear. Lock the pressure bar adjusting screws with the jam nuts provided.

### Snipe

Some amount of snipe may be inevitable with many thicknesser operations, but proper thicknesser adjustments can so minimize snipe as to make it negligible.

If noticeable snipes appear on each end of the material, as shown in Figure 22, a table roller is too high causing a slight lift of the material as it passes through the machine. Normally these snipes are more noticeable on the trailing end of the board than on the lead end, and most often occur during planing of rough lumber.

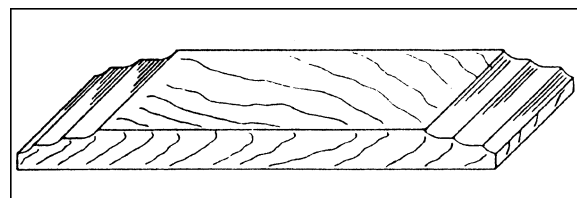


Figure 22  
(snipe)

Table rollers must be elevated for running rough or resaw lumber through the machine. When material is turned over to surface the other side, and you neglect to lower the table rollers for a finish cut, then definite snipes will appear on the ends of the material.

## Chatter

Chatter marks usually appear on thin material. See Figure 23. Even at their lowest point, the table rollers are too high to handle thin material. Solve the problem by either using a slave board or making an auxiliary table out of Formica countertop material with cleating at each end to keep it stationary over the thicknesser table.

## Tapers

If the machine planes a taper across the full width of the board, as shown in Figure 24, the table is not parallel with the cutterhead. First check that all knives are properly installed with equal protrusion from the cutterhead. If they are, then the table itself must be adjusted. See "Table Adjustments" on page 13.

## Twisting

If material twists while feeding through the thicknesser, the pressure bar, outfeed roller or table rollers may be out of level. Refer to adjustment settings on pages 13 and 14.

## Feed Restriction

This is caused either by the table rollers being set too low for roughing operations or by a low pressure bar. About 90 percent of the time the pressure bar is too low. As the sharp edge of the thicknesser knives wear, you must compensate for this wear by raising the pressure bar an equal amount on each side. Your first indication of knife wear is hesitation in feed of the material through the machine after it leaves the corrugated infeed roller on its way out of the machine. **Disconnect machine from power** and adjust the pressure bar accordingly. The material will free up and feed through smoothly when the thicknesser is restarted.

**CAUTION** Never attempt pressure bar adjustment while thicknesser is connected to power.

Feed restriction can also occur due to pitch buildup on the table. Be sure the table surface is clean. Occasionally dusting the surface with talc will aid in smoother feeding and help prevent pitch buildup.

## Halted Feeding

If the infeed roller takes the stock, the chipbreakers lift, and just as you hear the knives contact the material, it stops feeding, then the pressure bar is too low. Reset the pressure bar (see page 13).

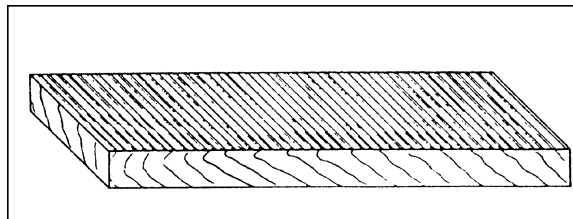


Figure 23  
(chatter)

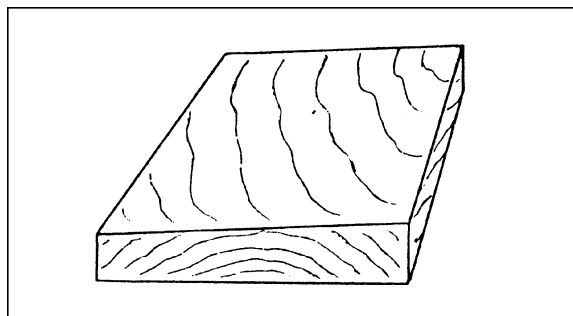


Figure 24  
(taper)

## Lubrication

The gear box oil should be changed at least once a year. Remove the drain plug (A, Figure 25) to drain the oil into an appropriate container. Replace the drain plug and fill the gear box with 60 to 90 weight gear oil through the fill hole (B, Figure 25). Capacity is 0.494 gallon (1.87L). The sight glass (C, Figure 25) should be checked periodically and oil topped off as necessary.

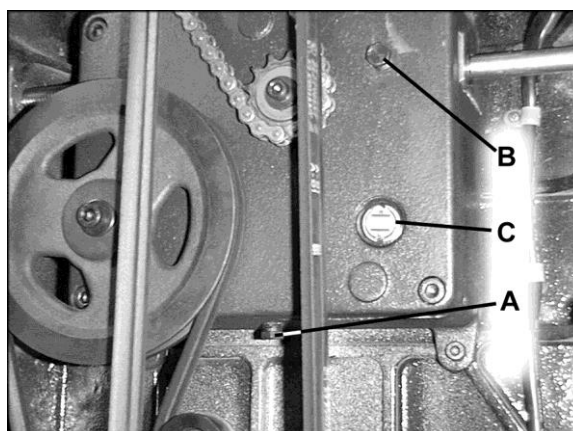


Figure 25

The recommended lubrication for roller chains used in medium to slow speed operation is to simply wipe the chain clean. When there is an appreciable buildup of dust, dirt or wood shavings, use an oil cloth but never pour the oil directly on the chain. Over-oiling defeats the purpose of the lubrication, since it tends to invite the collection of dust, shavings, etc. and works

## Maintenance

Periodic inspections are required to ensure that the machine is in proper adjustment, that all screws are tight, that belts are in good condition, that dust has not accumulated in the electrical enclosures, and that there are no loose or worn electrical connections.

Buildup of sawdust and other debris can cause your machine to plane inaccurately. Periodic cleaning is not only recommended but mandatory for accurate planing.

Close-fitting parts, such as the table locking rods, the cutterhead slot and gibs, should be cleaned with a cloth or brush and non-flammable solvent and freed from clinging foreign matter.

**⚠️WARNING** Use caution and proceed slowly when working with or around the cutterhead knives.

Remove resin and other accumulations from feed rolls and table with a non-flammable solvent.

Periodically check all the chains and belts for proper tension and adjust accordingly if required.

into members of the chain. This hastens wear and leads to premature replacement.

The bearings on the cutterhead are factory lubricated and sealed. They require no further attention.

Periodically oil the bearings on the infeed and outfeed rollers, through the oil cups located on the bearing blocks (Figure 26).

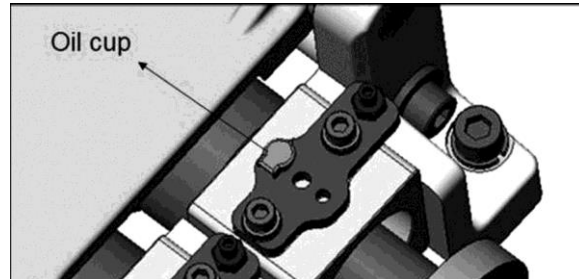


Figure 26

## Troubleshooting: Thicknesser Operating Problems

Trouble	Probable Cause	Remedy
Snipe.	Table rollers not set properly.	Adjust table rollers to proper height.
	Inadequate support of long boards.	Support long boards with a roller stand.
	Uneven feed roller pressure front to back.	Adjust feed roller tension.
	Dull knives.	Sharpen or replace knives. Rotate or replace knife inserts.
	Lumber not butted properly.	Butt end-to-end each piece of stock as they pass through.
Fuzzy grain.	Planing wood with a high moisture content.	Remove moisture from wood by drying, or use different stock.
	Dull knives.	replace knives. Rotate or replace knife inserts.
Torn grain.	Too heavy a cut.	Adjust proper depth of cut.
	Knives cutting against grain.	Try to cut with the grain for finish cut.
	Dull knives.	Rotate or replace knife inserts.



<b>Trouble</b>	<b>Probable Cause</b>	<b>Remedy</b>
Rough/raised grain.	Dull knives.	Rotate or replace knife inserts.
	Excessive depth of cut.	Decrease cutting depth.
	Moisture content too high.	Remove moisture from wood by drying, or use different stock.
Rounded, glossy surface.	Dull knives.	Rotate or replace knife inserts.
Poor feeding of lumber.	Inadequate feed roller pressure.	Adjust feed roller tension. If proper tension cannot be achieved, replace feed roller(s).
	Thickneser table rough or dirty.	Clean off pitch and residue; apply light coat of paste wax to thickneser table.
	Belts are slipping.	Check belt tension and make any needed adjustments.
	Surface of feed rollers has been worn too smooth.	Lightly roughen the feed roller surface with sandpaper.

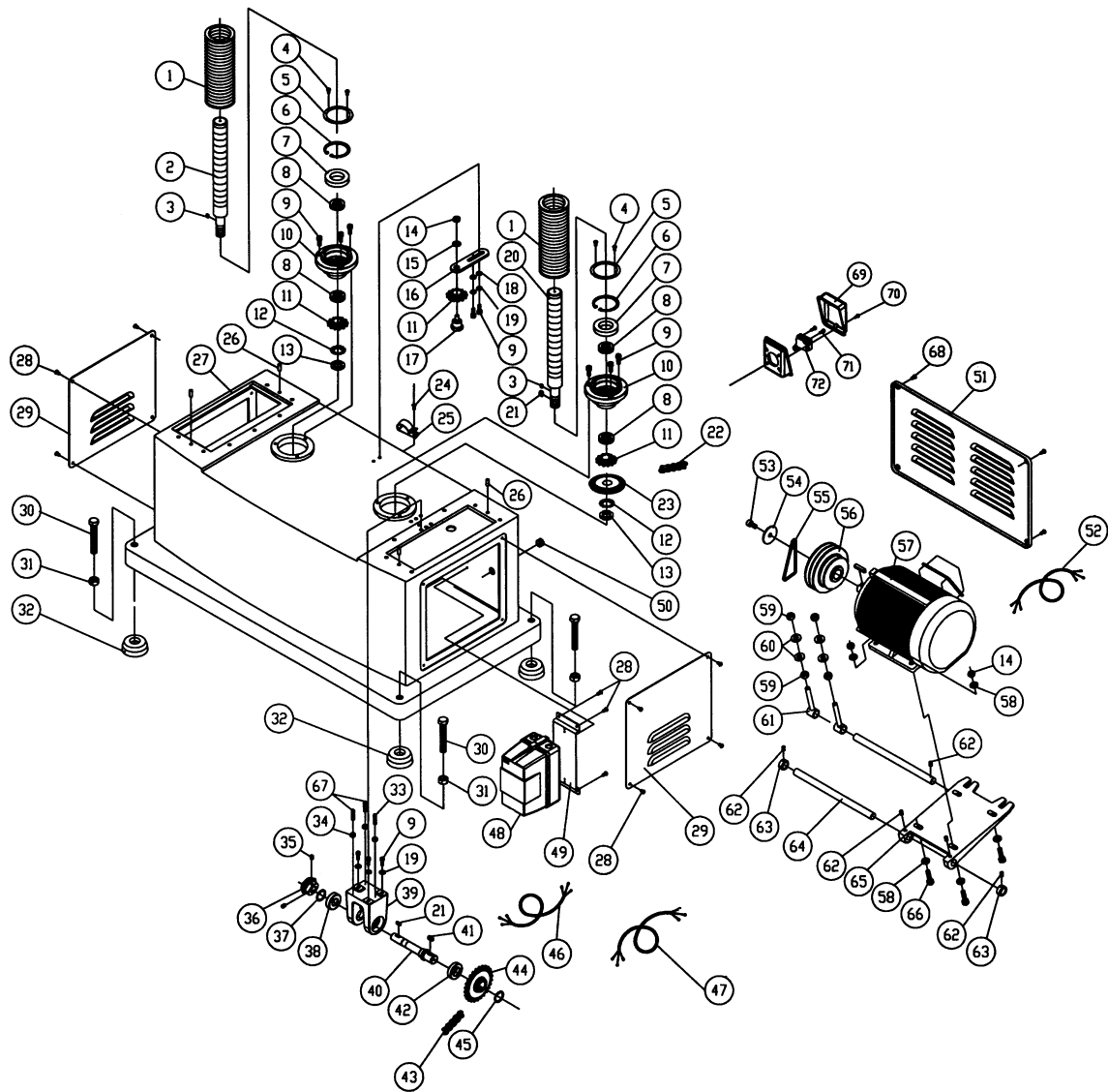
## Troubleshooting: Mechanical and Electrical Problems

<b>Trouble</b>	<b>Probable Cause</b>	<b>Remedy</b>
Uneven depth of cut side to side.	Thickneser table not parallel to cutterhead.	Adjust table parallel to cutterhead. See page 13.
Board thickness does not match depth of cut scale.	Depth of cut scale is incorrect.	Adjust pointer on depth of cut scale.
Chain is jumping.	Inadequate chain tension.	Adjust chain tension.
	Sprockets misaligned.	Align sprockets.
	Sprockets worn.	Replace sprockets.
Machine will not start/restart or repeatedly trips circuit breaker or blows fuses.	No incoming power.	Verify machine is connected to power.
	Stop button is still engaged.	Rotate stop button to disengage.
	Overload automatic reset has not reset.	When the thickneser overloads on the circuit breaker built into the motor starter, it takes time for the machine to cool down before restart. Allow machine to adequately cool before attempting restart. If problem persists, check amp setting on the motor starter inside the electrical switch box.

Trouble	Probable Cause	Remedy
<p>Machine will not start/restart or repeatedly trips circuit breaker or blows fuses. (continued)</p>	<p>Thickneser frequently trips.</p>	<p>One cause of overload trips which are not electrical in nature is too deep a cut. The solution is to take a lighter cut. If too deep a cut is not the problem, check the amp setting on the overload relay. Match the full load amps on the motor as noted on the motor plate.</p> <p>If amp setting is correct, then there is probably a loose electrical lead or a failed component. See items below.</p>
	<p>Building circuit breaker trips or fuse blows.</p>	<p>Verify that thickneser is on a circuit of correct size. If circuit size is correct, there is probably a loose electrical lead. Check amp setting on motor starter.</p>
	<p>Loose electrical connections.</p>	<p>Go through all of the electrical connections on the thickneser including motor connections, verifying the tightness of each. Look for any signs of electrical arcing which is a sure indicator of loose connections or circuit overload.</p>
	<p>Starter or motor failure (how to distinguish).</p>	<p>Examine motor starter for burned or failed components. If damage is found, replace motor starter.</p> <p>If you have access to a voltmeter, you can separate a starter failure from a motor failure by first, verifying incoming voltage at 400 and second, checking the voltage between starter and motor at 400.</p> <p>If incoming voltage is incorrect, you have a power supply problem.</p> <p>If voltage between starter and motor is incorrect, you have a starter problem.</p> <p>If voltage between starter and motor is correct, you have a motor problem.</p>
	<p>Motor failure.</p>	<p>If electric motor is suspect, you have two options: Have a qualified electrician test the motor for function or remove the motor and take it to an electric motor repair shop and have it tested.</p>
	<p>Machine incorrectly wired.</p>	<p>Double check to confirm all electrical connections are correct. Refer to appropriate wiring diagrams on pages 32 to make any needed corrections.</p>

Trouble	Probable Cause	Remedy
	Start/stop switch failure.	If a start or stop switch is suspect, you have two options: Have a qualified electrician test the switch for function, or purchase a new switch and establish if that was the problem on changeout.
Thickneser does not come up to speed.	Low current.	Contact a qualified electrician.

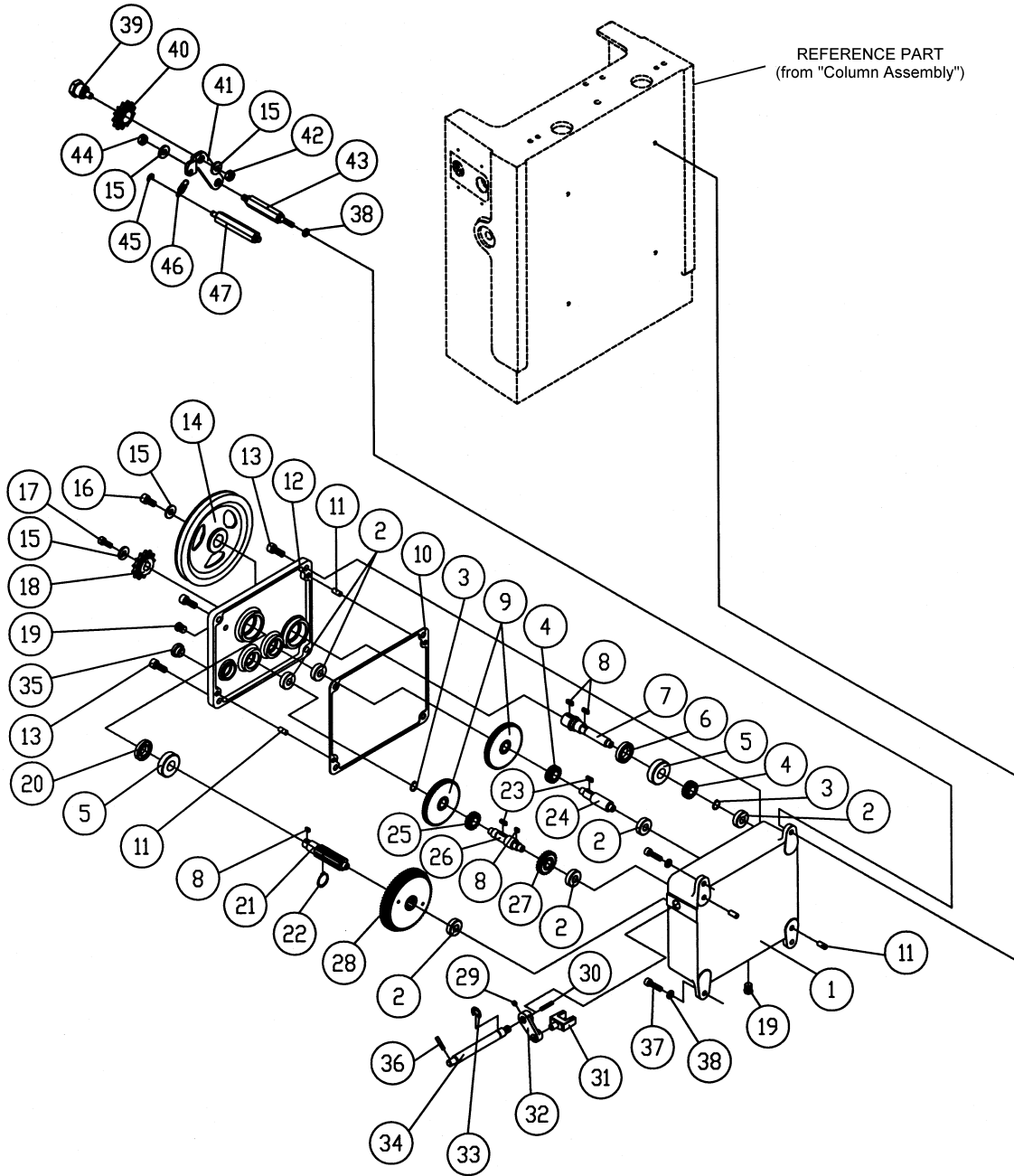
## Parts List: Base Assembly



Index No.	Part No.	Description	Size	Qty
1.....	6012068.....	Rubber Boot.....		2
2.....	6012069.....	Lead Screw.....		1
3.....	6293370.....	Key.....	5 x 5 x 10.....	2
4.....	6012070.....	Screw w/ Washer.....	M4x0.7Px8Lg / 4mmx10x0.8T.....	4
5.....	6012071.....	Bushing.....		2
6.....	6012072.....	R-Ring.....	RTW-68.....	2
7.....	6012073.....	Ball Bearing.....	6008-2NSE.....	2
8.....	6012074.....	Bearing.....	51105.....	4
9.....	6012066.....	Socket Head Cap Screw.....	M8 x 1.25P x 25Lg....	11
10.....	6012075.....	Bracket.....		2
11.....	6012076.....	Sprocket.....		3
12.....	6012077.....	Washer.....	25mm.....	2
13.....	6012078.....	Nut.....	M25 x 1.5.....	2
14.....	6012079.....	Hex Nut.....	M10 x 1.5P.....	5
15.....	6012080.....	Flat Washer.....	10mm x 25 x 3T.....	1
16.....	6012081.....	Rocker Arm.....		1
17.....	6012082.....	Shaft.....		1
18.....	6012083.....	Flat Washer.....	8.5mm x 19 x 2T.....	2
19.....	6012067.....	Spring Washer.....	8.2mm x 15.4.....	5
20.....	6012084.....	Lead Screw.....		1

21	6292745	Key	5 x 5 x 16	2
22	6012085	Chain	#40 x 79pcs	1
23	6012086	Bevel Gear		1
24	6012087	Screw	M5 x 0.8P x 10Lg	4
25	6012088	Strain Relief Clip	ACC-3	4
26	6012089	Pin		4
27	6012090	Base		1
28	6012091	Screw	M6 x 1.0P x 10Lg	12
29	6012092	Cover		2
30	6012093	Special Hex Screw		4
31	6012094	Hex Nut	M16 x 2.0	4
32	6012095	Foot		4
33	6012096	Set Screw	M8 x 1.25P x 30Lg	1
34	6012097	Hex Nut	M8 x 1.25	3
35	6012098	Set Screw	M5 x 0.8P x 5Lg	2
36	6012099	Bevel Gear		1
37	6012100	S-Ring	STW-20	1
38	6012101	Ball Bearing	6204-ZZ	1
39	6012102	Support Block		1
40	6012103	Shaft		1
41	6012104	Key	8 x 7 x 18	1
42	6012105	Ball Bearing	6005-ZZ	1
43	6012106	Chain	#40 x 107pcs	1
44	6012107	Sprocket		1
45	6012052	S-Ring	STW-25	1
46	6012109RU	Switch Cord	H05VV-F 4C x 1.5mm	1
47	6012267RU	Power Cord	VCT x 4C x 3.5mm	1
48	6012111RU	Switch	400V/3Ph	1
49	6012112	Switch Plate		1
50	6012113	Strain Relief Bushing	M20	1
51	6012114	Cover		1
52	6012266RU	Motor Cord	VCT x 4C x 3.5mm	1
53	6012048	Socket Head Cap Screw	M10 x 1.5P x 20Lg	1
54	6012116	Washer		1
55	6012117E	Belt	A57	1
56	6012118AE	Motor Pulley		1
57	6012119RU	Motor	7.5HP 3Ph 400V	1
	2210-271	Key	8x7x40mm	1
58	6012120	Flat Washer	10.3mm x 23 x 2T	8
59	6012121	Hex Nut	M12 x 1.75	4
60	6012122	Flat Washer	13mm x 28 x 3T	4
61	6012123	Adjusting Bolt		2
62	6012124	Set Screw	M8 x 1.25P x 12Lg	5
63	6012125	Spacer		2
64	6012126	Shaft		2
65	6012127	Motor Plate		1
66	6012128	Hex Screw	M10 x 1.5P x 40Lg	4
67	6012129	Set Screw	M8 x 1.25P x 20Lg	2
68	6012130	Flat Head Screw	M6 x 1.0P x 20Lg	4
69	6012269	Terminal Cover		1
70	6012270	Screw	3/16-24NC x 1/4	1
71	6012271	Screw	M5 x 0.8P x 20L	2
72	6012272	Terminal Plate		1

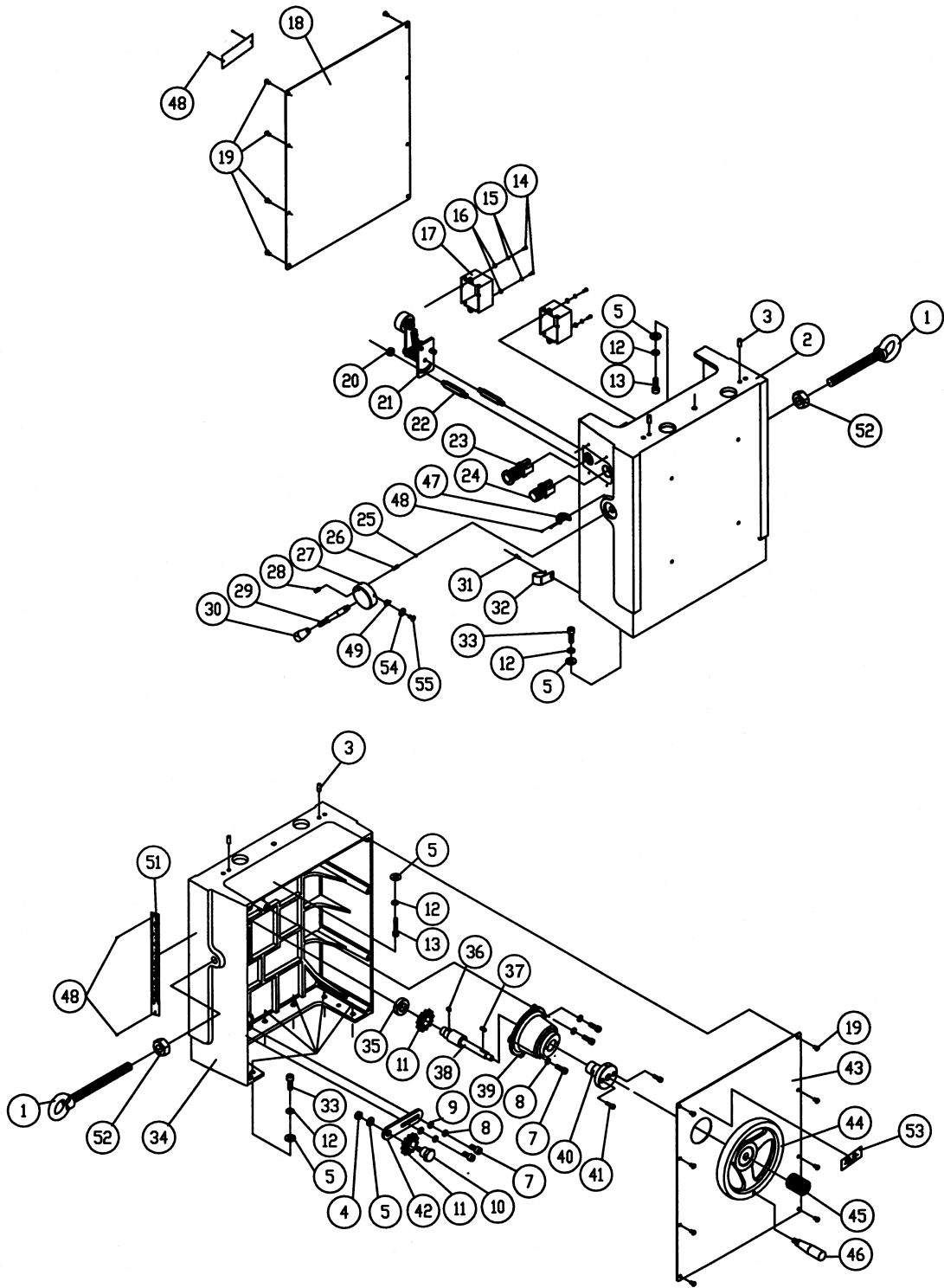
# Gearbox Assembly



## Parts List: Gearbox Assembly

Index No.	Part No.	Description	Size	Qty
	201-100	Gearbox Assembly		1
1	6012034	Gearbox Body		1
2	6012035	Ball Bearing	6201-2NSE	6
3	6012036	S-Ring	STW-16	2
4	6012037	Gear		2
5	6012038	Ball Bearing	6204-2NSE	2
6	6012039	Oil Seal	TC24 x 40 x 8	1
7	6012040	Shaft		1
8	6293370	Key	5 x 5 x 10	4
9	6012041	Gear		2
10	6012042	Gasket		1
11	6012043	Pin		4
12	6012044	Gearbox Cover		1
13	6012142	Hex Socket Cap Screw	M10 x 1.5P x 25Lg	4
14	6012046	Pulley		1
15	6012047	Flat Washer	10mm x 25 x 3T	2
16	6012048	Socket Head Cap Screw	M10 x 1.5P x 20Lg	1
17	6012049	Socket Head Cap Screw	M8 x 1.25P x 20Lg	1
18	6012050	Sprocket		1
19	6292789	Oil Plug	PT1/4"-19UNF	2
20	33-1051-00-1	Oil Seal	TC20 x 40 x 7	1
21	6012051	Shaft		1
22	6012052	S-Ring	STW-25	1
23	6292745	Key	5 x 5 x 16	2
24	6012053	Shaft		1
25	6012054	Gear		1
26	6012055	Shaft		1
27	6012056	Gear		1
28	6012057	Gear Assembly		1
29	6012058	Set Screw	M5 x 0.8P x 5Lg	1
30	6012059	Spring Pin	4mm x 25Lg	1
31	6012060	Shift Fork		1
32	6012061	Lever		1
33	6012062	E-Ring	ETW-12	1
34	6012063	Shift Shaft		1
35	6012064	Eye Glass Oil Level		1
36	6012065	Spring Pin	5mm x 26Lg	1
37	6012066	Socket Head Cap Screw	M8 x 1.25P x 25Lg	3
38	6012067	Spring Washer	8.2mm x 15.4	4
39	6012082	Shaft		1
40	6012286	Idle Sprocket		1
41	6012287	Bracket		1
42	6012079	Hex Nut	M10 x 1.5P	1
43	6012288	Stand Off		1
44	6012289	Check Nut	M10 x 1.5P	1
45	6012290	E-Ring	ETW-7	1
46	6012291	Spring		1
47	6012292	Stand Off		1

# Column Assembly

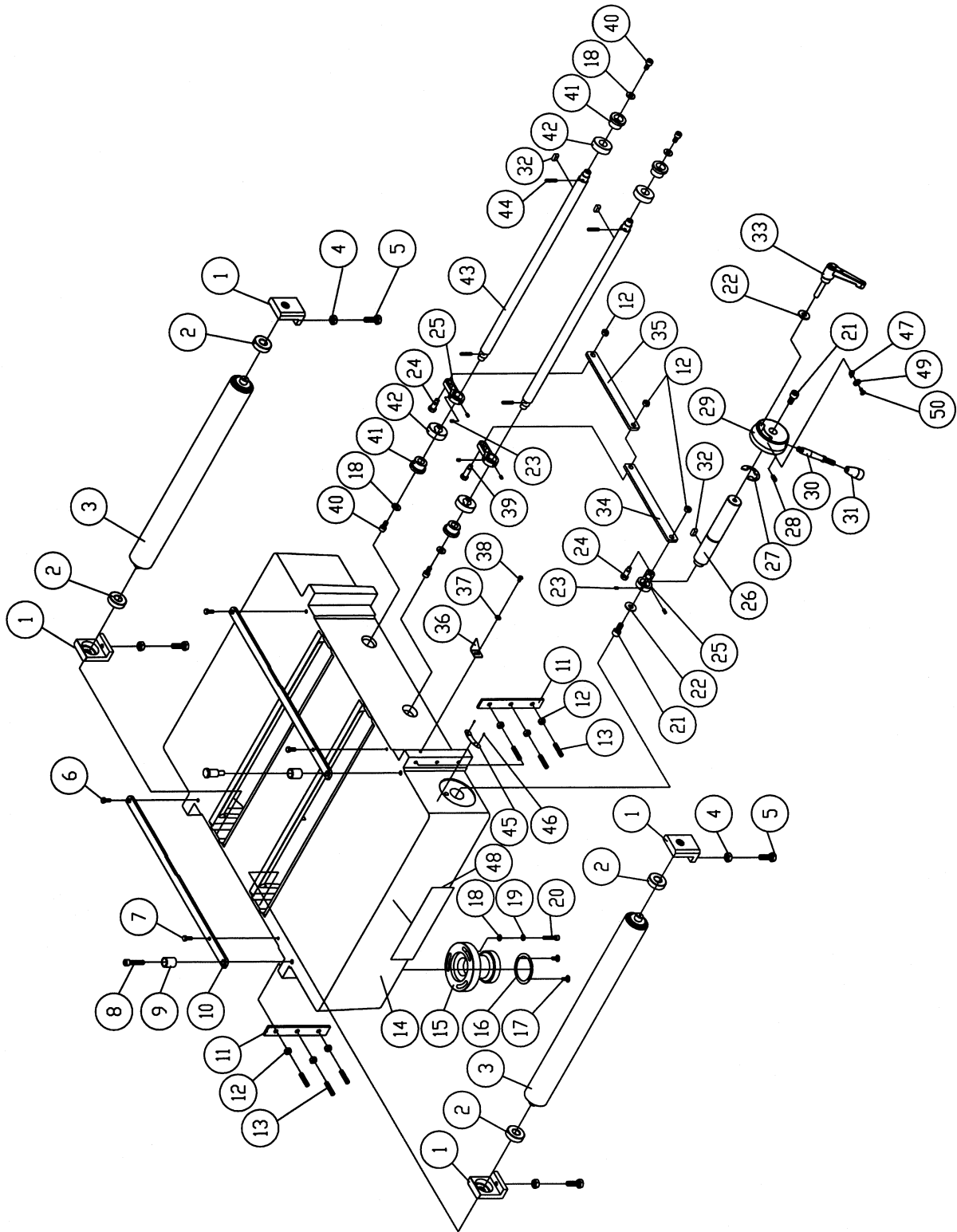




## Parts List: Column Assembly

Index No.	Part No.	Description	Size	Qty
1	6012193	Lifting Eye	M20 x 2.5P x 30Lg	2
2	6012194	Left Column		1
3	6012195	Pin		4
4	6012079	Hex Nut	M10 x 1.5P	1
5	6012080	Flat Washer	10mm x 25 x 3T	17
7	6012066	Socket Head Cap Screw	M8 x 1.25P x 25Lg	6
8	6012067	Spring Washer	8.2mm x 15.4	7
9	6012083	Flat Washer	8.5mm x 19 x 2T	2
10	6012082	Shaft		1
11	6012197	Sprocket		3
12	6012157	Spring Washer	10.2mm x 18.4	16
13	6012198	Socket Head Cap Screw	M10 x 1.5P x 40Lg	2
14	6012199	Pan Head Machine Screw	M4 x 0.7P x 10Lg	4
15	6012200	Spring Washer	4.1mm x 7.7	4
16	6012201	Flat Washer	4.3mm x 10 x 1T	5
17	6012202	Switch Box		2
18	6012203	Left Sidecover		1
19	6012091	Screw	M6 x 1.0P x 10Lg	16
20	6012204	Hex Nut	5/16"-18NC	1
21	6012205	Idler Assembly		1
22	6012206	Stand Off		2
23	6012207	Stop Switch		1
24	6012208	Start Switch		1
25	6012209	Ball Detent	6mm	1
26	6012210	Spring		1
27	6012211A	Shifter Hub		1
28	6012212	Set Screw	M6 x 1.0P x 12Lg	1
29	6012213	Shaft		1
30	6012214	Handle		1
31	6012087	Screw	M5 x 0.8P x 10Lg	4
32	6012088	Cord Clip	ACC-3	4
33	6012156	Socket Head Cap Screw	M10 x 1.5P x 35Lg	14
34	6012215	Right Column		1
35	6012216	Ball Bearing	6004ZZ	1
36	6293370	Key	5 x 5 x 10	1
37	6292745	Key	5 x 5 x 16	1
38	6012217	Shaft		1
39	6012218	Housing		1
40	6012219	Sleeve		1
41	6012220	Socket Head Cap Screw	M6 x 1.0P x 16Lg	2
42	6012221	Rocker Arm		1
43	6012222	Right Cover		1
44	6012223	Handwheel		1
45	6012224	Lock Knob		1
46	6012225	Handwheel Swivel Assembly		1
47	6012226E	Label Shifter		1
48	6012227	Rivet		6
49	6012228	Pointer		1
51	6012230	Scale		1
52	6012293	Hex Nut	M20 x 2.5	1
53	6012231E	Height Adjust Label		1
54	6012201	Flat Washer	4.3 x 10 x 1T	1
55	6012232	Screw	M4 x 0.7P x 8Lg	1

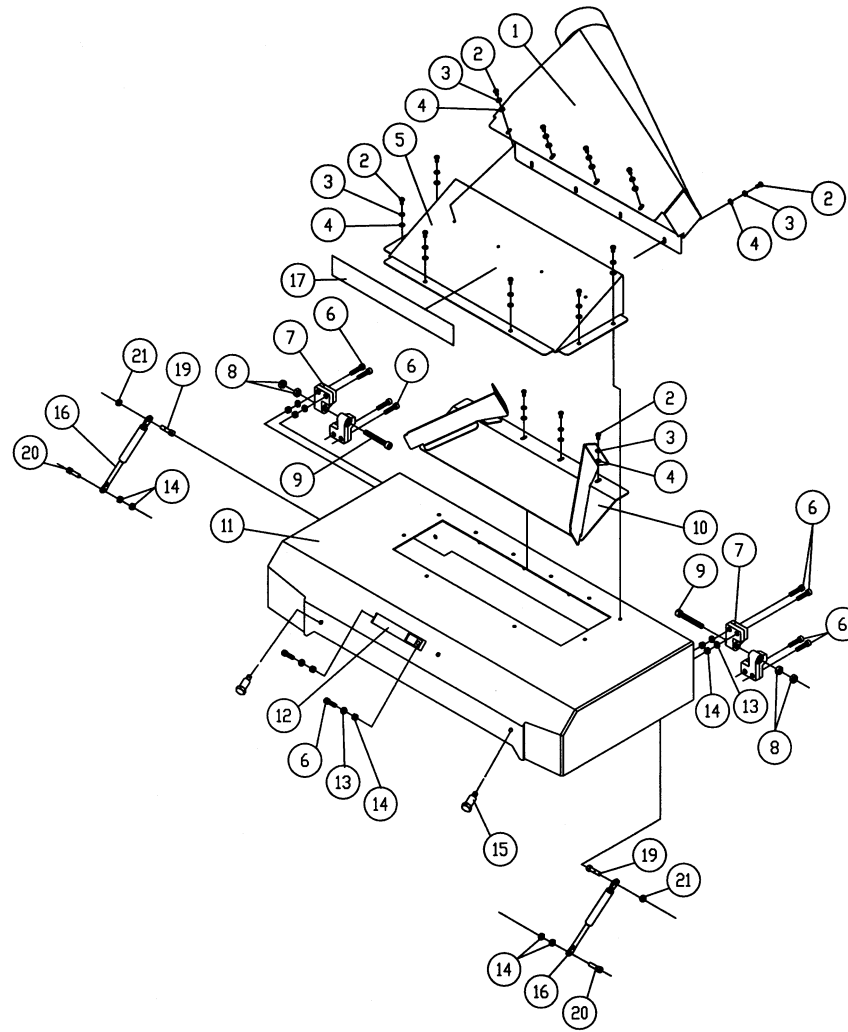
# Table Assembly



## Parts List: Table Assembly

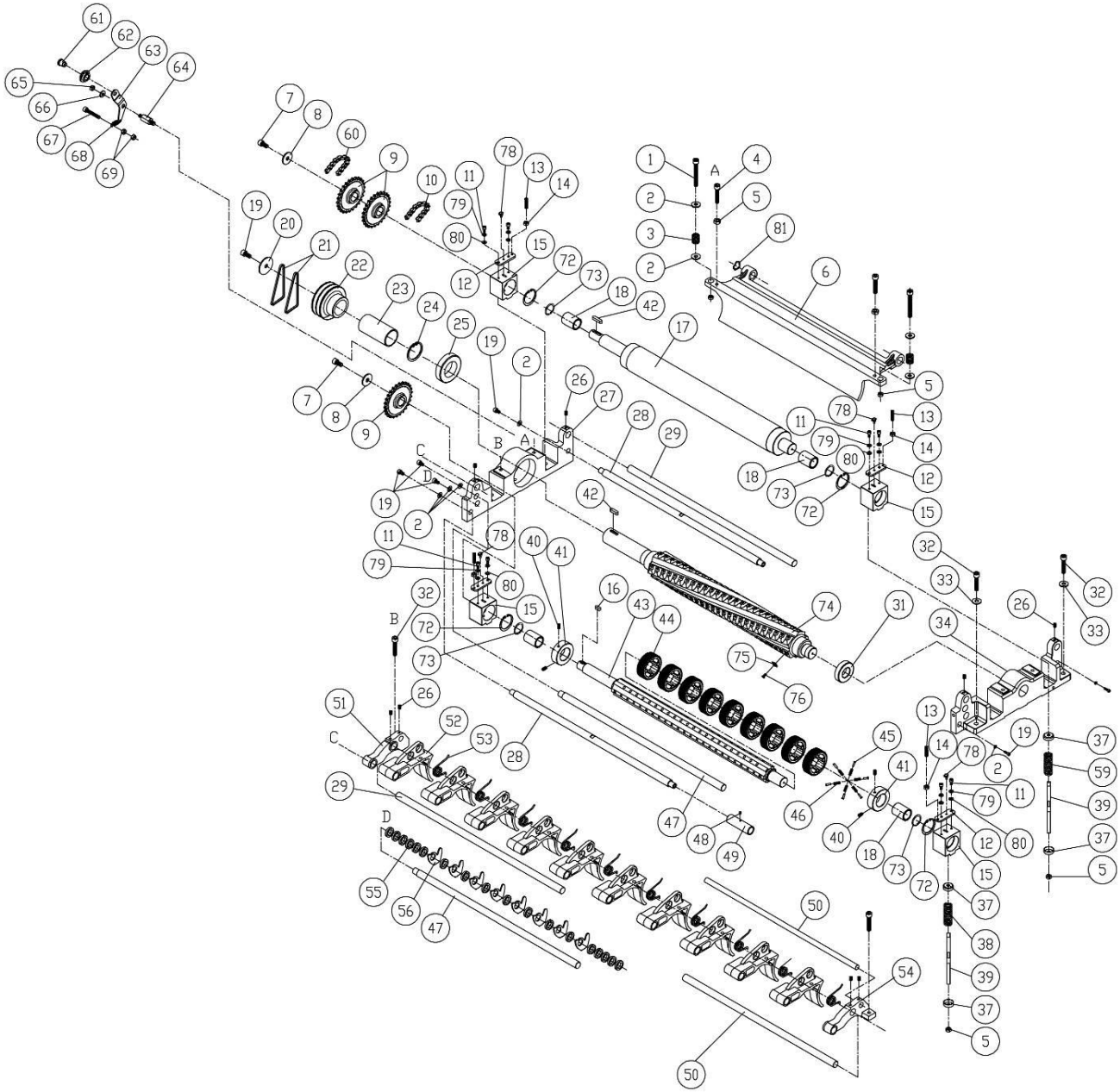
Index No.	Part No.	Description	Size	Qty
1	6012233	Bracket		4
2	BB-6203ZZ	Ball Bearing	6203-ZZ	4
3	6012234	Roller Assembly		2
4	6012079	Hex Nut	M10 x 1.5P	4
5	6012235	Hex Screw	M10 x 1.5P x 30Lg	4
6	6012236	Hex Screw	M8 x 1.25P x 16Lg	2
7	6012237	Hex Screw	M6 x 1.0P x 16Lg	2
8	6012238	Hex Screw	M10 x 1.5P x 50Lg	2
9	6012239	Pointer		2
10	6012240	Plate		2
11	6012241	Plate		2
12	6012097	Hex Nut	M8 x 1.25P	9
13	6012242	Set Screw	M8 x 1.25P x 35Lg	6
14	6012243	Table		1
15	6012244	Table Adjusting Hub		2
16	6012245	Bushing		2
17	6012070	Screw w/Washer	M4 x 0.7P x 8Lg/4mm x 10 x 0.8T	4
18	6012083	Flat Washer	8.5mm x 19 x 2T	10
19	6012067	Spring Washer	8.2mm x 15.4	6
20	6012246	Socket Head Cap Screw	M8 x 1.25P x 40Lg	6
21	6012048	Socket Head Cap Screw	M10 x 1.5P x 20Lg	2
22	6012080	Flat Washer	10mm x 25 x 3T	2
23	6012098	Set Screw	M5 x 0.8P x 5Lg	6
24	6012247	Special Screw		2
25	6012248	Linking Plate		3
26	6012249	Shaft		1
27	6012250	E-Ring	ETW-24	1
28	6012251	Set Screw	M6 x 1.0P x 12Lg	1
29	6012252	Hub		1
30	6012213	Shaft		1
31	6012214	Handle		1
32	6293370	Key	5 x 5 x 10	3
33	6012253	Handle		1
34	6012254	Fixing Plate		1
35	6012255	Fixing Plate		1
36	6012256	Pointer		1
37	6012257	Flat Washer	5.3mm x 12 x 1T	1
38	6012087	Screw	M5 x 0.8P x 10Lg	1
39	6012258	Special Screw		1
40	6012259	Socket Head Cap Screw	M8 x 1.25P x 16Lg	4
41	6012260	Shaft		4
42	6012261	Cam		4
43	6012262	Transfer Rod		2
44	6012263	Spring Pin	5mm x 26L	4
45	6012264E	Label		1
46	6012227	Rivet		2
47	6012228	Pointer		1
48	6012265	Name Label		1
49	6012201	Flat Washer	4.3mm x 10 x 1.0T	1
50	6012232	Screw	M4 x 0.7P x 8 Lg	1

## Parts List: Top Cover Assembly



Index No.	Part No.	Description	Size	Qty
1.....	6012181.....	Dust Hood .....		1
2.....	6012091.....	Screw .....	M6 x 1.0P x 10Lg.....	18
3.....	6012182.....	Spring Washer.....	6.1mm x 12.3.....	18
4.....	6012183.....	Flat Washer .....	6.6mm x 13 x 1T.....	18
5.....	6012184.....	Upper Cover.....		1
6.....	6012066.....	Socket Head Cap Screw.....	M8 x 1.25P x 25Lg....	10
7.....	6012185.....	Cast Hinge Half .....		4
8.....	6012079.....	Nut .....	M10 x 1.5P.....	4
9.....	6012186.....	Socket Head Cap Screw.....	M10 x 1.5P x 60Lg....	2
10.....	6012187.....	Deflection Plate .....		1
11.....	6012188.....	Top Cover .....		1
12.....	6012189.....	Handle.....		1
13.....	6012067.....	Lock Washer .....	8.2mm x 15.4.....	6
14.....	6012097.....	Hex Nut .....	M8 x 1.25P.....	10
15.....	6012190.....	Special Screw.....		2
16.....	6012191.....	Cylinder.....		2
17.....	6012192.....	Warning Label .....		1
18.....	6012282.....	Screw w/ Washer.....	M6 x 1.0P x 10Lg.....	4
19.....	6012283.....	Shoulder Screw.....		2
20.....	6012284.....	Shoulder Screw.....		2
21.....	6012285.....	Check Nut .....	M8 x 1.25P.....	2

# Cutterhead Assembly

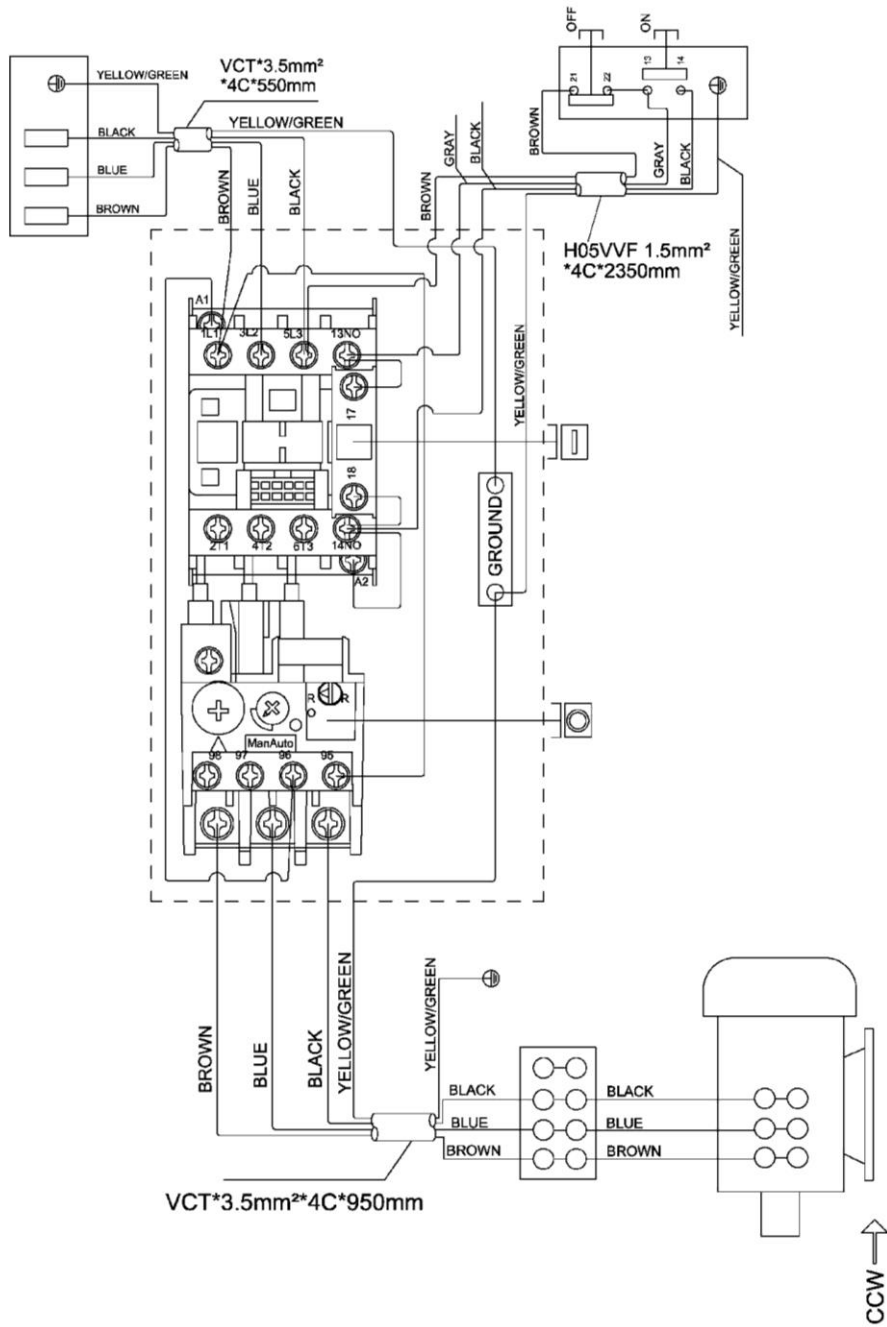


## Parts List: Cutterhead Assembly

Index No.	Part No.	Description	Size	Qty
1	6012131	Socket Head Cap Screw	M10 x 1.5P x 75Lg	2
2	6012080	Flat Washer	10mm x 25 x 3T	10
3	6012132	Spring		2
4	6012133	Socket Head Cap Screw	M10 x 1.5P x 50Lg	2
5	6012079	Hex Nut	M10 x 1.5P	8
6	6012134	Pressure Bar Casting		1
7	6012048A	Socket Head Cap Screw (LH Thread)	M10 x 1.5P x 20Lg	2
8	6012135	Washer		2
9	6012136	Sprocket		3
10	6012137	Chain (infeed roller to outfeed roller)	#40 x 60 pcs	1
	201-BHA	Bearing Housing Assembly (index #11-15,18,72,78)		4
11	6012138A	Socket Head Cap Screw	M6 x 1.0P x 20Lg	8
12	6012139	Plate		4
	6012139A	Plate		4
13	6012140	Set Screw	M8 x 1.25P x 25Lg	4
14	6012097	Hex Nut	M8 x 1.25P	4
15	6012141	Bearing Housing		4
	6012141A	Bearing Housing		4
16	6012104	Key	8 x 7 x 18	1
17	6012143	Outfeed Roller		1
18	6012144	Needle Bearing	NA-6906	4
19	6012048	Hex Socket Cap Screw (LH Threads)	M10 x 1.5P x 20Lg	7
20	6012116	Washer		1
21	6012145RU	Belt	A83	2
22	6012146	Cutterhead Pulley		1
23	6012147	Bushing		1
24	6012148	R-Ring	RTW-85	1
25	6012149	Ball Bearing	6209-2NSE	1
26	6012150	Set Screw	M8 x 1.25P x 10Lg	8
27	6012151	Cutterhead Casting Left		1
28	6012152	Shaft		2
29	6012153	Shaft		2
31	6012155	Ball Bearing	6007-2NSE	1
32	6012156	Socket Head Cap Screw	M10 x 1.5P x 35Lg	6
33	6012157	Spring Washer	10.2mm x 18.4	4
34	6012158	Cutterhead Casting Right		1
37	6012161	Washer		8
38	6012162	Spring		4
39	6012163	Shaft		4
40	6012150	Set Screw	M8 x 1.25P x 10Lg	4
41	6012164	Spacer		2
42	6012165	Key	8 x 7 x 30	1
43	6012166	Infeed Shaft		1
44	6012167	Infeed Roller		22
45	6012168	Shaft		132
46	6012169	Spring		132
47	6012170	Shaft		2
48	6012098	Set Screw	M5 x 0.8P x 5Lg	1
49	6012171	Stock Limiter		1
50	6012172	Shaft		2
51	6012173	Bracket, Left Hand		1
52	6012174	Sectional Chipbreaker		10
53	6012175	Spring		10
54	6012176	Bracket, Right Hand		1
55	6012177	Spacer		72
56	6012178	Anti-Kickback Finger		62
59	6012273	Spring		2

60.....	6012274.....	Chain (gearbox to outfeed roller).....	#40 x 72 pcs.....	1
61.....	6012275.....	Shaft.....		1
62.....	6012276.....	Idle Sprocket.....		1
63.....	6012277.....	Bracket.....		1
64.....	6012278.....	Shaft.....		1
65.....	6012279.....	Check Nut.....	M8 x 1.25P.....	1
66.....	6012083.....	Flat Washer.....	8.5mm x 19 x 2T.....	1
67.....	6012280.....	Socket Head Cap Screw.....	M8 x 1.25P x 50Lg.....	1
68.....	6012281.....	Spring.....		1
69.....	6012097.....	Hex Nut.....	M8 x 1.25P.....	2
72.....	201-672.....	Retainer Ring.....		4
73.....	201-673.....	Retainer Ring.....		4
.....	1791225A.....	Helical Cutterhead Assembly (index #74 thru #76).....		1
74.....	201HH-674A.....	Helical Cutterhead.....		1
75.....	1791212.....	Knife Insert (sold in set of 10).....		125 total
76.....	JWP208HH-111.....	Knife Insert Screw.....	#10-32 x 1/2".....	125
77.....	JJ6HH-113.....	Star Point Screwdriver (not shown).....		2
78.....	WP2510-71.....	Oil Cup.....		4
79.....	TS-2361061.....	Lock Washer.....	M6.....	8
80.....	201-680.....	Flat Washer.....	6.3 x 13 x 2mm.....	8
81.....	201-681.....	Wave Washer.....	BWW-6001.....	1

# Electrical Connections – 3 Phase, 400 Volt, 50Hz



427 New Sanford Road  
 LaVergne, Tennessee 37086  
 Phone: 800-274-6848  
 www.powermatic.com