



MFG. COMPANY, INC.

Ellis Drill Press Model 9400



Instruction Manual

POWER FEED DRILL PRESS

Infinitely Variable Speed

Model 9400

Operation Manual

July 16, 2010

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PATENTED



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PREFACE

IMPORTANT: READ LUBRICATION INSTRUCTIONS ON PAGE 8 BEFORE USING THIS MACHINE

This machine is suitable for drilling, reaming or thread cutting in metal, wood or plastic. The reversing feature allows the removal of a thread cutting tap. It is widely used for short part runs or high production. Read the instruction manual carefully for the operation and maintenance of this machine. Keep the machine in a good operational condition and keep it clean. The machine is powered by a 110-Volt single-phase line voltage but the control box (4830) powers a 3-phase, 220-Volt electrical motor at infinitely variable speeds. Some machines are furnished with a control box (4831) for 220 Volt, single phase in and 220 Volt 3-phase out. The control box was programmed at the factory. The program should not be changed by the operator.

INSTALLATION INSTRUCTION

The Ellis Variable Speed Drill Press is crated and shipped completely assembled. Check for any transit damage at the time you accept delivery. Surfaces that are not painted are protected with a film of heavy oil during shipment. Remove this oil after uncrating. **It is VERY important to remove this oil from the inside taper bore using mineral spirits or paint thinner by twisting a rag up into the bore.**

1. After uncrating, place the drill press on a flat, solid floor and within reach of the power cord to a 110-Volt, 60 HZ Single Phase **grounded** power outlet. (Some machines are built for 220-Volt single phase.) Make certain that the supply Voltage is 110 Volt (220-Volt). A long extension cord or a low supply Voltage can cause serious problems. The wire connections at the terminals have to be reliably tight.

Do not plug into a power receptacle until the rest of the installation is finished.

Warning:

Adapters, extension cords and surge protectors should not be used with this product. Also a GFCI (Ground Fault Circuit Interrupter) protected receptacle cannot be used. It is recommended to use a 20 amp, 115-Volt, AC dedicated circuit.

2. If the floor is uneven and the drill press rocks, place shims under the base to remove any motion. For light work the machine can stand on the floor by itself. It is advisable to bolt the machine to the floor when large work pieces are drilled. Four openings are provided in the column base for foundation bolts.
3. For optimum performance the Variable Speed Control assembly is preset at the factory. The circuit is protected by two fast blow ceramic fuses.

Do not tamper with the wiring or settings inside the Variable Speed Control Box.

SAFETY

DISCONNECT THE POWER CORD FROM THE WALL OUTLET BEFORE ANY MAINTENANCE.

CONTROL BOX AND MOTOR

1. **Do not open the Control Box. Tampering with the wiring or setting will void the warranty.** The circuit board is not field repairable. **Do not touch or adjust** anything without calling Ellis Manufacturing Co. for instructions. The circuits in the control box are not isolated. Elements of the circuit board are at 230 Volt. Direct contact with these circuits can cause serious injury.
2. The control circuit is not fail-safe. A disconnect at the wall outlet is the only way to reliably disable the control.
3. While power is ON or for some time after power-OFF, do not touch the inverter since the inverter will be extremely hot. Doing so can cause burns.

WARNING

- While power is ON or when the inverter is running, do not open the front cover. Otherwise you may get an electric shock.
- Do not run the inverter with the front cover or wiring cover removed. Otherwise you may access the exposed high voltage terminals or the charging part of the circuitry and get an electric shock.
- Even if power is OFF, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.
- Before wiring or inspection, power must be switched OFF. To confirm that, LED indication of the operation panel must be checked. (It must be OFF.) Any person who is involved in wiring or inspection shall wait for at least 10 minutes after the power supply has been switched OFF and check that there are no residual voltage using a tester or the like. The capacitor is charged with high voltage for some time after power OFF, and it is dangerous.
- This inverter must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical code (NEC section 250, IEC 536 class 1 and other applicable standards). A neutral-point earthed (grounded) power supply for 400V class inverter in compliance with EN standard must be used.
- Any person who is involved in wiring or inspection of this equipment shall be fully competent to do the work.
- The inverter must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Setting dial and key operations must be performed with dry hands to prevent an electric shock. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.
- Do not change the cooling fan while power is ON. It is dangerous to change the cooling fan while power is ON.
- Do not touch the printed circuit board with wet hands. Otherwise you may get an electric shock.
- When measuring the main circuit capacitor capacity, the DC voltage is applied to the motor for 1s at powering OFF. Never touch the motor terminal, etc. right after powering OFF to prevent an electric shock.

OPERATING SAFETY

1. Always wear safety glasses
2. Do not wear gloves, necktie, loose clothing, jewelry or other items that may get caught in moving parts. Long hair should be tied up and under a cap.
3. Do not hold the part to be drilled by hand. Clamp the work or brace it against the drill press column to prevent rotation or use the Safety Drill Press Vise; see the enclosed installation sheet about the Safety Drill Press Vise. Two T-Slots are provided in the table and column base to aid clamping.
4. Use recommended speeds that are proper for the drill, the material being drilled and accessories used.
5. Make a habit of removing the chuck key, drift key and other wrenches after their use.
6. Keep hands and fingers clear of the drill bit or cutter.
7. Shut off the power before removing the drill bit or cutting tool.
8. Do not try cutting or similar operations by moving the table or the head stock with respect to each other. Be sure that the head stock and table are securely clamped to the column.
9. Be sure the drill bit or cutting tool is securely clamped in the chuck.
10. Keep belt guard in place and closed.
11. Do not operate the machine beyond its capacity and possibly overload the power train.
12. Maintain the machine regularly, keep it clean and keep a maintenance and lubrication log.

MACHINE PARAMETERS

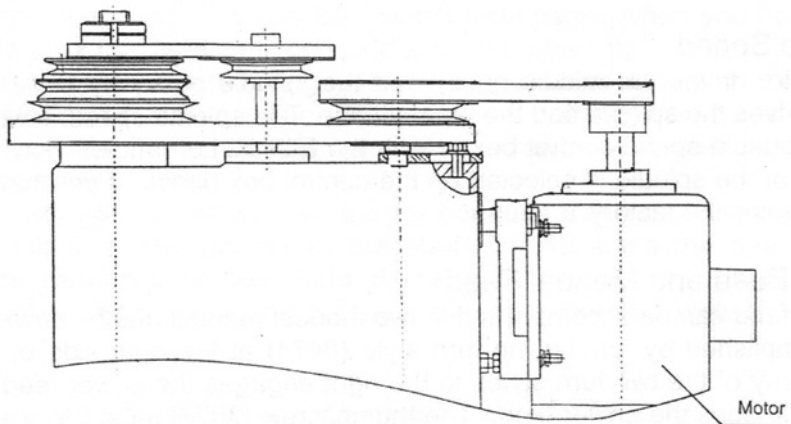
Maximum drill diameter	1.062" steel; 1.25" cast iron
Tapping capacity	3/4"-10 NC
Maximum spindle travel	5.38"
Spindle inner taper	Morse #3
Spindle speed	Variable, 0-1200 rpm
Size of table	15.88" x 17.88" or 16.50" Dia.
Size of base	16.38" x 26.62"
Power feed rate per spindle revolution	.004"
Diameter of column	4.0"
Diameter of quill	3.0"
Spindle travel	5.75"
Spindle to table	27.25"
Maximum distance spindle nose to base surface	46.25"
Drills to center	18.12"
Motor	2 HP
Net weight	675 LB
Overall size	20" W x 29"D x 69.5"H

SPEED CHANGE

A quick Speed (Torque) Range change can be accomplished with the Ellis HI-Lo Handle on the right side of the machine. (See the enclosed instruction sheet.) Note: The motor must rotate at a moderate speed to change the operating speed range selection. The variable speed control can vary the speed infinitely within each speed (Torque) range setting which is explained in the next paragraph.

LOW SPEED HIGH TORQUE OPERATION

It is highly recommended to shift into low using the "Ellis High/Low Shift" For big drills, tapping and hole saws see pages 14 and 15 for more information.



ELECTRICAL CONTROL BOX

Set up

DO NOT PLUG INTO A GFI CIRCUIT.

Start Turn the **BIG RED EMERGENCY** button clockwise (in the direction of the arrows) so that the button will pop out and the read out window will light up. Turn the Forward/Reverse switch to the reset position then to the desired direction of forward or reverse.

Set Button The small (middle) white **SET** button changes the read-out display in the number window. When the letter “**A**” lights up beside the window it shows the ampere draw of the motor. The voltage is shown when there is no letter on display.

Speed Push the small white **SET** button until you see the letters “**HZ**”. Now the read-out window displays the frequency in cycles/seconds. That feature controls the speed of the motor. This is **NOT** the **RPM** of the spindle but represents a reference that is relative to the spindle speed. (120 HZ = 100% of the spindle speed)

Speed Change The **BLACK** button in the upper left hand corner regulates the spindle speed. It works in both the forward and reverse mode. Spinning the black knob in the the upper left corner regulates the spindle speed. A clockwise rotation of the knob increases spindle speed in both the forward and reverse directions.

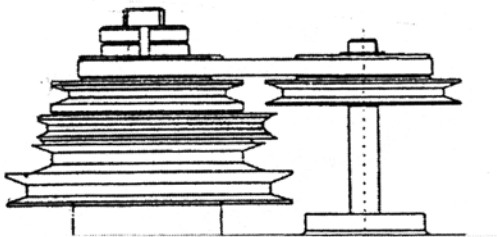
Forward Switch Position Use the Forward Switch Position for standard drilling, tapping and hole saw cutting.

Reverse Switch Position Use the Reverse Switch Position to retract a tap or to tap a left hand thread. Keep downward pressure on the feed handle when backing a tap out of the work piece.

Stop/Reset Switch Position This setting stops the motor from either forward or reverse rotation. Use this as the **STOP** switch while operating the drill press during the day. Reset to the position after a power outage or after hitting the **BIG RED EMERGENCY BUTTON**.

Stop The **BIG RED** button stops the machine and automatically disconnects the machine from electrical power after a time delay of about twenty seconds. Use this as the Power Off switch at the end of the day.

Note: Avoid stalling the spindle and stopping the motor under power; the resulting current surge can damage the electronic components in the control box. **Turn Power off immediately in a stalled motor condition.** Clear the jam mechanically. Repeated stalling abuse is detectable and can lead to voiding the warranty.



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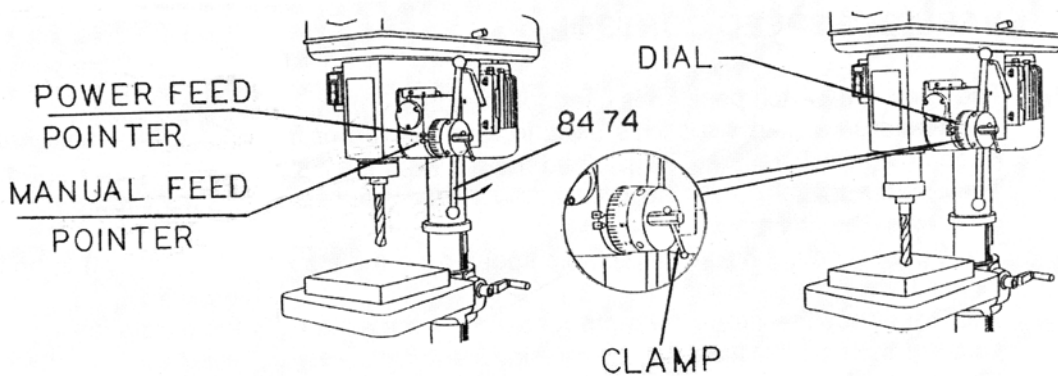
POWER TRAIN

Spindle Speed

The motor drives the middle pulley and the spindle pulley by a V-Belt. The spindle pulley drives the spindle and the taper sleeve. The spindle speed is variable by means of the variable speed control box or with Ellis Hi-Lo handle. Forward and reverse rotation of the spindle is selected on the control box panel. If you have any problems with this, call the factory.

Power Feed and Manual Feed

Spindle feed can be accomplished in two modes: manual and by power. Manual Feed is accomplished by turning the turn style (8474) at the right side of the head stock. Pulling any of the two turn styles to the right engages the power feed and returning it to the left stops the power feed. The thumbscrew (7027) must be loosened to engage the power feed, and tightening this thumbscrew prevents the machine from actually engaging in the power mode. **Use the power feed only when the spindle rotates in the CW (clockwise) rotation. Do not use power feed in the tapping mode.**

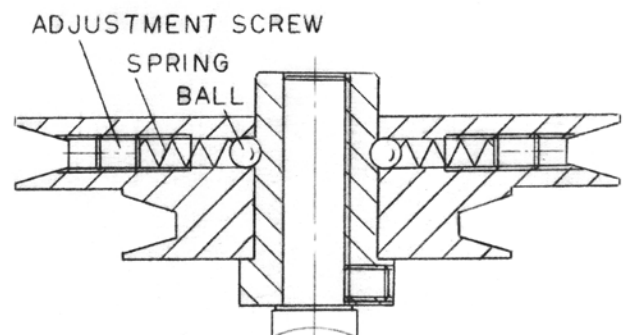


DEPTH OF DRILLED HOLE

Do not use the depth dial for through holes: unlock the locking clamp on the face of the depth dial. Proceed as described in the following for drilling holes to preset depth:

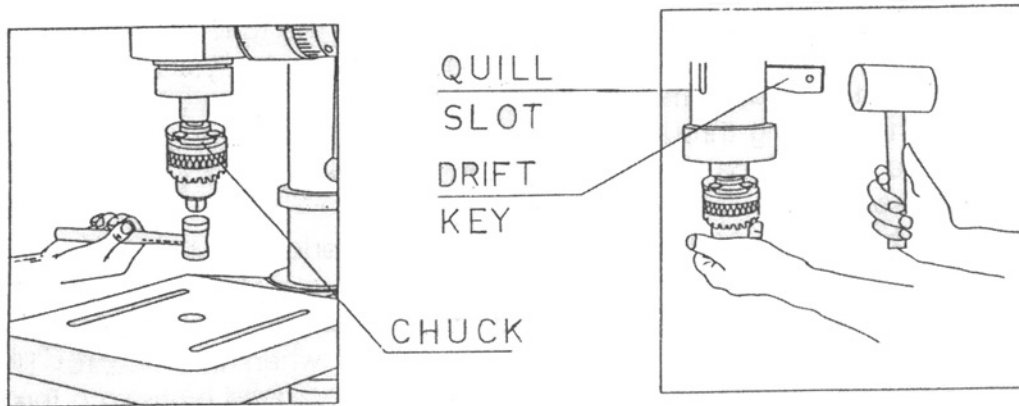
1. Stop the spindle rotation. Loosen the locking handle on the depth scale hub. Lower the drill end to the desired drill depth by turning the turn style. Turn the dial CCW (counter clockwise) as you face the end of the turn style hub. Lock the locking clamp when the dial comes to a stop.
2. Note: When drilling through holes, place a block of wood or scrap piece of metal under the work piece to prevent drilling into the table or use an Ellis Safety Drill Press Vise.
3. The machine is equipped with a power feed overload clutch. The overload clutch protects the feed power train from damage if too high a feed rate or too high a spindle speed is used. The overload clutch disengages when you hear a clicking noise. Reduce the feed rate or spindle speed when this occurs. The overload torque at which the clutch disengages can be increased by turning the adjustment screws clockwise and can be decreased by turning the adjustments screw counterclockwise. There are two adjustment screws in the pulley groove at 180 degree from one another.

Note: Do not tighten the screws too far because a solid spring cannot let the ball escape from the groove in the shaft. In this case the overload clutch would be rendered useless and damage can occur. To set the maximum torque: turn each set screw until tight and then back them out by two.



DRILL CHUCK AND TAPER SHANK DRILL ATTACHMENT

The size of the taper to be used with this machine is a **Morse # 3 Taper**. It is important to wipe the inside taper in the spindle and the outside of the chuck taper or drill taper clean of oil or dirt. Insert the arbor into the spindle and twist to align the tang with the slot in the spindle then thrust upward sharply to seat the chuck. Follow the same procedure for a taper shank drill or accessory. A wood hammer can assist in doing this.



REMOVING DRILL CHUCK OR DRILL FROM SPINDLE

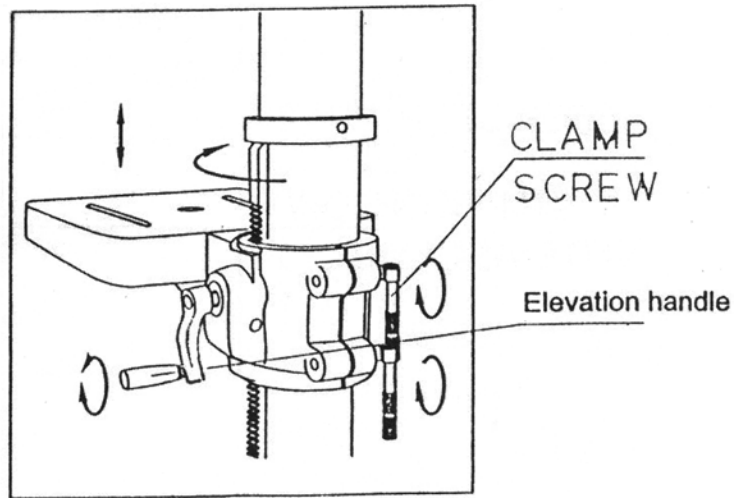
Loosen the locking handle on the depth scale collar. Lower the quill until the slot is completely uncovered. Grasp the locking handle and turn the collar CW (clockwise) as you face the end of the style handle body. Lock the handle securely when the collar comes against a stop. Turn the spindle until its slot lines up with the one in the quill. Insert the drift key into the slot. Hold the chuck or drill with one hand while tapping on the drift key with a hammer.

DRILL SPEEDS AND USAGE

The speed at which the drill has to rotate for efficient cutting depends on the type of material being worked and the diameter of the drill. Use a squirt bottle to add cutting oil (fluid) to the drill. Retract the drill often when deep holes are drilled; this removes chips. Use a low Spindle Speed (Torque) for tapping a threaded hole. Use a heavy oil or thread cutting fluid to lubricate the tap. Reverse the spindle rotation with the reverse switch on the variable speed control panel to retract the tap.

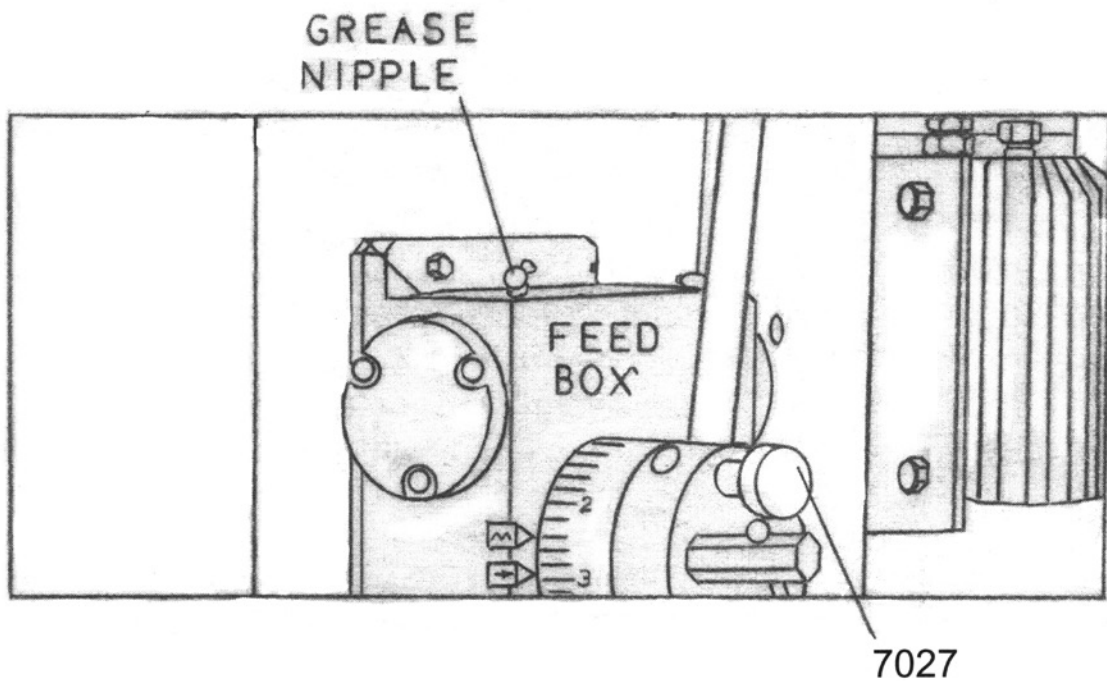
ELEVATING, ROTATING AND CLAMPING THE TABLE

The table can rotate 360 degrees and move up and down on the column. Loosen both clamp screws, rotate the table in the required position, elevate the table by means of the elevation handle and tighten both clamp screws again.



LUBRICATION

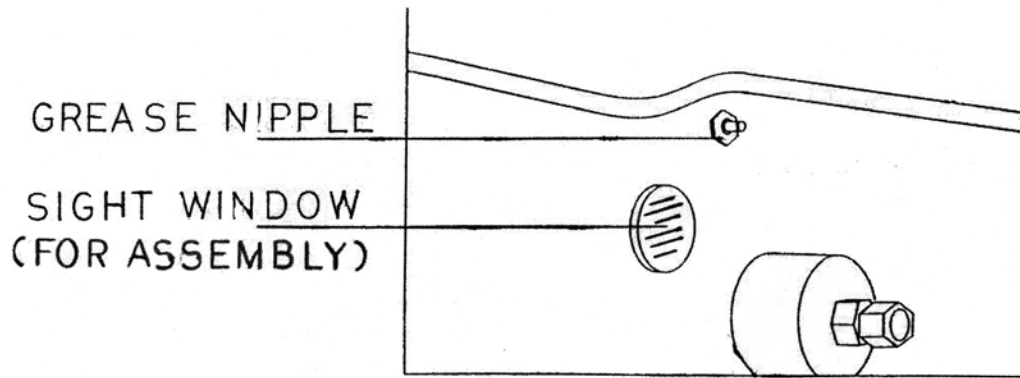
The power feed gear box at the right side of the head stock has a grease fitting. Another grease fitting is at the left side near the sight window, see next page.



LUBRICATION SCHEDULE

Location	Suggested Lubricant	Frequency
Grease Nipple	Lithium Grease N.L.G.I. # 2	Daily or twice daily under heavy use

Under light use, grease at least every other day. It is much more important that you grease the machine frequently than to worry about the type of lubricant used. Do not mix synthetic and mineral base oils.

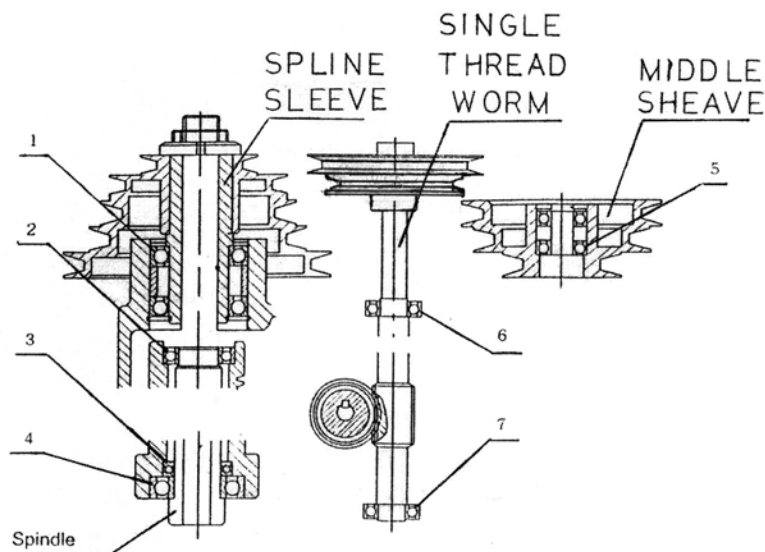


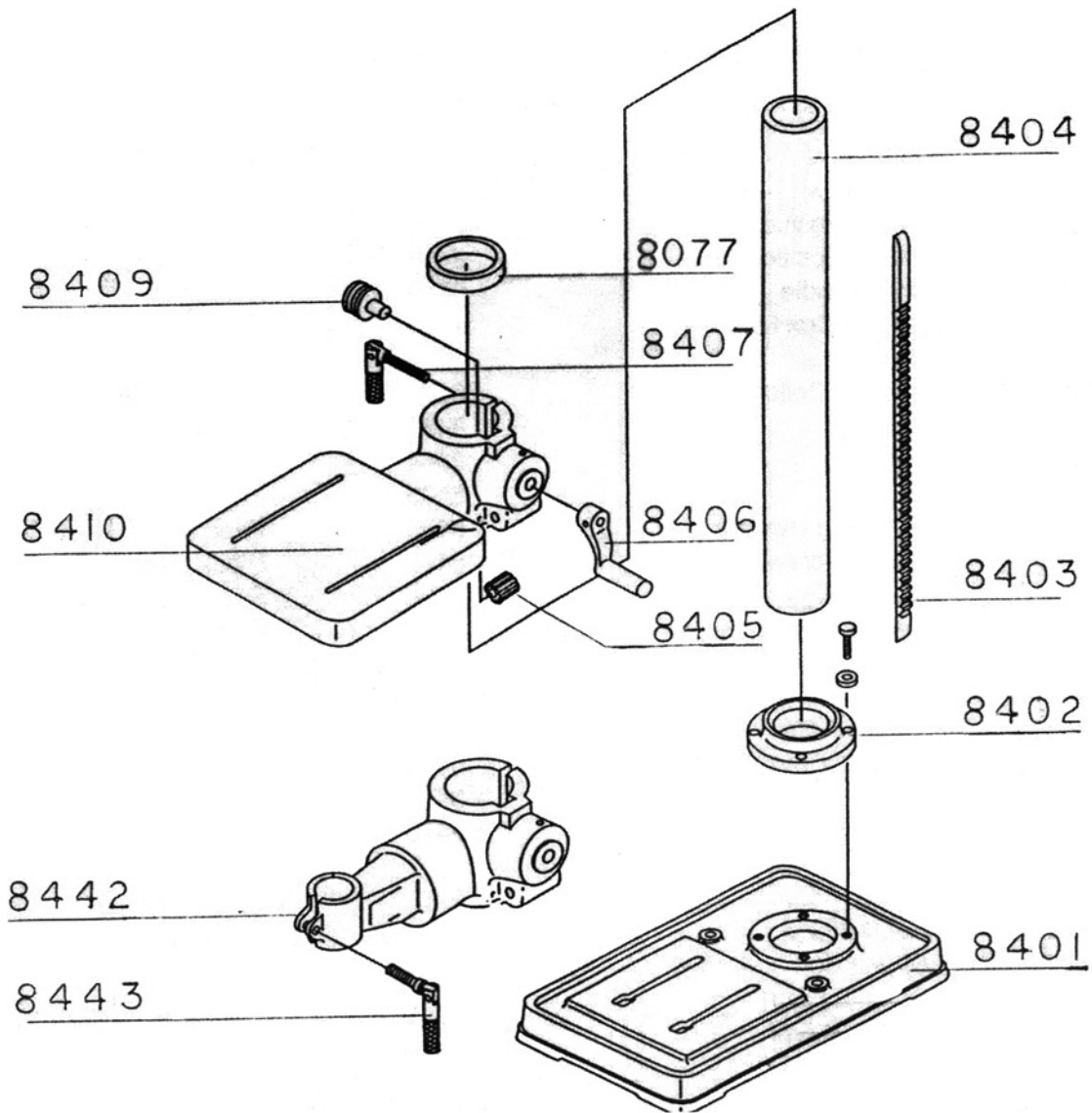
Maintenance

Keep table and sliding parts clean of dirt and chips. Every 3 months lower the quill, wipe clean and oil lightly. If raising the table becomes difficult, clean and wipe the column with light machine oil. The ball bearings in the motor, quill and V-Belt pulleys are lubricated for life. Keep the cooling fins of the speed control box and the motor clean and free of dirt and dust.

The chart below identifies the bearings in the various locations. The Ellis Part Number is required for replacement orders.

No.	Bearing Type	Location	Part No.	Size	Qty.
1	Deep Grove	Spline-Taper Sleeve	4490	45 x 75 x 16	2
2	Deep Grove	Quill	4491	30 x 55 x 13	1
3	Ball Thrust	Quill	4492	35 x 52 x 12	1
4	Deep Grove	Quill	4493	35 x 72 x 17	1
5	Deep Grove	Middle Sheave	4494	17 x 40 x 12	2
6	Deep Grove	Single Thread Worm	4495	20 x 42 x 12	1
7	Deep Grove	Single Thread Worm	4495	20 x 42 x 12	1





Parts List, 9400 Drill Press

Number	Name	Number	Name
4058	Hex Head Cap Screw	8430	Spacer
4144	Set Screw	8431	Cover
4146	Socket Set Screw	8432	Spindle Shaft
4260	Hex Nut	8433	Worm Base
4346	Lock Washer	8434	Spindle Pulley
4487	Ball Bearing (15 x 32 x 9)	8435	Overload Compression Spring
4530	Knob	8436	Nut
4831	Control Box, 230 Volt	8437	Feed Pulley
4646	Hilo Pulley	8438	Overload Cover
4647	Motor	8439	Handle Hub
4830	Control Box, 115 Volt	8440	Dial
4938	V-Belt-Upper, Power Feed	8441	Key
4939	V-Belt-Lower, Front Drive	8442	Table Bracket
4943	V-Belt, Rear Drive	8443	Clamp Screw
5059	Label	8445	Pin, Spring
7027	Thumb Screw	8446	Pin, Pawl
8077	Ring	8447	Middle Sheave
8081	Set Screw	8449	Middle Sheave Spacer
8104	Range Position Bolt	8452	Worm Cover
8107	Range Position Tube	8453	Worm, Double Thread
8115	Shift Handle	8454	Shim Plate
8127	Control Box Mount Plate	8455	Gear
8401	Base	8457	Transmission Shaft
8402	Column Collar	8458	Gear
8403	Rack	8459	Base
8404	Column	8460	Hub
8405	Gear	8461	Bevel Gear
8406	Elevating Handle	8462	Pawl
8407	Clamp Screw	8464	Spring
8409	Worm	8465	Plate
8410	Square Table	8466	Feed Box
8411	Spindle	8467	Block
8412	Nut	8468	Feed Label, Power
8413	Thrust Plate	8469	Feed Label, Manual
8414	Worm Cover	8470	Worm Housing
8415	Quill	8471	Lock Screw
8416	Counter Block	8472	Lock Handle
8417	Worm, single thread	8473	Washer
8418	Shaft	8474	Turn Style
8419	Head Stock	8476	Swivel Base
8423	Spring Cap		
8429	Spiral Spring and Cover Assembly		

PARTS LIST

Drill Press 9400

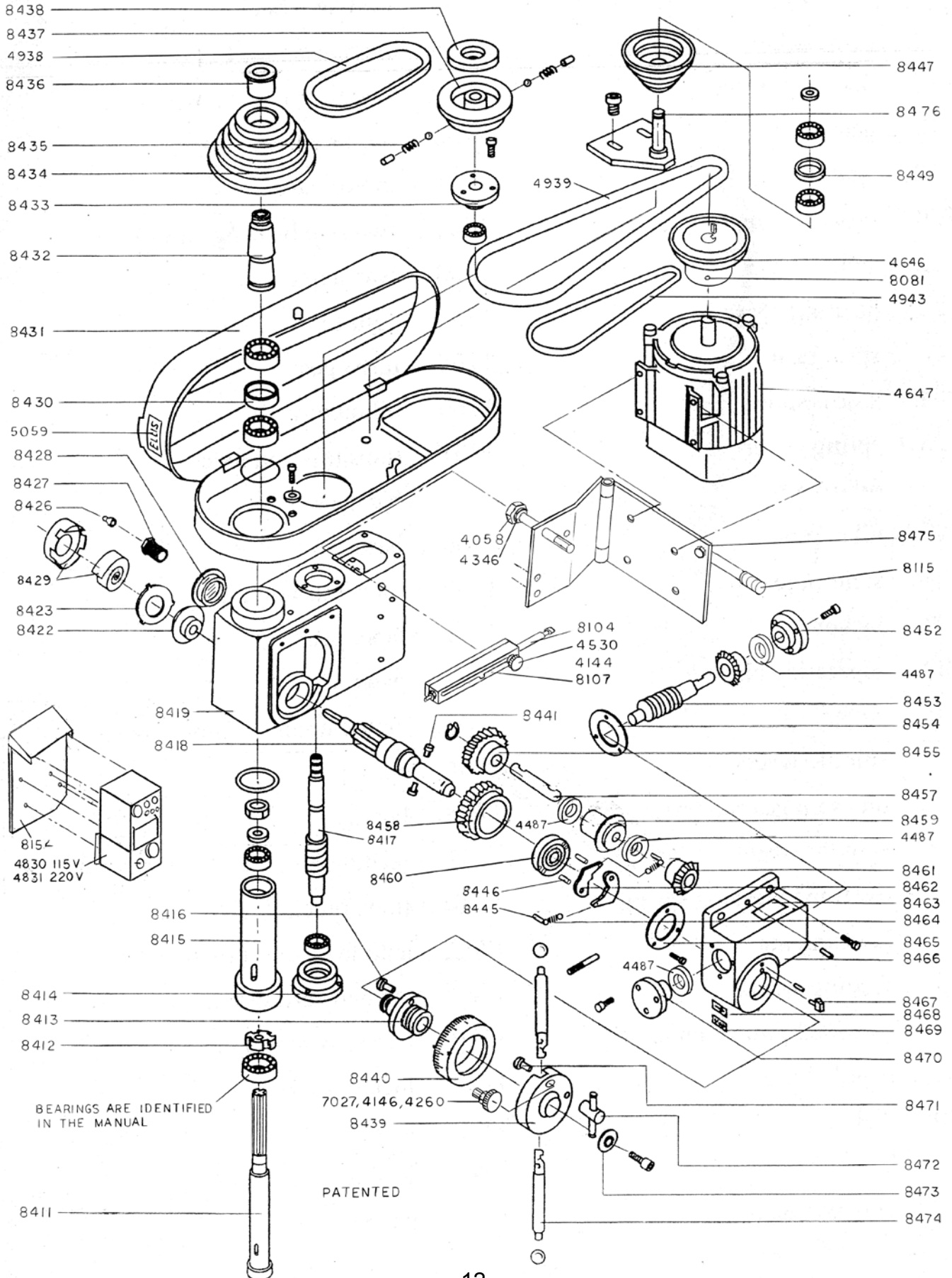


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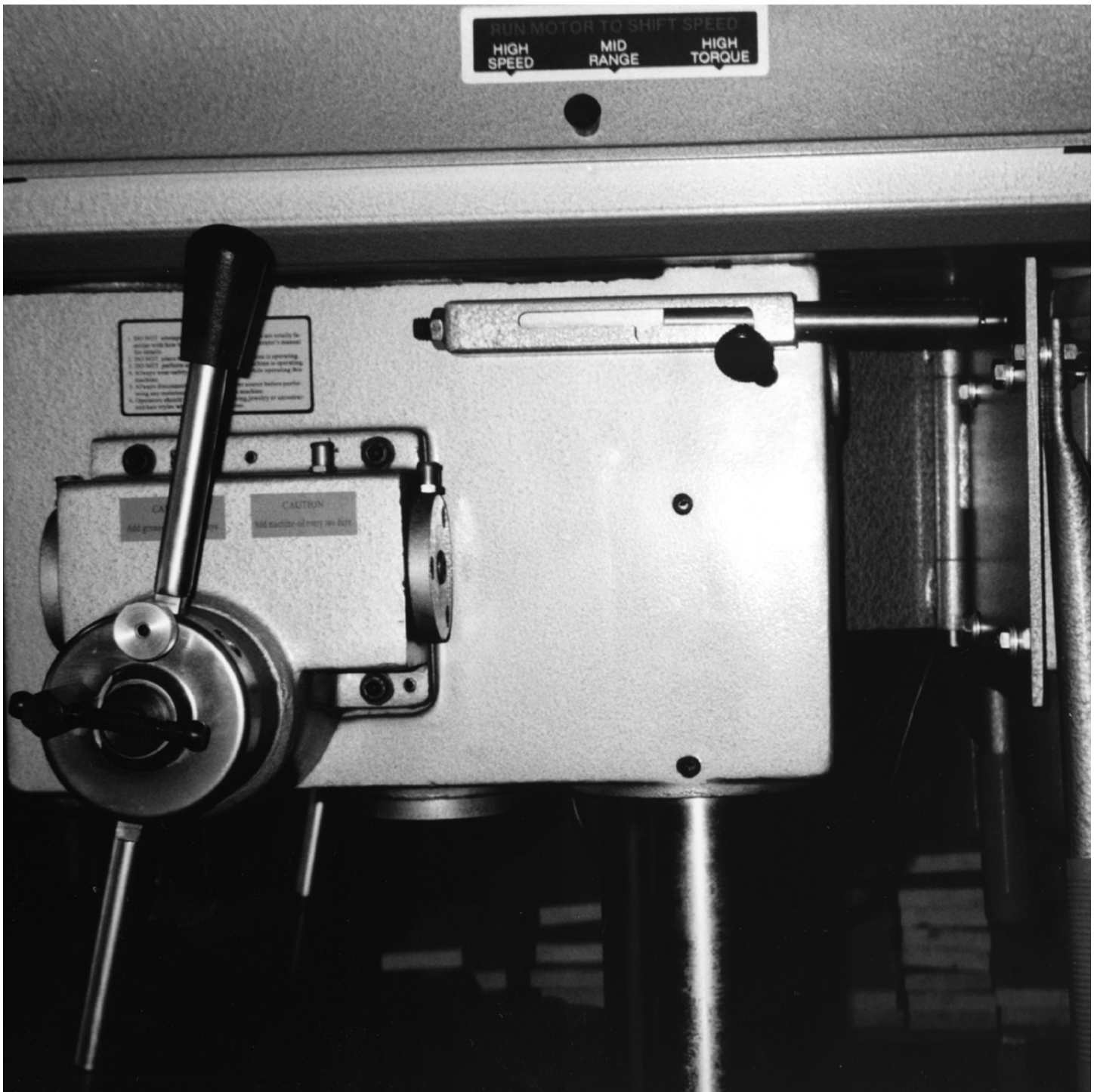


TROUBLESHOOTING

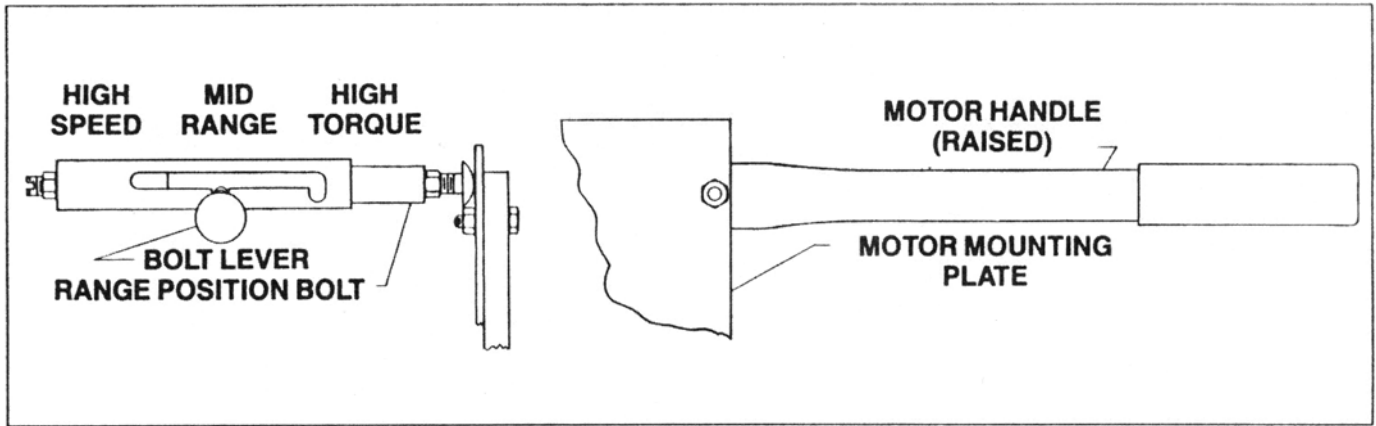
Problem	Probable Cause	Remedy
Motor Does Not Run	Power cord not plugged into source	Plug into receptacle
	Power not "ON" at Speed Control Box	Push "RUN" Button
	Speed knob in "0" position	Turn knob CW for more speed
	Main switch fuse blown	Replace fuse
	Motor too hot, heat switch tripped	Wait for motor to cool off
	Power cord plugged into GFCI protected outlet	Plug into an unprotected outlet preferably a dedicated circuit of 20 amp, 115 VAC
	Power cord not plugged into correct outlet	Power cord of a 115 V single phase machine has to be plugged into a 115 V outlet. A cord of a 230 single phase machine has to be plugged into a 230V outlet.
Noisy Operation	Incorrect belt tension	Adjust tension
	Loose spindle or motor pulley	Tighten set screw
	Belt is too tight	Reduce belt tension
	Spindle bearing worn	Replace spindle ball bearing
Spindle Not Moving Up	Return spring may be broken	Replace spiral spring
Drill Bit Smokes Or Is Burnt	Incorrect speed	Change speed
	Chips are not coming out of hole	Retract bit frequently to clear out chips
	Dull drill bit	Sharpen or replace drill bit
	Feed too slow	Increase feed to allow bit to cut
	Needs lubrication	Lubricate with cutting fluid
	Drill is running in reverse	Change motor rotation
Excessive Drill Run Out	Bent drill	Replace drill
	Chuck jaws not clamping evenly	Install drill correctly
	Worn spindle bearings	Replace ball bearings
No Power Feed	Worm gear worn	Replace worm gear
	Overload protection device not working	Tighten springs with set screws
	Pawl clutch is worn	Replace pawls
	Feed belt is sliding	Tighten belt
	Turn style does not move sideways	Loosen thumb screw #7027
Hole Depth Not Correct	Depth dial not clamped	Tighten dial lock
	Worm gear or quill worn	Replace gear
Drill Not Rotating	Taper on chuck slips in spindle	Remove grease and oil from inside taper bore in spindle and outside of taper on chuck. Use mineral spirits.
Spindle Not Rotating In Correct Rotation	Switch on control box may not be in correct position	Use forward switch for standard drilling and cutting. Use reverse switch to retract a tap or tapping for left-hand threads.

MODEL 9400

ELLIS VARIABLE SPEED DRILL PRESS WITH QUICK SPEED RANGE CHANGE



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Operating Instructions

Note: The motor must be moving at a moderate speed to change the spindle speed and the operating speed range selection.

- Stand next to the drill press facing toward the motor end of the drill press. Grasp the Motor Handle that is attached to the Motor Mounting Plate and raise it to a horizontal position with your right hand. See sketch above.
- Push forward on the handle just enough to relieve the pressure on the Range Position Bolt. Refer to the sketch above. Raise the Bolt Lever out of the position locking slot if the bolt is not in the High Speed position.
- Push the motor and the Range Position Bolt forward to reduce the spindle speed and increase the torque. Moving the Range Position Bolt and the motor in the opposite direction will increase the spindle speed. Make sure that the Bolt Lever is fully seated in the locking slot when in the MID RANGE or HIGH TORQUE positions.

MACHINE SPEED CONTROL CAPABILITY

Note: The speed range changes on the Ellis Variable Speed Drill Press are made conveniently. Each Speed range position provides a **maximum** speed limit. The complete speed variation from zero to the maximum of each range is made electronically using the speed control knob on the Ellis Variable Speed Control box.

- High Speed, 0 to approximately 1200 RPM range. This is the range best suited for small drills.
- Mid range, 0 to approximately 800 RPM speed. This is the general purpose drilling range. Most would want to leave the selector in this position.
- High Torque or Low Speed, 0 to approximately 450 RPM. This range provides the highest torque. Use it for larger drills and taps and for cutting large holes using Hole Saws.