

POCKET HOLE SAW SYSTEM



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General Safety Rules for Woodworking Machinery**WARNING**

The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

1. For your own safety, read the operation manual carefully. Know your machine. Learn its applications and limitations, and any hazards specific to this machine. All personnel should be trained in the operational procedures and received safety instruction before operating this equipment. If you have not received proper training in the use of this machine, **DO NOT OPERATE THIS MACHINE**, damage to the equipment or injury to the operator is possible.
2. This machine should not be operated without all of the guards in place and safety devices in operation. Removal of any guards or disabling any of the safety devices may result in damage to the equipment or injury to the operator. If any of the guards or safety devices are missing, damaged or not working properly, **DO NOT OPERATE THIS MACHINE**, notify your supervisor immediately.
3. If the operator has any safety concerns or questions regarding the operation of this equipment, **DO NOT OPERATE THIS MACHINE**, the machine should be locked out and your supervisor notified immediately.
4. All Lock Out/Tag Out procedures must be followed before servicing or adjusting this equipment. If you have not received proper training in the Lock Out/Tag Out procedures for this machine, **DO NOT OPERATE THIS MACHINE**, damage to the equipment or injury to the operator is possible.
5. In case of any equipment malfunction or jam the machine should be powered off and locked out before clearing any materials from the operational areas of this machine. Once cleared the reset procedures need to be followed when powering up the equipment. At no time should any of the machine control systems including electrical, hydraulic or pneumatic circuits be manually overridden.
6. Check machine for damaged parts. Before continued machine use any damaged guard or part must be carefully checked for proper operation of its intended function. Check all moving parts for proper alignment, check for binding of moving parts, breakage of parts, proper secure mounting, and any other condition that may affect machine operation. Guards or other parts that are damaged must be properly repaired or re-placed.
7. Machine must be properly grounded.

8. Maintain and clean machine at recommend intervals. Intervals may need to be adjusted due to work load or material type to keep machine in top condition. Follow instructions for lubrication, setup, and changing accessories
9. Disconnect machine from power source before, changing accessories, or any servicing activity.
10. Avoid accidental starting. Make sure switch is in the off position before connecting to power.
11. Remove any tools or loose objects from work surface of machine. Make sure any tools used for adjustment or maintenance are removed from machine before machine is restarted. Make a habit of scanning for tools and scraps every time the machine is started.
12. Keep work area clean. Cluttered work areas and workbenches increase the likelihood of an accident.
13. Do not use in dangerous environments. Do not use machine in damp or wet locations, or expose them to rain. Keep work area well illuminated.
14. Keep children away. All visitors should be kept at a safe distance from work area.
15. Make workshop childproof, with padlocks, master switches, or by removing starter keys.
16. Do not force the machine. It will function better and safer at its designed rate.
17. Use the right tools. Do not force the machine or attachments to do a job for which they were not designed. Contact the manufacturer or distributor if there is any question about the machine's suitability for a particular job.
18. Use only recommended accessories. Consult the operation manual for recommended accessories.
19. Wear proper apparel. Avoid loose clothing, gloves, neckties, rings bracelets, or jewelry which could be tangled in moving parts. Keep long hair contained to prevent entanglement. Non-slip footwear is recommended.
20. Always wear safety glasses.
21. Secure the work piece.
22. Keep proper footing and balance at all times.
23. Do not use machine while under the influence of drugs, alcohol, or any medication.
24. Always wear a face mask or dust mask if operation creates excessive dust or chips. Always operate machine in a well-ventilated area and provide proper dust removal.
25. Never leave machine running unattended. Turn power off. Do not leave machine until it comes to a complete stop.

Safety Rules for Cut-off Saw**WARNING**

The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

1. Read and understand the operation manual before operation.
2. Keep hands away from the cutting area.
3. Before making any adjustments disconnect all power sources including electrical and pneumatic.
4. Minimum air pressure is 50 psi, DO NOT operate saw if minimum air pressure is not available. Normal working pressure is 80psi.
5. At the start of each work session turn on saw and cycle the saw and check for normal operation of top clamp and blade advance cylinders. Turn off saw and as the motor slows and comes to a stop check for correct rotation direction compared to arrow indicator.
6. Do not cut warped wood; work piece should lay flat on table without rocking.
7. Use infeed and outfeed supports when cutting long work pieces.
8. Set top clamp to minimum close height for material being processed.
9. Short trim scraps should only be removed by pushing them out with a scrap piece and NOT with hands.

Arrival Inspection

WARNING

The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

The Pocket Hole Saw System ships on a pallet and a crate. The saw will be secured to a pallet. The RazorGage positioner, tables, legs, and tower control cabinet will be in the crate. Unpack the saw ensuring that all parts are present and free from damage. If any parts are missing or damaged contact your local distributor immediately. Do not assemble or attempt to operate saw without all components present and in undamaged condition.

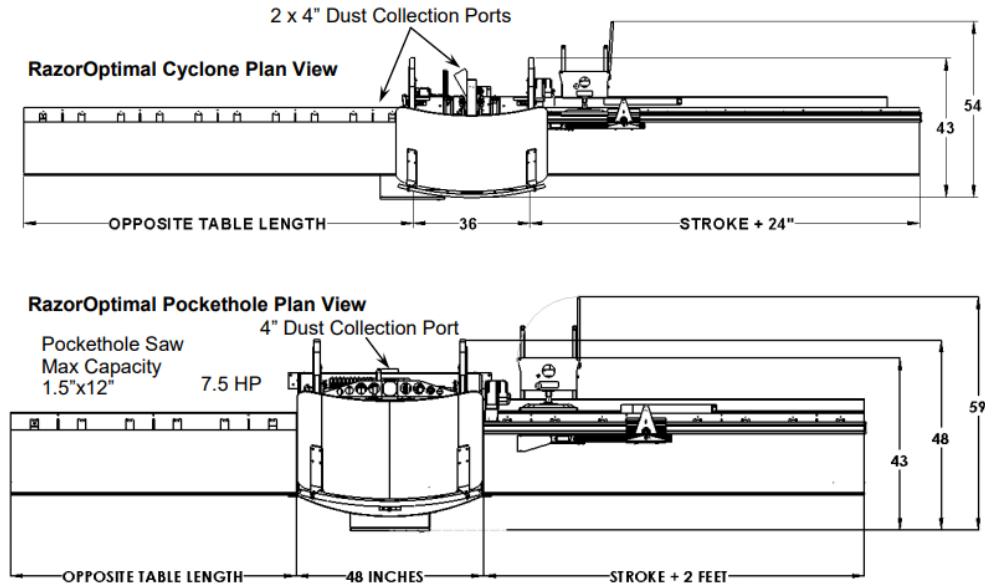
Installation



WARNING

The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

Install saw with enough free space to conveniently allow workpiece to be brought into saw. If infeed and/or outfeed tables are required allow room for such. See example floor layout below. The floor should be a flat non-slip surface. The saw will be more stable if bolted to floor. After locating the saw use leveling feet to adjust level of saw table. Place level on saw table and adjust feet to bring table into level position.



Leveling

To ensure product moves freely through the saw system, it is important to level the saw. After the saw has been located the saw can be leveled. Place the level on top of the saw adjacent to the back fence to check for level side-to-side. To check level front to back place level on the saw blade opening. Use the jack bolts on the mounting feet to make the adjustments to saw level. It is important that once the saw is level to check that all four mounting feet are sharing the weight of the saw. Otherwise the saw will be unstable.

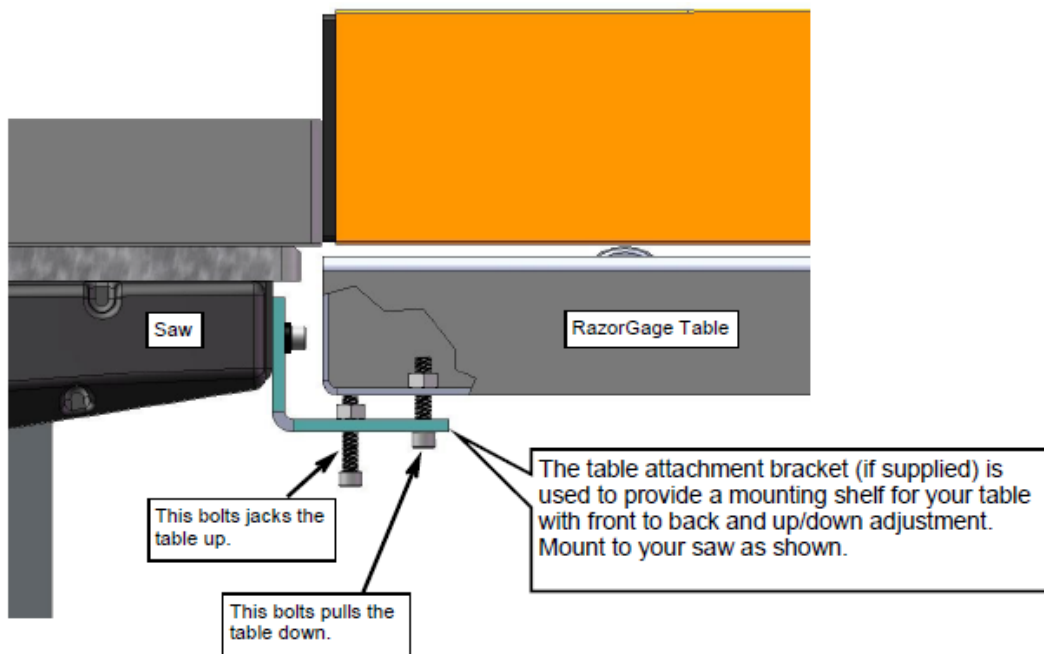


Anchoring

After saw is leveled, it is recommended that the saw is bolted down to the floor. This will improve stability and help keep the saw system components aligned to each other. The saw has four mounting feet located on the corners of the saw. Recommend using 3/8" x 7" anchor bolts.

Infeed/Outfeed Tables

The Pocket Hole Saw comes with table attachment brackets for mounting the infeed and outfeed tables. Use the diagram below to first bolt the table attachment bracket to the saw and then attach the table. After attaching the tables to the saw make sure to level them. There are leveling adjustment bolts on the table legs and also on the table attachment brackets shown below.



Electrical Power Connection



WARNING

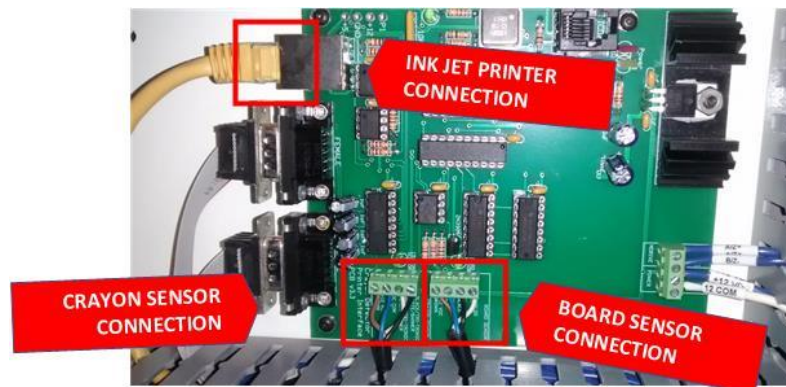
The operator must remove from and lock out all power sources to saw before servicing or connecting power.

The saw has been factory wired to the requested voltage before shipment. The Pocket Hole Saw power requirements are either **208 / 230 VAC 3 ϕ 40Amps** OR **480 VAC 3 ϕ 30Amps**. The RazorGage tower requires a separate **120VAC 1 ϕ 10A supply**. Check that your supply lines match the labeled voltage and the circuit protection and wire gauge is adequate. Connect wires to the disconnect inside the electrical enclosure as shown in pictures below.



Electrical Interface Connections

The Pocket Hole Saw requires a RazorOptimal pusher system to operate. To connect the pusher to the Pocket Hole saw an interface cable, valve cable, crayon sensor cable, and board sensor cable will need to be connected. The interface cable and valve bank cables are prewired from the factory and need only to be plugged back into the saw. The interface cable connects to the side of the saw control cabinet and the valve bank cable to the DIN connector on the valve bank. The crayon and board sensor cables will need to be wired to the crayon optimal circuit board in the RazorGage tower. Follow the sensor type and color code of the cable conductors marked next to the terminals on the board. The printer has a power cord that plugs into the power strip at the bottom on the tower and also an ethernet cable that plugs into the crayon board.



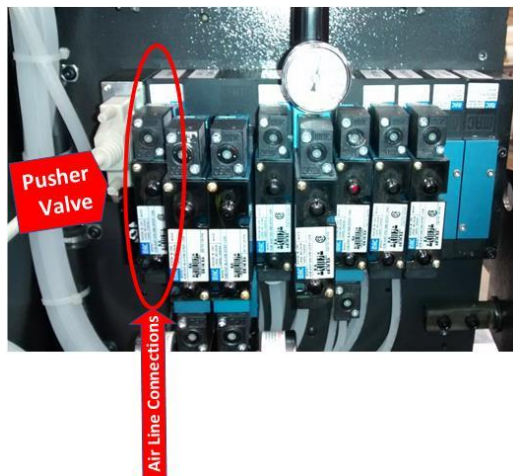
Air Supply Connection

The saw requires an 80 - 120 PSI compressed air supply connection. Connect air supply line to the FRL located on the back side of the saw as shown below.



Pneumatic Connections

The Pocket Hole Saw has all the valves for the RazorOptimal Pocket Hole System. The airlines for the pusher arm pop-up will need to be connected to the valve bank. The valve for the pusher is the first valve from the left. The air lines plug into the fittings on the bottom side of the valve. The pusher is normally down and pops up when the solenoid on the valve is activated. Reverse the two air lines if the pusher operates backwards.



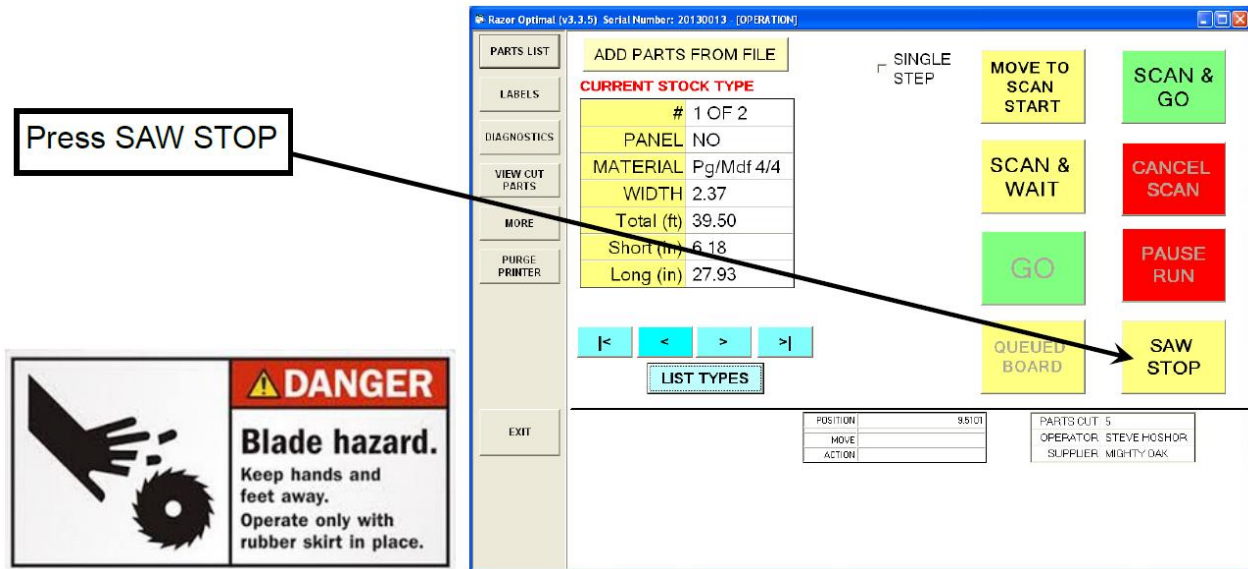
Dust Collection

This saw requires dust collection to keep saw dust from collecting in the saw & drills areas of the machine. Vacuum with the minimum capacity of 1200 CFM is recommended. There is one 4" dust collection port located at the back of the saw.

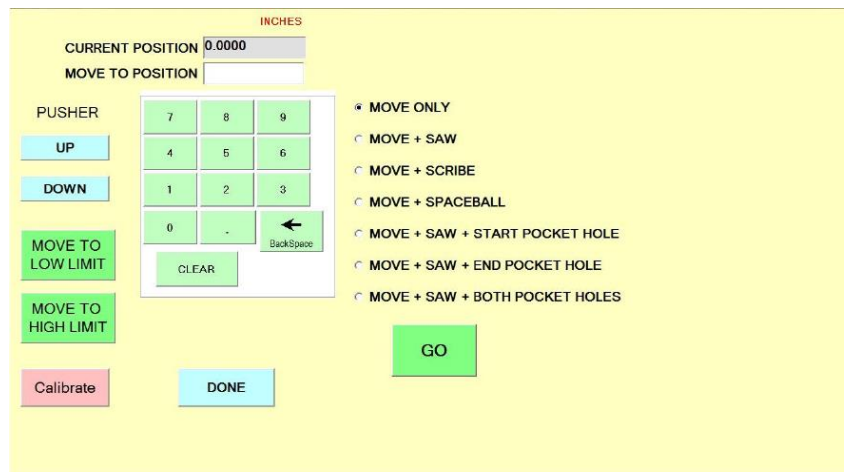


Setup Procedure

Set the Home Offset (PUSHER TO SAW AT LOW LIMIT). Follow the steps below after starting the software and homing the machine.



Touch in the MOVE TO POSITION box, enter the number 16, touch the MOVE ONLY radio button, and press GO. Now take a board longer than 16" with a squared end and put the square end against the pusher face and seat it against the fence so it is in position to be cut. Again type 16 in the MOVE TO POSITION box, click MOVE + SAW, and press GO. THE SAW WILL CYCLE. Remove the part from between the PUSHER AND THE SAW and press the CALIBRATE BUTTON.



Saw Stop Screen

Measure the part you just cut and In the CALIBRATE screen enter 16 as the LAST POSITION and the measured length of the part as the MEASURED PART LENGTH. Press CALIBRATE and then press CLOSE You have now set the home offset.

After performing a move, saw, enter the measured length of the piece cut, below, then click CALIBRATE to have the SAW to HOME automatically adjusted.

Last Position INCHES

Measured Part Length INCHES

7	8	9
4	5	6
1	2	3
0	.	←

CLEAR

BackSpace

CALIBRATE

CLOSE

Calibration Screen

NOTE: The scale factor will be set at the factory and only needs to be modified if the parts get incrementally smaller or larger than nominal as the pusher advances. Now that you have set the Home Offset, the next step is to set the Scale Factor. Again, use the SAW STOP screen. Find the longest, straightest piece of stock you can find and square one end. Measure the remaining length, subtract an inch or two from it, and enter that length in the MOVE TO POSITION box. Highlight the MOVE ONLY radio button and press GO. Now put the long piece of stock against the fence with the squared end against the stop. Enter the same value into the MOVE TO POSITION box, highlight the MOVE + SAW radio button and press GO. **The saw will cycle so make sure you're clear and that there are no tools or other obstructions in the way of the blade path.** Now measure that part. Make a note of the length you entered, the length of the actual part, and the current HOME OFFSET you set in the previous step. Press DONE and from the MAIN SCREEN press MORE, PARAMETERS, ENCODER. Record the SCALE FACTOR along with the other information mentioned above. Go to the jump drive that came with your machine or go to our website, www.razorgage.com/downloads and locate the SCALE FACTOR CALCULATOR PROGRAM. Open the program and enter the information you recorded and click CALCULATE. Enter the recommended scale factor in the ENCODER SCALE box on the ENCODER screen of the PARAMETERS menu.

PARTS LIST

SETTINGS SCREEN

DONE CANCEL

ENCODER SCALE

Encoder Type: ROTARY

ROTARY ENCODER SCALE: COUNTS PER INCH

You must enter the passcode to make changes to the encoder scale.

7	8	9
4	5	6
1	2	3

ENTER CLEAR

Encoder Parameters

Scale Factor Calculator

Step 1) Enter the Current Home Offset:

Step 2) Enter the Current Scale Factor:

Step 3) On the RazorGage Main Screen, enter a target position that will send the stop near to its high limit. Enter that same value at right:

Step 4) Square the end of a long piece of stock and put the square end against the stop while it's at the position entered above. Cut a part. Measure that part and enter its length at right:

The new Scale Factor:

Calculate

Note: For RazorOptimals get to the scale factor by clicking MORE, PARAMETERS, POSITION
RazorOptimal Password = 4812

Scale Factor Calculator

From the MAIN screen press MORE

Now press PARAMETERS

Now press POSITION

- **PUSHER TO SAW AT LOW LIMIT** – This value is the home offset and is set through the machine calibration process. Default is 0.5 inches
- **LOW LIMIT** – This value is the lowest position that the RazorGage is capable of moving. It does not need to be modified and cannot be selected from this screen.
- **HIGH LIMIT** – This value is the highest position that the RazorGage is capable of moving. It does not need to be modified and cannot be selected from this screen.
- **FIRST MOVE/CLAMP POSITION** – The position from the end of the board to the saw at which the infeed clamp will begin to activate. Default is 3 inches.
- **CLAMP SWITCH POSITION** – When the pusher position less than or equal to this value then the outfeed clamp is used instead of the infeed clamp. Default is 12 inches.
- **OUT-BOARD CLAMP OFFSET** – Distance from the outfeed clamp to the saw blade. Default is 4 inches.
- **MOTION ERROR UNLOAD DISTANCE** – Distance the RazorGage will backup on a motion error or stall to allow room for board removal if necessary. Default is 4 inches.

Now press the **MOTION** button on the left-hand side of the screen. These parameters control the speed, acceleration, and deceleration of the RazorGage. The **MOVE TO RUN START SPEED** is the first move of the board run. It is an intentionally slower move to keep the board close to the back fence until it is supported by the guide rollers and side clamps. **RUN CURRENT** is the percentage of current applied to the motor which determines the effective torque of the RazorGage movement. Set the parameters to the values shown below.

PARTS LIST LABELS DIAGNOSTICS VIEW CUT PARTS MORE PURGE PRINTER EXIT SOFTWARE	SETTINGS SCREEN		<input type="button" value="DONE"/> <input type="button" value="CANCEL"/>	
	POSITION	<div style="background-color: yellow; padding: 10px;"> <p>MOTION</p> <p>SPEED <input type="text" value="30"/> INCHES/SEC</p> <p>ACCEL <input type="text" value="90"/> INCHES/SEC</p> <p>DECEL <input type="text" value="90"/> INCHES/SEC</p> <p>MOVE TO RUN START SPEED <input type="text" value="10"/> INCHES/SEC</p> <p>RUN CURRENT <input type="text" value="100"/> Percent (20 - 100)</p> </div>		
	MOTION			
	SAW			
	PANELS			
	FIT			
	LOAD			
	PARTS			
	ENCODER			
	COM			
	REPORTS			
	SCRIBE			
	SPACE BALL			
	RAZ-ARRAY			
	POCKET HOLE DRILLS			

Motion Parameters

Press the SAW button on the left-hand side of the screen and set the timer values as shown below. To determine the kerf, measure a short board with square ends, saw it in two, put the two pieces together and measure the overall length of the resulting two pieces. The difference between the original length of the board and the length of the two boards together is the kerf.

PARAMETERS

SAW

SAW KERF 0.163 INCHES

SAW CLAMP TIMER 300 milliseconds

SAW TIMER 0 milliseconds

SAW UN-CLAMP TIMER 0 milliseconds

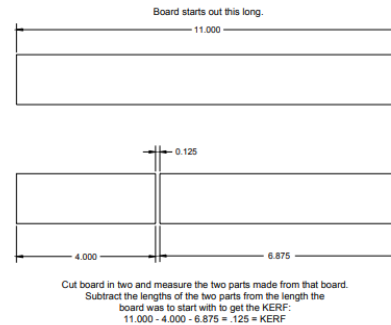
1. Turn on Clamp Valves
2. Delay * Saw Clamp Timer
3. Turn on Saw Valve
4. Delay * Saw Timer
5. Turn off Saw Valve
6. Delay * Saw Un-Clamp Timer
7. Turn off Clamp Valves
8. Move

☐ TURN OFF HORIZONTAL CLAMPS

The Min. SAW CLAMP TIMER is 300

If your saw is equipped with the 'Saw Up' proximity sensor (Input X15), then set the 'SAW TIMER' to zero.

If your saw is equipped with the 'Saw Down' proximity sensor (Input X16), then set the 'SAW UN-CLAMP TIMER' to zero.



Saw Parameters

- **SAW KERF** – This value is the length of material the saw blade removes with each cut. If all part lengths are off by the same amount from nominal dimension then the saw kerf may need to be adjusted.
- **SAW CLAMP TIMER** – This is the delay time after vertical clamp is activated before the saw advance is activated. Because there is no sensor for the vertical clamp, this timer will need to be set to 300ms at minimum. The vertical clamp needs to be fully engaging the part before saw is advanced. If either the vertical clamp flow controls or stop position are adjusted this value may need to be increased.
- **SAW TIMER** – This is the delay time after saw advance is activated before the saw is deactivated. The new saw versions have sensors to monitor saw position so this timer value need to be set to 0.
- **SAW UNCLAMP TIMER** – This is the delay time after saw advance is deactivated before the vertical clamp is deactivated. The new saw versions have sensors to monitor saw position so this timer value need to be set to 0.

Now press the SCAN button on the left-hand side of the screen and set the Scan Start Position and Scan Speed values as shown below.

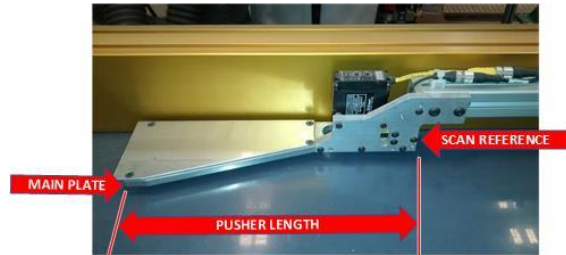
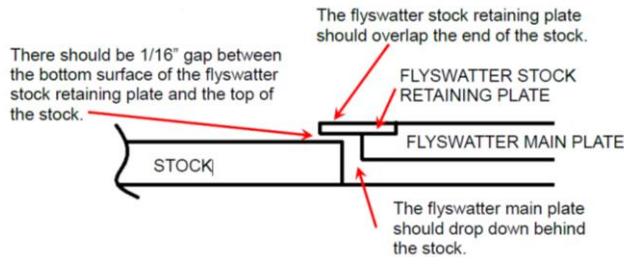
Enter the value for the Parameter called **PUSHER LENGTH** also found in the picture below. After a scan the pusher arm should drop behind the stock material with the retaining plate on top of the board and the main plate behind the end of the stock, shown in the diagram below. If you are noticing after scanning that the main plate of the pusher arm (or flyswatter) is dropping down on top of the board or if the retaining plate is not above the end of the stock material then there is likely a problem with either with the board end sensor or the value entered in the **PUSHER LENGTH** parameter. If the *flyswatter main plate* is dropping on top of the stock, increase **PUSHER LENGTH**. If it is going too far back and the *flyswatter stock retaining plate* is dropping down behind the part then decrease the **PUSHER LENGTH**. When the pusher or flyswatter drops down behind the stock, it should be positioned as shown in the diagram below.

There is a video that describes how to adjust the length sensor. Here is a link:

<http://www.youtube.com/watch?v=3YqQzSEUVAw&list=UU7xgOZ6NMmc1M3123BY-UtgA&feature=share&index=2>

PARTS LIST		SETTINGS SCREEN		DONE		CANCEL	
PARTS LIST LABELS DIAGNOSTICS VIEW CUT PARTS MORE PURGE PRINTER EXIT SOFTWARE	POSITION	-SCAN					
	MOTION	SCAN START POSITION (FROM LOW LIMIT) 9.5 INCHES					
	SAW	SCAN SPEED 45 INCHES					
	PANELS	SCAN ACCEL 90					
	FIT	SCAN DECEL 25					
	SCAN	PUSHER LENGTH 13.7 INCHES					
	PARTS	CRAYON MARK OFFSET 0 INCHES					
	ENCODER	SENSOR DIFFERENCE 1 INCHES					
	COM	BOARD SENSOR KERF 0.125 INCHES					
	REPORTS	SCAN UNITS <input checked="" type="radio"/> ENCODER <input type="radio"/> INCHES					
	SCRIBE	AFTER SCAN IS DONE: <input checked="" type="radio"/> Move to Run Start, Then Pusher Down					
	SPACE BALL	<input type="radio"/> Pusher Down, Then Move to Run Start					
	RAZ-ARRAY	MINIMUM TRIM AT START 0.75 INCHES					
	POCKET HOLE DRILLS						

Scan Parameters



- **SCAN START POSITION (FROM LOW LIMIT)** – This variable is the length of material the saw blade removes with each cut. If all part lengths are off by the same amount from nominal dimension then the saw kerf may need to be adjusted.
- **SCAN SPEED** – The speed in inches/sec at which the RazorGage moves during scanning. Default speed is 40 inches/sec.
- **PUSHER LENGTH** – This is the length from the scan reference to the main plate of the pusher arm. See picture above. This value is used by the program to determine where to drop the pusher after scanning. If the pusher is dropping on the end of the part increase this value. Decrease this value if the pusher is dropping behind the part where the stock retaining plate is not engaged. Default length is 13.7 inches.
- **CRAYON MARK OFFSET** – This offset determines where the saw cuts in relation the crayon mark on the board. Default is 0 inches.
- **SENSOR DIFFERENCE** – Distance from board sensor to crayon sensor. Default is 1 inch.
- **BOARD SENSOR KERF** – The width of the end of board sensor detection area.
- **SCAN UNITS** – The scan units can be setup for encoder pulses or inches. Default is inches.
- **AFTER SCAN IS DONE** – This option changes the machine sequence after a scan. The first option moves the RazorGage to the Run Start position then drops the pusher arm. The second (default) option is opposite. It drops the pusher arm and then move the RazorGage to the Run Start position.
- **MINIMUM TRIM AT START** – This variable is the minimum trim amount if the board has no crayon marks. **This value cannot be smaller than the scan end of board gap (approximately 0.250").** Default value is 0.750 inches.

Press the SCRIBE button on the left-hand side of the screen. The description of the variables is below.

- SCRIBE OFFSET – The distance from scribe to the centerline of the saw blade. Default is 0.
- SCRIBE CLAMP OFFSET – This parameter is not used. Default is 0.
- AFTER SCRIBE DELAY – This parameter is not used. Default is 0.

The screenshot shows the 'SETTINGS SCREEN' of the RAZOR Optimal v3.3.17 software. On the left is a vertical menu with buttons: PARTS LIST, LABELS, DIAGNOSTICS, VIEW CUT PARTS, MORE, PURGE PRINTER, SHAKE, FIRE SPACEBALL, EXIT SOFTWARE, and POCKET HOLE DRILLS. The 'SCRIBE' button is highlighted. The main area is titled 'SCRIBE' and contains three input fields: 'SCRIBE OFFSET' set to 0 INCHES, 'SCRIBE CLAMP OFFSET' set to 0 INCHES, and 'AFTER SCRIBE DELAY' set to 0 milliseconds. 'DONE' and 'CANCEL' buttons are at the top right.

Scribe Parameters

Press the POCKET HOLE DRILLS button on the left-hand side of the screen. This is where the maintenance counter for the drills is displayed. The counter can be reset from this screen.

The screenshot shows the 'SETTINGS SCREEN' of the RAZOR Optimal v3.3.17 software. On the left is a vertical menu with buttons: PARTS LIST, LABELS, DIAGNOSTICS, VIEW CUT PARTS, MORE, PURGE PRINTER, SHAKE, FIRE SPACEBALL, EXIT SOFTWARE, and POCKET HOLE DRILLS. The 'POCKET HOLE DRILLS' button is highlighted. The main area is titled 'Pocket Hole Drills' and contains a 'Reset' button, a 'Drill Cycle Counter' showing 0, and an 'Alarm Set Point' showing 5000. 'DONE' and 'CANCEL' buttons are at the top right.

Pocket Hole Drills Parameters

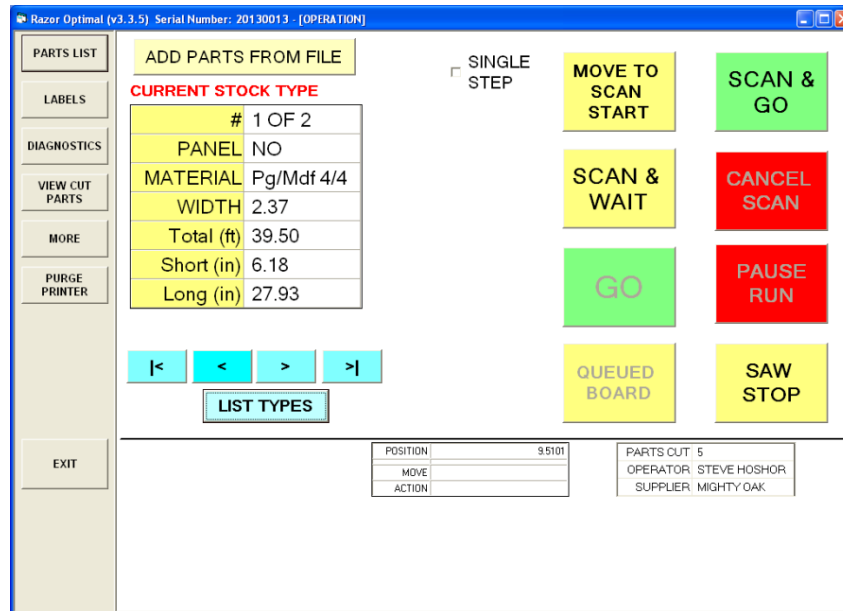
If you have the Raz-Array option, press the RAZ-ARRAY button on the left-hand side of the screen. The description of the variables is below. Use APPLY CHANGES button to update changes to parameters.

- **SELECT THE FIELD...** – Use the dropdown list to select field in the cutlist that contains the Raz-Array bin numbers.
- **SWITCH THE ROW DIRECTION** – Check this box to change row #1 from the top to the bottom.
- **SWITCH THE COLUMN DIRECTION** – Check this box to change column #1 from the left to the right.
- **SELECT HOW THE BINS ARE LAYED OUT** – *Horizontally* layout is where the bins count up horizontally first then increments vertically. *Vertically* layout is where the bins count up vertically first then increments horizontally.
- **SIMULATE NEXT BUTTON** – Changes active bin to the next bin in the que.
- **CLEAR BIN AND BIN QUE** – Deactivates current bin and clears bin que.
- **CLEAR BIN, BIN QUE AND LOAD FOR BIN TESTING** – Clears current bin and bin que. Activates bin #1 and populates the que with sequential bins from 2 – maximum. Use the **SIMULATE NEXT BUTTON** to set through testing bins.

Raz-Array Parameters

These settings should get your machine into good operating condition. Fine tuning some of these parameters may be necessary to customize the machine's operation to your needs.

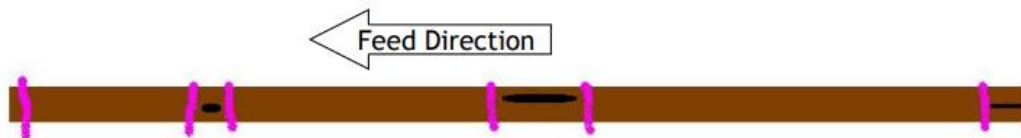
General Operation



Main Screen

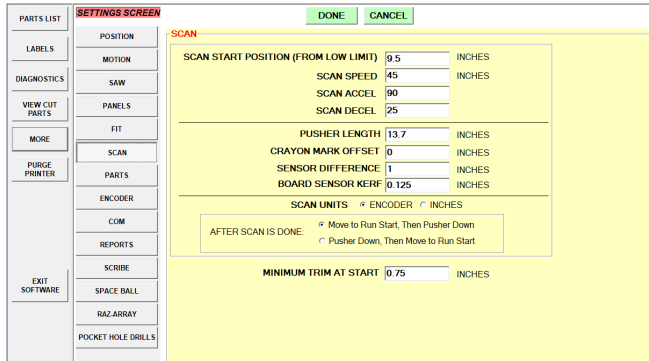
To begin cutting parts, follow these steps:

1. Start the saw and drills using the green start buttons on the front of the saw electrical cabinet.
2. Open the Razor Optimal software and home the RazorGage. When homing is finished the main screen will display.
3. Press the *ADD PARTS FROM FILE* button.
4. Select the cutlist file you want to open. When the cutlist opens, the list of parts will typically be sorted by material type. Types are determined by the species, thickness, and width of the wood. The sorting criteria can be easily changed to match the requirements of the customer's application.
5. Choose a type to run. Use the navigation keys to change type. Use the *LIST TYPES* button to see all remaining types.
6. Place a piece of stock matching the material type you are running on the table. Follow the instructions below to defect the board.



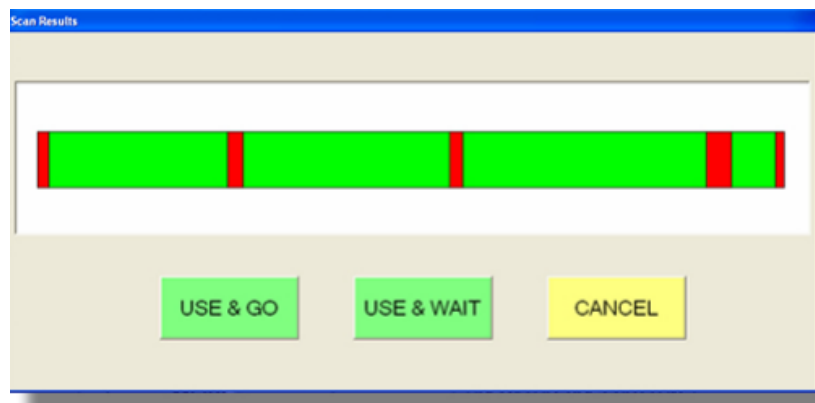
- a. Using the supplied fluorescent crayon, mark the leading edge trim cut. This is not required if the stock material does not have any defect locations.
- b. Mark the beginning and end of each defect.
- c. Mark the trailing edge trim cut (Optional).

- d. If you prefer to cut out the crayon marks, press in order *MORE*, *PARAMETERS*, *SCAN* buttons. The *CRAYON MARK OFFSET* variable will change how much material is cut at the crayon marks.



7. After defecting start the scanning process by first pressing *MOVE TO SCAN START* button. The scanner will move to scanning position. Place the defected board against the fence and crowd it to the back of the pusher arm. Then press *SCAN & WAIT* or *SCAN & GO* button. *SCAN & GO* will scan material for defects and overall length. Next, the machine will start cutting automatically. This option will be used in normal operation. Alternatively, you can use the *SCAN & WAIT* and follow instructions below.

- a. If you press *SCAN & WAIT*, a diagram will appear showing the defects the fluorescent crayon scanner picked up during the scan. Defects show up in red bands, and clear spans show up in the green bands. It is a good idea to use this when getting started to check that the crayon marks being made are dark enough for the scanner to read.



Scan Results

- b. Select one of the following.
- Press *USE & GO* button to accept the scan and start cutting parts.
 - Press *USE & WAIT* button to accept the scan and return to the main screen where pressing *GO* will continue the operation.
 - Press *CANCEL* to clear the scan and start over. If you press *CANCEL*, then to delete that scanned board from the queue press the *QUEUED BOARD* button.



8. Once the scan has been accepted and the process initiated the RazorOptimal will cut the optimal parts from the board to minimize waste. While the machine is processing the board, you can begin defecting a new board. When the previous board is finished the pusher will return to the scan start position automatically. Using the *MOVE TO SCAN START* button won't be necessary every time. Just place the defected board against the fence, crowd it against the back of the pusher, and choose either *SCAN & WAIT* or *SCAN & GO*.

Machine Adjustments**WARNING**

The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

**WARNING**

The operator must remove from and lock out all power sources to saw before servicing or connecting power.

Lockout / Tagout Points

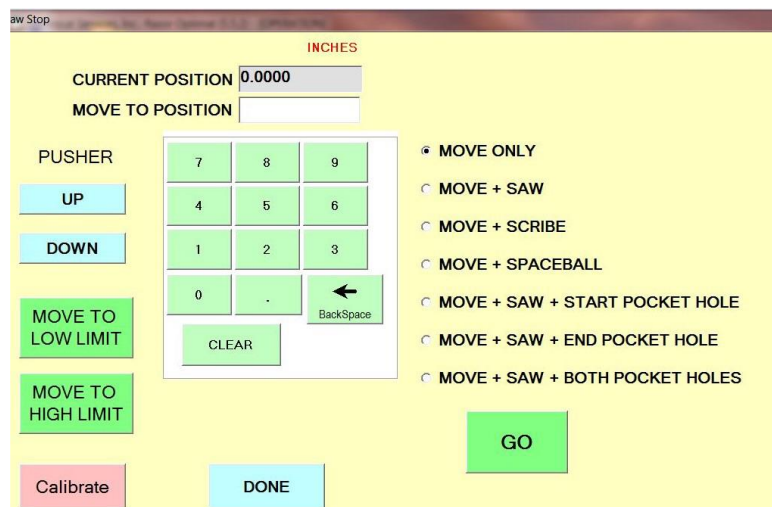


This machine has many adjustments that are used to set the machine up to a specific application. The machine adjustments are setup at the factory and fine-tuned during installation. If it is necessary to make changes to these settings (i.e. material size changes), make sure you read and understand all instructions before attempting to make any setup changes to the machine. If any assistance is needed contact your distributor or RazorGage. When removing any machine guards or panels properly lock-out tag-out machine power sources. See pictures above for electrical and pneumatic power source lock-out points.

Saw Flow Controls

The saw blade feed rate is adjustable with pneumatic flow controls. This adjustment may be necessary if material thickness or width changes. Also, a saw timeout error would be a reason to make this adjustment. The flow controls for saw feed rate are located a panel above the saw blade housing. There is a flow control for retract on the left and one for advance on the right. Turning the dial clockwise closes the flow which slows motion and turning counterclockwise will hastens motion. **Use precaution when making adjustments to saw feed rate. Changes to saw blade feed rate can affect cut quality.**

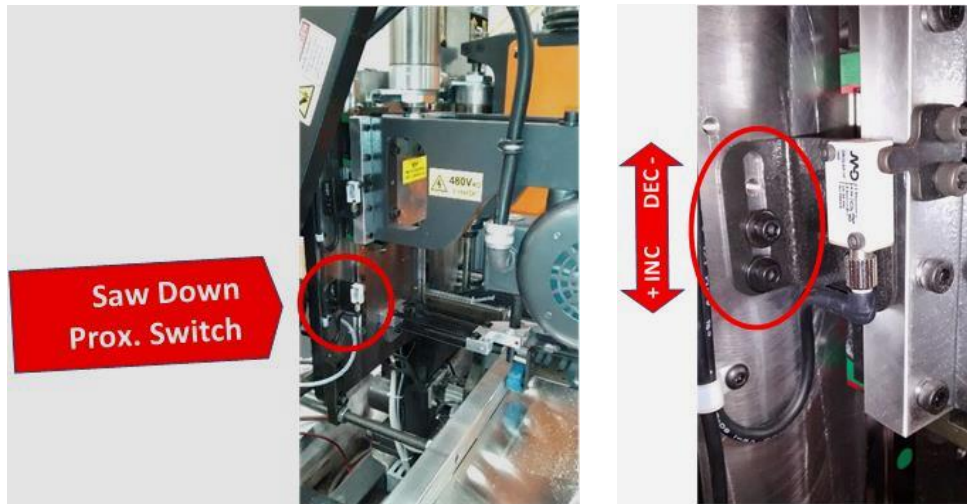
To test saw, go to SAW STOP MODE from the MAIN SCREEN and press MOVE TO HIGH LIMIT to get the pusher out of the way. Now place a test piece of board under the top clamp and against the fence. Enter a value equal to the current position, select MOVE + SAW, then press GO. The pusher won't move because it's already in position but the operation selected will be performed. Check saw feed rate as the saw is cycling and adjust flow controls to change advance and retract speed as needed.



Saw Stop

Saw Stroke Distance

The distance at which the saw blade strokes down is adjustable. This adjustment may be needed if the material width being cut changes. During the saw cycle the saw blade advances down until the flag reaches the down position proximity switch. To change the distance the saw blade travels down the saw down prox. switch can be adjusted. Moving the switch lower increases saw down stroke and moving switch up decreases travel.



Saw Blade Speed

The saw blade speed is adjustable from the display on the front of the electrical enclosure. The selectable range is from 1380 to 3450 RPM. Use the up and down arrow to change the saw blade RPM set point. Set the saw blade speed to the blade manufacturer's recommendation.



Drills Flow Controls

The retract speed on the left & right Pocket Hole drills is adjustable with pneumatic flow controls. This adjustment may be necessary if the drill feed rate is changed. To access the flow controls for the left & right drills retract are located underneath the corresponding top plate. See the Pocket Hole Drills Access in the Maintenance section of the manual for more information. Turning the flow control dial clockwise restricts the air flow which slows motion and counter-clockwise will open air flow which hastens motion.

**Left Drills
Retract
Flow Control**



Drills Feed Rate

The feed rate of the left & right Pocket Hole drills is adjustable with a Kinechek speed regulator. This adjustment may be necessary if the drill hole quality is not accessible or the shock has been replaced. To access the shock for the left & right drills feed remove the top plate of the corresponding side of Pocket Hole drills. See the *Pocket Hole Drills Access* in the *Maintenance* section of the manual for more information.

To adjust the speed with which the pocket drills advance, locate the brass knob on the speed control as shown below. Turning adjustment knob full circle, will not harm the unit but do not adjust while under load. Adjustment is at its fastest setting when indicator slot is at #0 on scale line and at its slowest setting at #30 on scale line.

To test the drills, go to SAW STOP MODE from the MAIN SCREEN and press MOVE TO HIGH LIMIT to get the pusher out of the way. Select MOVE + SAW + BOTH POCKET HOLES, enter a number equal to the current position, and press GO. The carriage will not move but the saw and drills will cycle. Make sure you have a board under the top clamp so the drills don't drill into it. With the top cover off you can watch the feed rate of the drills. If it's too fast or slow, adjust the Kinechek feed regulator.



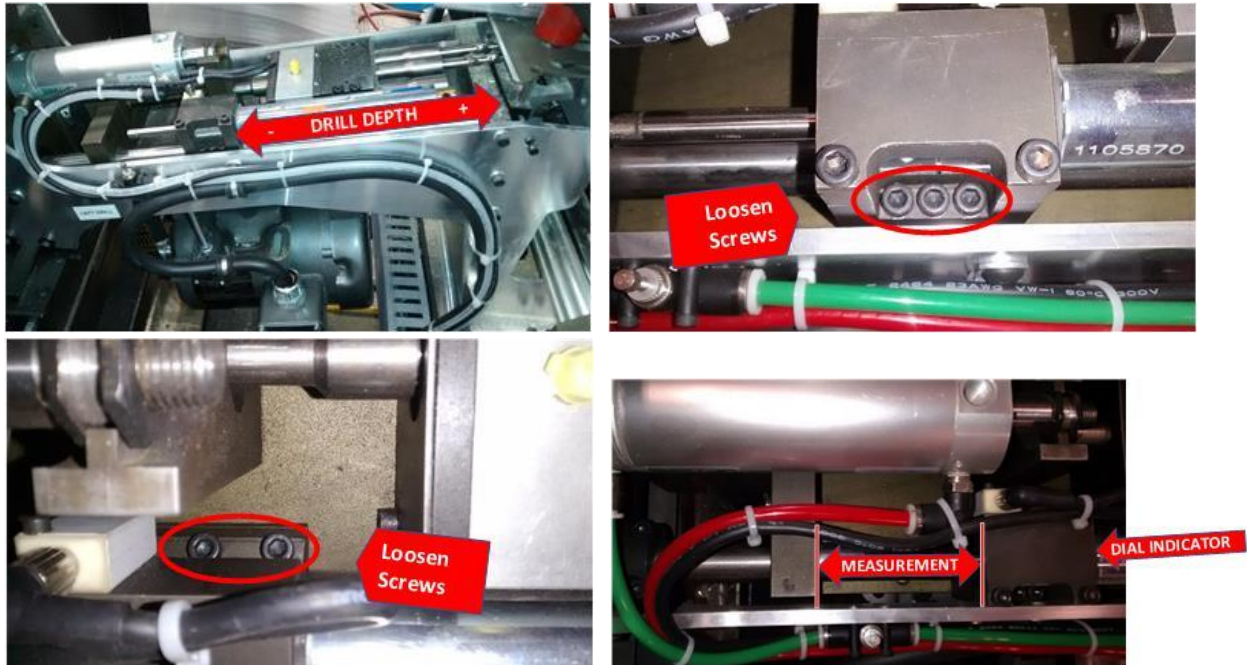
Drills Position

The Pocket Hole drills are positioned on linear bearing rails and held in place with a pneumatically actuated brake. Both sets of Pocket Hole drills are linked together on one adjustment mechanism. In order to make this adjustment the system air supply needs to be on. On the left side of the machine is a handle with a pneumatic switch. To adjust the pocket drills, press and hold the switch which releases the linear rail brake. Use the handle to move the pocket drill assembly to the new position and then release the switch to lock the brake. A stop block is provided at the rear side of the adjustment. This can be set to locate a commonly used position for the drills to make adjustments between positions easier.



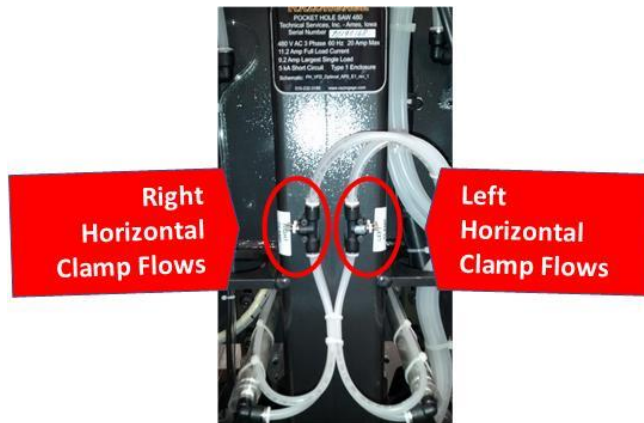
Drills Depth

The cutting depth at which the drills can advance is adjustable. While the depth is set at the factory it may be necessary to change if a different pocket hole depth is required or if the drill bit changes. Either measure the distance from the Kinechek block to the end stop or set up a dial indicator on the Kinechek block. To make the adjustment loosen the Kinechek block bolts shown below. Move the block the necessary distance and retighten all the screws. The Saw Stop screen can be used to cut and drill a test piece to determine if adjustment was successful. **Use precaution if drills are set too deep, they can collide with each other.**



Horizontal Clamps Flow Controls

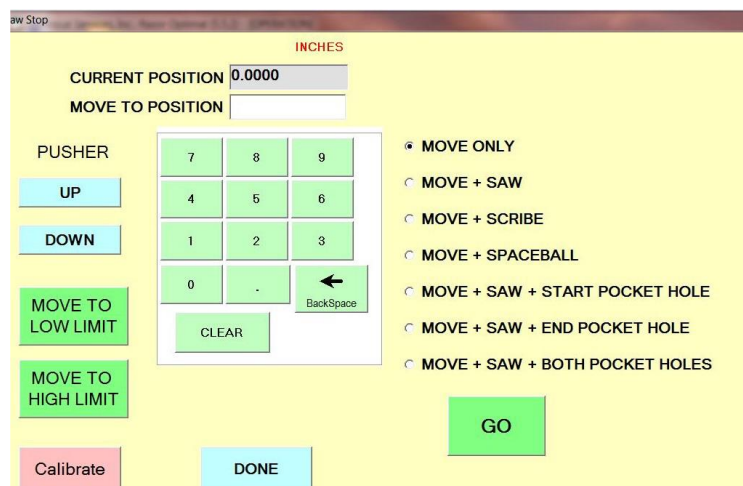
The horizontal clamp speed is adjustable with pneumatic flow controls. This adjustment may be necessary if material thickness or width changes. The flow controls for the horizontal clamps are located on the back of the saw. There are two flow controls per clamp with one being for advance and one for retract. Turning the dial clockwise restricts the air flow which slows motion and counter-clockwise will open air flow which hastens motion.



Vertical Clamp Flow Controls

The vertical clamp advance and retract speed is adjustable with pneumatic flow controls. This adjustment may be necessary if material thickness changes. The flow controls for vertical clamp are located a panel above the saw blade housing. There is a flow control for retract on the left and one for advance on the right. Turning the dial clockwise closes the flow which slows motion and turning counterclockwise hastens motion.

To test vertical clamp, go to SAW STOP MODE from the MAIN SCREEN and press MOVE TO HIGH LIMIT to get the pusher out of the way. Now place a test piece of board under the top clamp and against the fence. Enter a value equal to the current position, select MOVE + SAW, then press GO. The pusher won't move because it's already in position but the operation selected will be performed. Check the vertical clamp speed and ensure that the vertical clamp is clamping the material prior to the saw entering the material. Adjust flow controls to change advance and retract speed as needed.



Vertical Clamp Stroke Distance

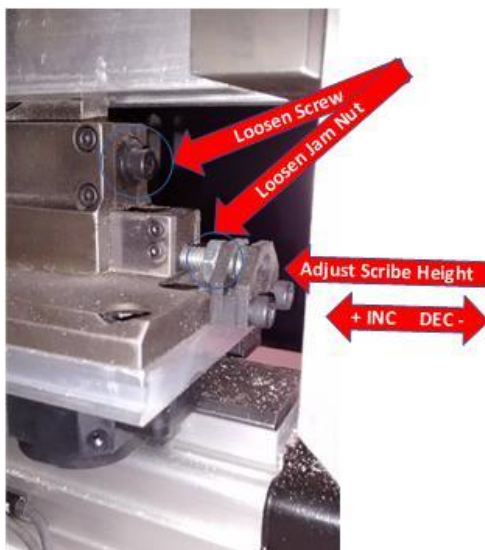
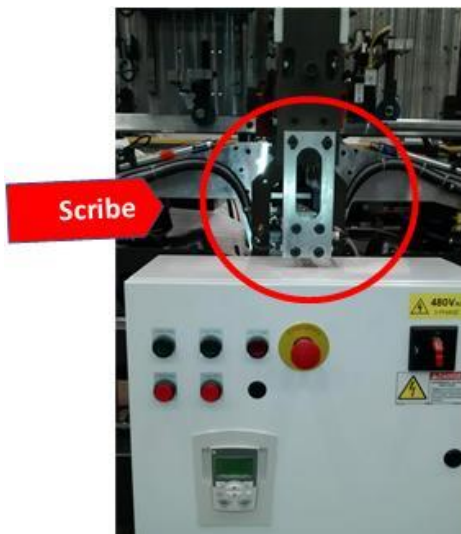
The cylinder stroke of the vertical clamp is adjustable to allow material of varying thickness to pass under the clamp. This adjustment may be necessary when material thickness changes. To adjust the vertical clamp, locate the vertical clamp cylinder behind the saw housing.



Scribe Height

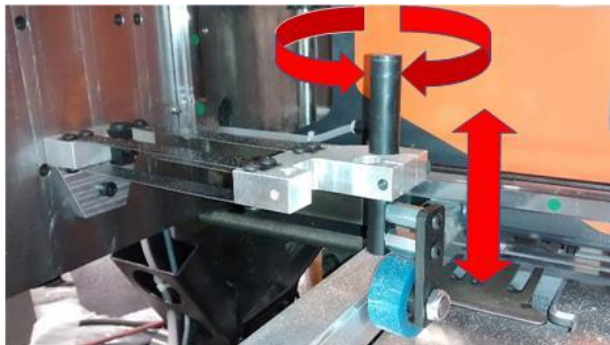
The scribe height is adjustable which may be necessary if material hardness changes, scribe blade dulls, or scribe blade is replaced. If the scribe mark is too light raising the scribe will make a deeper groove and vice versa. **Before making any adjustments follow lockout/tagout procedure.** To make this adjustment first locate the scribe assembly that is in between the saw and the electrical cabinet. With the compressed air supply off pull the scribe back to the front of the machine. There is a mounting screw in a slotted hole and an adjustment screw with a jam nut that are shown below. To adjust the scribe, loosen the mounting screw and jamb nut. Then the scribe can be move using an Allen wrench on the adjustment screw. Tightening the screw will raise and loosening will lower the scribe. When desired scribe height is reached tighten the mounting screw and then the jam nut on the adjustment screw.

To test scribe, go to SAW STOP MODE from the MAIN SCREEN and press MOVE TO HIGH LIMIT to get the pusher out of the way. Now place a 24" board under the top clamp and against the fence so that we can do some operations without driving the drills into the top clamp. Enter a value equal to the current position, select MOVE & SCRIBE, then press GO. The pusher won't move because it's already in position but the operation selected will be performed so you can watch what's going on. If the scribe moves but doesn't make a mark then adjust the scribe wheel up until a mark is made.



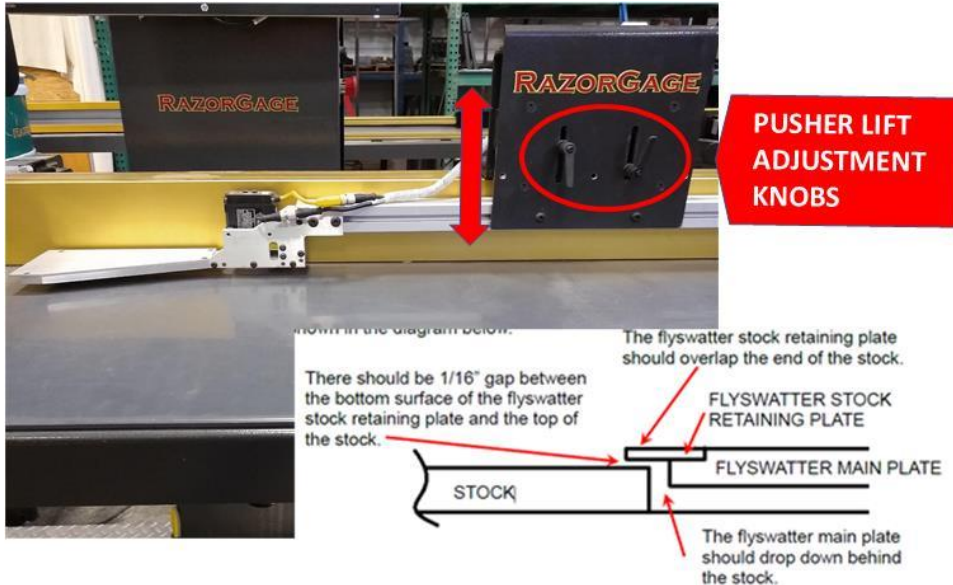
Guide Rollers

The Pocket Hole Saw is equipped with guide rollers to support the material as it is being feed through the saw. The guide rollers apply downward pressure to the material. The rollers are slightly angled toward the back fence to keep the material close to the fence while being advanced. If a printer is used, the right-side guide roller height adjustment sets the gap distance of the printer to the board. **A printer head gap of 3/32" should be maintained.** The roller & printer assembly can be adjusted vertically by moving the bracket along the 80/20 extrusion.



Pusher Arm Lift Height

The pusher arm lift height on the RazorGage is set to the thickness of the material. If adjustment is necessary (i.e. changes in material thickness) with the pusher arm down adjust the pusher so there is a 1/16" gap between the stock material thickness and the retaining plate of the pusher arm. To make the adjustment loosen the bolts with the adjustment handles. Then lower the entire pusher arm assembly until proper gap has been achieved. Tighten the adjustment bolts. If this adjustment is set too low it may cause a gap from the main plate to the material which will cause part lengths to be off.



Do NOT Adjust Back Fence

The back fence is a reference point for numerous components of the Pocket Hole Saw. It has been set at the factory and should NOT be adjusted.



Do NOT Adjust Drill Assembly Leveling Bolts.

Drill assembly leveling affects the positioning in relation to other components of the Pocket Hole Saw. It has been set at the factory and should NOT be adjusted.



Maintenance



WARNING

The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.



WARNING

The operator must remove from and lock out all power sources to saw before servicing or connecting power.

Front Guard Removal

To access many of the internal saw components for maintenance removing the front guard is necessary. This guard is large and may require two persons to remove. The front guard is secured by mounting bolts found in the four corners. The bottom bolts are in a slotted hole and only require to be loosened. Remove the top 2 mounting bolts from the guard. When the top bolts are off, the guard can be picked off the bottom bolts and pulled forward for removal.



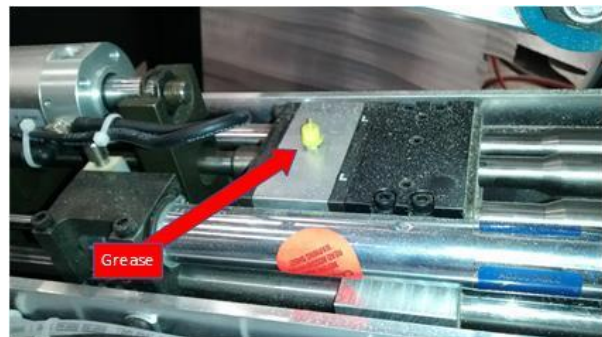
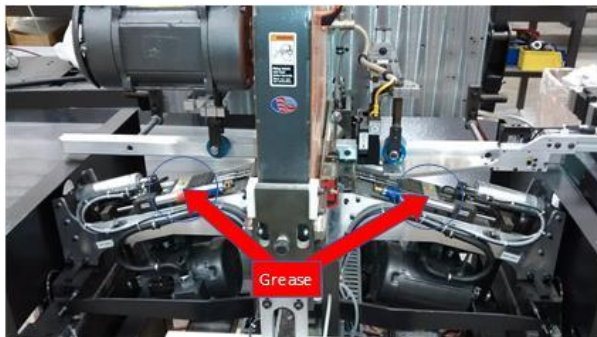
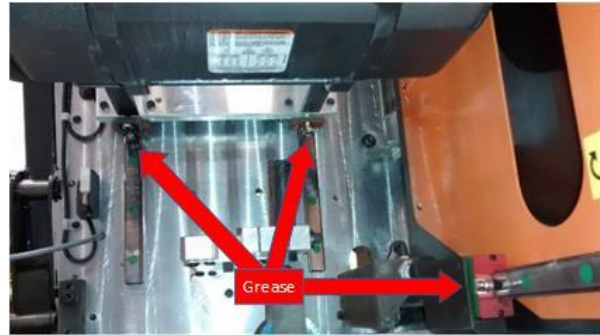
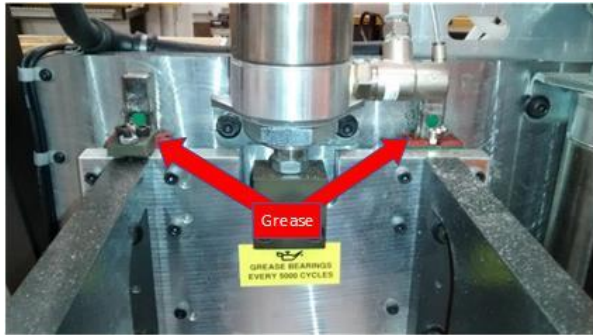
Do NOT Remove Side Guards

DO NOT LOOSEN SCREWS THAT HOLD THE ON SIDE GUARDS. The side guards hold the top plate and are aligned in the factory and are NOT to be adjusted. Do not remove the side guards.



Lubrication

There are several components on the Pocket Hole Saw that need to be lubricated regularly. The linear bearing rails need to be lubricated every 5000 machine cycles with lithium soap-based grease. The drill gear box will also need greasing on regular intervals of 10000 machine cycles.



Saw Blade Access

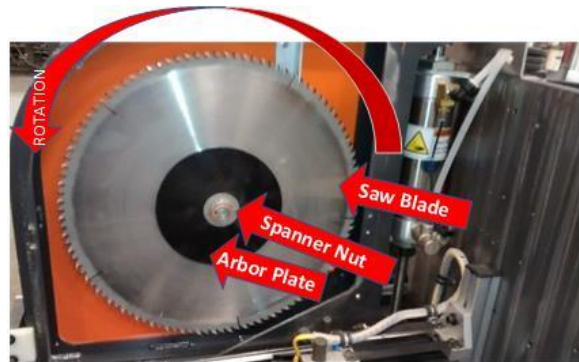
To access the saw blade for inspection or replacement, locate the blade access cover mounting screws on the right side of the saw housing. Loosen the three screws marked in the picture below. Next locate the first mounting hole on the bearing rail of the horizontal clamp. Use a pick or awl to remove the cap. This bolt is nutted on the back side. Remove the nut and bolt. After the bolt on the bearing rail has been moved, swing the bearing rail down out of the way of the last cover screw. Loosen this screw and then use the handle to lift the cover off the screws. Remount access cover and bearing rail after servicing the saw blade.



Changing Out Saw Blade

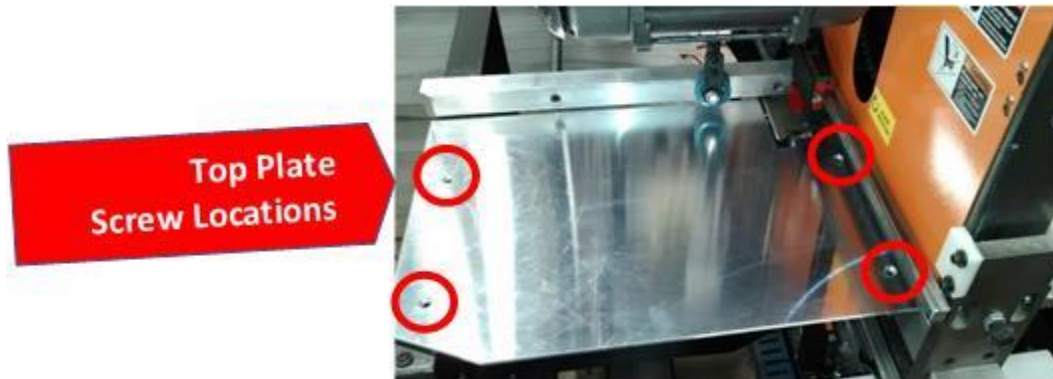
Follow Lockout / Tagout procedure to remove electricity and air pressure supply to the machine.

To change out the saw blade, first remove the access cover described in the previous section of this manual. The tools need to accomplish this task are a 1 1/4" open-end wrench and a 40/42 spanner wrench provided with the saw. Place the 1 1/4" open end wrench over the flats on the motor shaft as show in the picture below. Place the spanner wrench on the spanner nut at the end of the motor shaft on the blade access side of the machine. While holding the motor shaft from turning with the open-end wrench, turn the spanner wrench counter-clockwise to loosen and remove the nut. When nut has been removed, remove the arbor. Note the direction of the saw blade teeth and remove the saw blade. Always use appropriate gloves to protect hands when handling the saw blade. Mount the new blade with the teeth orientated in the same direction as the old blade. Remount the arbor and nut. While holding the motor shaft from turning with the open-end wrench, tighten the nut by turning the spanner wrench clockwise. Remount access cover.



Pocket Hole Drills Access

To access Pocket Hole drills for maintenance or machine adjustments, locate the mounting screws on the top plate on the side of the machine required. Left side top plate is show below. Right side will be a mirror image of this. These flat head cap screw require an Allen wrench to remove. Once the screws are removed, the plate will lift off for access to drill assembly below.



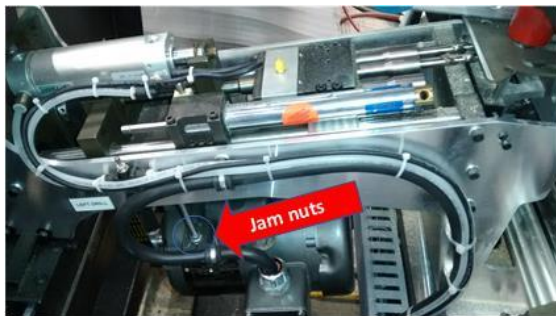
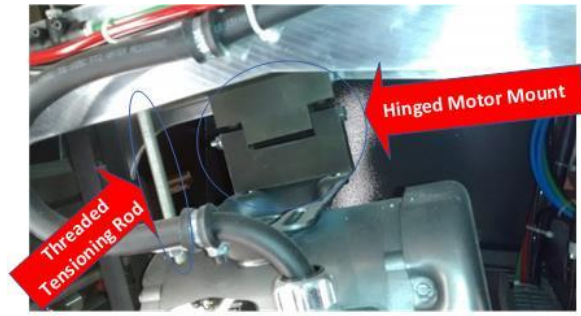
Replacing Drill Bits

Remove the top plate to access the drills (see section above). Locate the drills and loosen the set screws on the collet holding the drill bit to be removed. Slide the worn or broken drill bit out and replace with the new bit. Note that these Pocket Hole drill bits have been modified with a flat surface for the set screw to tighten against.



Replacing Drill Belt

Remove the top plate and front guard access the drills (see section above). Locate the drill motor underneath the drill assembly. To loosen the drive belt there is a threaded rod with 2 jam nuts that changes the angle of the hinged motor mount. Loosen the top nut which will allow the motor to swing up. Swing the motor up and slip the belt off the pulley on the motor. Then remove the belt off the pulley on the drill gearbox shaft. Put the new belt on in the reverse order and make sure to tighten the jam nuts. Check belt tension and adjust jam nuts accordingly. Then test drill operation and readjust belt tension if necessary.



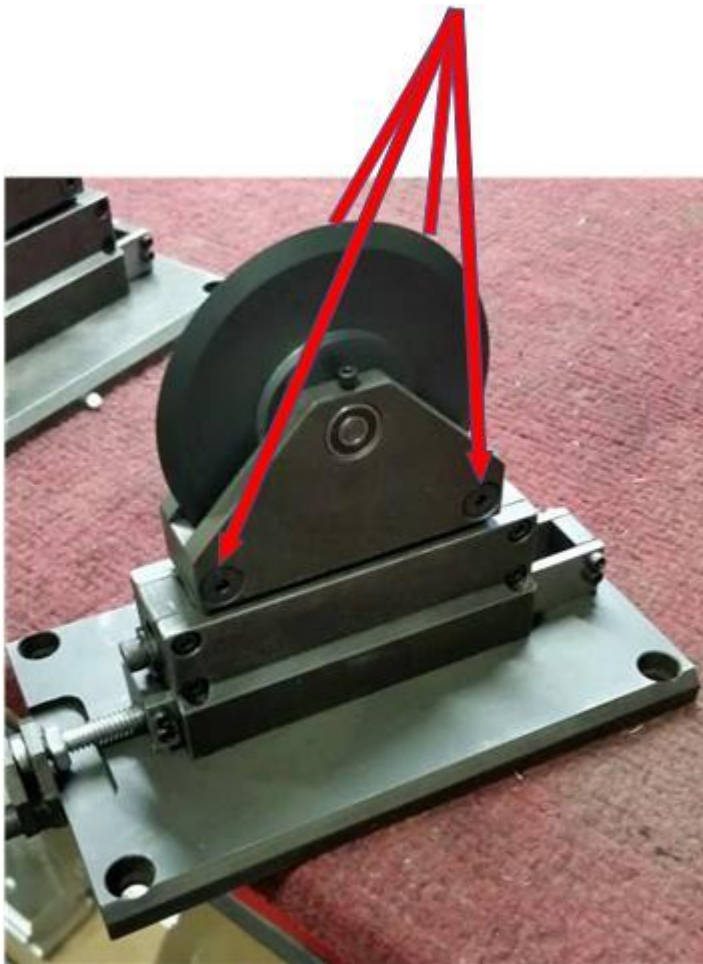
Replacing Scribe Wheel

Remove the curved front guard to access the scribe assembly.

If the scribe wheel is not already positioned at the front, pull it forward manually until it is in the position shown below. Remove the four screws holding the scribe wheel adjustment assembly to the carriage plate of the rod-less cylinder that drives it back and forth.

Now slide the rod-less cylinder carriage toward the back, out from under the scribe adjustment assembly. Once the rod-less cylinder carriage is out from under the scribe adjustment assembly, you should be able to angle the scribe assembly out from between the table plates.

Once the scribe adjustment assembly is removed, remove the four screws holding the scribe wheel plates. Replace with new scribe wheel/plate assembly.



Replacement Parts List

RGX NO	DESCRIPTION
RGX00024	DOUBLE SOLENOID VALVE, 12VDC, MANIFOLD MOUNTED
RGX00025	SINGLE SOLENOID VALVE, 12VDC, MANIFOLD MOUNTED
RGX00506	DUMP VALVE, 24VDC
RGX00472	SAW BLADE: 18" FOR CUTTING WOOD (TSI DOWN CUT SAW)
RGX00709	SAW MOTOR, 18" DOWNCUT TSI SAW
RGX00711	BALDOR MOTOR .5 HP 1725 RPM, POCKET HOLE DRILLS
RGX00739	DRILL HOLDER (POCKETHOLE)
RGX02174	DRILL BITS (POCKETHOLE)
RGX00767	KINECHEK CONSTANT SPEED CONTROL
RGX00793	REAR DRIVE SHAFT
RGX00833	DRIVE BELT, POCKET HOLE SPINDLES, MICRO-V
RGX00834	MICRO V DRIVE PULLEY FOR GEAR DRILL SPINDLE
RGX00835	DRIVEN PULLEY 1/2" BORE FOR GEAR DRILL SPINDLE
RGX00860	AIR CYLINDER FOR REAR-MOUNTED LEFT/RIGHT CLAMPS
RGX01128	POCKET HOLE DRILL GEAR DRIVE SPINDLE CARTRIDGE, RIGHT HAND
RGX01129	POCKET HOLE DRILL GEAR DRIVE SPINDLE CARTRIDGE, LEFT HAND
RGX01338	FLEX SHAFT FOR GEAR DRIVE POCKET DRILL
RGX00593	ELECTRICAL DISCONNECT SWITCH
RGX00595	ELECTRICAL DISCONNECT HANDLE
RGX01307	SAW VARIABLE FREQUENCY DRIVE / 208-230V
RGX01387	SAW VARIABLE FREQUENCY DRIVE / 480V
RGX01307	LINE REACTOR, 208-230V
RGX01387	LINE REACTOR, 480V
RGX01108	DRILLS CONTACTOR RELAY
RGX01104	DRILLS THERMAL OVERLOAD RELAY / 208-230V
RGX01106	DRILLS THERMAL OVERLOAD RELAY / 480V
RGX01366	SAFETY TIMER RELAY
RGX02187	NO FAULT 2 POLE RELAY
RGX01742	RED EXTENDED HEAD PUSHBUTTON
RGX01297	GREEN ILLUMINATED PUSHBUTTON
RGX01747	E-STOP PUSHBUTTON
RGX01749	RED FLUSH ILLUMINATED PUSHBUTTON
RGX01748	PUSHBUTTON HOLDER / NC CONTACT
RGX01620	PUSHBUTTON HOLDER / NO CONTACT
RGX00482	END OF BOARD SENSOR
RGX01533	CRAYON SENSOR
RGX00805	CRAYON DEFECTING BOARD ASSEMBLY
RGX00155	DIRECTLOGIC 06 PLC

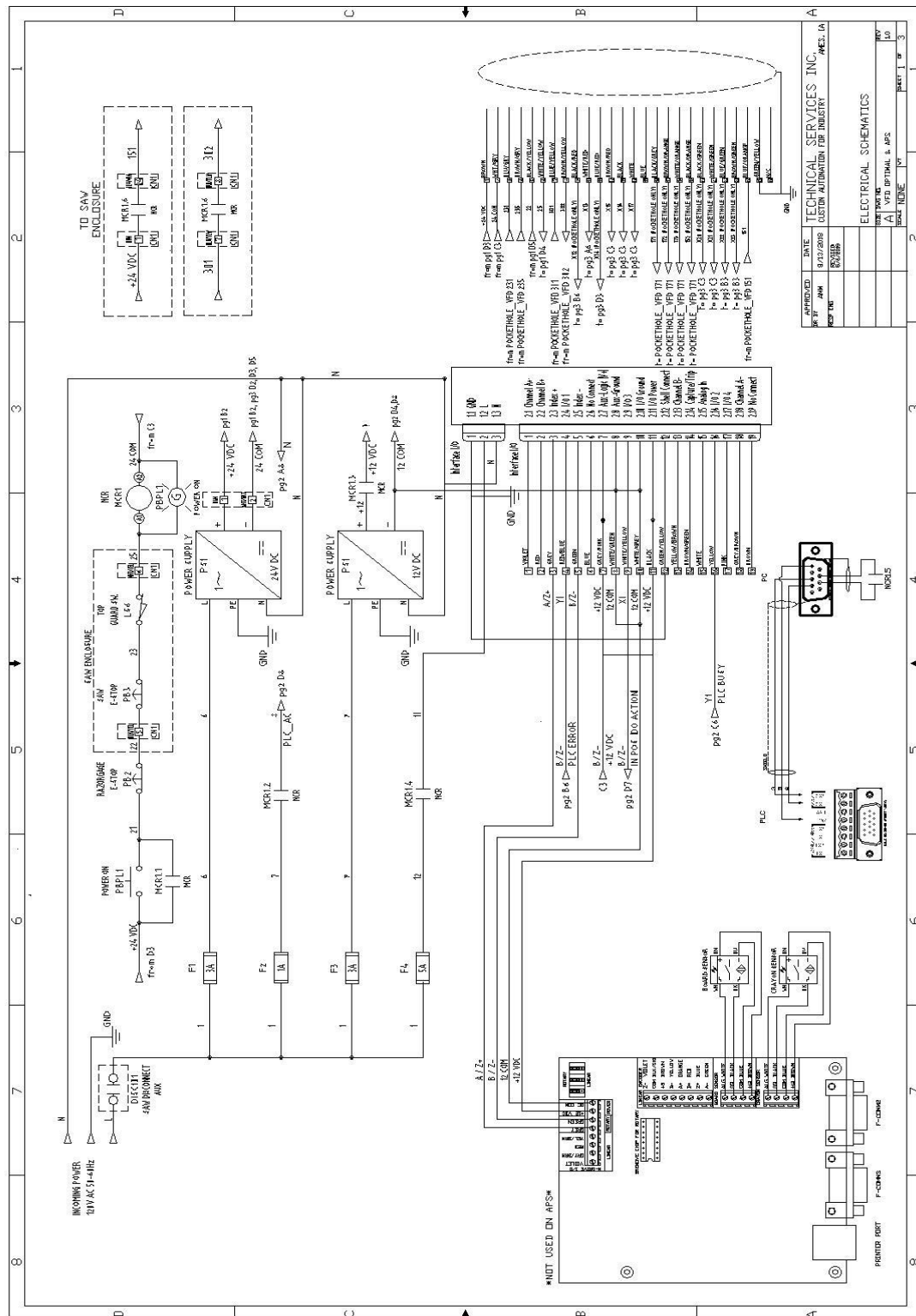
RGX01305	DIRECTLOGIC PLC RELAY OUTPUT CARD
RGX00009	M-DRIVER STEPPER MOTOR
RGX00577	CYLINDER POSITION PROXIMITY SWITCH
RGX00576	PROX. SWITCH CABLE
RGX01448	INTERFACE CABLE
RGX00417	VALVE BANK CABLE
RGX01448	INTERFACE CABLE
RGX00716	SCRIBE RODLESS CYLINDER
RGX02160	SCRIBE WHEEL
RGX01439	SAW CYLINDER
RGX00694	POCKETHOLE DRILL CYLINDER
RGX00312	HORIZONTAL CLAMP CYLINDER
RGX00712	VERTICAL CLAMP CYLINDER
RGX00535	PUSHER ARM LIFT CYLINDER
RGX00429	FLANGED HIWIN BEARING BLOCK
RGX00704	FLANGELESS HIWIN BEARING BLOCK
RGX00674	SPRING ROLLER SUPPORT
RGX00400	HORIZONTAL CLAMP ROLLER / MATERIAL GUIDE ROLLER

A full list of field replaceable parts can be accessed at our web site:

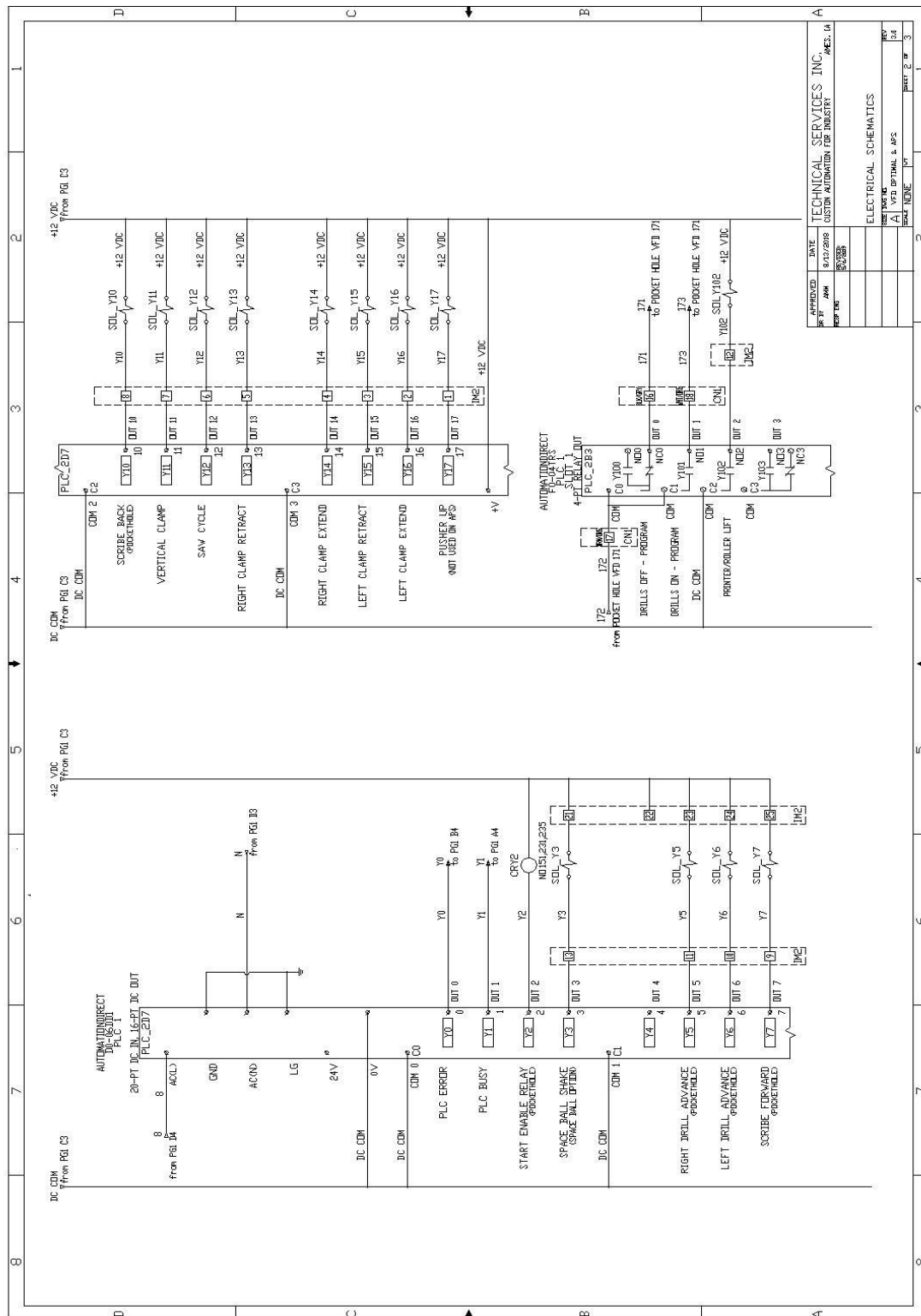
<https://razorgage.com/product-line/replacement-parts/>

Troubleshooting

Electrical Schematics (Page 1 of 4)

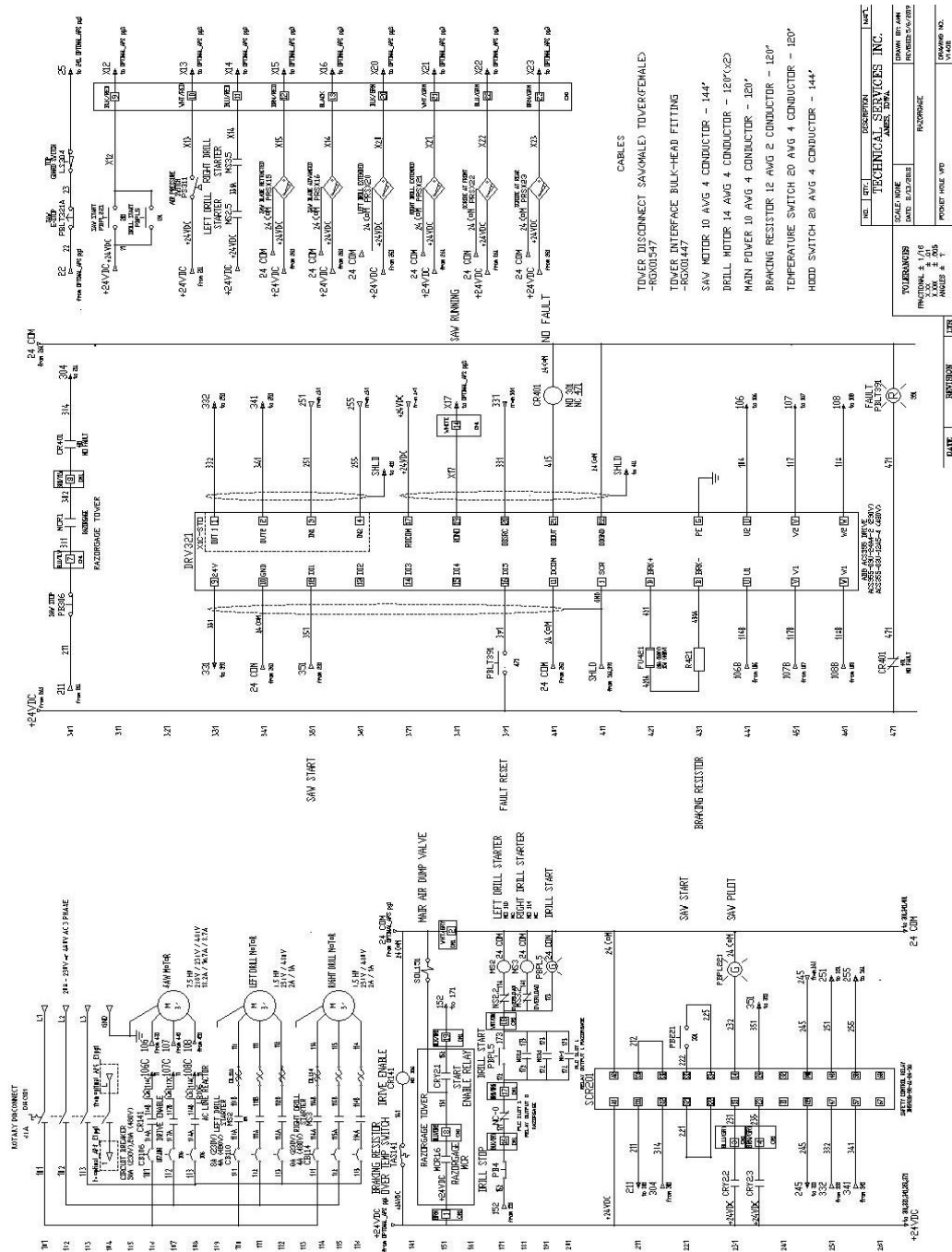


Electrical Schematics (Page 2 of 4)

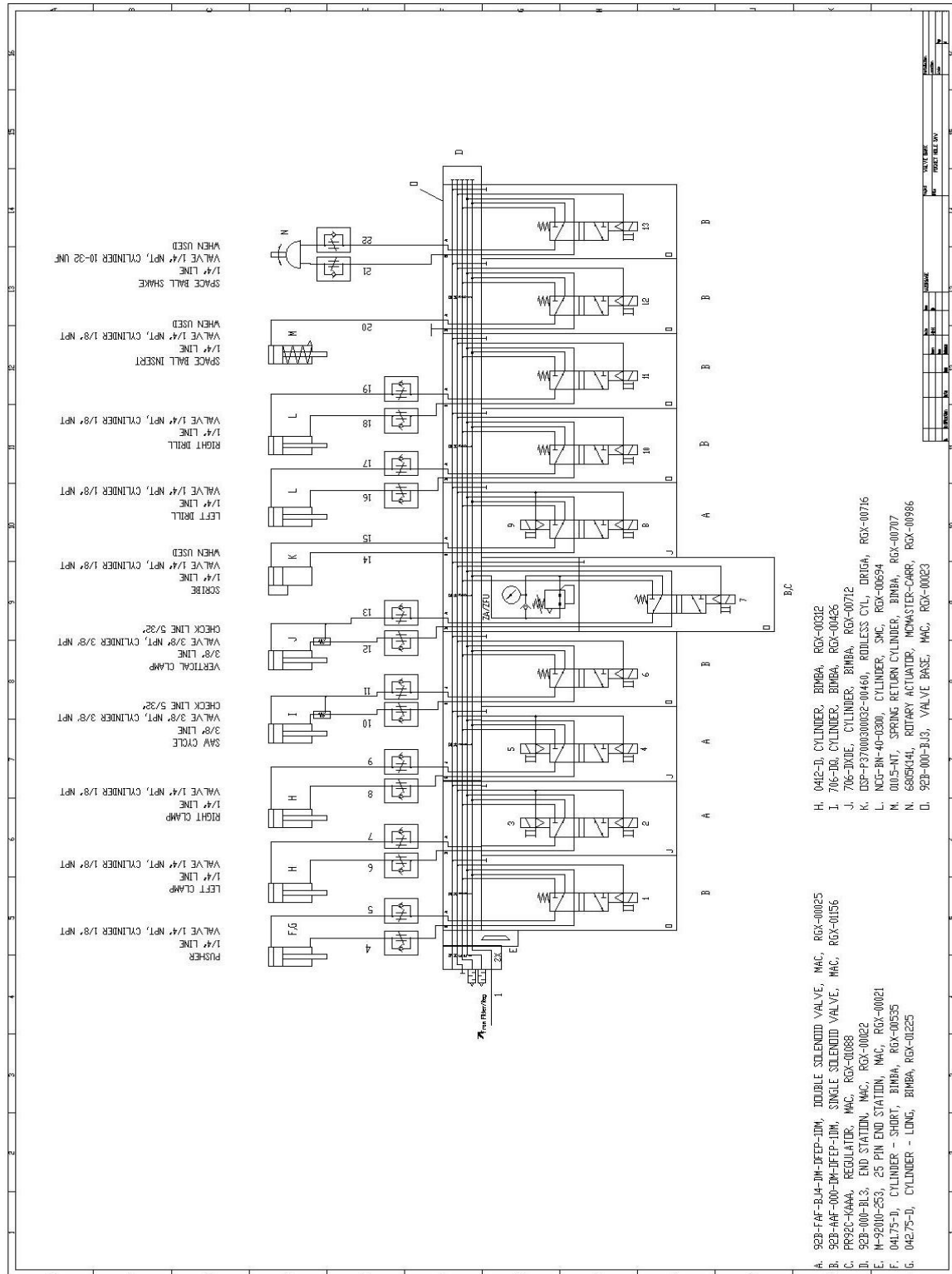


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Electrical Schematics (Page 4 of 4)



Pneumatic Schematics



Troubleshooting Guide

	Description	Possible Causes	Corrective Action
1	SAW DOES NOT START	<ul style="list-style-type: none"> RazorGage tower panel control power is off. E-Stop is active. Tripped circuit breaker Machine is not enabled. VFD fault. 	<ul style="list-style-type: none"> Check for 120VAC power to tower panel, reset any E-stops, close top guard, and press Power On pushbutton. Reset saw and & panel E-stops and close top guard switch. Press Power ON button on the RazorGage panel. See section <i>Troubleshooting E-Stop Faults</i>. Check the status of the circuit breaker for the saw VFD. Reset if tripped. Home RazorGage. Check air pressure, saw retracted & not advanced, left drills not advanced, and right drills not advanced. Check that the Saw Up and either Scribe Forward or Scribe Back proximity switches are on. Check the display on the front of the electrical cabinet for error code. Use drive manual to determine corrective action. Use the Fault Reset pushbutton to clear the fault.
2	DRILLS DO NOT START	<ul style="list-style-type: none"> RazorGage tower panel control power is off. E-Stop is active. Tripped circuit breaker Machine is not enabled. Overload is tripped. 	<ul style="list-style-type: none"> Check for 120VAC power to tower panel, reset any E-stops, close top guard, and press Power On pushbutton. Reset saw and & panel E-stops and close top guard switch. Press Power ON button on the RazorGage panel. See section <i>Troubleshooting E-Stop Faults</i>. Check the status of the circuit breaker for the drill starters. Reset if tripped. Home RazorGage. Check air pressure, saw retracted & not advanced, left drills not advanced, and right drills not advanced. Check that the Saw Up and either Scribe Forward or Scribe Back proximity switches are on. Check the overload relays inside the electrical enclosure for both drills. If the yellow tripped indicator is on, reset the overload with the blue reset button.
3	FAULT RESET LIGHT IS ON.	<ul style="list-style-type: none"> Saw Variable Frequency Drive Fault 	<ul style="list-style-type: none"> Refer to the previous section of this manual and the Fault Tracing section of the manufacturer's VFD manual for correction action for the fault # shown on the display. See link to manual below. https://search-ext.abb.com/library/Download.aspx?DocumentID=3AUA0000066143&LanguageCode=en&DocumentPartId=1&Action=Lau
4	RAZORGAGE MOVES BUT SAW DOES NOT CYCLE.	<ul style="list-style-type: none"> Air pressure supply shutoff on the FRL is off. Variable Frequency Drive <i>Saw Running</i> signal is not on. RazorGage <i>Do Action</i> signal did not turn on. 	<ul style="list-style-type: none"> Turn air pressure supply shutoff on the FRL to on position. If saw isn't running start the saw. Otherwise check wiring from the drive to the PLC X17 input. Check that the I/O cable (largest of the three) on the RazorGage Mdrive is seated tightly. The connector needs to be wiggled while tightening otherwise it doesn't make a good connection and intermittent problems occur. If the Mdrive I/O cable connection is good and the Do Action input X1 on the PLC

		<ul style="list-style-type: none"> Valve did not shift. 	<p>isn't coming on when running the program, then the Mdrive I/O is bad and it will have to be replaced (see Figure #4).</p> <ul style="list-style-type: none"> If the indicator on the saw cycle valve is on and the saw assembly isn't obstructed then the valve is sticking and needs to be replaced. If the indicator is off and the PLC output is on for the valve check the valve cable connections (see Figure #4).
5	RAZORGAGE MOVES BUT POCKET DRILL(S) DO NOT CYCLE.	<ul style="list-style-type: none"> Air pressure supply shutoff on the FRL is off. Pocket drill slide are obstructed with saw dust or wood pieces. Pocket drill bushing seized up. RazorGage <i>Do Action</i> signal did not turn on. Valve did not shift. 	<ul style="list-style-type: none"> Turn air pressure supply shutoff on the FRL to on position. Remove front cover and blow out drill slides to remove any debris that is restricting pocket drills motion. If indicator on the drill valve in question lights up, use a pry bar to pop the drill assembly slide loose. (See Figures #1, 2, &3). Restart the machine. Check that the I/O cable (largest of the three) on the RazorGage Mdrive is seated tightly. The connector needs to be wiggled while tightening otherwise it doesn't make a good connection and intermittent problems occur. If the Mdrive I/O cable connection is good and the Do Action input X1 on the PLC isn't coming on when running the program, then the Mdrive I/O is bad and it will have to be replaced (see Figure #4). If the indicator on the drill valve in question is on and the drill assembly isn't stuck then the valve is sticking and needs to be replaced. If the indicator is off and the PLC output is on for the valve in question check the valve cable connections (see Figure #4).
6	RAZORGAGE MOVES BUT THE SCRIBE DOES NOT CYCLE.	<ul style="list-style-type: none"> Air pressure supply shutoff on the FRL is off. Scribe is set too high. RazorGage <i>Do Action</i> signal did not turn on. Valve did not shift. 	<ul style="list-style-type: none"> Turn air pressure supply shutoff on the FRL to on position. See <i>Machine Adjustment-Scribe Height</i> section for instruction on lowering the scribe height if necessary. Check that the I/O cable (largest of the three) on the RazorGage Mdrive is seated tightly. The connector needs to be wiggled while tightening otherwise it doesn't make a good connection and intermittent problems occur. If the Mdrive I/O cable connection is good and the Do Action input X1 on the PLC isn't coming on when running the program, then the Mdrive I/O is bad and it will have to be replaced (see Figure #4). If the indicator on the drill valve in question is on and the drill assembly isn't stuck then the valve is sticking and needs to be replaced. If the indicator is off and the PLC output is on for the valve in question check the valve cable connections (see Figure #4).
7	E-STOP FAULT	<ul style="list-style-type: none"> E-stop switch is active or Top Guard is open. E-stop circuit connection to PC problem 	<ul style="list-style-type: none"> Reset saw and & panel E-stops and close top guard switch. Press Power ON button on the RazorGage panel. See section <i>Troubleshooting E-Stop Faults</i>. See section <i>Troubleshooting Random E-Stop Faults with Safety Switches Reset</i>.
8	ERROR #0001 Tried to cut the board, but a scribe sensor was not on. Please check both scribe sensors (X22 & X23)	<ul style="list-style-type: none"> Scribe cylinder is obstructed with debris. Loose sensor 	<ul style="list-style-type: none"> Remove the front guard, lift the top guard and with the air supply off check for free movement of the scribe cylinder. Remove any wood pieces or saw dust that may be obstructing motion of the cylinder. Remove the front guard, lift the top guard, and turn the air supply off. But leave the electrical power on. Move the scribe to the front and check for sensor indicator to light. If it doesn't

		<ul style="list-style-type: none"> Failed sensor or wiring problem. 	<p>the sensor may be loose and will need to be adjusted until it lights and tightened. Repeat for rear sensor.</p> <ul style="list-style-type: none"> If sensor is not loose and lights up, check cable and wiring to PLC input X22 for front sensor and X23 for the rear. If wiring is ok and there is voltage to sensor and it doesn't light when flagged replace the sensor.
9	<p>ERROR #0002</p> <p>Tried to Scribe, but the saw valve is activated.</p>	<ul style="list-style-type: none"> Saw didn't complete cycle. Output Y12 Saw Cycle is on when scribe tried to cycle. 	<ul style="list-style-type: none"> Check sensor indicator or PLC input X16 if either is off and the saw is down, then there may be an open in the cable or wiring to PLC input X16. Check all the connections for this input for an open circuit and replace cable or sensor if necessary.
10	<p>ERROR #0003</p> <p>Tried to Saw, but the Saw motor is not running. (Input X17)</p>	<ul style="list-style-type: none"> Stop Saw pushbutton was pressed. Saw Variable Frequency Drive fault. Tripped circuit breaker. Wiring problem. 	<ul style="list-style-type: none"> Restart the saw motor with the Start Saw pushbutton. Refer to the Fault Tracing section of the VFD manual for correction action for the fault # shown on the display. See link to manual below. https://search-ext.abb.com/library/Download.aspx?DocumentID=3AUA0000066143&LanguageCode=en&DocumentPartId=1&Action=Lau nch Check the status of the circuit breaker for the saw VFD. Reset if tripped. Check VFD output to PLC X17 wiring per electrical schematic pages 3 & 4.
11	<p>ERROR #0004</p> <p>Tried to drill, but the Drill motors are not running. (X14)</p>	<ul style="list-style-type: none"> Stop Drills pushbutton was pressed. Tripped breaker. Pocket Drills motor overload is tripped. Wiring problem. Failed starter or motor. 	<ul style="list-style-type: none"> Restart the drill motors with the Start Drills pushbutton. Check the status of the circuit breaker for the drill starters. Reset if tripped. Lock-out / Tag-out the saw electrical panel. Check to see which overload is tripped (left OL relay is left drill). On the side of the tripped OL, check pocket drill belt & pulleys and gearbox for excessive friction. If necessary, grease pocket drill gearbox. Reset overload relay by pressing the blue reset button on it. Reset the machine. If starter is energizing check the wiring from the starter contacts to PLC X14 per electrical schematic pages 3 & 4. If starter is not energizing when starting the drills, check wiring to the coils of the starter per page 3 of the electrical schematics. If overloads aren't tripped and wiring checks out replace the contactor.
12	<p>ERROR #0005</p> <p>'Saw Cut' Timeout. The lower 'Saw Down' proximity switch was not activated in the required time. Please check Sensor X16</p>	<ul style="list-style-type: none"> Saw Down flow control set too low. Low air pressure or leak. Valve did not shift. 	<ul style="list-style-type: none"> See <i>Saw Flow Controls</i> in the <i>Machine Adjustment</i> section of the manual for information on adjusting. Verify adequate system air pressure. Then check for any leaks in the air lines, check valves or cylinder on the saw cycle cylinder. If system air pressure is OK and valve solenoid indicator is coming on without the saw moving down, the valve needs to be replaced. (see Figures #7).

		<ul style="list-style-type: none"> • Saw motor stalled. • Proximity switch out of alignment. • Cable or wiring problem. • Proximity switch failed. 	<ul style="list-style-type: none"> • If saw is faulted indicating a stall, either slow the feed rate of the saw using the flow controls or speed up the RPM of the saw blade. • If saw is physically in down position, check that the Saw Down prox. switch bracket and flag are tight and aligned with each other. • If sensor indicator or PLC input X16 is off and the saw is down, then there may be an open in the cable or wiring to PLC input X16. Check all the connections for this input for an open circuit and replace cable if necessary. • If sensor indicator is off with the saw down and the cable & wiring check out, then proximity switch has failed. Replace the sensor.
13	<p>ERROR #0006</p> <p>‘Saw Return’ Timeout. The upper ‘Saw Up’ proximity switch was not activated in the required time. Please check Sensor X15</p>	<ul style="list-style-type: none"> • Saw Up flow control set too low. • Low air pressure or leak. • Valve did not shift. • Saw motor stalled. • Proximity switch out of alignment. • Cable or wiring problem. • Proximity switch failed. 	<ul style="list-style-type: none"> • See <i>Saw Flow Controls</i> in the <i>Machine Adjustment</i> section of the manual for information on adjusting. • Verify adequate system air pressure. Then check for any leaks in the air lines, check valves or cylinder on the saw cycle cylinder. • If system air pressure is OK and valve solenoid indicator is coming on without the saw moving down, the valve needs to be replaced. (see Figures #7). • If saw is faulted indicating a stall, either slow the feed rate of the saw using the flow controls or speed up the RPM of the saw blade. • If saw is physically in down position, check that the Saw Up prox. switch bracket and flag are tight and aligned with each other. • If sensor indicator or PLC input X15 is off and the saw is up, then there may be an open in the cable or wiring to PLC input X15. Check all the connections for this input for an open circuit and replace cable if necessary. • If sensor indicator is off with the saw up and the cable & wiring check out, then proximity switch has failed. Replace the sensor.
14	<p>ERROR #0007</p> <p>‘No Air Pressure detected’ (Input X13)</p>	<ul style="list-style-type: none"> • Air pressure supply shutoff on the FRL is off. • Pinched or damaged air line. • Wiring problem. • Failed air pressure switch. 	<ul style="list-style-type: none"> • Turn air pressure supply shutoff on the FRL to on position. • Check air line running from the FRL to the pressure switch mounted on the electrical cabinet. Reroute the air line if it is pinched and replace the air line if it is damaged. • If air supply is on and air line looks good check wiring for air pressure switch per electrical schematics page 3. • If air supply, air line, and wiring check out, replace the air pressure switch.
15	<p>ERROR #0008</p> <p>The ‘Saw up’ proximity switch must be ON for the Saw to start. (Input X15)</p>	<ul style="list-style-type: none"> • Low Air Pressure or air leak. • Saw was manually left advanced. • Saw Up proximity switch is not aligned. 	<ul style="list-style-type: none"> • If saw is physically down, verify adequate system air pressure. Then check for any leaks in the air lines, check valves or cylinder on the saw cycle cylinder. • Use the valve bank to manually retract the saw by pressing the bottom solenoid button on the saw cycle valve. See Figure #7. • If saw is physically in up position, check that the Saw Up prox. switch bracket and flag are tight and aligned with each other.

		<ul style="list-style-type: none"> • Cable or wiring problem. • Proximity switch failed. 	<ul style="list-style-type: none"> • If sensor indicator or PLC input X15 is off and the saw is retracted (up), then there may be an open in the cable or wiring to PLC input X15. Check all the connections for this input for an open circuit and replace cable if necessary. • If sensor indicator is off with the saw up and the cable & wiring check out, then proximity switch has failed. Replace the sensor.
16	<p>ERROR #0009</p> <p>Drills cannot be started while the Left Drill 'End of Stroke' switch is on. (Input X20)</p>	<ul style="list-style-type: none"> • Pocket drills were left manually extended. • Pocket drills return flow control is set too low. • Cable or wiring problem. • Proximity switch failed. 	<ul style="list-style-type: none"> • Use the valve bank to manually retract drills by pressing the bottom solenoid button on the left drills valve. See Figure #7. • If pocket drill return flow control is set too low it will not retract. See <i>Drill Flow Control</i> section for instruction on adjusting. • If sensor indicator or PLC input X20 is on without drills being extended, then there may be a short in the cable or wiring to PLC input X20. Check for a short and replace cable if necessary. • If sensor indicator is on without drill being extended and the cable & wiring check out, then proximity switch has failed. Replace the sensor.
17	<p>ERROR #0010</p> <p>Drills cannot be started while the Right Drill 'End of Stroke' switch is on. (Input X21)</p>	<ul style="list-style-type: none"> • Pocket drills were left manually extended. • Pocket drills return flow control is set too low. • Cable or wiring problem. • Proximity switch failed. 	<ul style="list-style-type: none"> • Use the valve bank to manually retract drills by pressing the bottom solenoid button on the left drills valve. See Figure #7. • If pocket drill return flow control is set too low it will not retract. See <i>Drill Flow Control</i> section for instruction on adjusting. • If sensor indicator or PLC input X21 is on without drills being extended, then there may be a short in the cable or wiring to PLC input X21. Check for a short and replace cable if necessary. • If sensor indicator is on without drill being extended and the cable & wiring check out, then proximity switch has failed. Replace the sensor.
18	<p>ERROR #0011</p> <p>Saw cannot be started unless ONE of the Scribe Sensors are on.</p>	<ul style="list-style-type: none"> • Scribe motion is obstructed. • Scribe height is set too high • Low Air Pressure or air leak. • Scribe front or rear cylinder proximity switch is loose. • Cable or wiring problem • Failed cylinder proximity switch 	<ul style="list-style-type: none"> • With system air off check for obstructions in scribe motion. It should move freely by hand. Remove any wood pieces and clean out saw dust. • See <i>Machine Adjustment-Scribe Height</i> section for instruction on lowering the scribe height if necessary. • If scribe is physically not at front or back position, check that air supply is on and regulator set at the appropriate air pressure. Check for any leaks in air lines or cylinder. • If the pneumatics to the scribe checks out then check the proximity switch for the current position. If the sensor is off check to see if it is loose. Adjust until it is on and tighten if necessary. • If pneumatics to the scribe cylinder checks out and the switch is on, check for an open in the cable or wiring to input X22 or X23 per schematic page 3. • If the cylinder is in position and the cylinder proximity switch is off, replace the failed switch.
19	<p>MOTION ERROR (STALL) DURING PUSHER BAR RUN.</p>	<ul style="list-style-type: none"> • Bar stock or pusher arm are physically bound up. 	<ul style="list-style-type: none"> • Press BACK PUSHER UP button. Remove the source of the bind and press the RE-SEND THE LAST MOVE button to resume operation. See figure #8.

		<ul style="list-style-type: none"> • The RazorGage speed is set too high. • The RazorGage accel and/or decel is set too high for the application. • The RazorGage run current is set too low for the application. • The RazorGage drive belt is tensioned too tightly. 	<ul style="list-style-type: none"> • Press the RE-SEND THE LAST MOVE button to resume operation. After bar is completed or if motion error reoccurs, go to the SETUP SCREEN and check the user parameter speed. Set the speed to 30 or less. • Press the RE-SEND THE LAST MOVE button to resume operation. After bar is completed or if motion error reoccurs, go to the SETUP SCREEN and check the user parameters accel & decel. Set each to 90 or less. • Press the RE-SEND THE LAST MOVE button to resume operation. After bar is completed or if motion error reoccurs, go to the SETUP SCREEN and check the user parameter current. Set the current to 100%. • Press the RE-SEND THE LAST MOVE button to resume operation. After bar is completed or if motion error reoccurs, check the drive belt tension and loosen the belt tension if it is too tight.
20	<p>MOTION IS LOCKED OUT.</p> <p>A MOVE WAS REQUESTED WHILE THE SAW WAS NOT IN A SAFE CONDITION FOR PUSHER MOVEMENT.</p> <p>THE REQUEST HAS BEEN CANCELLED.</p>	<ul style="list-style-type: none"> • MDrive tool safe input lost • The retract switch opened during the RazorGage move. • A move was requested with the SAW DONE MOVE TO NEXT on-screen button. 	<ul style="list-style-type: none"> • Check MDrive I/O is tight. • Check the saw retracted prox. switch and adjust if necessary. If adjustment is ok, check the cable connection and wiring back to RazorGage tower enclosure. Press OK to recover from the error. The recovery from this error exits the runtime screen back to the setup screen. • Press OK to recover from the error. The recovery from this error exits the runtime screen back to the setup screen.

VFD Faults

Fault #	Description	Possible Cause	Corrective Action
0002	DC OVERVOLT	<ul style="list-style-type: none"> • Open braking resistor circuit. 	<ul style="list-style-type: none"> • Remove power then check fuses for the braking resistor marked FU421. Replace any blown fuses. • Remove power and fuses FU421. Check resistance of the braking resistor. If main power to the Pocket Hole saw is 480V then resistance should be 75 ohms. For 208V/230V the resistance should be 30 ohms. Replace resistor if necessary.
0044	SAFE TORQUE OFF	<ul style="list-style-type: none"> • Safety timer relay set point time is set too low. 	<ul style="list-style-type: none"> • Adjust the trim pot higher to at least 8 seconds.

Troubleshooting Reference Pictures

If one pocket drill doesn't extend when it is supposed to, first watch the valve bank on the back of the machine to see if the indicator light for the malfunctioning drill is being lit. If it is being lit when the drill is supposed to be cycling, that means that the controller is sending the signal and that the valve is getting the signal. Either the valve is stuck (unlikely) or that the bushings on the pocket drill slide have seized up. This can happen if the machine sits idle for a while. Just use a pry bar to pop the slide loose and re-start the machine. See pictures on the next page.



Figure #1



Figure #2

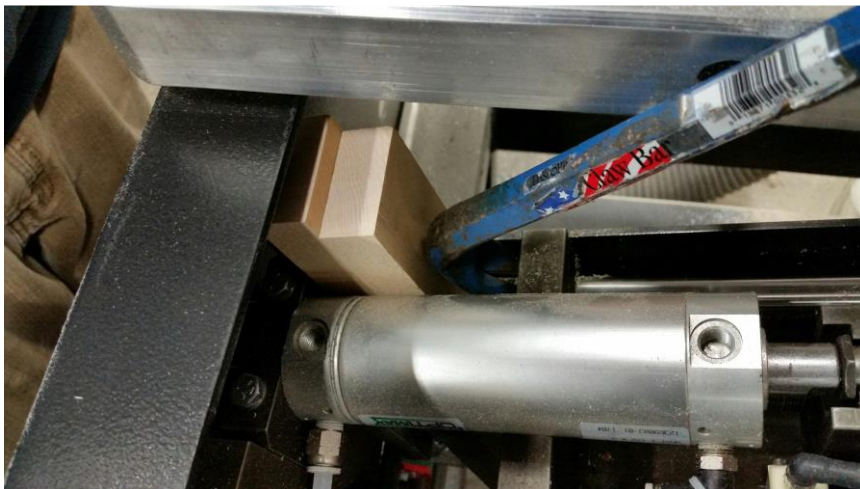


Figure #3

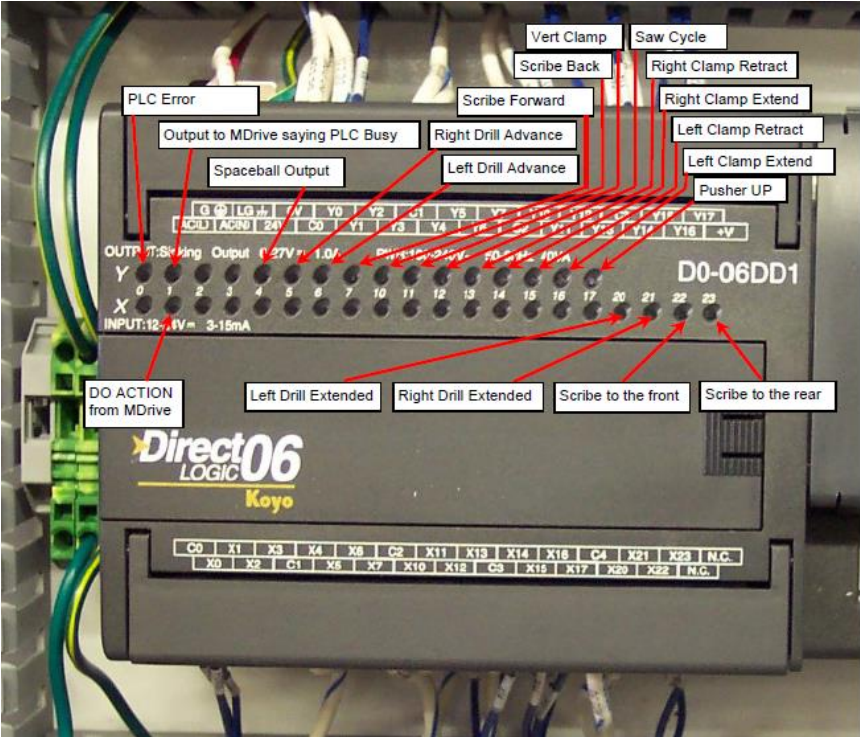


Figure #4



Figure #5

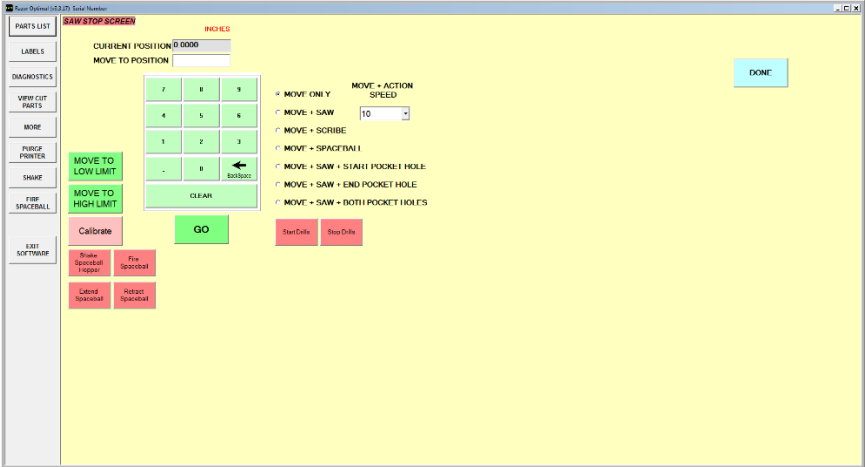


Figure #6

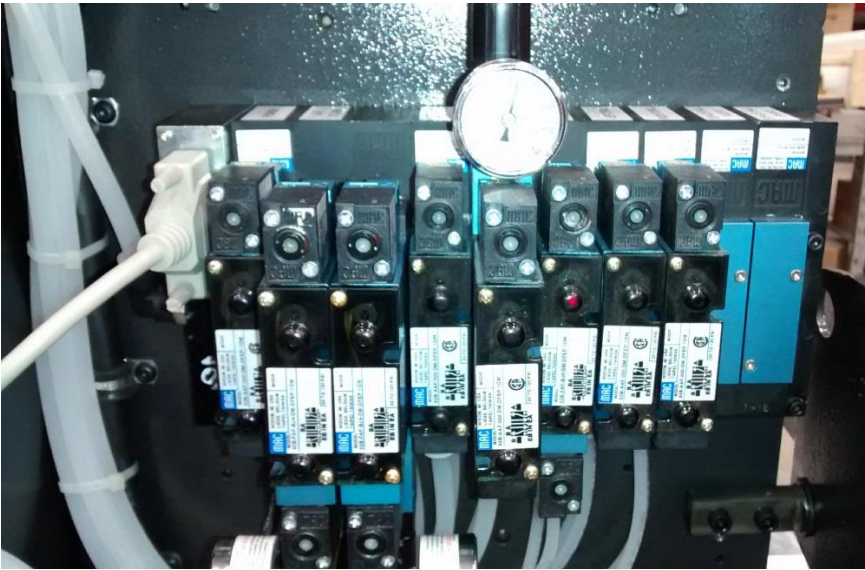


Figure #7

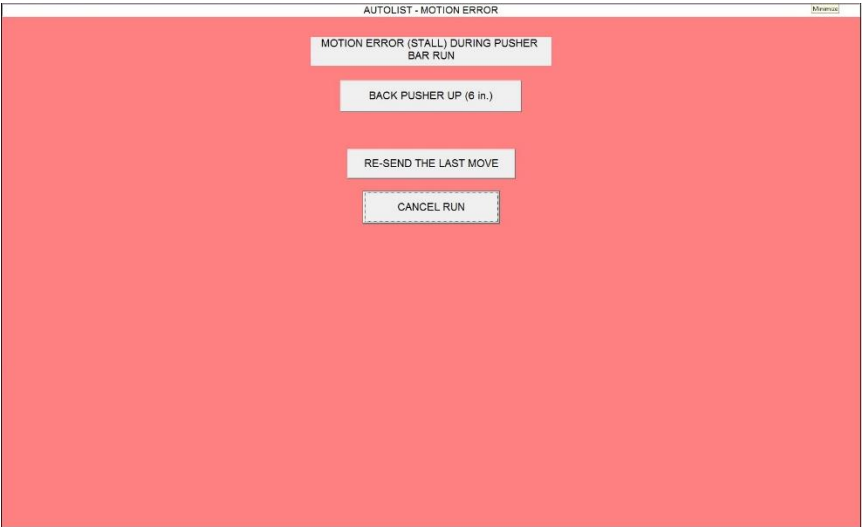
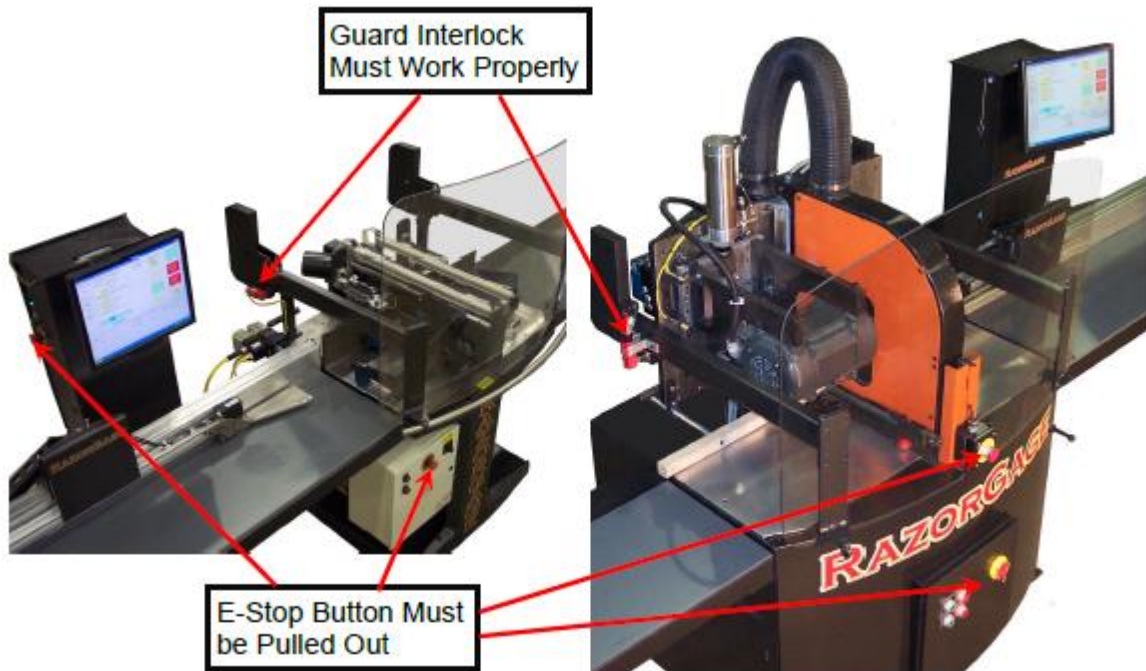


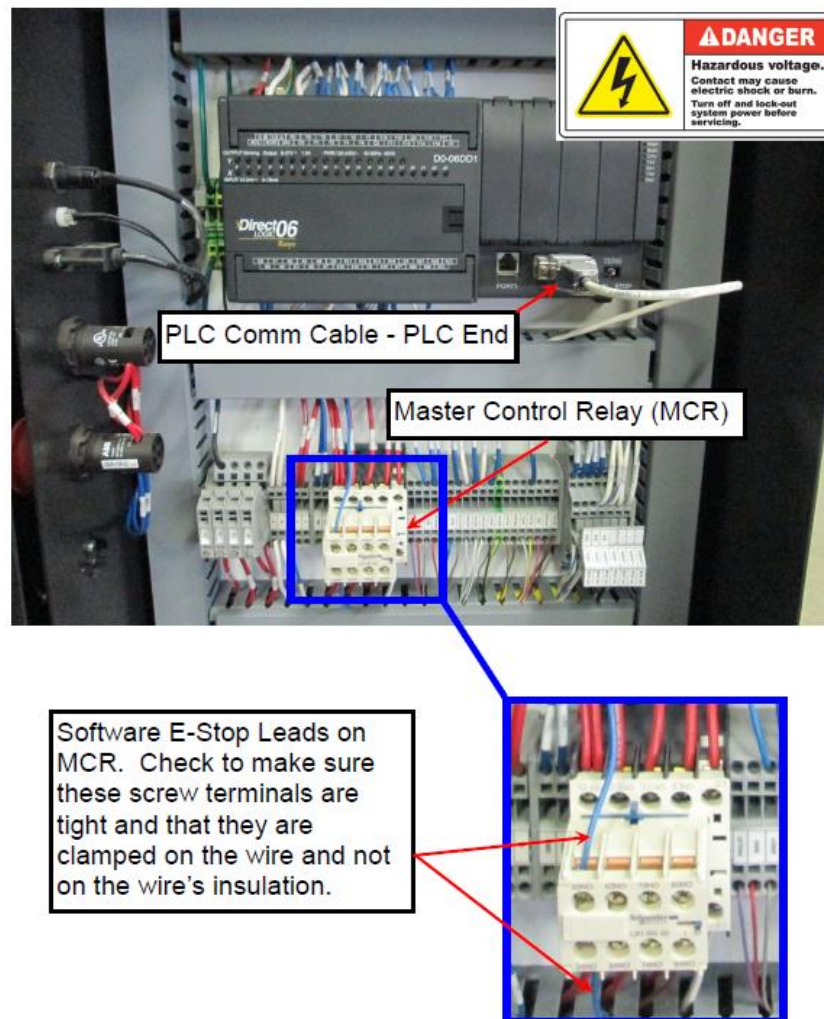
Figure #8

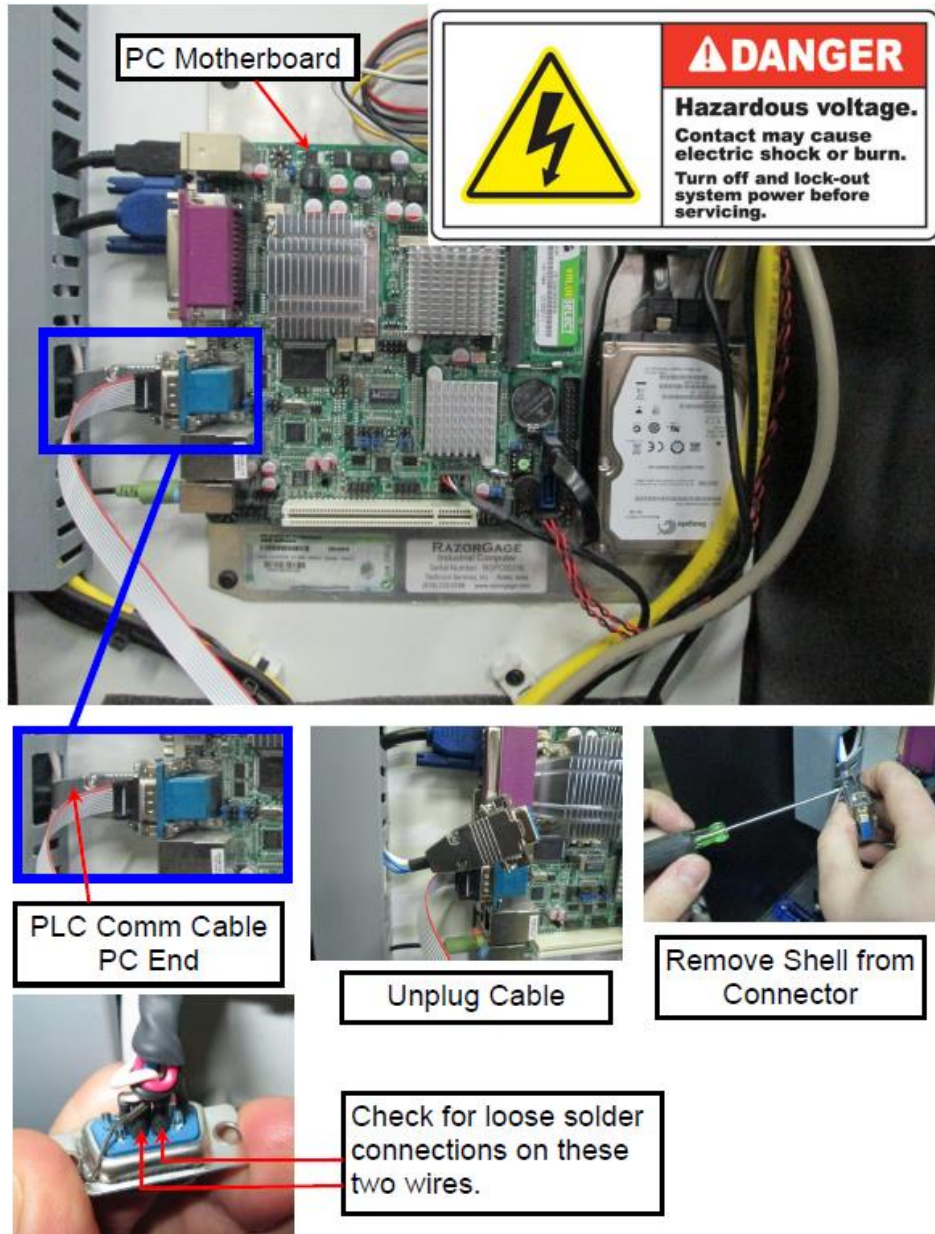
Troubleshooting E-Stop Faults



Troubleshooting E-Stop Faults with Safety Switches Reset

An E-Stop circuit is a hard-wired system intended to drop power and air whenever any component in the E-Stop circuit changes from closed to open. This circuit cannot rely on software to drop power and air yet it is helpful if the software informs the user that an E-Stop condition is present. On RazorGage systems we use two normally unused pins on one of the serial communication connectors to trigger a software event that we use to display the E-Stop screen. If your system randomly displays E-Stop screens even though all guard interlocks are closed, air pressure is present, and all E-Stop switches are disengaged then it is possible that the software E-Stop circuit is compromised. The software E-Stop circuit comprises two wires that go from the Master Control Relay to the DB-9 connector that is on the PC end of the PLC communication cable. To troubleshoot this potential problem, disconnect all power to the RazorGage using your company's lock-out / tag-out procedure then open the door on the PLC enclosure. This is the enclosure to which the touch screen monitor is mounted. The pictures on the following pages will lead you through the troubleshooting process. Your enclosure may vary from the one shown in the photos but the basic components and methods will be the same.





- Make sure bare drain wire is hooked up to DB9 chassis.

If you have more questions about RazorGage products visit our Downloads page and our You Tube channel. Both are accessible from the RazorGage home page, www.razorgage.com. If you would like to discuss an application, feel free to call us at (515) 232-3188.