

CYCLONE RAZOROPTIMAL 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 Cyclone Optimal ships with two items 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.

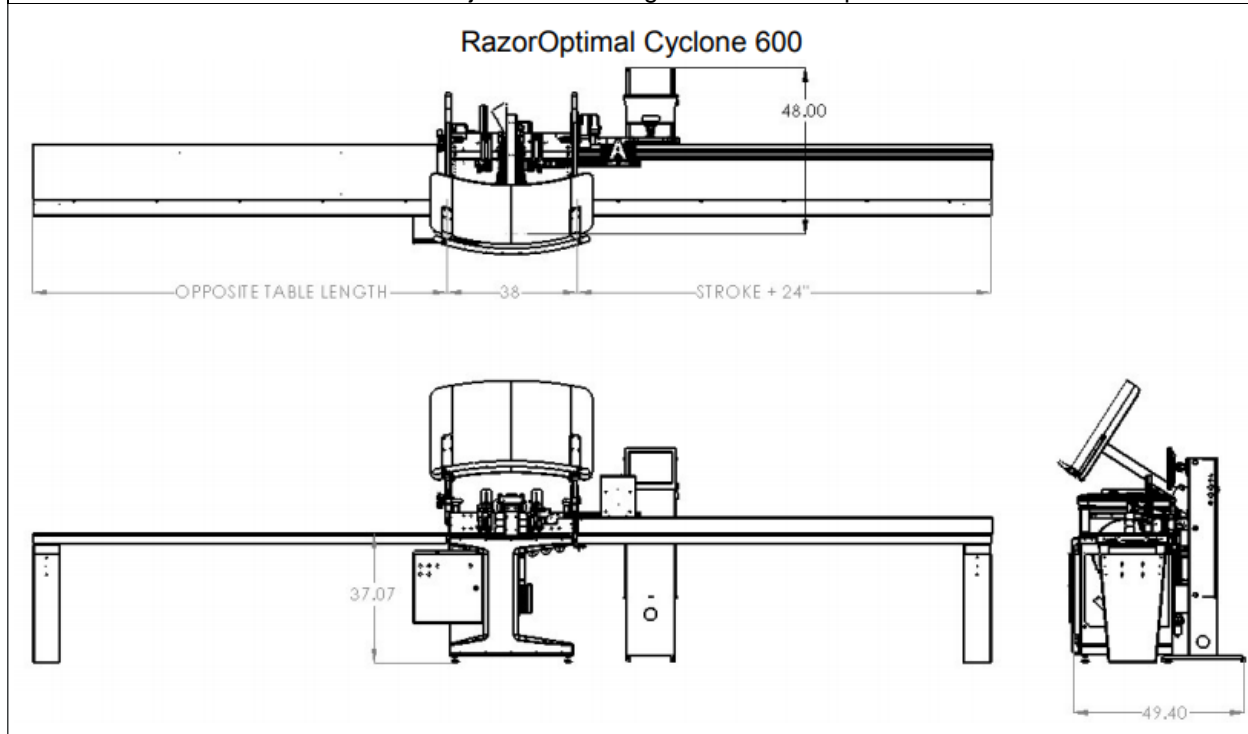
Installation



WARNING

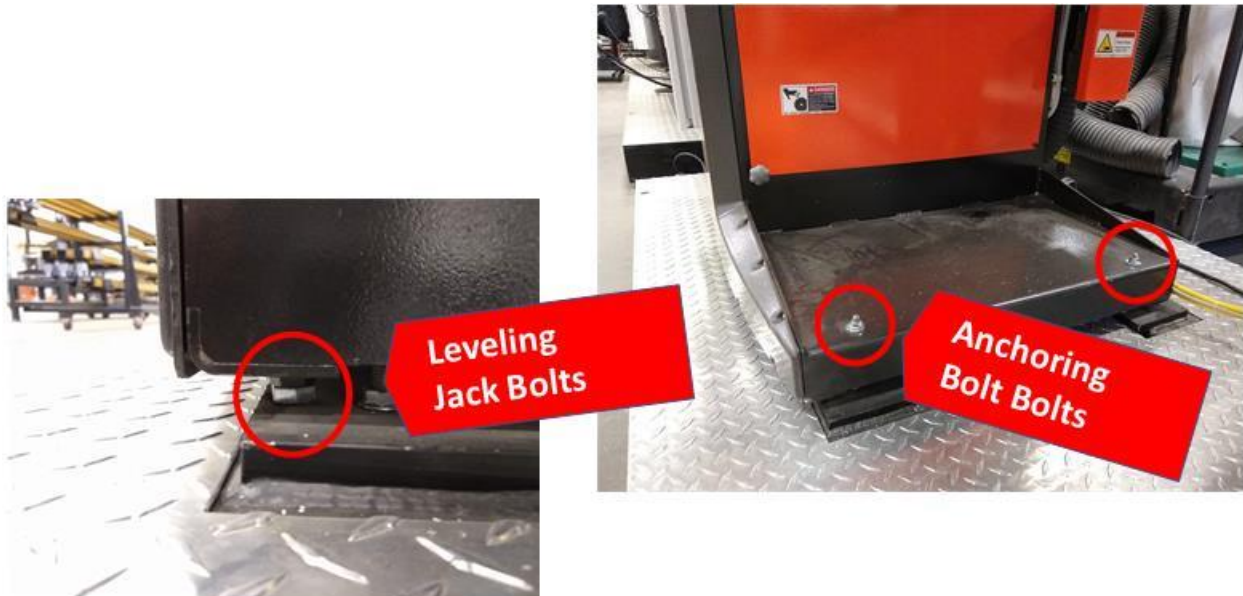
The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

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. 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.

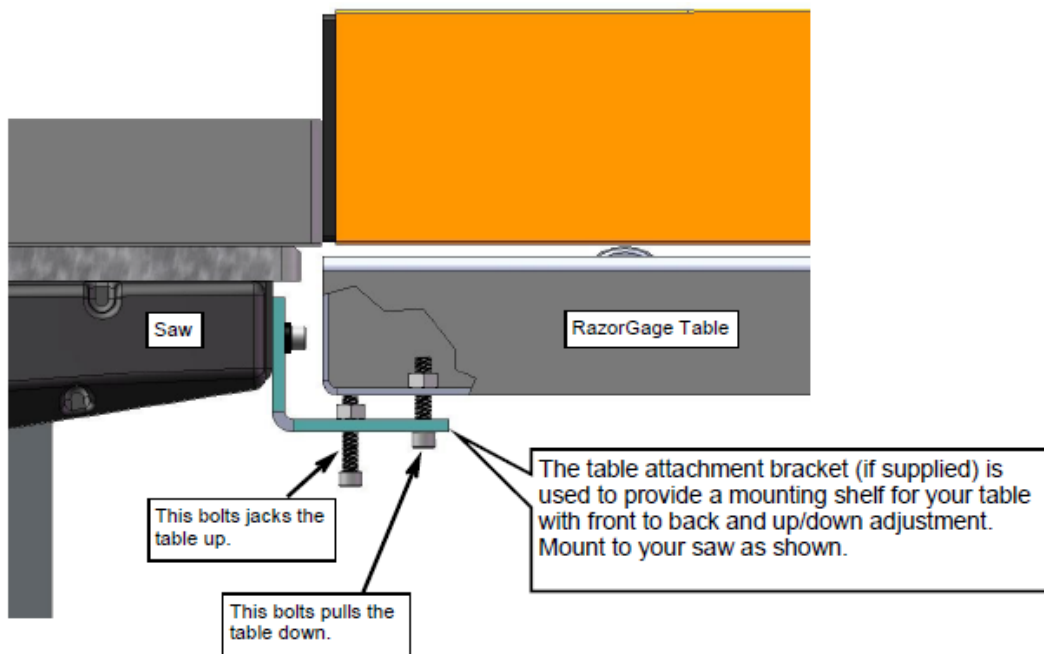


Anchoring

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 12" anchor bolts.

Infeed/Outfeed Tables

The Cyclone RazorOptimal 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.



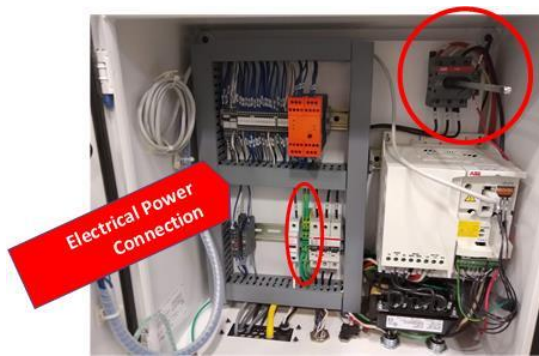
Electrical Power Connection



WARNING

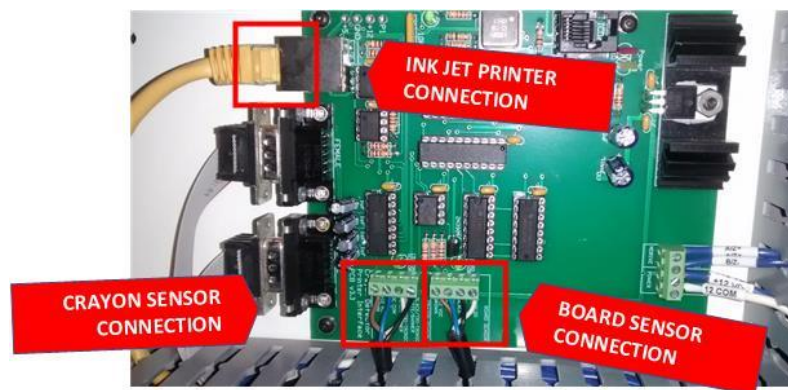
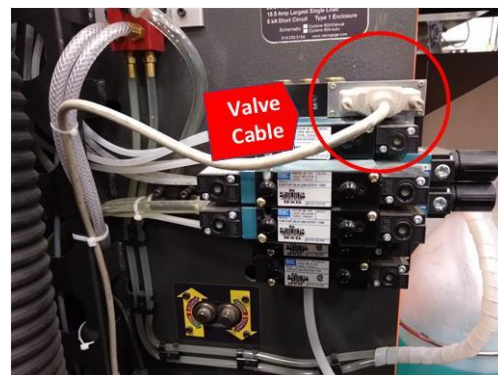
The operator must remove from and lock out all power sources to saw before servicing or connecting power.

The saw has been factory wired to the requested voltage before shipment. The saw power requirements are either **208 / 230 VAC 3 ϕ 30Amps** OR **480 VAC 3 ϕ 20Amps**. The RazorGage tower requires a separate **120V 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.



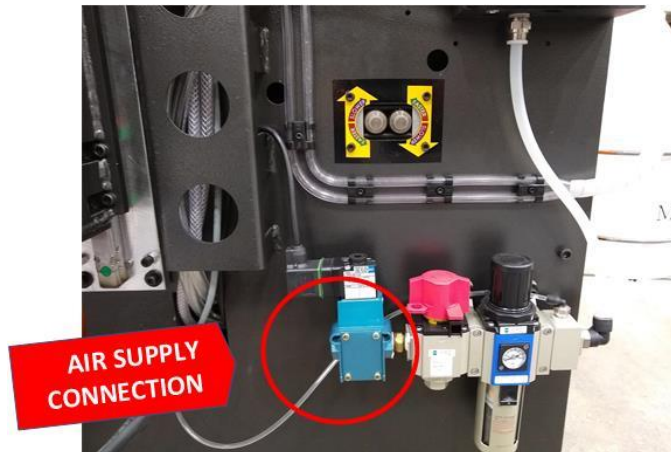
Electrical Interface Connections

The Cyclone Optimal system used a RazorGage automated positioner. To connect the RazorGage to the Cyclone 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 underside 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.



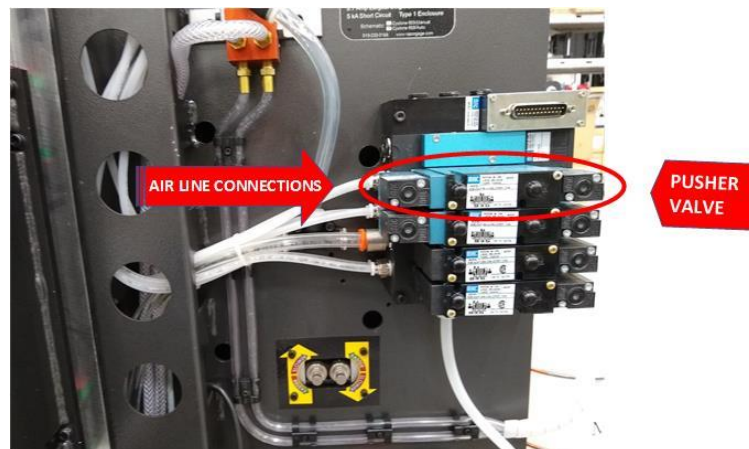
Air Supply Connection

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.



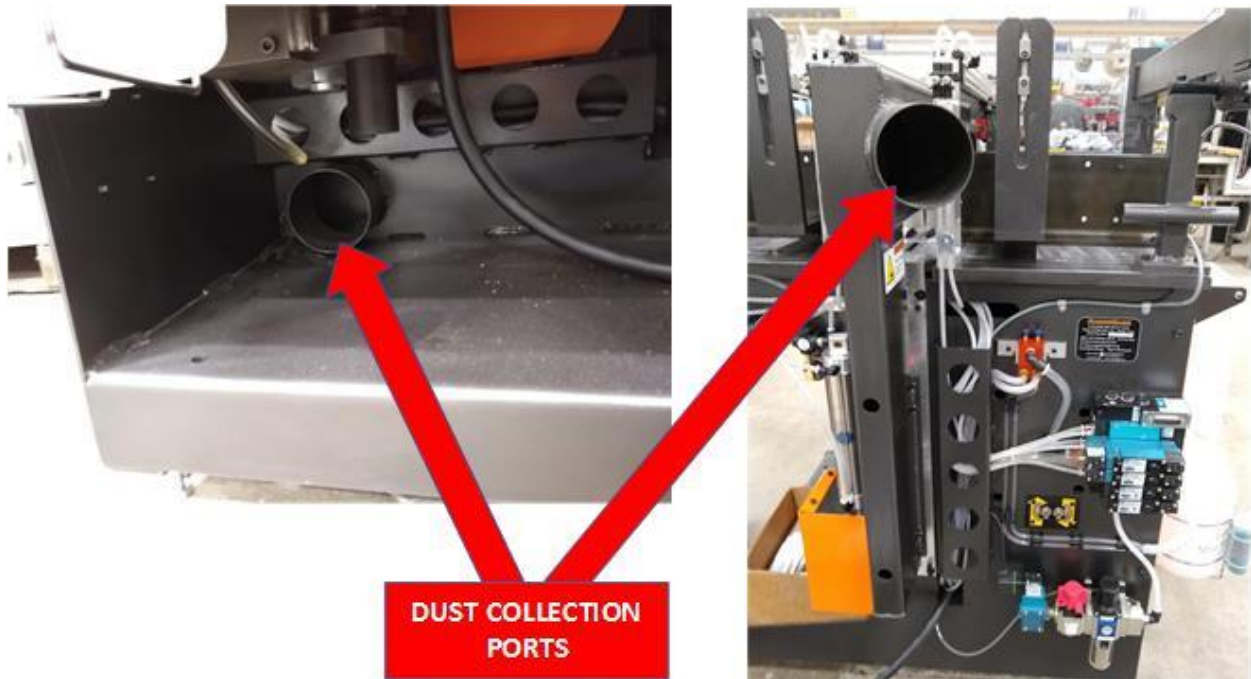
Pneumatic Connections

The Cyclone Upcut Saw has all the valves for the Cyclone RazorOptimal System. The air lines 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.



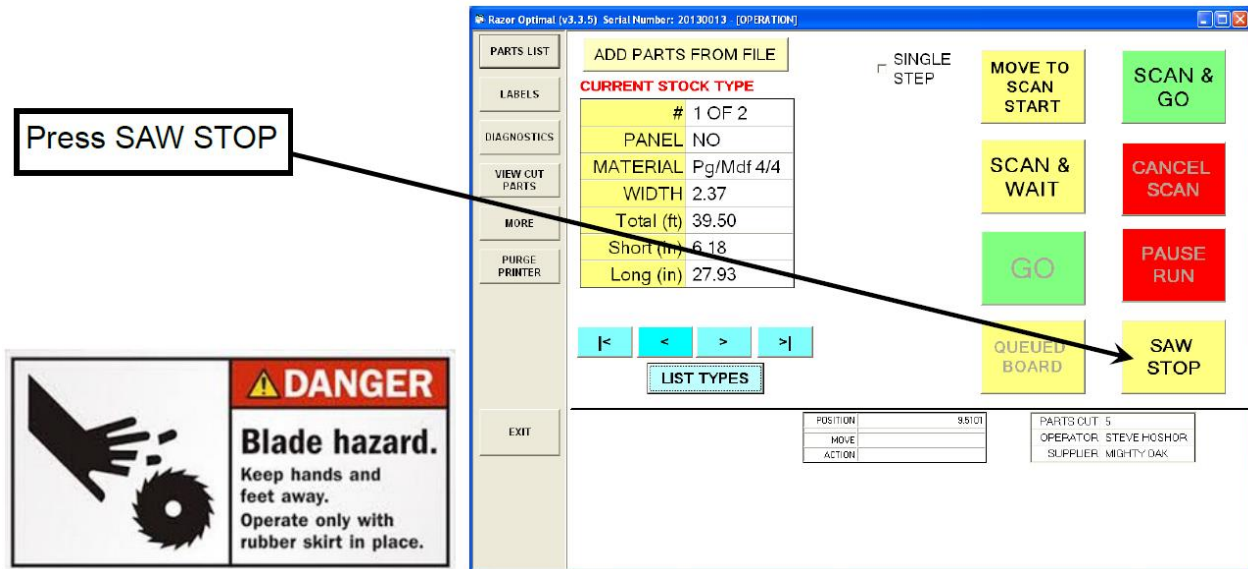
Dust Collection

This saw requires dust collection to keep saw dust from collecting on the machine. Vacuum with the minimum capacity of 1200 CFM is recommended. There are two 4" dust collection on the saw. One port is located at the back of the saw and the other is underneath the saw carriage accessible from the left side of the saw.

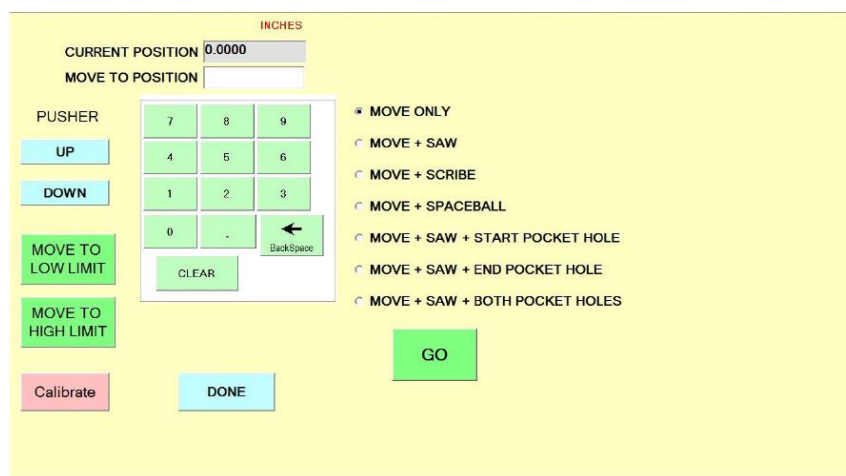


Setup Procedure

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	.	←
BackSpace		

CLEAR

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

LABELS POSITION

DIAGNOSTICS MOTION

VIEW CUT PARTS SAW

MORE PANELS

PURGE PRINTER FIT

PARTS SCAN

ENCODER

COM

REPORTS

SCRIBE

SPACE BALL

RAZARRAY

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.

SETTINGS SCREEN DONE CANCEL

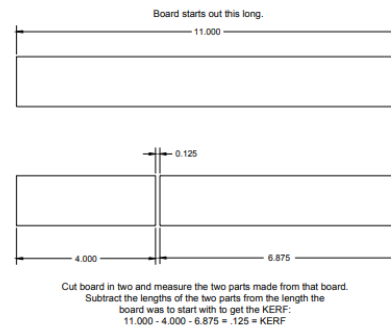
MOTION

SPEED	<input type="text" value="30"/>	INCHES/SEC
ACCEL	<input type="text" value="90"/>	INCHES/SEC
DECEL	<input type="text" value="90"/>	INCHES/SEC
MOVE TO RUN START SPEED	<input type="text" value="10"/>	INCHES/SEC
RUN CURRENT	<input type="text" value="100"/>	Percent (20 - 100)

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.

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.

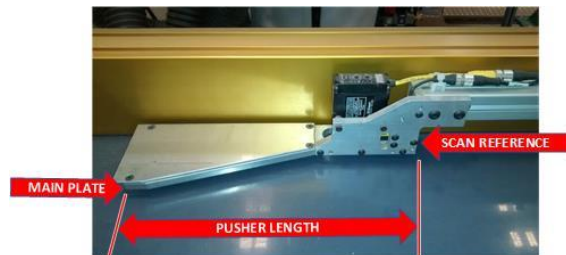
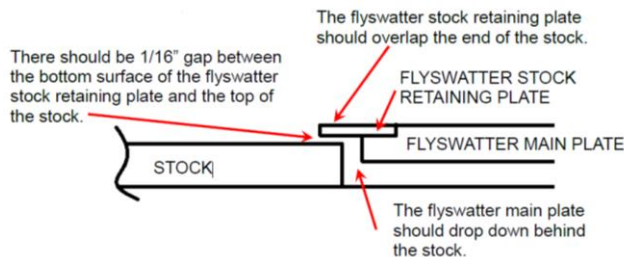
Enter the value for the Parameter called **PUSHER LENGTH** also found in the picture below. After a scan the pusher arm should drop behind the stock material with the retaining plate on top of the board and the main plate behind the end of the stock, shown in the diagram below. If you are noticing after 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>

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 load side of the pusher to the process load side 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 13.5 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 dropped 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.

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.

Cyclone 600 Sawing Capacity Chart

Material Thickness	Cyclone 600 Width Capacity for Common Blade Diameters					
	14" Blade	16" Blade	18" Blade	500mm Blade	22" Blade	24" Blade
0.5	6.97	10.38	13.23	15.42	18.27	20.62
0.75	6.04	9.77	12.76	15.02	17.93	20.32
1	4.89	9.10	12.25	14.59	17.57	20.00
1.25	3.32	8.35	11.70	14.13	17.19	19.67
1.5		7.49	11.10	13.64	16.79	19.32
1.75		6.49	10.44	13.11	16.36	18.95
2		5.25	9.72	12.54	15.90	18.55
2.25		3.56	8.91	11.92	15.42	18.14
2.5			7.98	11.24	14.90	17.70
2.75			6.90	10.50	14.35	17.24
3			5.58	9.68	13.75	16.74
3.25			3.78	8.75	13.11	16.22
3.5				7.68	12.42	15.67
3.75				6.40	11.67	15.08
4				4.75	10.84	14.45
4.25				1.99	9.92	13.77
4.5					8.88	13.03
4.75					7.68	12.24
5					6.20	11.37
5.25					4.20	10.40
5.5						9.30
5.75						8.03
6						6.49

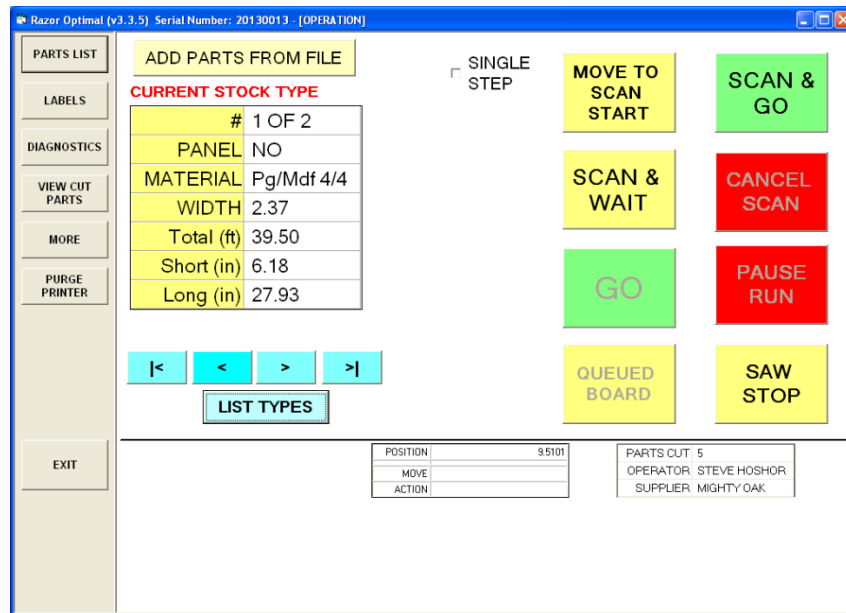
The vertical stroke of the upcut saw blade requires that the workpiece be centered over the center line of the blade to maximize thickness capacity. The fence is adjustable to accommodate the potential material sizes as shown in the chart above. For best cut quality on thin stock the work piece should be toward the rear of the saw. Adjust the position of the fence toward the rear of saw to optimize cut quality. See adjustment section for directions on adjustment of fence and squaring fence to blade after adjustment.

General Operation

Turning the Saw On

Make sure all guards are in place and that no person will be at risk in any way when the motor is energized and the saw blade begins to turn before making the decision to turn on the saw. Make sure you and all persons who may be operating the saw know how to turn the saw OFF before turning the saw ON. Pull the Emergency Stop button OUT. Press the green START button. The motor will begin ramping up to operating speed.





Main Screen

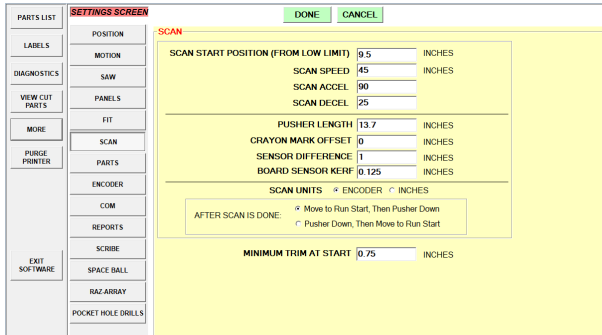
To begin cutting parts, follow these steps:

1. Power up the Cyclone Optimal by the steps below.
 - a. Turn on power the PC or tablet.
 - b. Turn on tower control power using the green POWER ON button on the side.
 - c. Start the Razor Optimal software and follow the instruction to home the RazorGage.
 - d. Start the Cyclone saw by turning on the disconnect, resetting the E-stop, and pressing the START button.
2. Press the *ADD PARTS FROM FILE* button.
3. 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.
4. Choose a type to run. Use the navigation keys to change type. Use the *LIST TYPES* button to see all remaining types.
5. Place a piece of stock matching the material type you are running on the table. If the Cyclone Optimal has crayon defecting option, follow the instructions below to defect the board. Otherwise go to step 6.



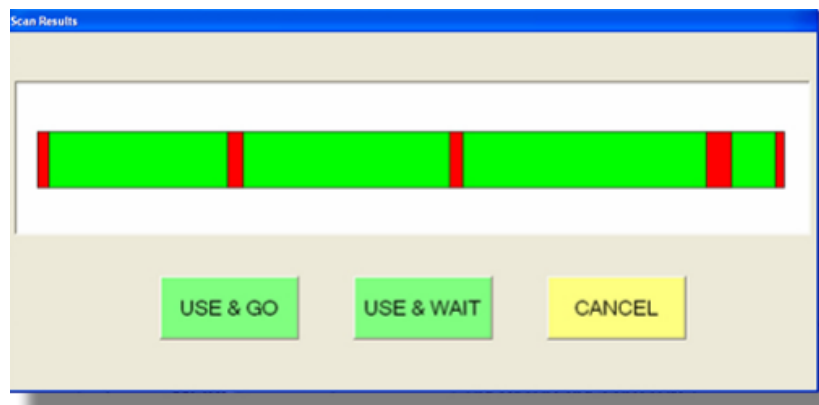
- a. Using the supplied fluorescent crayon, mark the leading edge trim cut. This is not required if the stock material does not have any defect locations.
- b. Mark the beginning and end of each defect.

- 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.



6. After defecting press the 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, crowd it against the back of the pusher foot. 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. This is a good idea to use when getting started to check that the crayon marks being made are dark enough for the scanner to read.



- b. Select one of the following.
 - i. Press *USE & GO* button to accept the scan and start cutting parts.
 - ii. Press *USE & WAIT* button to accept the scan and return to the main screen where pressing *GO* will continue the operation.
 - iii. 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.



7. 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 foot, 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

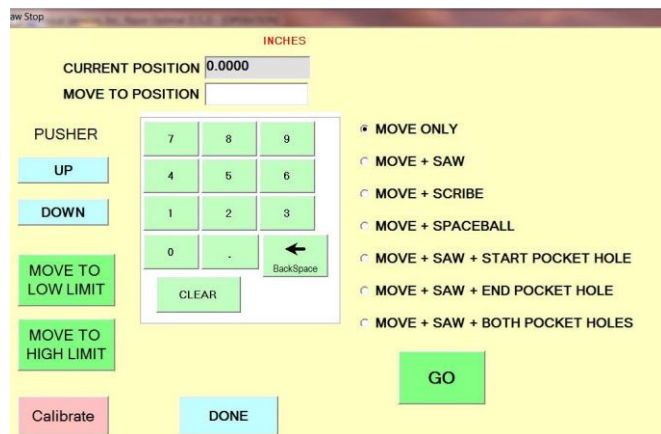


This machine has many adjustments that are used to set the machine up to a specific application. The machine adjustments are setup at the factory and fine-tuned during installation. If it is necessary to make changes to these settings (i.e. material size changes), make sure you read and understand all 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 Feed Flow Controls

The saw blade feed rate is adjustable with pneumatic flow controls. This adjustment may be necessary if material thickness and/or width changes. Also, a saw timeout error may be a reason to make this adjustment. The flow controls for saw feed rate are located at the back of the machine in-between the valve and the FRL. There is a flow control for retract on the left and one for advance on the right. Loosen the locking thumb nut before adjusting. Adjust by turning the dial clockwise to close the flow which slows motion or turning counterclockwise to 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 move the pusher out to high limit to get it 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 Stroke Distance



The photo at right shows the saw in the down position as it should be with air and power locked out. During the saw cycle, the saw moves up until the upper saw switch dog passes over the upper saw switch. The upper saw switch dog is mounted in a slot in the saw motor plate and secured by a nut on either side of the plate. To move it, crack loose one of the nuts, slide the dog up or down as desired, and re-tighten the nut. To make the saw reverse direction at a higher point, move the upper saw switch dog DOWN. To make the saw reverse direction at a lower point, move the saw switch dog UP.

To adjust how high the saw blade extends, first lock out power and air to the machine and then remove the motor guard by removing the screws indicated at left by the red arrows.



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.



Horizontal Clamps Pressure Regulator

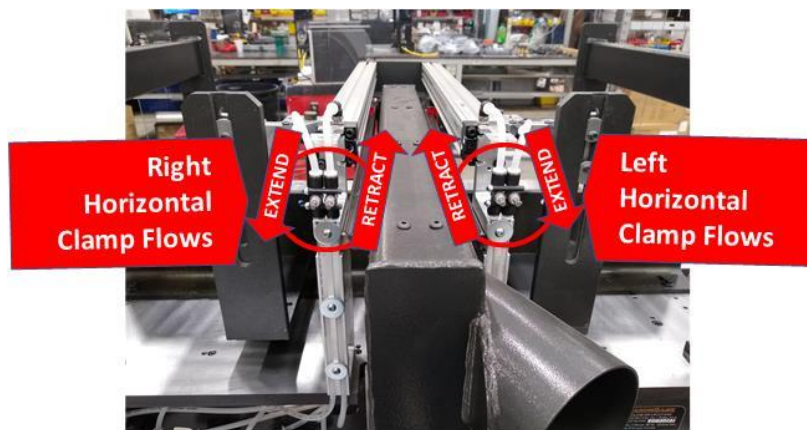
The pressure of the horizontal clamps is adjustable to allow clamping of material of varying rigidity. To adjust the horizontal clamps pressure, locate the horizontal clamps pressure regulators located under the right side of the saw table. Pull out on the adjustment knob to unlock it. Turn clockwise to increase the pressure and counter-clockwise to decrease pressure to the horizontal clamps pressure. The horizontal clamps pressure regulators normally will be set to completely open.



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 extend and one for retract. To adjust loosen the jam nut. Then turning the dial clockwise restricts the air flow which slows motion and counter-clockwise will open air flow which hastens motion. Tighten the jam nut when adjustment is completed.

To test horizontal clamps, go to SAW STOP MODE from the MAIN SCREEN and move the pusher out to high limit to get it 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 horizontal clamp speed during cycle and ensure that the horizontal clamps are clamping before the saw enters the material. Adjust flow controls to change advance and retract speed as needed.



Vertical Clamp Pressure Regulator

The pressure of the vertical clamp is adjustable to allow clamping of material of varying rigidity. To adjust the vertical clamp pressure, locate the vertical clamp pressure regulator located under the right side of the saw table. Pull out on the adjustment knob to unlock it. Turn clockwise to increase the pressure and counter-clockwise to decrease pressure to the vertical clamp pressure. Start at a low pressure and increase pressure until the material is firmly held and cut quality is acceptable.

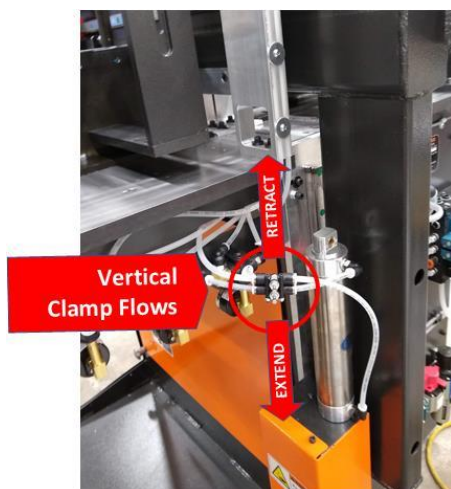
To test vertical clamp, go to SAW STOP MODE from the MAIN SCREEN and move the pusher out to high limit to get it out of the way. Now place a test piece of board under the top clamp and against the fence. Enter a value equal to the current position, select MOVE +SAW, then press GO. The pusher won't move because it's already in position but the operation selected will be performed. Check the vertical clamp vertical clamp during machine cycle and ensure that the vertical clamp is clamping pressure is adequate for the material. Adjust the regulator to change clamp pressure as needed.



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 will hastens motion.

To test vertical clamp, go to SAW STOP MODE from the MAIN SCREEN and move the pusher out to high limit to get it 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.



aw Stop

INCHES

CURRENT POSITION 0.0000

MOVE TO POSITION

PUSHER

UP

DOWN

MOVE TO LOW LIMIT

MOVE TO HIGH LIMIT

Calibrate

DONE

GO

7 8 9

4 5 6

1 2 3

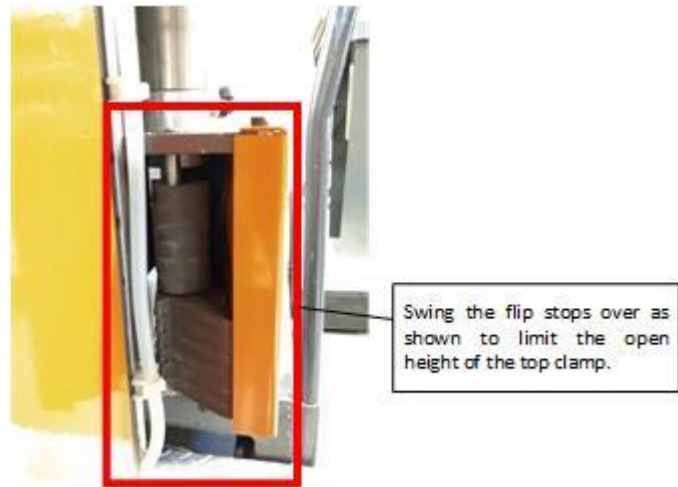
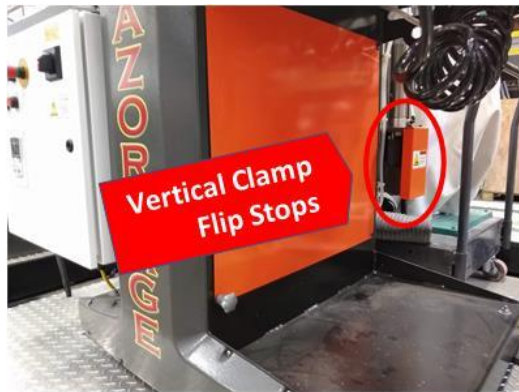
0 . ← BackSpace

CLEAR

- MOVE ONLY
- MOVE + SAW
- MOVE + SCRIBE
- MOVE + SPACEBALL
- MOVE + SAW + START POCKET HOLE
- MOVE + SAW + END POCKET HOLE
- MOVE + SAW + BOTH POCKET HOLES

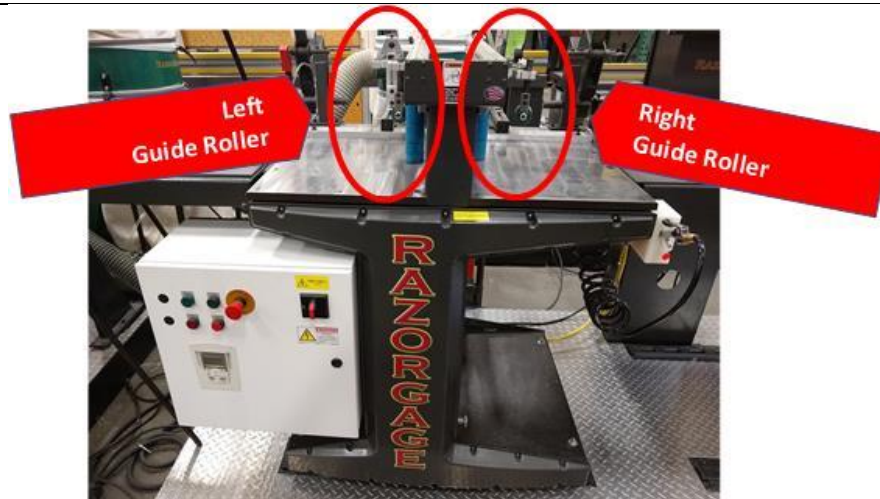
Vertical Clamp Stroke Distance

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 flip stops underneath the table top on the right side of saw. Swing the flip stop to the back to engage or swing to the front to disengage the stops. The more stops engaged the shorter the vertical clamp stroke.



Guide Rollers

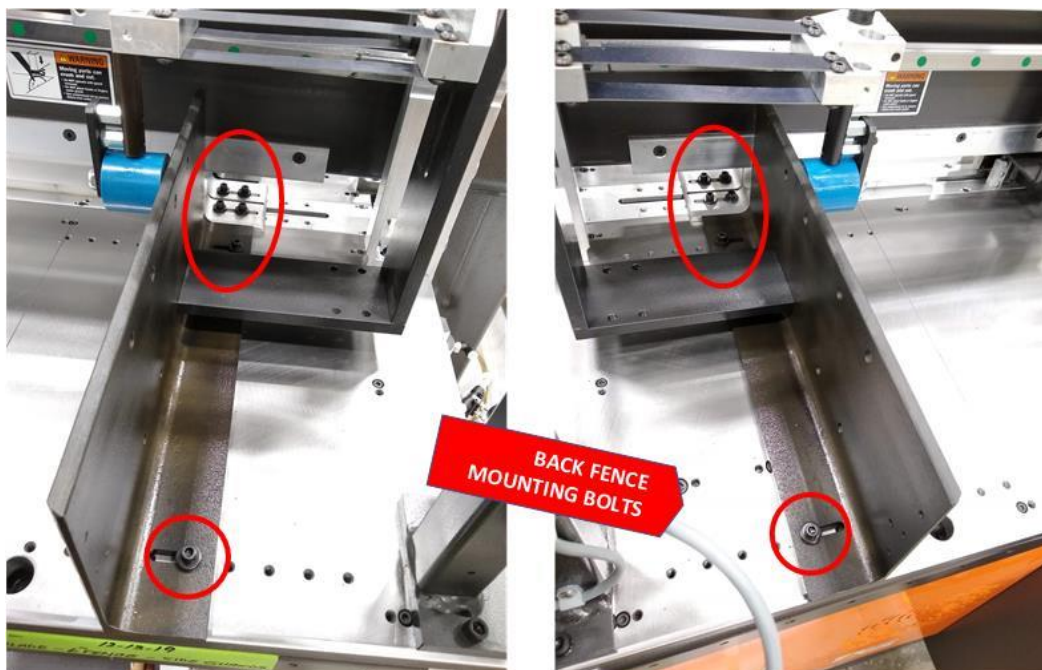
The Cyclone RazorOptimal is equipped with guide rollers to support the material as it is being feed through the saw. The guide rollers apply downward pressure to the material. The rollers are slightly angled toward the back fence to keep the material close to the fence while being advanced. If a printer 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 aluminum bracket along the slotted hole in the painted mounted bracket.





Back Fence

The back fence on the Cyclone saw is set to the width of the material and also is squared to the saw blade from the factory. If adjustment is necessary (i.e. changes in material width) move the back fence to center the material on the saw blade. The back fence is mounted with slotted holes. For small adjustments just loosen the bolts and slid in the slotted hole and retighten. For larger adjustments there is a grid pattern of threaded holes, remove the bolts and remount in a different set of holes. Always square the back fence to the saw blade after any adjustment to the back fence. See the next section for further instruction on squaring the back fence to the saw blade.



Squaring Back Fence to Saw Blade



DANGER

The operator must ensure that no person will be in harms way before performing any of the following steps.

NOTE: The blade is squared at the factory so this step is not necessary unless you need to move the fence off the factory setting.

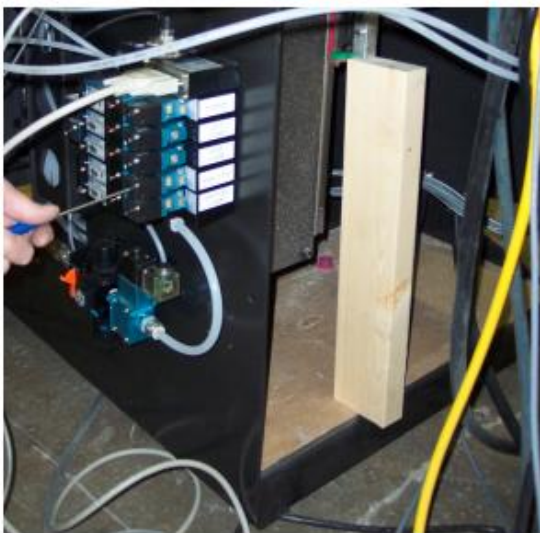
Make sure no person or other obstruction will interfere with the blade as it rises before performing this operation. Use a probe to manually actuate the saw lift valve to raise the saw blade.



Step 1 for Manual Cyclone 600



Step 1 for Automatic Cyclone 600



Step 2 for All Cyclone 600 Saws: While holding the valve button, use a board to prop up the saw motor. Release the valve and remove and lock out power and air to the saw.



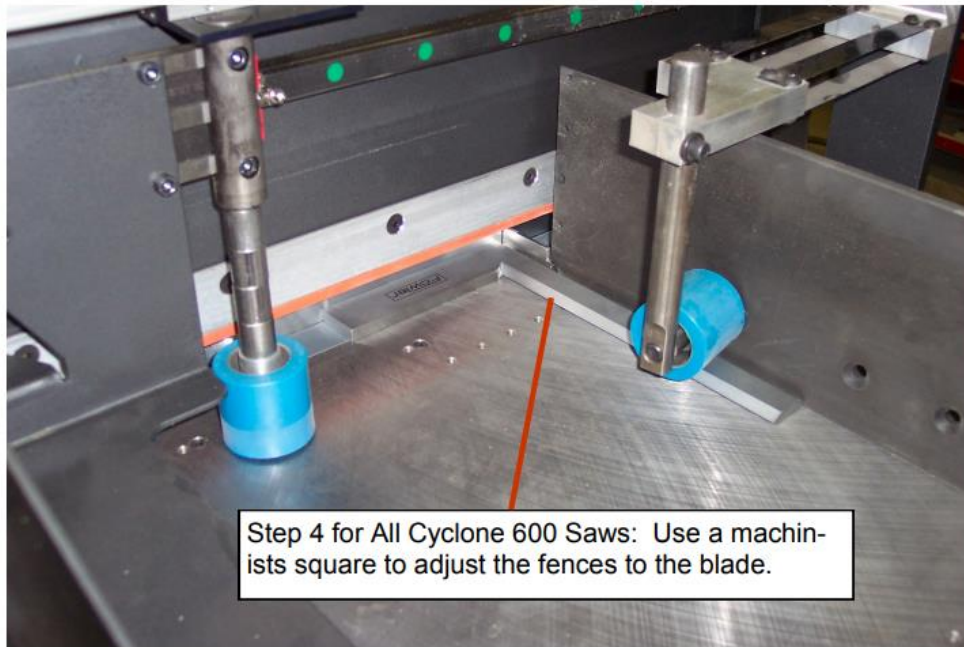
DANGER

The operator must remove from and lock out all power to saw before continuing.



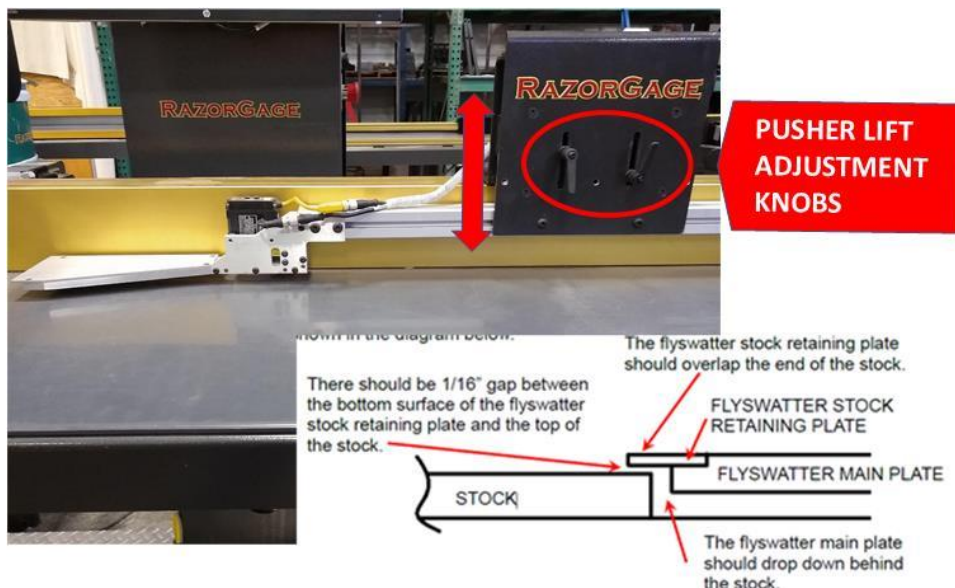
11

Step 3 for All Cyclone 600 Saws: Manually raise the top clamp and place a spacer under it to hold it up off the table.



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.



Maintenance



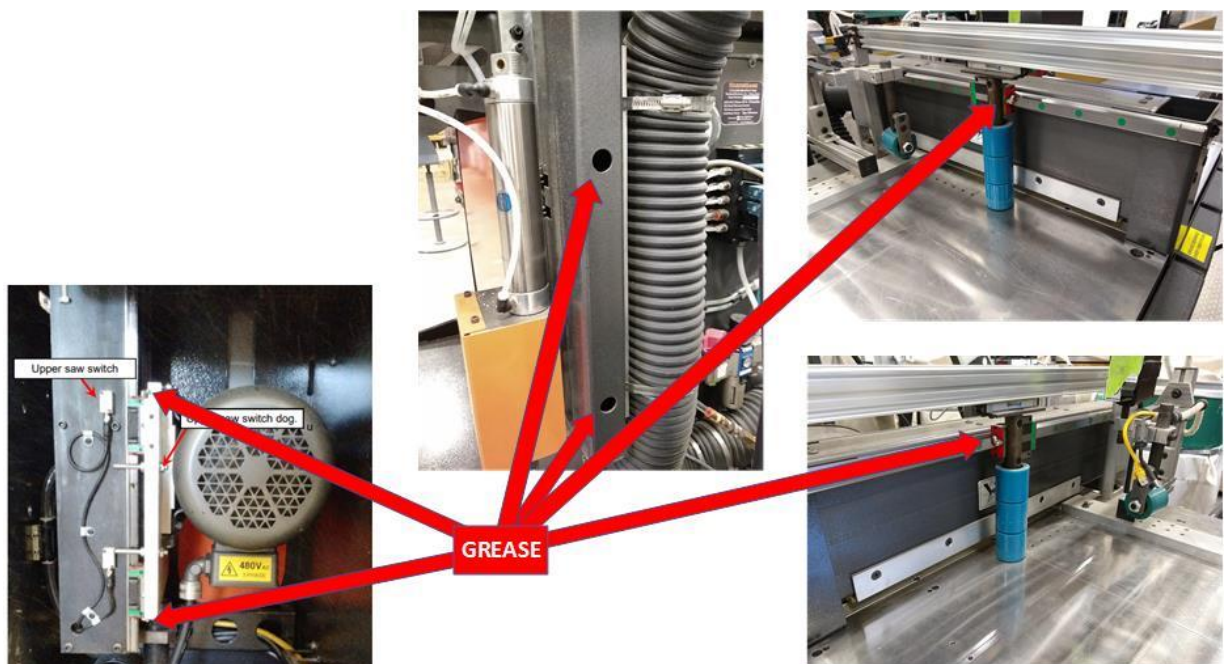
WARNING

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.

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

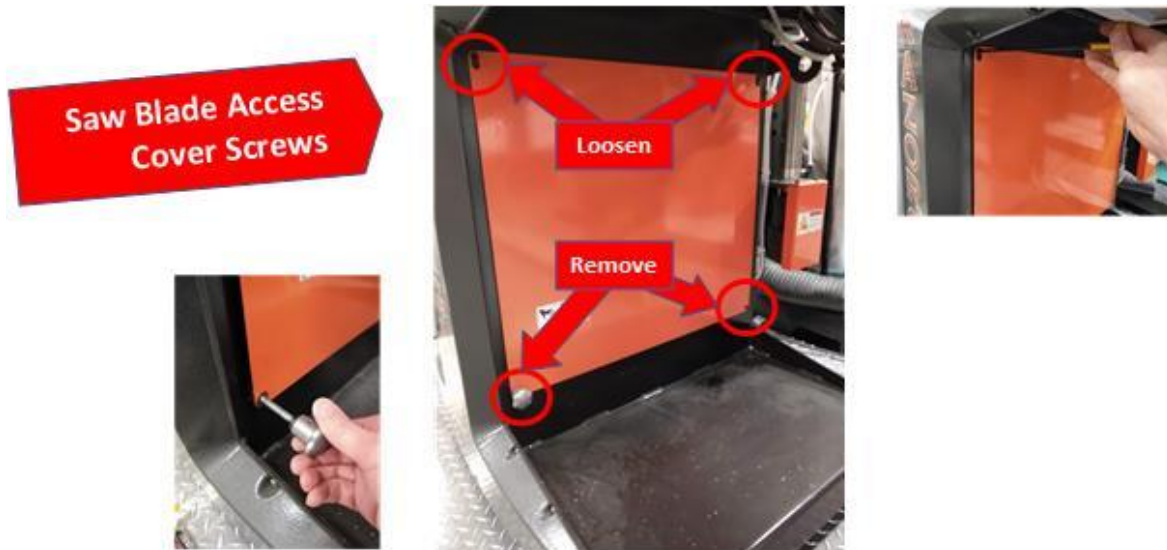
Lubrication

There are several components on the Cyclone Optimal Saw that need to be lubricated regularly. The linear bearing rails on the saw carriage, vertical clamp, and horizontal clamps need to be lubricated every 5000 machine cycles with lithium soap-based grease. Each of the linear bearing block have a grease zerk for application of grease. To access the saw carriage the motor guard panel will have to removed.



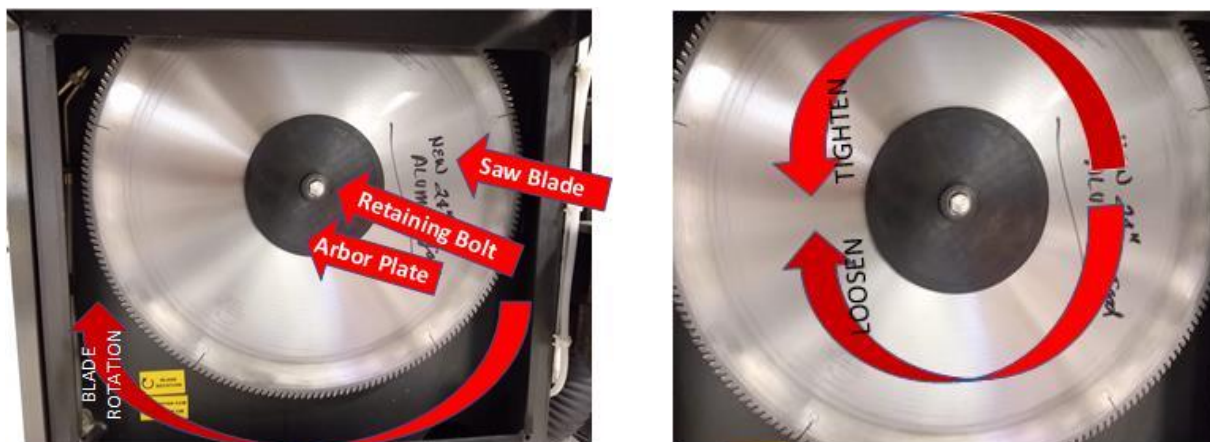
Saw Blade Access

To access the saw blade for inspection or replacement, locate the blade access cover the right side of the saw housing. Loosen the top two screws marked in the picture below. Remove the bottom right screw along with the thumb screw on the bottom left. Lift the blade guard panel off the top two screws and remove for access to the saw blade. Remount access cover before attempting to restart machine.



Changing Out Saw Blade

Lock-out & Tag-out both the electricity and air pressure supply to the machine. When installing or changing blade observe the proper rotation and be sure blade matches the rotation arrow. Use scrap wood to block blade while tightening or loosening blade retaining screw. Blade retaining bolt has left hand threads the direction for tightening and loosening is opposite from normal bolts. To loosen retaining bolt turn wrench in same direction as rotation of blade, clockwise when looking at the blade. Note the direction of the saw blade teeth. Remove retaining bolt and blade arbor plate to free saw blade from motor shaft. Do not remove rear arbor plate. 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 retaining bolt. Tighten the retaining bolt by turning the wrench counter-clockwise. Remount access cover.



Replacement Parts List

RGX NO	DESCRIPTION
RGX00024	DOUBLE SOLENOID VALVE, 12VDC, MANIFOLD MOUNTED
RGX00025	SINGLE SOLENOID VALVE, 12VDC, MANIFOLD MOUNTED
RGX00506	DUMP VALVE, 24VDC
RGX01124	SAW BLADE: 20" FOR CUTTING WOOD
RGX01220	SAW BLADE: 20" FOR CUTTING ALUMINUM
RGX00473	SAW BLADE: 24" FOR CUTTING WOOD
RGX00474	SAW BLADE: 24" FOR CUTTING ALUMINUM
RGX01593	SAW MOTOR, CYCLONE
RGX00593	ELECTRICAL DISCONNECT SWITCH
RGX00595	ELECTRICAL DISCONNECT HANDLE
RGX01307	SAW VARIABLE FREQUENCY DRIVE / 208-230V
RGX01387	SAW VARIABLE FREQUENCY DRIVE / 480V
RGX01366	SAFETY TIMER RELAY
RGX02187	NO FAULT 2 POLE RELAY
RGX01742	RED EXTENDED HEAD PUSHBUTTON
RGX01743	GREEN ILLUMINATED PUSHBUTTON
RGX01747	E-STOP PUSHBUTTON
RGX01749	RED FLUSH ILLUMINATED PUSHBUTTON
RGX01748	PUSHBUTTON HOLDER / NC CONTACT
RGX01620	PUSHBUTTON HOLDER / NO CONTACT
RGX01415	LINE REACTOR, 480V
RGX01414	LINE REACTOR, 208V
RGX00009	M-DRIVE STEPPER MOTOR
RGX00577	CYLINDER POSITION PROXIMITY SWITCH
RGX00576	PROX. SWITCH CABLE
RGX01448	INTERFACE CABLE
RGX00417	VALVE BANK CABLE
RGX01547	INTERFACE DISCONNECT TO TOWER
RGX00494	SAW CYLINDER
RGX02076	HORIZONTAL CLAMP CYLINDER
RGX00490	VERTICAL CLAMP CYLINDER
RGX00535	PUSHER ARM LIFT CYLINDER
RGX00429	FLANGED HIWIN BEARING BLOCK
RGX00704	FLANGELESS HIWIN BEARING BLOCK
RGX00400	HORIZONTAL CLAMP ROLLER / MATERIAL GUIDE ROLLER



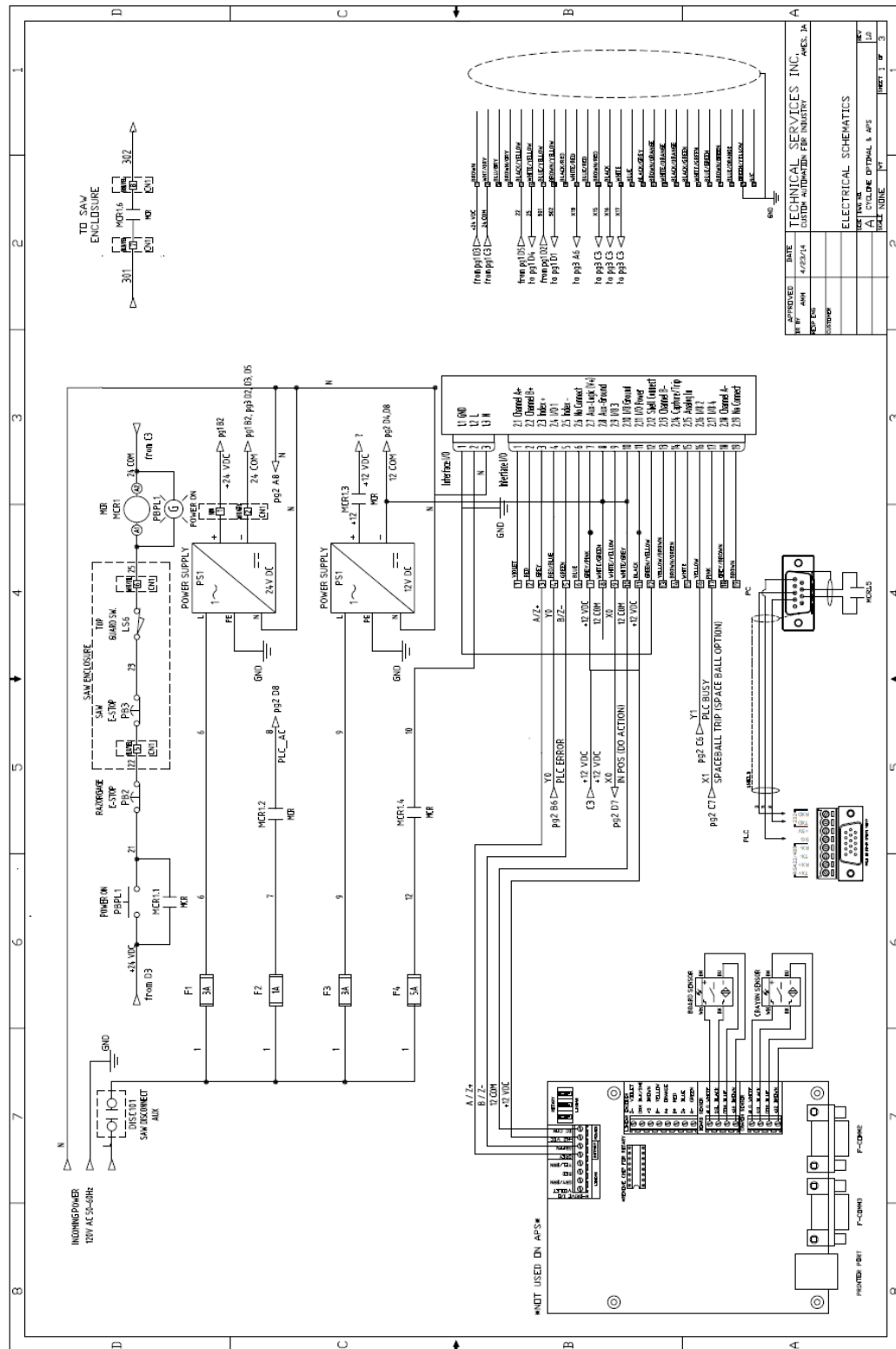
RGX00674	SPRING ROLLER SUPPORT
RGX00482	END OF BOARD SENSOR
RGX01533	CRAYON SENSOR
RGX00805	CRAYON DEFECTING BOARD ASSEMBLY
RGX00155	DIRECTLOGIC 06 PLC

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

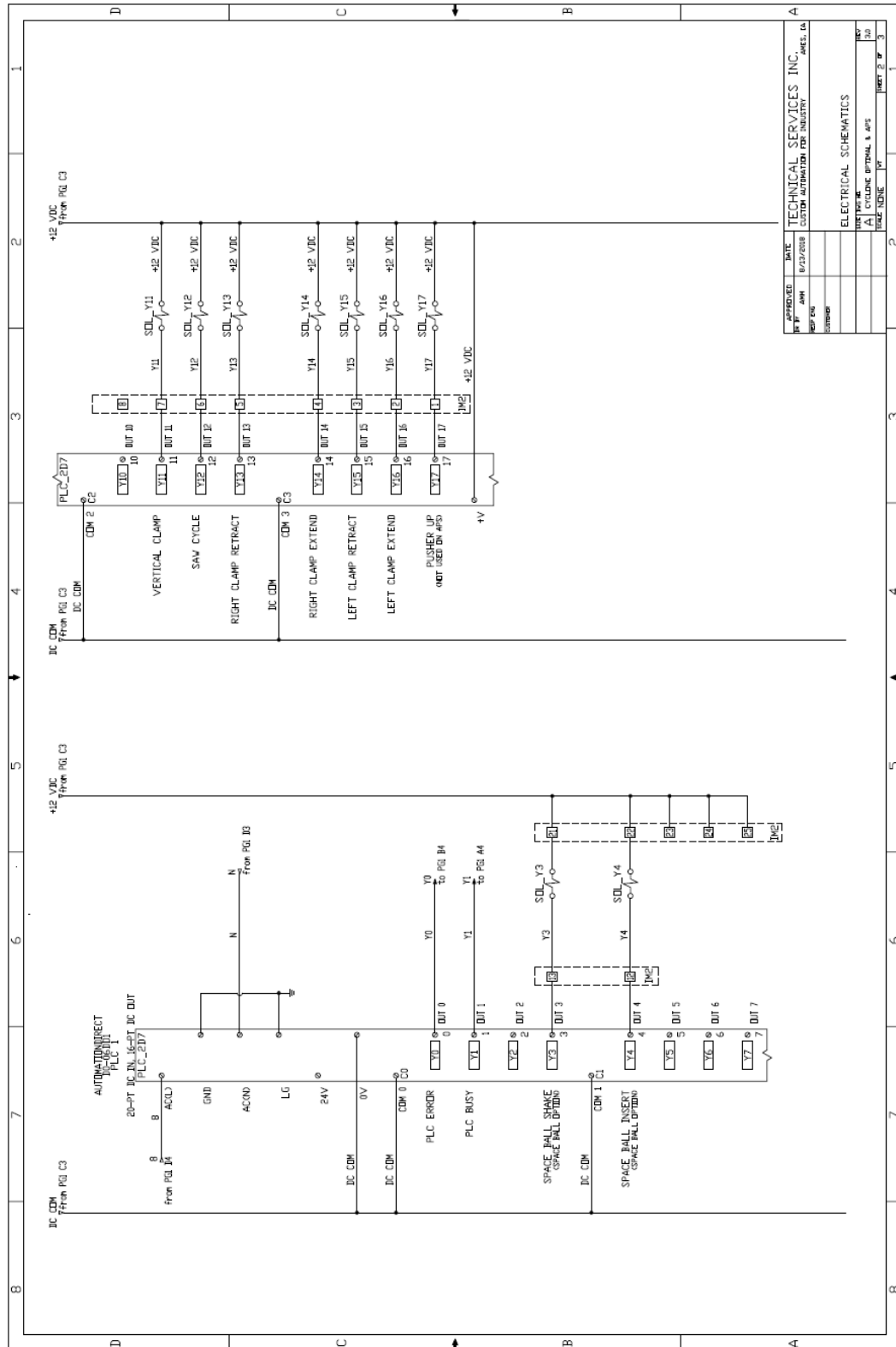
<https://razorgage.com/product-line/replacement-parts/>

Troubleshooting

Electrical Schematics (Page 1 of 4)

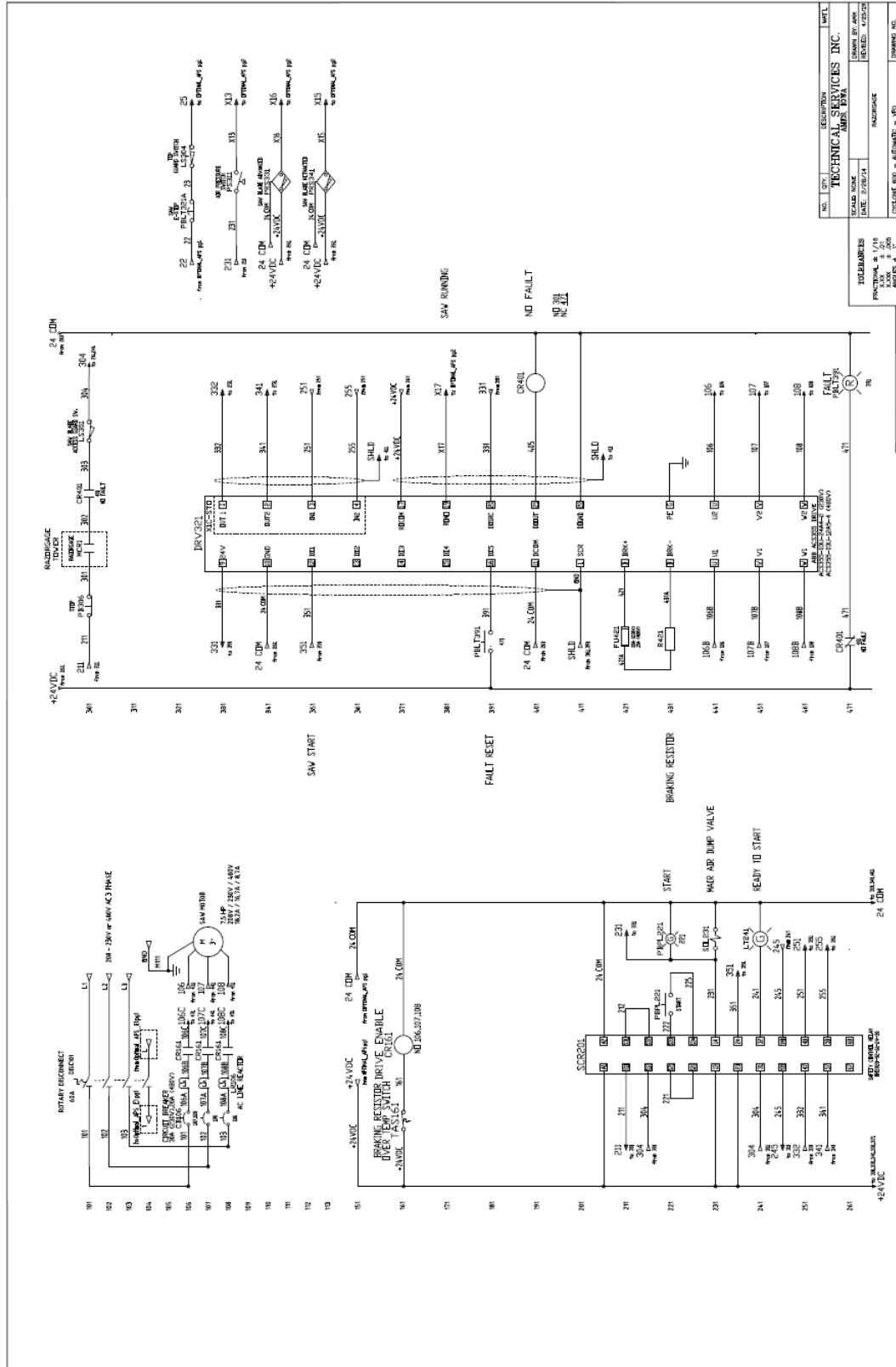


Electrical Schematics (Page 2 of 4)

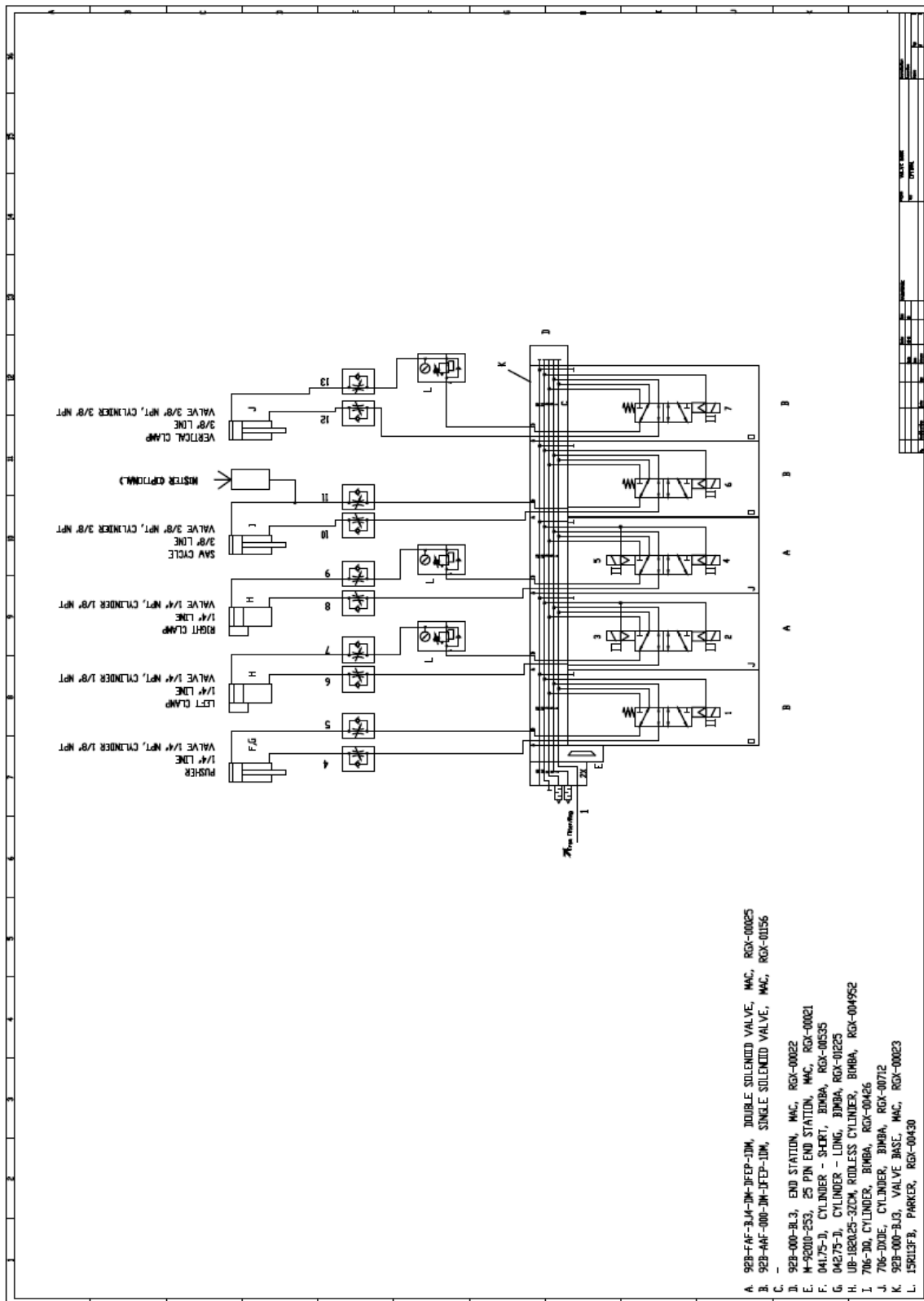


[illegible]

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 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. 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	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 next 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=3AU0000066143&LanguageCode=en&DocumentPartId=1&Action=Lau nch
3	RAZORGAGE MOVES BUT SAW DOES NOT CYCLE.	<ul style="list-style-type: none"> Compressed air supply is shutoff. Variable Frequency Drive <i>Saw Running</i> signal is not on. RazorGage <i>Do Action</i> signal did not turn on. Valve did not shift. 	<ul style="list-style-type: none"> Turn compressed air 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 tighten up enough to 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 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).
4	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>.
5	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 Failed sensor or wiring problem. 	<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 the sensor may be loose and will need to be adjusted until it lights and tightened. Repeat for rear sensor. 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.
6	ERROR #0002 Tried to Scribe, but the saw valve is activated.	<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.
7	ERROR #0003 Tried to Saw, but the Saw motor is not running. (Input X17)	<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.
8	ERROR #0004 Tried to drill, but the Drill motors are not running. (X14)	<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.
9	ERROR #0005 'Saw Cut' Timeout. The lower 'Saw Down' proximity switch was not activated in the required time. Please check Sensor X16	<ul style="list-style-type: none"> Saw Down 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. 	<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 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

		<ul style="list-style-type: none"> Proximity switch failed. 	<p>input X16. Check all the connections for this input for an open circuit and replace cable if necessary.</p> <ul style="list-style-type: none"> If sensor indicator is off with the saw down and the cable & wiring check out, then proximity switch has failed. Replace the sensor.
10	<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.
11	<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.
12	<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. Cable or wiring problem. Proximity switch failed. 	<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. 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.

13	<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.
14	<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.
15	<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.
16	<p>MOTION ERROR (STALL) DURING PUSHER BAR RUN.</p>	<ul style="list-style-type: none"> • Bar stock or pusher arm are physically bound up. • The RazorGage speed is set too high. • The RazorGage accel and/or decel is set too high for the application. 	<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. • 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.

		<ul style="list-style-type: none"> 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 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.
17	<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 cable 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

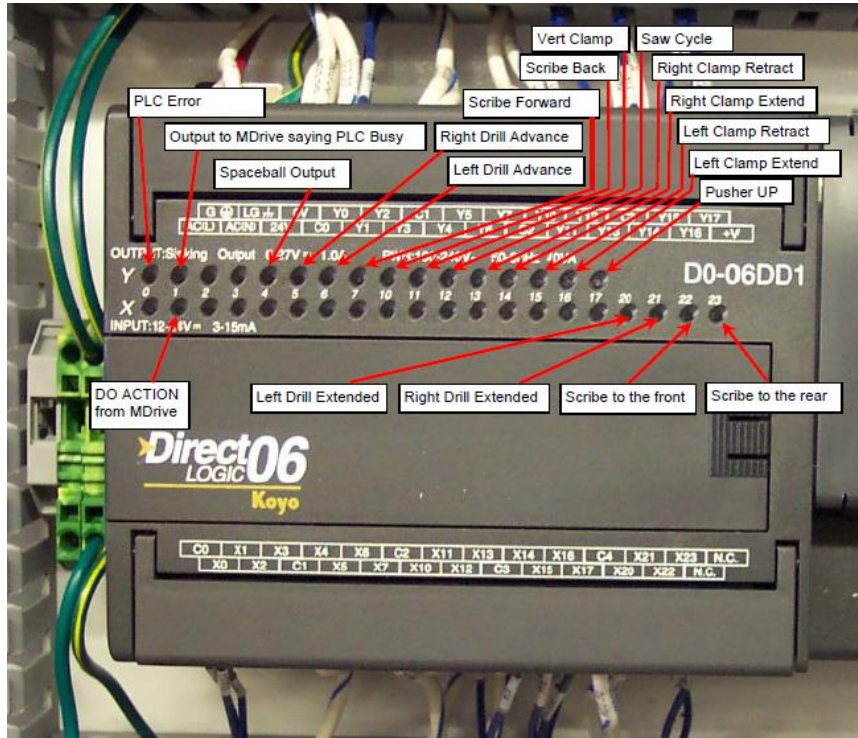


Figure #4



Figure #5

RAZORGAGE

POSITIONERS • SOFTWARE • SYSTEMS



Figure #6

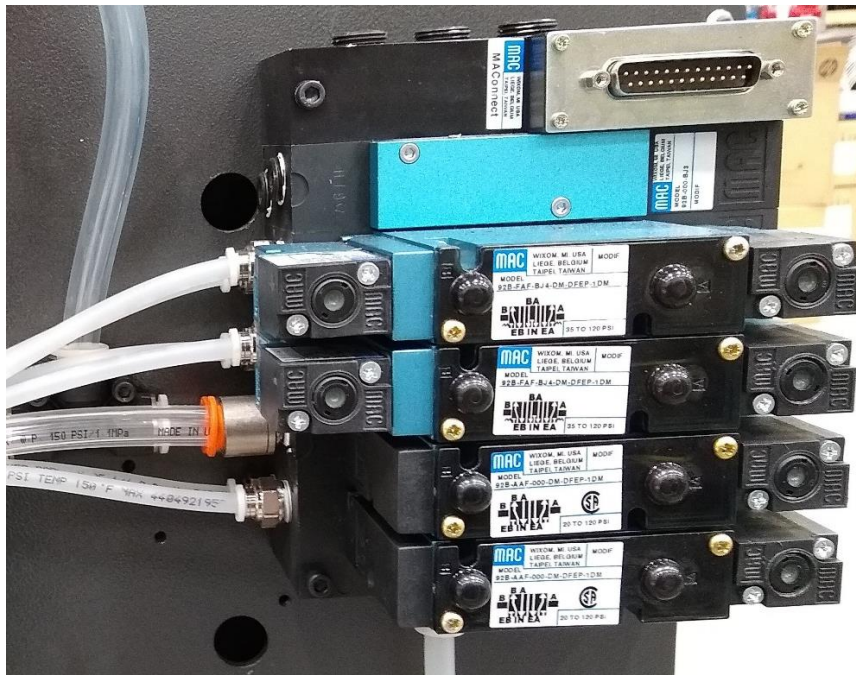


Figure #7

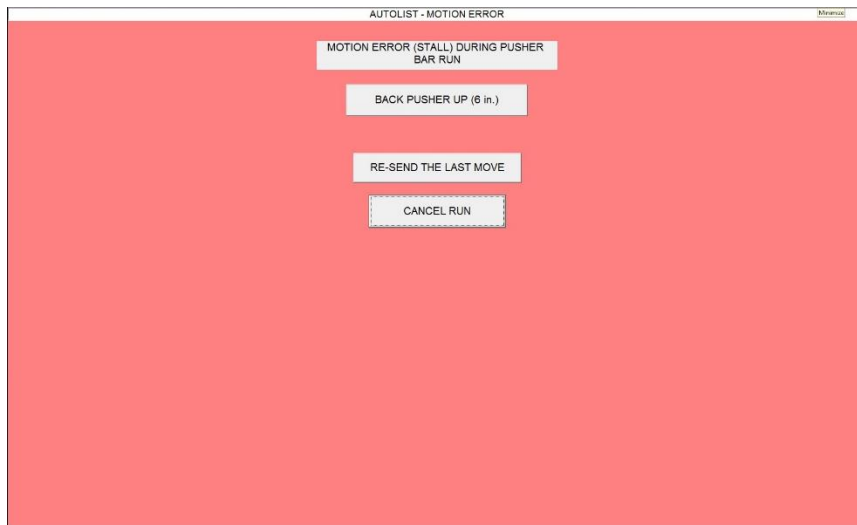
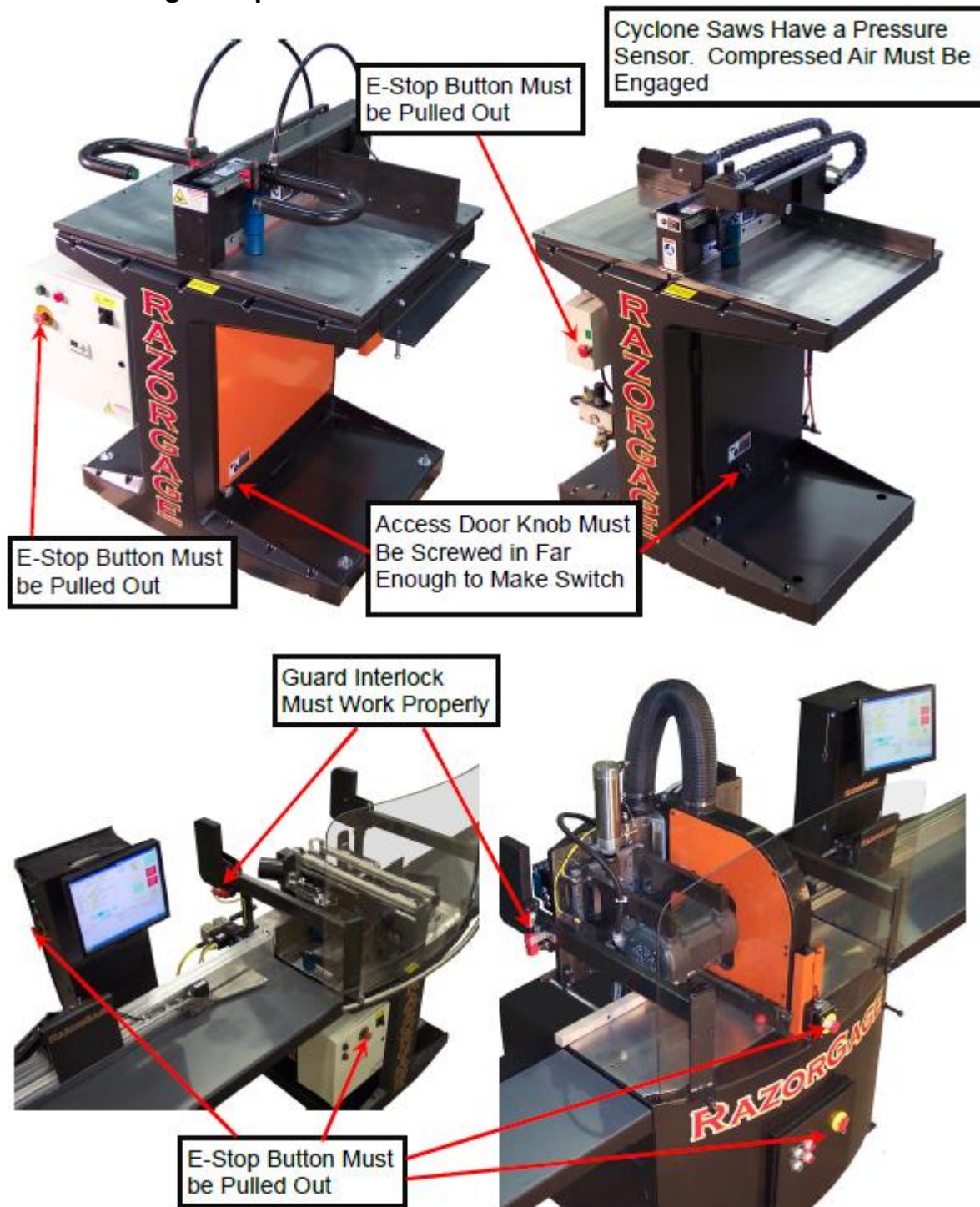


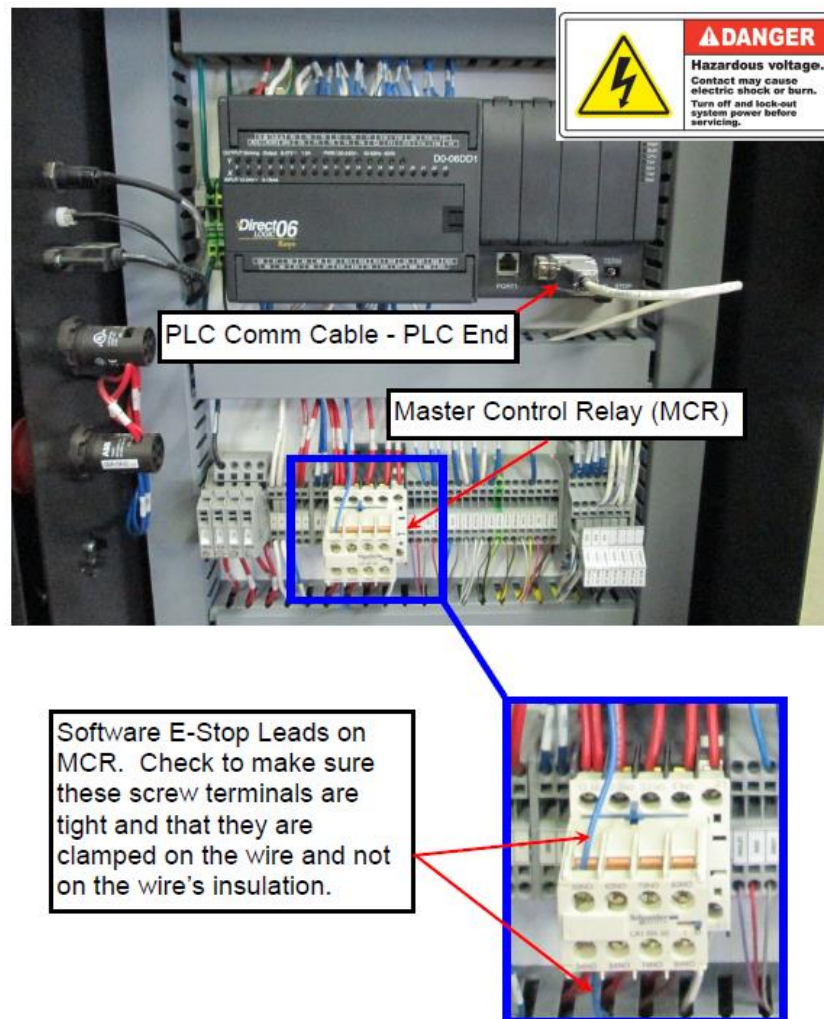
Figure #8

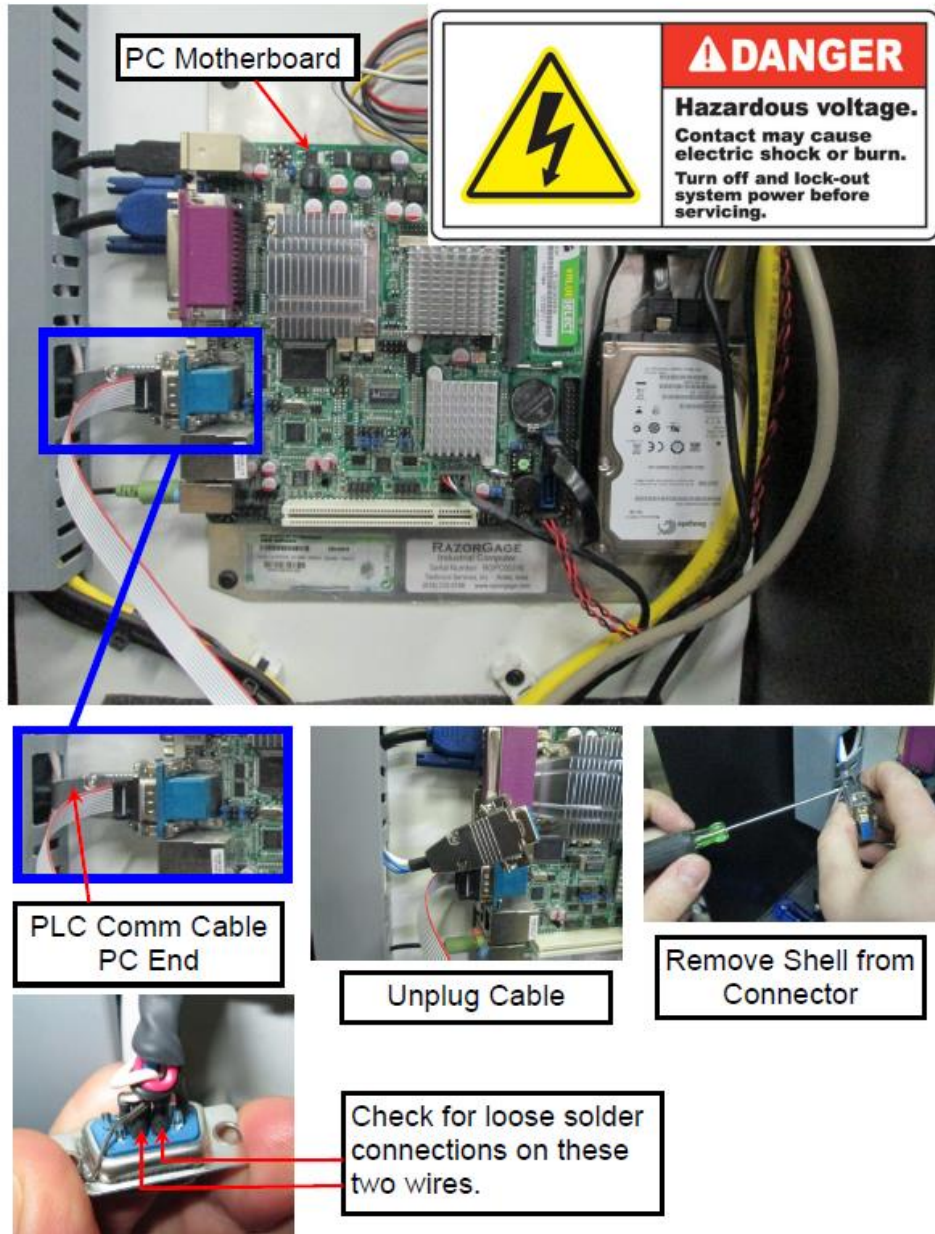
Troubleshooting E-Stop Faults



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.