

AUTOPUSHER SYSTEM



Table of Contents

General Safety Rules for Woodworking Machinery.....	4
Safety Rules for Cut Off Saw	6
Arrival Inspection	7
Installation	8
Leveling.....	9
Anchoring	9
Infeed/Outfeed Tables	10
Electrical Power Connection.....	10
Electrical Interface Connections	11
Air Supply Connection.....	12
Pneumatic Connections.....	12
Dust Collection.....	13
Setup Procedure	14
Saw Capacity.....	19
General Operation	20
Auto Pusher	21
Batch Parts.....	23
Autolist	25
Machine Adjustments.....	27
Lockout / Tagout Points	28
Saw Feed Flow Controls	28
Saw Stroke Distance.....	29
Saw Blade Speed.....	30
Horizontal Clamps Pressure Regulator	31
Horizontal Clamps Flow Controls	31
Vertical Clamp Pressure Regulator	32

Vertical Clamp Flow Controls	32
Vertical Clamp Stroke Distance	33
Guide Rollers.....	33
Back Fence	34
Squaring Back Fence to Saw Blade	35
Maintenance.....	37
Lubrication	37
Saw Blade Access	38
Changing Out Saw Blade	38
Replacement Parts List	39
Troubleshooting	40
Electrical Schematics	40
Pneumatic Schematics	44
Troubleshooting Guide.....	45
VFD Faults	49
Troubleshooting Reference Pictures.....	50
Troubleshooting E-Stop Faults.....	52

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 APS 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 assembly or attempt to operate saw without all components present and in undamaged condition.

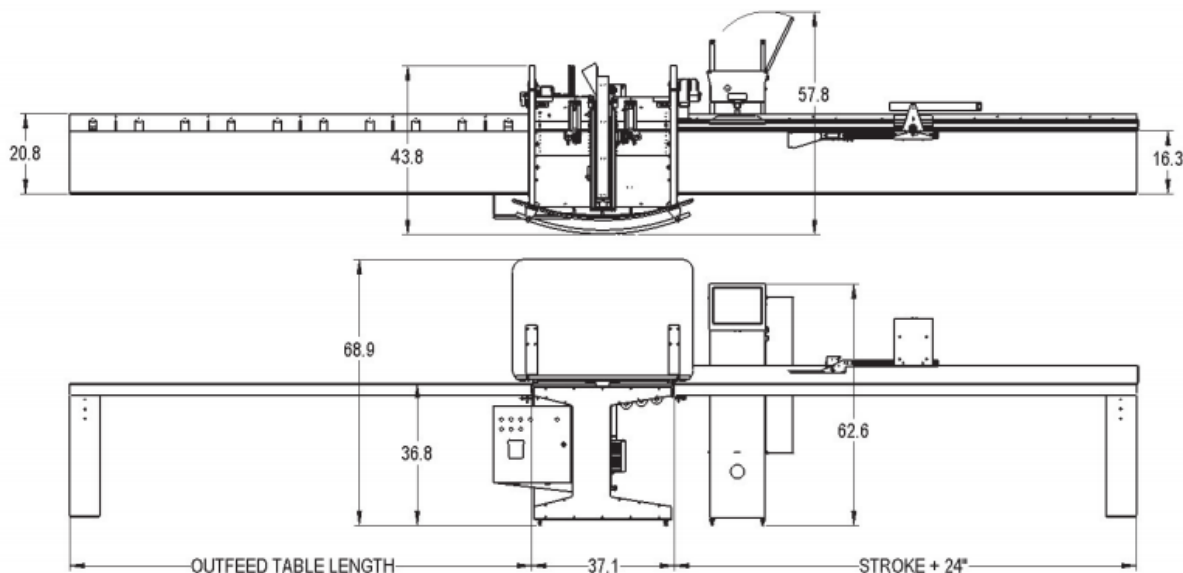
Installation



WARNING

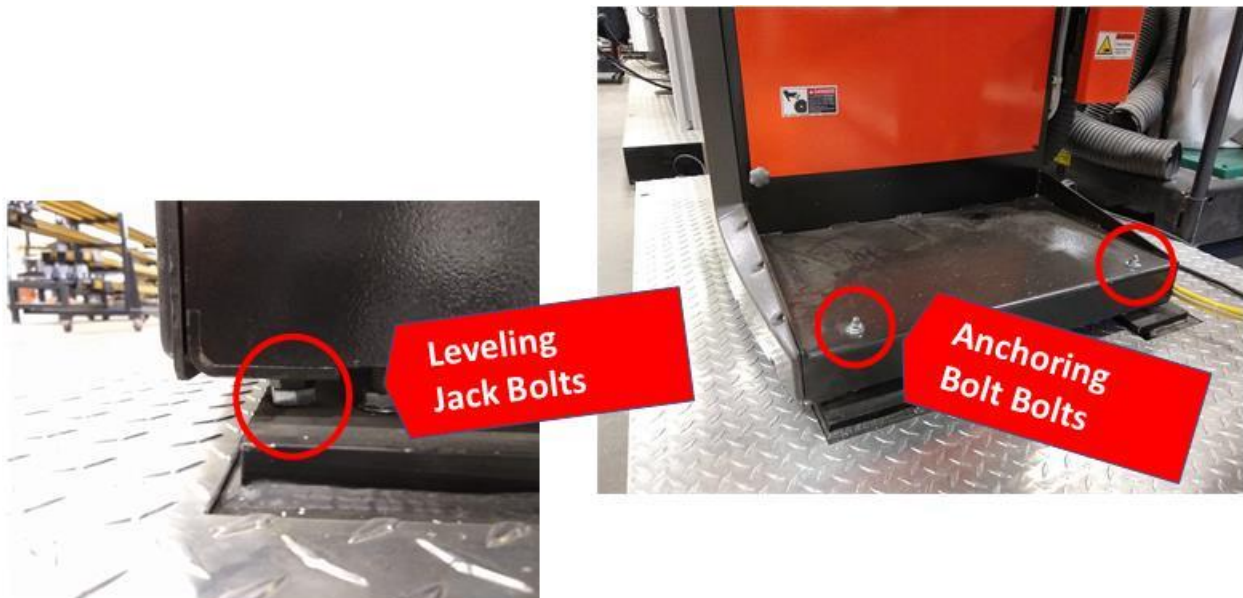
The operator must thoroughly read and understand this manual before operating the saw or starting any servicing. All safety and warning instructions should be followed. This manual must be available to all operators.

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. Turn 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.

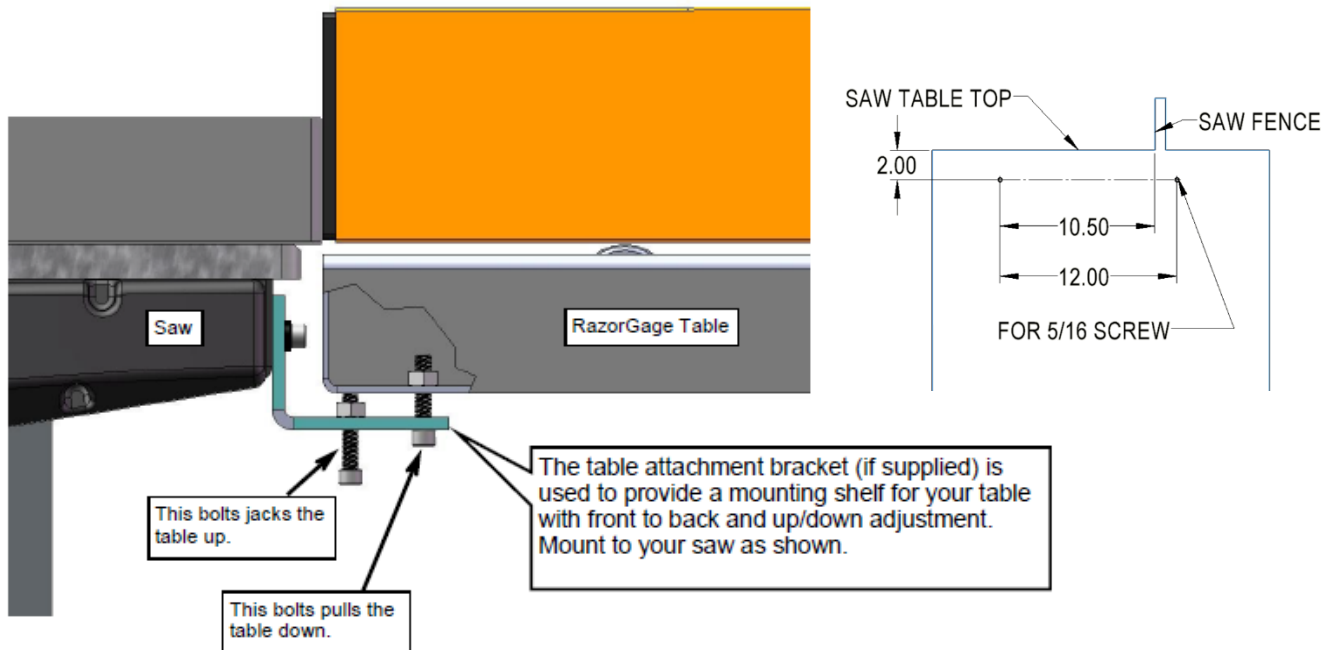


Anchoring


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.



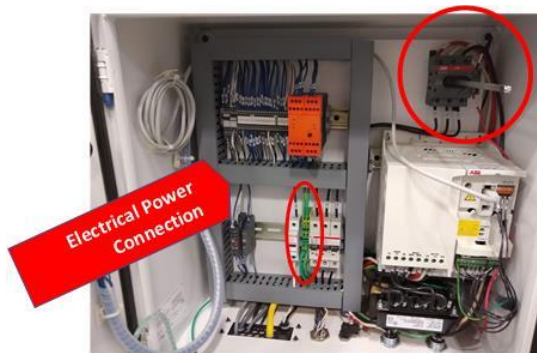
Electrical Power Connection



WARNING

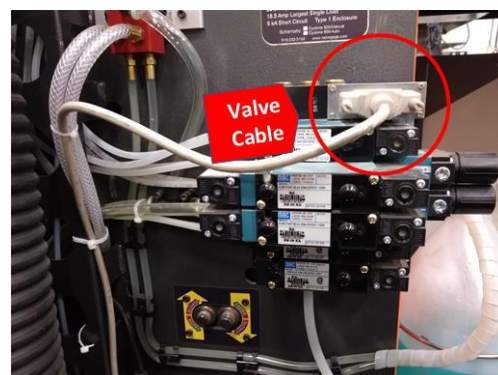
The operator must remove from and lock out all power sources to saw before servicing or connecting power.

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.



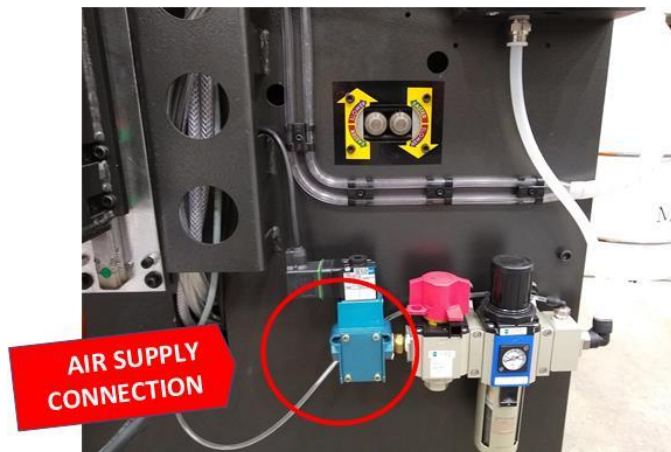
Electrical Interface Connections

The Auto Pusher System used a RazorGage automated positioner. To connect the RazorGage to the Cyclone saw an interface cable and valve 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 to 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.



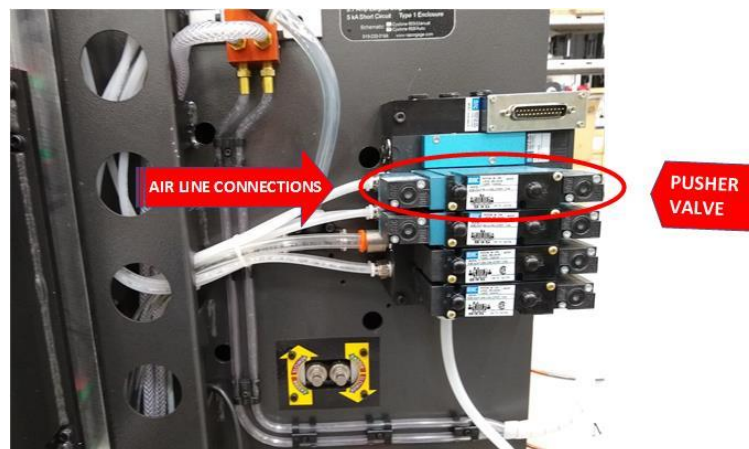
Air Supply Connection

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.



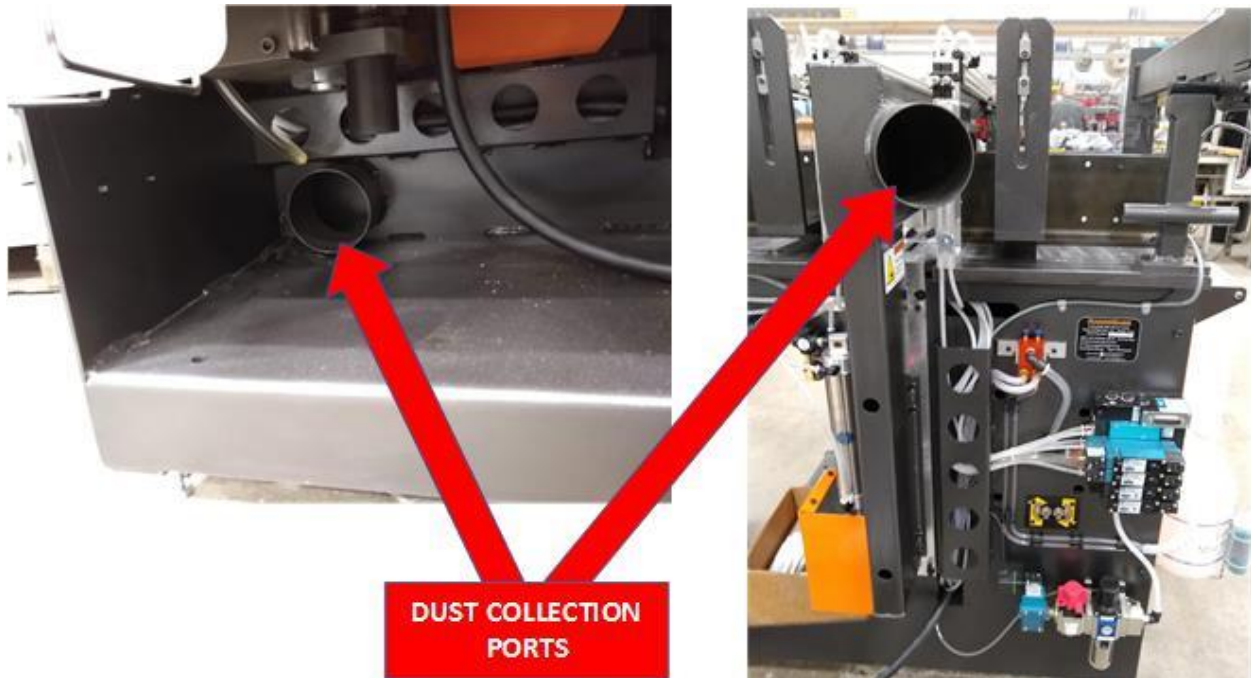
Pneumatic Connections

The Cyclone Upcut Saw has all the valves for the Auto Pusher 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 in 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

This section goes over how to set up the Cyclone Auto Pusher System. Although setup procedure is done prior to shipment of the machine, the parameters shown below are adjustable for calibration and changes in application. Do not change any parameters if you are unsure how it will affect your system.

NOTE: The MDrive is indexed and the scale factor is set at the factory. The RazorGage will need to be indexed and scaled if the MDrive is replaced or on long spliced extrusions. The scale factor may also need modified if the same length parts get incrementally smaller or larger than nominal length as the pusher advances. The home offset will need to be setup to reference the RazorGage to the interfaced saw or other equipment. It may also need adjusted if different length parts, small or large, are off of nominal length by the same amount.

1. Turn on control power to the RazorGage tower and start the PC or tablet. The first time the software boots up it will call for the RazorGage stroke length and serial number. Enter these values and press OK.
2. Next, it will prompt you to press OK to home to the RazorGage. Once pressed, homing will begin. On initial setup or if the MDrive stepper motor has been replaced, homing process will likely be interrupted with a message stating the motor will need to be indexed.
3. Index the MDrive. See diagram at the end of this section.
 - a. Press the NEXT button.
 - b. Locate stepper motor gearbox. Remove set screw access cap.
 - c. Press START PROCEDURE.
 - d. Push the RazorGage carriage to the hard stop. Press STEP 2.
 - e. Slowly move the carriage by hand away from the stop until the set screw in the gearbox can be seen. Loosen set screw with 4mm or 5/32" Allen wrench (not ball-end) then leave it in place. This holds the gearbox in position when the motor indexes. Press STEP 3.
 - f. Tighten the screw in the gearbox. Replace access hole plug. Press the OK button to close the completed program.
4. Home the RazorGage. Verify that the short backup move at the end of the homing sequence is more than 3/16" but less than 7/16". If not enter the SETUP SCREEN and press the RUN INDEX LOCATOR button. Repeat the index the MDrive instructions from step 2.
5. Set the Home Offset. The home offset is the distance from then end of the pusher arm to the center line of the saw. The calibration screen will help to accurately set this value. As part of the procedure a short piece of material will be cut and measured using calipers.
 - a. Enter in the 5239 for the password follow by the ENTER button.
 - b. Press CALIBRATE. The calibration screen will open and STEP 1 tab will guide through setting of the home offset.
 - c. Enter in a TARGET POSITION. Use a material length that can be accurately measured with calipers.
 - d. Press MOVE TO TARGET button and the RazorGage will move to target position.
 - e. Cut the Part. **Stay clear of the saw and clamps.** Start the saw if not running. Press the CYCLE SAW button to cut the part.
 - f. Accurately measure the cut part. Enter this value into PART MEASUREMENT box.
 - g. Press the SAVE TO HOME OFFSET AND EXIT button if RazorGage scale factor has already been calibrated or CONTINUE TO NEXT STEP to calibrate the RazorGage scale factor.

6. Calibrate the RazorGage scale factor. (See images at the end of this section). The scale factor is the number of the stepper pulses per revolution. The calibration screen will assist in accurately setting this value. As part of this step a long part will be cut and measured.
 - a. (If just completing the home offset go to step c). Press SETUP SCREEN button to open screen. Enter password of 5239 and press ENTER button.
 - b. Press CALIBRATE. The calibration screen will open and STEP 1 tab is for setting the home offset. STEP 2 guides through setting scale factor. Press USE THE CURRENT HOME OFFSET or CONTINUE NEXT STEP to get to STEP 2.
 - c. Enter in the 5239 for the password follow by the ENTER/OK button.
 - d. Enter in a TARGET POSITION. Use the length just 1-2 inches shorter than the longest stock material. The longer the length the more accurate the scale factor will be.
 - e. Press MOVE TO TARGET button and the RazorGage will move to target position.
 - f. Cut the Part. **Stay clear of the saw and clamps.** Start the saw if not running. Press the CYCLE SAW button to cut the part.
 - g. Use a tape measure as accurately as possible measure the cut part. Enter this value into PART MEASUREMENT box.
 - h. Press the DONE button to save the new scale factor and exit calibration.

7. Go to the SETUP SCREEN and set the User Parameters. See descriptions below for more information on these parameters. To change the parameters first enter 90210 as a password followed by the ENTER button. This will unlock the user parameters.
 - a. Speed – This is the velocity at which the RazorGage moves. The units are in/sec or mm/sec. Default value is 30 in/sec.
 - b. Accel. – The is the acceleration rate of the RazorGage during the move. The units are in/sec² or mm/sec². Default value is 90 in/sec².
 - c. Decel. – The is the deceleration rate of the RazorGage as movement comes to a stop. The units are in/sec² or mm/sec². Default value is 90 in/sec².
 - d. Run Current – This variable is the percentage of current (amperage) applied to the motor which determines the effective torque of the motor during the RazorGage movement. Default value is 100%.
 - e. Load Speed – The speed at which the RazorGage returns to the load position. Default is 30 in/sec.
 - f. First Move Speed – This is the RazorGage speed to the first cut position. The speed is purposely reduced to help keep material against the back fence until it engages the guide rollers and if a printer is used keeps stock material from damaging the printer as it is initially fed under the unit. Default is 10 in/sec.
 - g. Unload Dist. – The unload distance is used when RazorGage is used as a programmable stop (Main, Auto Calc, Presets, & Work Order). The unload distance is the incremental distance from the current RazorGage position away from the saw the positioner will move when the UNLOAD button is pressed. This allows for extra space to remove the finished parts. Default is 5 inches.
 - h. Load Offset – The load offset is used when the RazorGage is used as an automatic pusher (APS, Batch, & Autolist modes). This offset is added to the length of stock material to make the load position. This allows for additional room to load stock material on the RazorGage table without clamps and guide rollers interfering. Default is 5 inches.

-
- Board starts out this long.
- 11.000
- 0.125
- 4.000
- 6.875
- Cut board in two and measure the two parts made from that board.
- Subtract the lengths of the two parts from the length the board was to start with to get the KERF:
- $$11.000 - 4.000 - 6.875 = .125 = \text{KERF}$$

- [illegible]

Indexing the Mdrive

Main Screen Print Dimension

Current Position: **0.000**

Target Position:

Off Target ●

Absolute Mode

Incremental Mode

Offset = None

UNLOAD

7	8	9	-	SETUP SCREEN
4	5	6	+	AUTO CALC SCREEN
1	2	3	ENTER	AUTO PUSHER SCREEN
.	0	←	BackSpace	WORK ORDER SCREEN
1/32 0.03125	1/16 0.0625	3/32 0.09375	1/8 0.125	PRESETS SCREEN
5/32 0.15625	3/16 0.1875	7/32 0.21875	1/4 0.250	AUTOLIST SCREEN
9/32 0.28125	5/16 0.3125	11/32 0.34375	3/8 0.375	BATCH SCREEN
13/32 0.40625	7/16 0.4375	15/32 0.46875	1/2 0.500	
17/32 0.53125	9/16 0.5625	19/32 0.59375	5/8 0.625	
21/32 0.65625	11/16 0.6875	23/32 0.71875	3/4 0.750	
25/32 0.78125	13/16 0.8125	27/32 0.84375	7/8 0.875	
29/32 0.90625	15/16 0.9375	31/32 0.96875	CLEAR ALL	

OPENS SETUP SCREEN WHERE RAZORGAGE PARAMETERS ARE SET.

OPENS THE AUTOPUSHER SCREEN. THE AUTOPUSHER OPERATING MODE IS USED TO CREATE AND RUN CUT ROUTINES FOR SPECIFIC BARS LENGTHS.

WORK ORDER SCREEN, PRESETS SCREEN, AND AUTO CALC SCREEN UTILIZE THE RAZORGAGE BEING USED AS A STOP. THEY ARE NOT USED WITH THE CYCLONE APS.

OPENS THE AUTOLIST SCREEN. AUTOLIST IS USED TO SETUP, OPTIMIZE, AND RUN A CUTLIST CREATED FROM A COMPATIBLE DESIGN SOFTWARE PARTS LIST FILE.

OPENS THE BATCH PARTS SCREEN. THIS OPERATING MODE IS USED TO CUT BAR(S) INTO A DESIRED NUMBER OF SAME LENGTH PARTS.

RazorGage Main Screen

System Parameters		User Parameters		Setup Screen			
Stroke: 120.000		Speed: 30.000	Unload Dist: 5.000	7	8	9	RETURN
Scale: 3472.618		Accel: 90.000	Load Offset: 5.000	4	5	6	Help
Home Offset: 0.000		Decel: 90.000	Saw Kerf: 0.162	1	2	3	PC Software Manual
<input type="checkbox"/> Metric		Run Current: 100%	Clamp Offset: 2.000	.	0	←	ENTER
• Home Left		Load Speed: 30.000		Backspace			
• Home Right		First Move Speed: 10					
ST Extrusion <input type="checkbox"/>							
Move to Lower Limit		Move to Upper Limit		Run Index Locator		Calibrate	
Home The Positioner		Run Laser Routine		Run Break-In		Printer Setup	
				Software Options		Generate Event Log	
				Password: XXXXXX		Save Changes	

RazorGage Setup Screen

Calibration Screen

STEP 1

First thing to do is set the Home Offset. To do this, you will need to cut a short piece that you can measure with Calipers.

NOTE: If the Home Offset has already been set, press the "Use Current Home Offset" button to continue to the next step.

A) Enter a distance in the "Target Position" (For Example 6")

B) Press Move to Target

C) Cut the Part.

D) Measure the part and enter into the "Part Measurement" box.

Use The Current Home Offset

Target Position: 5

Move to Target

Cycle Saw

Part Measurement: 5.063

Save the Home Offset And Exit

Continue to Next Step (Calibrate the Scale Factor)

CALIBRATION SCREEN

STEP 1: Setup Home Offset.

STEP 2: Calibrate Scale Factor.

Calibration Screen

STEP 1

Second, we will need to cut and measure a long part. Note: The longer the part, the more accurate the scale factor will be.

A) Enter a distance in the "Target Position" (For Example 48")

B) Press Move to Target

C) Cut the Part.

D) Measure the part and enter into the "Part Measurement" box.

E) Press Done to Save and Exit.

Target Position: 96

Move to Target

Cycle Saw

Part Measurement: 95.813

Done

Razorgage Calibration Screen

Printer Setup

☒ Check Here to Enable Printing

SAVE **CANCEL**

Select Printer Type

NO PRINTER

PAPER LABEL PRINTER

INK JET PRINTER

INK JET PRINTER SETTINGS

Print Head Offset

Label Offset

Ink Jet Printer Port

INK JET

CALLOUTS:

- EXITS THE PRINTER SETUP SCREEN DISCARDING ANY CHANGES.
- SAVES CHANGES AND EXITS THE PRINTER SETUP SCREEN
- CHECK THIS BOX TO ENABLE PRINTING.
- SELECT PRINTER TYPE BEING USED EITHER PAPER LABEL PRINTER OR AN INK JET PRINTER.
- SETTINGS FOR THE INK JET PRINTER.
 - PRINT HEAD OFFSET - LOCATION OF THE PRINTER TO THE CENTERLINE OF SAW BLADE.
 - LABEL OFFSET - THE OFFSET DISTANCE FROM THE END OF THE BOARD TO WHERE THE LABEL IS PRINTED.
 - INK JET PRINTER PORT - THE SERIAL PORT NUMBER USE BY THE PRINTER.
- SETTINGS FOR THE PAPER LABEL PRINTER.
 - FONT SIZE - SIZE OF THE FONT USED.
 - LEFT MARGIN SPACES - SETS THE LEFT TO RIGHT LOCATION OF THE LABEL TEXT.
 - BLANK LINES FROM TOP - SETS THE TOP TO BOTTOM LOCATION OF THE LABEL TEXT.
- THE PRINT SETUP SCREEN IS ACCESS FROM MAIN SCREEN > SETUP SCREEN > PRINT SETUP SCREEN
- ADDITIONAL SETTINGS FOR THE EVOLUTION INK JET PRINTER OR TEST PRINT BUTTON FOR THE PAPER LABEL PRINTER

RazorGage Printer Setup Screen

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.



Turning the Saw OFF

The RazorGage software offers 3 different operating screens that utilizes the capabilities of the Cyclone Auto Pusher System. The type of application will dictate which of the modes Auto Pusher, Batch, or Autolist will work the best.

Auto Pusher

The Auto Pusher Screen is an operating mode where cut patterns can be defined to a bar of stock material of a desired length and saved to the hard drive as a CSV file. These saved files can then be opened as needed. To setup a bar file enter in the bar stock *OAL*, the *Load Pos*, and *Lead Trim* length in the *Bar Settings*. Then to add cuts to the bar locate the *Add New Cuts* settings to enter the quantity and length followed by the ENTER key. Repeat this until the bar is completely populated with desired cut lengths. The *Status* box will display the remaining length of the bar factoring in the lead trim, home offset, and current cuts. After the bar file has been setup, the part cut lengths making up the bar are displayed on the left side of the screen. When setup is complete the LOAD button is pressed and the APS will move to the load position. Once the stock material is loaded and the cycle initiated, the machine will continue to push the material and cut parts to the length setup for the active bar. It will continue until the all bar cuts are completed or the cycle is cancelled. The auto pusher mode allows cutting of multiple bar stock pieces simultaneously. As it cuts it will track this in the quantity of completed parts. Please note before running multiple bars of stock material make sure the saw has enough capacity and necessary saw adjustments (i.e. clamp pressures, clamp flows, saw cycle speed, etc.) have been made. Automatic ink jet or label printing is an option with Auto Pusher. More information on Auto Pusher Screen is shown below.

CURRENT BAR LAYOUT SHOWING THE TRIM CUT, ADDED CUT LENGTHS, AND HOME OFFSET.

IF LABEL PRINTING OPTION IS USED, PRESS THE SET LABELS BUTTON TO OPEN THE LABEL DESIGNER. SHOWN BELOW, IT HAS 4 FIELDS THAT CAN BE POPULATED. TO USE THE PART LENGTH IN A FIELD PRESS THE INSERT LENGTH BUTTON. PRESS DONE BUTTON TO SAVE CHANGES TO THE LABEL. EACH PART LABEL IS SETUP INDIVIDUALLY.

EXITES AUTO PUSHER SCREEN TO THE MAIN SCREEN.

DISCARD CURRENT BAR AND START NEW BAR. ANY UNSAVED CHANGES WILL BE LOST.

OPEN A EXISTING BAR FROM THE SAVED CSV FILE.

SAVE THE CURRENT BAR CONFIGURATION AS A CSV FILE TO BE USED LATER.

ACCEPTS NEW FIELD ENTRIES.

SELECT A BAR QUANTITY TO SIMULTANEOUSLY RUN. IF RUNNING STACKED BARS CHECK SAW ADJUSTMENT SETTINGS.

THE PART COUNTER TRACKS QUANTITIES OF THE ALL CUT PARTS LENGTHS MAKING UP THE BARS PROCESSED. ZERO BUTTON CLEARS THIS LIST.

TO ADD A NEW CUT TO THE ACTIVE BAR ENTER A QUANTITY AND A LENGTH FOLLOWED BY THE ENTER KEY. REPEAT UNTIL BAR IS POPULATED.

PRESS THE LOAD BUTTON TO RUN THE CURRENT BAR.

BAR SETTINGS
OAL – ENTER THE OVERALL LENGTH OF THE BAR STOCK MATERIAL.
LOAD POSITION – ENTER THE RAZORGAGE POSITION FOR LOADING THE BAR ONTO THE TABLE. THE VALUE NEEDS TO BE GREATER THAN OR EQUAL TO THE OAL.
LEAD TRIM – THE LENGTH OF MATERIAL THAT IS CUT OFF THE LEADING END OF THE BAR BEFORE CUTTING PARTS.

THE STATUS SHOW HOW MUCH BAR LENGTH REMAINS AFTER THE ADDED CUTS. IF THE USED BAR LENGTH IS GREATER THAN THE OAL OF THE BAR THIS NUMBER WILL BE A NEGATIVE AND AN ERROR MESSAGE POP UP. THE STATUS ALSO SHOWS THE SAW KERF LENGTH.

BAR OPTIONS
AUTO LOAD – SELECT TO MAKE THE RAZORGAGE AUTOMATICALLY SELECT THE SAME BAR AND MOVE TO LOAD POSITION AFTER A BAR IS COMPLETED.
PRINT LABELS – ACTIVATES PRINTING. USE THE SET LABEL TO DESIGN LABEL FIELDS. SEE RAZORGAGE SETUP FOR PRINTER SETTINGS.
DELETE SELECTED CUT – TO DELETE A SELECTED CUT, CLICK ON THE CUT LENGTH FIELD OF DESIRED PART AND CLICK THIS BUTTON.

File Name: C:\Culists\ap_1212.csv

Label Designer

Auto Pusher Setup Screen

Auto Pusher Setup Screen

RAZORGAGE

POSITIONERS • SOFTWARE • SYSTEMS



Auto Pusher Runtime Screen

Batch Parts

The Batch Parts Screen is designed for application that demand cutting a select quantity of the same size parts. With batch mode user can setup parts of varying part numbers, lengths, and/or material type. The created parts are saved as a text file (default path C:\Batch Parts\[part#].txt). After the part files have been created, they are added to a parts list to be selected from. Stock material overall length is entered along with a desired quantity. The APS will be moved to the load position. Once the stock material is loaded and cycle is initiated the machine will continue to push the material and cut parts to the same length. This will continue stopping only when the next stock material needs loaded, desired part quantity was reached, or the cycle is cancelled. The batch mode will allow cutting of multiple, stacked bar stock pieces as once. As it cuts it will track this in the quantity of completed parts. Before running stacked bars make sure the saw has enough capacity and necessary saw adjustments (i.e. clamp strokes, clamp pressures, clamp flows, saw cycle speed, etc.) have been made. More information on Batch Parts Screen is shown below.

Since the Batch Screen is used for push feeding, a load position must be determined based on stock length. When a new piece of stock is to be introduced to the machine its length is indicated and the software instructs the RazorGage pusher to move out to a position suitable for the part to be loaded. Typically the value of this position must be greater than the stock length to ease the loading of the stock. To accommodate this condition the software adds the LOAD parameter to the stock length when calculating the load position. For example if the stock length is 10 feet and the LOAD parameter is set to 12 inches then the RazorGage will calculate the load position by adding 12 inches to the stock length for a position of 11 feet. To set the LOAD parameter follow the instructions below.



RazorGage Setup Screen

To add a part/material configuration click CREATE NEW PART.

Batch Parts Screen

Part Number (Filename):

Trim Cut: .500 Change

Desired Quantity: 0 Change

Cut Length: 5 + -

Material Type:

of Stock Pieces Loaded: 0 Change

Completed Parts: 0 Save

USE A NEW STOCK LENGTH

USE LAST STOCK LENGTH (96)

RUN RESUME PAUSE CANCEL

Enter a name for the part / material configuration, the length of the parts you want to cut, and the material designation that will tell the operator what kind of stock to use. Then press Save.

Batch Part Entry Screen

Part Number (Filename): test1

Cut Length: 24.375

Material Type: AL6064T-534

NUMERIC KEYPAD: 1-9, 0, ., /, %, *, ^, &, Ü, Ý, Þ, ß, à, á, â, ã, ä, å, æ, ç, è, é, ê, ë, ì, í, î, ï, ð, ñ, ò, ó, ô, õ, ö, ÷, ø, ù, ú, û, ü, ý, þ, ÿ, BACKSPACE

Save Cancel

Once you have entered your part lengths and material types they will appear in the white box at the left of the Batch Parts Screen. Choose a part to bring up that part's information as shown below.

Enter the leading edge trim cut length here. This is a global variable that will stay constant regardless of which part you choose. It may be changed at any time by pressing the CHANGE button.

Press the + or - button to change the number of stock pieces you are going to push. This will enable the software to keep a count of how many finished pieces you've cut.

Enter the desired quantity for the current run here by pressing the CHANGE button.

Batch Parts Screen

Part Number (Filename): test1

Trim Cut: .500 Change

Desired Quantity: 0 Change

Cut Length: 24.375

Material Type: AL6064T-534

of Stock Pieces Loaded: 5 + -

Completed Parts: 0 Change

USE A NEW STOCK LENGTH

USE LAST STOCK LENGTH (96)

RUN RESUME PAUSE CANCEL

Press the USE A NEW STOCK LENGTH to tell the RazorGage how long of a piece you will be introducing to the machine.

Press the USE LAST STOCK LENGTH to tell the machine that you will be feeding the same size stock that you had previously entered.

Batch Parts Setup Screen

PUSHER MODE - RUNNING A BAR

BATCH MODE

Load 2 Stock Pieces

22 Parts Completed.

Running a Bar

Save Done Move to Next

CANCEL RUN

Bar Stock Diagram: 1 2 3 4 5 6 7 8 9

Loading Trim End Trim or Home Offset

THE CONTROL BUTTONS FOR RUNNING A BAR

LOAD OUT - THIS INDICATOR DISPLAYS WHEN THE RAZORGAGE IS MOVING TO LOAD POSITION.

GO - AFTER LOADING THE NUMBER OF BAR STOCK PIECES INDICATED IN THE UPPER LEFT CORNER, PRESS THIS BUTTON TO START THE MACHINE CYCLE PROCESSING THE BAR WITH THE CUTS IN THE FILE.

CANCEL RUN - THIS BUTTON WILL ABORT THE CYCLE EXITING TO THE SETUP SCREEN.

THE BAR STOCK DIAGRAM SHOW THE PARTS THAT WILL BE CUT OUT OF THE BAR STOCK. THE RED LINE ON LEFT IS THE LEADING TRIM AND ON THE RIGHT IS THE HOME OFFSET OR END TRIM. THE GAPS BETWEEN THE PARTS SHOW THE SAW KERF. THE STATUS OF THE CYCLE IS DISPLAYED BY YELLOW AND RED DOTS. THE YELLOW INDICATES THE POSITION OF THE RAZORGAGE PUSHER AND THE RED DOTS SHOW THE COMPLETED CUTS.

Batch Parts Runtime Screen

Autolist

The Autolist software includes an optional operating mode for the APS and requires a software license to use. Autolist is useful when an operation is using design software to determine a list of part sizes used in making their products. After running this design software parts file through the Parts List Processor, the RazorGage parts list file created can be utilized by the Autolist software. Autolist takes this parts list file and sorts it by first material, then width, then thickness, and lastly by length longest to shortest. This is the default sorting arrangement for the part groups but can be easily modified to better fit an application. After a parts list file is open in Autolist, a sorted group of parts, or cutlist, is selected. Stock material length is entered and load out is requested. The run screen comes up and the APS moves to the load position. The bar(s) of stock material are loaded on the table in front of the pusher. Based on the length of the stock material and the cutlist, Autolist will optimize cuts using the entire list of remaining parts in the cutlist to efficiently populate the stock material cuts to maximize yield and minimize the amount of scrap produced. Once stock material is loaded and cycle is initiated the machine will start pushing the stock material into position and cut parts from the cutlist. As parts are cut the software keeps track of the quantity left. When all quantities of a part size are completed it is crossed out. The Cyclone APS will continue feeding and cutting parts until the next piece of stock material needs loaded, the cutlist is completed, or the cycle is cancelled. Below describes the printer setup, parts list file, and runtime screens for Autolist.

Autolist Label Setup

NOTE: The type of printer can be selected by going into the Main > Setup Screen.

☒ Check Here to Enable Printing

SAVE **CANCEL**

Printed Fields:

	FIELD 1	FIELD 2	FIELD 3
LINE 1	ROOM NUM	THICKNESS	MATERIAL
LINE 2	CABINET NUM	WIDTH	LENGTH

VIRTUAL LABEL FONT SIZE 10

☒ Print Dimensions (Length, Width, Thickness) as fractions

Callouts:

- CANCEL**: CANCELS ANY CHANGES AND RETURNS TO THE AUTOLIST CONFIG SCREEN.
- SAVE**: SAVES CHANGES TO THE LABEL SETUP AND RETURNS TO THE AUTOLIST CONFIG SCREEN.
- Check Here to Enable Printing**: CHECK TO ENABLE PRINTING. GOTO MAIN>SETUP SCREEN>PRINTER SETUP TO SELECT TYPE OF PRINTER USED.
- Printed Fields**: USE THE DROP-DOWN LISTS TO POPULATE THE AS MANY OF THE PRINT FIELDS AS NEEDED. ALL FIELDS OF THE AUTOLIST CUTLIST ALONG WITH THE DATE&TIME ARE AVAILABLE FOR PRINT FIELDS.
- VIRTUAL LABEL FONT SIZE**: SELECT THE FONT SIZE FOR THE LABEL.
- Print Dimensions**: CHECK TO PRINT ANY DIMENSIONS USED IN LABEL AS A FRACTION INSTEAD OF A DECIMAL.

Autolist Label Setup Screen

RAZORGAGE

POSITIONERS • SOFTWARE • SYSTEMS

QTY +/- BUTTONS ARE USED TO CHANGE THE QUANTITY OF A SELECTED PART IN THE CUTLIST GROUP.

EDIT QTY BUTTON IS USED TO CHANGE QUANTITIES OF ALL THE PARTS IN THE CUTLIST GROUP.

THE OFFSET BUTTON OPENS A SCREEN WHERE A LIST OF PREVIOUSLY SETUP OFFSETS CAN BE SELECT FROM.

THE TWO LOAD BUTTONS SETS THE BAR LENGTH AND RUNS THE CURRENT CUTLIST GROUP. LEFT BUTTON SETS A NEW BAR LENGTH AND THE RIGHT BUTTON USES PREVIOUS BAR LENGTH SHOWN ON BUTTON.

OPEN/CLOSE FILE IS USED TO OPEN OR CLOSE AN AUTOLIST PARTS LIST FILE.

TO SELECT THE CUTLIST GROUP USE THE NEXT OR PREV GROUP BUTTON TO CYCLE THROUGH ALL THE PART GROUPINGS OR THE GROUPING LIST TO VIEW ALL THE PART GROUPING AT ONCE TO SELECT THE CUTLIST GROUP.

EXITS AUTO PUSHER SCREEN TO THE MAIN SCREEN.

OPENS THE EMBEDDED PARTS LIST PROCESSOR APPLICATION TO CREATE A PARTS LIST FILE.

OPEN THE SETTING SCREEN FOR AUTOLIST SOFTWARE.

SELECTS THE WAY THE RAZORGAGE IS USED PUSHER OR STOP. FOR A CYCLONE APS USE PUSHER MODE.

THE CURRENT CUTLIST GROUP STATUS IS SHOWN HERE. AS THE PARTS ARE CUT THE QUANTITIES ARE TRACKED AND WHEN PARTS ARE COMPLETED THEY ARE CROSSED OFF OF THE CUTLIST. AT THE TOP A TOTAL QUANTITY OF ALL PART IS LISTED ALONG WITH THE PART GROUPING NUMBER. USE THE PAGE UP AND DOWN KEYS TO SCROLL THROUGH CUTLIST.

Autolist Cutlist Setup Screen

PUSHER MODE - RUNNING A BAR

#	DONE	PART	WIDTH	MATERIAL	THICKNESS	LENGTH	ROOM NAME	ROOM NUM	CABINET NAME	CABINET NUM	MANUAL SCRIBE
1	NO	Middle Stile	1.5	Solid Wood	0.8125	5.5	Room 1	1	1 Top Cabinet (Stove)	6 1/1	
2	NO	Middle Stile	1.5	Solid Wood	0.8125	5.5	Room 1	1	1 Top Cabinet (Stove)	6 1/1	
3	NO	Middle Rail	1.5	Solid Wood	0.8125	5.5	Room 1	1	1 Base 4 Drawer	5 1/1	
4	NO	Middle Stile	1.5	Solid Wood	0.8125	5.625	Room 1	1	1 Base 4 Drawer	5 1/1	
5	NO	Middle Stile	1.5	Solid Wood	0.8125	5.625	Room 1	1	1 Base 4 Drawer	5 1/1	
6	NO	Right Stile	1.5	Solid Wood	0.8125	6.625	Room 1	1	1 Top Cabinet (Stove)	6 1/1	
7	NO	Left Stile	1.5	Solid Wood	0.8125	6.625	Room 1	1	1 Top Cabinet (Stove)	6 1/1	
8	NO	Middle Rail	1.5	Solid Wood	0.8125	6.75	Room 1	1	1 Base 4 Drawer	5 1/1	
9	NO	Middle Rail	1.5	Solid Wood	0.8125	6.75	Room 1	1	1 Base 4 Drawer	5 1/1	
10	NO	Middle Rail	1.5	Solid Wood	0.8125	6.75	Room 1	1	1 Base 4 Drawer	5 1/1	
11	NO	Middle Rail	1.5	Solid Wood	0.8125	6.75	Room 1	1	1 Base 4 Drawer	5 1/1	
12	NO	Left Exp St							1 Top Cabinet (Stove)	6 1/1	
13	NO	Right Stile							1 Base 4 Drawer	5 2/2	
14	NO	Left Stile	1.5	Solid Wood	0.8125	9.5	Room 1	1	1 Base 4 Drawer	5 2/2	
15	NO	Top Rail	1.5	Solid Wood	0.8125	10.25	Room 1	1	1 Base 4 Drawer	5 2/2	
16	NO	Bottom Rail	1.5	Solid Wood	0.8125	10.25	Room 1	1	1 Top Cabinet (Stove)	6 1/1	
17	NO	Bottom Rail	1.5	Solid Wood	0.8125	10.25	Room 1	1	1 Top Cabinet (Stove)	6 1/1	
18	NO	Bottom Rail	1.5	Solid Wood	0.8125	10.25	Room 1	1	1 Base 4 Drawer	6 2/2	

THE CONTROL BUTTONS FOR RUNNING A BAR

LOAD OUT – THIS INDICATOR DISPLAYS WHEN THE RAZORGAGE IS MOVING TO LOAD POSITION.

GO – AFTER LOADING THE NUMBER OF BAR STOCK PIECES INDICATED IN THE UPPER LEFT CORNER, PRESS THIS BUTTON TO START THE MACHINE CYCLE PROCESSING THE BAR WITH THE CUTS IN THE FILE.

CANCEL RUN – THIS BUTTON WILL ABORT THE CYCLE EXITING TO THE SETUP SCREEN.

THE CURRENT CUTLIST GROUP STATUS IS SHOWN HERE. AS THE PARTS ARE CUT THE QUANTITIES ARE TRACKED AND WHEN PARTS ARE COMPLETED THEY ARE CROSSED OFF OF THE CUTLIST.

THE BAR STOCK DIAGRAM SHOW THE PARTS THAT WILL BE CUT OUT OF THE BAR STOCK. THE RED LINE ON LEFT IS THE LEADING TRIM AND ON THE RIGHT IS THE HOME OFFSET OR END TRIM. THE GAPS BETWEEN THE PARTS SHOW THE SAW KERF. THE STATUS OF THE CYCLE IS DISPLAYED BY YELLOW AND RED DOTS. THE YELLOW INDICATES THE POSITION OF THE RAZORGAGE PUSHER AND THE RED DOTS SHOW THE COMPLETED CUTS.

Autolist Runtime Screen

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.

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.

Lockout/Tagout 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 air flow is restricted which decreases speed or turning counterclockwise air flow is opened which increases speed. **Use precaution when making adjustments to saw feed rate. Changes to saw blade feed rate can affect cut quality.**

To test saw, go to SETUP SCREEN from the MAIN SCREEN and enter 5239 for the password followed by ENTER. Select CALIBRATE button and the calibrate screen will open. To move the pusher out of the way, press MOVE TO HIGH LIMIT. Now place a test piece of board under the top clamp and against the fence. Check to make sure everyone is clear and press CYCLE SAW. The pusher won't move because it's already in position but the saw will cycle. Check the saw feed rate during the cycle and adjust flow controls to change advance and/or retract speed as needed.



STEP 1		STEP 2	
First thing to do is set the Home Offset. To do this, you will need to cut a short piece that you can measure with Calipers.			
NOTE: If the Home Offset has already been set, press the "Use Current Home Offset" button to continue to the next step.		<input type="button" value="Use The Current Home Offset"/>	
A) Enter a distance in the 'Target Position' (For Example: 6")		<input type="text" value="Target Position"/>	
B) Press 'Move to Target'		<input type="button" value="Move to Target"/>	
C) Cut The Part.		<input type="button" value="Cycle Saw"/>	
D) Measure the part and enter into the 'Part Measurement' box.		<input type="text" value="Part Measurement"/>	
<input type="button" value="Save the Home Offset And Exit."/>		<input type="button" value="Continue to Next Step (Calibrate the Scale Factor)"/>	

Calibration Screen			
Current Pos: 0.000		OFF Target ●	
<input type="button" value="7"/>	<input type="button" value="8"/>	<input type="button" value="9"/>	
<input type="button" value="4"/>	<input type="button" value="5"/>	<input type="button" value="6"/>	
<input type="button" value="1"/>	<input type="button" value="2"/>	<input type="button" value="3"/>	
<input type="button" value="."/>	<input type="button" value="0"/>	<input type="button" value="←"/>	
<input type="button" value="Move to Low Limit (1)"/>		<input type="button" value="Move to High Limit (49)"/>	
<input type="button" value="Cancel and Return To Main"/>			

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.



⚠ DANGER

Crush hazard.
Keep hands clear.
Follow lock-out
procedures
before servicing

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

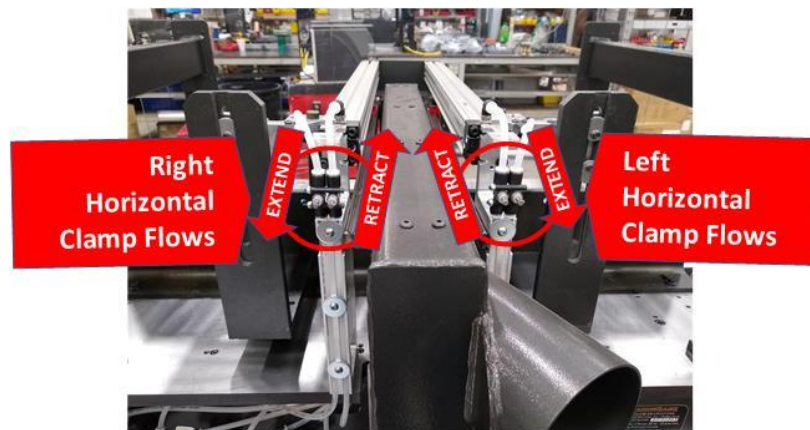
The pressure of the horizontal clamps is adjustable to allow clamping of material of varying rigidity. To adjust the horizontal clamps pressure, locate the horizontal clamps pressure regulators located under the right side of the saw table. Pull out on the adjustment knob to unlock it. Turn clockwise 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 decreasing speed and counter-clockwise will open air flow increasing speed of the clamps. Tighten the jam nut when adjustment is completed.

To test horizontal clamps, go to SETUP SCREEN from the MAIN SCREEN and enter 5239 for the password followed by ENTER. Select CALIBRATE button and the calibrate screen will open. To move the pusher out of the way, press MOVE TO HIGH LIMIT. Now place a test piece of board under the top clamp and against the fence. Check to make sure everyone is clear and press CYCLE SAW. The pusher won't move because it's already in position but the saw will cycle. 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.

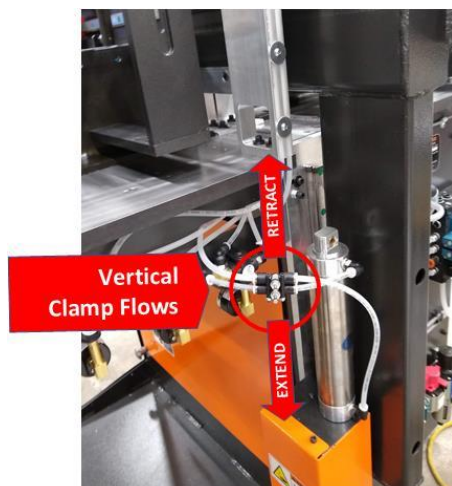
To test vertical clamp, go to SETUP SCREEN from the MAIN SCREEN and enter 5239 for the password followed by ENTER. Select CALIBRATE button and the calibrate screen will open. To move the pusher out of the way, press MOVE TO HIGH LIMIT. Now place a test piece of board under the top clamp and against the fence. Check to make sure everyone is clear and press CYCLE SAW. The pusher won't move because it's already in position but the saw will cycle. Check the vertical clamp force during the saw cycle and adjust the pressure regulator 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 restricts the air flow decreasing speed and turning counterclockwise opens the air flow increasing speed of the clamp.

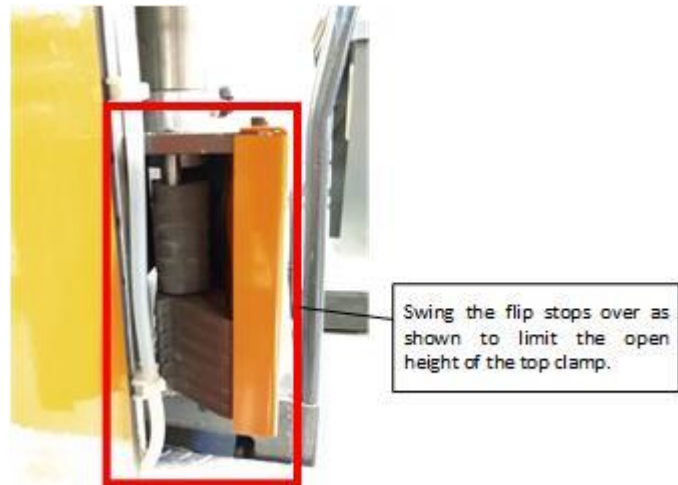
To test vertical clamp, go to SETUP SCREEN from the MAIN SCREEN and enter 5239 for the password followed by ENTER. Select CALIBRATE button and the calibrate screen will open. To move the pusher out of the way, press MOVE TO HIGH LIMIT. Now place a test piece of board under the top clamp and against the fence. Check to make sure everyone is clear and press CYCLE SAW. The pusher won't move because it's already in position but the saw will cycle. Check the vertical clamp speed during cycle and ensure that the vertical clamps are clamping before the saw enters the material. Adjust flow controls to change advance and retract speed as needed.



Calibration Screen																		
STEP 1		STEP 2																
First thing to do is set the Home Offset. To do this, you will need to cut a short piece that you can measure with Calipers. NOTE: If the Home Offset has already been set, press the "Use Current Home Offset" button to continue to the next step.																		
A) Enter a distance in the 'Target Position' (For Example: 6")		<input type="text"/>																
B) Press 'Move to Target'		<input type="button" value="Move to Target"/>																
C) Cut The Part.		<input type="button" value="Cycle Saw"/>																
D) Measure the part and enter into the 'Part Measurement' box.		<input type="text"/>																
<input type="button" value="Save the Home Offset And Exit."/>		<input type="button" value="Continue to Next Step (Calibrate the Scale Factor)"/>																
		Current Pos: 0.000 OFF Target ●																
		<table border="1"> <tr> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>.</td> <td>0</td> <td>←</td> </tr> <tr> <td colspan="3">Backspace</td> </tr> </table>		7	8	9	4	5	6	1	2	3	.	0	←	Backspace		
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Cancel and Return To Main																		

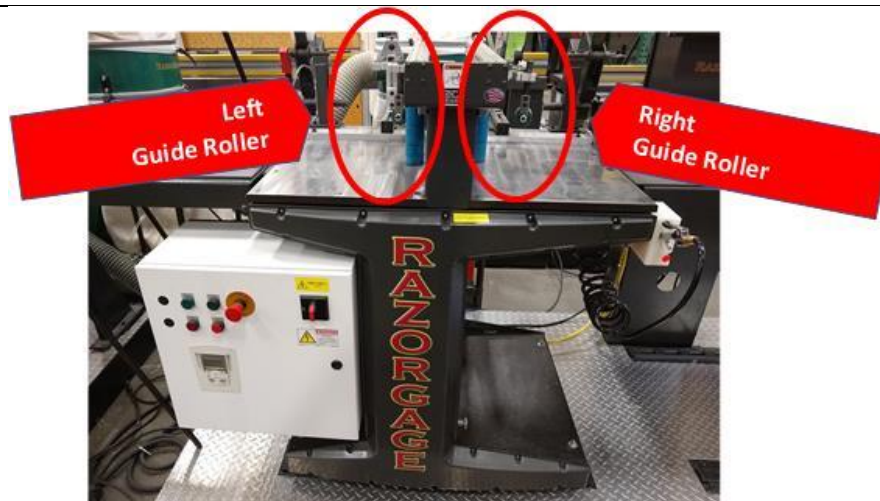
Vertical Clamp Stroke Distance

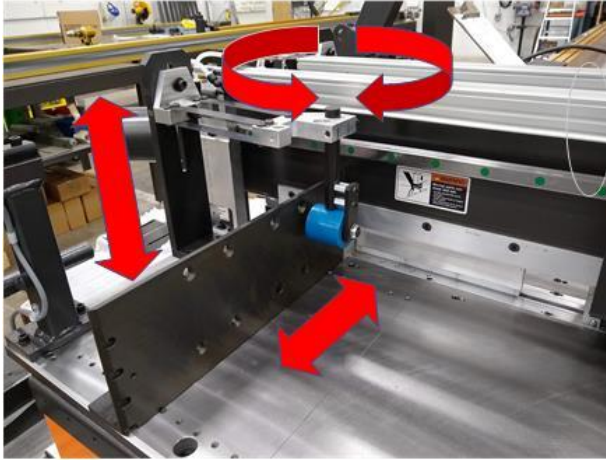
The cylinder stroke of the vertical clamp is adjustable to allow material of varying thickness to pass under the clamp. This adjustment may be necessary when material thickness changes. To adjust the vertical clamp, **turn off are pressure and use lockout / tagout procedure.** Then locate the vertical 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

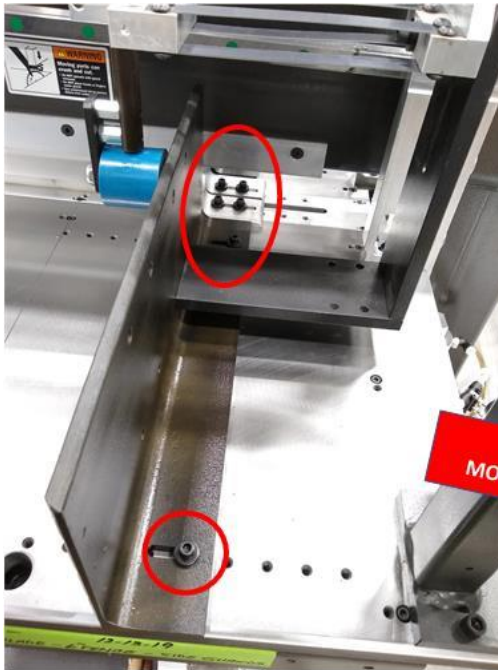
The Cyclone RazorOptimal is equipped with guide rollers to support the material as it is being feed through the saw. The guide rollers apply downward pressure to the material. The rollers are slightly angled toward the back fence to keep the material close to the fence while being advanced. If a printer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





Back Fence

The back fence on the Cyclone saw is set to the size of the saw blade and also is squared to the saw blade from the factory. If adjustment is necessary (i.e. changes in material width or size of saw blade) move the back fence to position the material on the saw blade. To optimize cut quality adjust the fence so the material is positioned toward the rear of the saw. 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

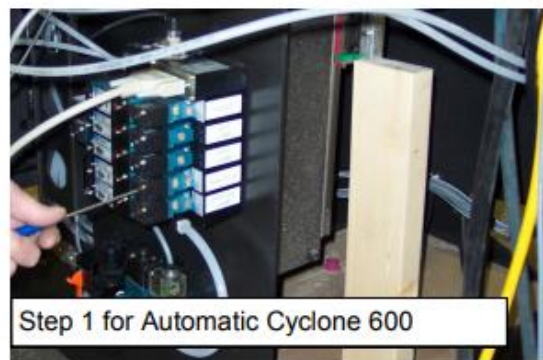


DANGER

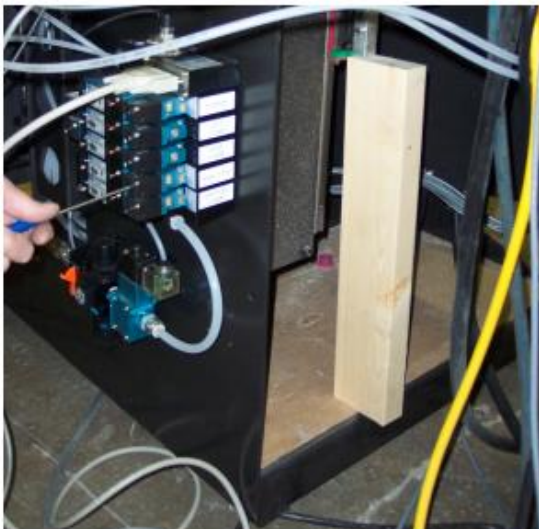
The operator must ensure that no person will be in harms way before performing any of the following steps.

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 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.



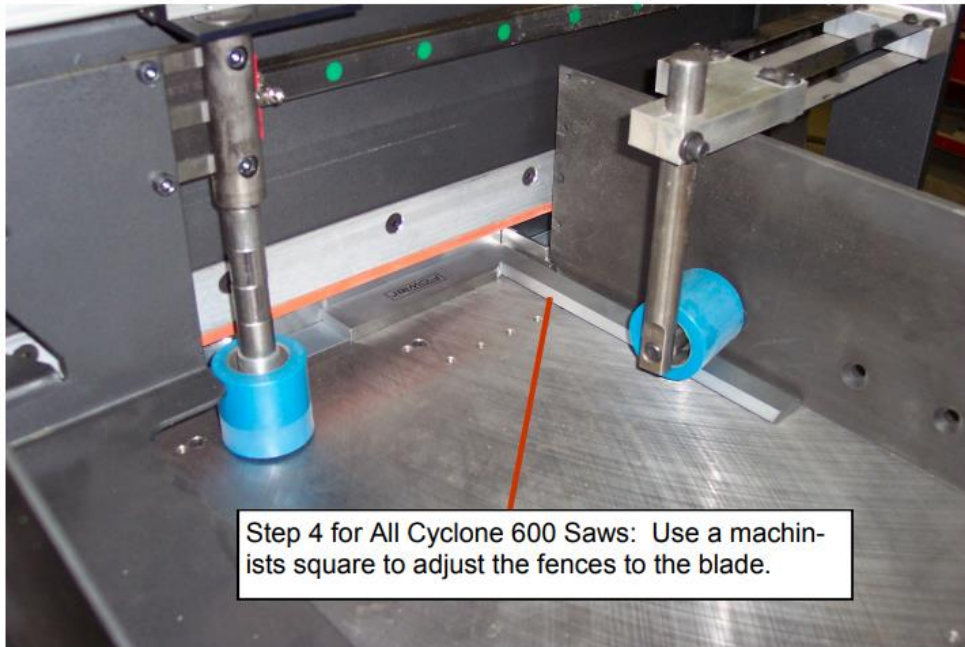
DANGER

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



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.

11



Maintenance



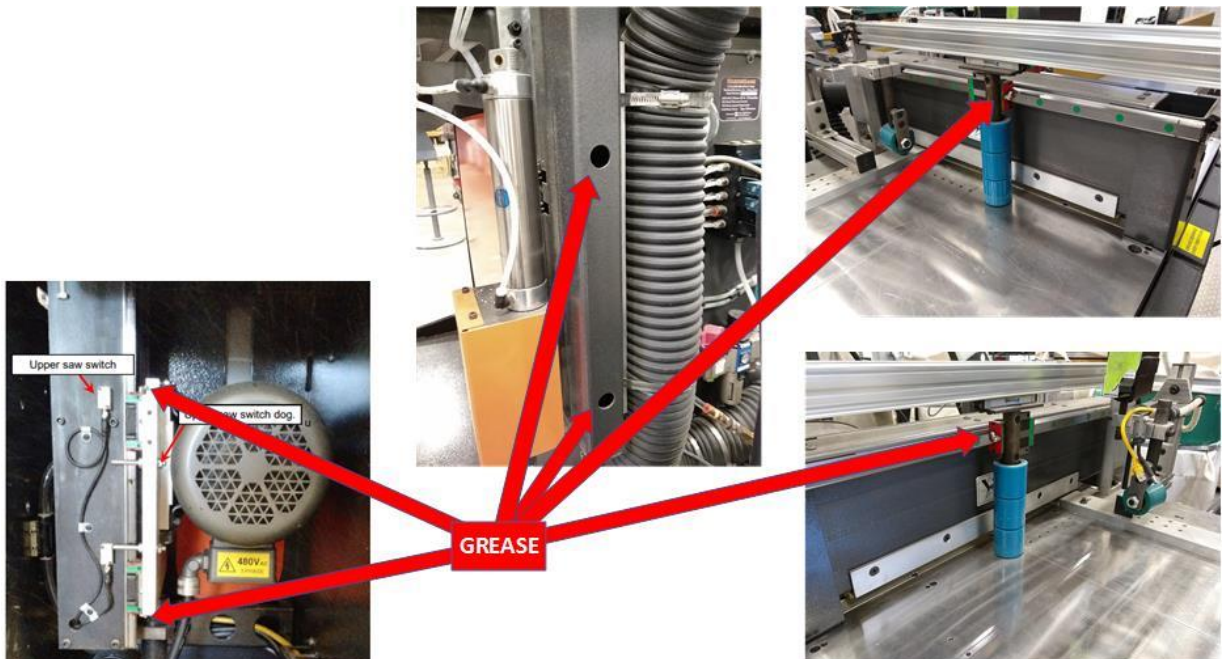
WARNING

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.

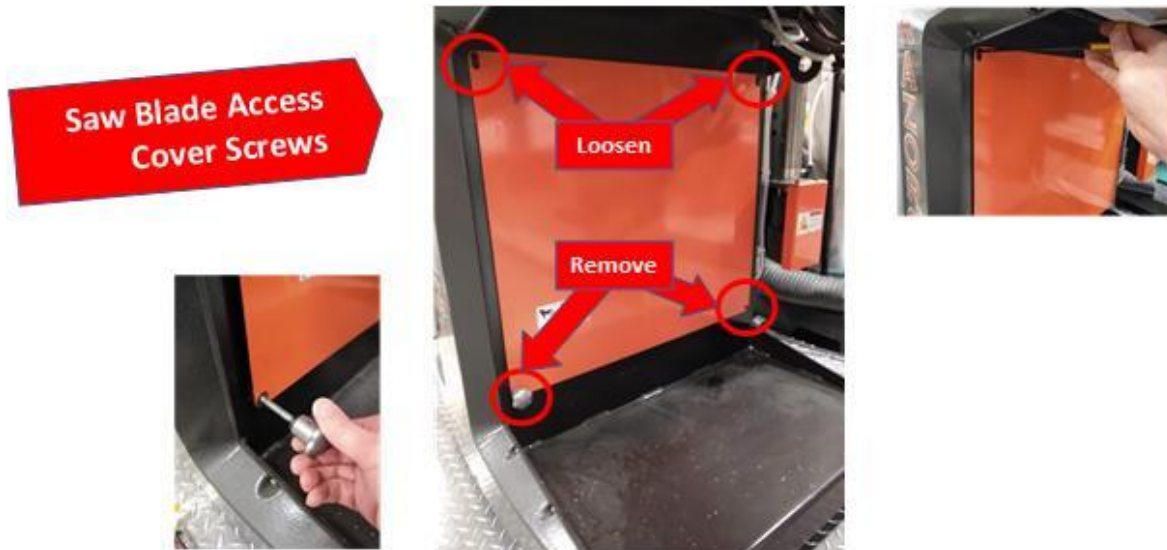
Lubrication

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. In order to access the saw carriage, the motor guard panel will have to be 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 restarting machine.



Changing Out Saw Blade

Turn off and Lock-out & Tag-out both the electrical and compressed air supply to the machine. Always use appropriate gloves to protect hands when handling the saw blades. 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 bolt. Blade retaining bolt has left hand threads so 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. Remove the worn saw blade. Do not remove rear arbor plate. 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

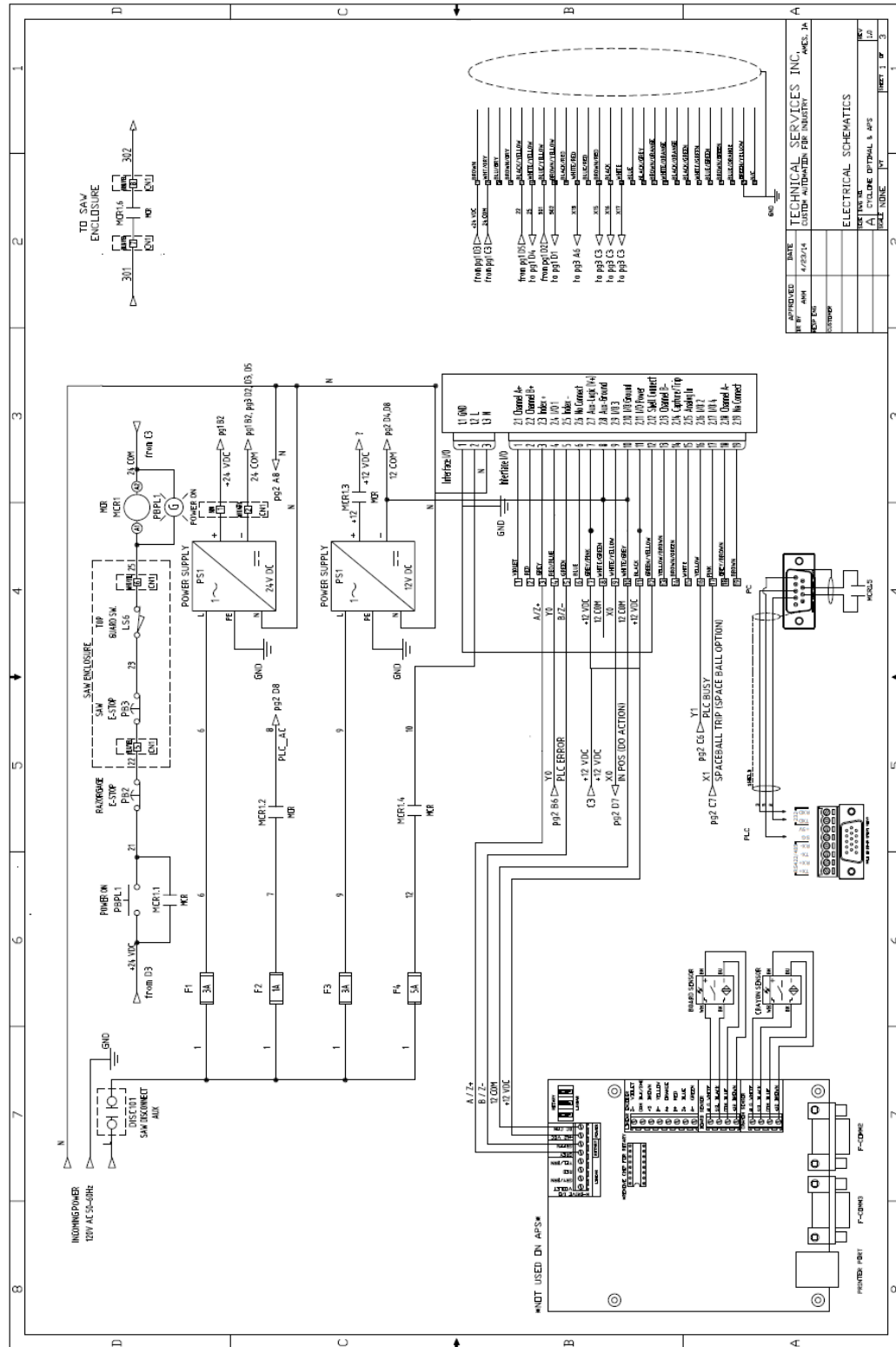
RGX NO	DESCRIPTION
RGX00024	DOUBLE SOLENOID VALVE, 12VDC, MANIFOLD MOUNTED
RGX00025	SINGLE SOLENOID VALVE, 12VDC, MANIFOLD MOUNTED
RGX00506	DUMP VALVE, 24VDC
RGX01124	SAW BLADE: 20" FOR CUTTING WOOD
RGX01220	SAW BLADE: 20" FOR CUTTING ALUMINUM
RGX00473	SAW BLADE: 24" FOR CUTTING WOOD
RGX00474	SAW BLADE: 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
RGX00429	FLANGED HIWIN BEARING BLOCK
RGX00704	FLANGELESS HIWIN BEARING BLOCK
RGX00400	HORIZONTAL CLAMP ROLLER / MATERIAL GUIDE ROLLER
RGX00674	SPRING ROLLER SUPPORT
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

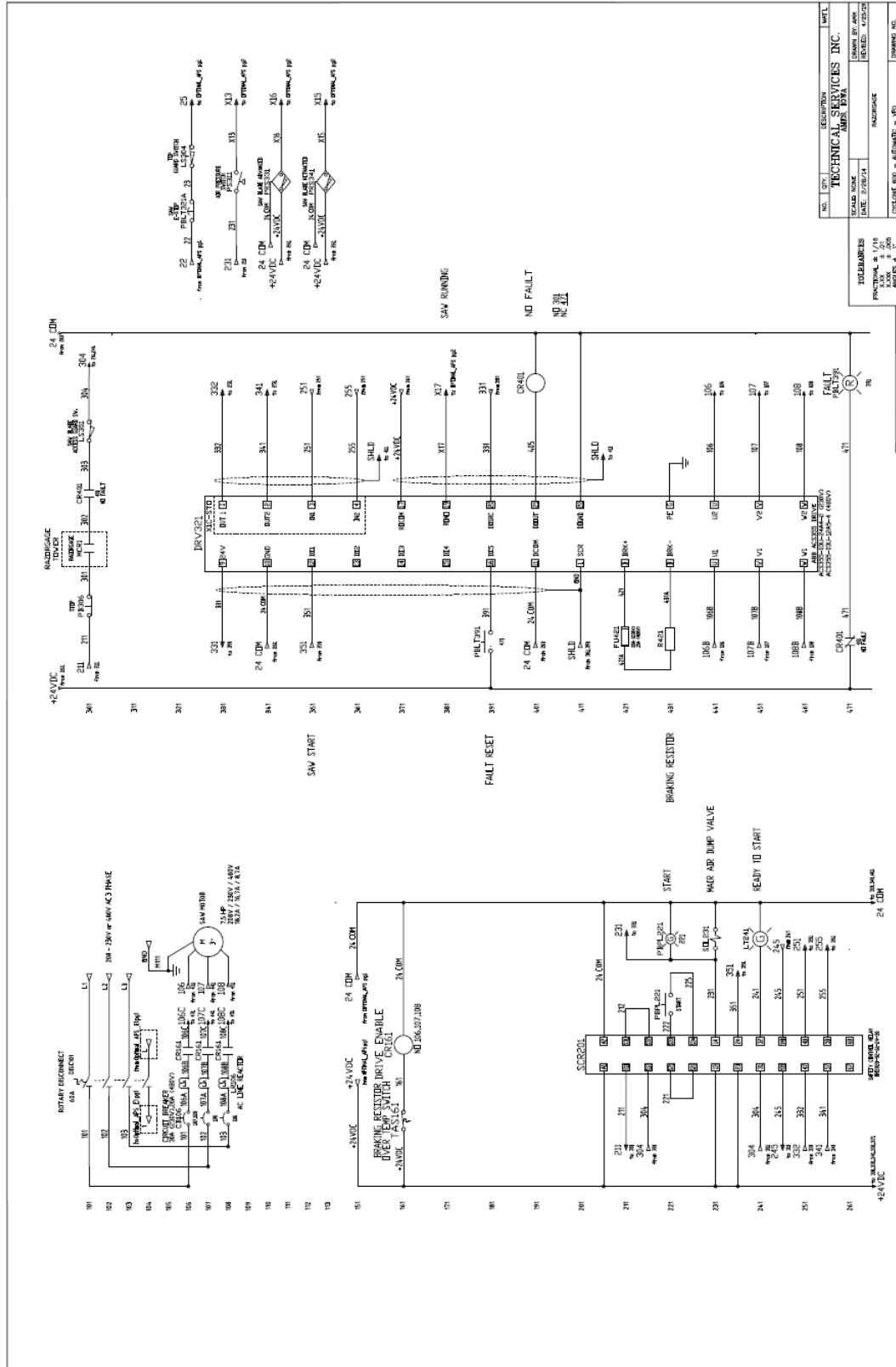
Electrical Schematics (Page 1 of 4)



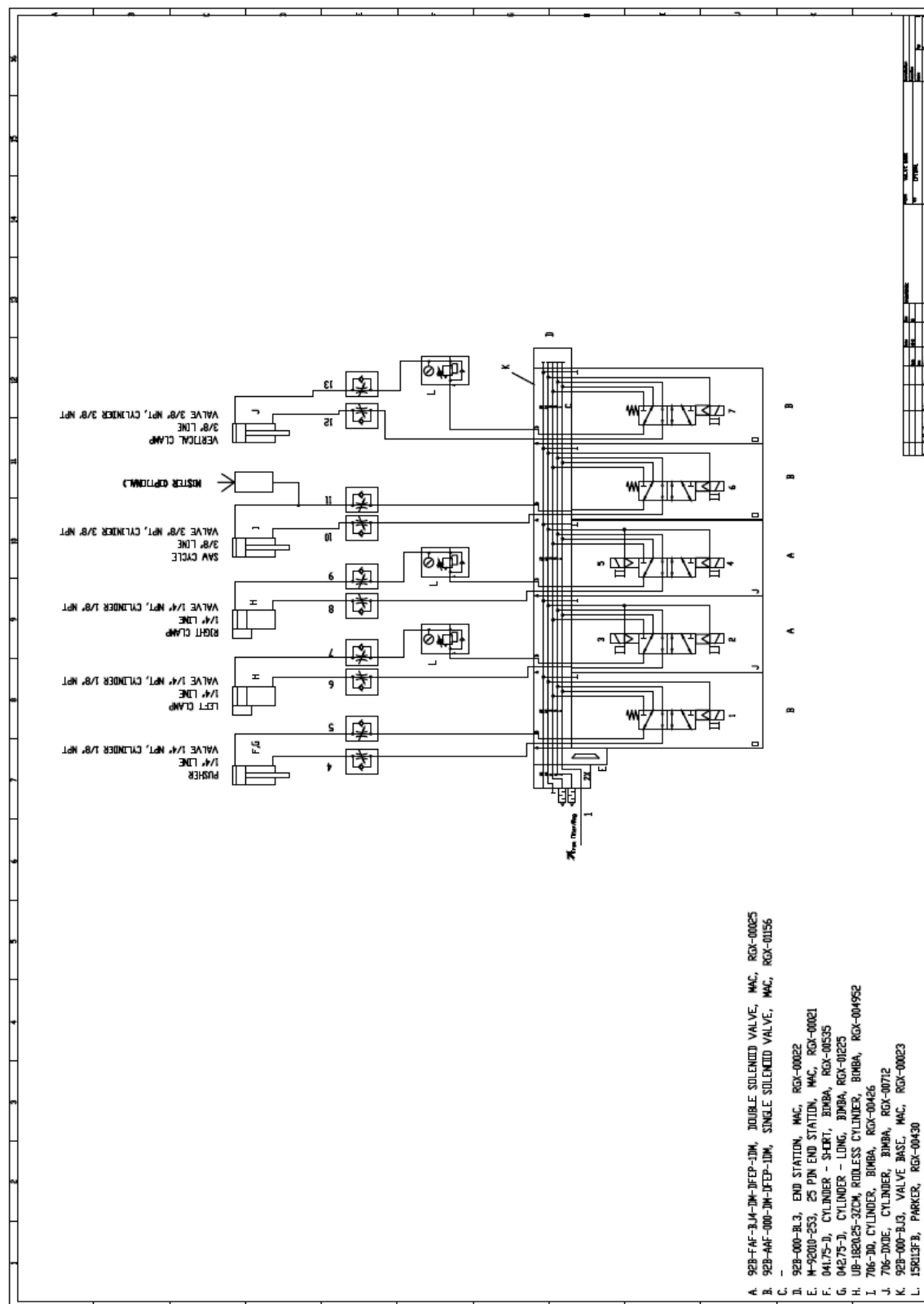
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Electrical Schematics (Page 4 of 4)



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. Check that the Saw Retracted proximity switch is 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	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 	<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.
6	<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.
7	<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.
8	<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.
9	<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. Saw motor stalled. 	<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.

		<ul style="list-style-type: none"> Proximity switch out of alignment. Cable or wiring problem. Proximity switch failed. 	<ul style="list-style-type: none"> 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.
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. 	<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.

		<ul style="list-style-type: none"> Proximity switch failed. 	<ul style="list-style-type: none"> 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"> Witch 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. 	<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 #6. 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.

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

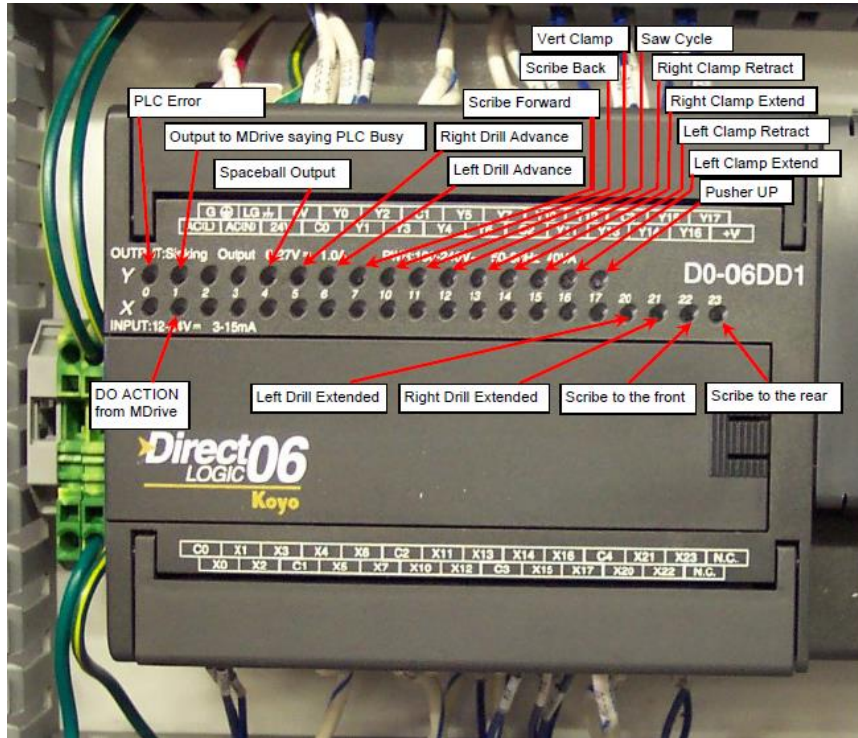


Figure #4

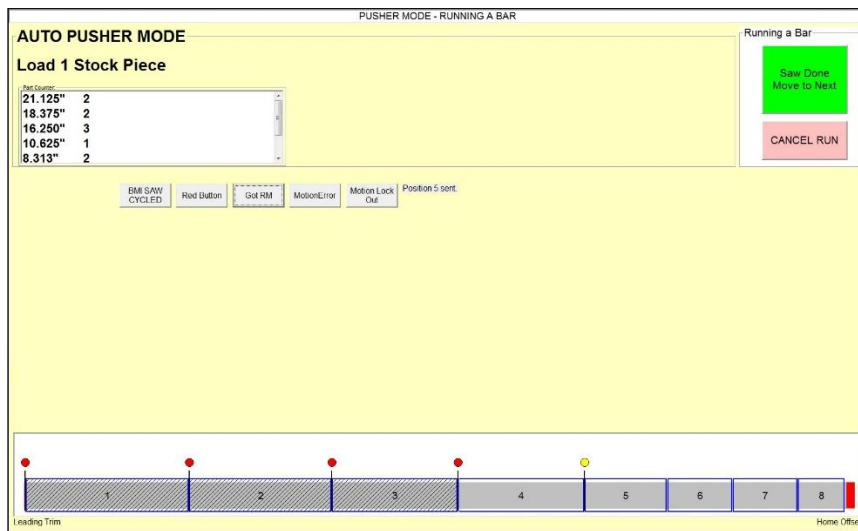


Figure #5

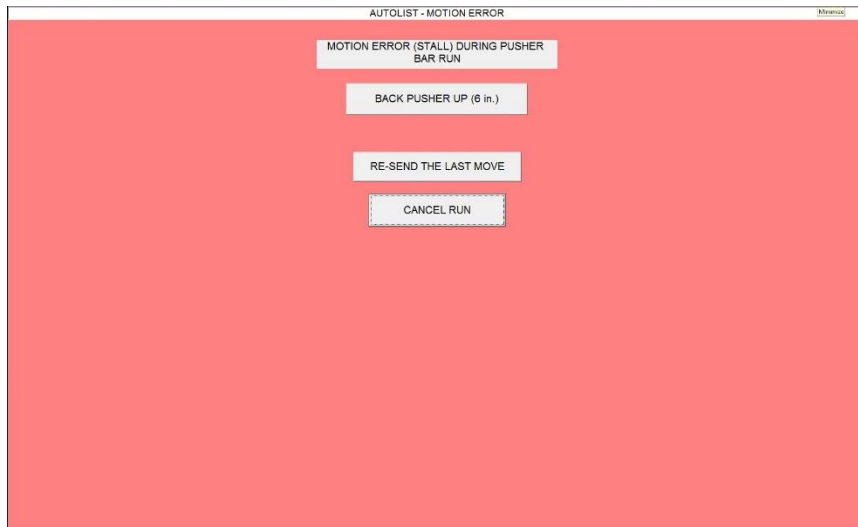


Figure #6

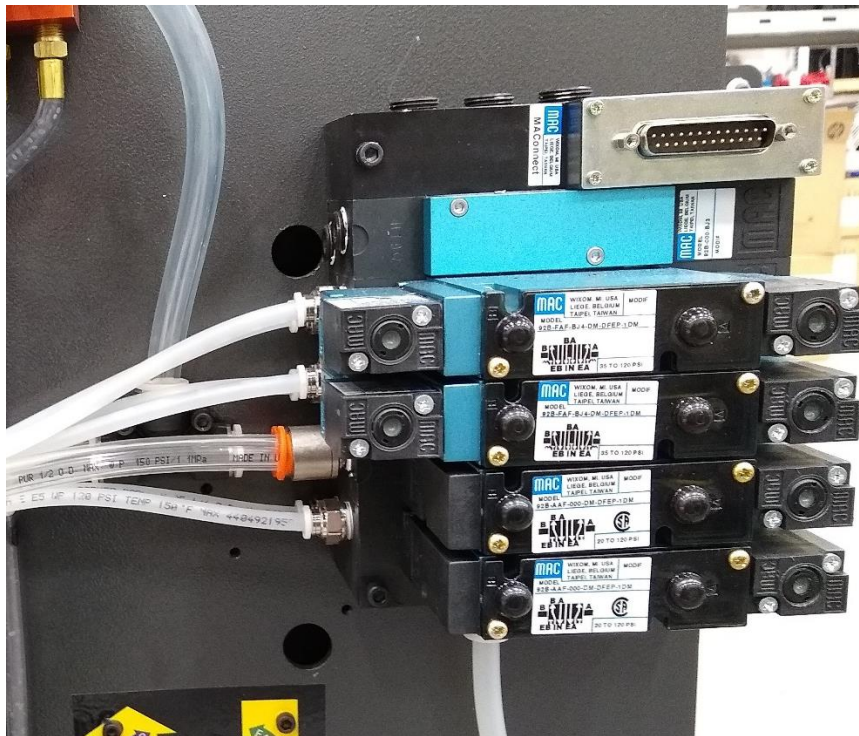
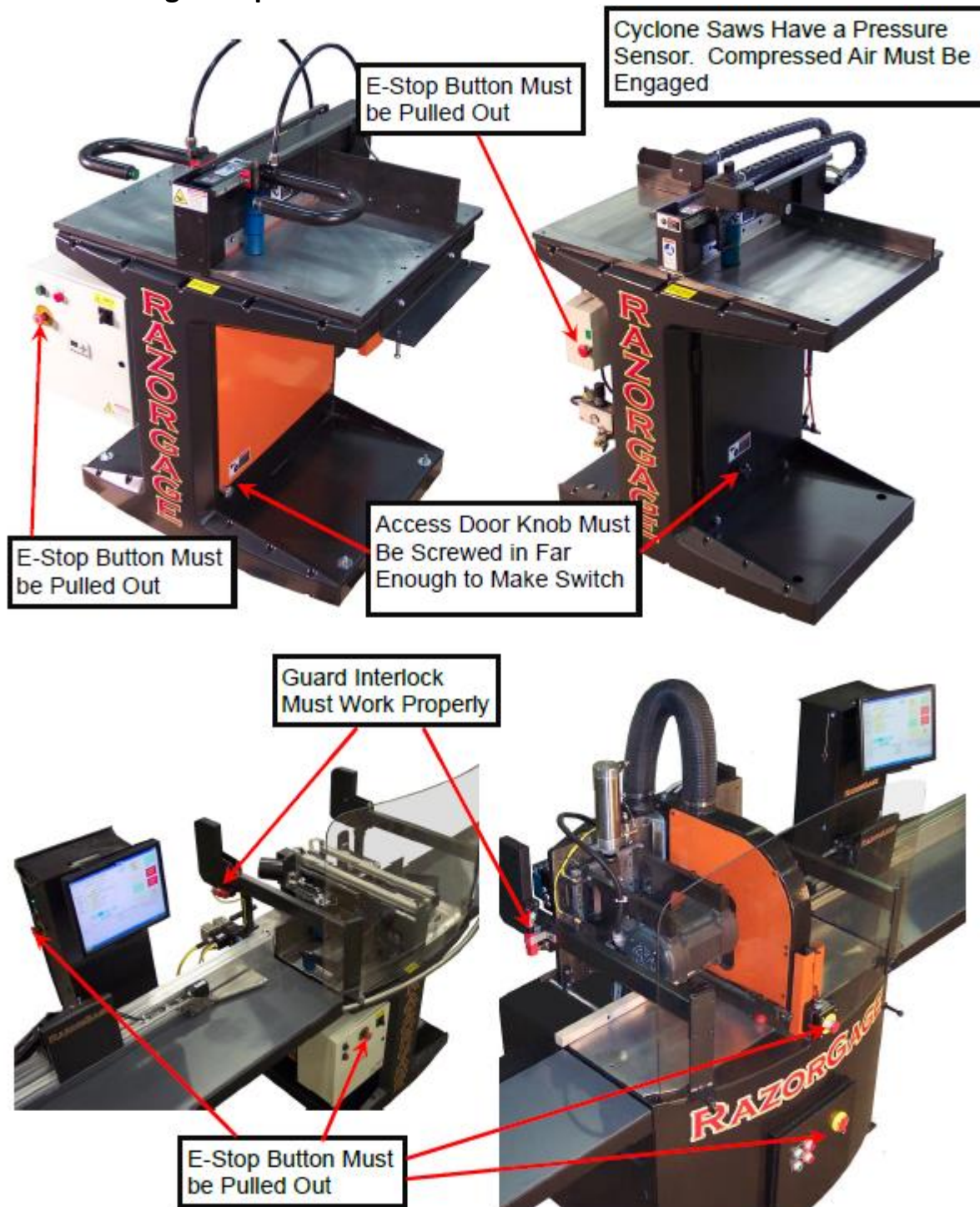


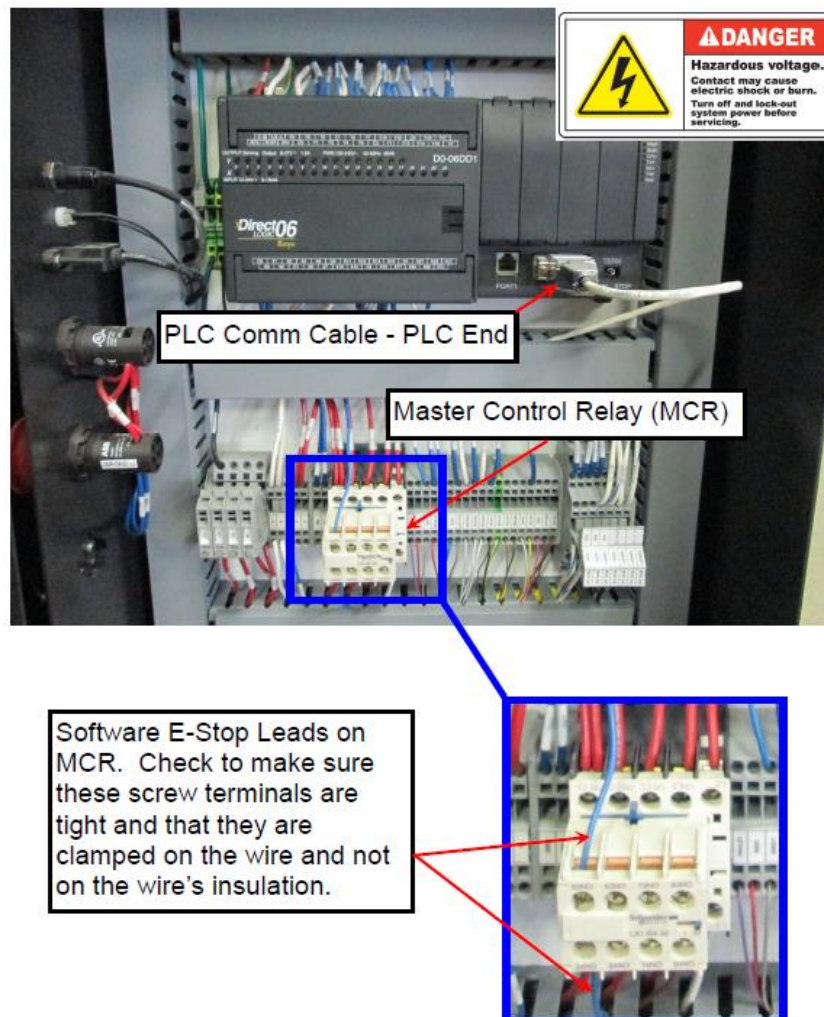
Figure #7

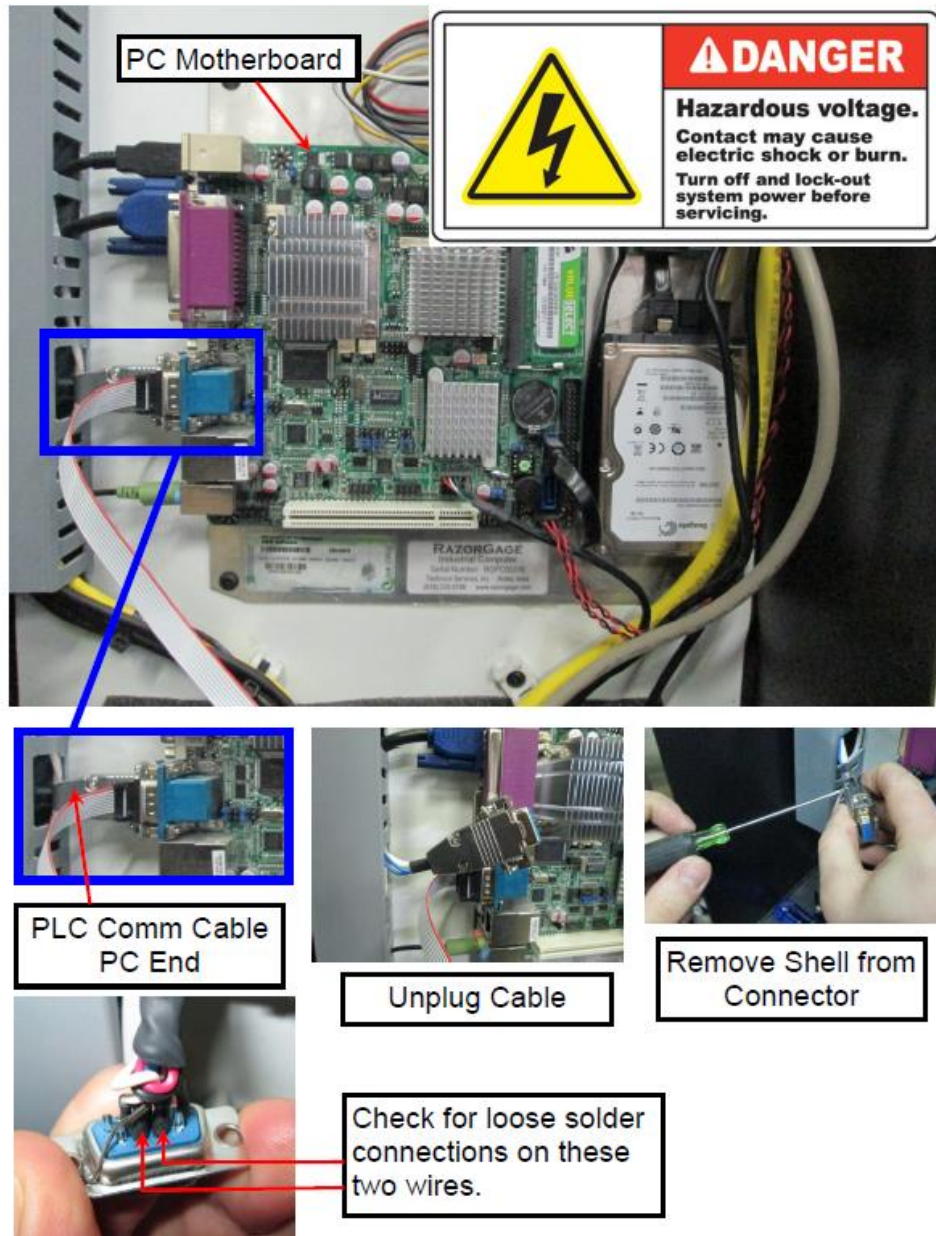
Troubleshooting E-Stop Faults



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.