AIR BEARING PRECISION GRINDER

MODEL 30A

USER'S MANUAL

English Version 1.1 | Original Instructions | Date of Issue: August 5, 2015

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READ MANUAL THOROUGHLY BEFORE INSTALLING OR OPERATING EQUIPMENT

MODEL 30A CNC AIR BEARING PRECISION GRINDER

The Pride Model 30A Air Bearing Grinder is the most refined technology for carbide die grinding. The Model 30A Grinder will achieve closer tolerance accuracy and better surface finish for draw and iron (D & I) (two piece) can tooling than any grinder ever made. This has been accomplished utilizing;

a. An air bearing wheel head and work head with guaranteed radial run out of less than 15 millionths of an inch (0.4 microns).

b. Digital direct drive motor that is the grinder's rotary with no gears, chains or universal joints that will leave an imprint on the radius of the die. The rotary and drive motor are one and the same for ground radii of draw dies such as the redraw die of a D & I Bodymaker.

c. Unitizing the two air bearings and the digital direct drive rotary on one granite plate.

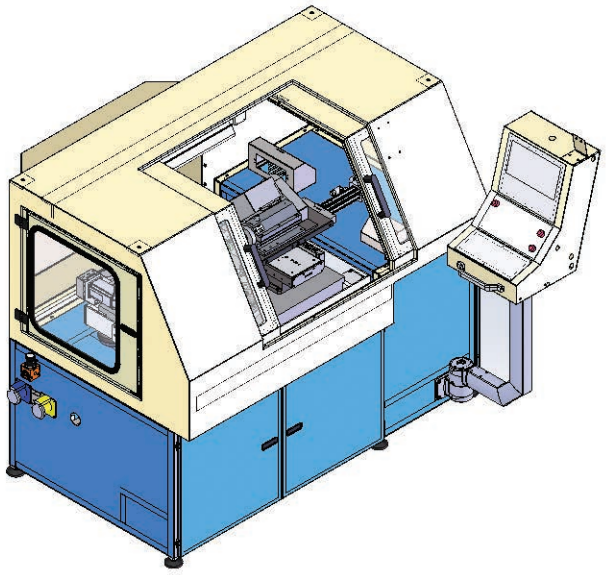
d. Suspending the granite plate on air bags to isolate critical parts from damage at high and low frequency vibrations.

e. Variable speed grinding wheels for surface finishes of one micro inch or better.

f. A Bosch Rexroth CNC controller that comes with Windows® based operating windows for commonly run operations

g. Easy to program with open architecture for parts without their own window.

h. Absolute scales that never require referencing or lose position.



English Version 1.1

MODEL 30A GRINDER INSTALLATION AND OPERATION MANUAL

MODEL 30A GRINDER

INTRODUCTION OF MACHINE AND SAFETY

PRIDE ENGINEERING

1. Introduction of Machine and Safety

1.1 INTRODUCTION TO USER'S MANUAL

The purpose of this manual is to provide initial set-up, operational, part identification, and maintenance information for the Pride Model 30A Air Bearing Grinders. Pride Engineering, LLC, Minneapolis, Minnesota +1 (763) 427-6250 should be consulted prior to major field repairs.

READ MANUAL THOROUGHLY BEFORE INSTALLING OR OPERATING EQUIPMENT

The User's Manual is intended to help familiarize the user with the safe and effective operation of the Pride Model 30A Air Bearing Grinder. Following the instructions in the manual will reduce safety risks while facilitating the efficient operation of the equipment. Specifically, the recommended maintenance items covered in this manual are intended to maximize the machines availability for use.

KEEP USER'S MANUAL FOR FUTURE USE!

1.1.1 SAFETY RELATED SYMBOLS DEFINITIONS

Signifies read manual

Signifies general warning, indicating danger to life and limb or extensive machine damage

Signifies mandatory action

Signifies electrical hazard

Signifies eye protection must be worn

Signifies important information

Signifies a prohibited action

Signifies do not remove guard

Signifies safety interlock inside

Signifies arc flash hazard

Signifies cut/sever hazard

Signifies entanglement hazard

Signifies pinch point hazard

Signifies rotating shaft hazard

Signifies lock out mechanism

Signifies disconnect power

1.2 TECHNICAL CHARACTERISTICS OF MACHINE

1.2.1 INTENDED USE

The Pride Model 30A Air Bearing Grinder is intended to be used for carbide die grinding. It is designed to achieve tighter tolerances and better surface finishes on dies used in the Drawn and Iron (two piece) can manufacturing process.

Maximum Diameter of Die:	**7 inches (178 mm)**
Material to be Ground:	**Carbide Material Only**

1.2.2 MODIFICATION OF EQUIPMENT

Do not modify the equipment. Modification of the equipment may defeat measures taken to ensure safe operation of the equipment.

1.2.3 TECHNICAL CHARACTERISTICS

Weight:	**3,640 lbs. (1,650 Kg)**
Height:	**70 inches (1,780 mm)**
Length:	**76 inches (1,880 mm)**
Width:	**52 inches (1,320 mm)**

Operating Conditions:

Air Temperature:	**68 F˚ +/- 2˚ (20 C˚ +/- 1˚)**
Relative Humidity:	**35–45%**
Altitude:	**0–10,000 ft. (0–3,000 m)**

Approximate air conditioned floor space (including work area) required for convenient operation is 8 feet by 10 feet.

Plant utilities in the immediate area must include 480 volt 3 phase 60 ampere electrical service and an air supply of 10 CFM (280 liters per minute).

NOTE: Air source for air bearing spindles is from plant air, at a minimum of 80 psi or 6 bar.

1.3 SAFETY

1.3.1 PROPER USE FOR INTENDED PURPOSE

The machine is intended for use in the can making industry.

1.3.1.1 Applications

The machine is intended for the following applications only:

- Grinding ironing dies, re-draw dies, re-draw sleeves, pilot dies and trimmer blades utilized in the two piece can making process and held by a work piece clamping device.
- The machine is intended to grind carbide material only.

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• Dressing of the grinding wheel used in the machine by utilizing the dressing tool mounted in the machine.

1.3.1.2 Work Piece Holding

The work piece must be held securely in a clamping device integral to the machine. The machine is made to work with a six jaw chuck or magnetic chuck.

1.3.1.3 Tools Which May be Fitted to the Machine

The following grinding wheels are recommended for the intended applications:

• Rough Grinding: 800 grit, 63% diamond wheel	Part No. 9-143
• Finish Grinding: 1,000 grit, 100% diamond wheel	Part No. 9-178
• Grinding of 6/7" Chuck Jaws:	Part No. 19-125
• Grinding of 6/7" Chuck Jaw Face: (cupping wheel)	Part No. 19-126
• Grinding of Mag Chuck Face:	Part No. 9-202

Please refer to the list of accessories found in Section 5 for a complete listing of the compatible tools and accessories.

1.3.1.4 Acceptable Coolant Type

The machine is designed to work with Pride Coolant mixed 20 parts water to 1 part coolant.

Pride Coolant Part No. 19-217A

1.3.1.5 Acceptable Lubrication Type

The machine is designed to utilize Mobil Vactra # 2 oil for lubricating the ways and ball screws.

1.3.1.6 Servicing

Service of the machine should only be performed by qualified and trained maintenance personnel.

1.3.2 IMPROPER USE

The following are improper, prohibited uses of the machine.

- Using the machine with protective devices removed or bypassed.
- Using the machine with safety warning labels removed or illegible.
- Using the machine while holding the work piece or tooling by hand.
- Using hand held wheel dressing tools.
- Using the machinery without proper work holding.
- Using the machine with cutting tools instead of grinding wheels.
- Grinding without coolant.
- Grinding materials other than intended.

1.3.3 USER SAFETY

Operators of the equipment should do so wearing eye protection. Operators and maintenance personnel should read the user's manual prior to operating the equipment. Only trained maintenance personnel should perform maintenance on the equipment and should follow control of hazardous energy procedures (Lock Out-Tag Out) to ensure maintenance can be performed safely.

See section 1.1 for the meanings of safety warning labels utilized on the machine.

1.3.4 RESIDUAL RISK

Hazards which cannot be eliminated or countered by design measures are residual risks. Residual risks are documented in this manual and noted by the symbols utilizing a yellow triangle. Specific symbol meanings are noted in Section 1.1.1.

Example: 

1.3.5 SAFETY ELEMENTS LOCATION PLAN

The protection devices must be installed and fully functional. All warning labels need to be clear and legible. Refer to Section 5 for a diagram indicating the location of safety elements and safety labeling.

Protective devices must not be bypassed or removed.
Protective devices much be kept in good working condition.
Any illegible or removed warning labels must be replaced.

1.3.6 NOISE MEASUREMENT

Noise produced during the use of this equipment is below 70 dB(A).

1.3.7 SUSPENSION OF SAFE GUARDS

The following operations utilize a suspension of certain door safe guards to facilitate the process. Movement of the axis is limited during these operation steps to the following maximum speeds:

X Axis: 1,200 mm/minute
Y Axis: 1,200 mm/minute
Z Axis: 1,200 mm/minute
A Axis: 1,200 mm/minute
C Axis: 360 mm/minute

Operations utilizing a suspension of door safe guards:

Dressing of Grinding: Wheel: Right hand operating door (Wheel Head side) can be open while visually determining contact between the grinding wheel and the dressing material.

Chuck Maintenance: Right hand operating door (Wheel Head side) can be open while visually determining contact between the grinding wheel and the chuck material.

MODEL 30A GRINDER

INSTALLATION AND PREPARING PRODUCT FOR USE

PRIDE ENGINEERING

2. Installation and Preparing Product for Use

Read instructions for unpacking completely before proceeding further.
Only qualified individuals should move this equipment.

2.1 UNLOADING, MOVING AND UNPACKING

The packaging of the equipment includes important information on the outside of the packaging as to the proper treatment during transportation, unloading and movement prior to unpacking. The packaging techniques may vary according to customer geographical location and mode of transportation. The most common will be described in this section and others will be self-explanatory using this section as a guideline. The grinder is in two crates. The control pedestal for the computer control is unattached and packed in a smaller crate with the coolant system. The remainder of the grinder is in a larger crate. The Pride Grinder Service Engineer will reattach the control pedestal and the computer's electrical connections when he arrives to commission the grinder. Carefully move the unit to its permanent location, remove from pallet and inspect for shipping damage. If damage is evident notify the transportation carrier.

2.2 ACCESSORIES

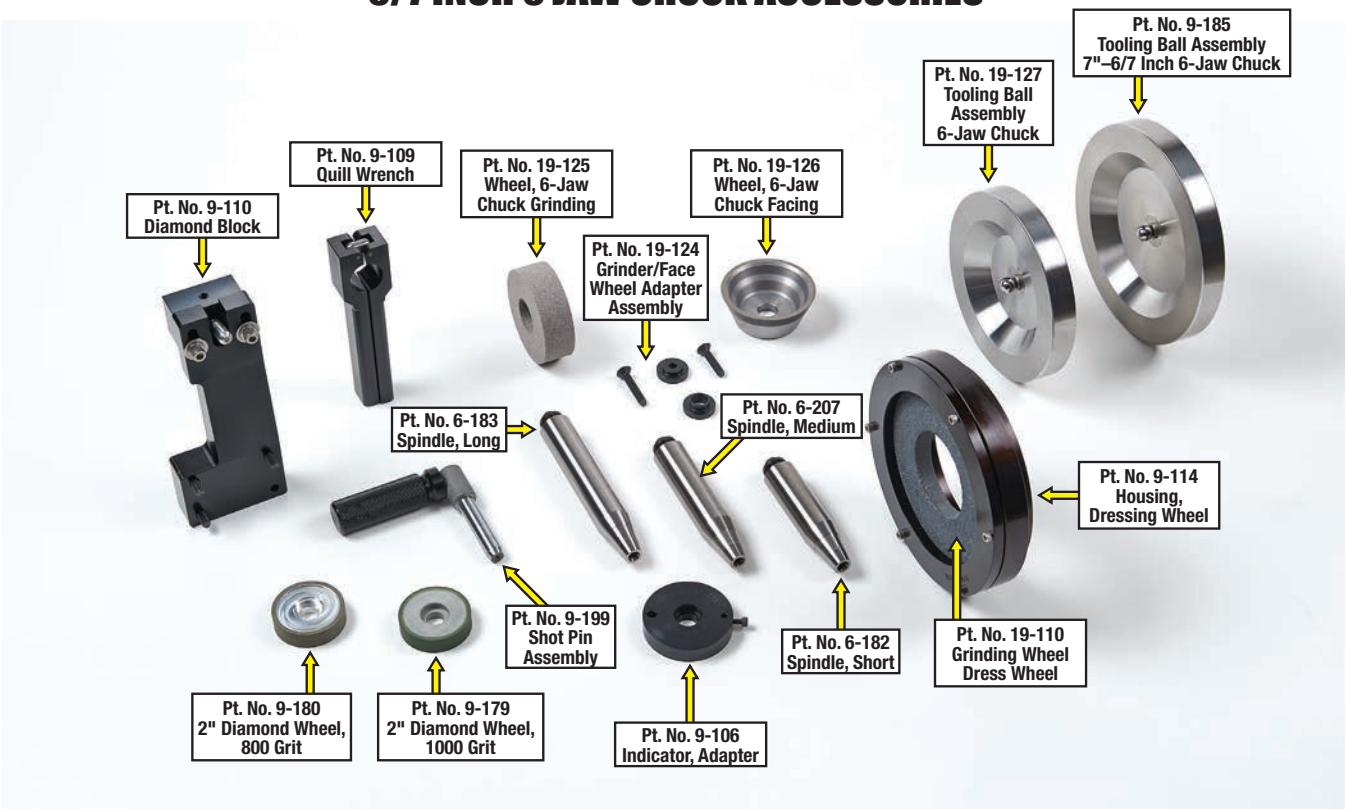
Accessories Provided with a Pride Air Bearing Grinder:

Pre-Filter, Coolant (5 microns) 5-101
Spindle, Short 6-182
Spindle, Long 6-183
Indicator, Adapter 9-106
Quill Wrench 9-109
Diamond Block 9-110
Chuck Dress Block 9-111
Housing, Dressing Wheel 9-114
Retainer, Dressing Wheel 9-115
Coolant, 5 Gal. . . . . 19-217A (Mix 20 Parts Water : 1 part Coolant)
Diamond Wheel 9-143
Dresser Diamond 9-149
Diamond Wheel 9-201
Dressing Wheel, Chuck 9-202
Filter, Coalescer. 19-106
Filter, Activated Carbon 19-107
Float Drain, Automatic (2) 19-108
Filter, Roll 19-114
Grinder/Face Wheel Adapter Assy. 19-124
Wheel, 6-Jaw Chuck Grinding 19-125
Wheel, 6-Jaw Chuck Facing 19-126
Tooling Ball Assy. 6-Jaw Chuck 19-127

6-JAW CHUCK ACCESSORIES

MAGNETIC CHUCK ACCESSORIES

6/7 INCH 6 JAW CHUCK ACCESSORIES

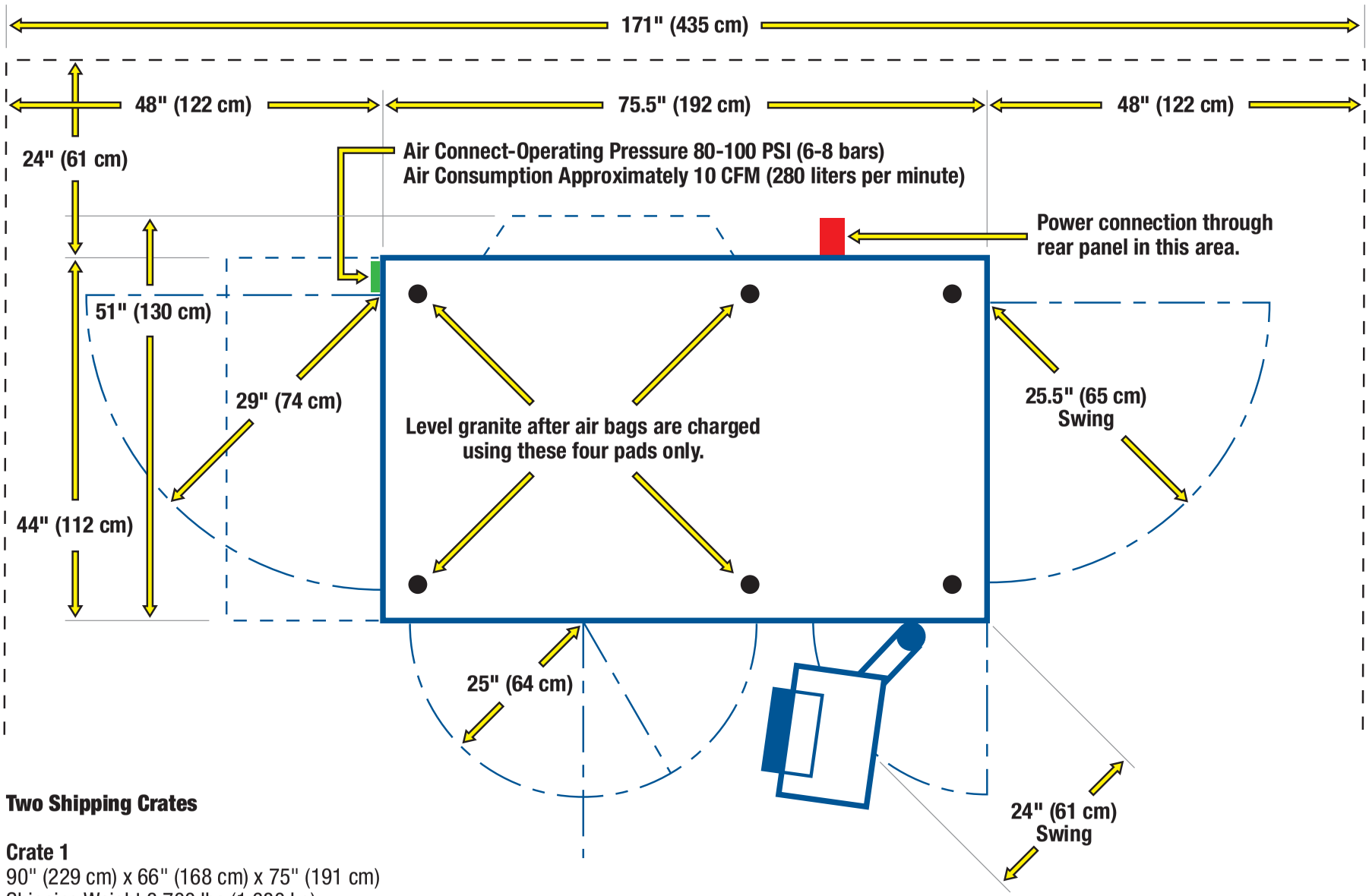


2.3 INSTALLATION

Only qualified personnel should connect the electrical power to the grinder.

Remove the grinder assembly from its shipping pallet and position it on a clean, level floor. See the Grinder footprint for floor lay out and connection points.

- Use only lift points indicated on the machine with lift point labels.
- Connect to 380-480, 3 phase, 50/60 hz. electrical service to the right side of the machine. Please refer to the electrical schematic in Section 5.6. The equipment uses a multi-tap transformer that may need to be changed for your input voltage. All internal electrical hookups should be completed before the grinder is energized with the plant's electrical service.



Two Shipping Crates

Crate 1
90" (229 cm) x 66" (168 cm) x 75" (191 cm)
Shipping Weight 3,700 lbs (1,680 kg)

Crate 2
48" (122 cm) x 46" (117 cm) x 32" (82 cm)
Shipping Weight 450 lbs (205 kg)

Total Weight of Installed Grinder
3,640 lbs (1,650 kg)

No special foundation required.

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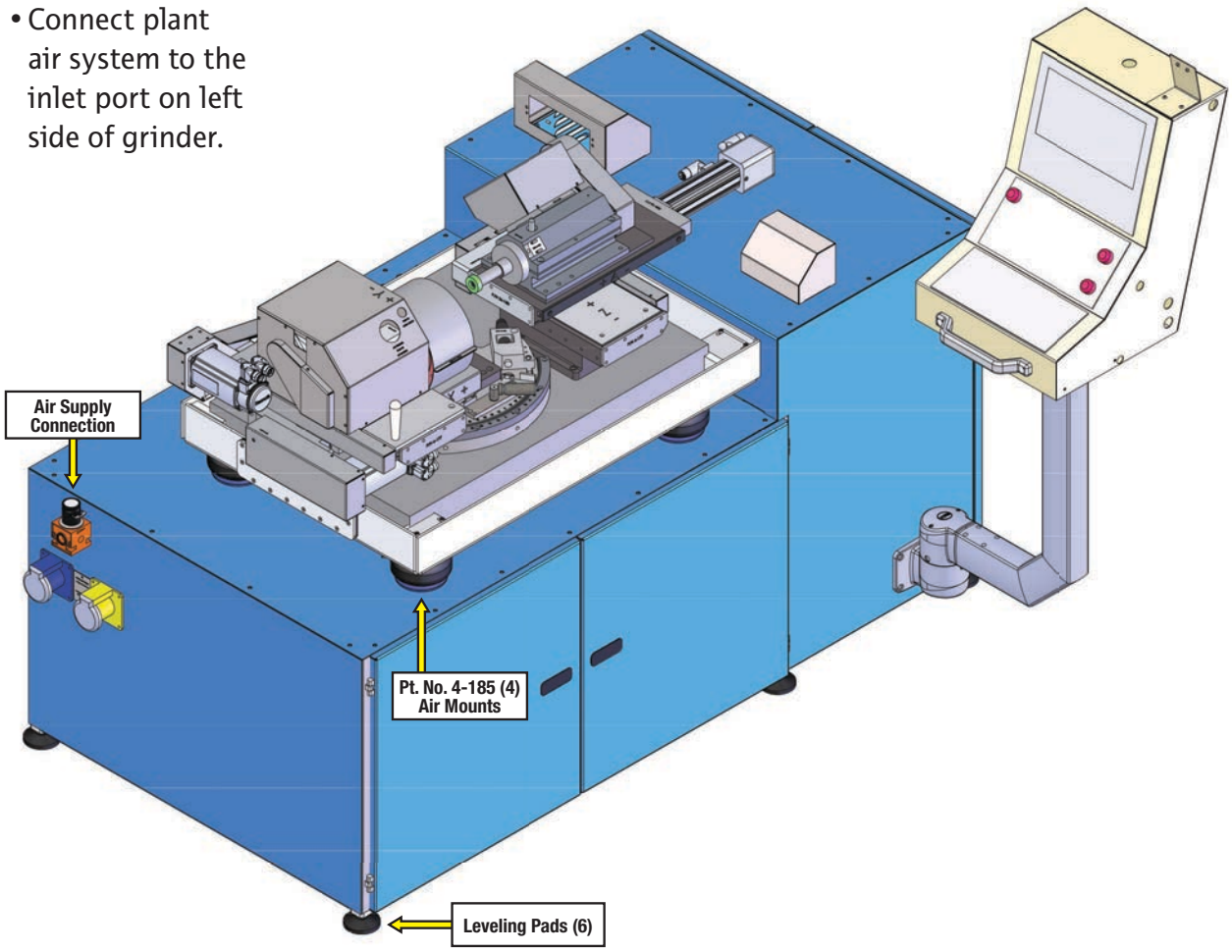
- Connect plant air system to the inlet port on left side of grinder.



- Turn on the air supply on the left side of the grinder cabinet. You will notice the granite table lift when the air pressure reaches an adequate level.
- Open the cabinet front doors and you will see the air controls.
- Pressurize the granite plate air mount (4 places) with 30 psi (2.1 bar) suspending the granite plate.

- After energizing the air mounts under the granite block, adjust the four (4) leveling feet located under each corner of the granite block with a precision level resting on the granite block.
- Level the granite side to side, front to back and corner to corner. Ignore the two (2) feet on the right end under the controls until the four Leveling pads supporting the granite plate are level.

- Fill coolant reservoir with proper coolant which is provided. Use ratio of 20 parts water to 1 part Pride coolant. Refills are available in 5 gallon containers from Pride, Part Number 9-217A. The coolant tank holds approximately 21 gallons (80 Liters). Therefore, you should add 128 ounces (3.8 liters) of coolant and fill the rest of the tank with water to achieve the 20:1 ratio of water to coolant.

MODEL 30A GRINDER

OPERATING INSTRUCTIONS

PRIDE ENGINEERING

3. Operating Instructions

3.1 SAFETY

3.1.1 PERSONAL PROTECTIVE EQUIPMENT REQUIRED

Protective eye wear is required while operating the machine.

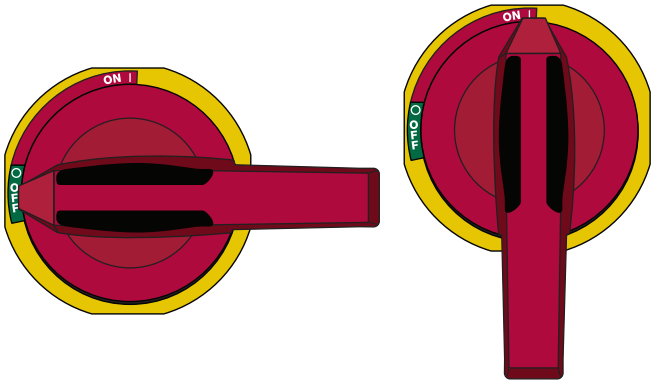
3.2 MAIN ELECTRICAL POWER SWITCH

WARNING–Lethal electrical shock by live parts with more than 50V!

Before working on live parts: De-energize installation and secure power switch against unintentional or unauthorized re-energization.

Before accessing device, wait at least 30 minutes after switching off the supply voltages to allow discharging. Check whether voltage has dropped below 50V before touching parts!

The Main Electrical Power Switch is located on the right side of the grinder on the control cabinet door. This machine is equipped with a NFPA79 Disconnect. It features an internal handle that permits operation of the disconnect switch when the panel door is open. The internal switch is only to be used by trained and qualified maintenance personnel.



WARNING–Lethal electrical shock by live parts with more than 50V!

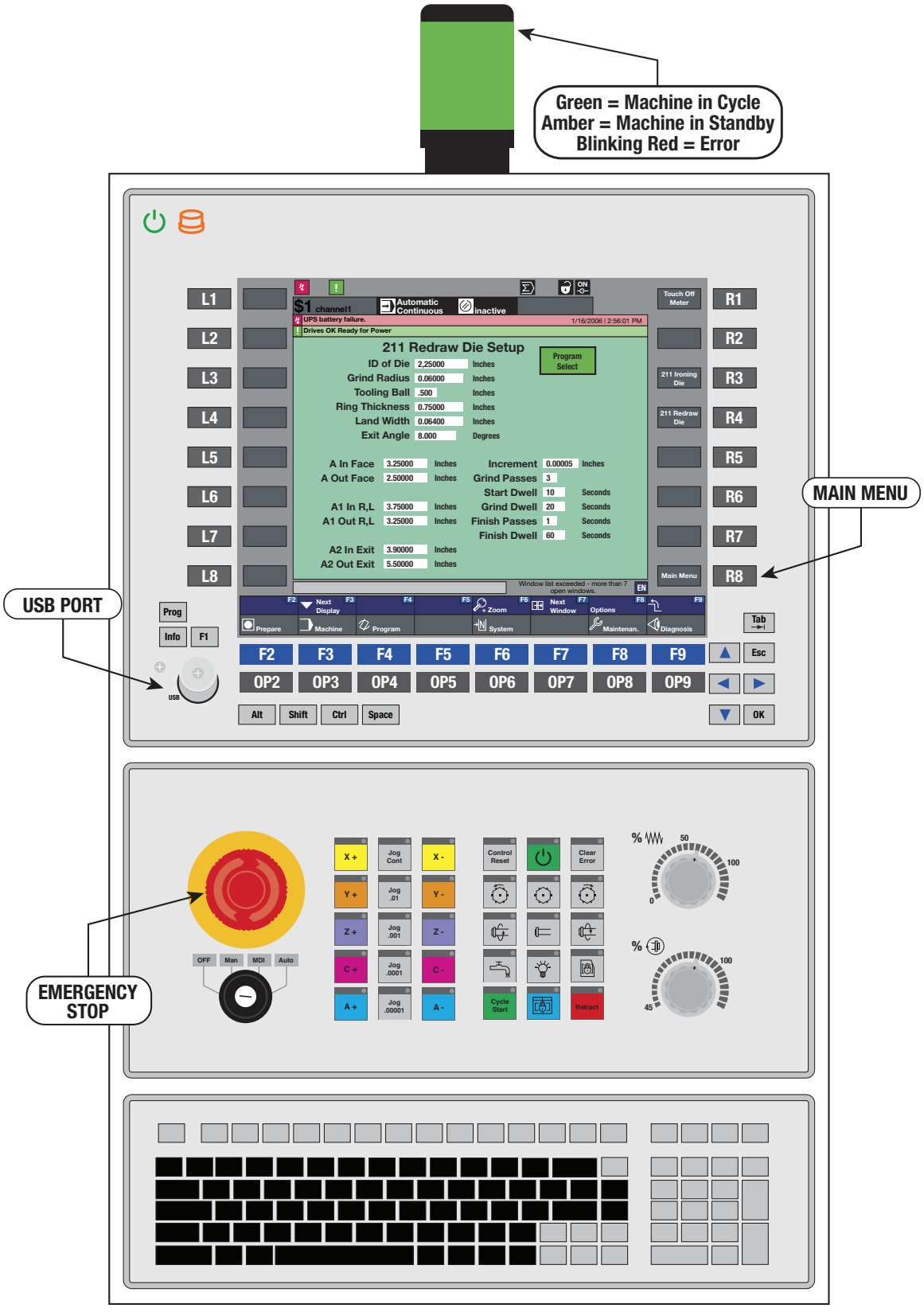
Main electrical power switch over ride should only be used by qualified and trained maintenance personnel. Power will remain on if the switch is over ridden.

Before accessing device, wait at least 30 minutes after switching off the supply voltages to allow discharging. Check whether voltage has dropped below 50V before touching parts!

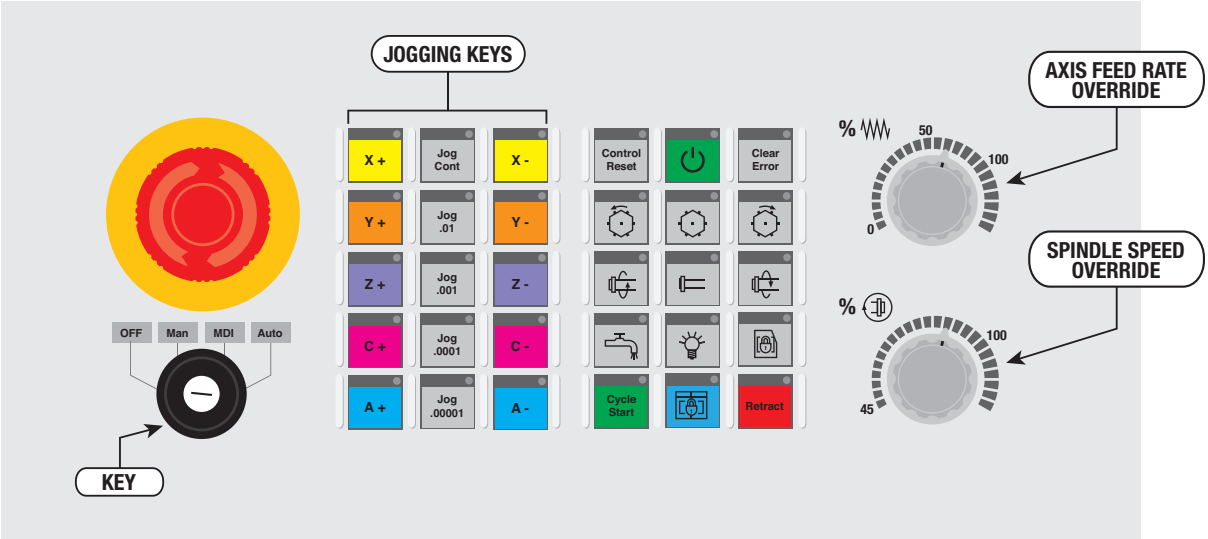
3.3 Control Pedestal, Buttons and Icons

Familiarize yourself with the control pedestal, operator panel and screens.

CONTROL PEDESTAL



OPERATOR PANEL



The Key lock, just below the E-stop, controls operating mode of the control and grinder.

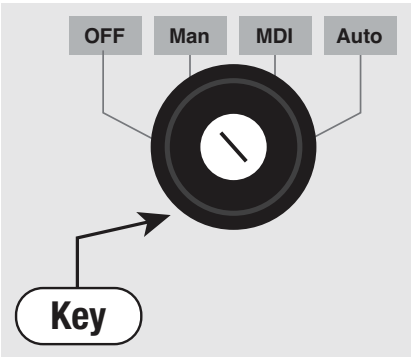
Man mode for jogging the axis movements manually.

MDI mode for entering and executing lines of code.

Auto mode to gain access to the menu for preset programs such “Ironing Die” or “Wheel Dressing” and for executing a selected program.

The two override knobs are intended to allow the operator to change spindle speed or feed rates without disturbing the program when Grinder is in the **Auto** mode. Both knobs are calibrated to adjust from 0% to 120% of the program speed. The **Axis Feed Rate Override** controls the speed of all drives. The **Spindle Speed Override** controls the speed of both the Wheel Head and the Work Head.

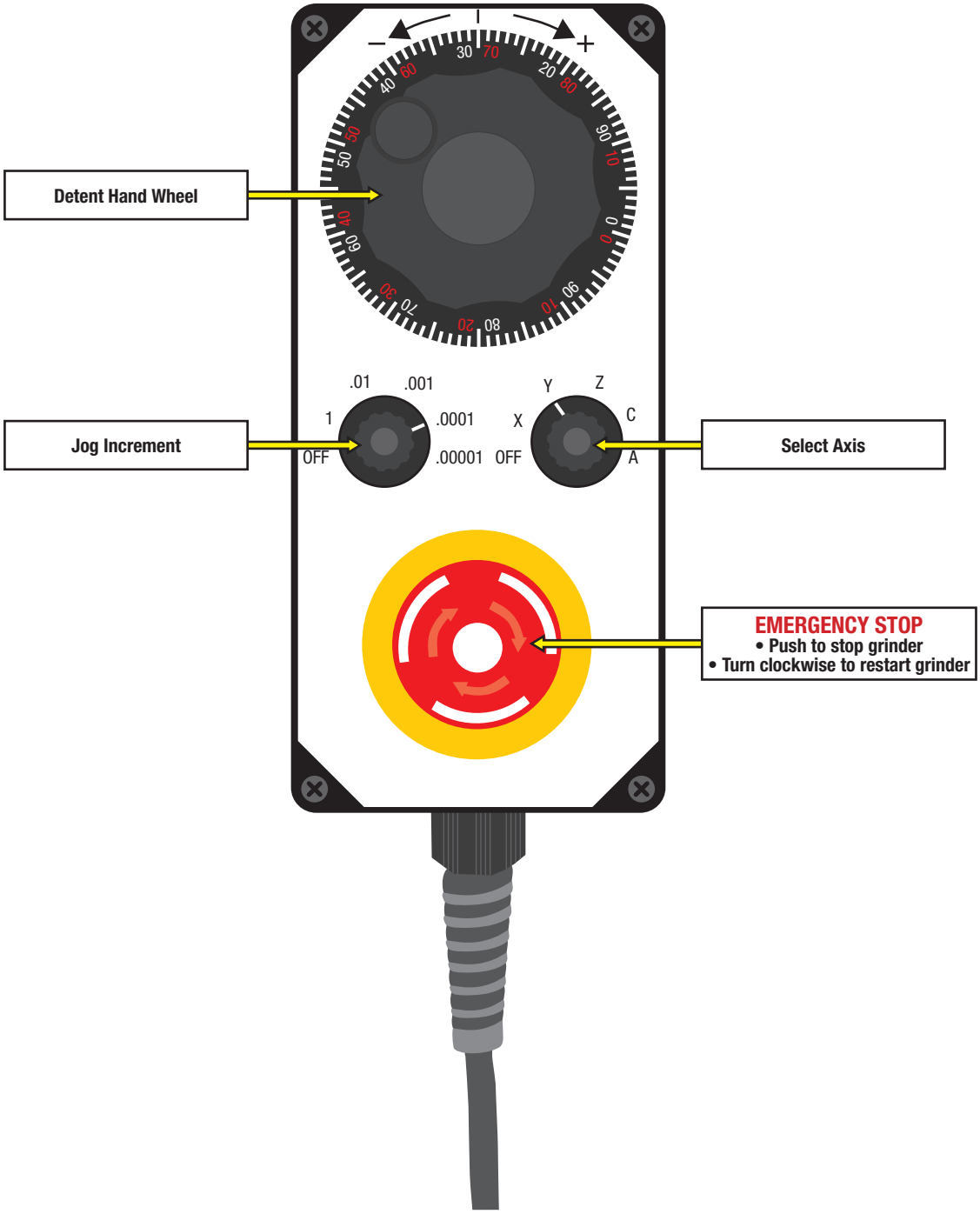
The **Jogging Keys** control the movement for each of the five axes when the Key is in the Man mode.



The Retract button is used for stopping the current operation. When the Retract button is depressed, the grinding wheel will back off the material (Z -) and withdraw from the part.

Depress the Control Reset to start over.

HAND WHEEL


Detent Hand Wheel
Jog Increment
Select Axis
EMERGENCY STOP
• Push to stop grinder
• Turn clockwise to restart grinder
.01
.001
1
.0001
OFF
.00001
X
Y
Z
C
OFF
A

CONTROL PANEL ICONS

Work Head Counter Clockwise

Work Head Stop

Work Head Clockwise

Wheel Head Spindle Off

Wheel Head Counter Clockwise

Wheel Head Clockwise

Coolant On/Off

Machine LED Light On/Off

Emergency Stop
Push to stop Grinder/
Turn Clockwise to Restart Grinder

Display Status of Grinder
Show all Error Messages.

Display Root Directory including
Program List

Next Display, Do not use

Display all coordinate positions
and movements

Inhibit Axis Movement

Automatic, Run program
until complete

Change Channel, Do not use

Main Door Interlocks

Side Access Door Interlocks

3.4 GETTING STARTED WITH WINDOWS

The purpose of this section is to provide instruction for the basic operation of Pride Grinders. It is advised that this section be thoroughly reviewed and several “dry runs” attempted before actual operation to familiarize operating personnel with control location.

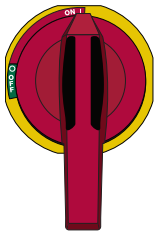
> **Pride Grinders have a protection feature that does not energize the electrical system until the air pressure reaches 70 psig (4.8 Bar) for both air bearings.**

1. Insure that work area is clean and free of all obstructions.
2. Increase air bearing pressure to 80 psig. (5.5 Bar) (Regulator and Gage, inside front cabinet door).

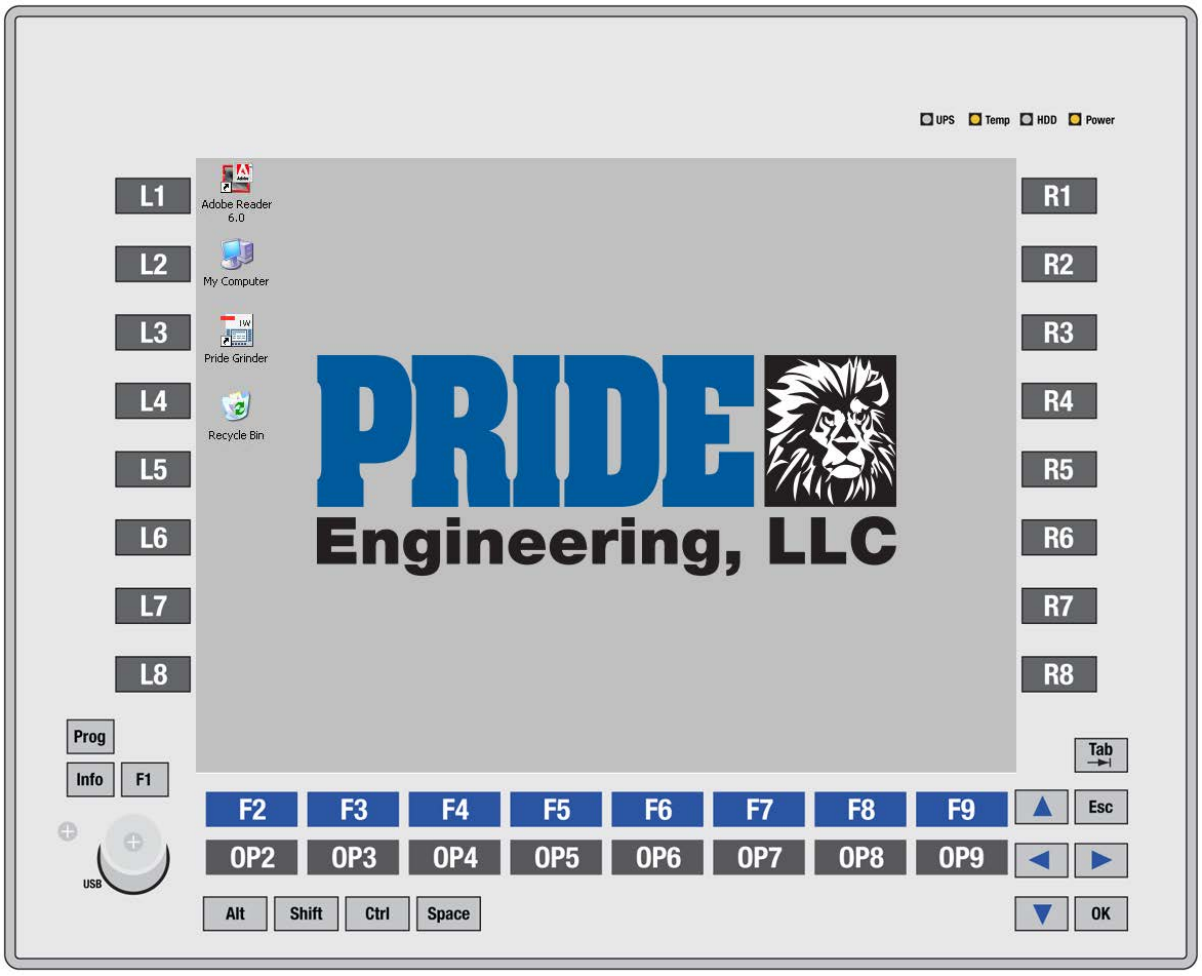
3. Verify air mount isolation mount pressure is 90 psig. (5.5 Bar) (The Regulator and Gauge are inside front cabinet door).

4. Check to be sure that the Emergency Stop button is not depressed. Turn the button clockwise (to the right) and it will release (pop out).

5. Turn on the main power switch on the right side of the grinder cabinet. The control will execute the boot-up sequence for its operating System.



6. After the grinder control has booted up use the Tracker Ball on the right of the control pedestal to highlight the “Pride Grinder” Icon on the opening screen.



You will need to return to the opening screen to have access to the definitions of error messages, the operating manuals for the Bosch Rexroth MTX control, IndraDives and NC Programming Manual as well as other programs. You can return to the opening screen by selecting the “Maintenance” (OP8), selecting “Close Active Screen” (F9)and then selecting “Close IndraWorks” (F9).

You can now select the operating mode using the Key lock located left side, just below the E-Stop: Manual, MDI or Auto.

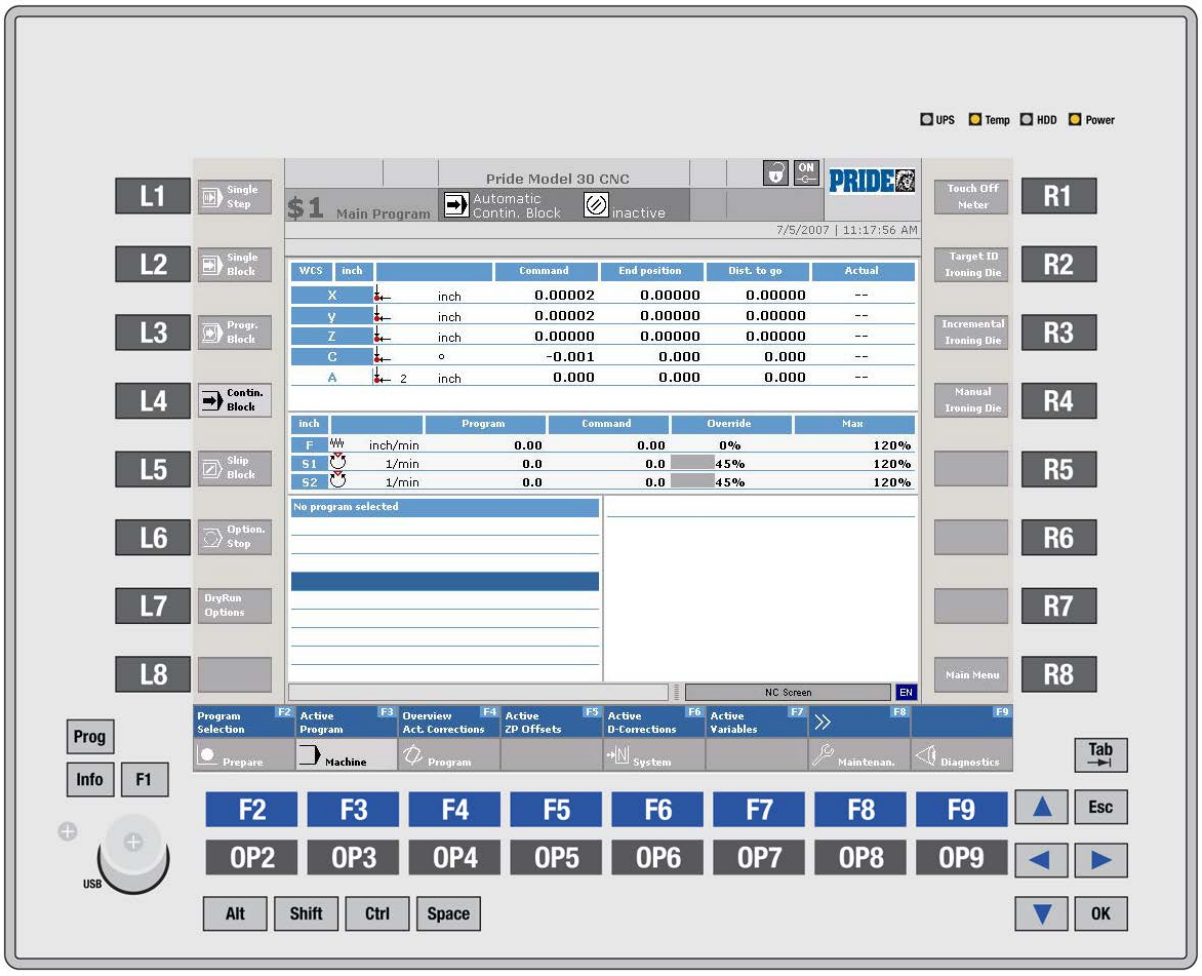
Man for moving (jogging buttons on left of Operator Control Panel) the axis movements manually. Needed for finding Z zero without Pride Touch.

MDI for entering and executing lines of code.

Auto for executing a selected program.

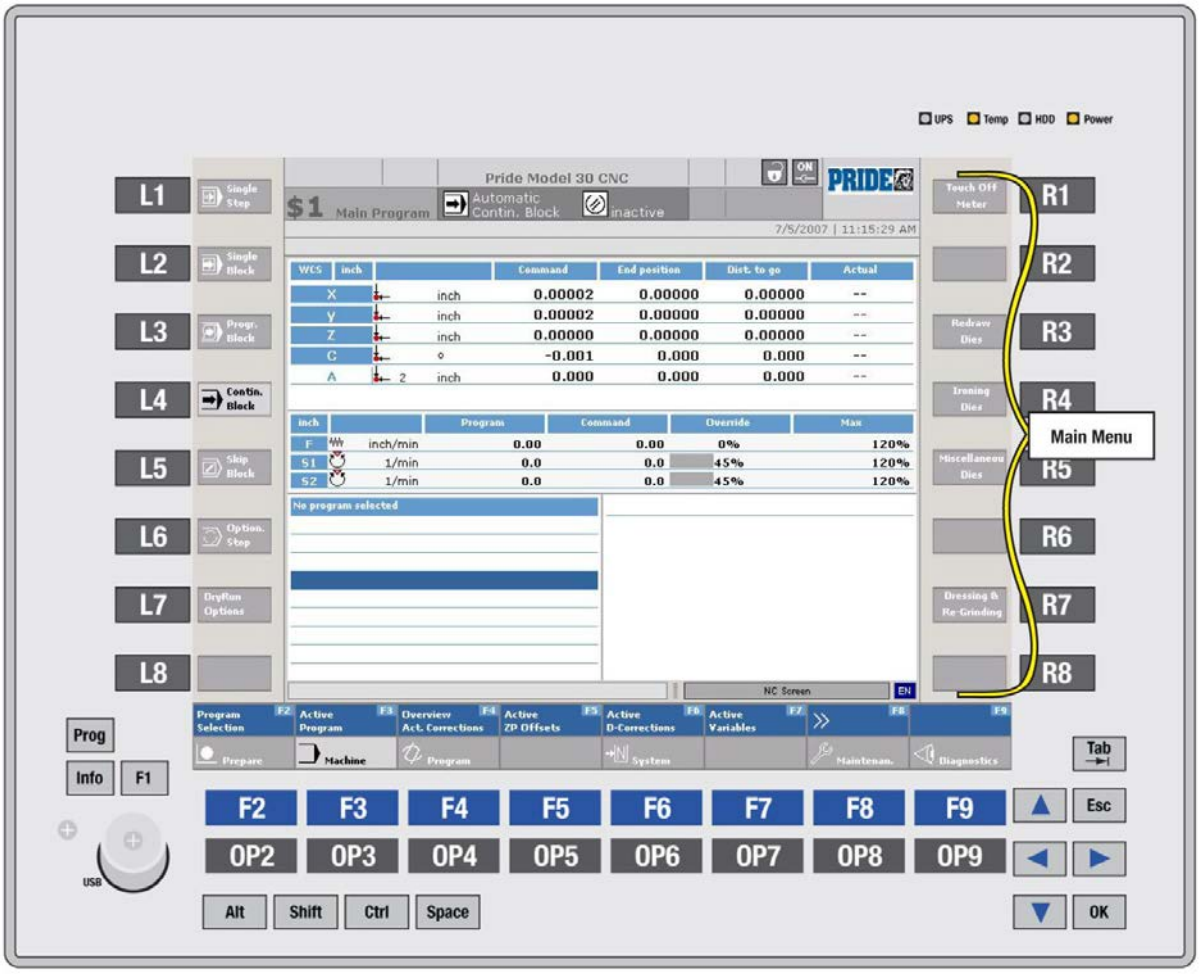
7. Choose Auto if wish to run a program.

8. The next screen you will see is the "Human Machine Interface" (HMI) screen (below) and it will show the Axis locations. The HMI screen will allow you to monitor the progress of the program you are running and the last command.



9. Depress and hold until small light in upper right corner of this button stays on.

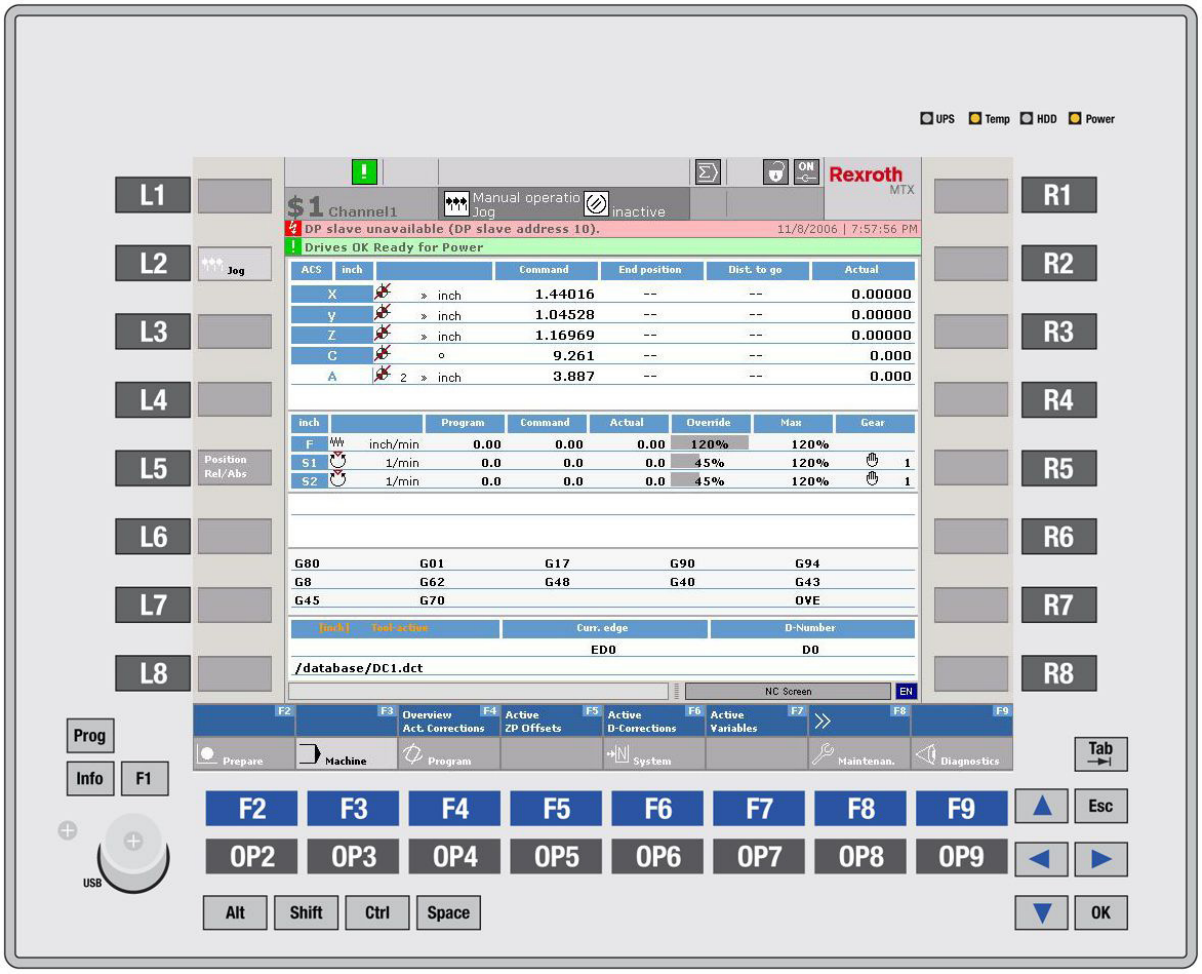
10. If you are not at the Main Menu, left click on the “Main Menu” on the lower right hand corner of the screen or depress the “R8” button which is just off the screen to the right of the “Main Menu”



11 . Select the desired Window from the alternatives on the right side of the screen. Notice the alternatives shown on the above screen are “Touch-Off Meter (Wheel Head Torque), Redraw Dies, Ironing Dies, Miscellaneous Dies and Dressing & Re-Grinding”.

3.5 WORK HEAD POSITIONING C, X, & Y AXIS

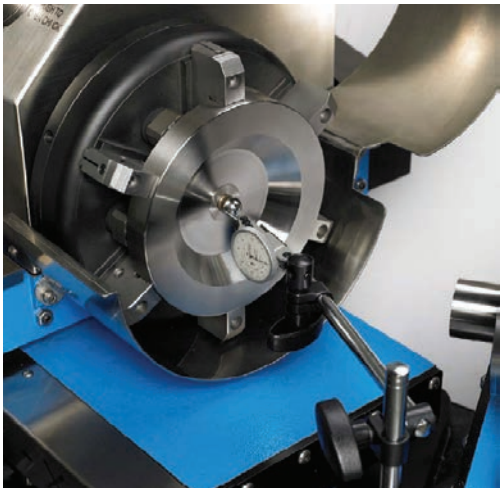
1. At the opening screen select the “Grinder Set Up”.
2. Turn the key to the “Man” mode. The Screen will show “Manual” at the top of the screen.



3. Load 6 Inch tooling ball fixture (Pt. No. 19-127) into chuck. If using a 6 Jaw Chuck, skip to step 6. Energize magnetic chuck to 25%.
4. Indicate tooling ball radially to within 0.0001 inches (2.5 µm) or better.
5. Turn chuck on to full power.
6. Move the indicator 0.5 inches (12.7mm) away from the tooling ball to serve as a visual reference while aligning the swing point of the tooling ball.
7. Manually operate the Rotary axis through 90 degree limits, and Jog the “X” and “Y” work head slides until the ball looks visually centered.
8. As the tooling ball gets closer to being centered, move the indicator closer to the ball. Finally the indicator can be moved to contact the tooling ball when the “X” & “Y” adjustments are visually close. Be careful with the indicator. Once the indicator is in contact with the ball you are ready for final adjustments.

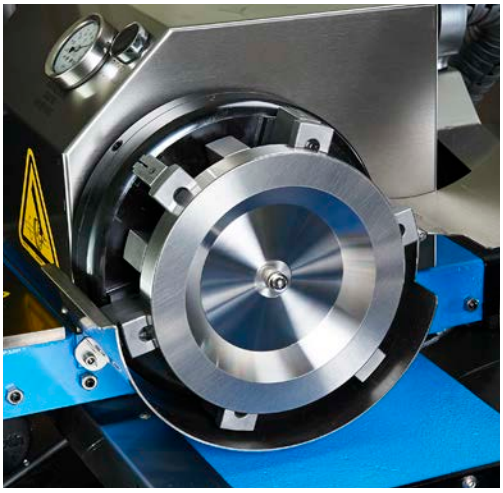
9. At this time it is important that the indicator tip be set at center height and 90 degrees to the direction which the tooling ball is to be rotated.

10. Continue to Jog the “X” & “Y” work head slides until the indicator does not move when rotating the Rotary axis through 90 degrees of travel.



6 JAW CHUCK WITH
6 INCH TOOLING BALL

6/7 INCH 6 JAW CHUCK WITH
6 INCH TOOLING BALL

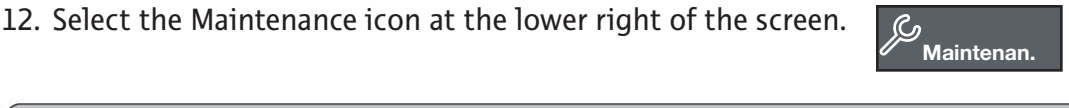


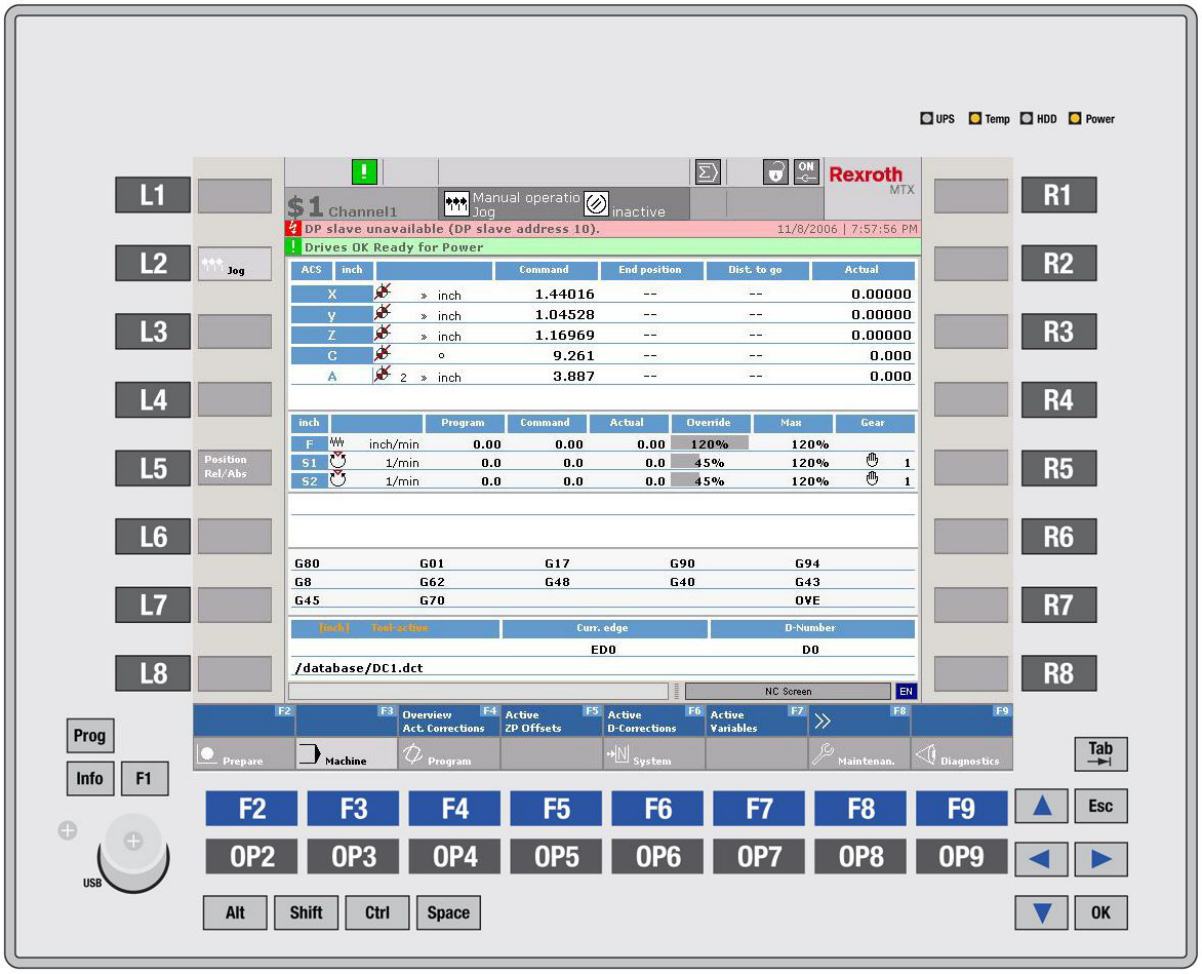
6/7 INCH 6 JAW CHUCK WITH
7 INCH TOOLING BALL

MAGNETIC CHUCK WITH
6 INCH TOOLING BALL

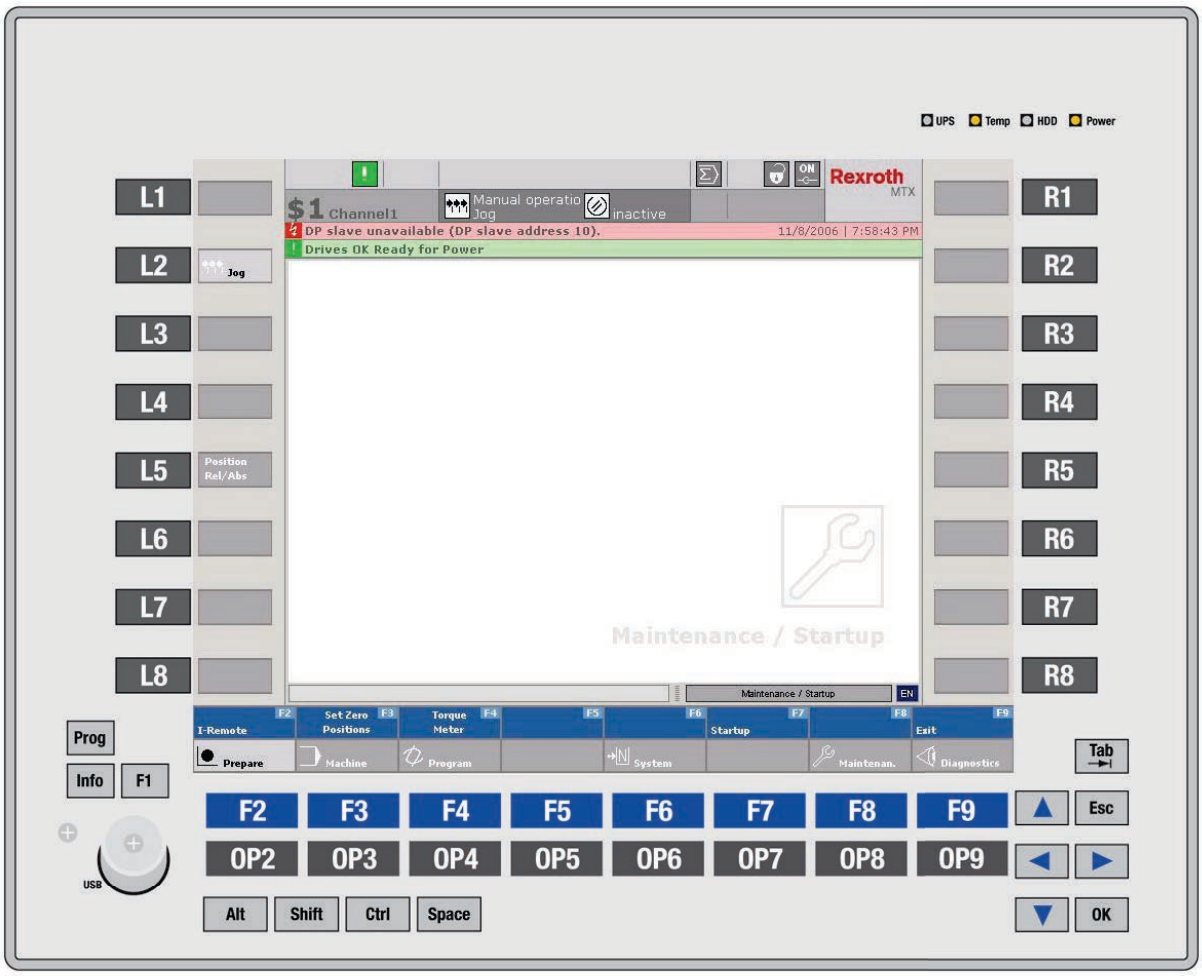
11. You are now on center with the “Y” axis and exactly 0.5000 inches (12.7mm) off the face of the chuck. You are ready to set zero accordingly.

12. Select the Maintenance icon at the lower right of the screen.

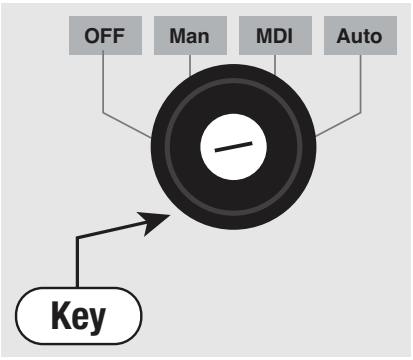




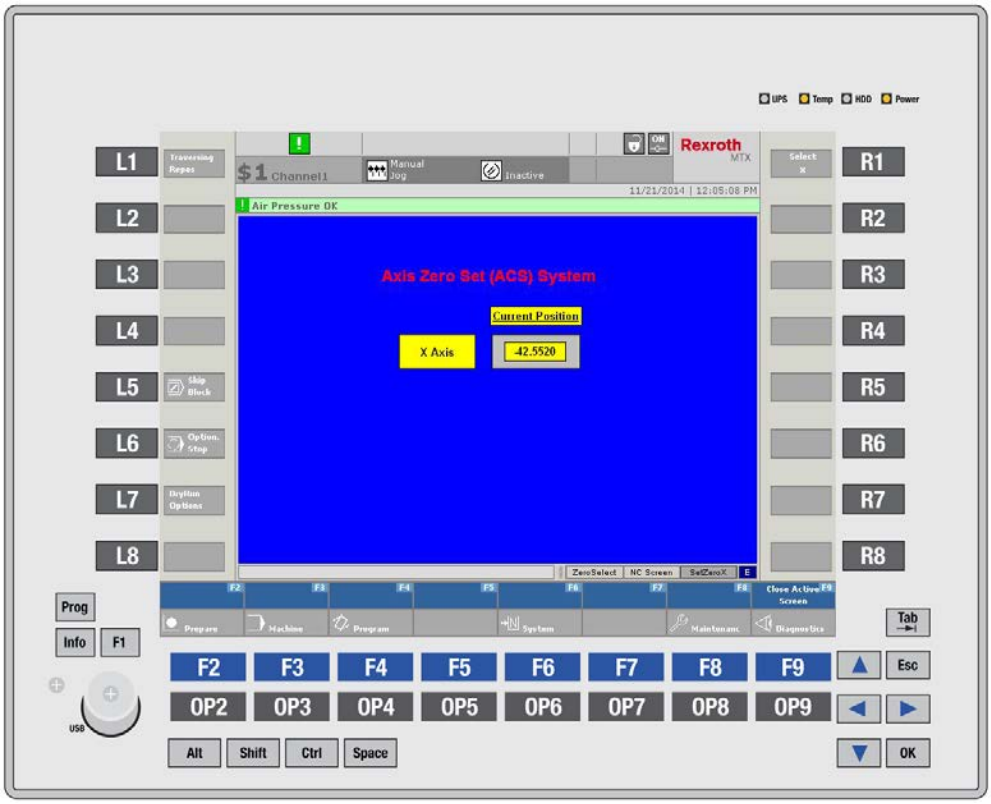
13. Select the Set Zero Positions icon (F3) at the lower left hand of the screen.

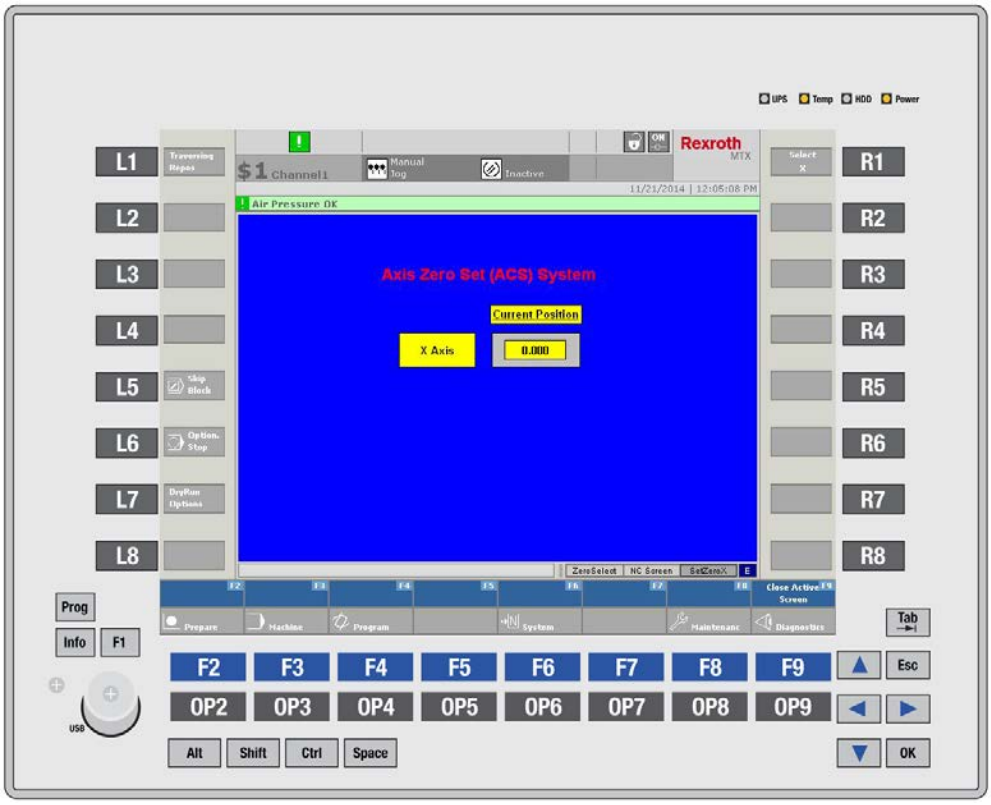


14. Turn the key to the Auto Mode.



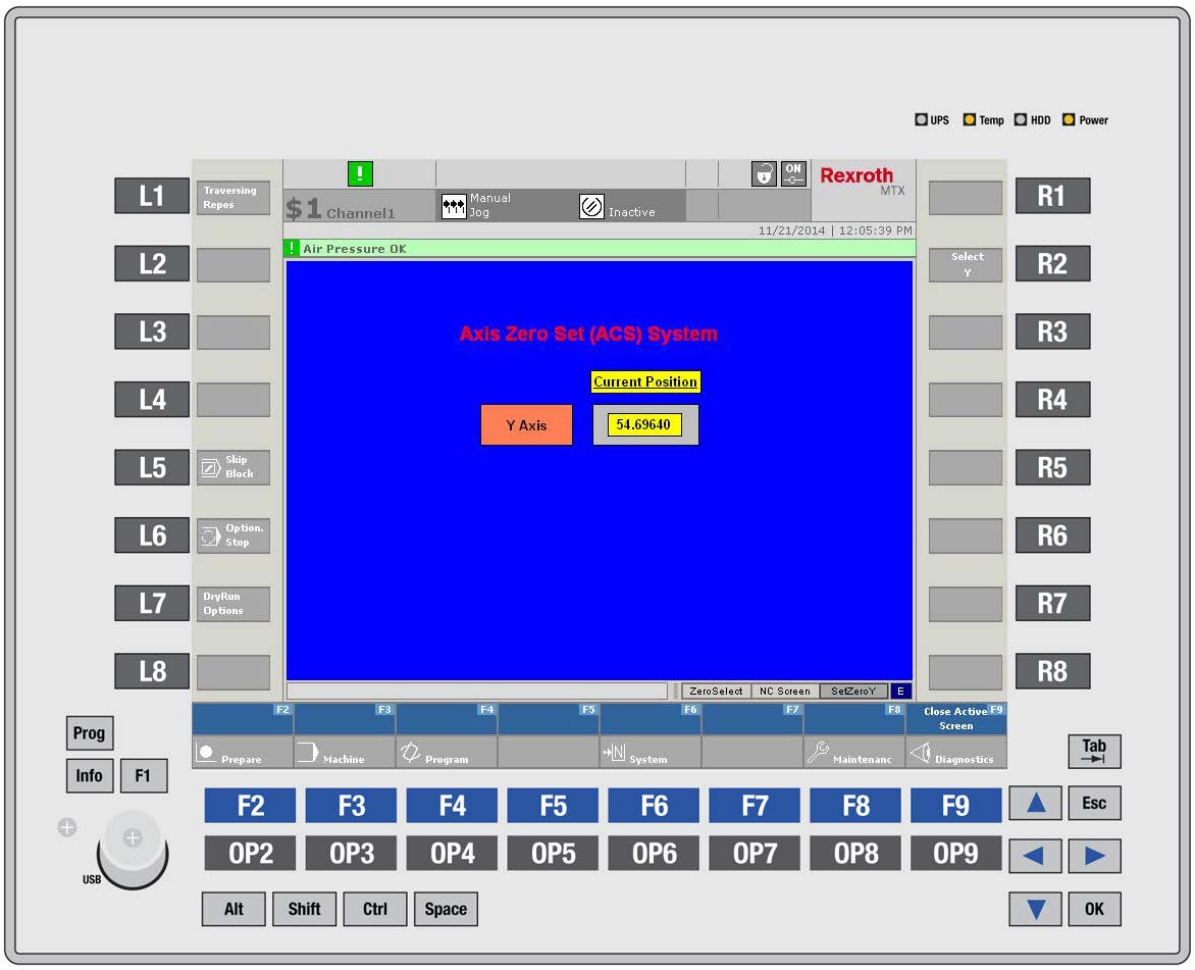
15. Select the X Axis by touching the gray icon that states “Select X” on the right side of the screen.





Notice that the “Current Position” of the X Axis resets to zero automatically after the Select X icon is touched. Select “Close Active Screen” (F9).

16. Select the Y Axis by touching the gray icon “Select Y”. Push the gray “Select Y” icon, it will automatically reset the Y-Axis at zero. Select “Close Active Screen” (F9).



You have now completed re-setting the tooling ball.

If you are using a 6/7 Inch Chuck, continue to the next step:

17. Load the 7 Inch Tooling Ball (Pt. No. 9-185) in the 7 Inch jaws.

18. Maintain the Y Axis position at the zero position set in Step 16 and the C Axis at 0 degrees.

19. Select the X Axis so that you can observe the current position and Jog the X Axis in the X- direction approximately 0.600 inches (15.24 mm).

20. Place the indicator tip on the tooling ball side closest to the operator.

21. Rotate the C Axis manually through 90 degrees and observe the indicator. Jog the X Axis until the indicator remains within +/- 0.0001 inches (0.0025 mm).

22. Record the X Axis current position value. This value will be used in any 7 Inch Re-Draw Die programs window.

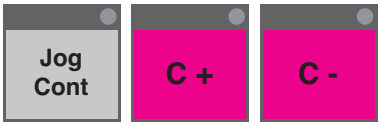
3.6 WHEEL HEAD POSITIONING A AXIS

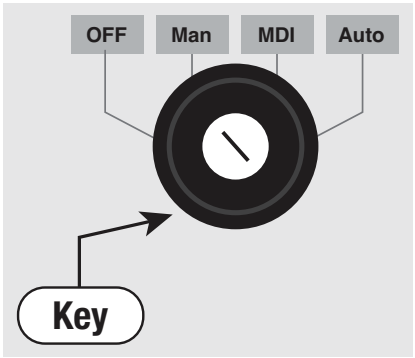
1. Jog A axis in the A - direction until within 0.25 inches (6 mm) of the axis travel limit.
2. Select Maintenance Icon (OP8).
3. Select Set Zero Position (F3)
4. Turn Key to the Auto position
5. Select A Axis (R5)
6. Select A Axis (R5) again and this will set A axis zero.

3.7 DRESSING THE GRINDING WHEEL

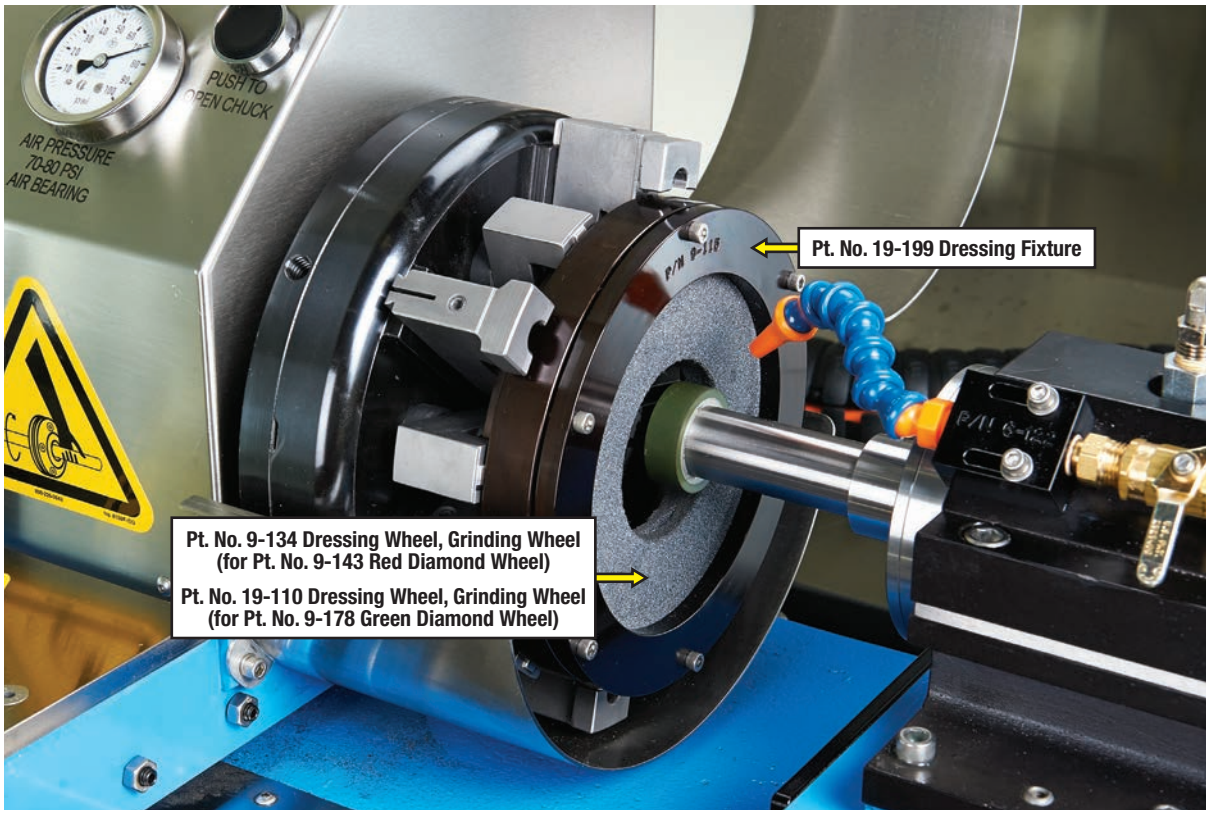
One of the first tasks to be performed when starting a new grinder is to dress the grinding wheel. Dressing the die grinding wheel is a manual hand wheel operation but first you must it set up. The grinding wheel should lose contact with the dressing wheel at both ends of its stroke which is the opposite of grinding dies where the grinding wheel should never lose contact with the die.

1. Select and install a grinding wheel. Suggested size: 1-½" diameter X ½" wide X ½" hole. Diamond wheel with 100% diamond concentration, depending on application.
2. Turn the Key to Manual
3. Use the Jogging keys to move the C (rotary) axis to zero (0° or 360°) degrees.



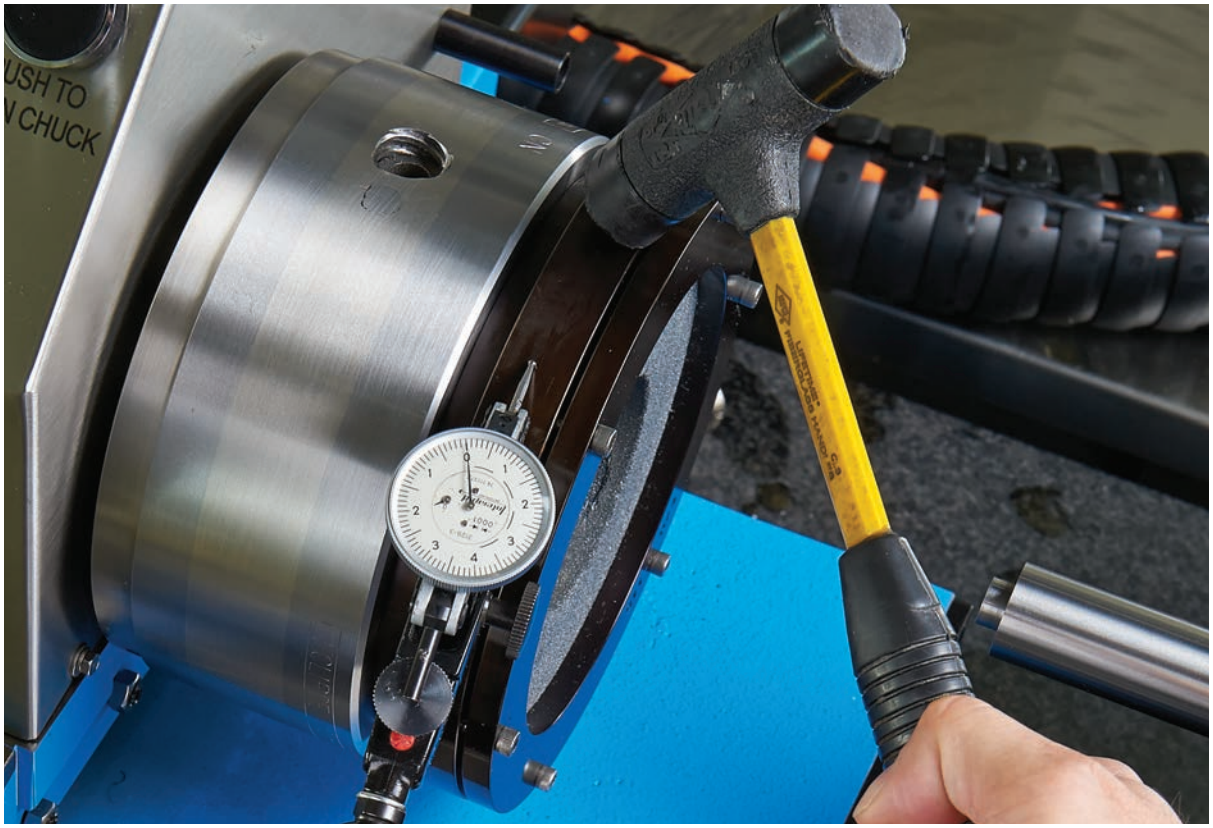


4. Install wheel dressing fixture on chuck in the same manner that a die is put on the chuck.

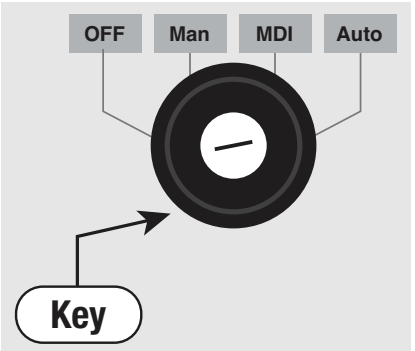


If the grinder has a magnetic chuck, energize chuck to 50% to allow for easy alignment of fixture and steps 4a. and 4b. If the grinder has a 6-Jaw chuck, skip to step 5.

a. Indicate the dressing fixture concentric within 0.0002 inches (5 µm) total indicator reading, with chuck rotating.

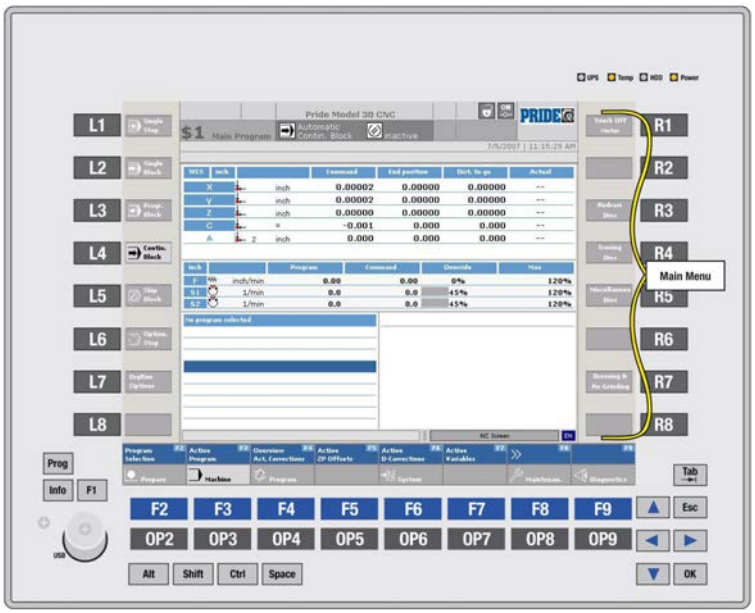


b. Energize magnetic chuck to full power.

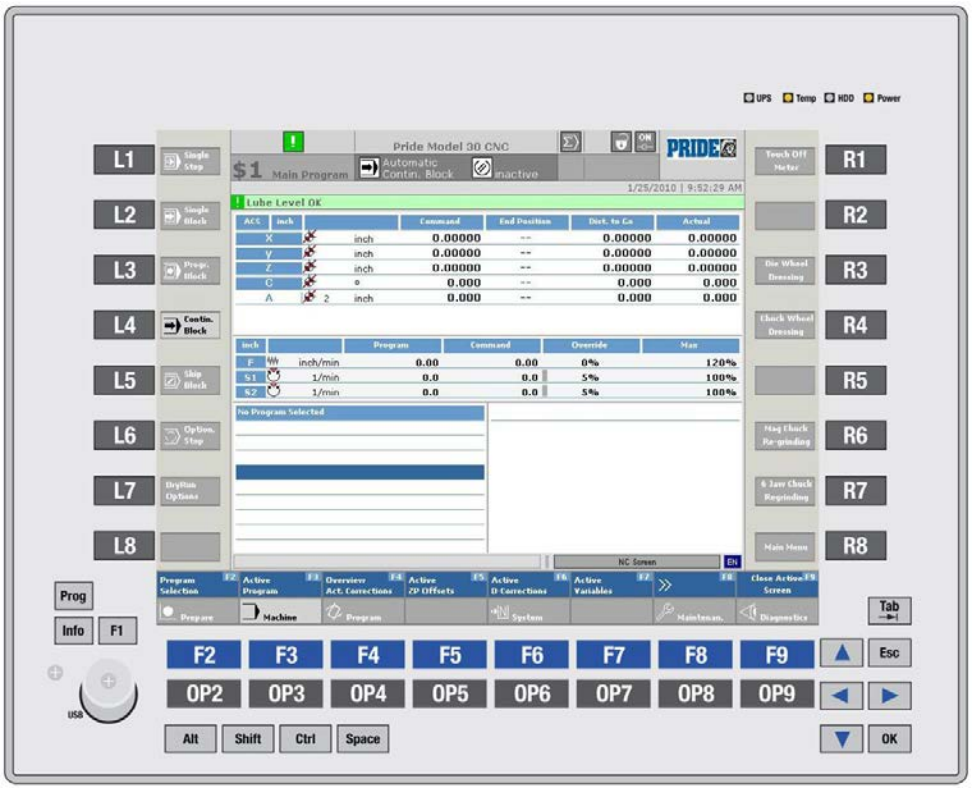


5. Turn switch Key to Auto

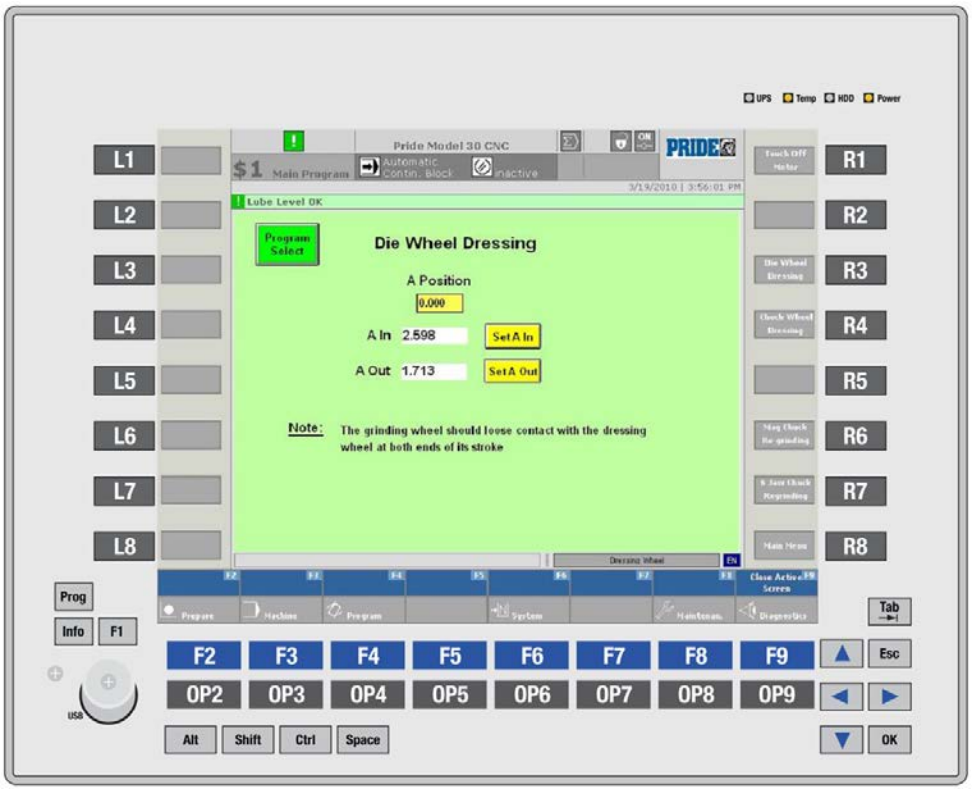
6. Bring up the **Main Menu (R8)** and the screen below will appear.



7. Select the **Dressing & Re-Grinding (R7)** program by using the Tracker Ball left button or depressing the **R7** button on the right. The screen below will come to appear.

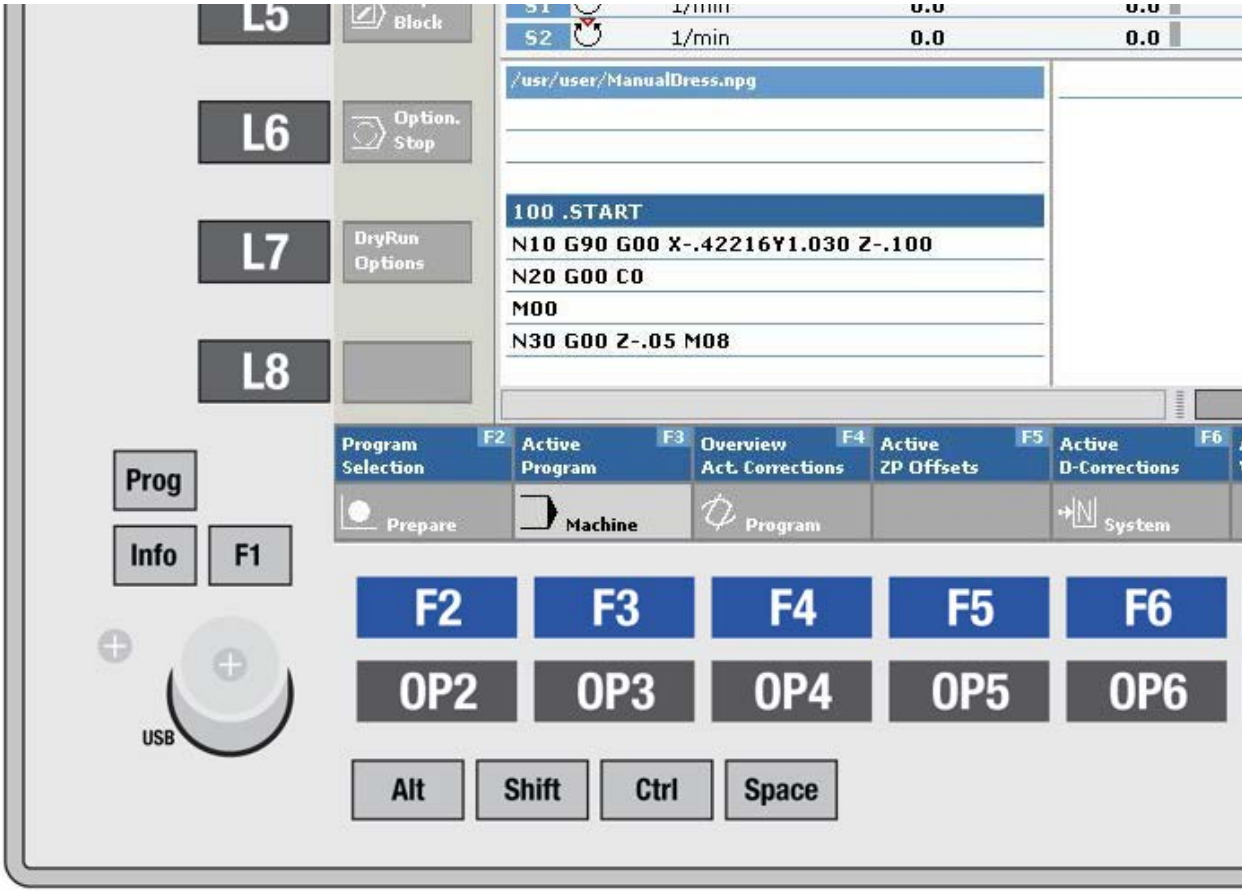


8. Select **"Die Wheel Dressing"** (R3). The screen below will come to appear.

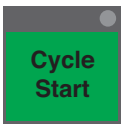


9. With the track ball, left click on the “Program Select” box in the upper left corner of the screen. With the tracker ball, depress and hold the left button on the “Program Select” box. The “Program Select” box will turn red and then grey. Keep the left tracker ball button depressed until it turns grey.

10. Select OP3 “Machine” and verify the header in lower left box reads: “/usr/user/ManualDress.ngp”, the file name for the wheel dressing program file.



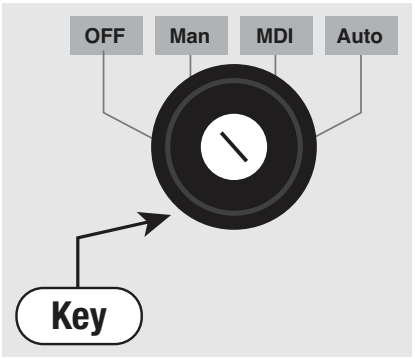
11. If “/usr/user/ManualDress.ngp” does appear as the selected program then push “Cycle Start” once. This will position the dressing fixture to the correct X and Y Position.



If “/usr/user/ManualDress.ngp” does not appear depress the “Control Reset” button on the operator panel, select **“Die Wheel Dressing” (R3)** again and repeat Steps 11 through 13.

12. Select the **“Die Wheel Dressing” (R3)** again so you may set the A In and A Out positions.

13. Switch the key lock to the “Man” position.

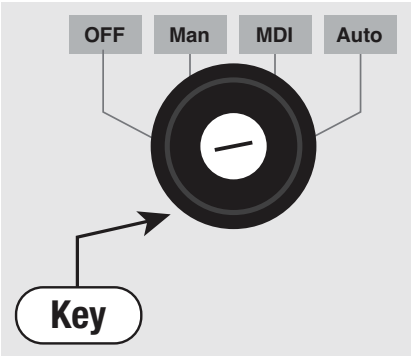


14. Using the jog keys on the operator panel, jog the A axis in (+) until the back edge of the diamond wheel clears the back edge of the dressing stone. When you are satisfied with **A In** position click on the "Set A In" button in the screen. This will transfer the position to the "A In" box.

15. Repeat the process using the jog keys on the operator panel, Jog A to get the A Out position. Make sure the front edge of the diamond wheel clears the front edge of the dressing stone. When satisfied with the position click the "Set A Out" button in the screen. This will transfer the position to the "A Out" box.

> **The grinding wheel should lose contact with the dressing wheel at both ends of its stroke.**

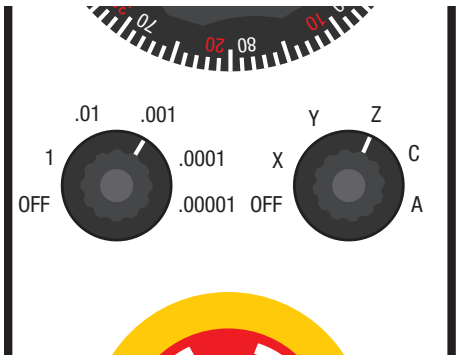
16. Return the key lock switch to the "Auto Position".



17. You are ready to start dressing the wheel. Select OP3 "Machine" and verify header in lower left box reads: "/usr/user/ManualDress.ngp", as on the screen below.

This program uses the Hand Wheel to control the Z axis.

18. Position coolant supply nozzle directly over contact point of wheel and dressing stone.



19. Depress “Cycle Start” two times. The spindle motors will start and the A axis will start oscillating

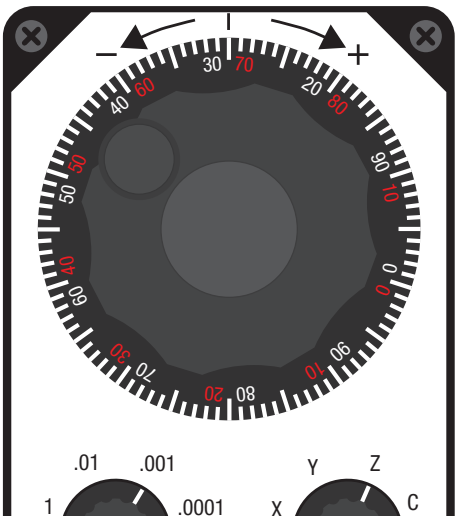
20. When the Diamond Wheel is oscillating in and out of the dressing fixture depress “Cycle Start” once more and this will activate the Hand Wheel enabling you to move the Z axis.

21. Using the Hand Wheel turn the right (axis select) knob to the Z position.

22. Using the Hand Wheel turn the left (increment select) knob to the .0001 position.

Note: you may select the .001 increment until you get close to the work and then switch back to the .0001 increment when you start to dress.

23. Using the large knob on the hand wheel feed the diamond wheel into the dressing stone one or two clicks at a time. Until the die grinding wheel is dressed.



24. When dressing is complete depress the “Cycle Start” again. This will send the A axis to the home position and stop the spindles

25. Check grinding wheel for run out. If the grinding wheel is not concentric or did not fully clean up run the dressing program again starting at step 20. Continue until you know your wheel has full clean up. You can use a marker to mark the grinding wheel surface before dressing the wheel. There should be no marker visible after dressing the wheel if the grinding wheel is fully cleaned up.

3.8 DIE, SLEEVE AND BLADE GRINDING

The following symbols are used in the instructions for performing the intended grinding operations:

Designates the process step. Perform the steps by following the sequence indicated by these numbers.

Indicates you should use the key board on the controller to enter data.

Indicates you should press the button identified by the arrow.

Indicates you should repeat the step.

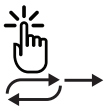
Indicates you should verify the item as directed by the arrows.

Symbol for equals.

Indicates you should use the right mouse button to select the item indicated.

Symbol for does not equal.

Indicates you should hold down the right mouse button until the indicated item reaches the result noted.

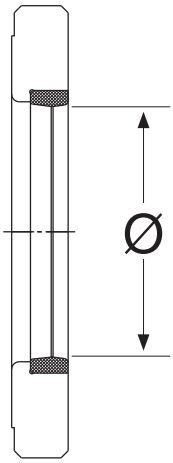


Indicates you should press the button until the result indicated by the arrow is achieved.

GRINDING WHEEL/SPINDLE SELECTION		
	Work Piece Chuck Type	**Grinding Wheel Size/Spindle**
Ironing Die	6 inch	1-1/2 inches/Short (6-182)
Ironing Die	6–7 inch	2 inches/Medium (6-207)
Pilot Die	6 inch	1-1/2 inches/Short (6-182)
Pilot Die	6–7 inch	2 inches/Medium (6-207)
Redraw Die 6 inch	6 inch	1-1/2 inches/Short (6-182)
Redraw Die 6 inch	6–7 inch	2 inches/Medium (6-207)
Redraw Die 7 inch	6–7 inch	2 inches/Medium (6-207)
Redraw Sleeve	6 inch	1-1/2 inches/Long (6-183)
Redraw Sleeve	6–7 inch	1-1/2 inches/Long (6-183)
Trimmer Blades	6 inch	1-1/2 inches/Medium (6-207)
Trimmer Blades	6–7 inch	1-1/2 inches/Medium (6-207)

3.8.1 SETTING "Z" ZERO

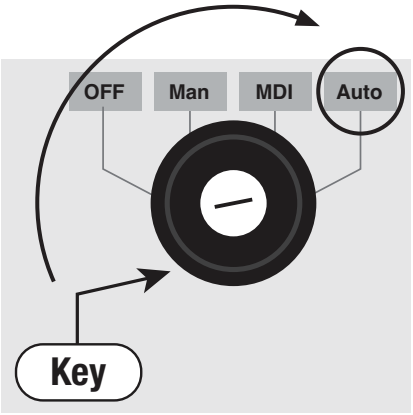
1



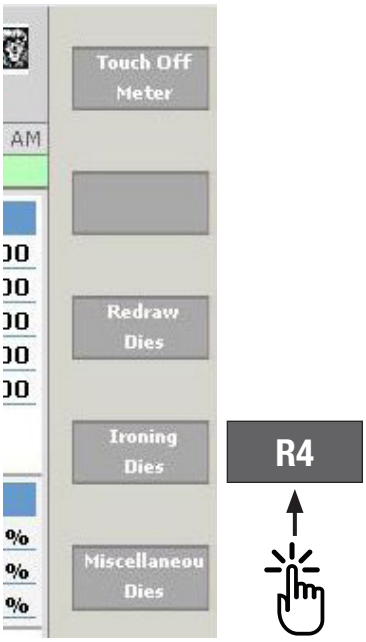
> Please note that these instructions utilize an **Ironing Die** to set Z Axis Zero.

2

3



4



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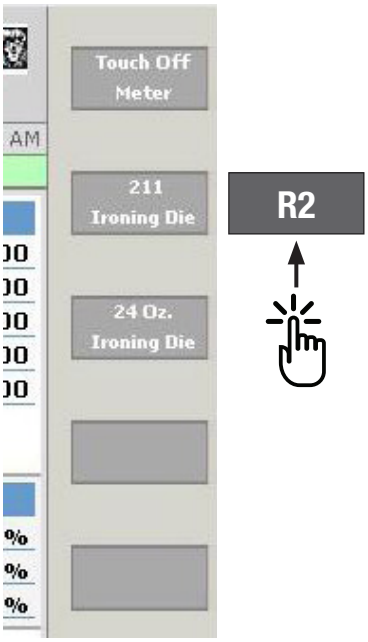
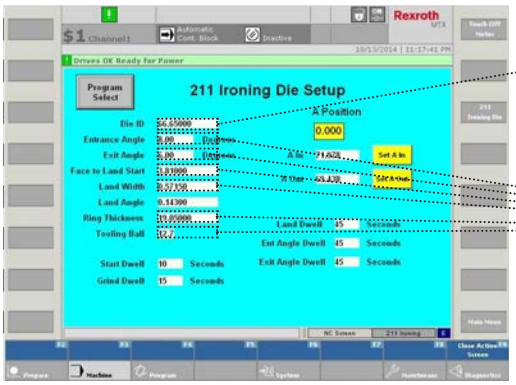
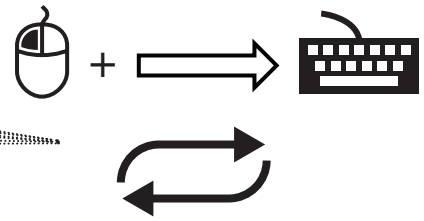


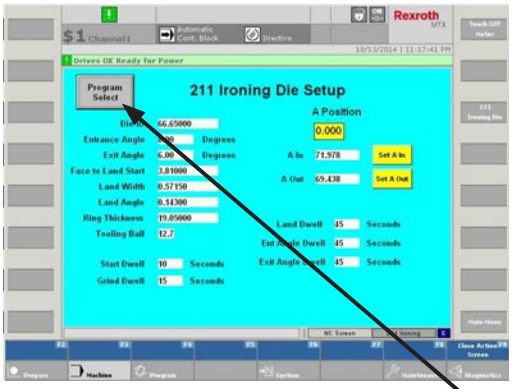
6



= Ø Actual X.XXXXX

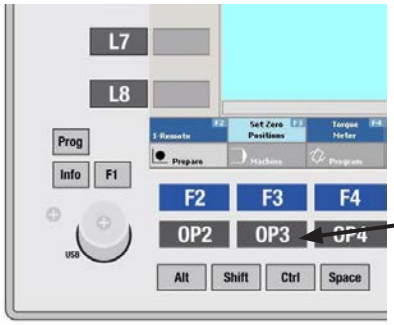


7

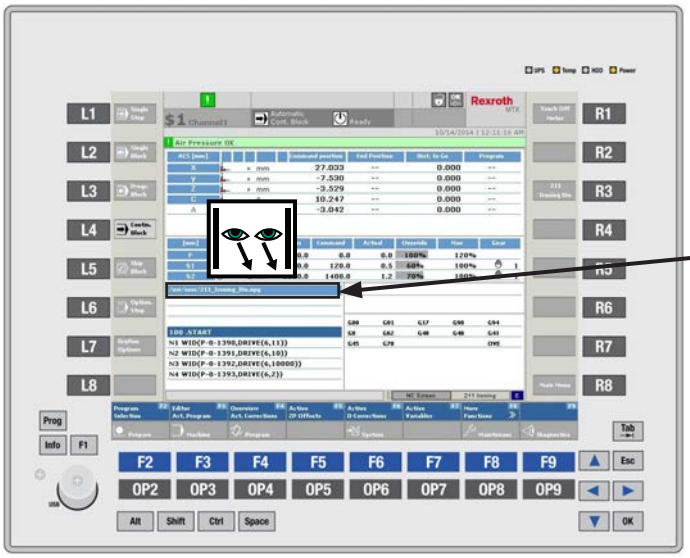


Program Select → Program Select → Program Select

8



9



7

≠

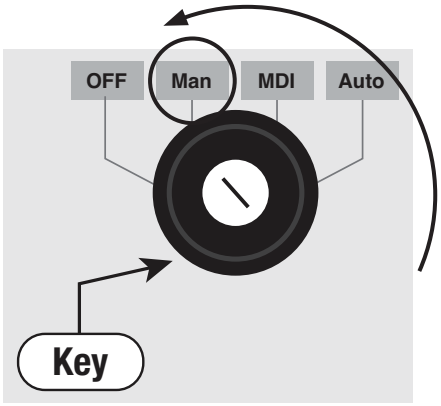
/usr/user/211_Ironing.npg ?

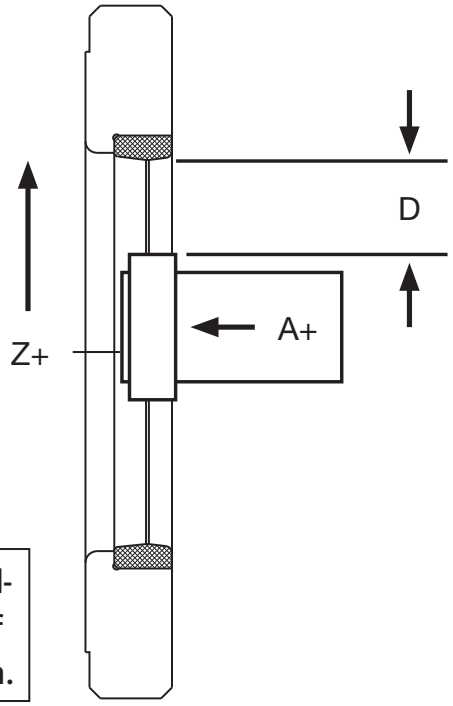
=

10

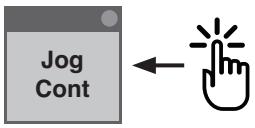
Cycle Start

11

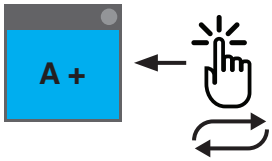




12

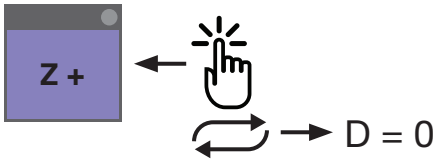


13



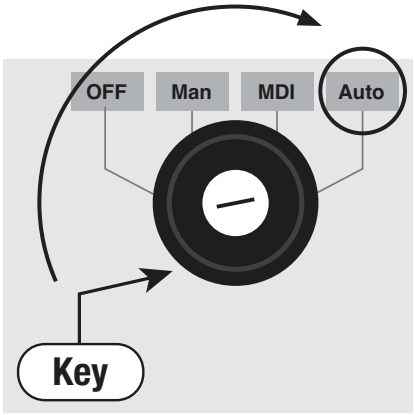
> Jog A+ to center grinding wheel on center of ironing die land width.

14

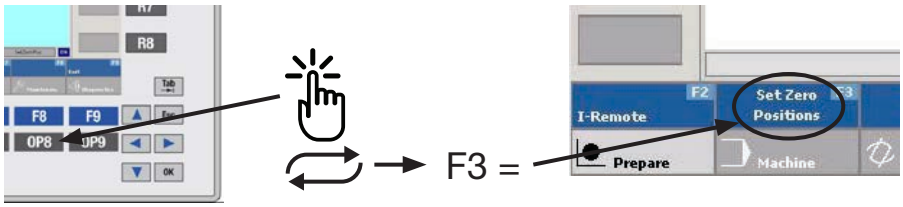


> Hand spin the work piece while using the Z+ Jog keys to move the grinding wheel until the wheel touches the work piece and just starts to spin due to contact with the spinning work piece.

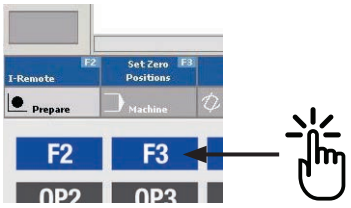
15

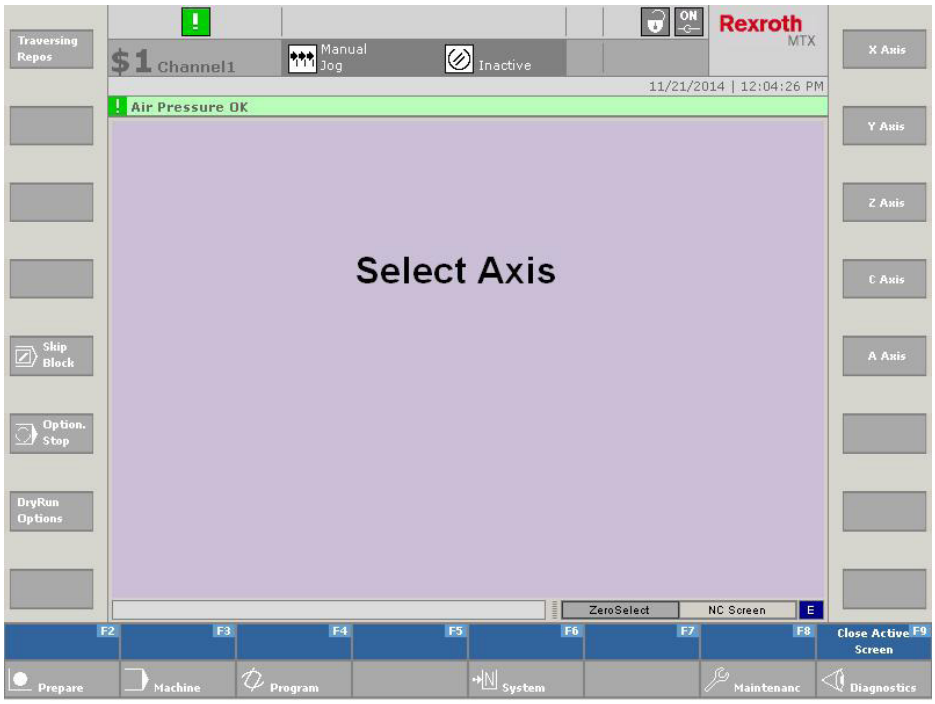


16

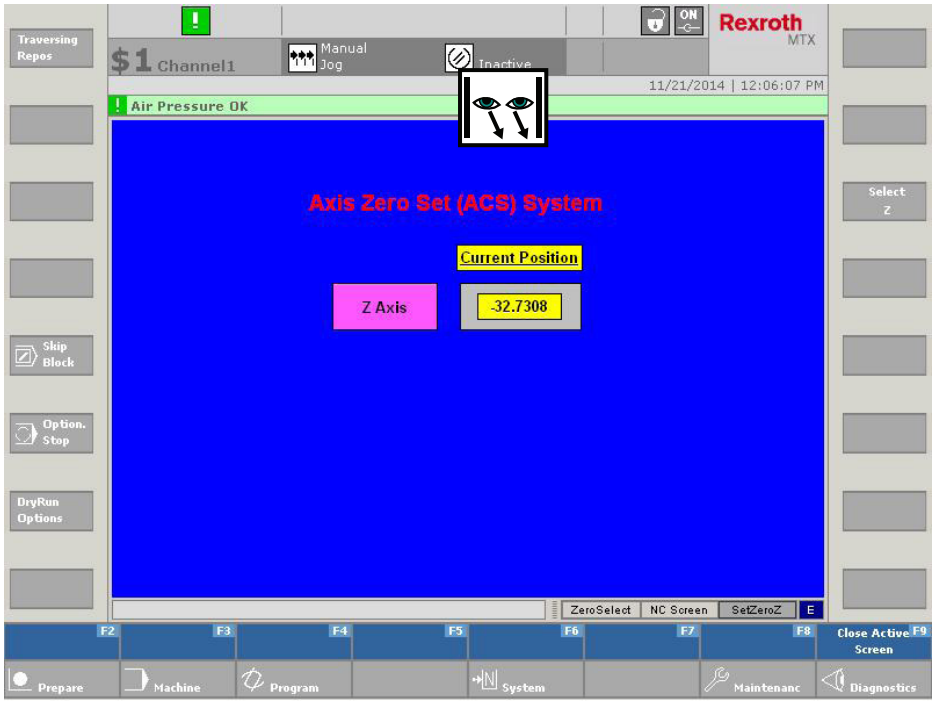


17





18



19

11

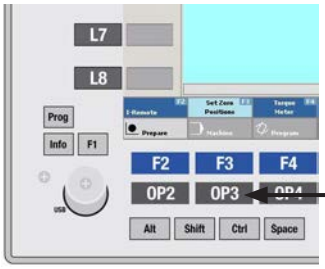
$Z \neq 0$

$Z = 0$

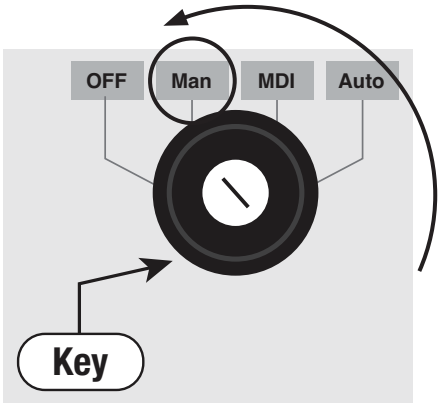
F9

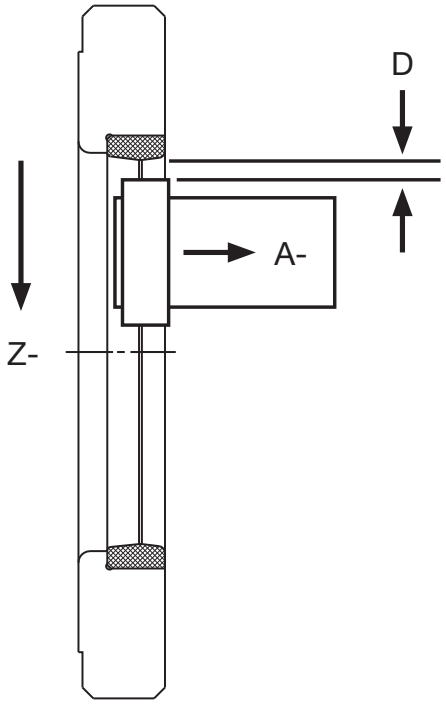
20

21

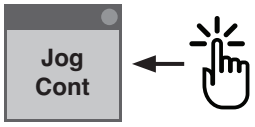


22

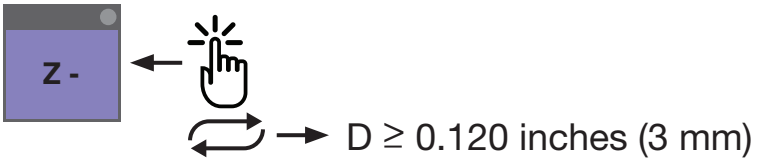




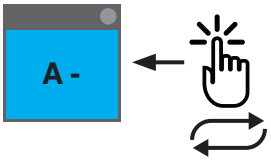
23



24

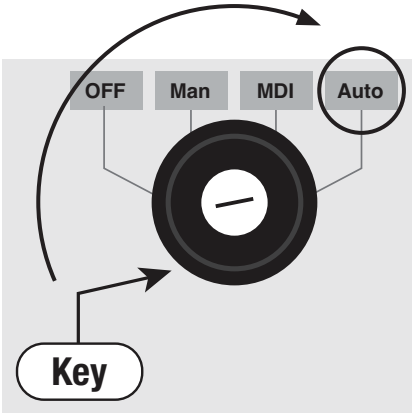


25



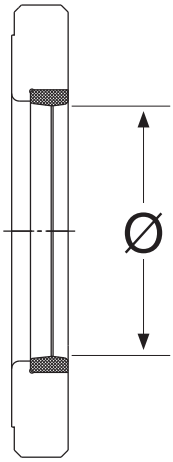
Jog A- until it stops. The control may show an error when the end of the A axis travel is reached.

26



3.8.2.1 Ironing Die Grinding – Set Up

1

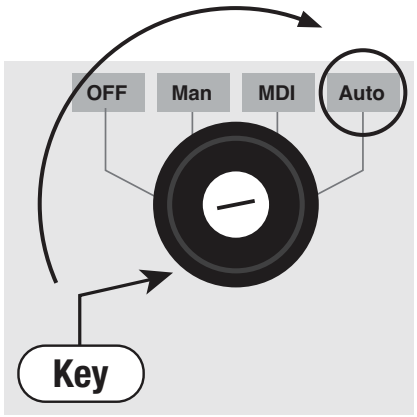


> **Please note that these instructions utilize the 211 Ironing Die as an example.** You will need to choose the appropriate program for the die you are setting up to grind.

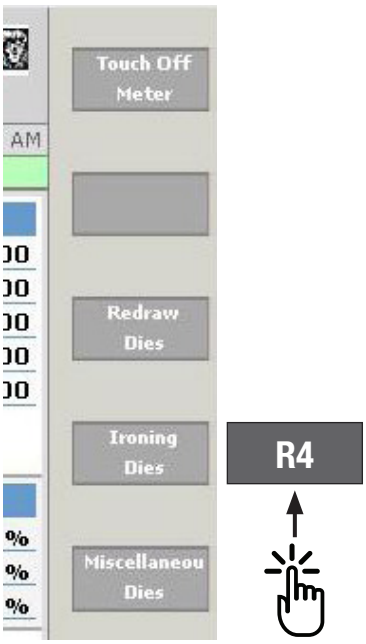
> Z Axis Zero must have been set prior to Step 1 of these instructions (refer to Section 3.8.1).

2

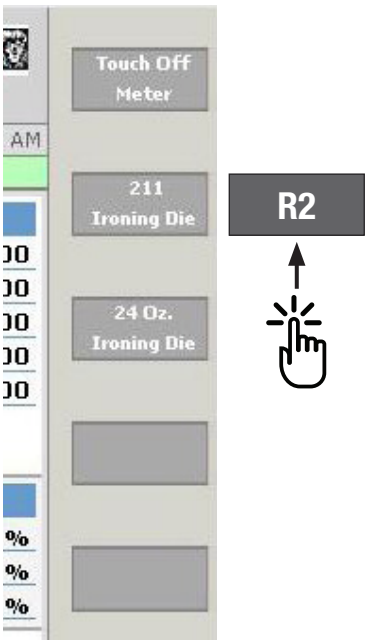
3



4

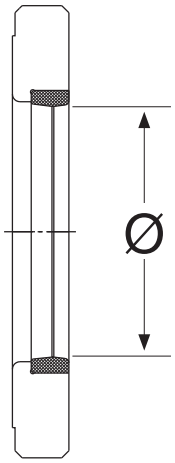


5

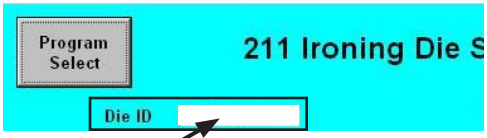


6

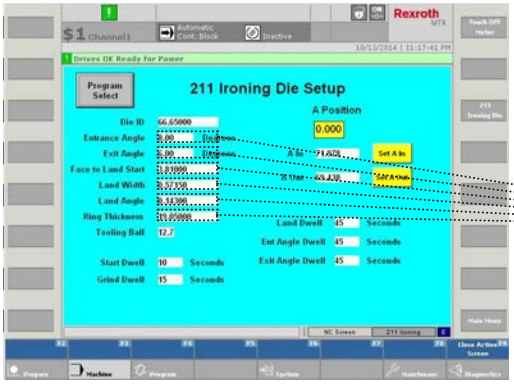
7



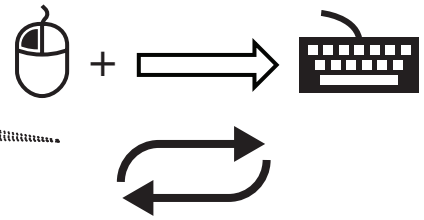
Ø + 0.015 mm (0.0006 in) =

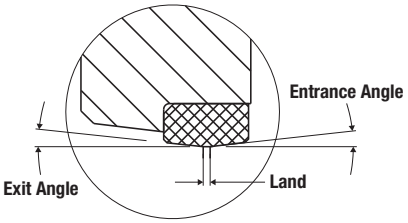


8

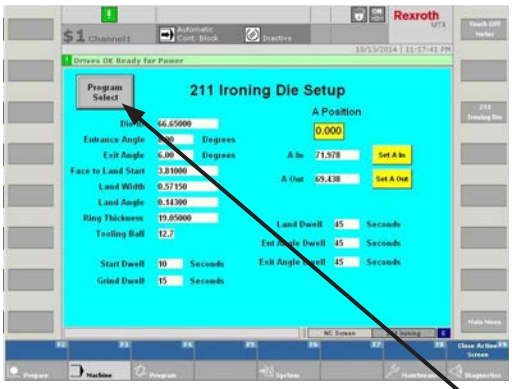


X.XXXXX



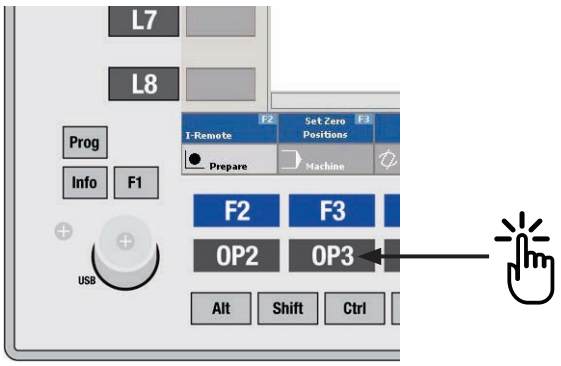


9

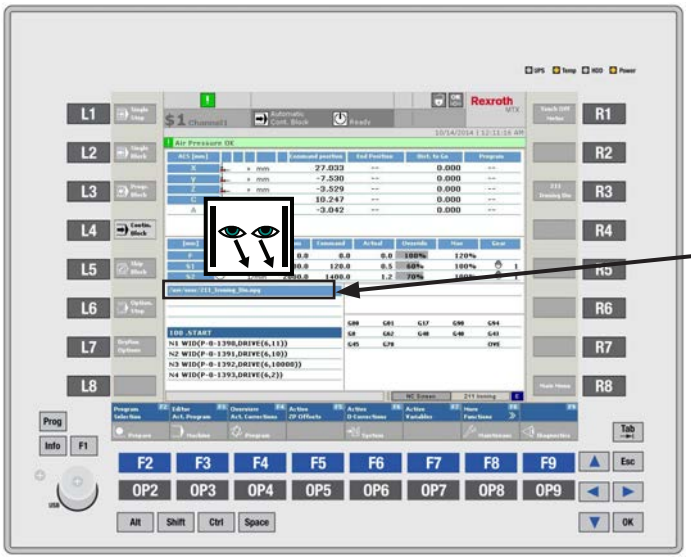


Program Select → Program Select → Program Select

10



11



9

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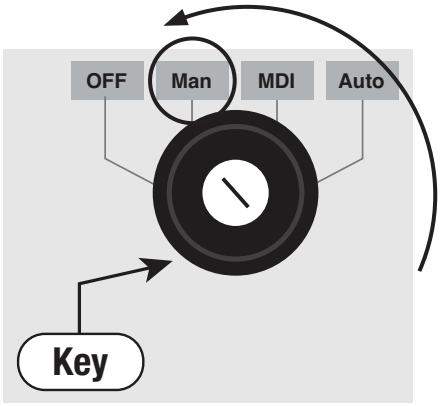
/usr/user/211_Ironing.npg ?

=

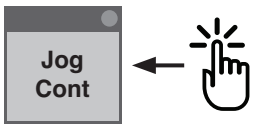
12

Cycle Start

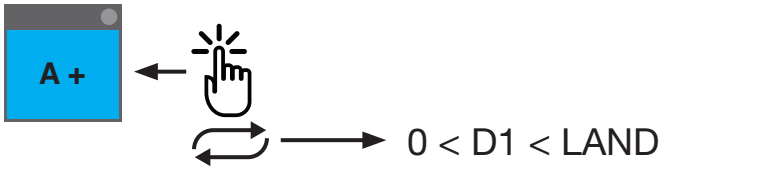
13

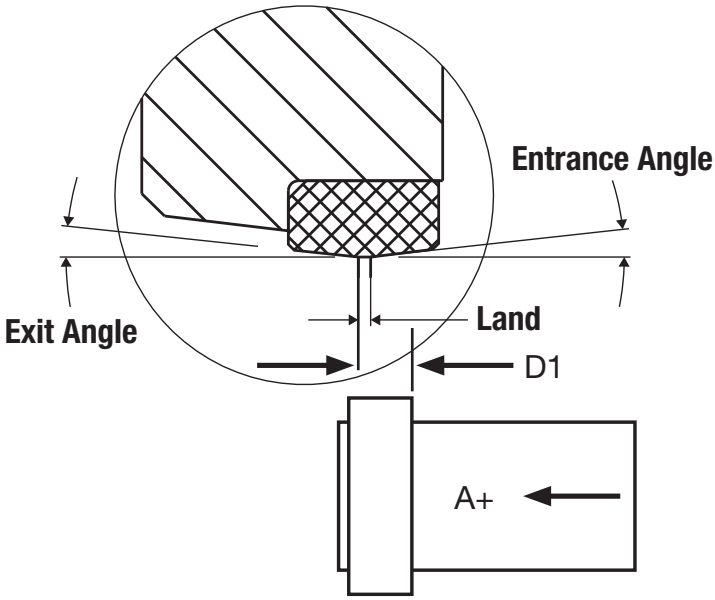

OFF
Man
MDI
Auto
Key

14

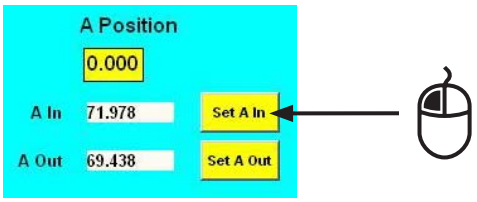

Jog
Cont

15

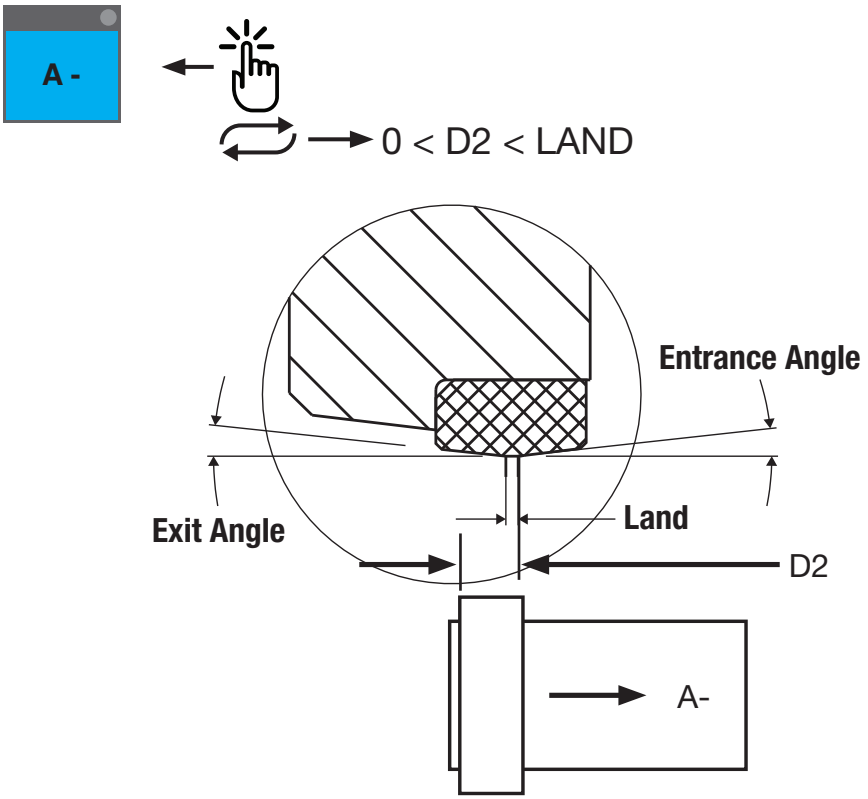

A +
0 < D1 < LAND


Entrance Angle
Exit Angle
Land
D1
A+

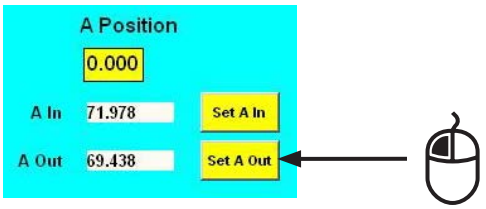
16


A Position
0.000
A In
71.978
Set A In
A Out
69.438
Set A Out

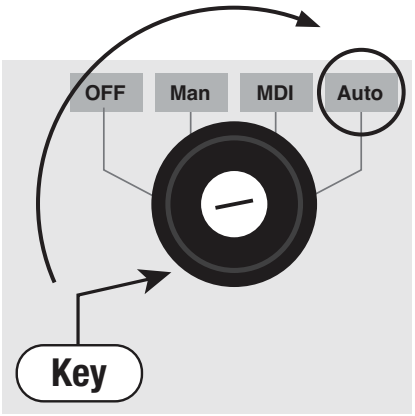
17



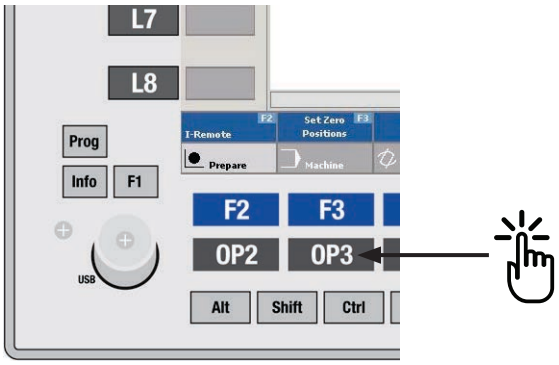
18



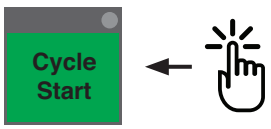
19



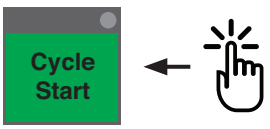
20



21

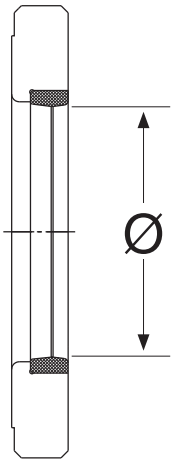


22



3.8.2.2 Ironing Die Grinding

1

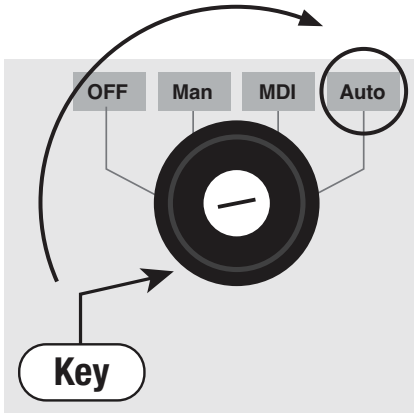


> **i** Please note that these instructions utilize the **211 Ironing Die as an example.** You will need to choose the appropriate program for the die you are setting up to grind.

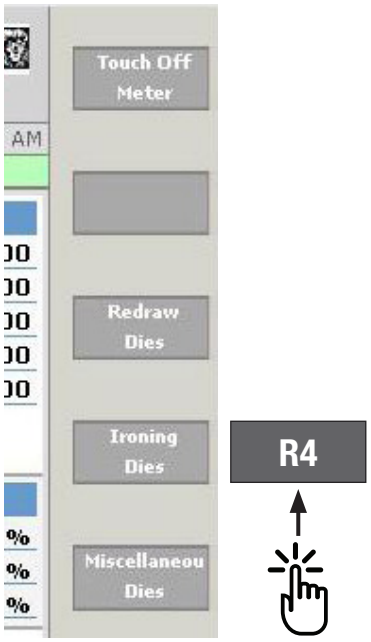
> **!** Z Axis Zero must have been set prior to Step 1 of these instructions (refer to Section 3.8.1).

2

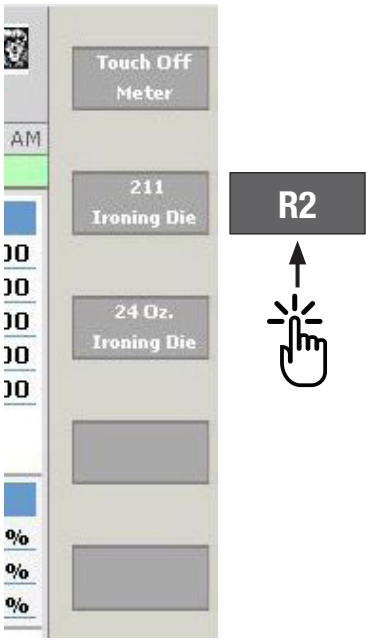
3



4

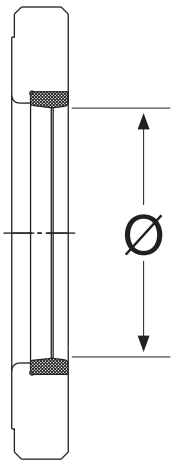


5

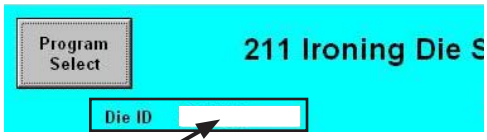


6

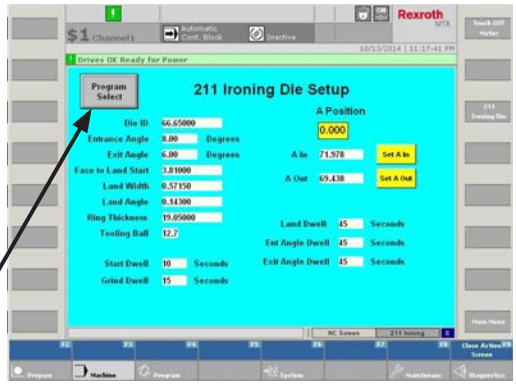
7



Ø + 0.0006 inches (0.015 mm)

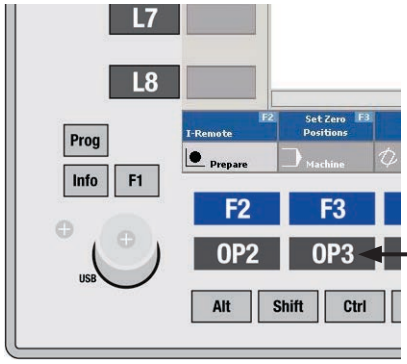


8



Program Select → Program Select → Program Select

9



8

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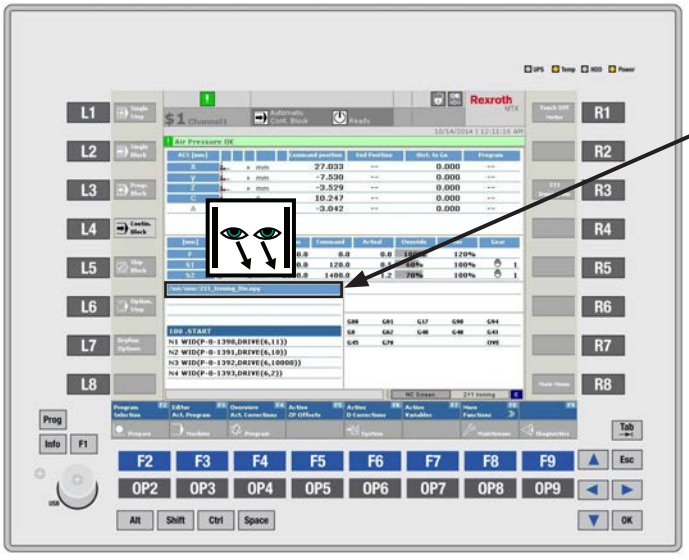
/usr/user/211_Ironing.npg ?

=

10

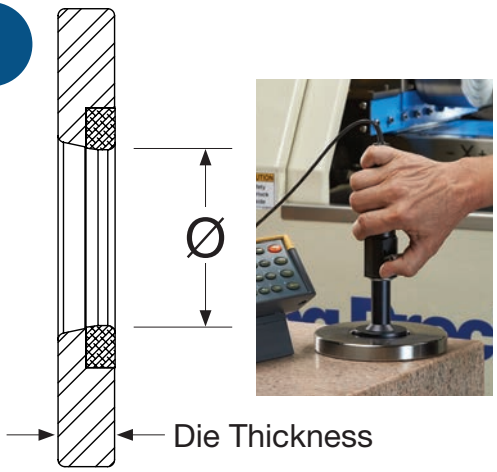


11 Cycle Start

12 Cycle Start

3.8.3.1 Redraw Die Grinding — Set Up

1

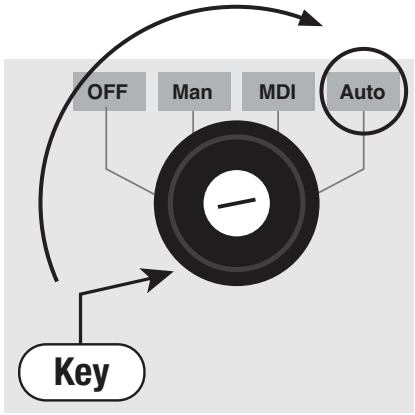


Please note that these instructions utilize the **211 Redraw Die as an example**. You will need to choose the appropriate program for the die you are setting up to grind.

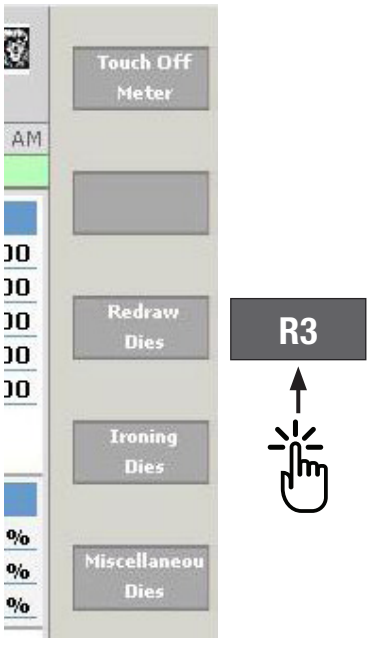
Z Axis Zero must have been set prior to Step 1 of these instructions (refer to section 3.8.1).

2

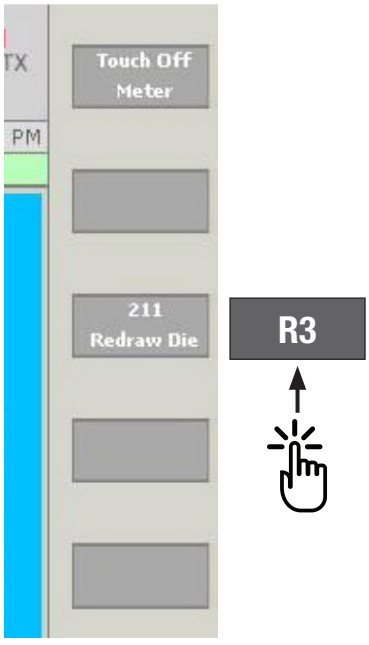
3



4

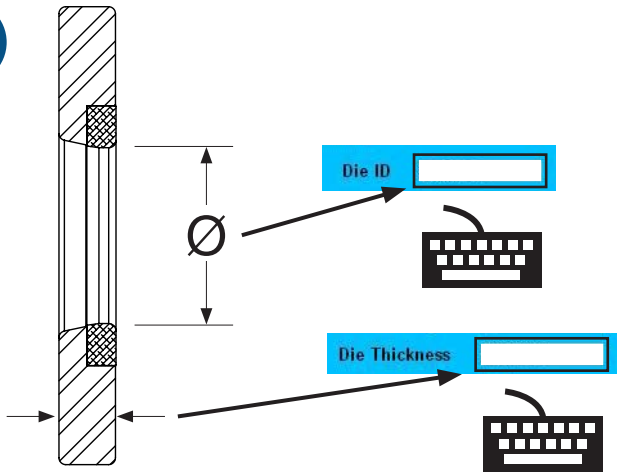


5



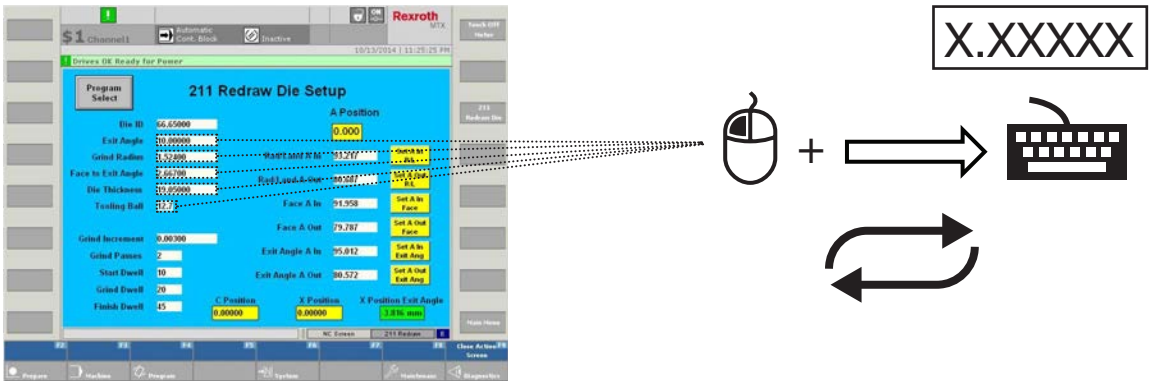
6

7

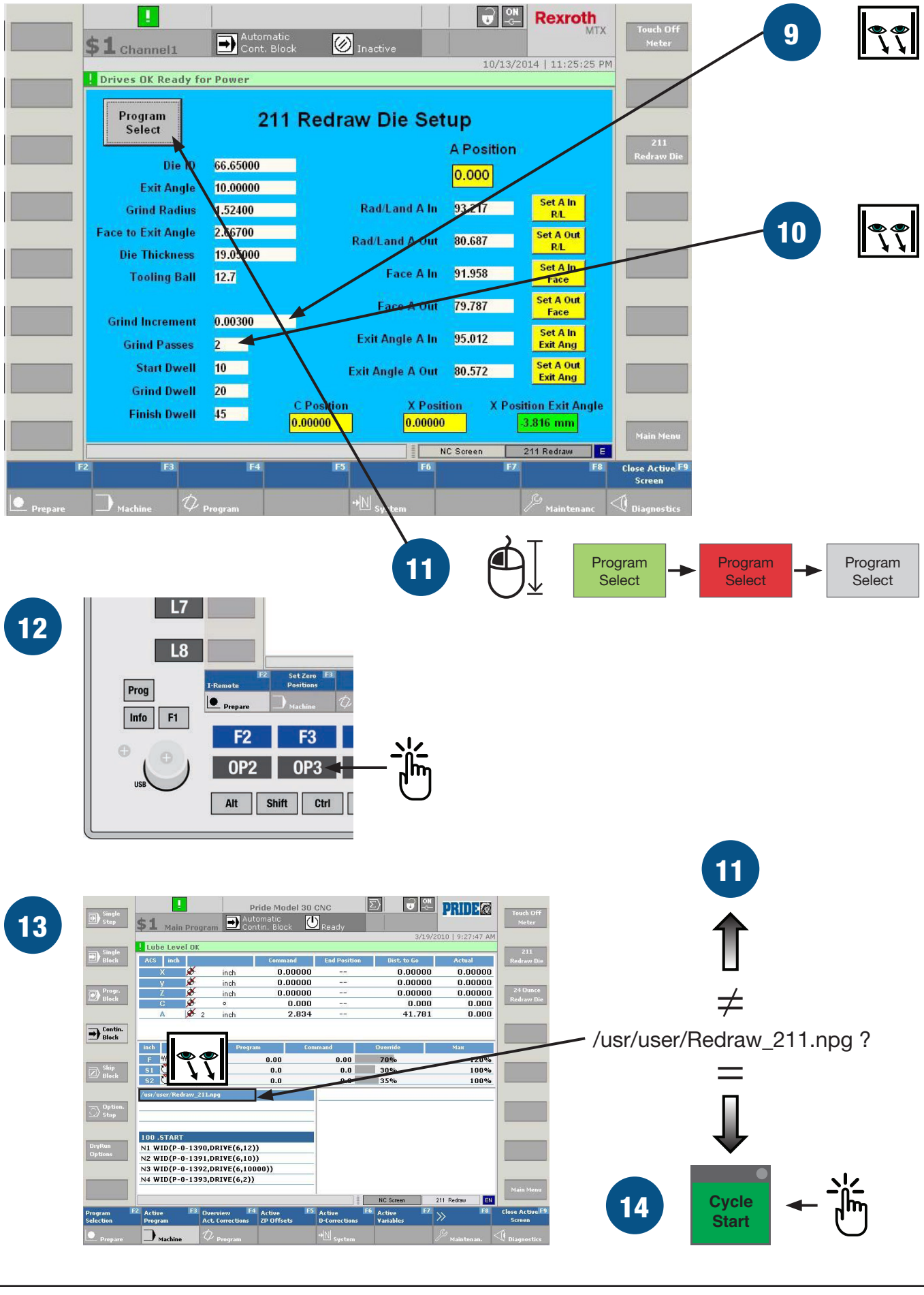


Enter actual Die Id and Die Thickness. Die thickness should be measured over the carbide insert area.

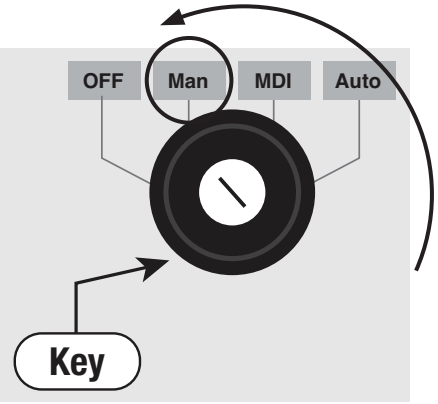
8



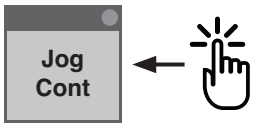
Please note we recommend removing enough material to increase the Die ID by 0.0004 – 0.0006 inches (0.010-0.015 mm).


Rexroth MTX
Automatic Cont. Block
Inactive
10/13/2014 | 11:25:25 PM
Drives OK Ready for Power
Program Select
211 Redraw Die Setup
A Position
0.000
Die ID 66.65000
Exit Angle 10.00000
Grind Radius 1.52400
Face to Exit Angle 2.66700
Die Thickness 19.05000
Tooling Ball 12.7
Grind Increment 0.00300
Grind Passes 2
Start Dwell 10
Grind Dwell 20
Finish Dwell 45
Rad/Land A In 93.217
Rad/Land A Out 80.687
Face A In 91.958
Face A Out 79.787
Exit Angle A In 95.012
Exit Angle A Out 80.572
Set A In R/L
Set A Out R/L
Set A In Face
Set A Out Face
Set A In Exit Ang
Set A Out Exit Ang
C Position 0.00000
X Position 0.00000
X Position Exit Angle 3.816 mm
Touch Off Meter
211 Redraw Die
Main Menu
NC Screen
211 Redraw
Close Active Screen
Prepare
Machine
Program
Maintenanc
Diagnostics
9
10
11
Program Select
Program Select
Program Select
12
L7
L8
Prog
Info
F1
F2
F3
OP2
OP3
Alt
Shift
Ctrl
USB
I-Remote
Set Zero Positions
13
Pride Model 30 CNC
PRIDE
Main Program
Automatic Contin. Block
Ready
3/19/2010 | 9:27:47 AM
Lube Level OK
/usr/user/Redraw_211.npg
100 .START
N1 WID(P-0-1390,DRIVE(6,12))
N2 WID(P-0-1391,DRIVE(6,10))
N3 WID(P-0-1392,DRIVE(6,10000))
N4 WID(P-0-1393,DRIVE(6,2))
11
≠
/usr/user/Redraw_211.npg ?
=
14
Cycle Start

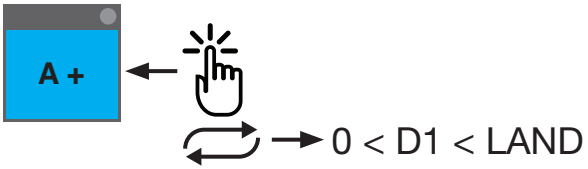
15

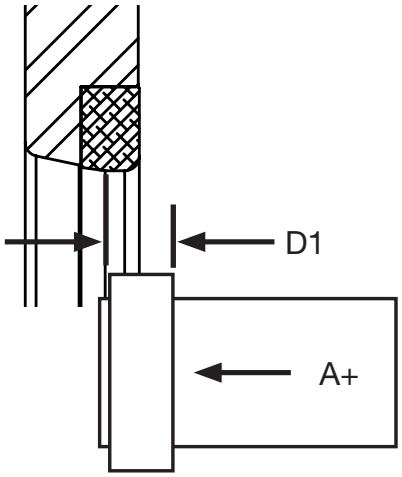


16

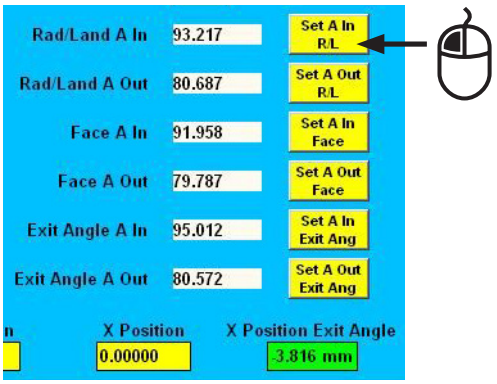


17

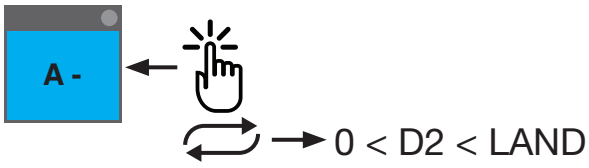


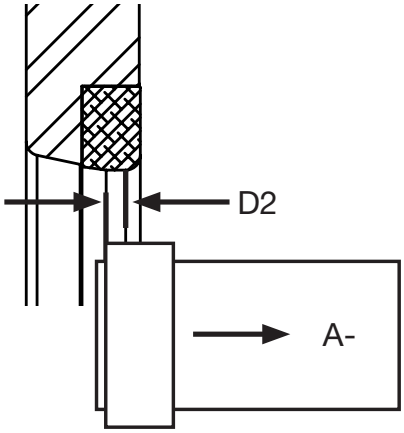


18

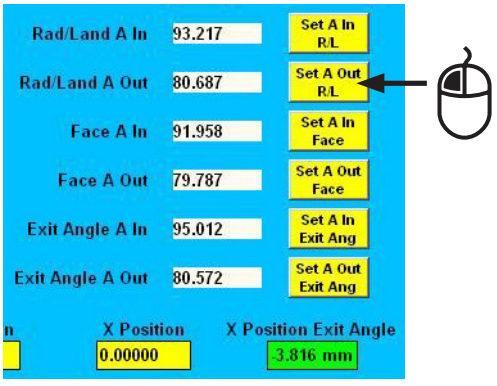


19

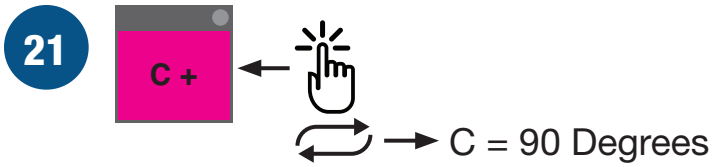


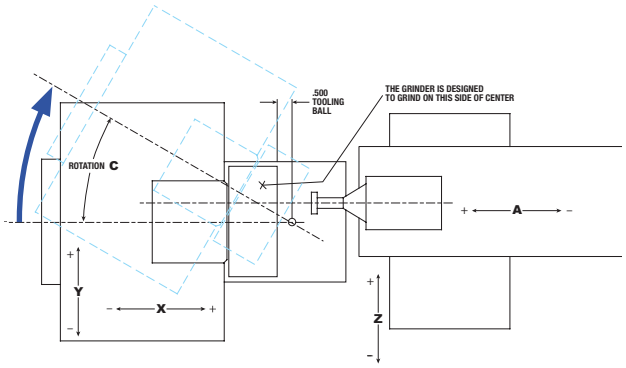


20

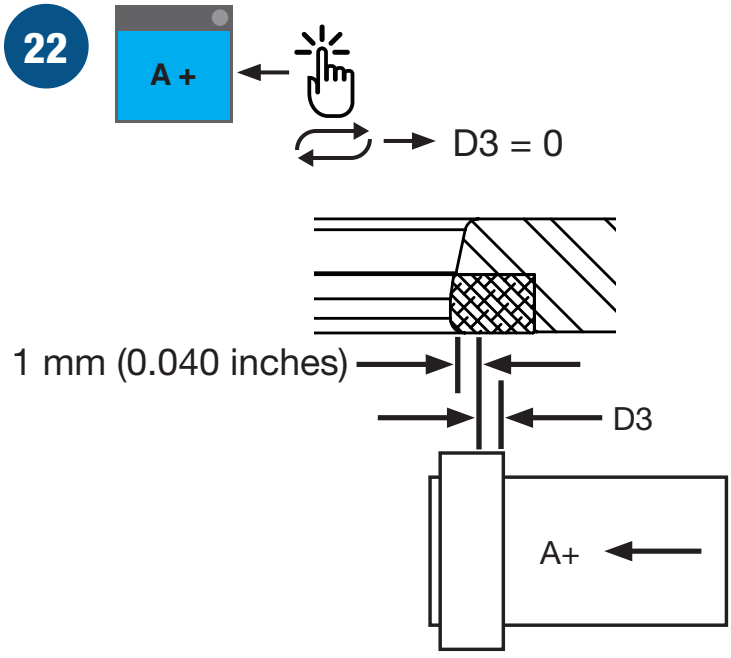


21

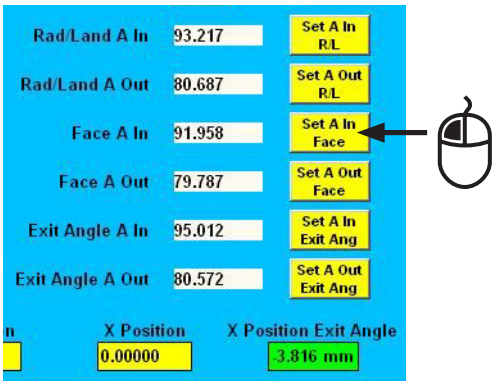

C +
C = 90 Degrees


.500 TOOLING BALL
THE GRINDER IS DESIGNED TO GRIND ON THIS SIDE OF CENTER
ROTATION C
A
Y
X
Z

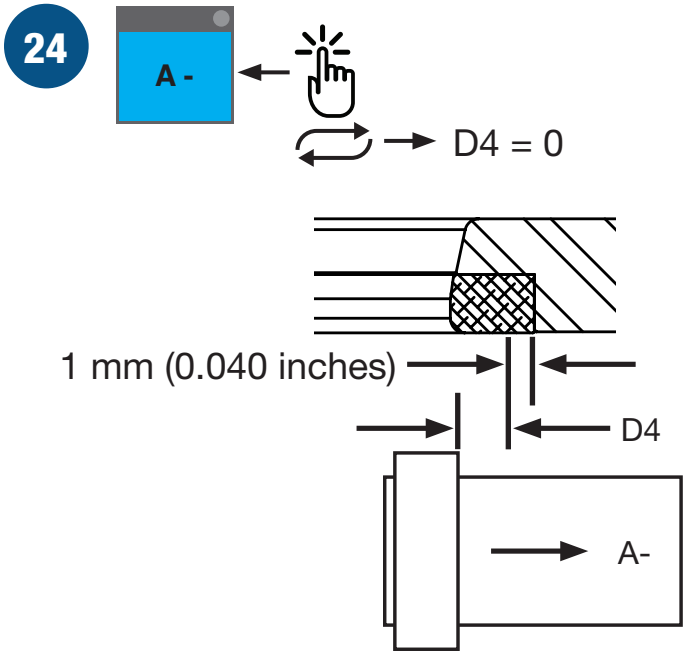
22


A +
D3 = 0
1 mm (0.040 inches)
D3
A+

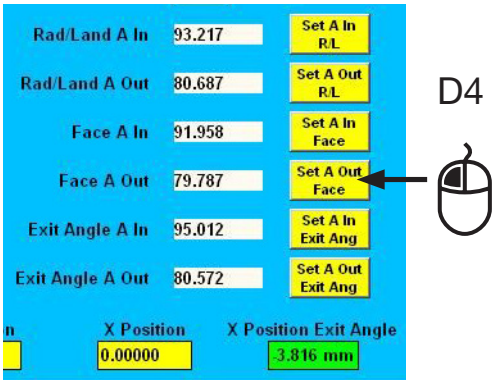
23


Rad/Land A In
93.217
Set A In R/L
Rad/Land A Out
80.687
Set A Out R/L
Face A In
91.958
Set A In Face
Face A Out
79.787
Set A Out Face
Exit Angle A In
95.012
Set A In Exit Ang
Exit Angle A Out
80.572
Set A Out Exit Ang
X Position
0.00000
X Position Exit Angle
-3.816 mm

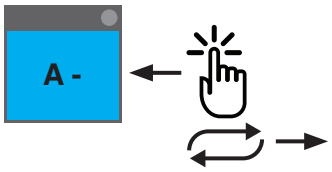
24

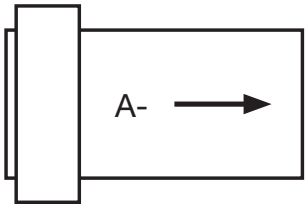

A -
D4 = 0
1 mm (0.040 inches)
D4
A-

25


Rad/Land A In
93.217
Set A In R/L
Rad/Land A Out
80.687
Set A Out R/L
Face A In
91.958
Set A In Face
Face A Out
79.787
Set A Out Face
Exit Angle A In
95.012
Set A In Exit Ang
Exit Angle A Out
80.572
Set A Out Exit Ang
X Position
0.00000
X Position Exit Angle
-3.816 mm
D4

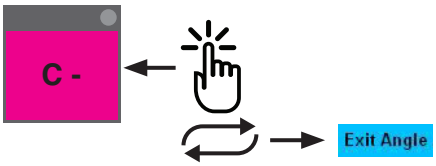
26

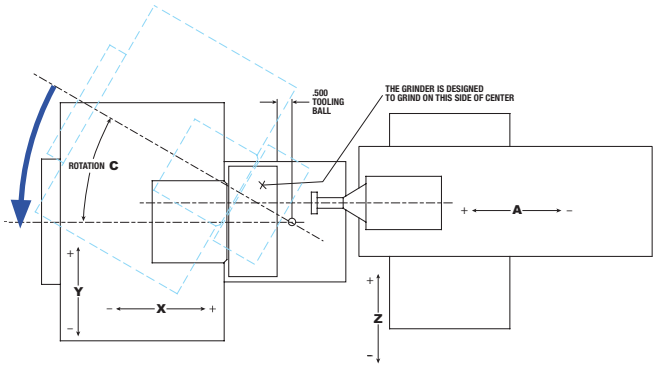




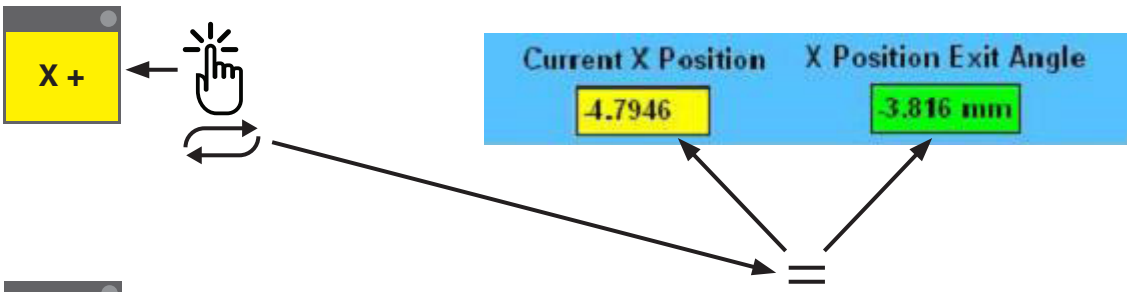
Until you reach
A Axis Zero position

27

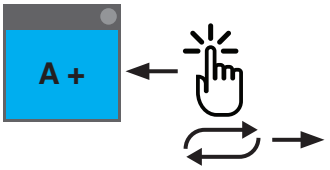




28

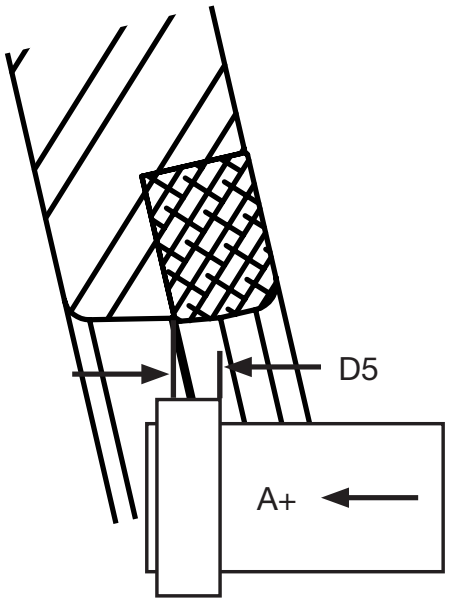


29

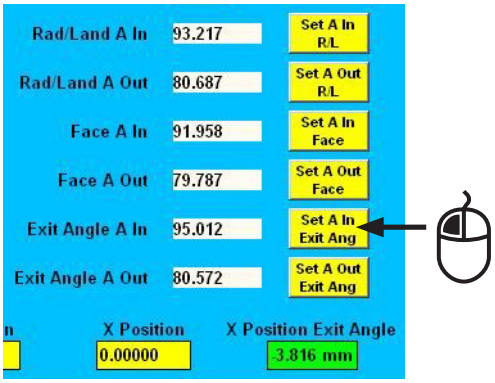


D5 = 0.040 inches (1 mm)

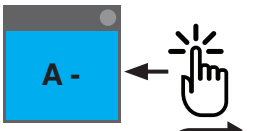
Stop advancing if the grinding wheel is going to hit the chuck.



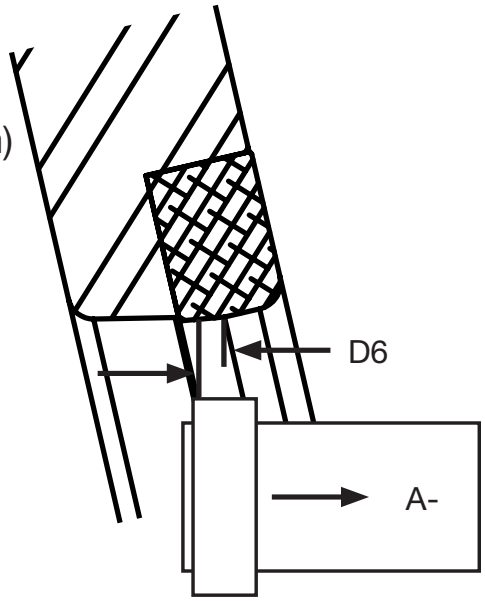
30



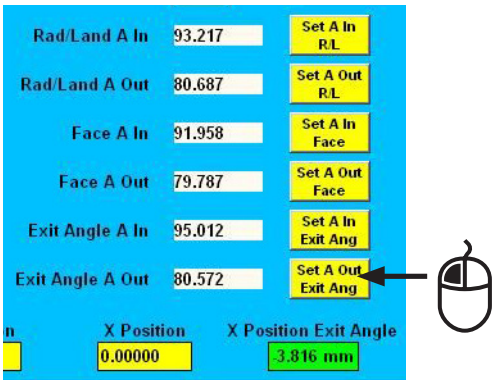
31



D6 = 0.040 inches (1 mm)

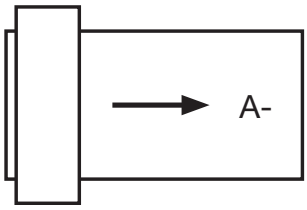


32

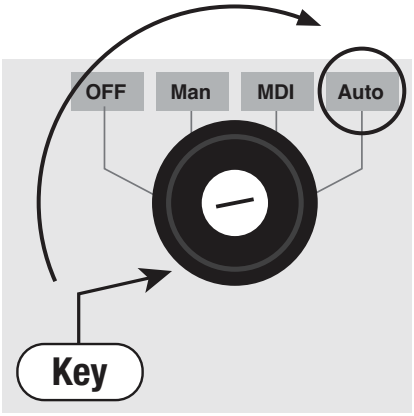


33

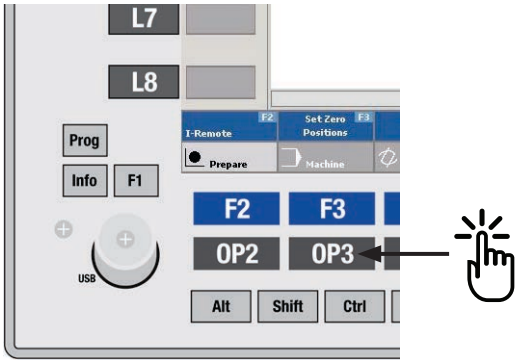
A = 0



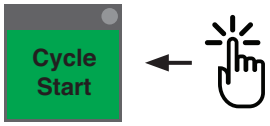
34



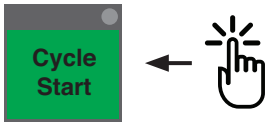
35



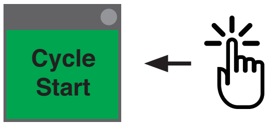
36



37



38

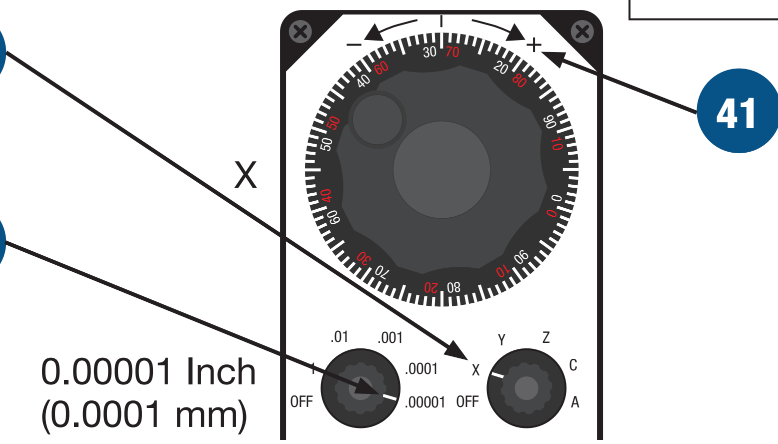


Wait for the program to perform its first steps and then you will be prompted to press Cycle Start again to activate the hand wheel.

39

40

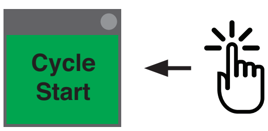
41



0.00001 Inch
(0.0001 mm)

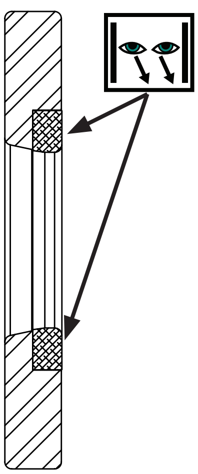
Turn dial in (+) direction for additional grinding as needed to clean up face.

42



De-activates hand wheel. Axes will move to safe position to allow inspection of die face.

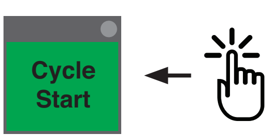
43



Inspect face of die to determine if additional grinding is required.

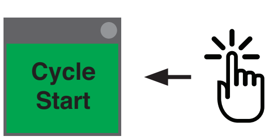
CAUTION! Do not move key from the Auto position. If you do move it from this position the program will start again from the beginning.

44



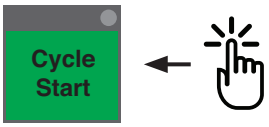
Continues grinding program.

45



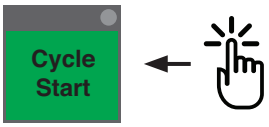
Feeds wheel into the last face grinding position.

44



Wait for the program to perform its next steps and then you will be prompted to press Cycle Start again to activate the hand wheel. Use hand wheel for additional grinding as needed.

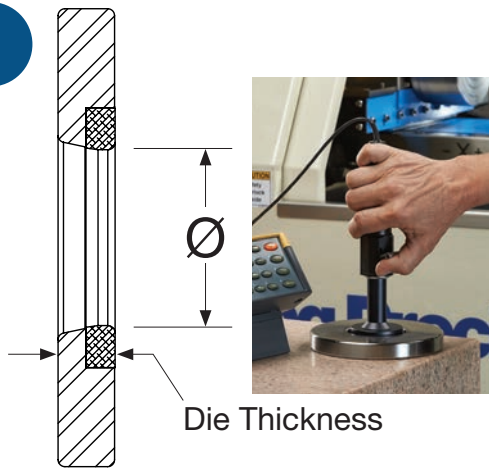
45



De-activates hand wheel and completes grinding program.

3.8.3.2 Redraw Die Grinding

1

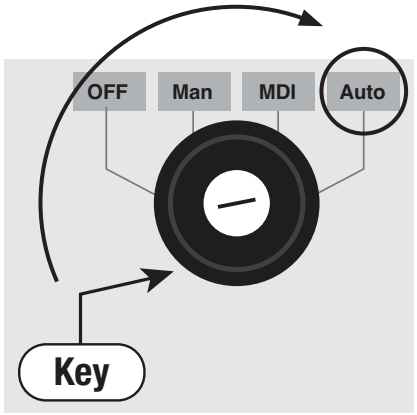


Please note that these instructions utilize the **211 Redraw Die as an example**. You will need to choose the appropriate program for the die you are setting up to grind.

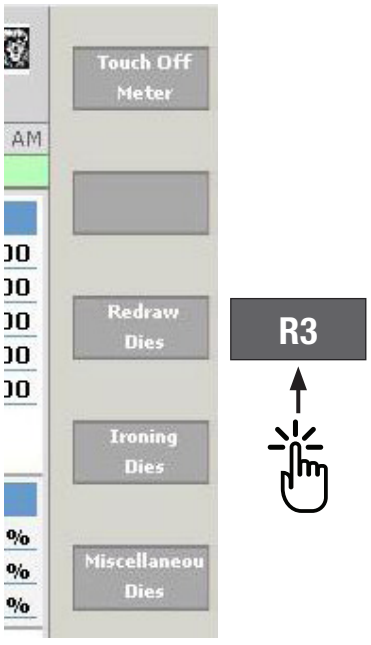
Z Axis Zero must have been set prior to Step 1 of these instructions (refer to section 3.8.1).

2

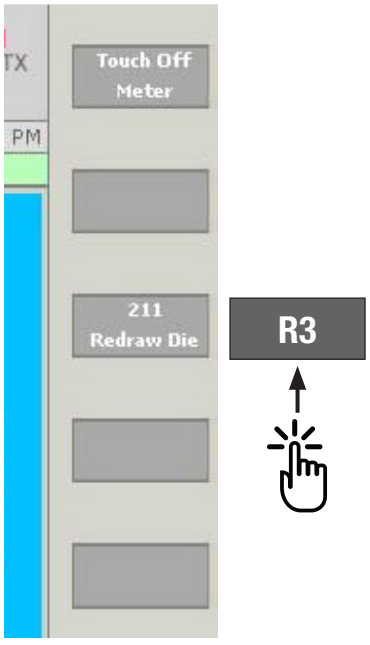
3



4

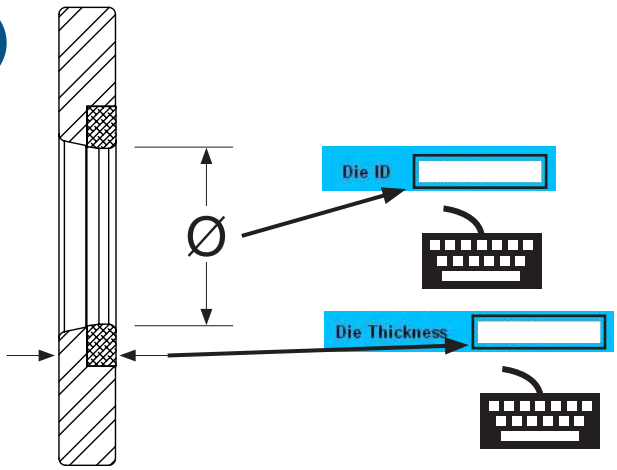


5

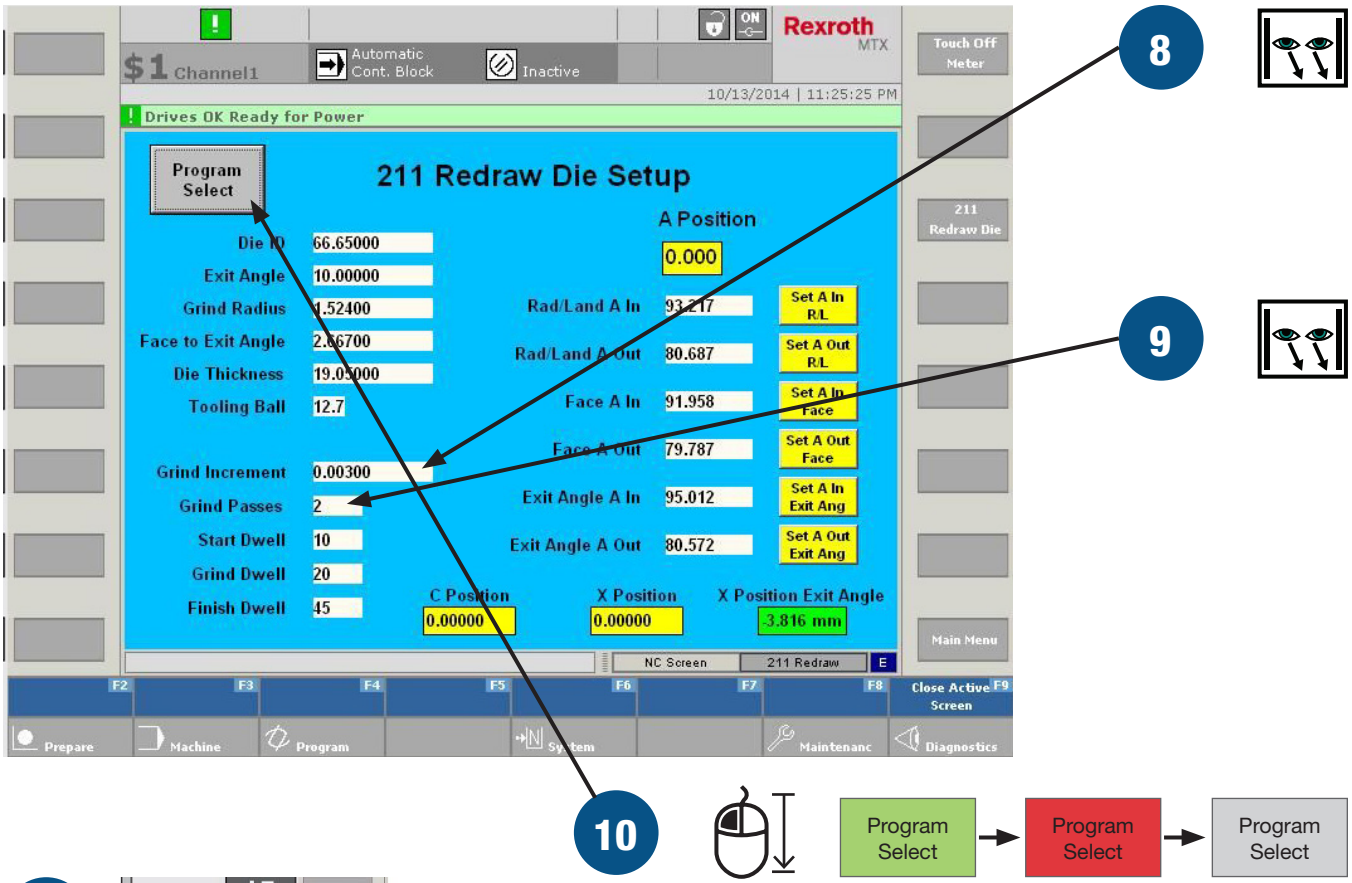


6

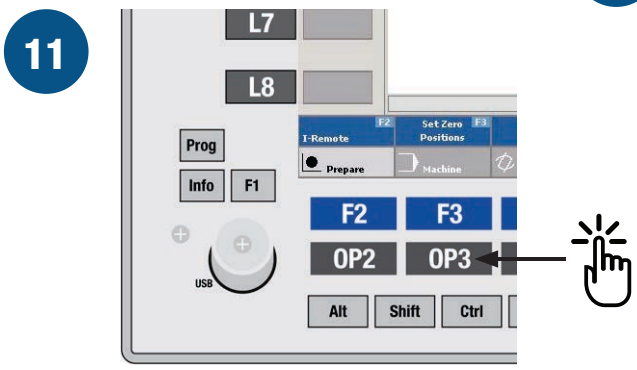
7

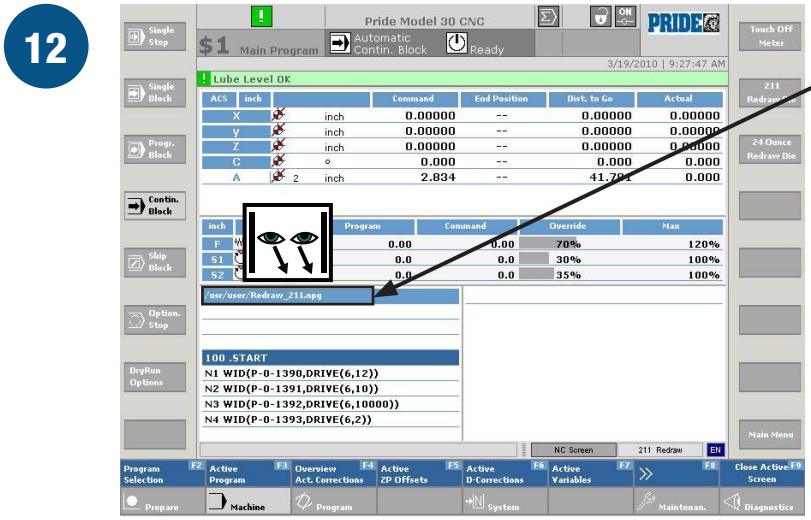


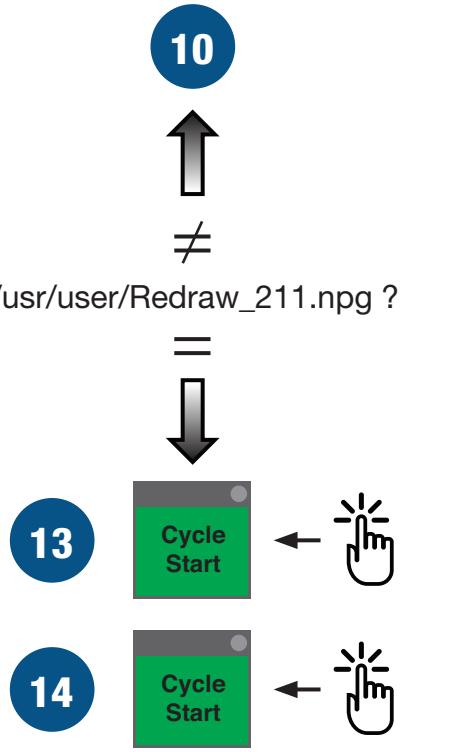
Enter actual Die Id and Die Thickness. Die thickness should be measured over the carbide insert area.


Rexroth MTX
$1 Channel1
Automatic Cont. Block
Inactive
10/13/2014 | 11:25:25 PM
Drives OK Ready for Power
Program Select
211 Redraw Die Setup
A Position
0.000
Die ID 66.65000
Exit Angle 10.00000
Grind Radius 1.52400
Face to Exit Angle 2.66700
Die Thickness 19.05000
Tooling Ball 12.7
Grind Increment 0.00300
Grind Passes 2
Start Dwell 10
Grind Dwell 20
Finish Dwell 45
Rad/Land A In 93.217
Rad/Land A Out 80.687
Face A In 91.958
Face A Out 79.787
Exit Angle A In 95.012
Exit Angle A Out 80.572
Set A In R/L
Set A Out R/L
Set A In Face
Set A Out Face
Set A In Exit Ang
Set A Out Exit Ang
C Position 0.00000
X Position 0.00000
X Position Exit Angle 3.816 mm
Touch Off Meter
211 Redraw Die
Main Menu
NC Screen
211 Redraw
Close Active Screen
Prepare
Machine
Program
Maintenanc
Diagnostics
8
9
10

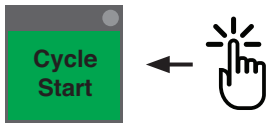
Program Select
Program Select
Program Select


11
L7
L8
Prog
Info
F1
T-Remote
Set Zero Positions
Prepare
Machine
F2
F3
OP2
OP3
Alt
Shift
Ctrl
USB


12
Pride Model 30 CNC
PRIDE
$1 Main Program
Automatic Contin. Block
Ready
3/19/2010 | 9:27:47 AM
Lube Level OK
/usr/user/Redraw_211.npg
100 ;START
N1 WID(P-0-1390,DRIVE(6,12))
N2 WID(P-0-1391,DRIVE(6,10))
N3 WID(P-0-1392,DRIVE(6,10000))
N4 WID(P-0-1393,DRIVE(6,2))
NC Screen
211 Redraw


10
≠
/usr/user/Redraw_211.npg ?
=
13
Cycle Start
14
Cycle Start

15

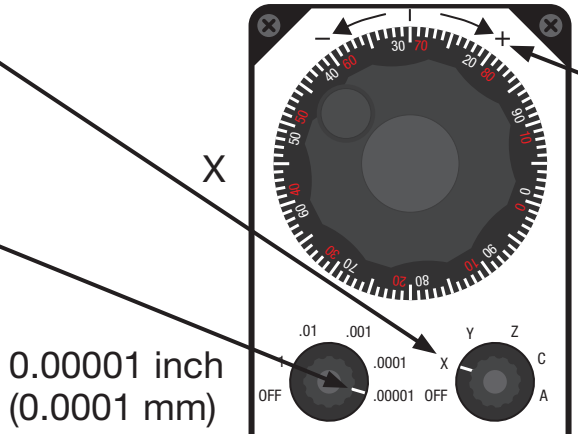


Wait for the program to perform its first steps and then you will be prompted to press Cycle Start again to activate the hand wheel.

16

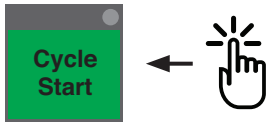
17

18



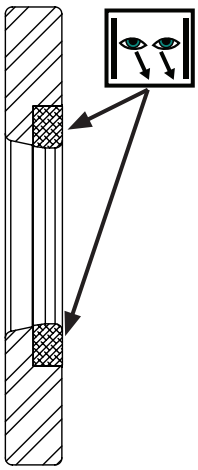
Turn dial in (+) direction for additional grinding as needed to clean up face.

19

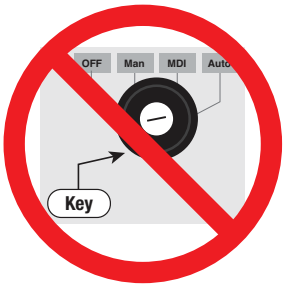


De-activates hand wheel. Axes will move to safe position to allow inspection of die face.

20

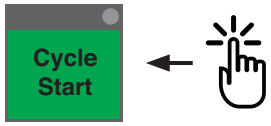


Inspect face of die to determine if additional grinding is required.



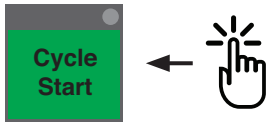
CAUTION! Do not move key from the Auto position. If you do move it from this position the program will start again from the beginning.

21



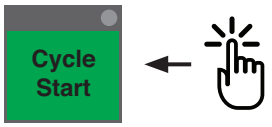
Continues grinding program.

22



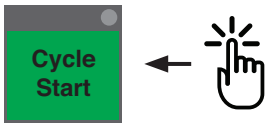
Feeds wheel into the last face grinding position.

44



Wait for the program to perform its next steps and then you will be prompted to press Cycle Start again to activate the hand wheel. Use hand wheel for additional grinding as needed.

45



De-activates hand wheel and completes grinding program.

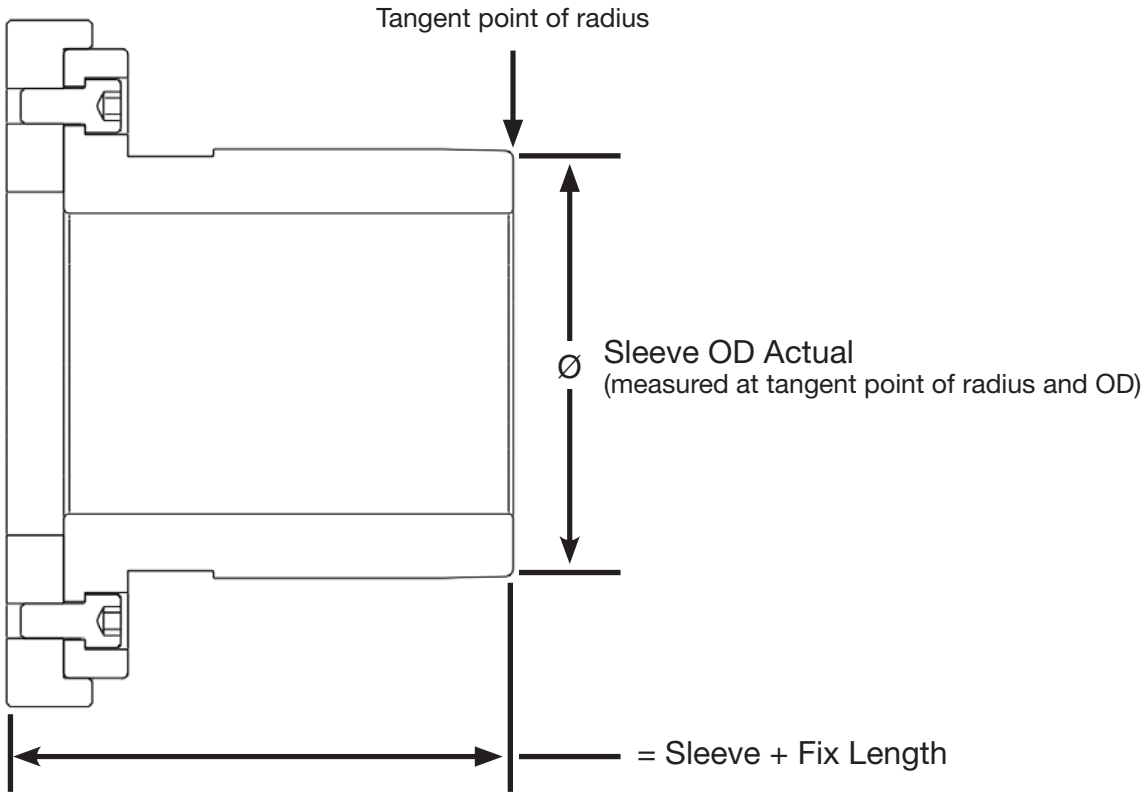
3.8.4.1 Redraw Sleeve Grinding — Face and Radius Only

1. Mount the redraw sleeve in the grinding fixture. Tighten the bolts in a star pattern until the redraw sleeve is held lightly by the fixture.

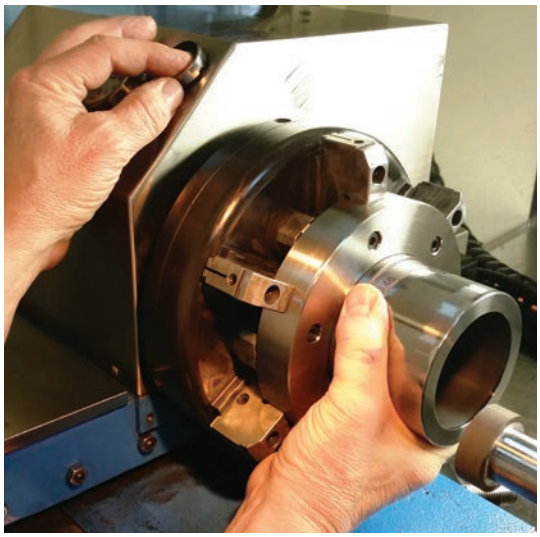
2. Measure the following dimensions for input into the redraw sleeve program.

Please note that these instructions utilize a redraw sleeve example. You will need to choose the appropriate program for the redraw sleeve you are setting up to grind.

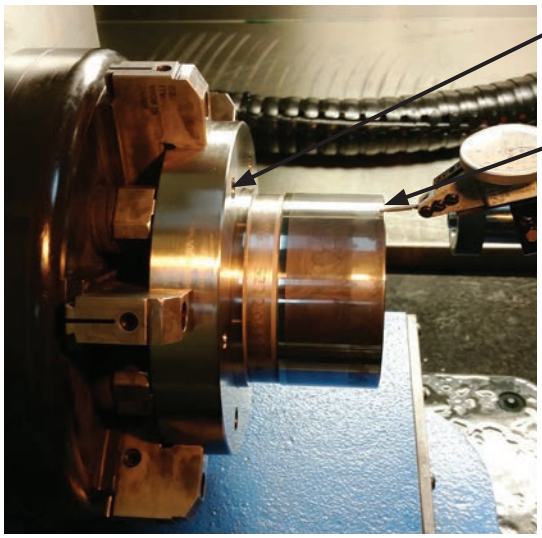
Redraw sleeve grinding requires the long spindle (Pt. No. 6-183).



3



4

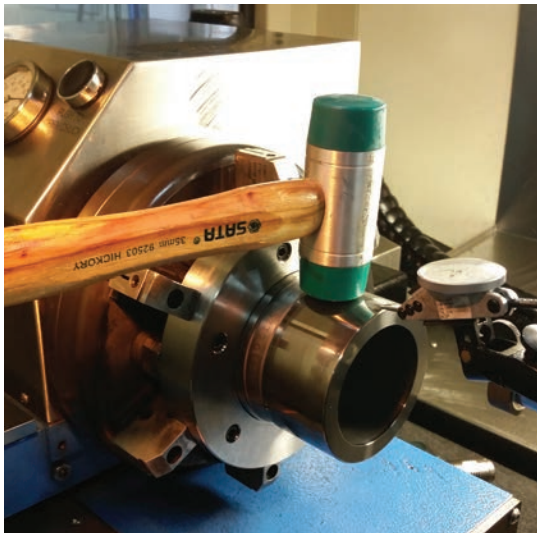


Loosen fixture screws enough so tapping down will move sleeve in fixture.

Touch indicator to top side of sleeve.

Rotate sleeve and note high and low points and then determine mid-point of indicator swing.

5



Rotate to high point and tap down approximately to mid-point.

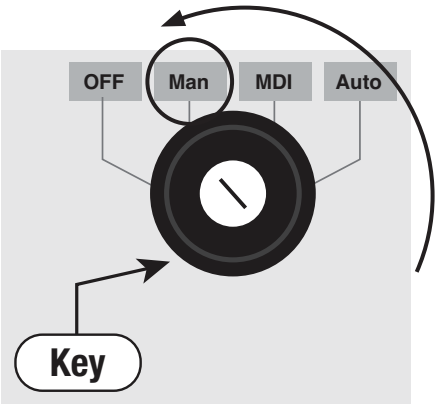
Repeat above step until the difference between high and low points is < 0.0005 inches (0.013 mm).

Rotate to high point and tighten nearest screw until indicator reaches mid-point.

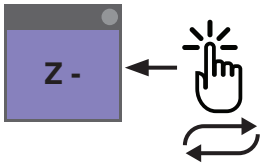
Repeat above step until all screws are hand tight and sleeve runs true to center.

Note: Loosening a screw slightly will raise a low point.

6

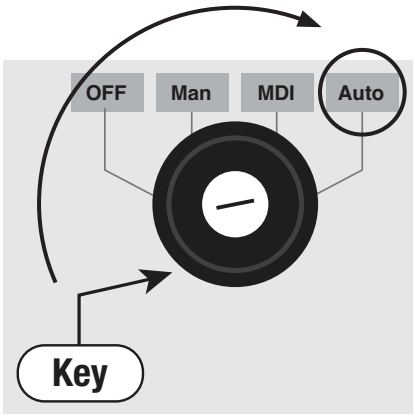


7

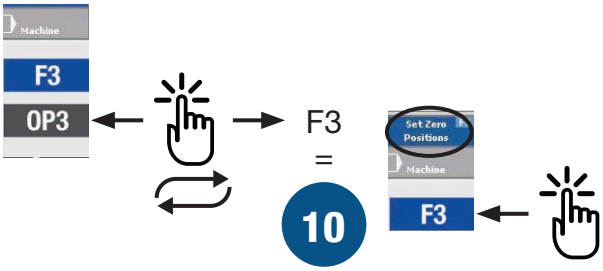


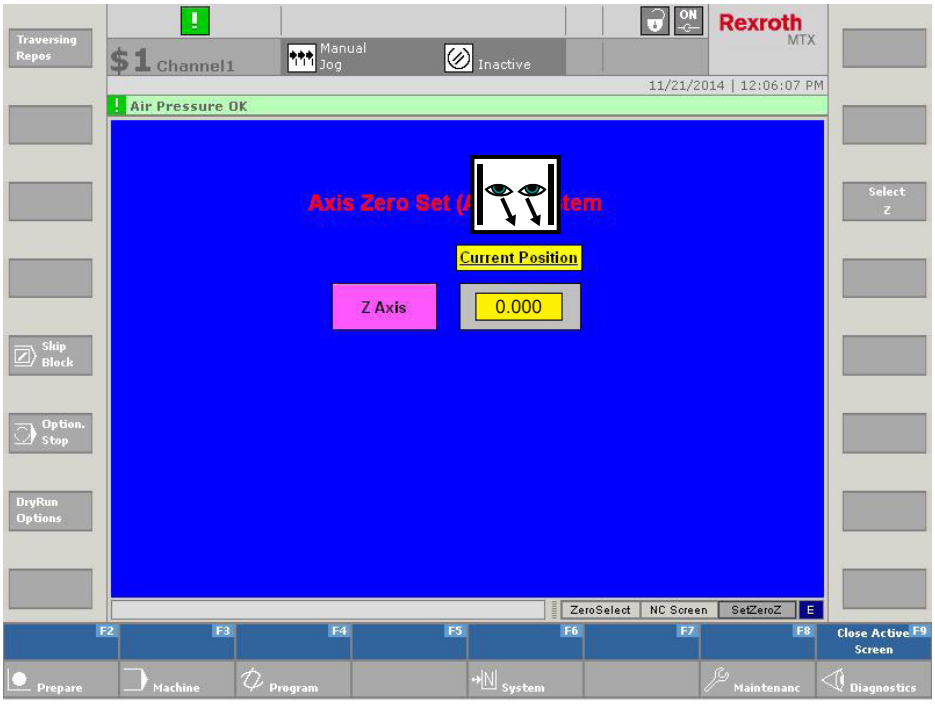
Move Z to a safe position clear of the redraw sleeve.

8



9





11

11

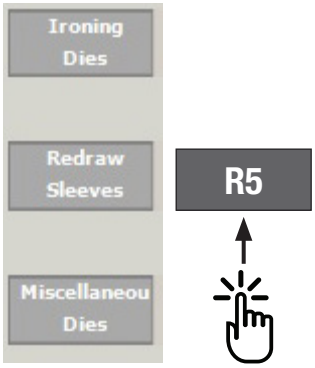
Z ≠ 0

Z = 0

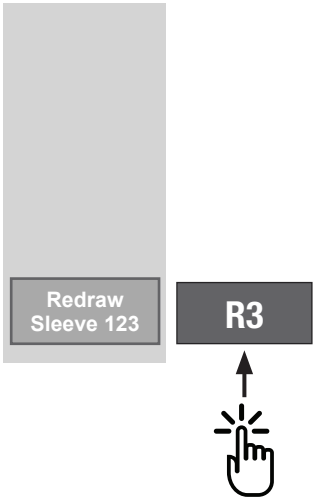
F9

12

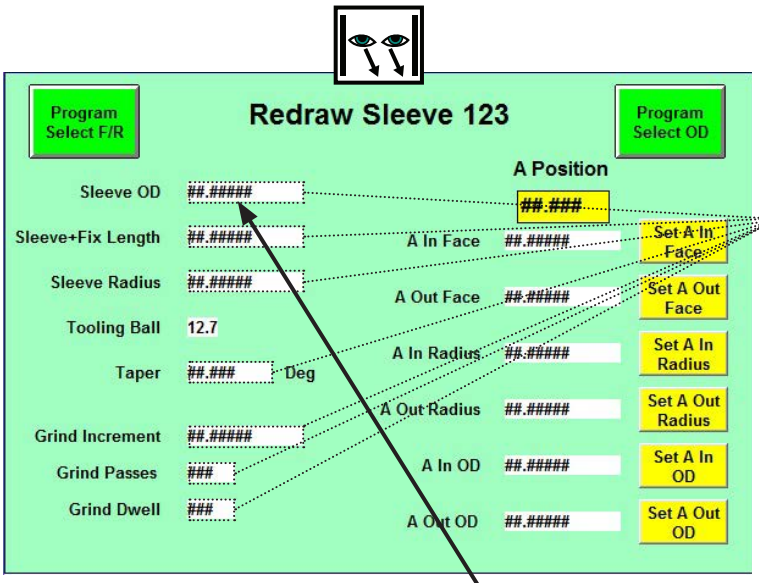
13



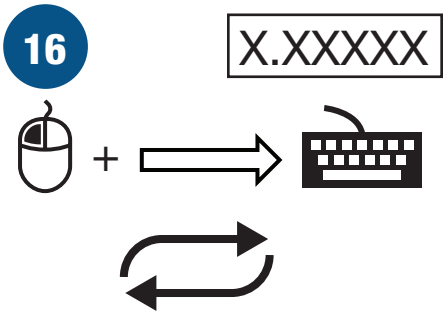
14



15

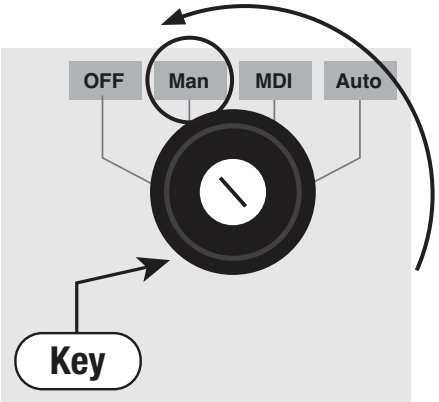


16

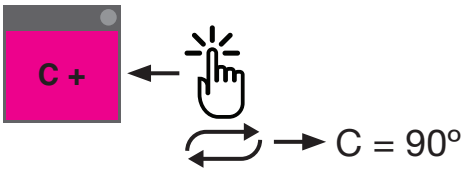


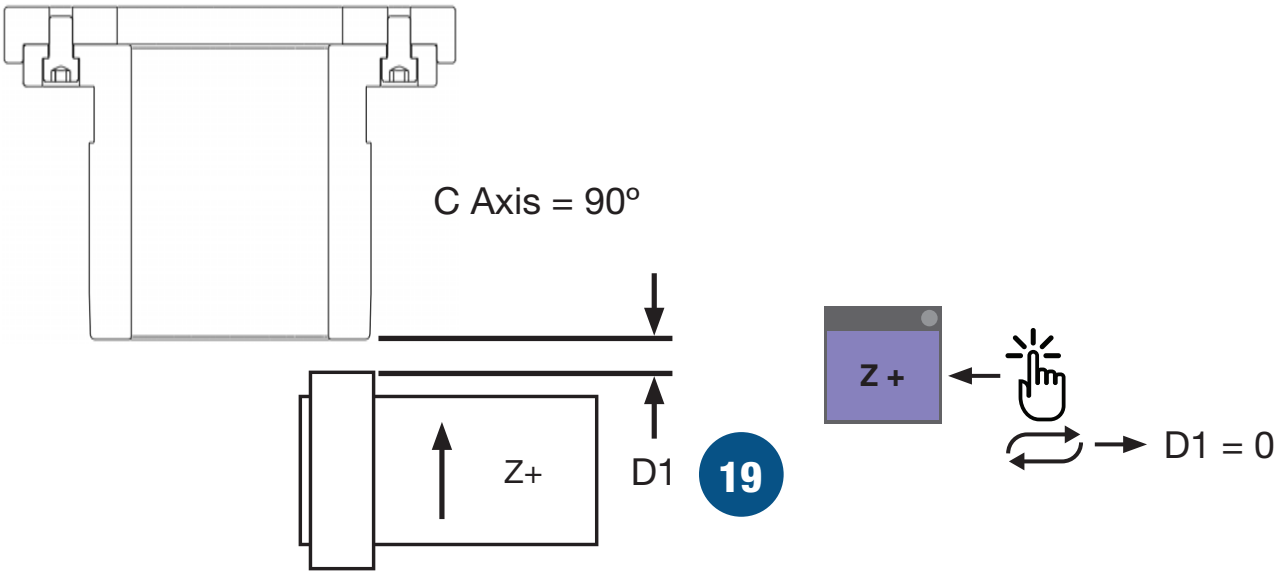
Sleeve OD = Sleeve OD Actual + 0.002 inches (0.05 mm) when only grinding the face and radius. This allows the grinding wheel to clear the OD.

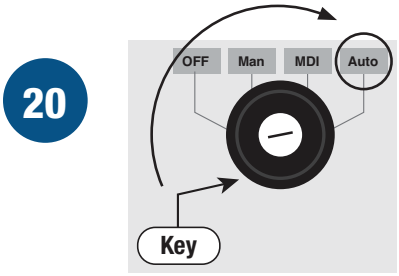
17

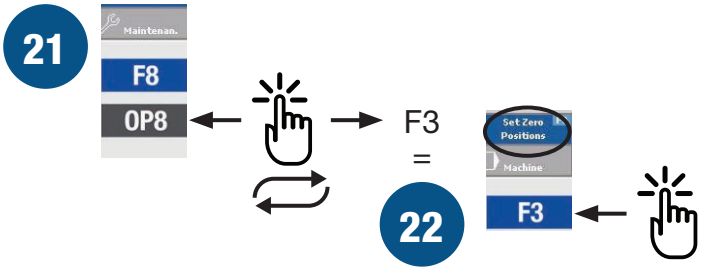


18

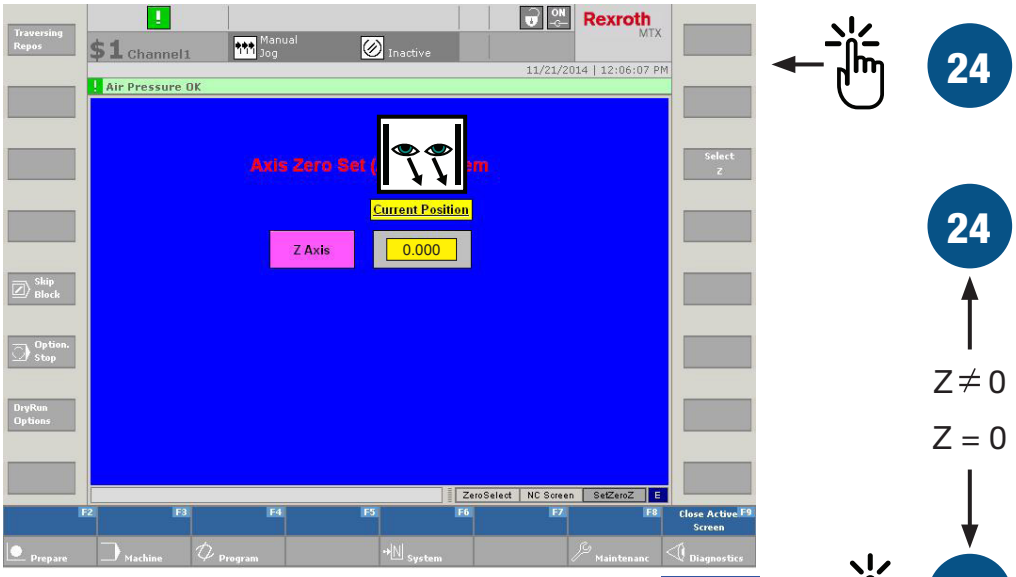


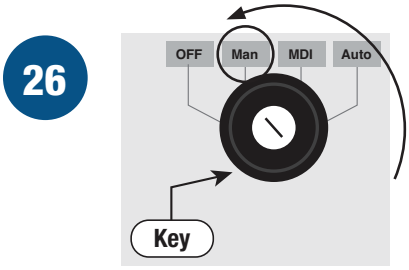

C Axis = 90°
Z+
D1
19
Z +
D1 = 0


20
OFF
Man
MDI
Auto
Key

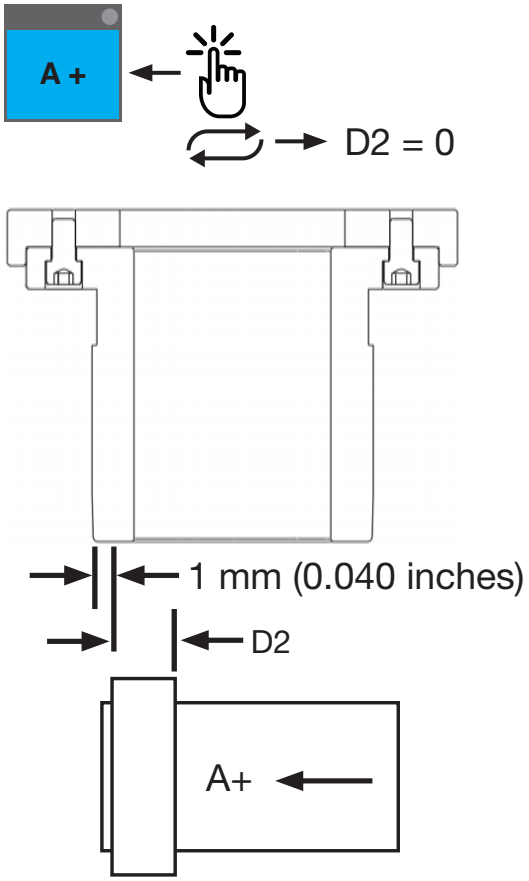

21
Maintenan.
F8
OP8
F3
=
22
Set Zero Positions
Machine
F3


23
Z Axis


Rexroth
MTX
$1 Channel1
Manual Jog
Inactive
11/21/2014 | 12:06:07 PM
Air Pressure OK
Axis Zero Set
Current Position
Z Axis
0.000
ZeroSelect
NC Screen
SetZeroZ
Close Active Screen
Prepare
Machine
Program
System
Maintenanc
Diagnostics
24
24
Z≠0
Z = 0
F9
25

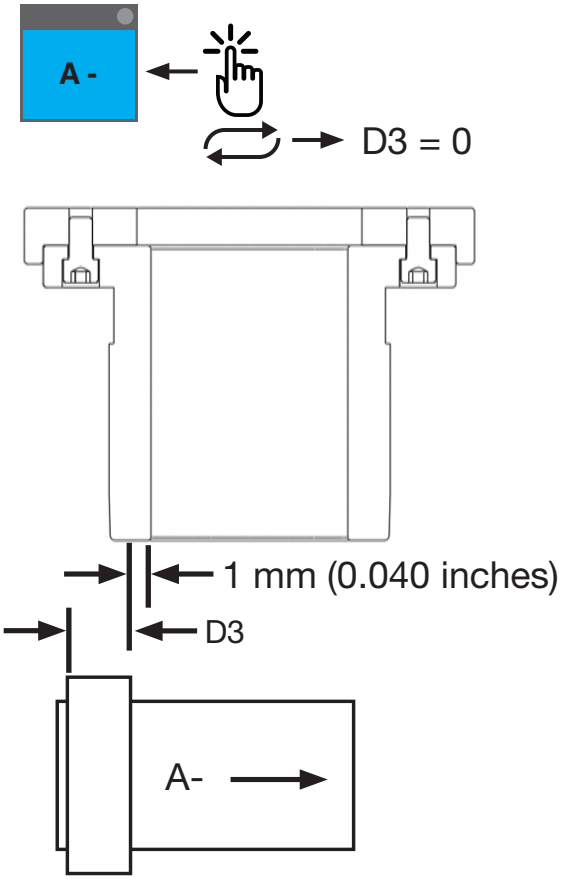

26
OFF
Man
MDI
Auto
Key

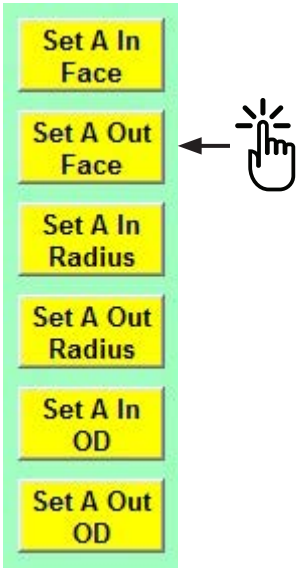
27


A +
D2 = 0
1 mm (0.040 inches)
D2
A+

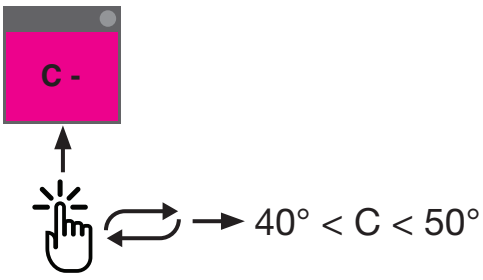

Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD

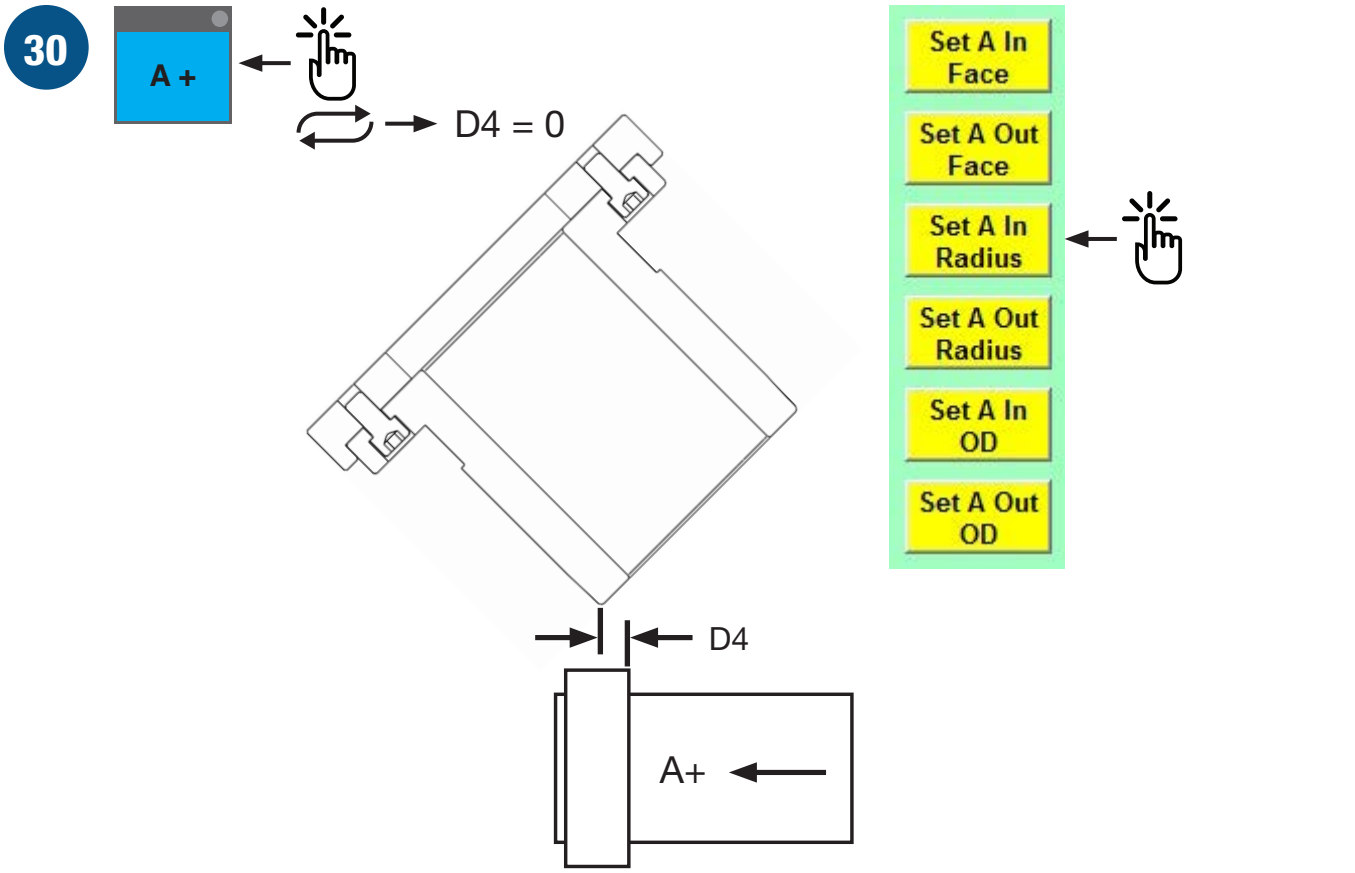
28

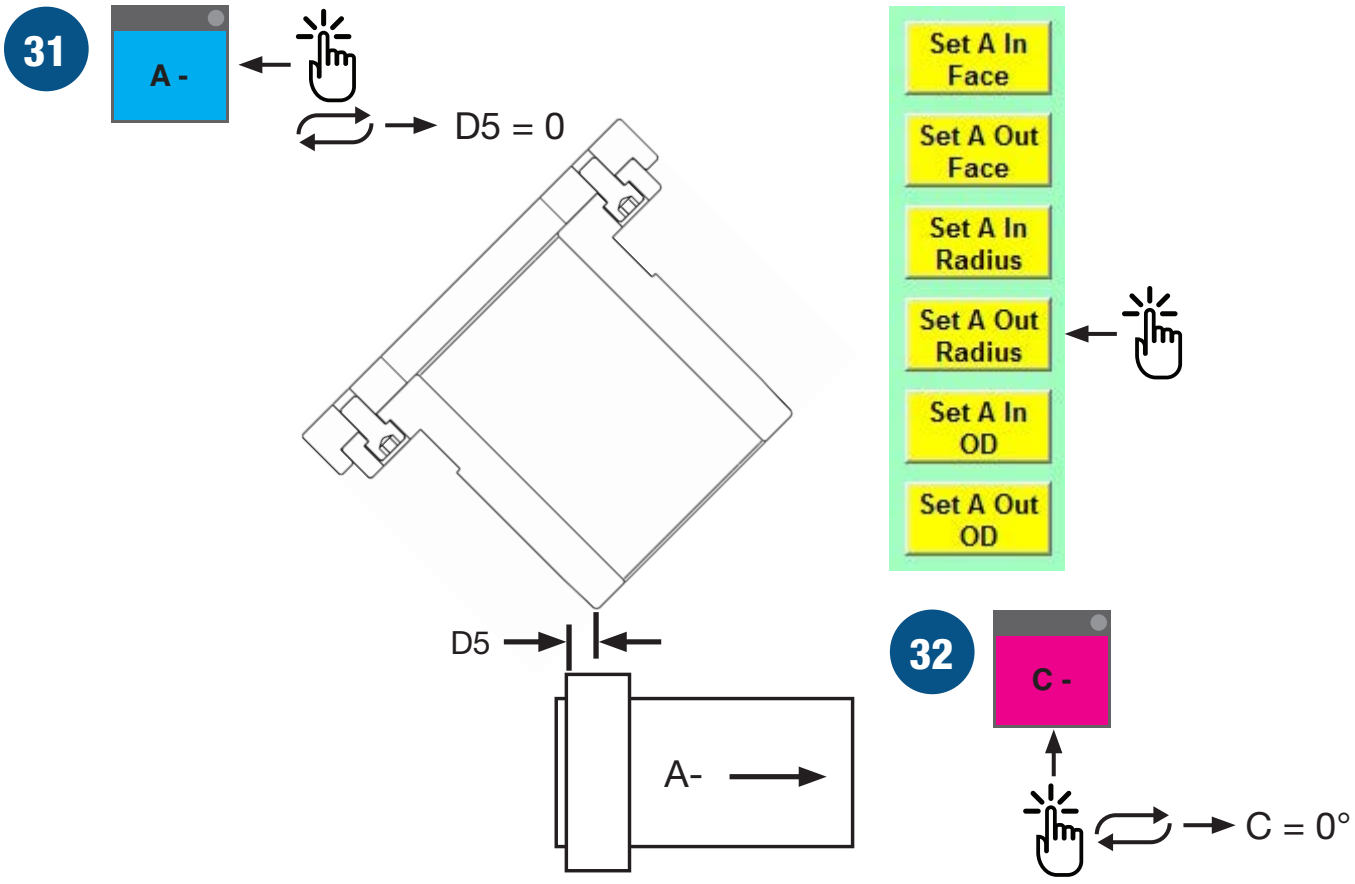

A -
D3 = 0
1 mm (0.040 inches)
D3
A-


Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD

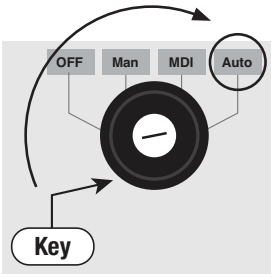
29

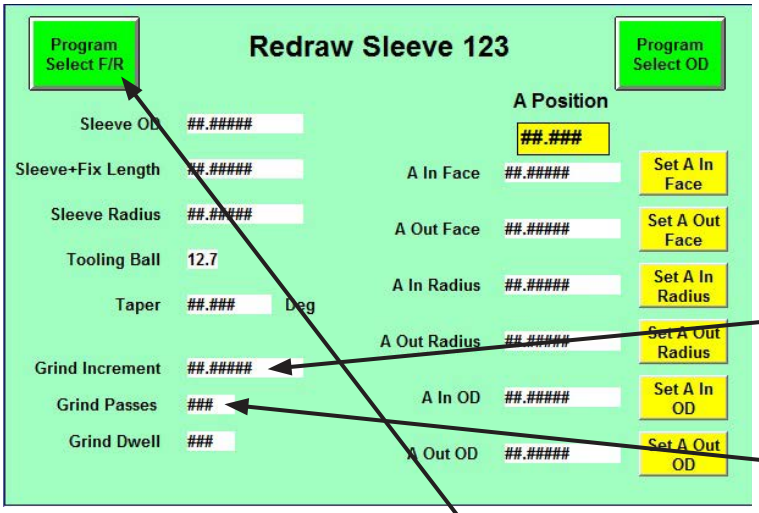

C -
40° < C < 50°


30
A +
D4 = 0
Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD
D4
A+


31
A -
D5 = 0
Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD
D5
A-
32
C -
C = 0°

33

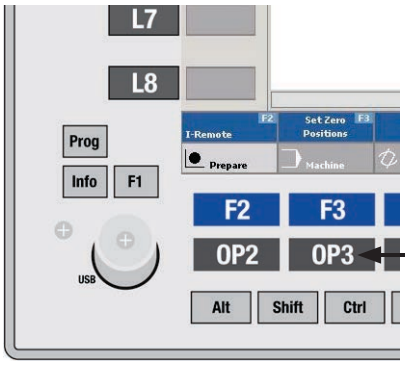




34

35

37



36

Program Select → Program Select → Program Select

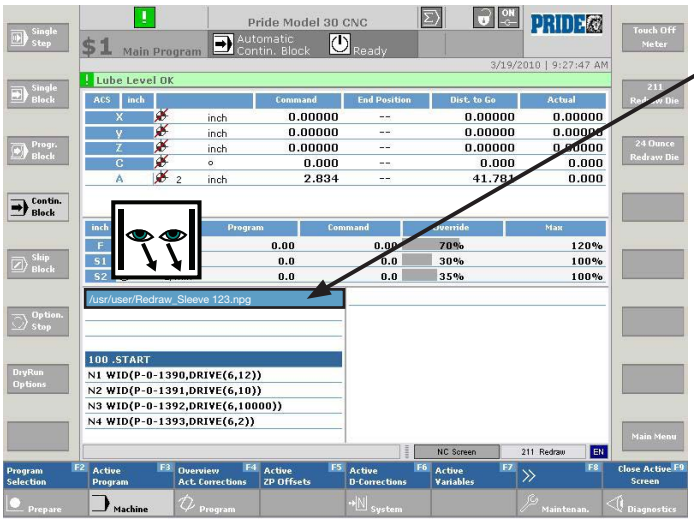
36

≠

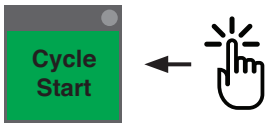
/usr/user/Redraw_Sleeve 123.npg ?

=

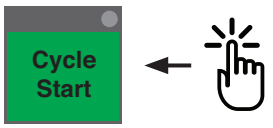
38



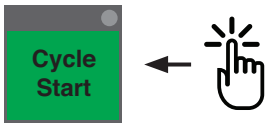
39



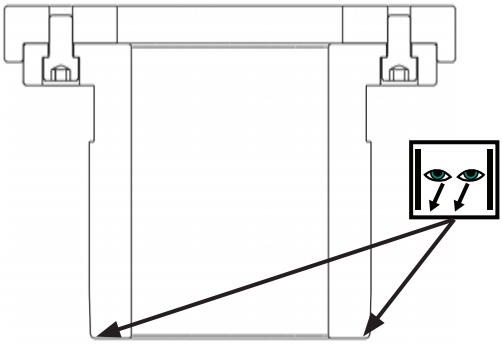
40



41

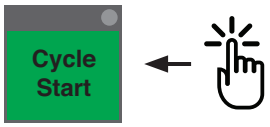


42



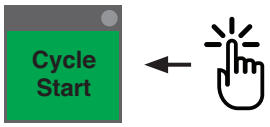
Machine cycle will pause to allow inspection of face to determine if additional grinding is required.

43



Start A axis oscillation and brings wheel to surface of redraw sleeve.

44

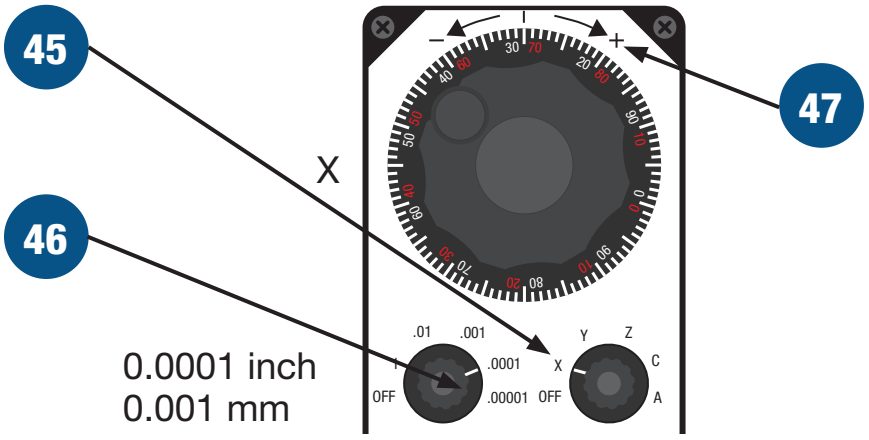


Activates the hand wheel.

CAUTION! Do not move key from the Auto position. If you do move it from this position, the program will start again from the beginning.

45

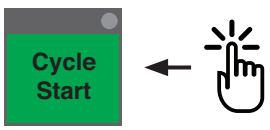
46



47

Turn dial in (+) direction for additional grinding as needed to clean up face.

48



De-activates hand wheel and continues the grinding program until finished.

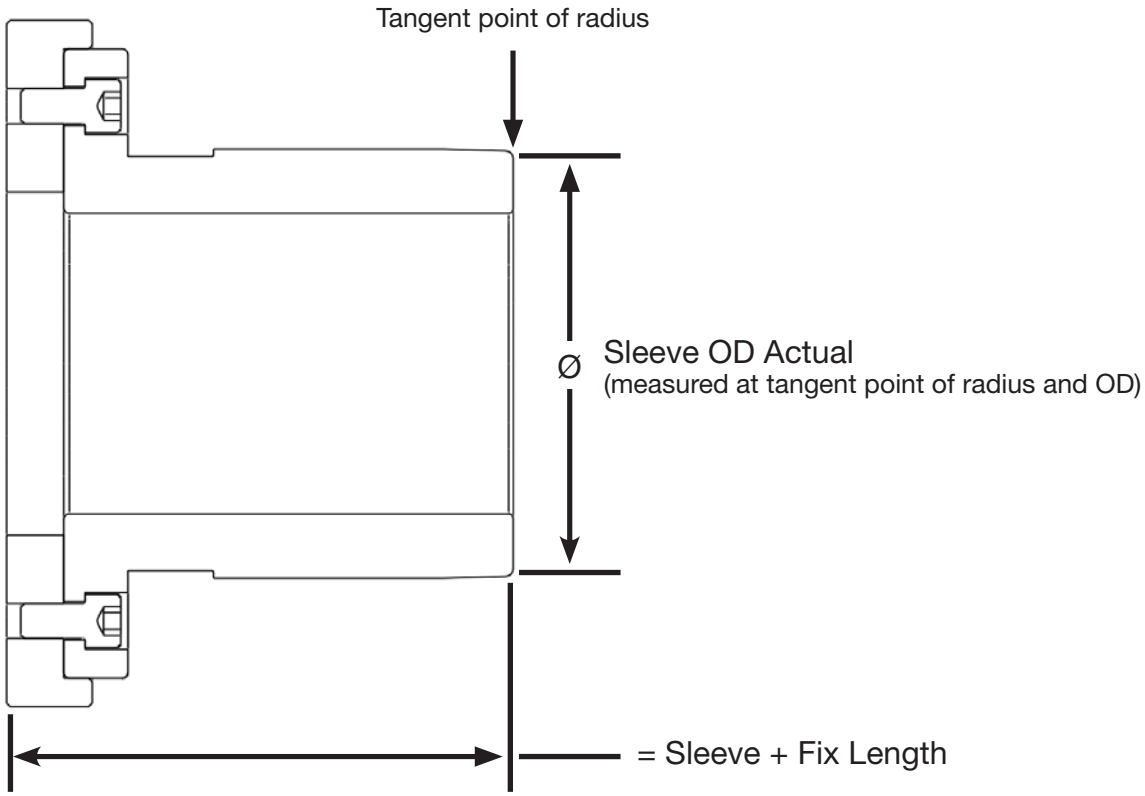
3.8.4.2 Redraw Sleeve Grinding — Face, Radius and OD

1. Mount the redraw sleeve in the grinding fixture. Tighten the bolts in a star pattern until the redraw sleeve is held lightly by the fixture.

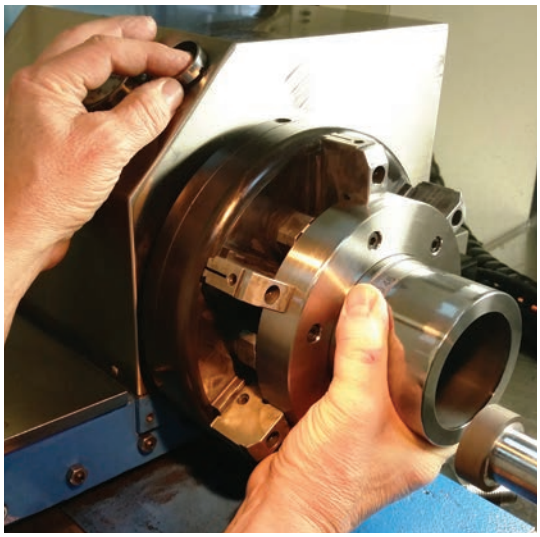
2. Measure the following dimensions for input into the redraw sleeve program.

Please note that these instructions utilize a redraw sleeve example. You will need to choose the appropriate program for the redraw sleeve you are setting up to grind.

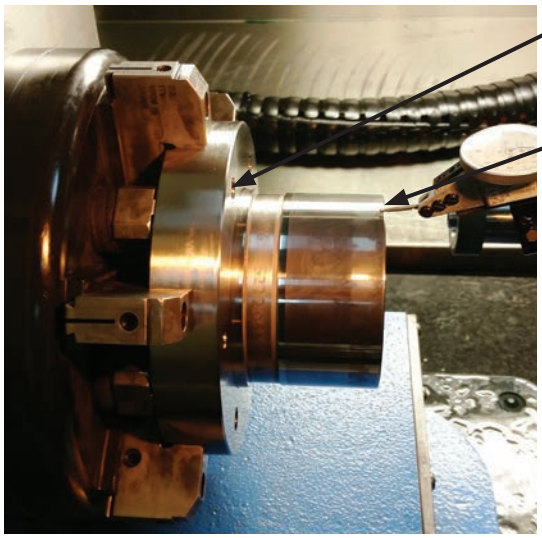
Redraw sleeve grinding requires the long spindle (Pt. No. 6-183).



3



4

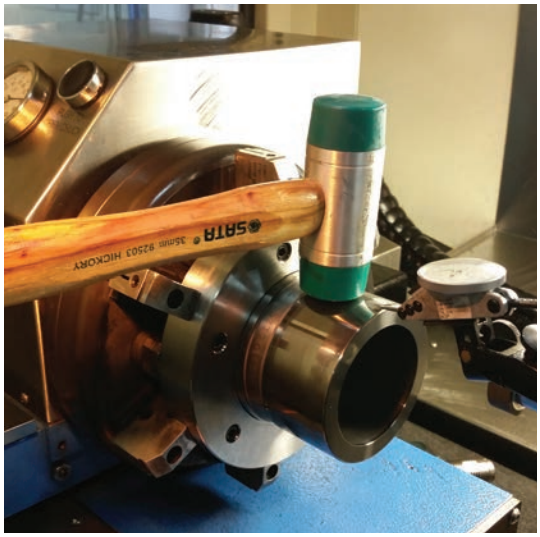


Loosen fixture screws enough so tapping down will move sleeve in fixture.

Touch indicator to top side of sleeve.

Rotate sleeve and note high and low points and then determine mid-point of indicator swing.

5



Rotate to high point and tap down approximately to mid-point.

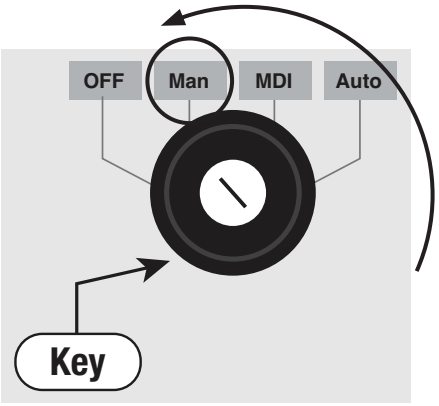
Repeat above step until the difference between high and low points is < 0.0005 inches (0.013 mm).

Rotate to high point and tighten nearest screw until indicator reaches mid-point.

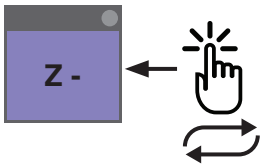
Repeat above step until all screws are hand tight and sleeve runs true to center.

Note: Loosening a screw slightly will raise a low point.

6

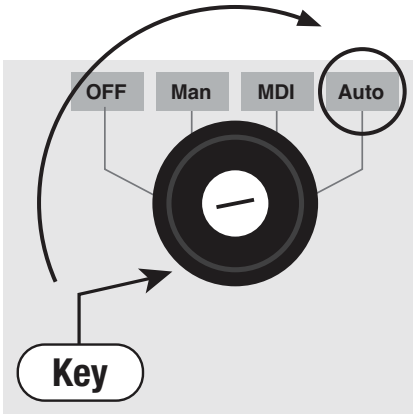


7

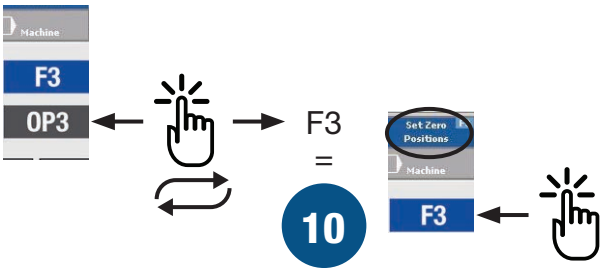


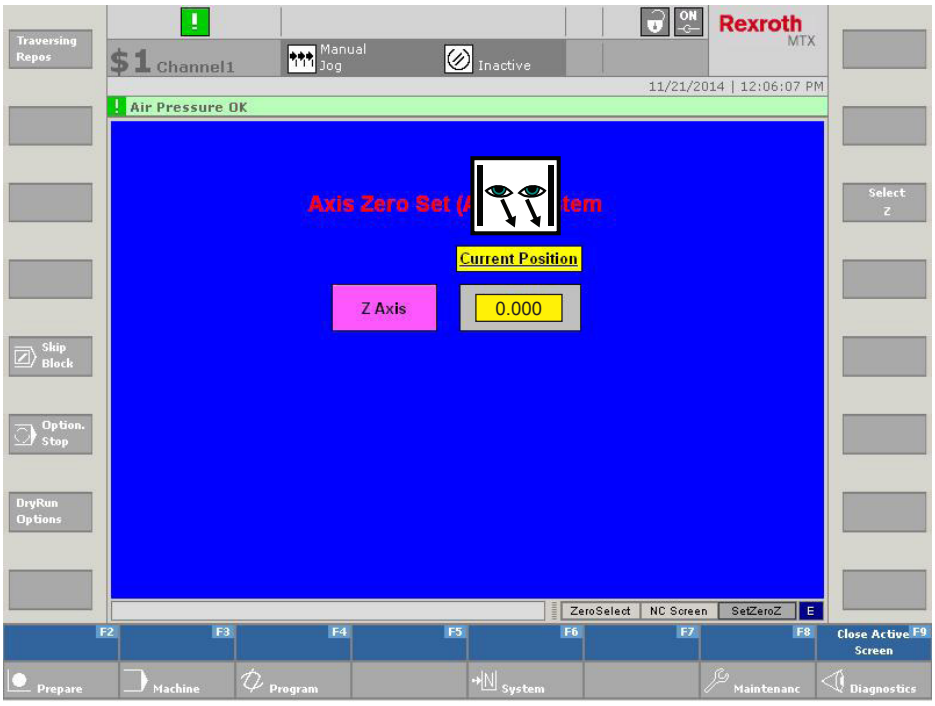
Move Z to a safe position clear of the redraw sleeve.

8



9





11

11

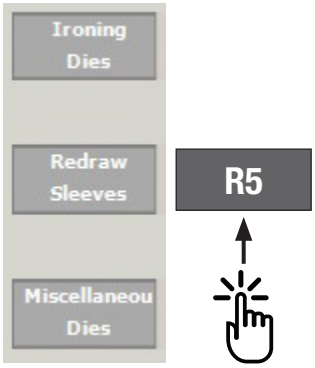
Z ≠ 0

Z = 0

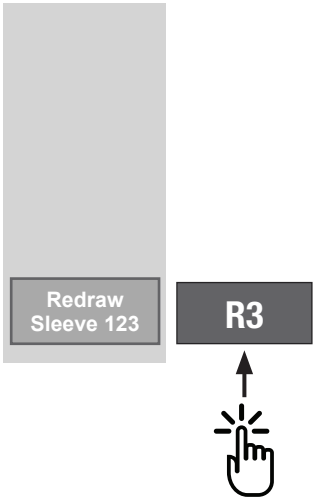
F9

12

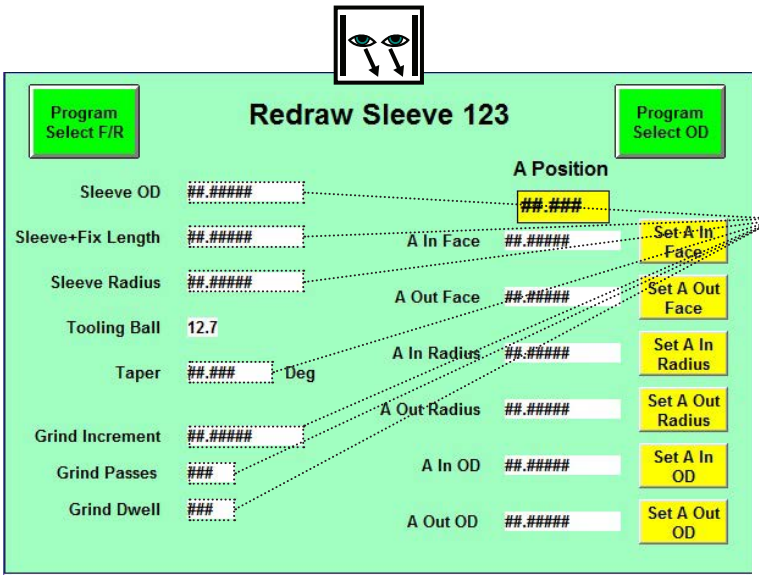
13


Ironing Dies
Redraw Sleeves
Miscellaneou Dies
R5

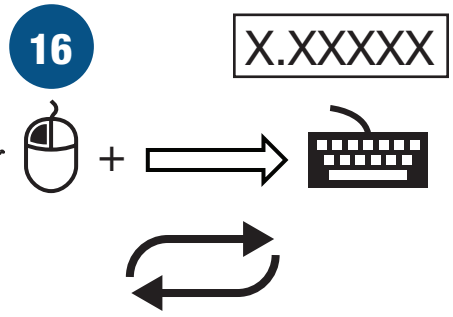
14


Redraw Sleeve 123
R3

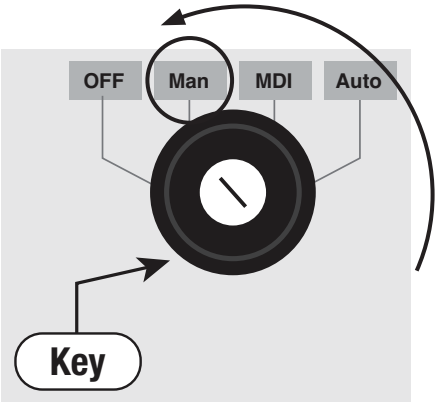
15

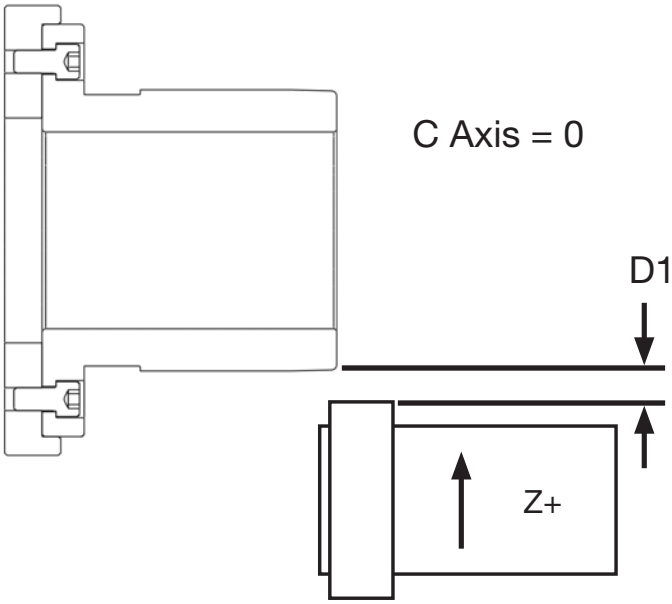

Program Select F/R
Redraw Sleeve 123
Program Select OD
A Position
Sleeve OD
##.#####
##.###
Sleeve+Fix Length
##.#####
A In Face
##.#####
Set A In Face
Sleeve Radius
##.#####
A Out Face
##.#####
Set A Out Face
Tooling Ball
12.7
A In Radius
##.#####
Set A In Radius
Taper
##.###
Deg
A Out Radius
##.#####
Set A Out Radius
Grind Increment
##.#####
A In OD
##.#####
Set A In OD
Grind Passes
###
A Out OD
##.#####
Set A Out OD
Grind Dwell
###

16


X.XXXXX

17


OFF
Man
MDI
Auto
Key

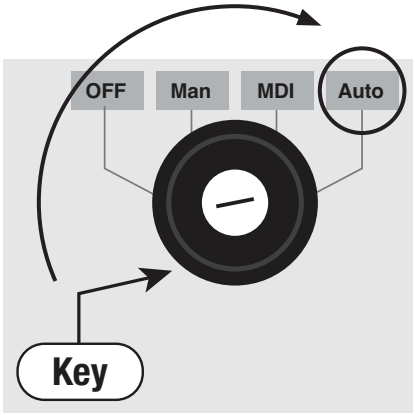


18

D1 = 0

Touch off grinding wheel near tangent of OD to the radius.

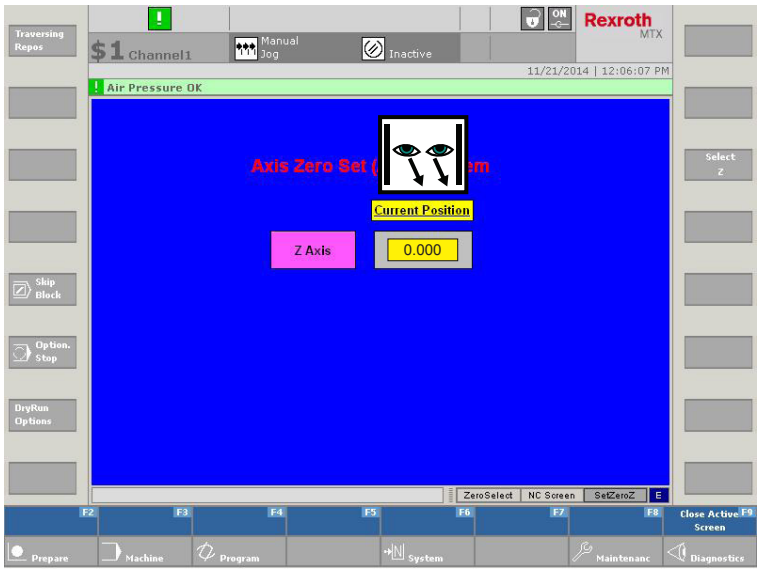
19



20

F3
=
21

22



23

23

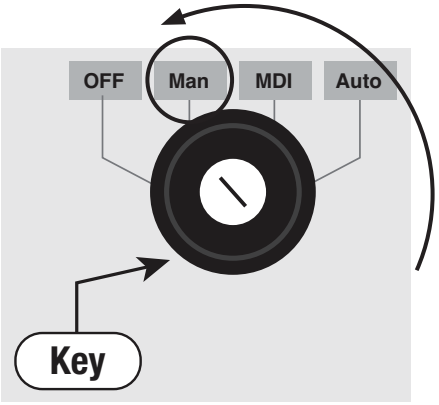
Z ≠ 0

Z = 0

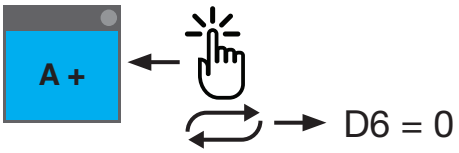
F9

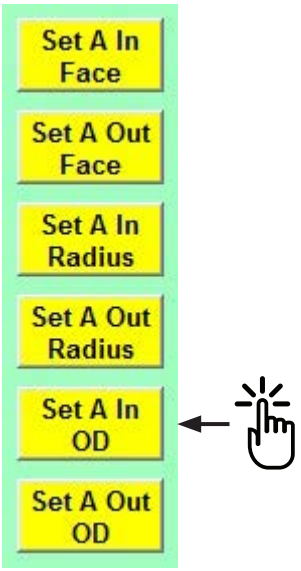
24

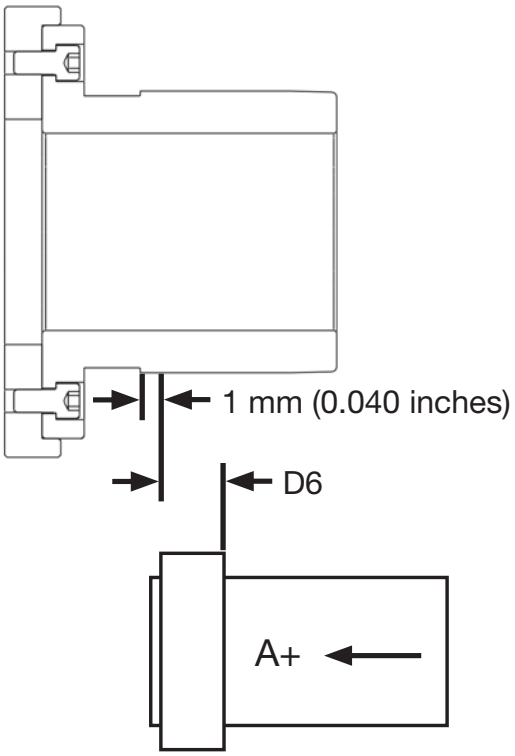
25


OFF
Man
MDI
Auto
Key

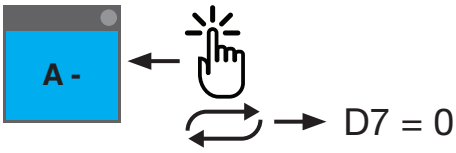
26


A +
D6 = 0

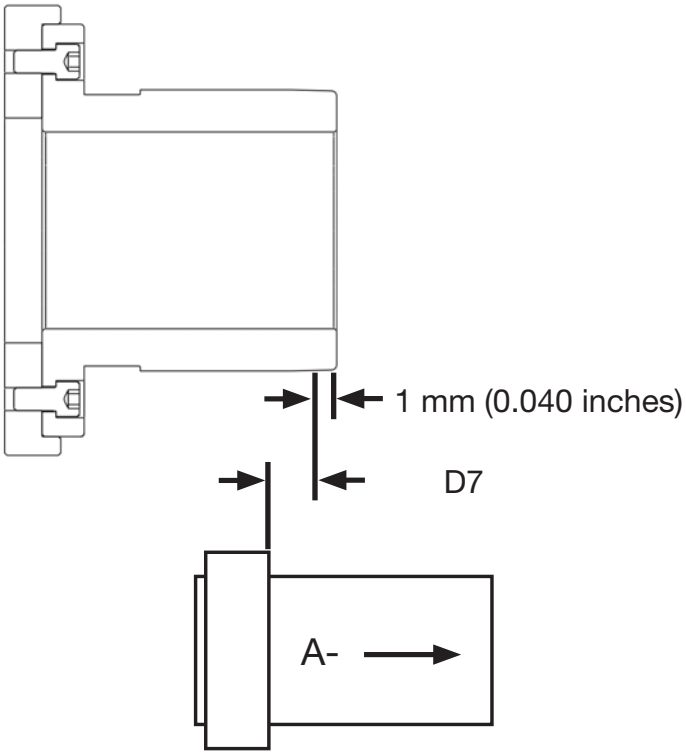

Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD


1 mm (0.040 inches)
D6
A+

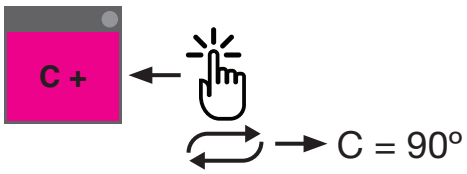
27


A -
D7 = 0

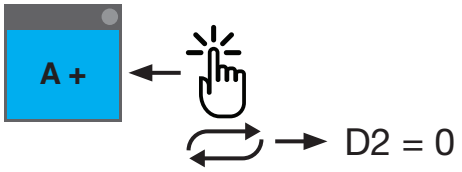

Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD

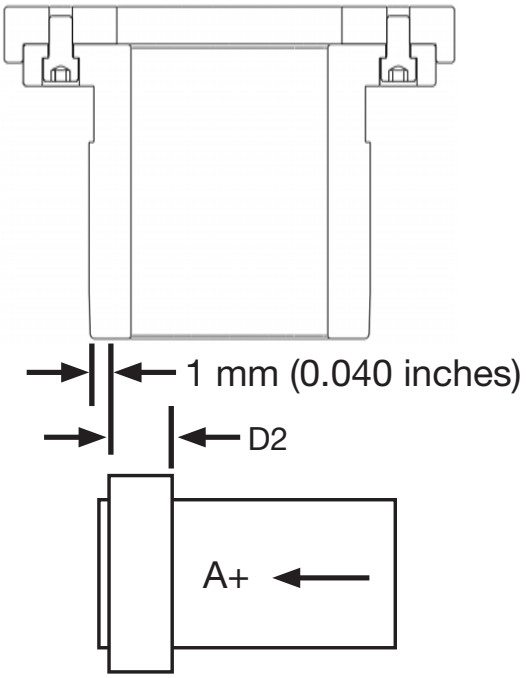

1 mm (0.040 inches)
D7
A-

28


C +
C = 90°

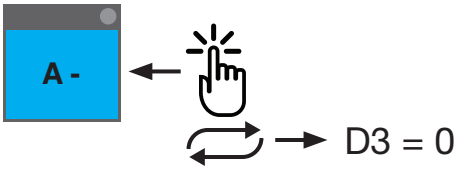
29

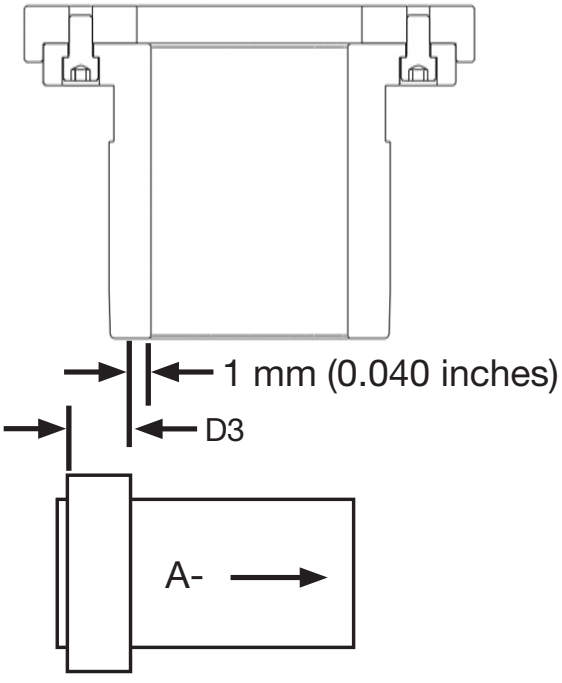

A +
D2 = 0

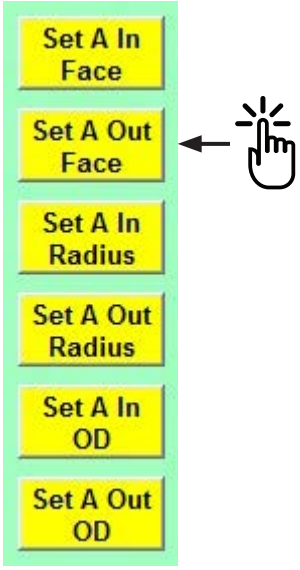

1 mm (0.040 inches)
D2
A+


Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD

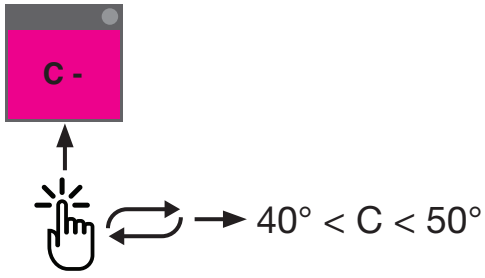
30

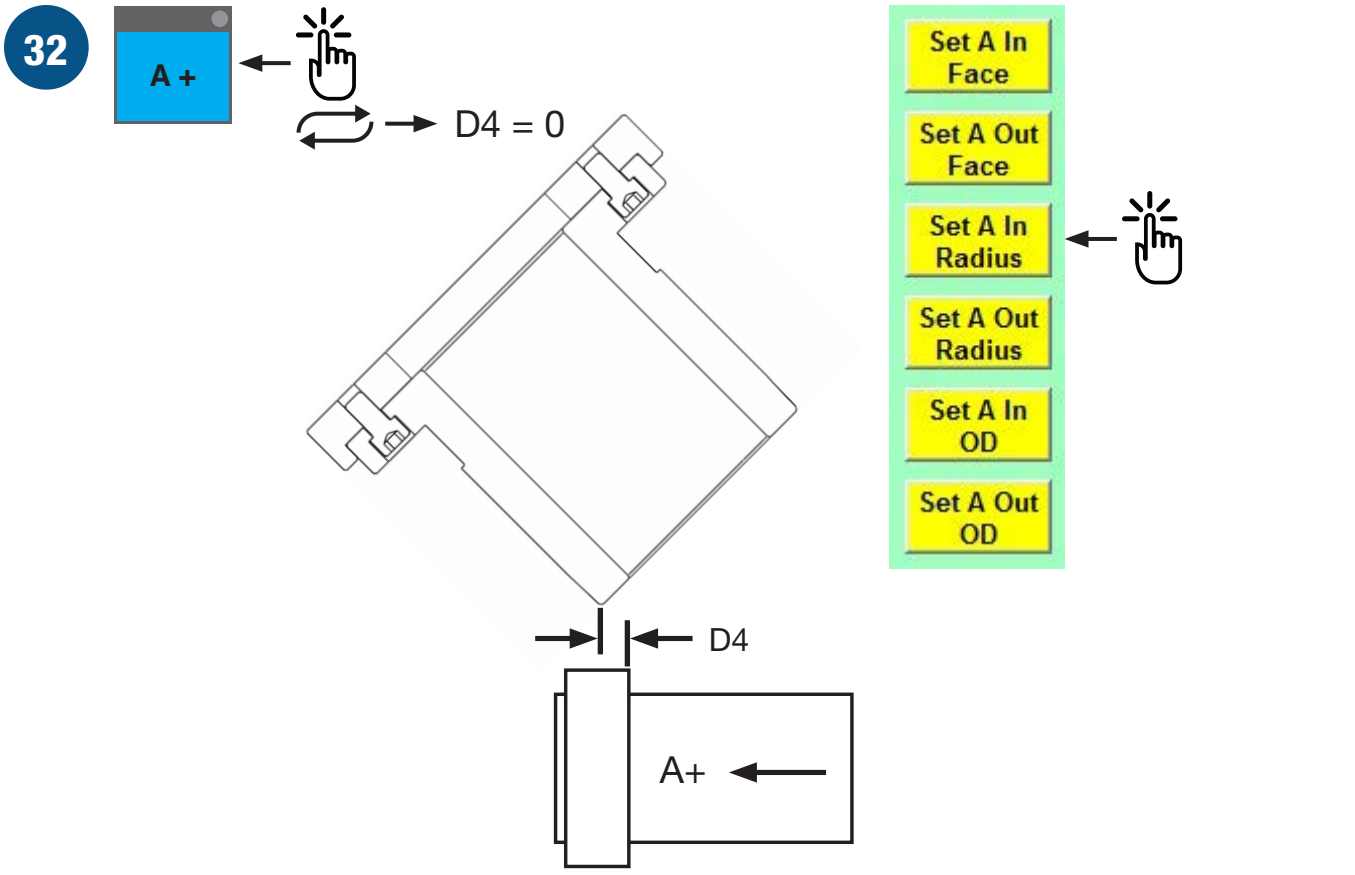

A -
D3 = 0

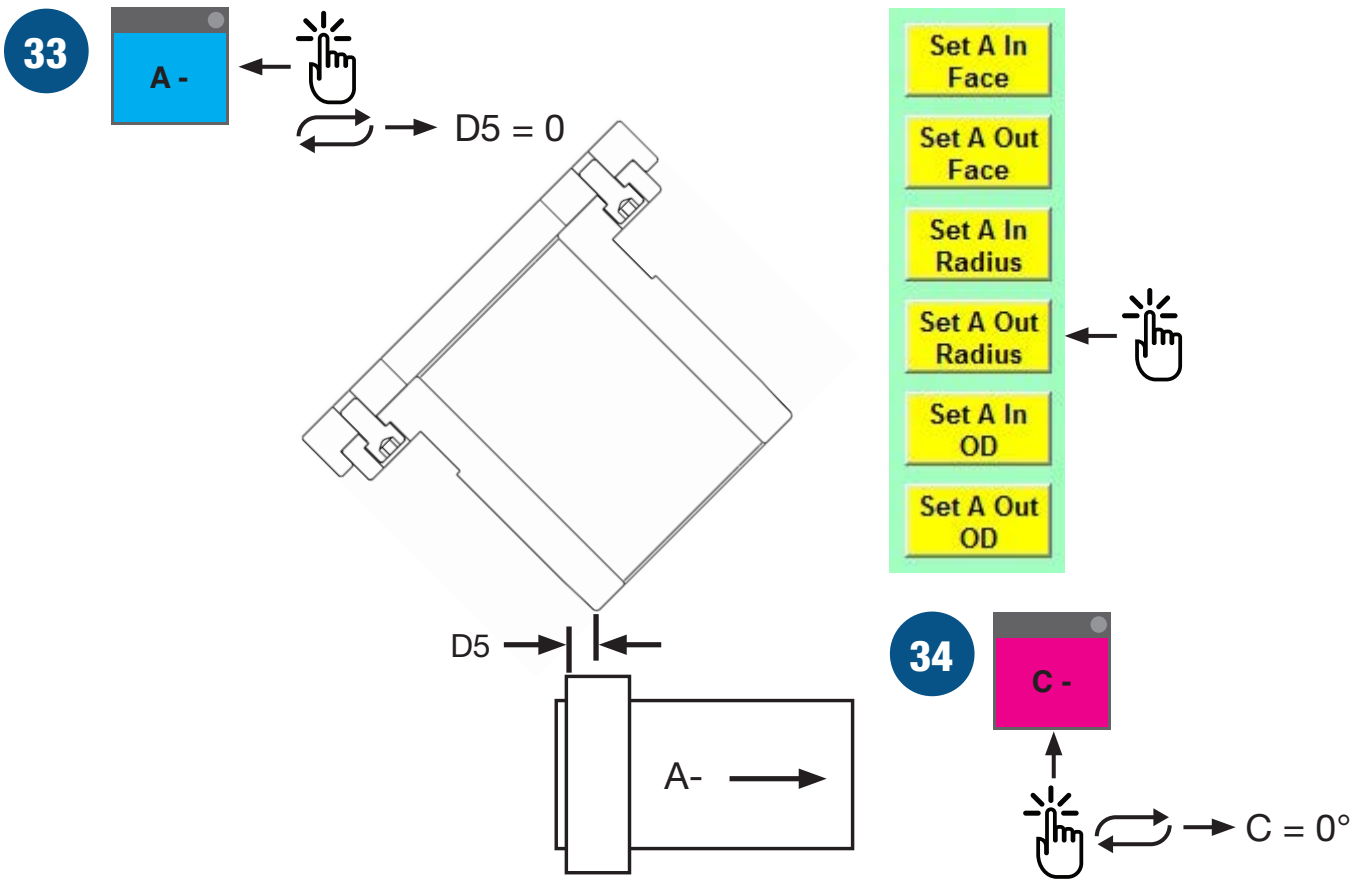

1 mm (0.040 inches)
D3
A-


Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD

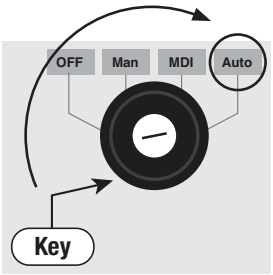
31

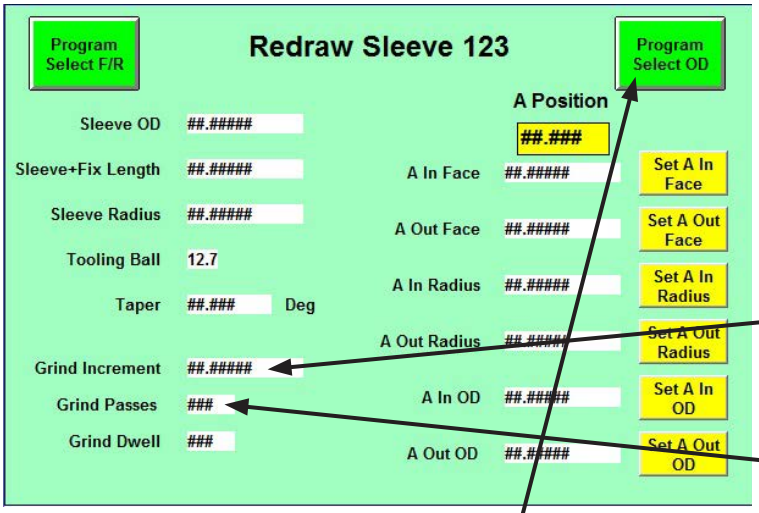

C -
40° < C < 50°


32
A +
D4 = 0
Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD
D4
A+


33
A -
D5 = 0
Set A In Face
Set A Out Face
Set A In Radius
Set A Out Radius
Set A In OD
Set A Out OD
D5
A-
34
C -
C = 0°

35



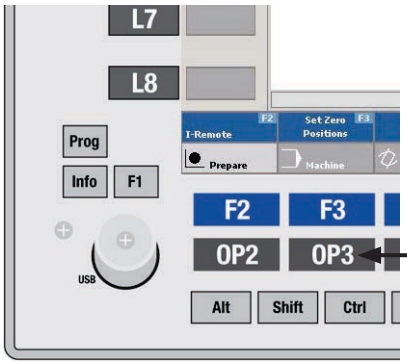


36

37

38

39



Program Select → Program Select → Program Select

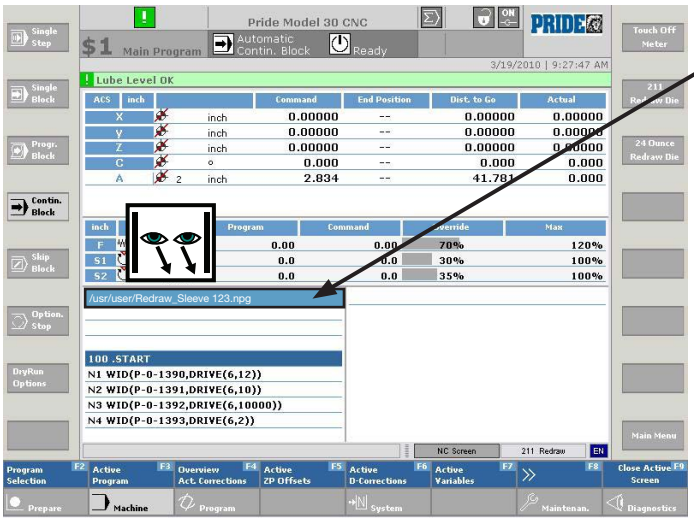
38

≠

/usr/user/Redraw_Sleeve 123.npg ?

=

40



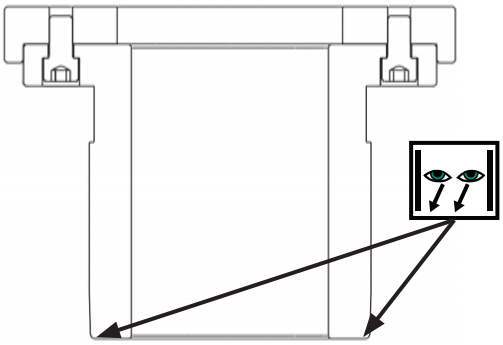
41

Cycle Start

42

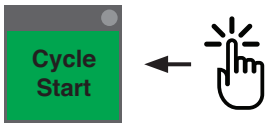
Cycle Start

43



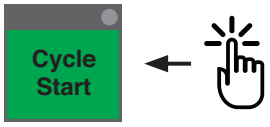
Machine cycle will pause to allow inspection of face to determine if additional grinding is required.

44



Start A axis oscillation and brings wheel to surface of redraw sleeve.

45

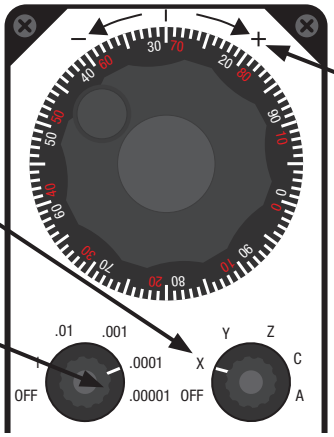


Activates the hand wheel.

CAUTION! Do not move key from the Auto position. If you do move it from this position, the program will start again from the beginning.

46

47

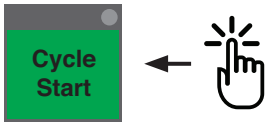


0.0001 inch
0.001 mm

48

Turn dial in (+) direction for additional grinding as needed to clean up face.

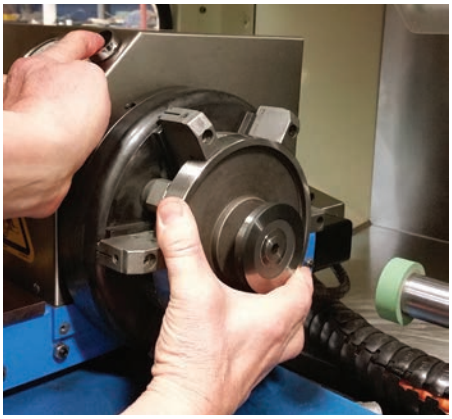
49



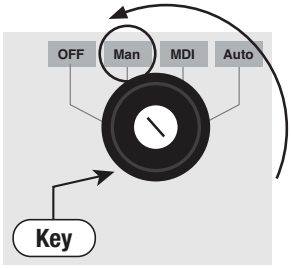
De-activates hand wheel and continues the grinding program until finished.

3.8.5 Trimmer Blade Grinding

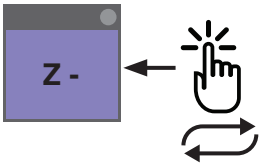
1



2

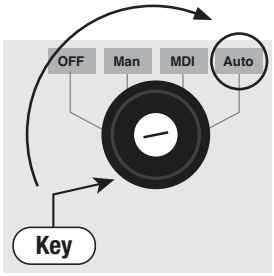


3

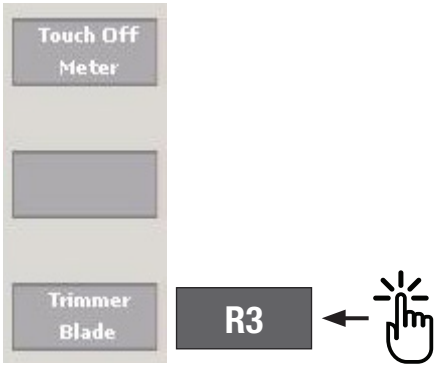


Move Z to a safe position clear of the trimmer blade.

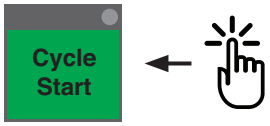
4



5

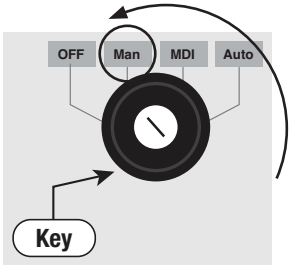


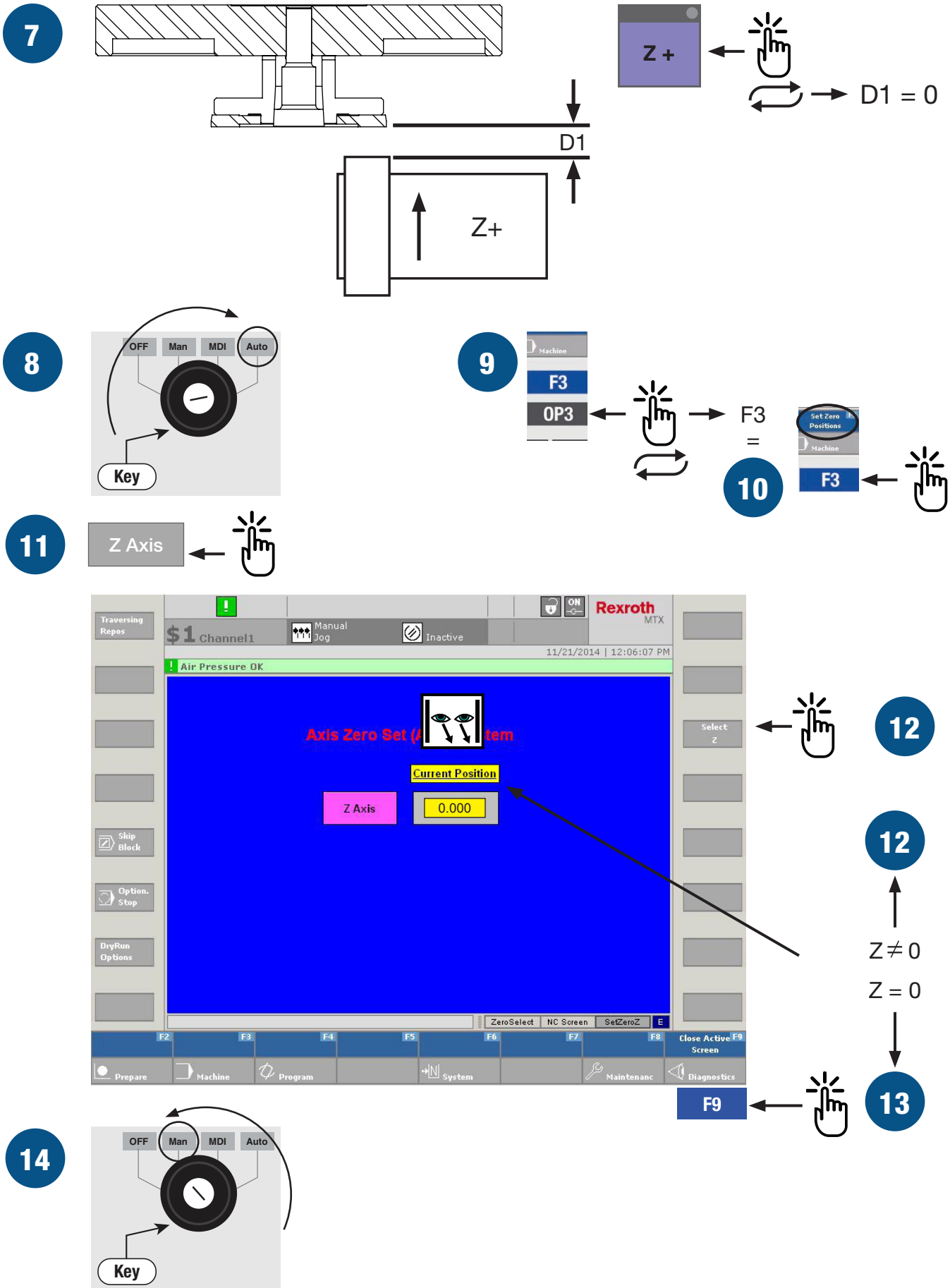
6



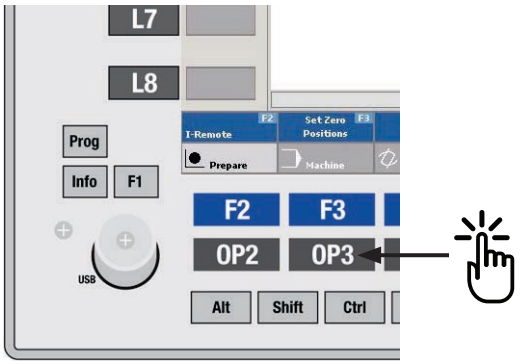
Moves C axis to 90 degrees.

7

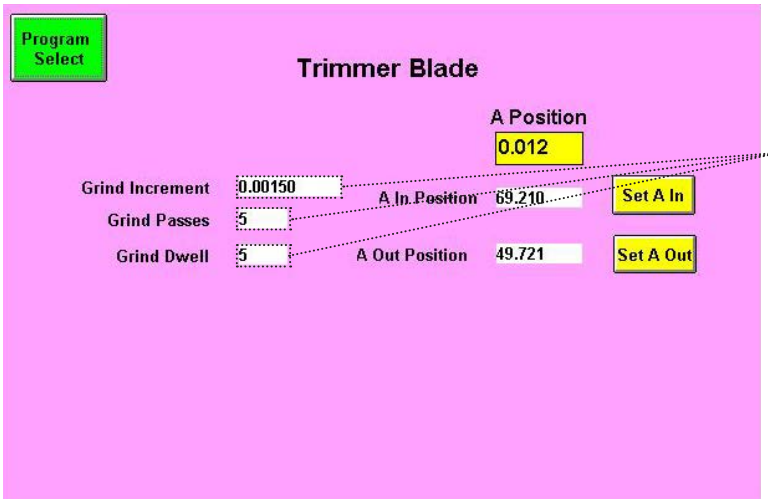



7
D1
Z+
Z +
D1 = 0
8
OFF
Man
MDI
Auto
Key
9
Machine
F3
OP3
F3
=
10
Set Zero Positions
Machine
F3
11
Z Axis
Traversing Repos
$1 Channel1
Manual Jog
Inactive
Rexroth MTX
11/21/2014 | 12:06:07 PM
Air Pressure OK
Axis Zero Set (
tem
Current Position
Z Axis
0.000
Select Z
12
Skip Block
Option. Stop
DryRun Options
ZeroSelect
NC Screen
SetZeroZ
E
F2
F3
F4
F5
F6
F7
F8
Close Active Screen
F9
Prepare
Machine
Program
System
Maintenanc
Diagnostics
12
Z≠0
Z = 0
F9
13
14
OFF
Man
MDI
Auto
Key

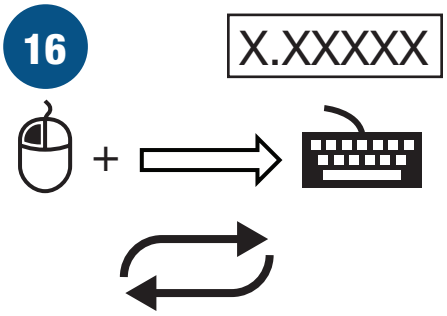
15


L7
L8
Prog
Info
F1
F2
F3
OP2
OP3
Alt
Shift
Ctrl
USB
I-Remote
Prepare
Set Zero Positions
Machine

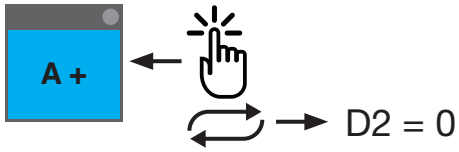
16

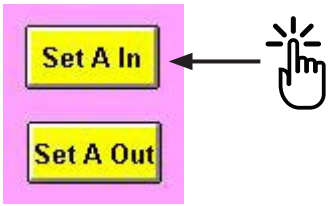

Program Select
Trimmer Blade
A Position
0.012
Grind Increment
0.00150
Grind Passes
5
Grind Dwell
5
A In Position
69.210
A Out Position
49.721
Set A In
Set A Out

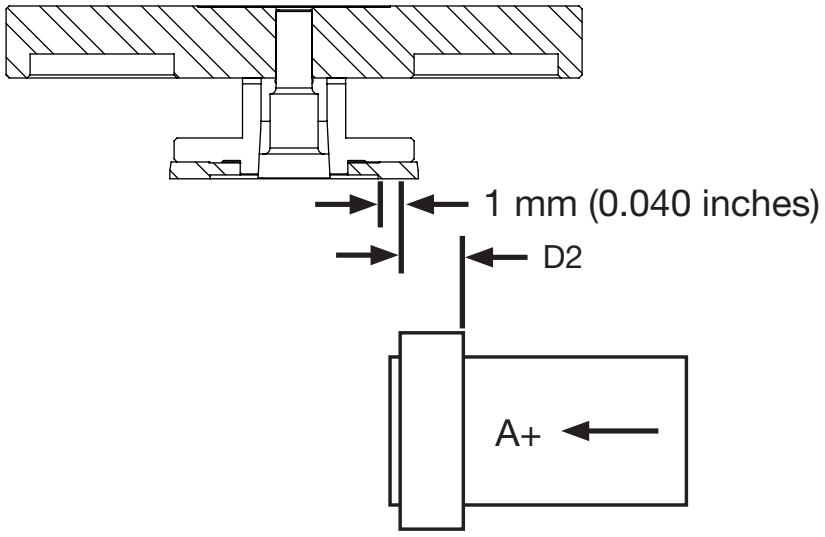
16


X.XXXXX
+

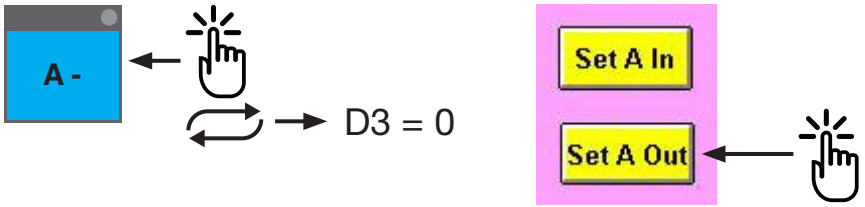
17

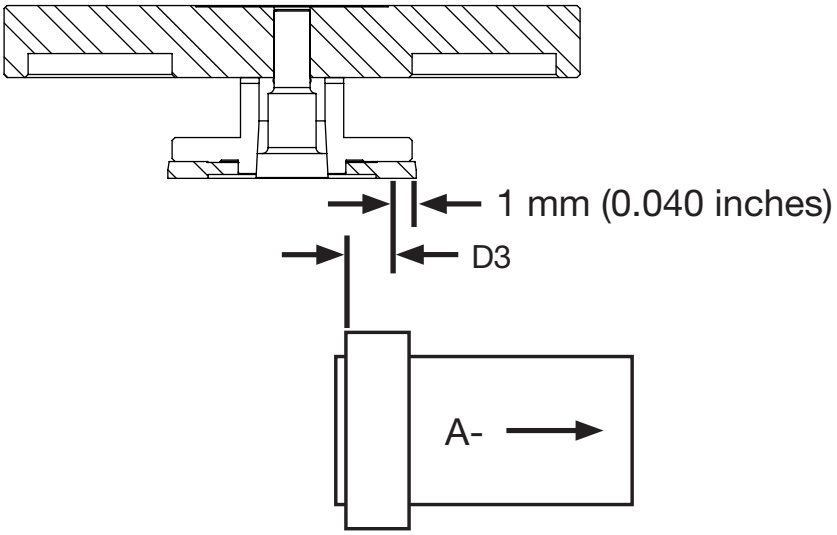

A +
D2 = 0


Set A In
Set A Out

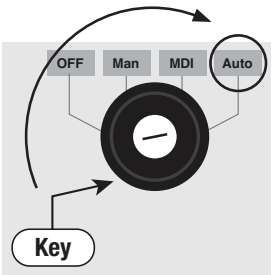

1 mm (0.040 inches)
D2
A+

18

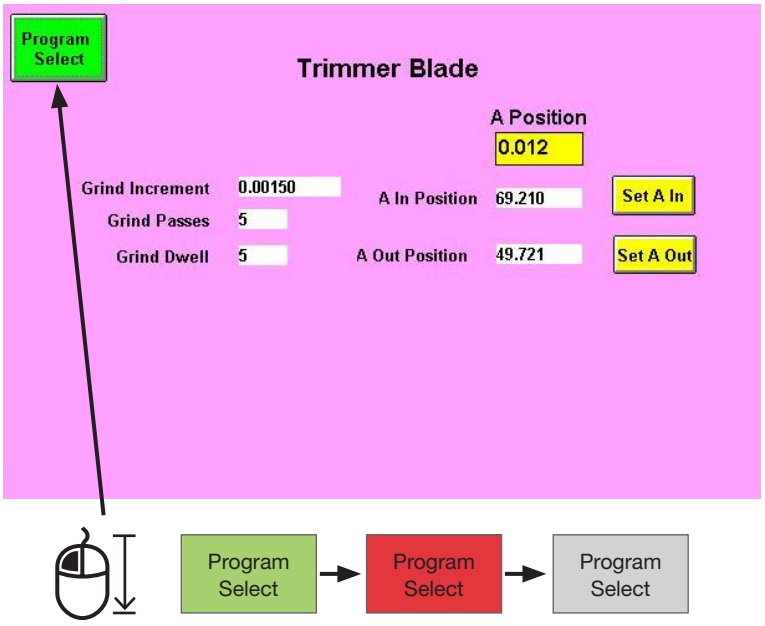

A -
D3 = 0
Set A In
Set A Out


1 mm (0.040 inches)
D3
A-

19

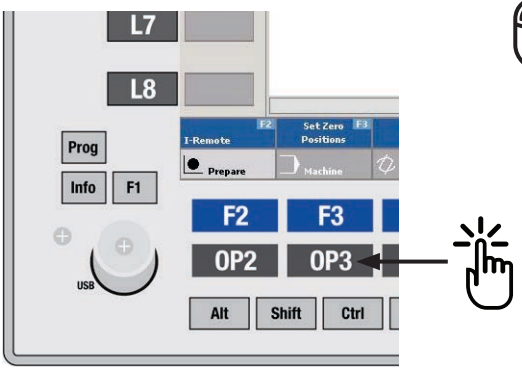

OFF
Man
MDI
Auto
Key

20

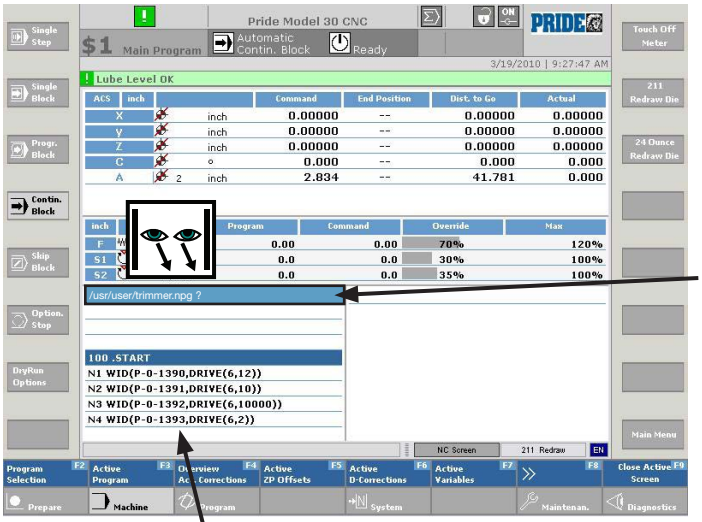

Program Select
Trimmer Blade
A Position
0.012
Grind Increment
0.00150
Grind Passes
5
Grind Dwell
5
A In Position
69.210
A Out Position
49.721
Set A In
Set A Out

Program Select
Program Select
Program Select

21


L7
L8
Prog
Info
F1
F2
F3
OP2
OP3
Alt
Shift
Ctrl
USB

22



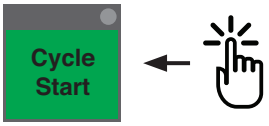
20

≠

/usr/user/trimmer.npg ?

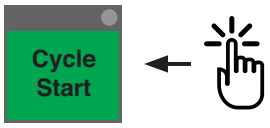
=

23



Watch program text area for prompt to press cycle start.

24

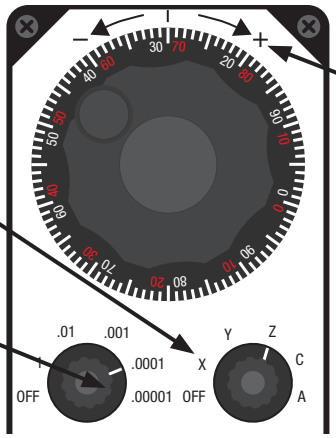


Activates the hand wheel.

CAUTION! Do not move key from the Auto position. If you do move it from this position, the program will start again from the beginning.

25

26

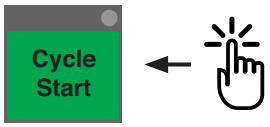


0.0001 inch
(0.001 mm)

27

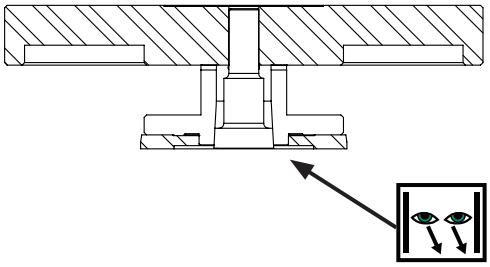
Turn dial in (+) direction for additional grinding as needed to clean up face.

28



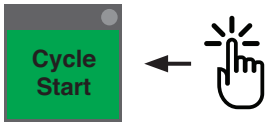
De-activates hand wheel and allows inspection of the trimmer blade face.

29



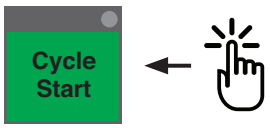
Inspect face of trimmer blade to determine if additional grinding is required.

30



Start A axis oscillation and brings wheel to surface of trimmer blade. Watch program text area for prompt to press cycle start.

31



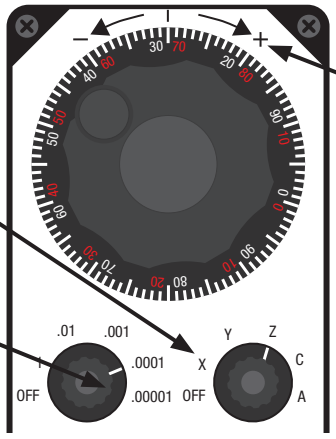
Activates the hand wheel.

CAUTION! Do not move key from the Auto position. If you do move it from this position, the program will start again from the beginning.

32

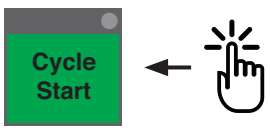
33

34



Turn dial in (+) direction for additional grinding as needed to clean up face.

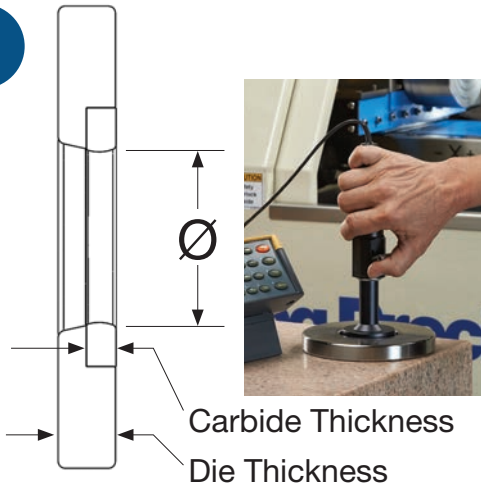
35

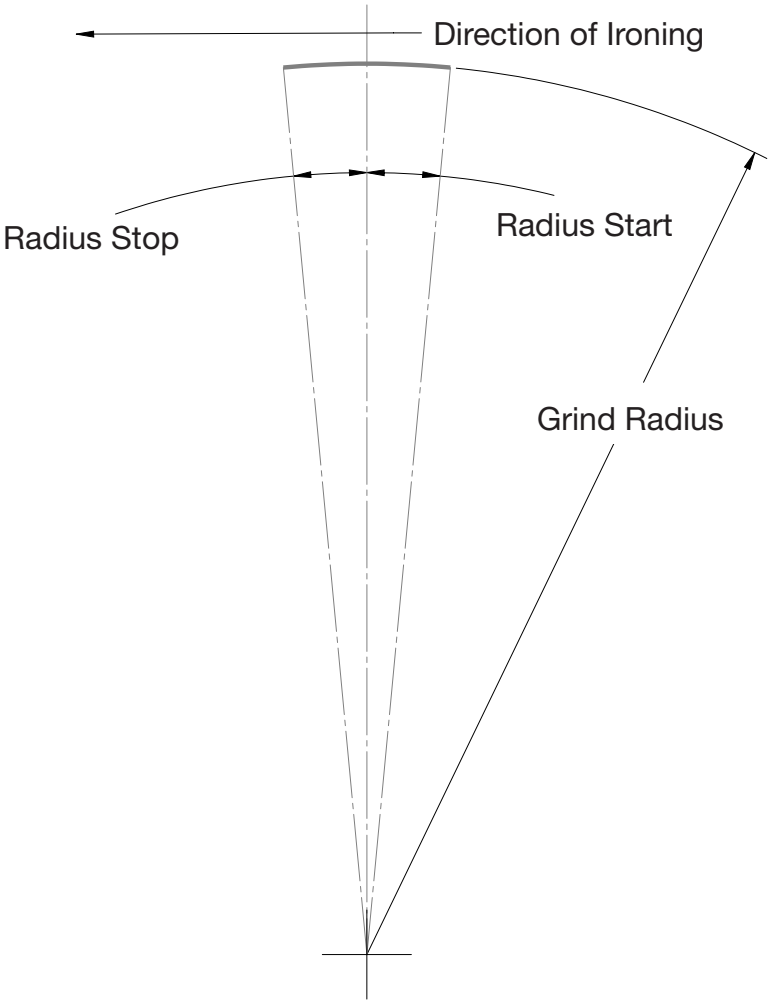


De-activates hand wheel and ends program.

3.8.6 Pilot Die Grinding

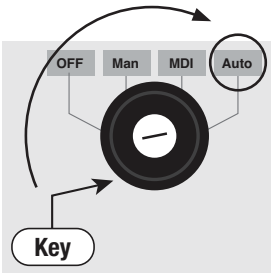
1





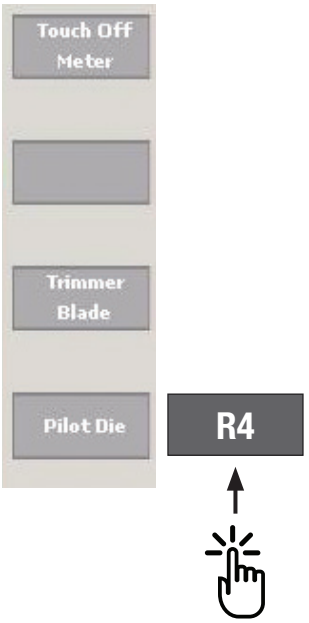
2

3

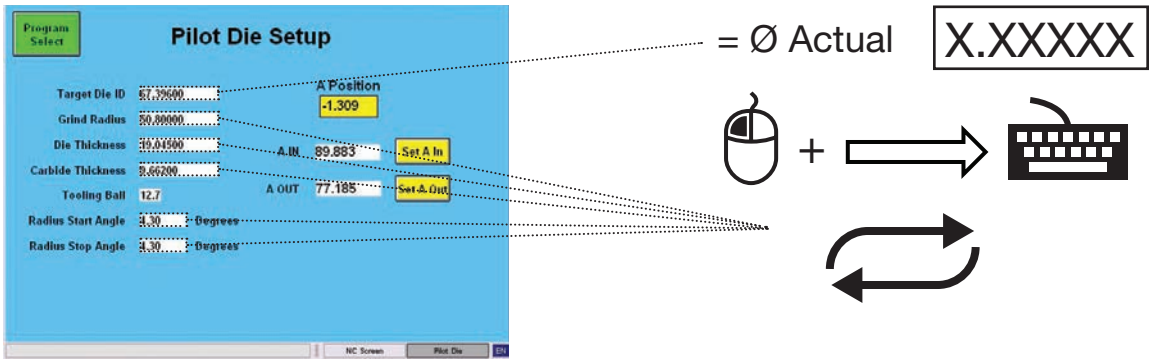


4

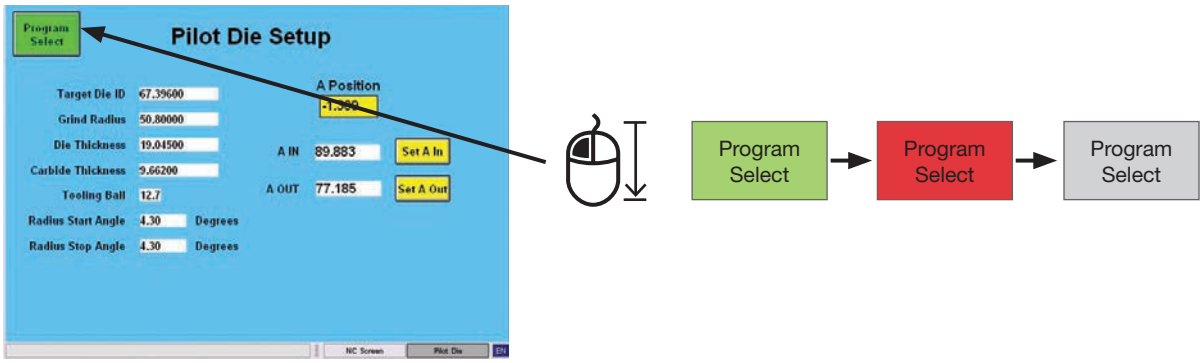
5



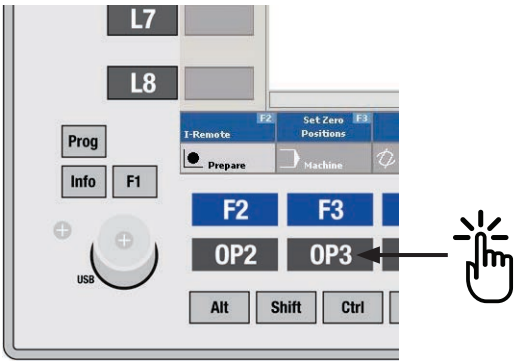
6



7



8



Override
60%
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80%

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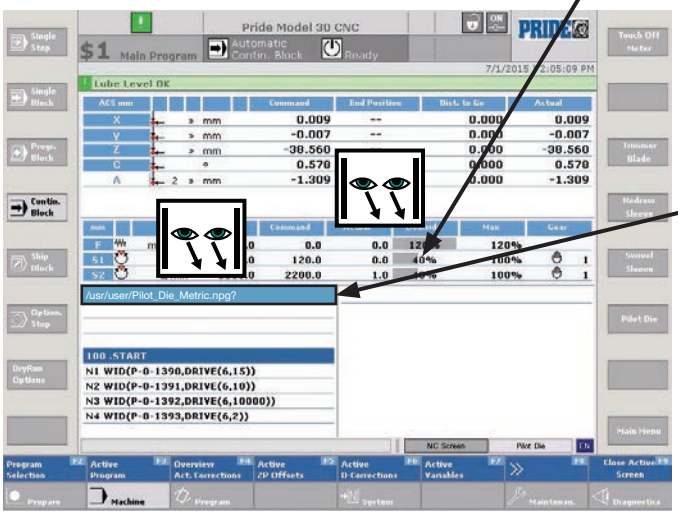

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/usr/user/Pilot_Die_Metric.npg?

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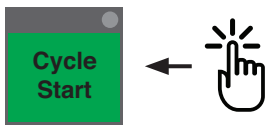

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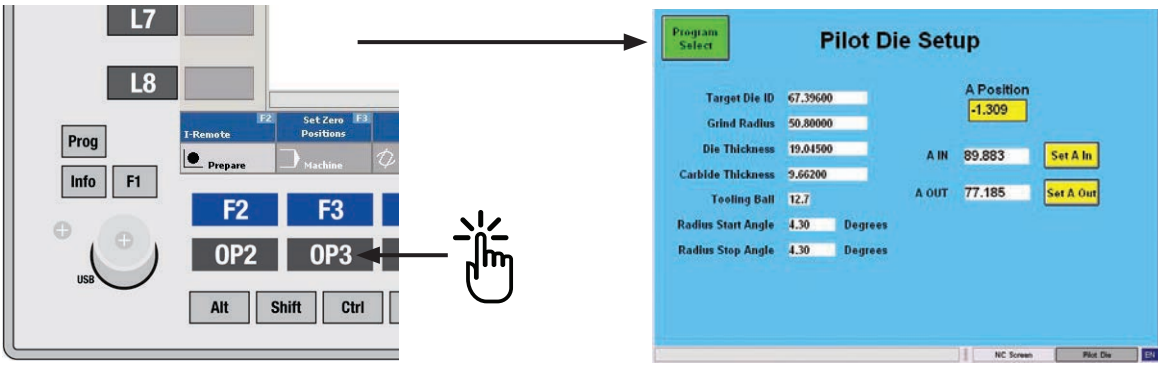

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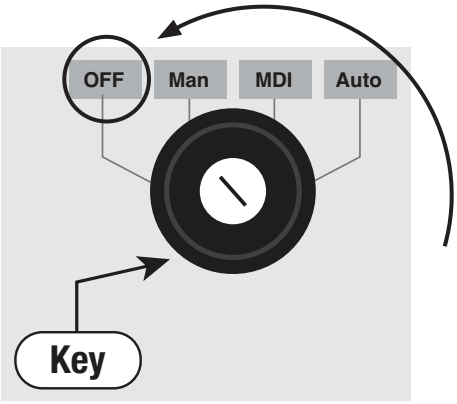

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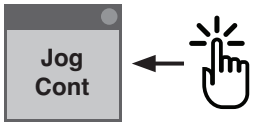

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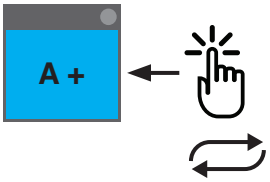
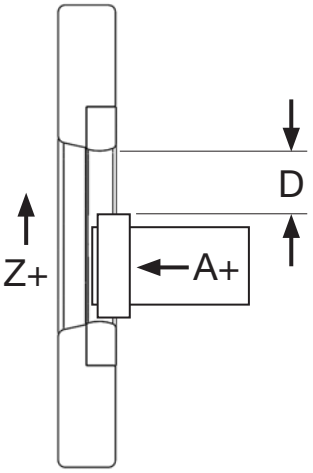
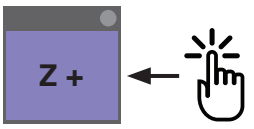




Jog A+ to center grinding wheel on center of pilot die carbide thickness.

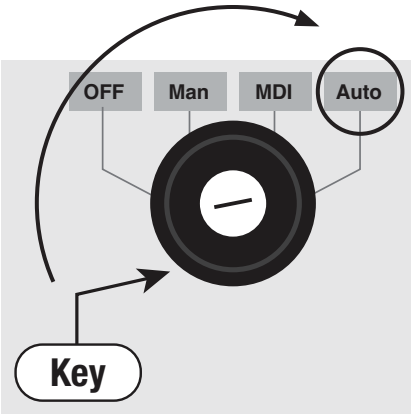
15



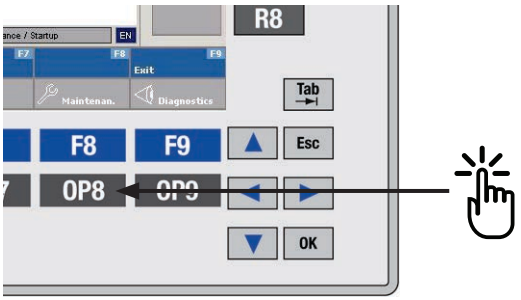
D = 0

Hand spin the work piece while using the Z+ Jog keys to move the grinding wheel until the wheel touches the work piece and just starts to spin due to contact with the spinning work piece. The grinding wheel should only contact about 25% of a full rotation of the work piece.

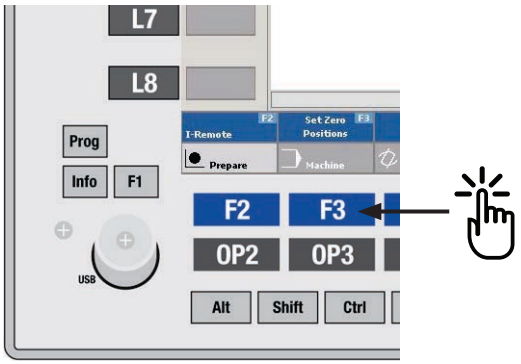
16


OFF
Man
MDI
Auto
Key

17


R8
Tab
F8
F9
Esc
OP8
OK

18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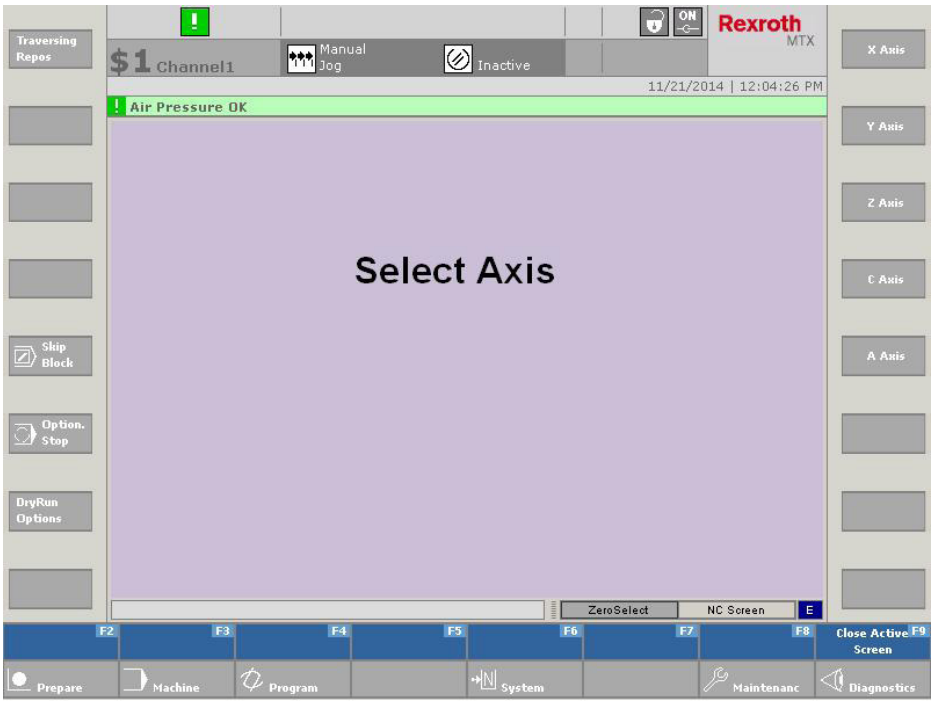

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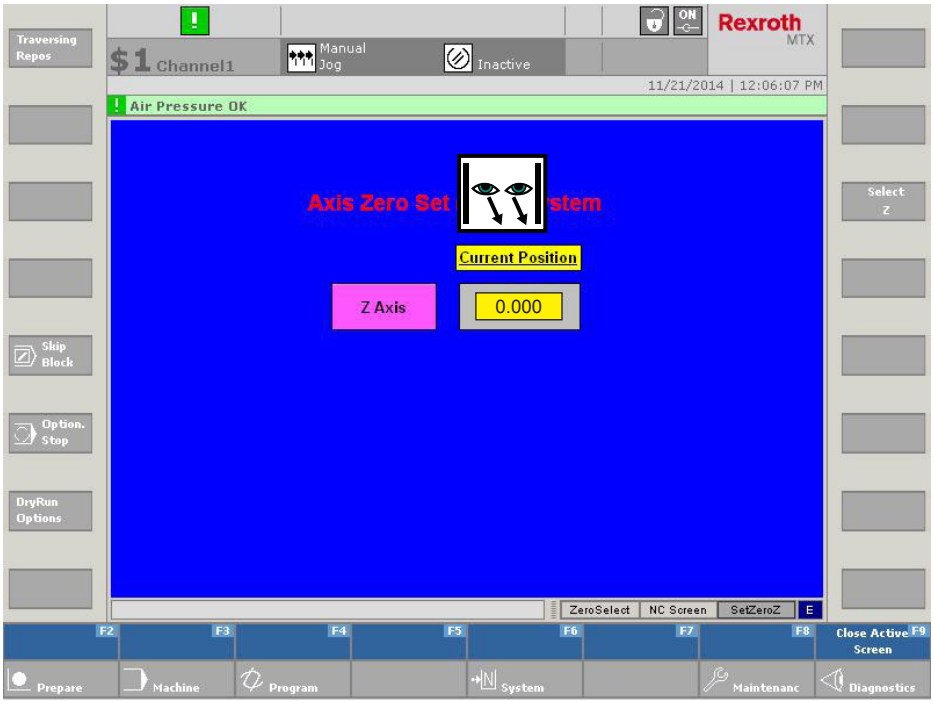

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$Z \neq 0$

$Z = 0$

F9

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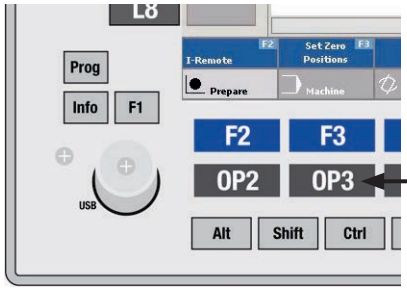

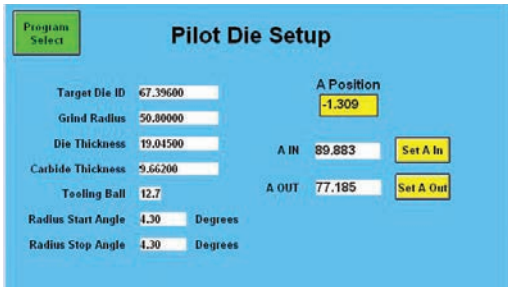

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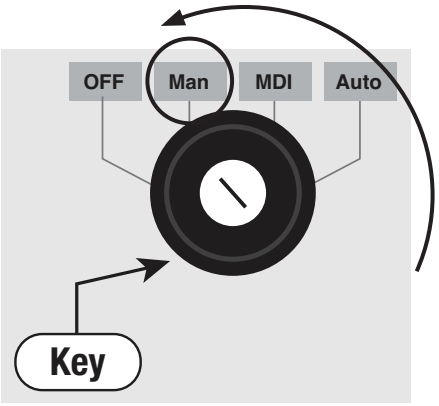

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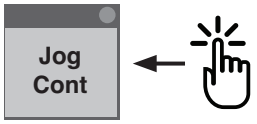

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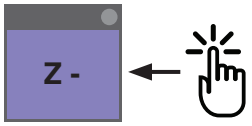
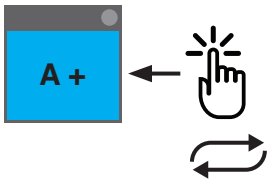


Z ~ - 0.080 inches (2 mm)

26



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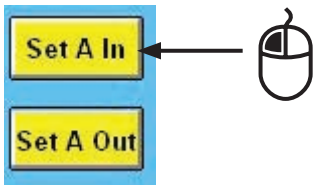

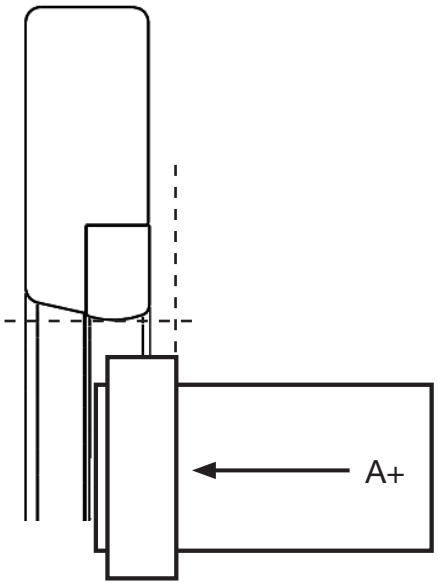

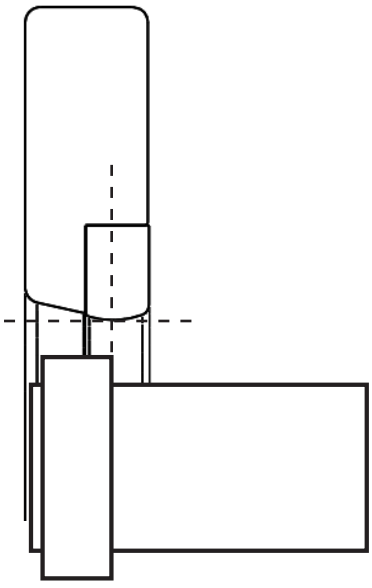

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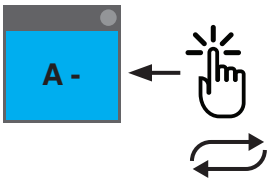

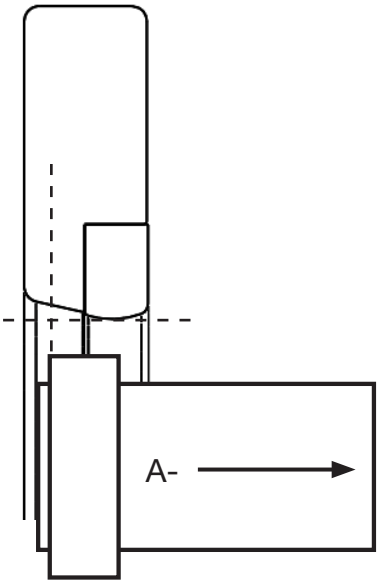

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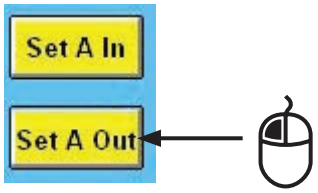

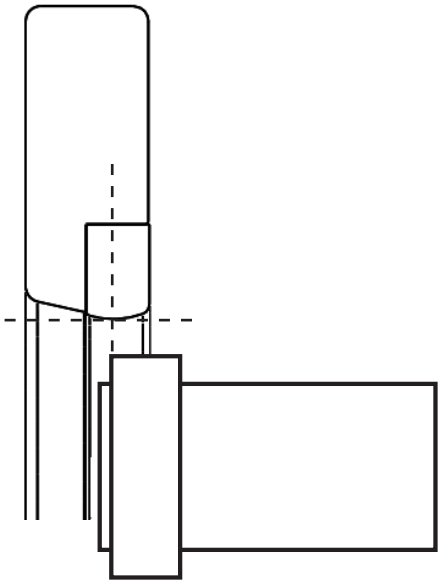

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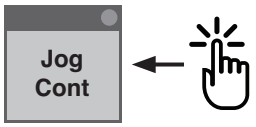

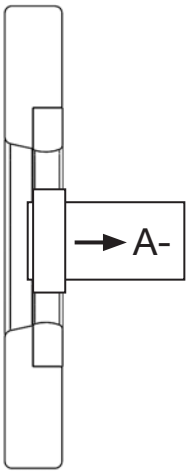

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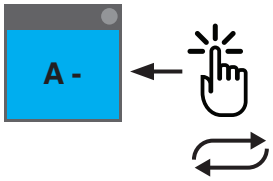
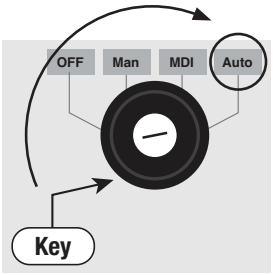
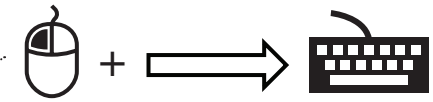


Jog A- until it stops. The control may show an error when the end of the A axis travel is reached.

32



X.XXXXX | Enter Target ID



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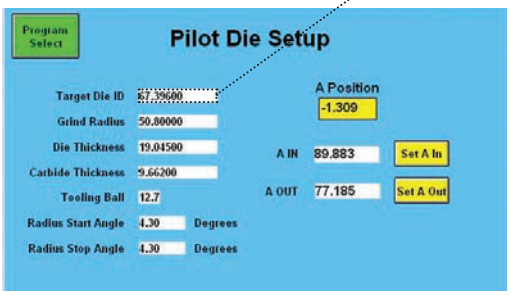
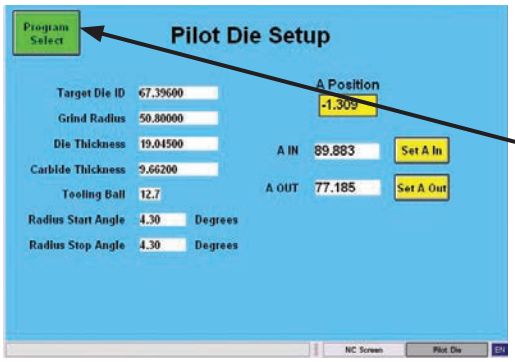


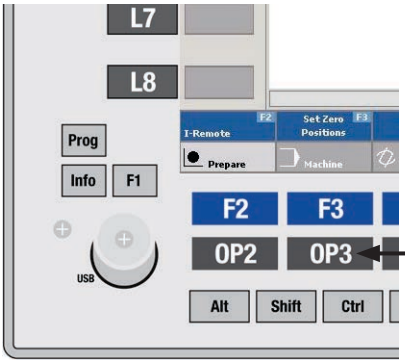
Please note we recommend removing enough material to increase the Die ID by 0.0004 – 0.0006 inches (0.010-0.015 mm).



34

Program Select → Program Select → Program Select

35



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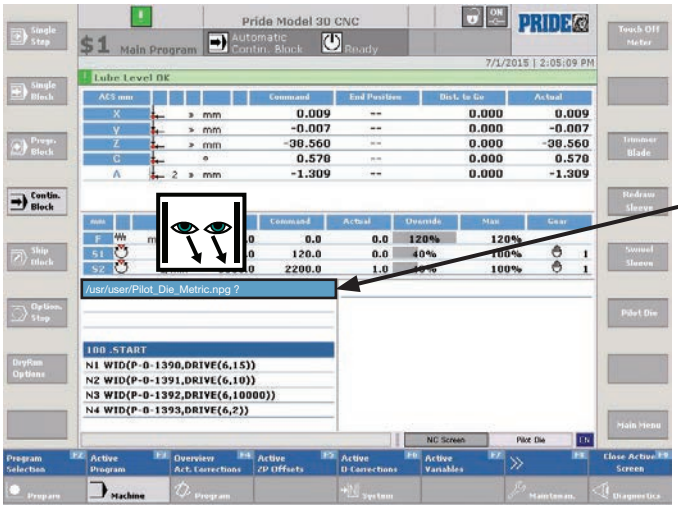

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/usr/user/Pilot_Die_Metric.npg ?

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37 Cycle Start

38 Cycle Start

3.9 TROUBLESHOOTING

3.9.1 OPERATOR LEVEL TROUBLESHOOTING TOPICS

The following guide provides methods to help troubleshoot potential issues. Typical issues operators can address:

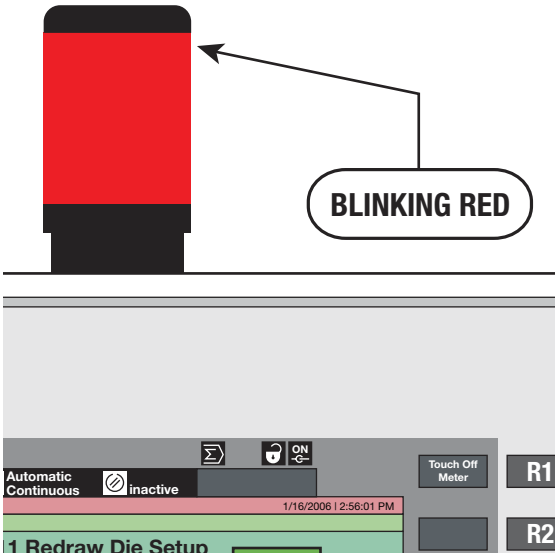
- Low lube oil
- Low air pressure
- Errors that can be addressed by re-starting the main control.
- Safety-Interlock Errors caused by leaving a door open.

Error messages that require access to the electrical cabinet to address should only be carried out by qualified personnel.

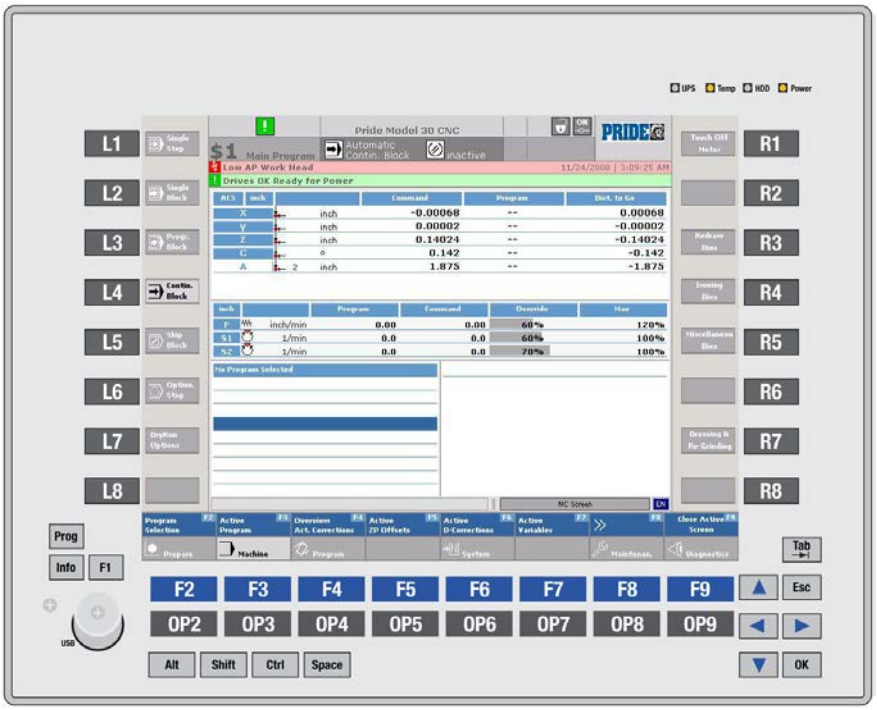
3.9.2 SKILLED PERSONNEL LEVEL TROUBLESHOOTING TOPICS

Errors that require isolation of energy sources such as electrical and compressed error should only be carried out by qualified personnel trained in proper procedures for safely isolating energy sources. Refer to the maintenance section.

3.9.3 CLEARING ERRORS



Errors such as machine crashes and other errors will occur. The grinder will shut down and the operator is notified when an error occurs: the operation light on top of the control pedestal will flash **red** instead of **green** and an error message will appear on the control screen. Each error message on the screen will be highlighted in **red** like the message below stating "Low AP Work Head". There are three types of errors: Machine errors, Control errors and Drive errors. Error messages for machine errors are easily identified from the message on the screen. The error message below is an example describing the error as low air pressure at the work head. Control errors and Drive errors can be defined with one of the two diagnostic manuals that are available through an icon on the opening screen. Control errors will be identified with the help of **"Rexroth IndraMotion MTX Diagnosis Massages"**. Drive errors can be identified with the help of the manual labeled **"Rexroth IndraDrive Trouble Shooting Guide"**.



Once an error occurs and the grinder is shut down, the grinder can not be restarted until the problem causing the error has been resolved. In this example, the grinder will not re-start until the air supply to the Work Head rises to the minimum required (70psi. or 4.8 bar). In the event of a machine crash or exceeding the load limits of a drive, the grinder will stop and the **green** operation light will turn to flashing **red**. The error can reside in either the control or on one of the drives.

1. When an error occurs, click on the Diagnostics (OP9) icon and a log of errors will appear on the control screen.

2. After you click on the Diagnostics (OP9) icon a window with a list of errors will appear. Address the problem shown on the control screen. In this example, increase the air supply to the Work Head.

   If a Drive error occurs, such as an error caused by a sudden loss of power, the Diagnostic screen will show SERCOS errors like those below.

These SERCOS errors were caused by a sudden loss of power such as those resulting from depressing the E-Stop or the tripping of a breaker or fuse.

E-STOP

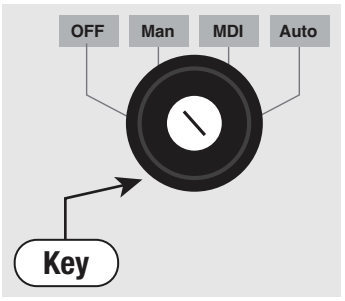
BREAKER

FUSE

If needed, look up the error number (F2026 on this screen) in the **"Rexroth IndraDrive Trouble Shooting Guide"** or the **"Rexroth IndraMotion MTX Diagnosis Messages"** manuals.

3. Left click on any one of the errors and then left click on the Delete Square (F4), at the bottom of the screen or depress the Clear Error. If the error is no longer present the error will disappear and the grinder can be re-powered. If the error persists you must address the error.

4. Switch the key to the "Man" mode.



5. Depress the "Power On" and hold it down until the small **green light** in the upper corner of the button stays on. If the button light stays on then the error message can be cleared in the diagnostic screen and you may resume grinder operation. If the **green light** does not stay on proceed to the next step.

6. If the small **green light** on the "Power On" button does not stay on then the grinder and the grinder's Windows® based computer control must be re-booted. Shut down the Windows® control in the same manor that you would shut down any Windows® based computer, through the **"Start"** Menu. After the control is shut down, turn off the power to the grinder at the main power switch. The main power switch is located on the control panel door on the right hand side of the grinder. Turn the power back on and the control will boot up.

3.10 POWER INTERRUPTION

Electrical power interruption will cause the machine to stop. The main control will need to be re-started once electrical power is restored. Power interruptions during a grinding process will most likely result in a damaged work piece. Check to make sure the grinding wheel or other machine components were not damaged.

If you experience interruptions of air pressure to the air bearings longer than 12 hours, follow the instructions in section 4.6 Air Bearings, steps 1-6.

MODEL 30A GRINDER

MAINTENANCE

PRIDE ENGINEERING

4. Maintenance

The purpose of this section is to provide maintenance instruction for your grinder.

4.1 SAFETY


Protective eyewear is required while performing maintenance on the machine.

WARNING–Lethal electrical shock by live parts with more than 50V!

Main electrical power switch over ride should only be used by qualified and trained maintenance personnel. Power will remain on if the switch is over ridden.

Before accessing device, wait at least 30 minutes after switching off the supply voltages to allow discharging. Check whether voltage has dropped below 50V before touching parts!

4.2 ENVIRONMENTAL

Handle and dispose of coolants and lubricants in accordance with local and national environmental protection and disposal requirements.

All fluids, filter papers and filters should be handled in accordance with local and national environmental standards.

4.3 DAILY MAINTENANCE

Close observation should be made to all areas, air bearings in particular, to assure dependable operation.

1. Clean grinder thoroughly to remove all grinding and/or diamond dust.

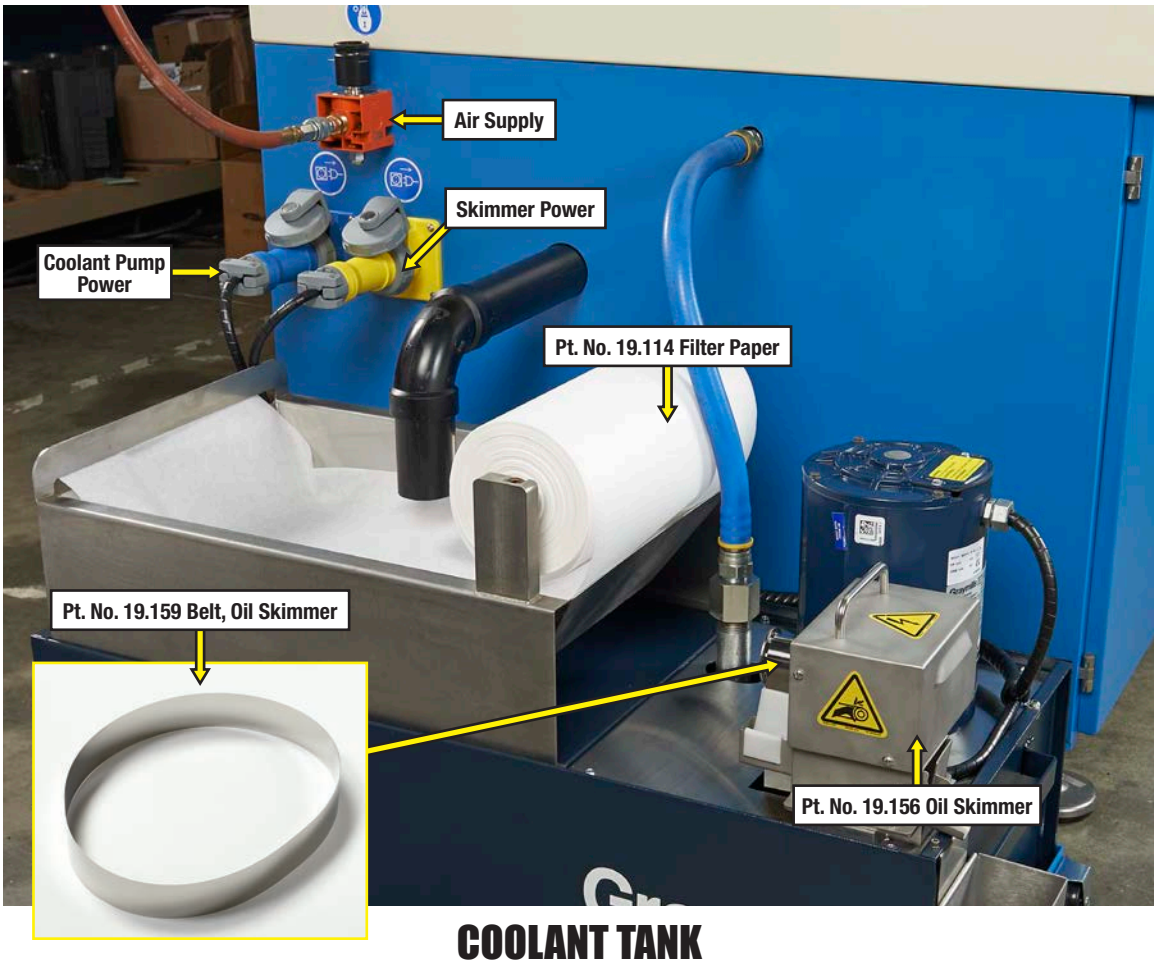
Do not use compressed air to clean off grinder.

2. Check the Way and Ball Screw lubrication tank has sufficient oil. You will find the tank by opening up the cabinet door underneath the Work Head side of the machine. The Way and Ball screw lubrication is automatic by means of a pump, timed to pump oil into the slides during operation of the grinder. The timer runs whenever the control power is on. At the time of discharge, the way lube system is pressurized and the oil is distributed to the ball screws and the axis ways. The majority of the oil is metered to reciprocating A slide.

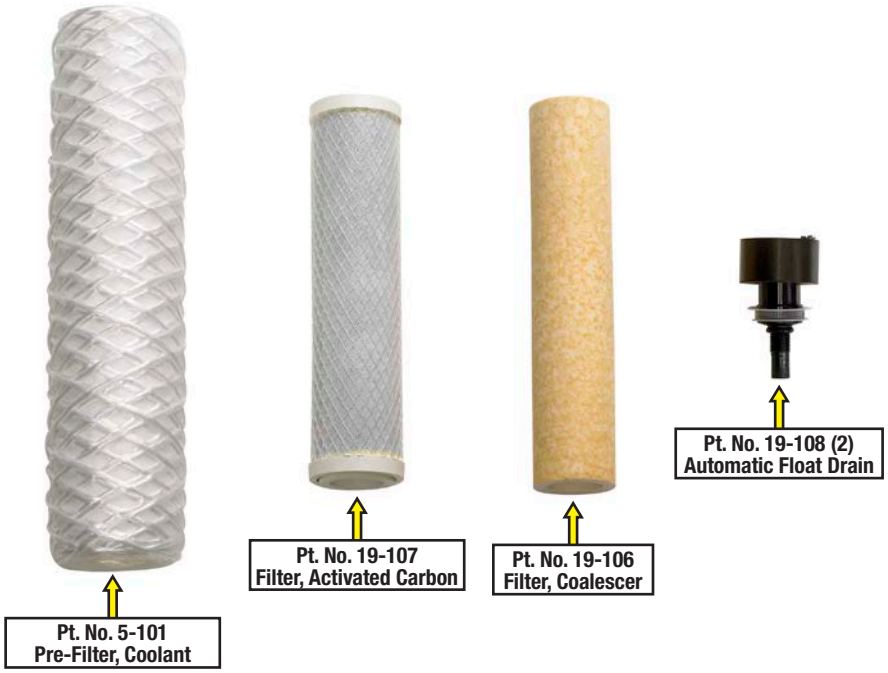
   The machine will display an error if the oil level in the tank is to low. The system is programmed to allow the grinder to run for 30 minutes after the low oil level is detected. This provides adequate time for a grinding program to be completed. The grinder will not run until the oil level is increased and the error is cleared.

LUBE PUMP

3. Inspect Filters, Skimmer Belt and Coolant Fluid, Replace as Necessary



COOLANT TANK



4. Cycle each Axis (A, X, Y, and Z) through its full range of travel to lubricate full axis travel.

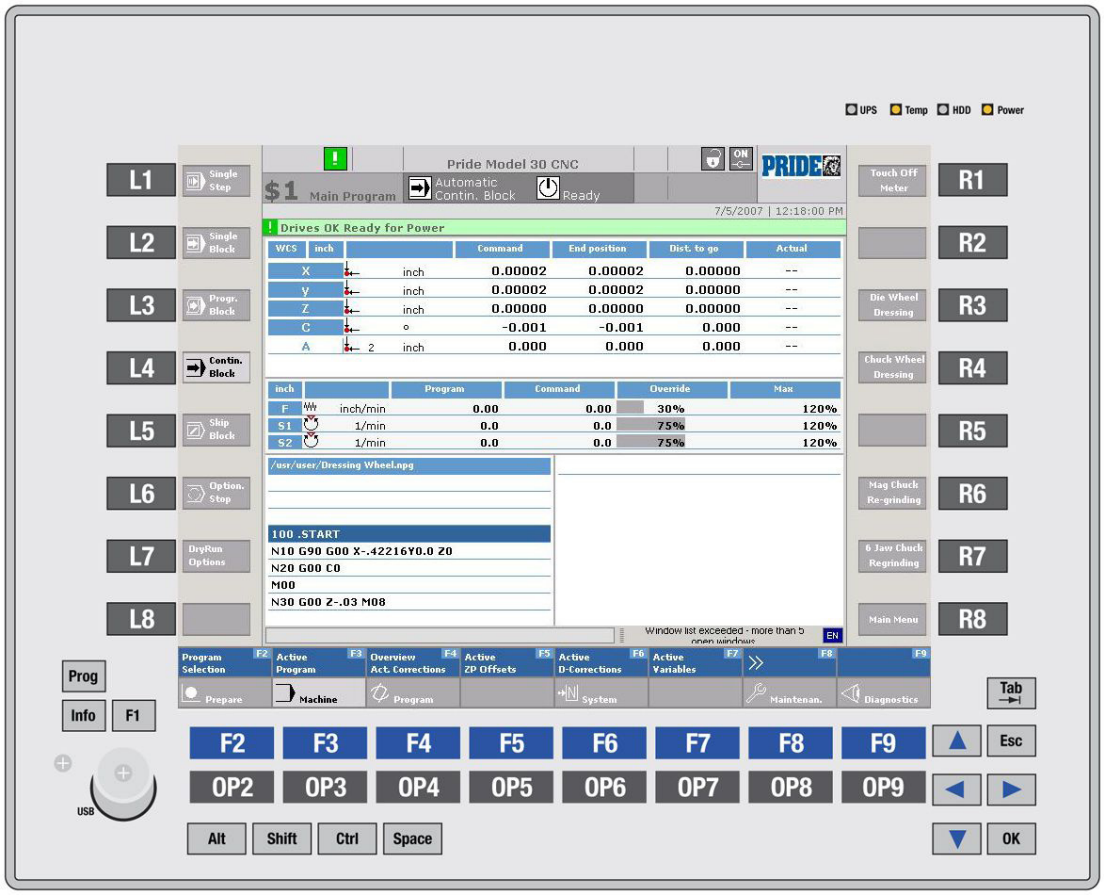
4.4 PERIODIC MAINTENANCE

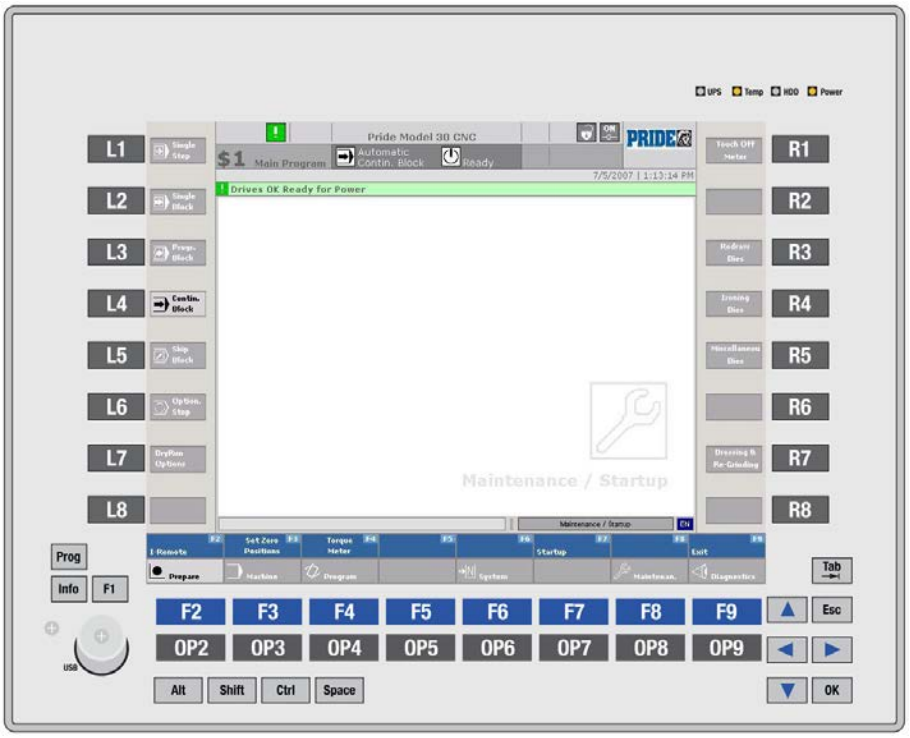
1. Check wheel head and work head belts monthly.

> **Do not over tighten belts.**

2. Change air pre-filters when necessary or once a year, which-ever comes first.
3. Re-grind work holding chucks as needed.
4. Tighten gibs as required, but be careful not to over tighten. To set the tension on the gibs:

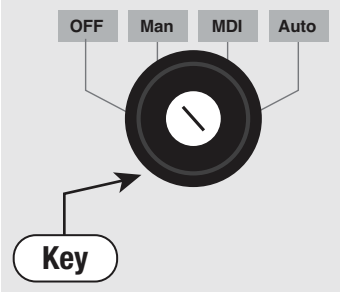
   a. Select the Maintenance icon (OP8) in the lower right corner of the screen.

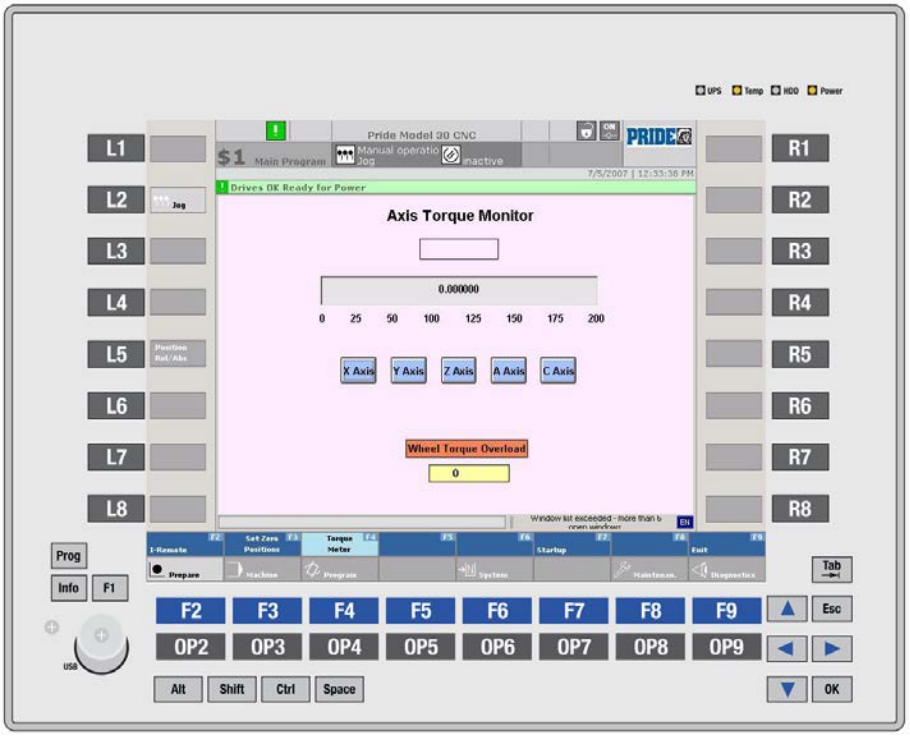




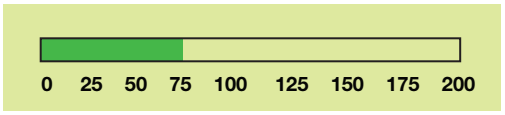
b. Turn the Key to the "Man" mode because you will need to move the slides while tightening the gibs using the Jog keys.

c. Select the Torque Monitor (F4) icon at the bottom of the screen.

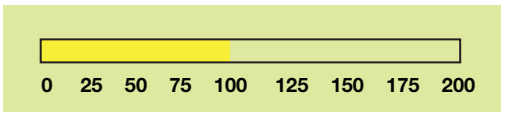




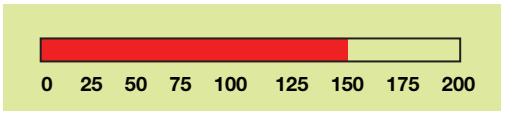
You may select the axis and the bar graph will show its tension. The tension on each slide will be shown as Torque on each axis' drive motor. 100 on the bar graph means that the tension on the gib requires 100% of the torque capability for the drive motor for the selected axis. If the tension is below 75 the graph will be green.



If the tension is closer to the design capacity of drive motor it will show Yellow.



A reading over 100 means that there is risk of overheating and perhaps burning up the drive motor. If the gib has been over tightened the drive motor is in danger of overheating and graph will show red.



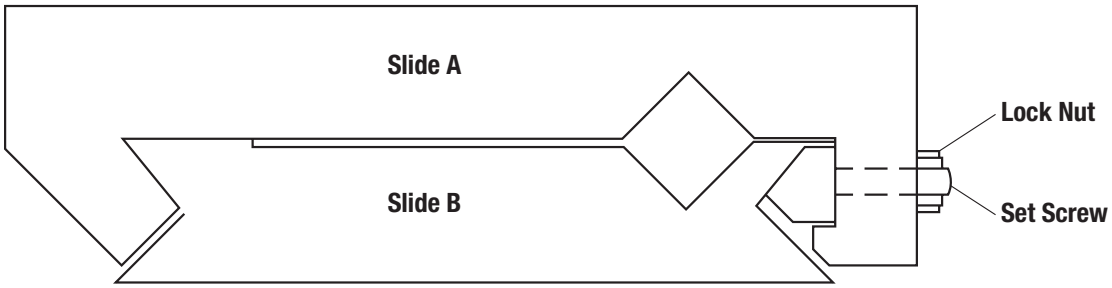
d. Set the tension on each axis so the bar graph is approximately 75.

The A slide is a special situation:

e. Loosen the lock nut and set screw.

f. Move the A slide forward.

g. Tighten only the back 5 set screws by hand. **Do not tighten the set screws that do not have a slide behind them.**



Move Slide A all the way forward. Adjust back five Set Screws by first loosening Lock Nut and applying light pressure to Set Screw. Move Slide A back and adjust front five sets.

h. Move the slide back and tighten the remaining (front) set screws. Set the tension to achieve approximately 75 on the bar graph.

The X, Y, and Z are easier:

i. Loosen the locking nut and set screw

j. Re-tighten the set screw to about 6 inch pounds or 40 N·m, but watch the tension to achieve approximately 75 on the bar graph.

k. Re-tighten the locking nut.

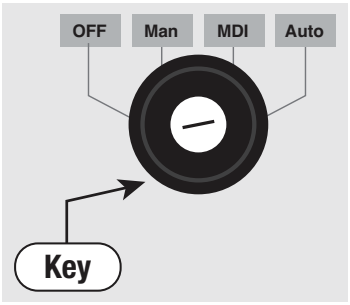
4.5 CHUCK MAINTENANCE

Occasionally the chuck must be ground to maintain flatness and squareness. Failure to re-grind the chuck when required will cause the ground work to be distorted and out of round when removed from the chuck. The face of a redraw die will check out of flat when ground in a distorted state. First the grinding wheel used for grinding the chuck must be dressed or the quality of the ground chuck will be distorted. Use the following procedures to dress the grinding wheel used for grinding the chuck.

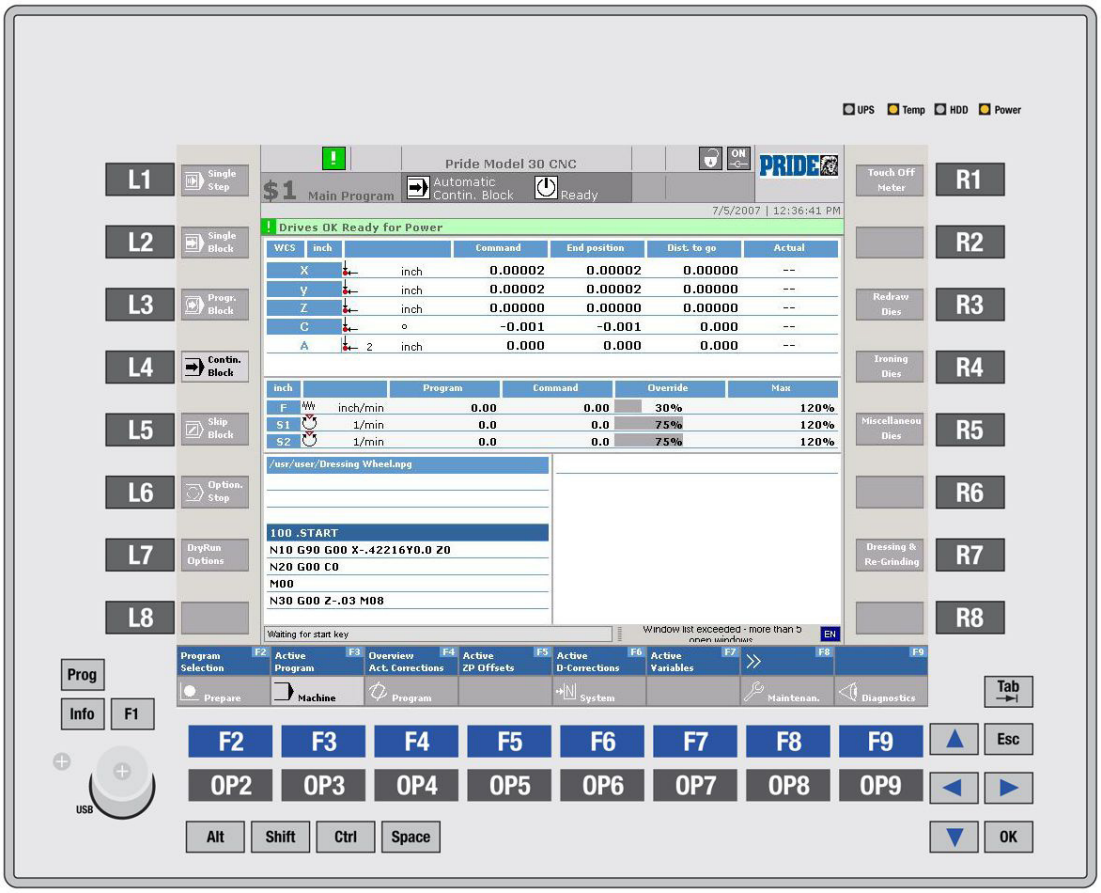
> **Do not use hand held grinding wheel dressing tools.**

4.5.1 DRESSING THE SINGLE POINT DIAMOND

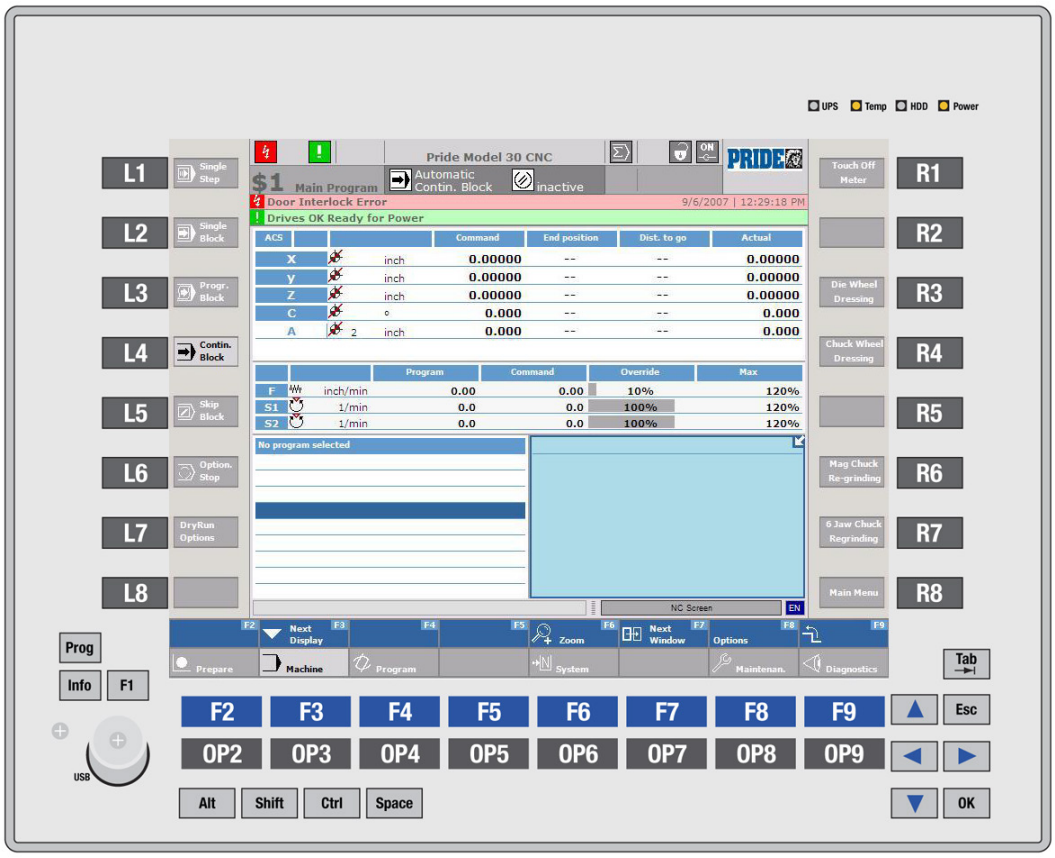
Before grinding the chuck or chuck jaws, the grit wheel used for grinding the chuck must be dressed or the quality of the ground chuck will be distorted. Use the following procedures to dress the grit wheel used for grinding the chuck.



1. Turn the key to the Auto position
2. Select R7, Dressing & Regrinding



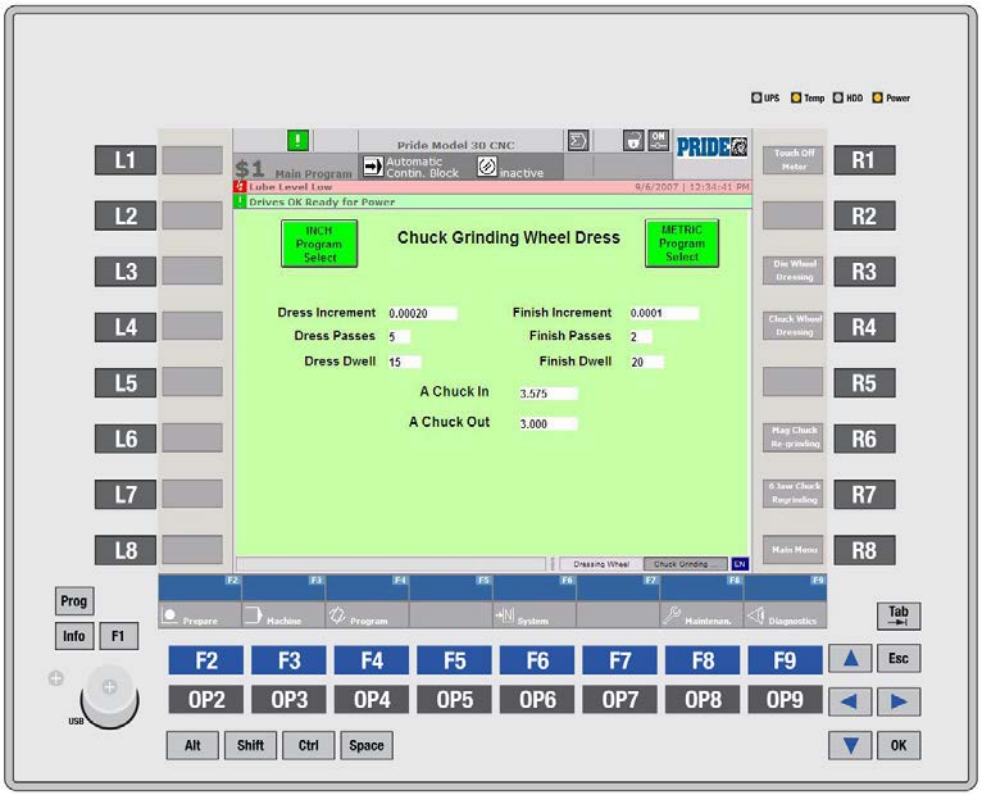
3. Select R4, Chuck Wheel Dressing.



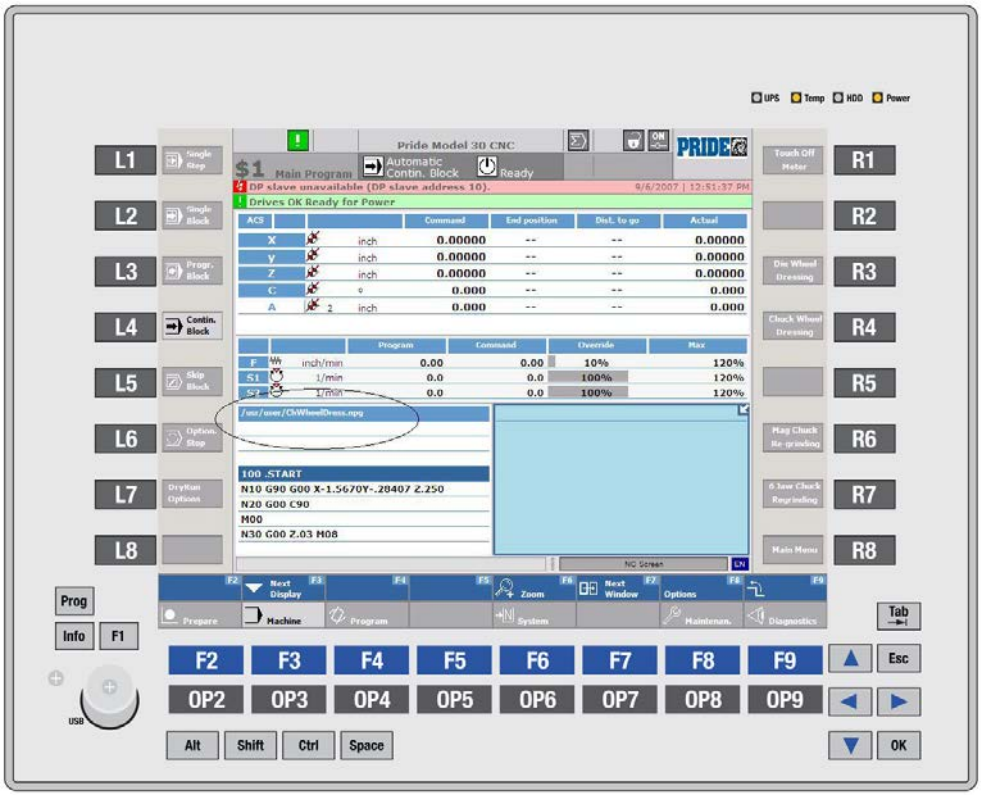
4. Fill in the fields with the required information in the Chuck Grinding Wheel Dress window.

Check to make sure the Control Power On Icon is on before proceeding to step 5.

5. Move the cursor to the Inch Program Select or Metric Program Select icon. Depress left mouse button until the green icon turns gray.

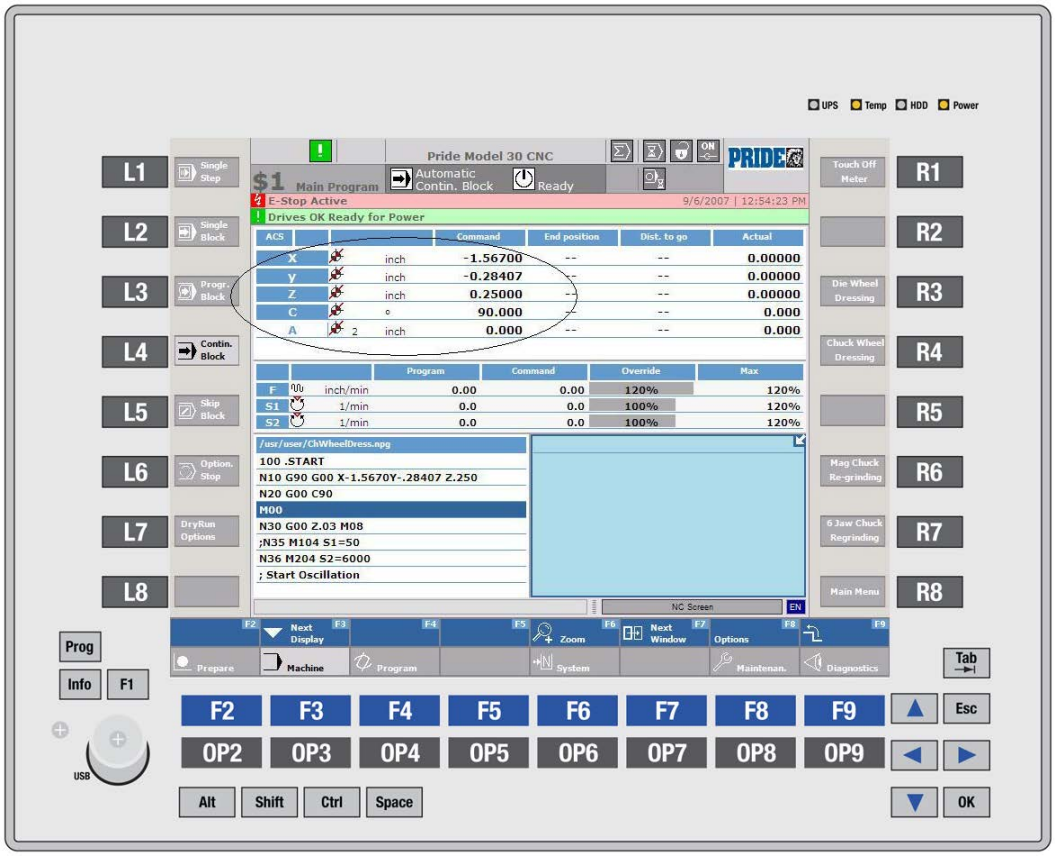


6. Select the Machine icon (OP3) and verify that the program “ChWheelDress.npg” is selected.



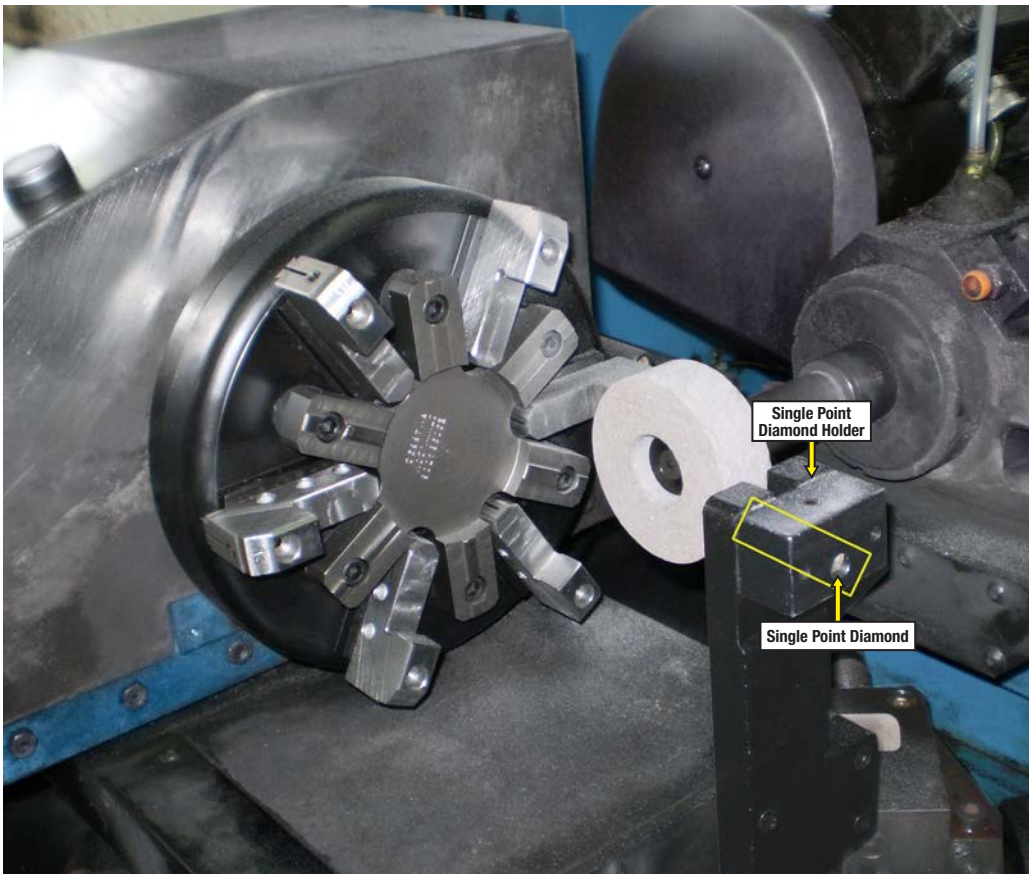
7. Depress Cycle Start key. 

The X, Y and Z slides will move to position and the Rotary C will move to 90°



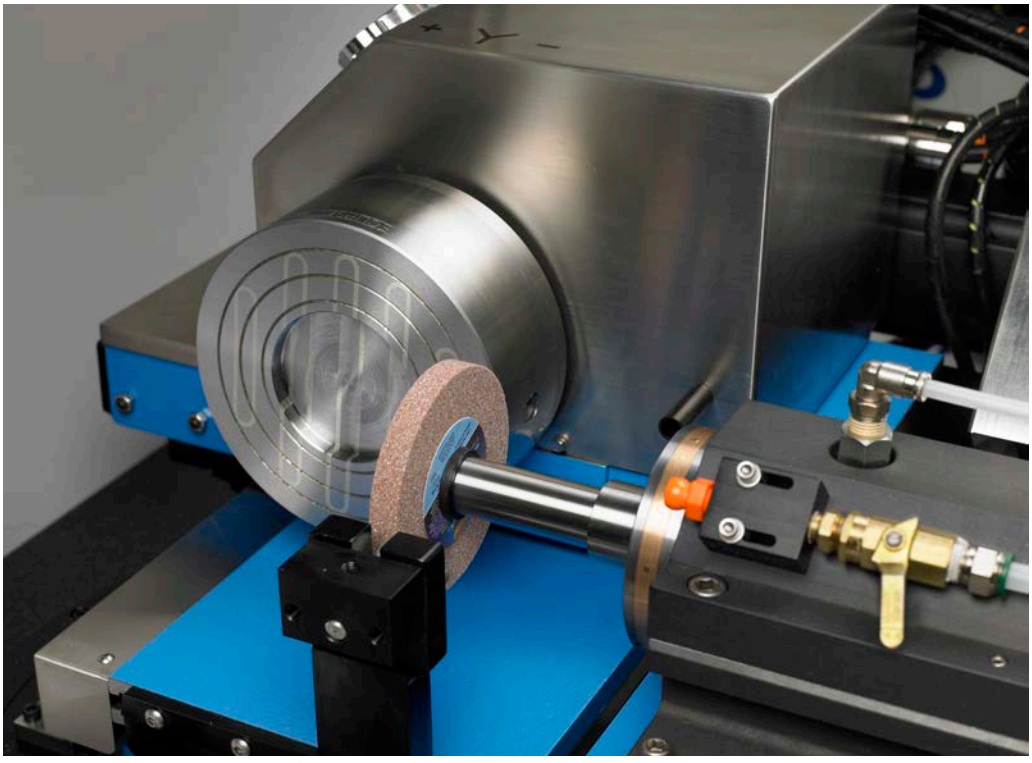
8. Mount the single point diamond holder on front of “X” axis slide. You will need to use the single point diamond to dress the grit wheel in the same manner that you would for grinding a magnetic chuck shown later in this section.

Dress the Grit Wheel for Grinding the Jaws on the 6-Jawed Chuck

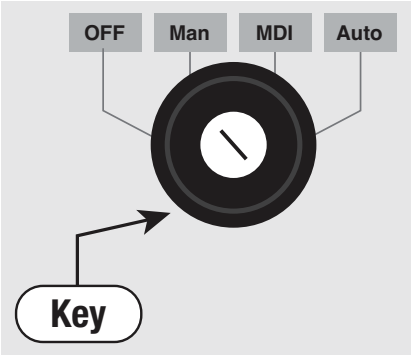


Set up Single Point Diamond to dress the Grinding Wheel that will grind the Chuck Jaws.

Or for dress the Grit Wheel for grinding the Magnetic Chuck.



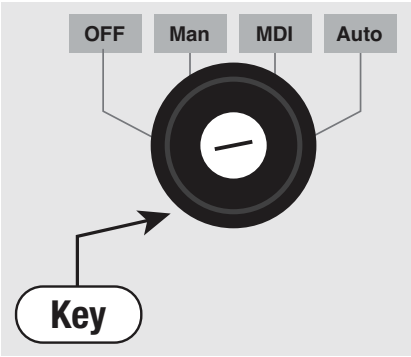
9. Turn the key lock to Manual (“Man”).



10. Perform manual touch off on the Single Point Diamond by jogging the Z and A axis. This is the same procedure for performing a manual touch off for Ironing or Diamond Wheel Dressing.

11. After manual touch off, set Z zero by:

    a. Select maintenance (OP8)
    b. Select Z Axis (R3)
    c. Select Z again (R3) to set Z to zero.

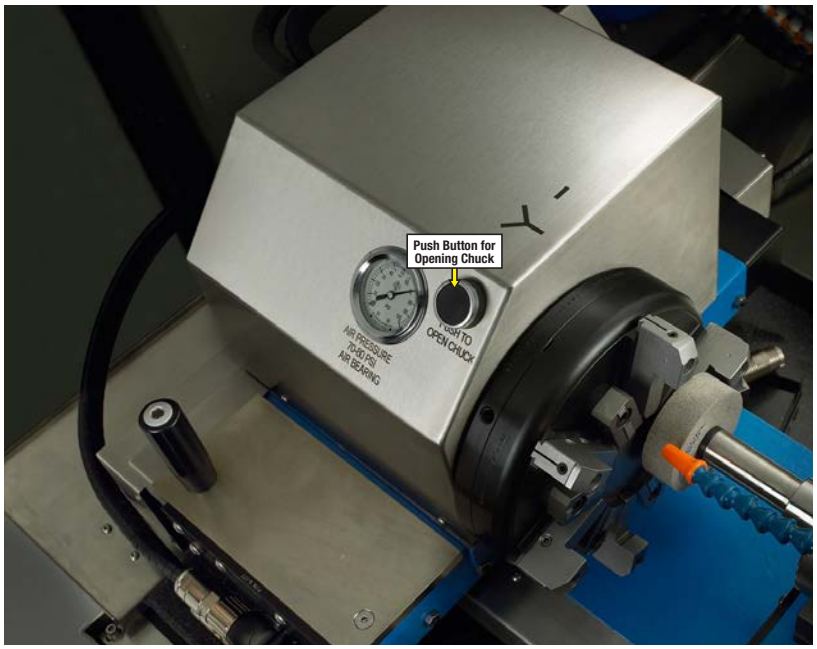


12. Return the Key lock switch to Automatic and depress Cycle Start.

4.5.2 ALTERNATIVE A: SIX-JAW AIR CHUCK (6 INCH OR 6/7 INCH)

Unlike conventional machine chucks where the jaws slide in and out, the 6-Jaw Air Chuck operates on an air diaphragm that cantilevers the six jaws out away from center when charged with air. When the air pressure is absent, the six jaws close by cantilevering in toward the center gripping the die. During normal operations the chuck is opened or cantilevered out with 80 lbs. (5.5 bar) of air pressure to change parts.

When the operator depresses the button to change dies the air pressure is applied and the jaws cantilever open. As soon as the operator releases the button the chuck jaws close. **This mechanism achieves much better concentricity than would be possible with a conventional sliding jaw chuck.**



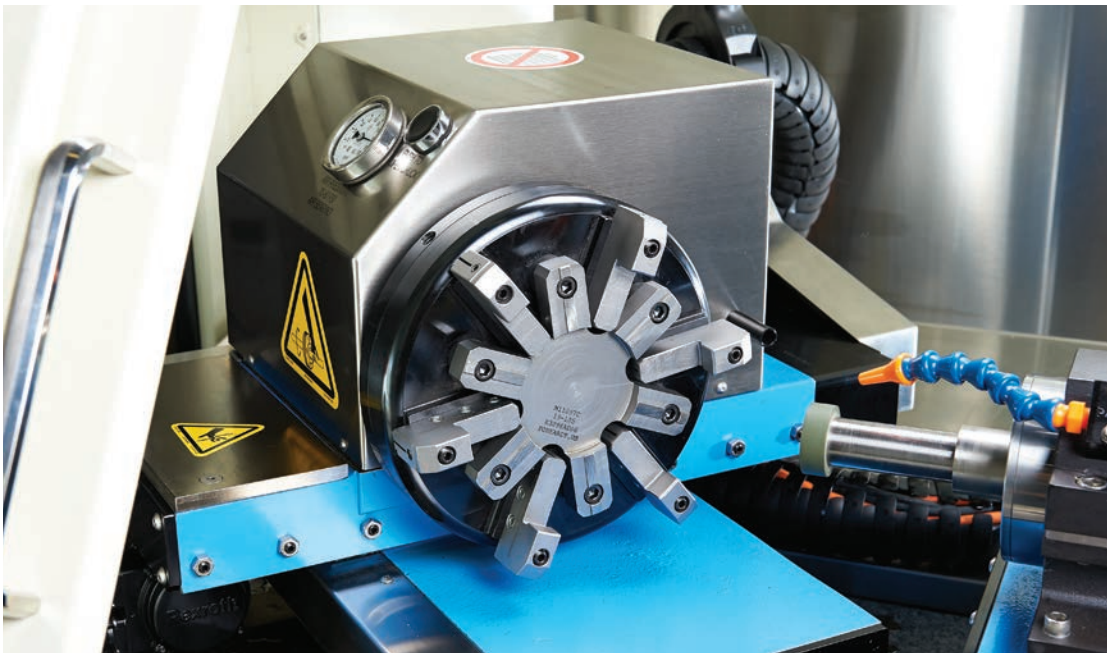
GRINDING CHUCK JAWS

If the chuck is not charged with air when no die is present, the chuck jaws will be cantilevered in at an angle instead of remaining square as they would if a die were present. This is not a problem, but you should **never regrind the chuck jaws in this cantilevered state**. When it is time to regrind the jaws of the chuck, the jaws must be held square without a die present. If the jaws are ground while they are cantilevered in, the die will not properly seat in the jaws when the chuck is re-turned to service.

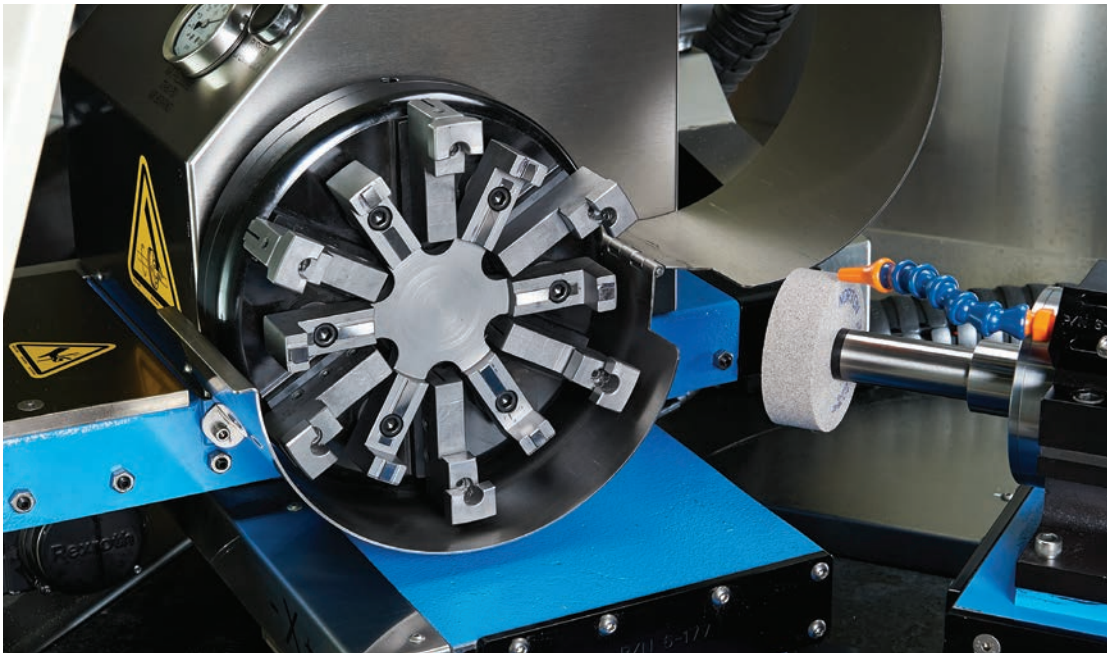
When the chuck is re-ground the air pressure on the chuck diaphragm must be held at 50 psi (3.5 bar) air pressure so that the chuck jaws are held square without a die present. There is a separate air pressure regulator for this purpose. The air pressure regulator intended for holding the jaws square during re-grinding is activated by a toggle “Switch, 6-Jaw Chuck Grinder 19-128” on the left of the guard covering the Work Head spindle.

If you are having trouble removing the die from the chuck, check to be sure that there is 80 psi (5.5 bar) on the chuck gauge (80 psi pressure is required to open the chuck jaws). If the die is loose in the chuck, remove all air pressure to the chuck which should close the chuck, because air pressure is required to open the chuck. If the die is still loose, turn the Selector button to grind the chuck (50 psi) and then regrind the chuck jaws according to the procedure below.

Both the Chuck Jaws and the Spider must be reground when-ever the chuck is re-ground. The following procedure starts with the chuck jaws instead of the spider, but it makes no difference which is ground first. Refer to the instructions for the appropriate style of 6 Jaw Chuck you are using, either the 6 Inch (Alternative A1) or the 6/7 Inch Step Jaw Chuck (Alternative A2).



6 JAW CHUCK



6/7 INCH 6 JAW CHUCK

Alternative A1 - 6 Inch 6-Jaw Chuck

Regrind Chuck Jaws (Part Number 19-104)

1. Select “Chuck Grinding” on the selector located on the gage panel below. This will move the jaws to a position 90° from the base of the chuck. The correct position for grinding the chuck jaws.

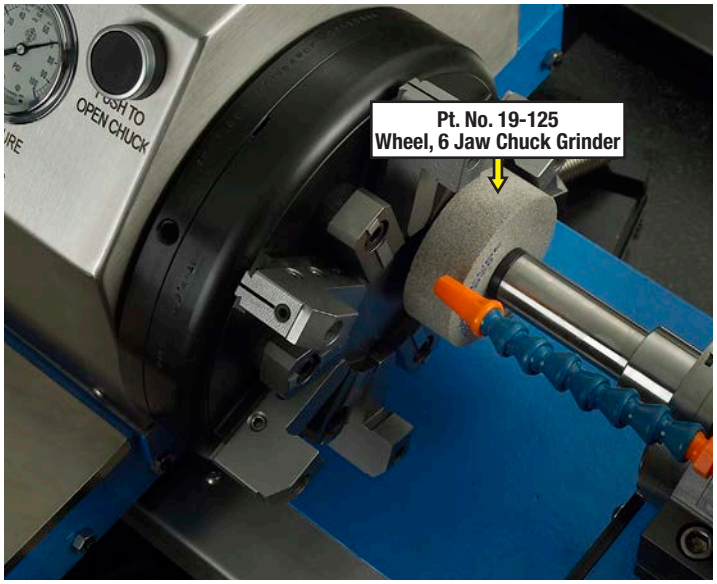
2. Adjust the location of each of the six (6) chuck jaws so that there will be interference fit between the chuck jaws and the die of 0.0025” to 0.005” (0.065 mm

to 0.130 mm). As an example, if you are grinding 6 inch dies adjust the jaws to 5.995" diameter. Start the process by moving each opposing jaw in toward center an equal amount.

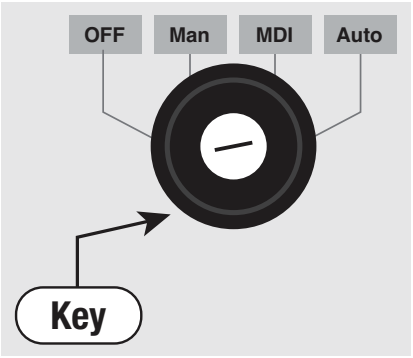
3. Use an indicator to check the concentricity of the jaws. Adjust each jaw to achieve concentricity within 0.0005" (0.130 mm).

4. Mark the surface of each jaw where it contacts the die with bluing or similar marking material. This will enable the operator to know when all jaws are cleaned up.

5. Mount grinding wheel 19-125 on the wheel head.

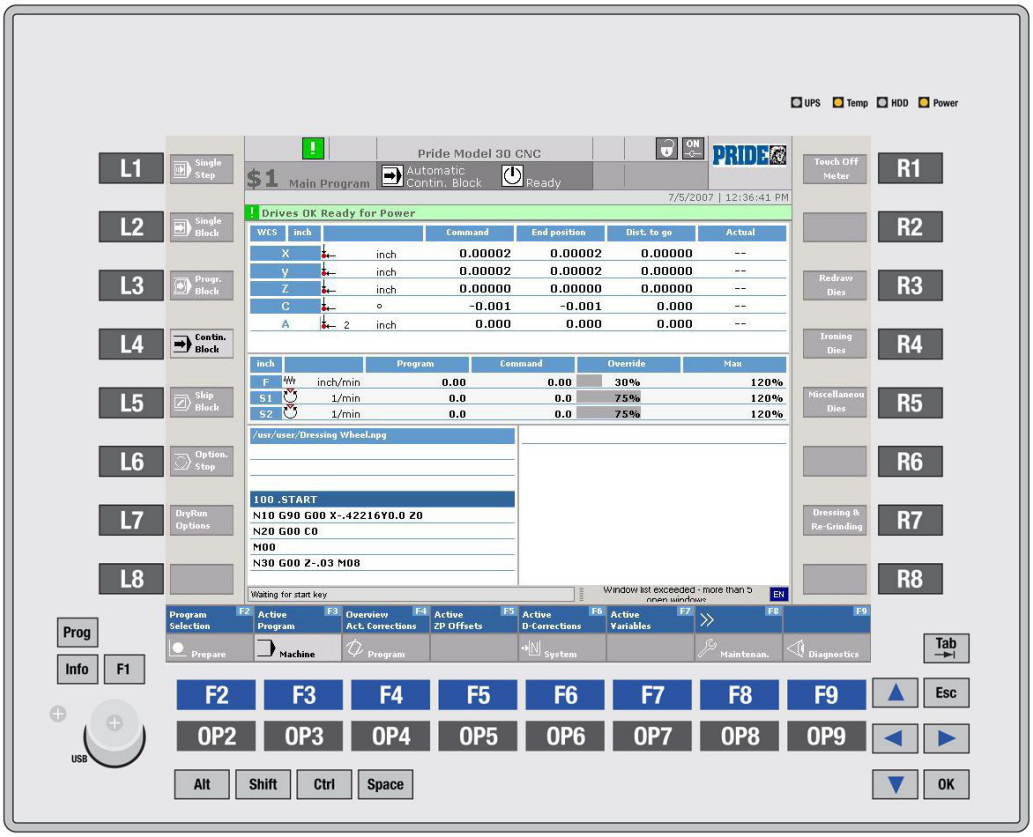


6. Turn the Key Switch to the "Auto" mode. The menu will appear on the right of the screen that can also be activated by the R Buttons next to the screen.



Check to make sure the Control Power On Icon is on before proceeding to step 5.

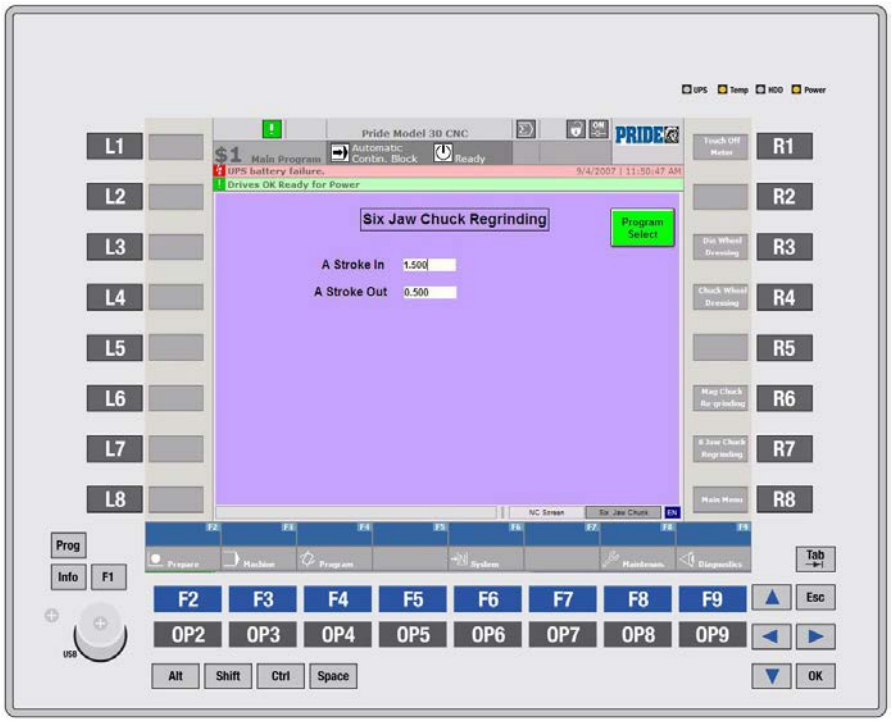
7. Select “Dressing and Re-Grinding (R7) from the “Machine.”



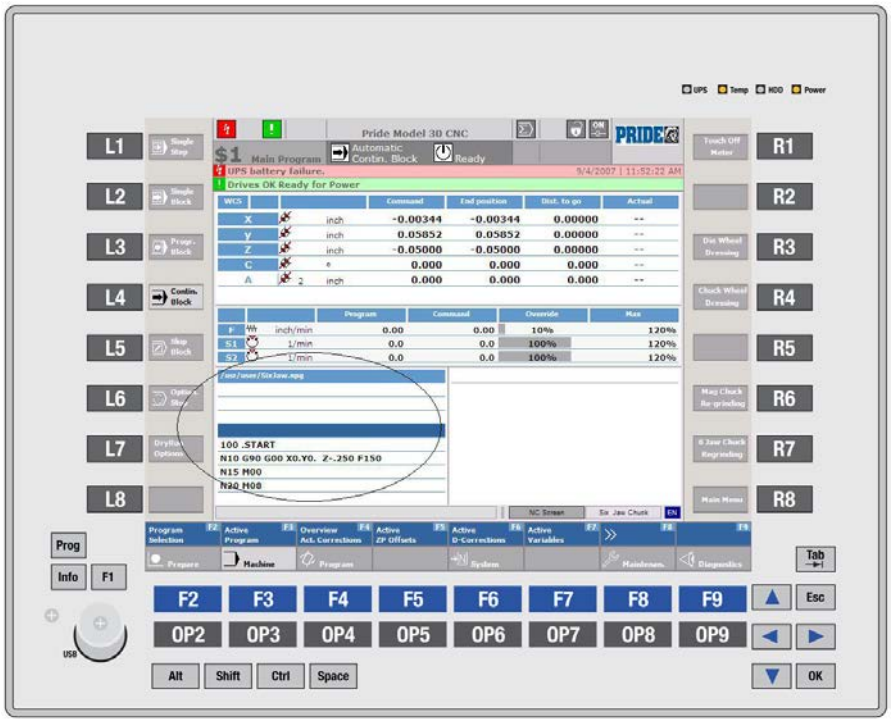
8. Select “6-Jaw Chuck Re-grinding” (R7).

9. The “A Chuck In & A Chuck Out” values will be inserted in the fields below at a later point.

10. Select the green “Program Select” icon in the upper right corner of the “Six Jaw Chuck Regrinding” screen, left click and hold. The green icon will turn red then grey. Release the left button when it turns grey.



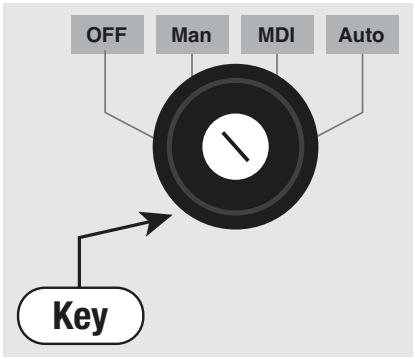
11. Return to the machine display by clicking “Machine” (OP3) and verify the “SixJaw.npg” in the lower left box.

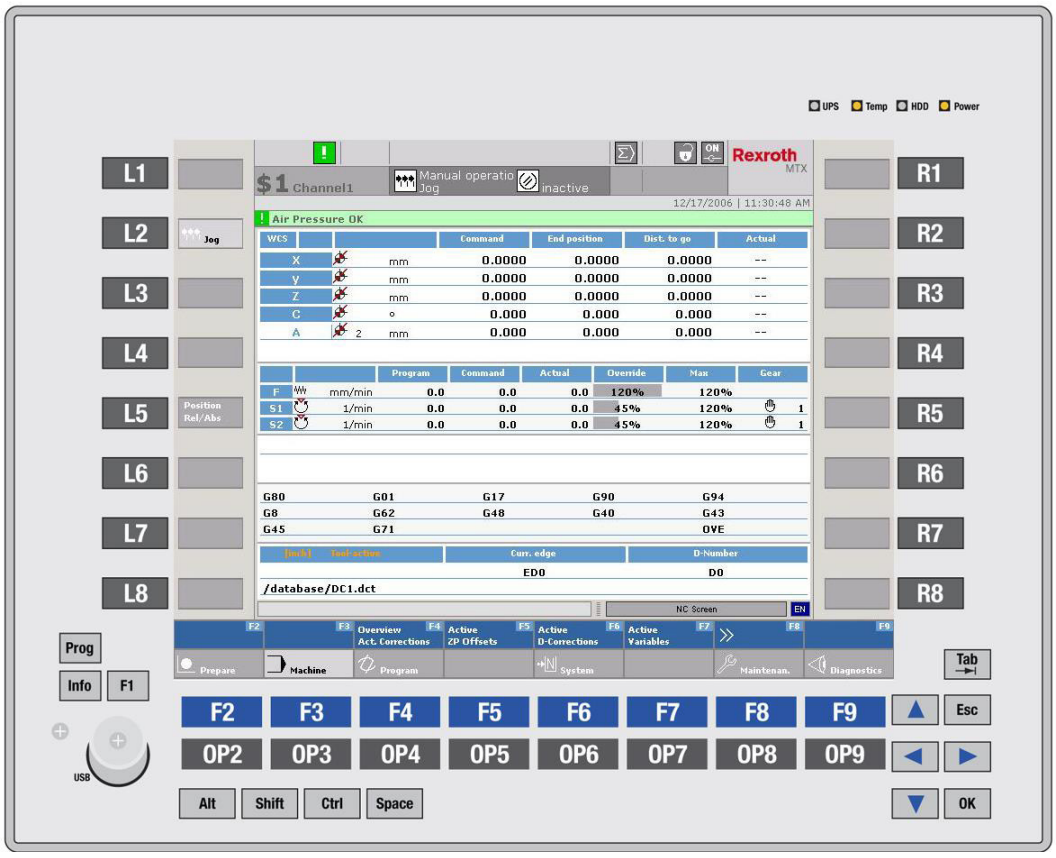


12. Depress the cycle start key. This will position the X and Y axis and Z axis for Chuck re-grinding. Check to make sure the Z is centered inside the chuck diameter.

13. Switch the key lock switch to the “Manual Mode” so the operator can determine the position for the “A Chuck In and the A Chuck Out.”

14. Jog A in (A+) until the front edge of the grinding wheel resides in the relief cut in the jaw, while avoiding a collision with the Part Stop 19-105. Record the A value. This will become the “A Stroke In” position.

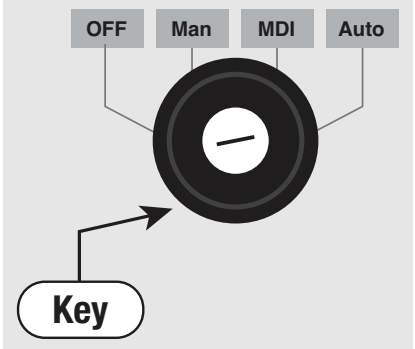




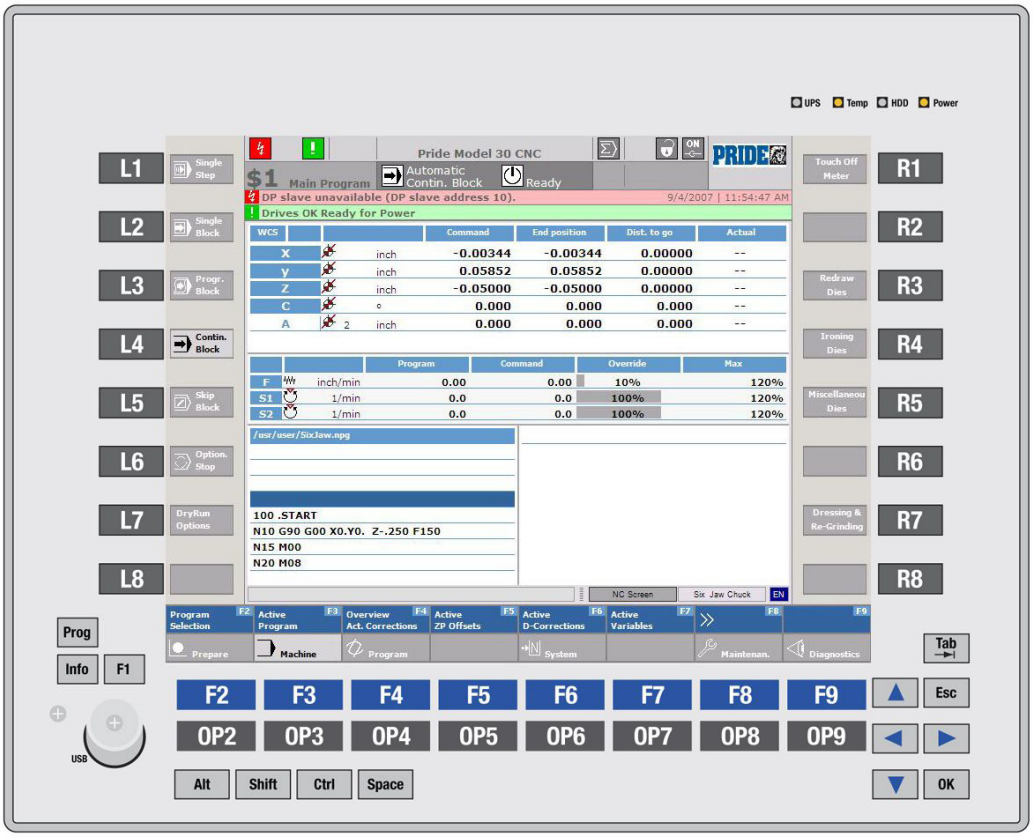
15. Jog A Out (A-) until the front edge of the wheel is approximately 0.060 inches (1.5 mm) from the outer edge of the jaw. Record the A value. This will become the “A Stroke Out” position.

16. Perform a manual touch off on the chuck jaw, just as you would on a die. Set Z Zero.

17. Return the Key lock switch to the Auto mode.

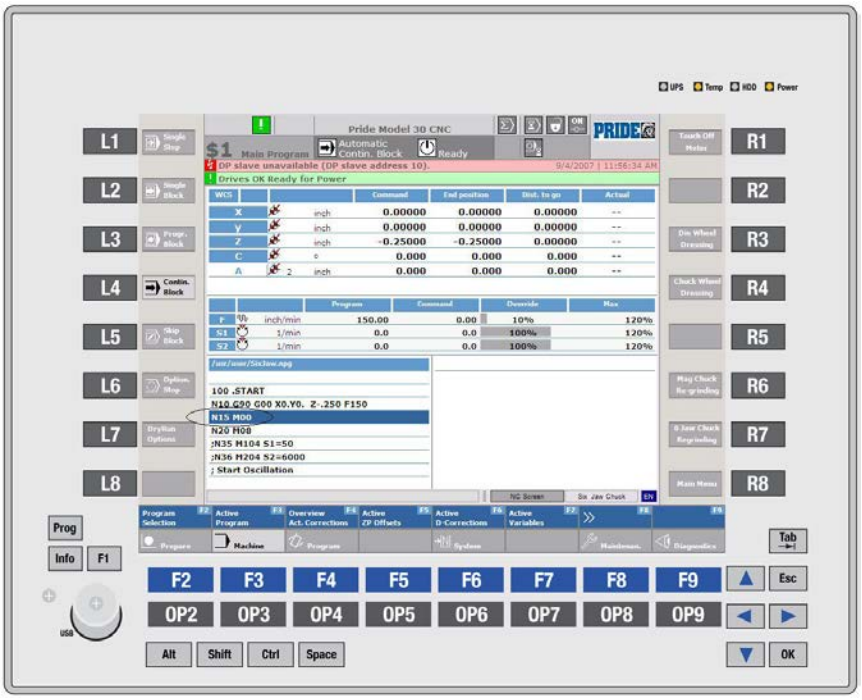


18. Select “Dressing and Re-Grinding (R7) from the “Machine” screen.



19. Select “Six Jaw Chuck Re-grinding” (R7).

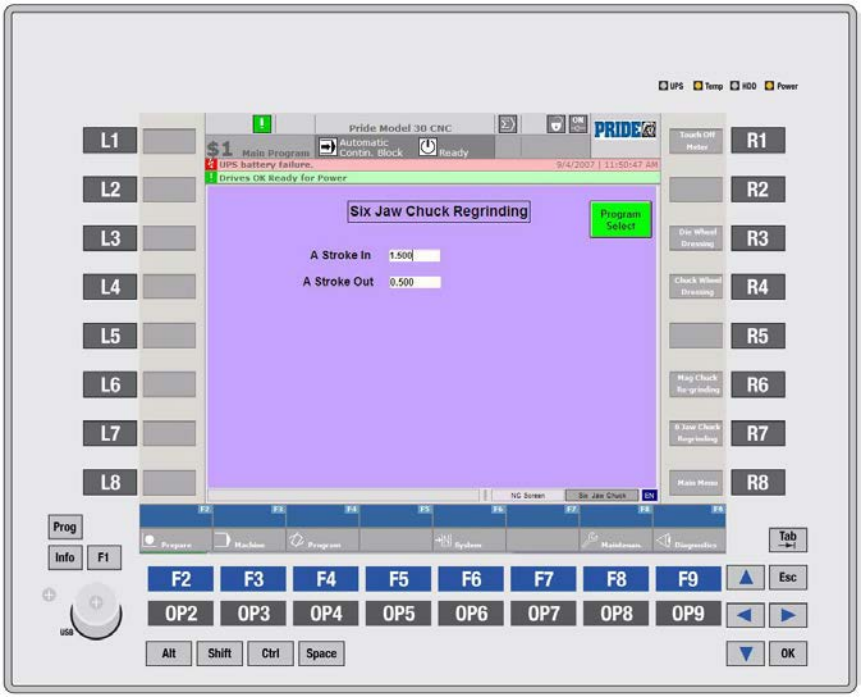
20. When the Six Jaw Chuck Re-Grinding screen appears, insert the values recorded in Step 14 and Step 15 into the appropriate “A Chuck In and A Chuck Out” field.



21. Return to the machine display by clicking Machine (OP3) and verify the “SixJaw.npg” in the lower left box.

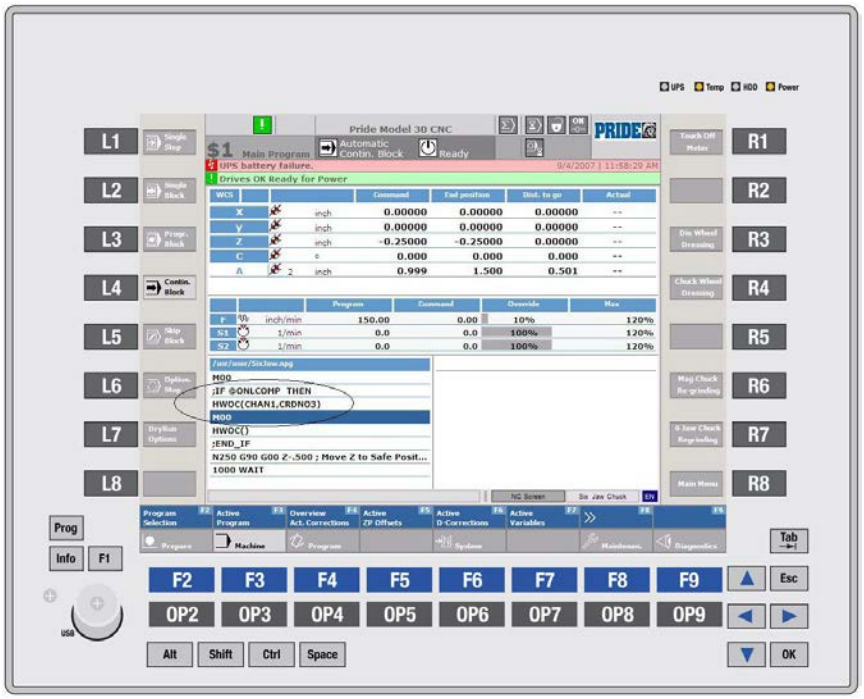
22. Depress Cycle Start once.

The oscillation cycle will begin and the machine will do a program stop (M00). Check to be sure there is no collision with the Part Stop 19-105 before proceeding.



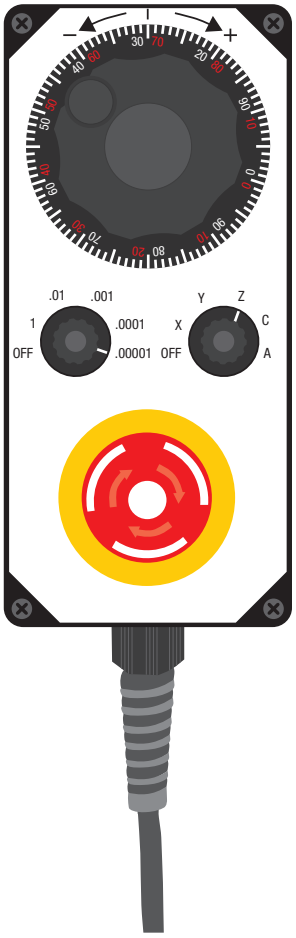
23. Depress cycle start again.

The line of code “HWOC(Chan1,CRDN03)” will be executed. This activates the hand wheel.



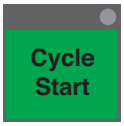
24. Set the hand wheel increment switch to .00001 and the axis to Z.

25. Turn the hand wheel dial clockwise (+) and the Z axis will move in. One click is one increment.



26. Turn the hand wheel one click at a time, allowing spark on the jaw to occur, continue the process until the desired amount of material has been removed from the jaws.

27. When you have removed the desired amount of material, depress the cycle start key. The Z axis will retract to a safe position and the A axis will return to the home position.

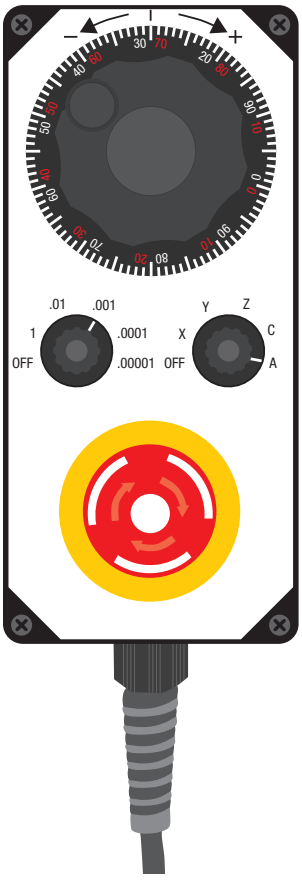


28. You can now measure the ID of the jaws. The finished ID should be 6.0000 + or - 0.0005 inches. Repeat the process if necessary.

29. Reset the tooling ball and reset the X and Y axis when both the jaws and spider are complete. Refer to Section 3.5 C, X & Y Work Head

Regrind Chuck Spider 19-105

1. Install Cupping Wheel 19-126.
2. Turn the key switch to Manual
3. Jog the C axis (rotary) to 0° and drop the Shot Pin 9-199 in the pin plate 6-111.



4. Mark the raised part of the Spider with bluing or other of marking ink

5. With either the hand wheel or the jogging keys on the operator panel jog the A in +) until the cupping wheel is approximately 0.005" (0.13mm) away from the raised portion of the Spider.

6. Jog the Z axis in (+) until the edge of the cupping wheel resides in the relief cut of the chuck jaws. This is intended to ensure that the entire raised portion of the Spider is ground, leaving no edge out of flat with the remainder of the Spider. Be sure that the jaws are not contacted by the cupping wheel.

7. Start both the wheel head and work head motors.
8. Jog the A positive (+) in by small increments (0.001) until the cupping wheel contacts the Spider allowing spark out to occur.
9. Continue to jog A positive (+) in with smaller increment (0.0001) until the bluing or marking ink is ground off all surfaces of the Spider.
10. When complete switch the increment to 0.001 and jog A negative (-) to clear the ground surface: no more than 0.005" (0.13mm)
11. Change the axis to Z and jog minus (-) until the cupping wheel can withdraw without any danger of interference with the chuck jaws when the cupping wheel is withdrawn.
12. Switch to the A axis and withdraw (-) cupping wheel and return it to the home position (0).
13. Check the flatness of the raised flats on the spider and repeat the procedure as required.
14. Reset the tooling ball when both the jaws and spider are complete. Refer to Section 3.5 C, X & Y Work Head Positioning

Alternative A2 - 6/7 Inch 6-Jaw Chuck

Regrind Chuck Jaws (Part Number 19-177)

1. Select "Chuck Grinding" on the selector located on the gage panel below. This will move the jaws to a position 90° from the base of the chuck. The correct position for grinding the chuck jaws.

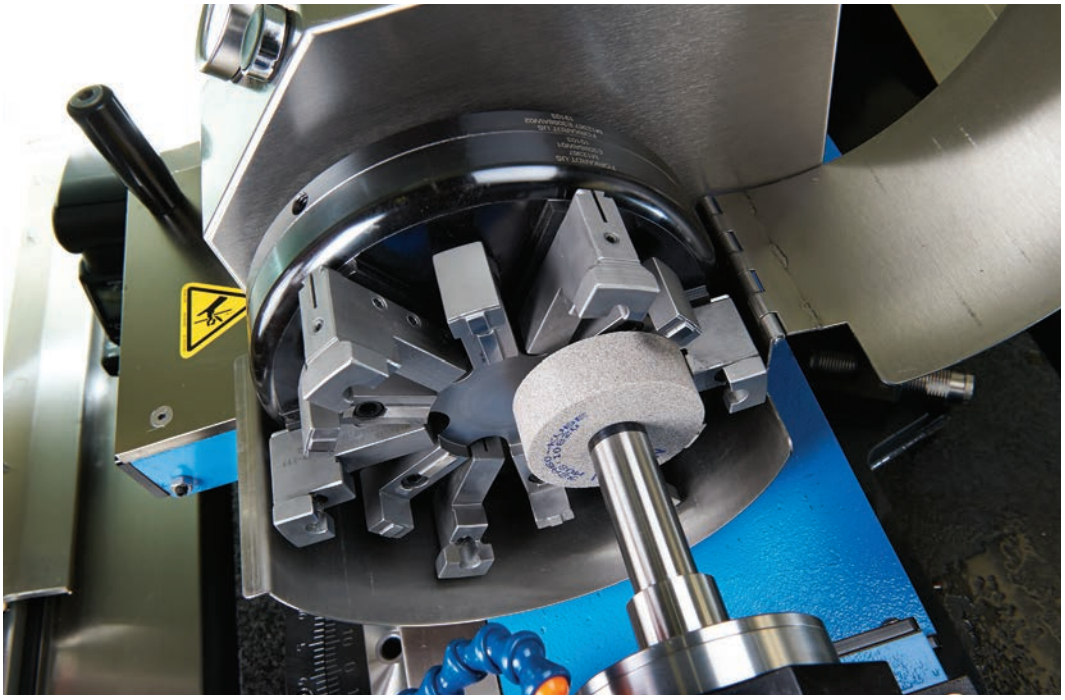
> **Use a 6 inch Ironing Die loaded in the 6 inch jaws to set the jaw location. The instructions will have you start with grinding the 6 inch jaws first followed by the 7 inch jaws.**

2. Adjust the location of each of the six (6) chuck jaws so that there will be interference fit between the chuck jaws and the die of 0.005” (0.130 mm). As an example, if you are grinding 6 inch dies adjust the jaws to 5.995” diameter. Start the process by moving each opposing jaw in toward center an equal amount.

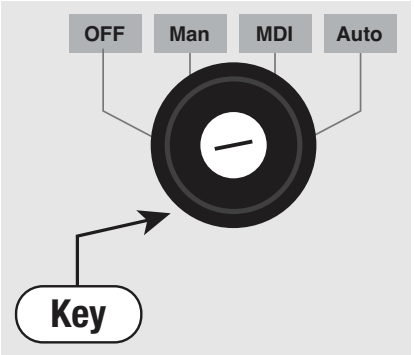
3. Use an indicator to check the concentricity of the jaws. Adjust each jaw to achieve concentricity within 0.0005” (0.130 mm).

4. Mark the surface of each jaw where it contacts the die with bluing or similar marking material. This will enable the operator to know when all jaws are cleaned up.

5. Mount grinding wheel 19-125 on the wheel head.



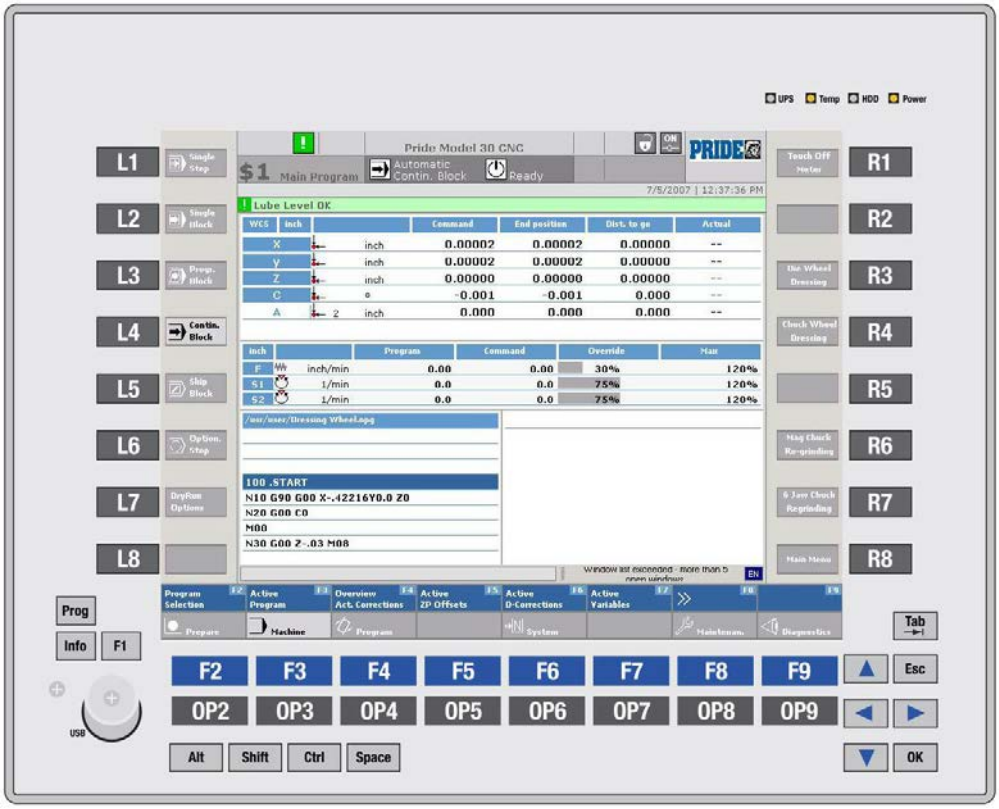
6. Turn the Key Switch to the “Auto” mode. The menu will appear on the right of the screen that can also be activated by the R Buttons next to the screen.



Check to make sure the Control Power On Icon is on before proceeding to step 7.

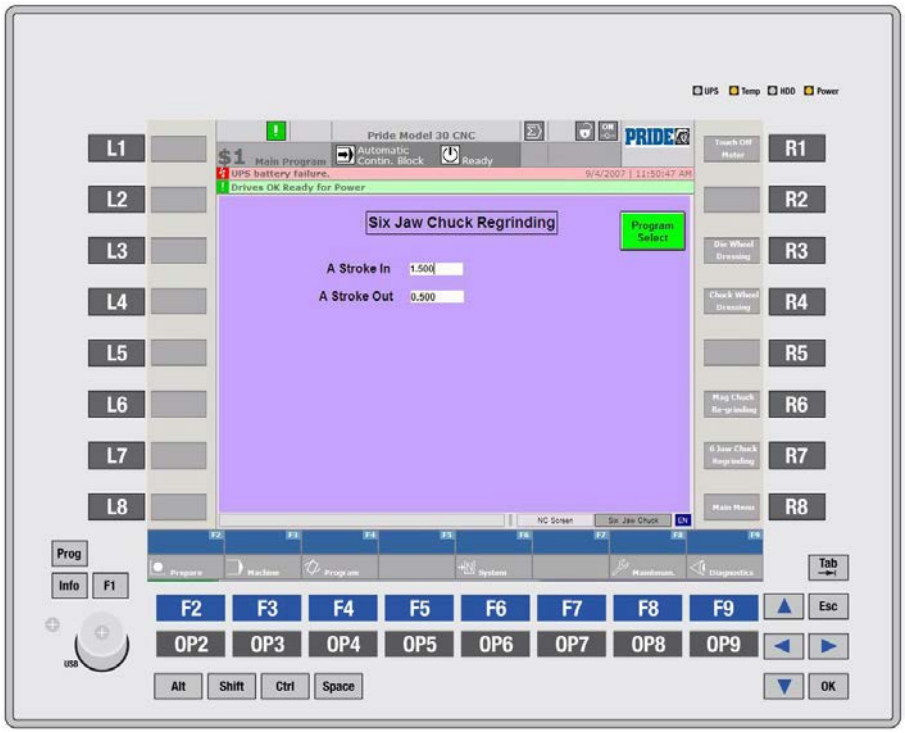
7. Select “Dressing and Re-Grinding (R7) from the “Machine.”

8. Select “6-Jaw Chuck Re-grinding” (R7).

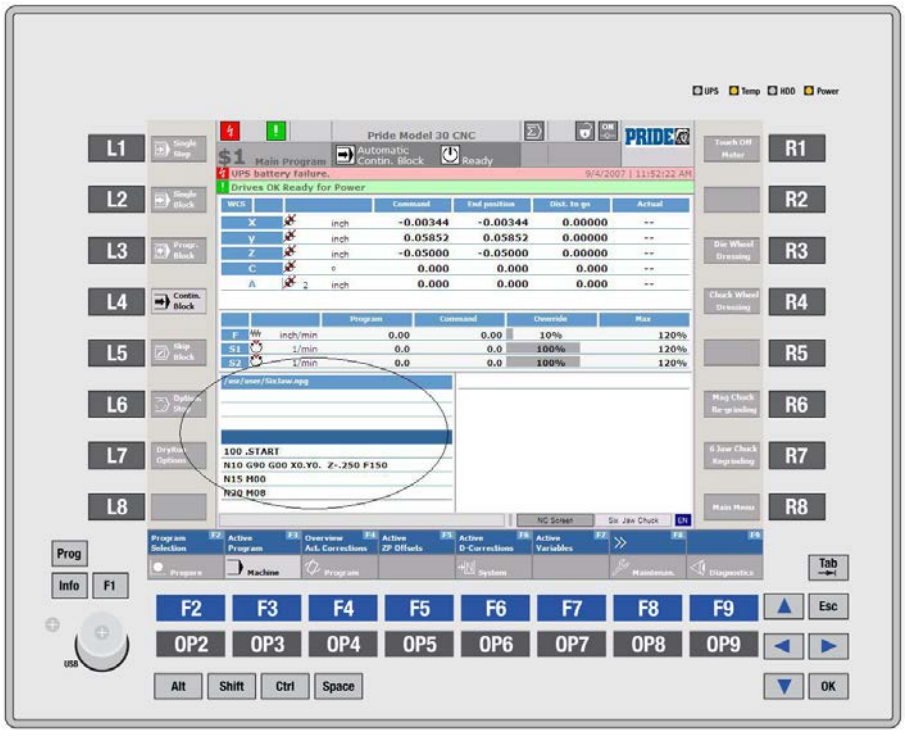


9. The “A Chuck In & A Chuck Out” values will be inserted in the fields below at a later point.

10. Select the green “Program Select” icon in the upper right corner of the “Six Jaw Chuck Regrinding” screen, left click and hold. The green icon will turn red then grey. Release the left button when it turns grey.

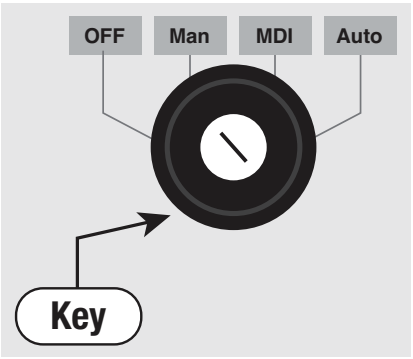


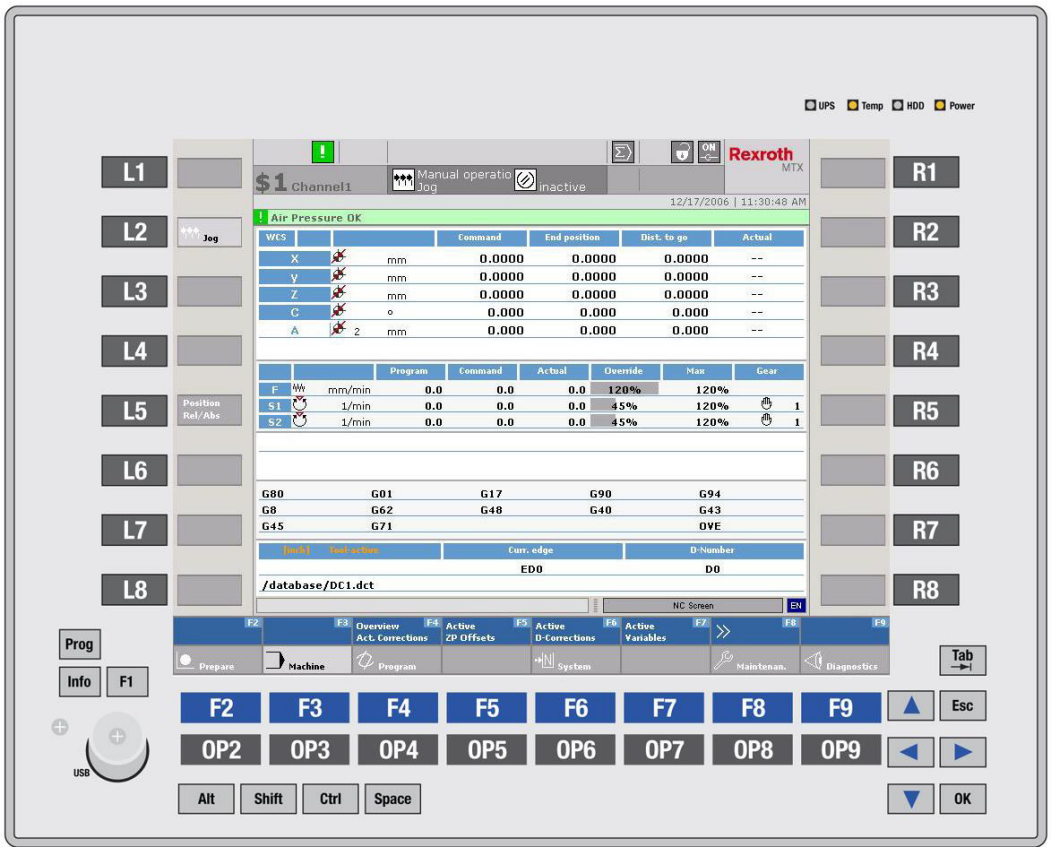
11. Return to the machine display by clicking “Machine” (OP3) and verify the “SixJaw.npg” in the lower left box.



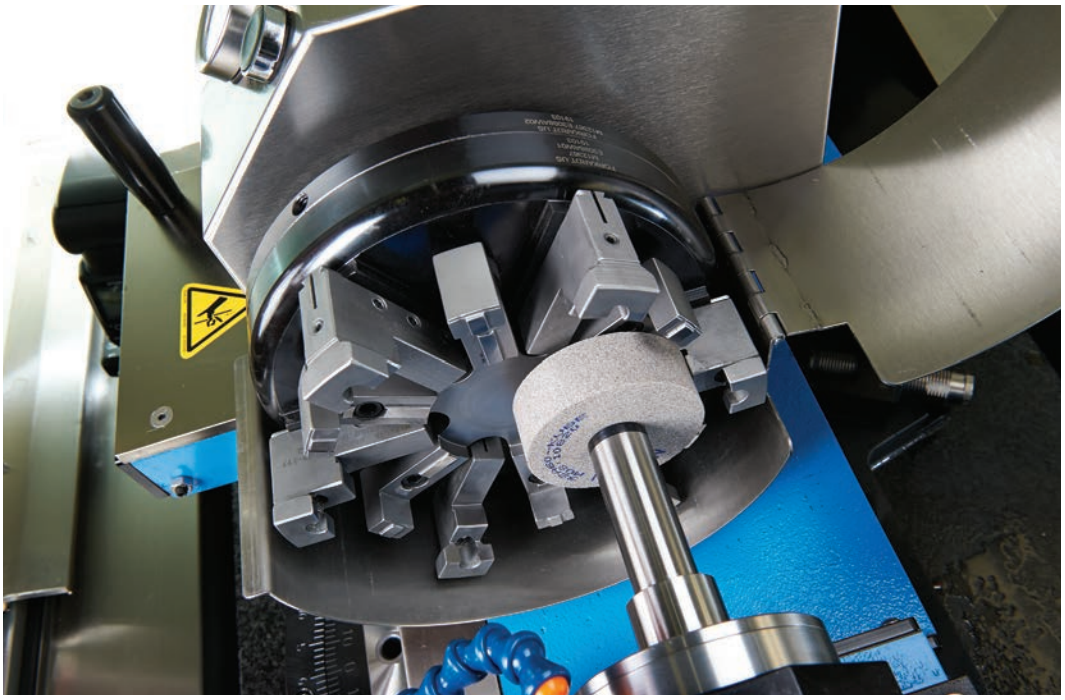
12. Depress the cycle start key. This will position the X and Y axis and Z axis for Chuck re-grinding. Check to make sure the Z is centered inside the chuck diameter for the specific set of jaws you will be grinding (6 or 7 inch diameter).

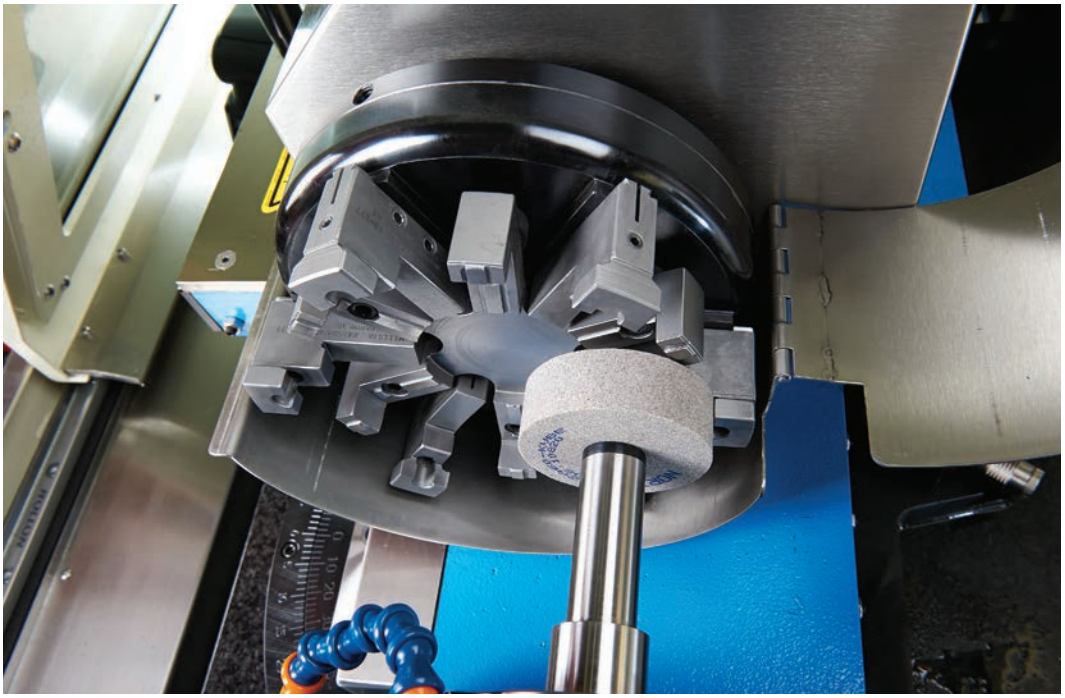
13. Switch the key lock switch to the “Manual Mode” so the operator can determine the position for the “A Chuck In and the A Chuck Out.”





14. Jog A in (A+) until the front edge of the grinding wheel resides in the relief cut in the jaw, while avoiding a collision with the Part Stop 19-178. Record the A value. This will become the “A Stroke In” position.



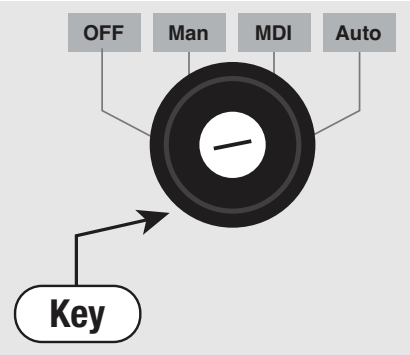


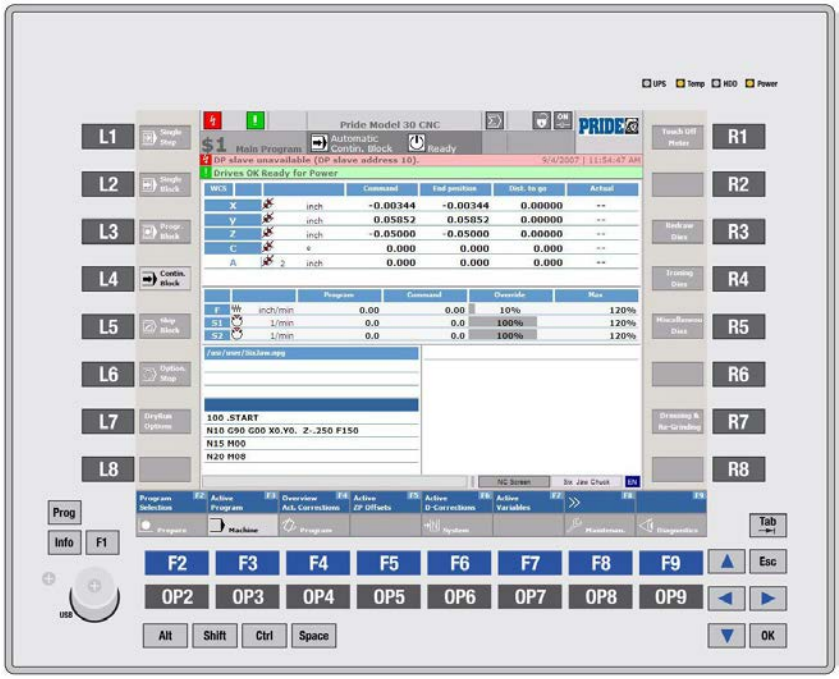
15. Jog A Out (A-) until the front edge of the wheel is approximately 0.060 inches (1.5 mm) from the outer edge of the jaw. Record the A value. This will become the “A Stroke Out” position.

16. Perform a manual touch off on the chuck jaw, just as you would on a die. Set Z Zero.

17. Return the Key lock switch to the Auto mode.

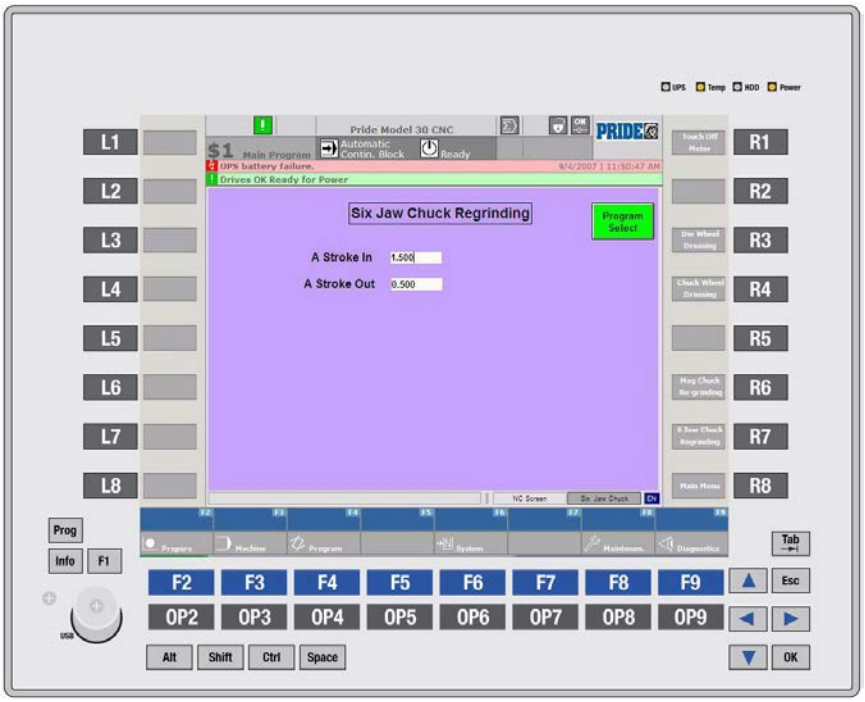
18. Select “Dressing and Re-Grinding (R7) from the “Machine” screen.





19. Select “Six Jaw Chuck Re-grinding” (R7).

20. When the Six Jaw Chuck Re-Grinding screen appears, insert the values recorded in Step 14 and Step 15 into the appropriate “A Chuck In and A Chuck Out” field.



21. Return to the machine display by clicking Machine (OP3) and verify the “SixJaw.npg” in the lower left box.

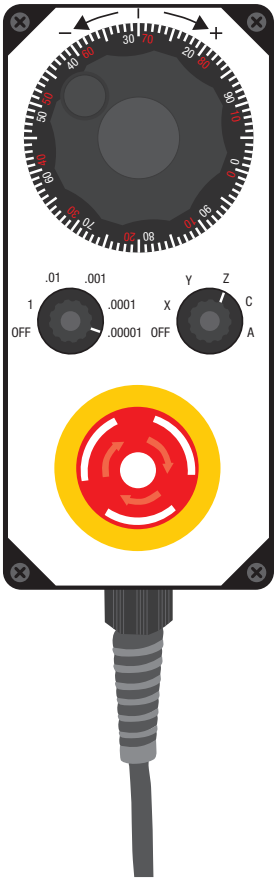
22. Depress Cycle Start once

The oscillation cycle will begin and the machine will do a program stop (M00). Check to be sure there is no collision with the Part Stop 19-178 before proceeding.

23. Depress cycle start again.

The line of code “HWOC(Chan1,CRDN03)” will be executed. This activates the hand wheel.

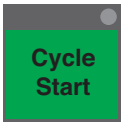
24. Set the hand wheel increment switch to .00001 and the axis to Z.



25. Turn the hand wheel dial clockwise (+) and the Z axis will move in. One click is one increment.

26. Turn the hand wheel one click at a time, allowing spark on the jaw to occur, continue the process until the desired amount of material has been removed from the jaws.

27. When you have removed the desired amount of material, depress the cycle start key. The Z axis will retract to a safe position and the A axis will return to the home position.



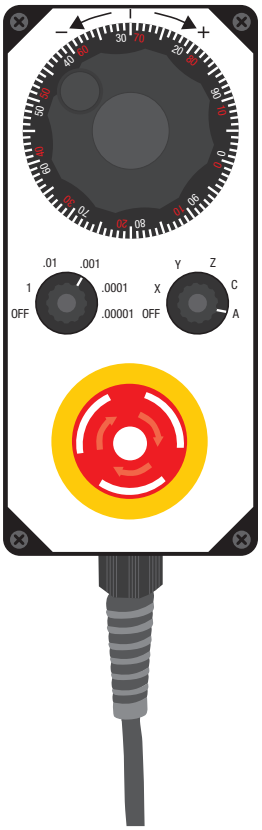
28. You can now measure the ID of the jaws. The finished ID should be 6.0000 (or 7.0000 if grinding the 7 inch jaws) + or - 0.0005 inches. Repeat the process if necessary.

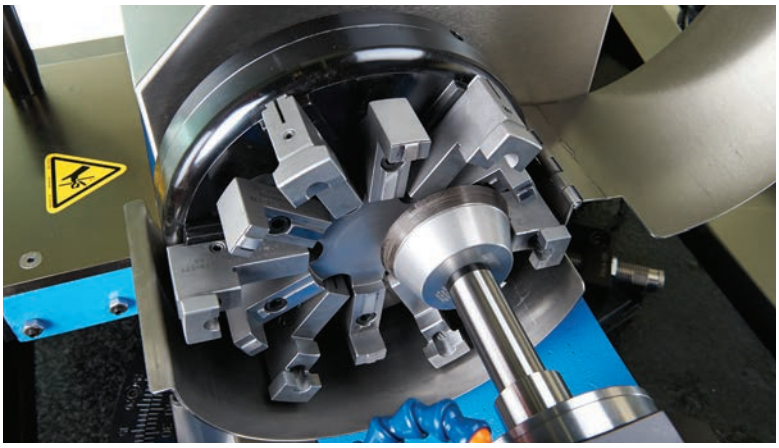
29. Repeat steps 4 through 28 for the 7 inch set of jaws.

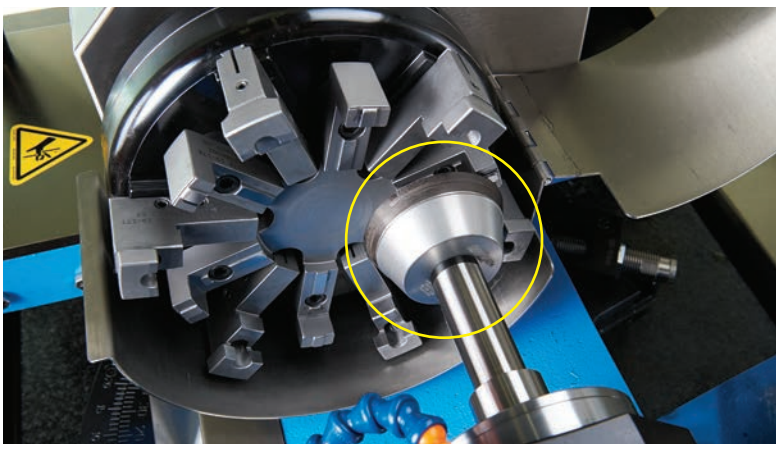
30. Reset the tooling ball and reset the X and Y axis when both the jaws and spider are complete. Refer to Section 3.5 C, X & Y Work Head.

The instructions below will have you start with grinding the 6 inch die stops first followed by the 7 inch die stops.

1. Install Cupping Wheel 19-126.
2. Turn the key switch to Manual
3. Jog the C axis (rotary) to 0° and drop the Shot Pin 9-199 in the pin plate 6-111.
4. Mark the raised part of the Spider with bluing or other of marking ink.
5. With either the hand wheel or the jogging keys on the operator panel jog the A + in until the cupping wheel is approximately 0.005" (0.13mm) away from the raised portion of the Spider.
6. Jog the Z axis in (+) until the edge of the cupping wheel resides in the relief cut of the chuck jaws. This is intended to ensure that the entire raised portion of the Spider is ground, leaving no edge out of flat with the remainder of the Spider. Be sure that the jaws are not contacted by the cupping wheel.







7. Start both the wheel head and work head motors.
8. Jog the A positive (+) in by small increments (0.001) until the cupping wheel contacts the Spider allowing spark out to occur.
9. Continue to jog A positive (+) in with smaller increment (0.0001) until the bluing or marking ink is ground off all surfaces of the Spider.
10. When complete switch the increment to 0.001 and jog A negative (-) to clear the ground surface: no more than 0.005" (0.13mm)
11. Change the axis to Z and jog minus (-) until the cupping wheel can withdraw without any danger of interference with the chuck jaws when the cupping wheel is withdrawn.
12. Switch to the A axis and withdraw (-) cupping wheel and return it to the home position (0).
13. Check the flatness of the raised flats on the spider and repeat the procedure as required.
14. Repeat steps 4 through 13 for the 7 inch die stops.
15. Reset the tooling ball when both the jaws and spider are complete. Refer to Section 3.5 C, X & Y Work Head Positioning

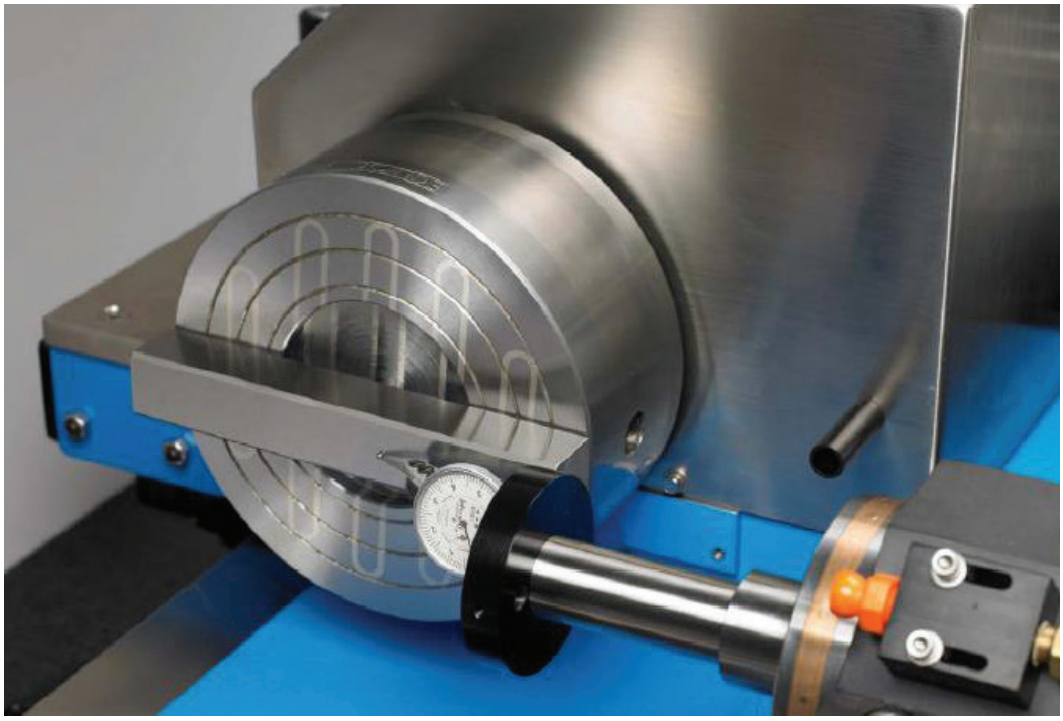
4.5.3 ALTERNATIVE B: MAGNETIC CHUCK

To maintain accurate roundness of your work, it will sometimes be necessary regrind the magnetic chuck. Failure to do this when required will cause the ground work to be distorted when removed from the chuck and inspected in a normal state. Some out of roundness will be noticed. The face of a redraw die will check out of flat when ground in a distorted state. Use the following procedures to regrind the chuck.

1. Move the Rotary axis to zero degrees. Install your indicator on the quill nose with an adapter. Indicate the face of the chuck by sweeping with the quill. Chuck should be set either at zero position or so that land would increase slightly in the direction of ironing.

CHUCK FLATNESS

2. Move Rotary axis to 90 degrees and install test bar. Indicate test bar by moving wheel head slide forward. If test bar reads zero, you may begin grinding. If run out exists, the chuck must be adjusted by grind or shimming the rest button.



SQUARING

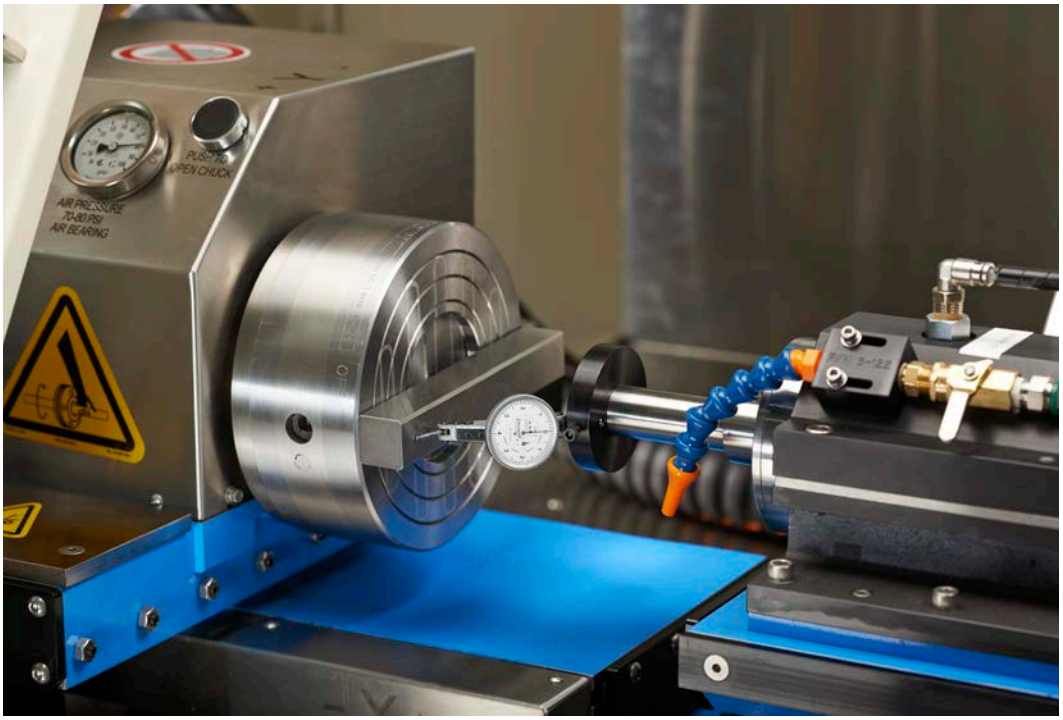
3. Install the adapters and the 4 inch grinding wheel. Remove the test bar and energize the chuck.

4. Install single point diamond holder on front of "X" axis slide. Dress the grinding wheel by moving the "Z" axis toward the diamond. Run the wheel head spindle at 50% speed. The single point diamond fixture may be left in place for subsequent dressing.

5. After the grinding wheel is true, move the "Z" axis until wheel touches the magnetic chuck. **Set zero and back off "Z" axis.**

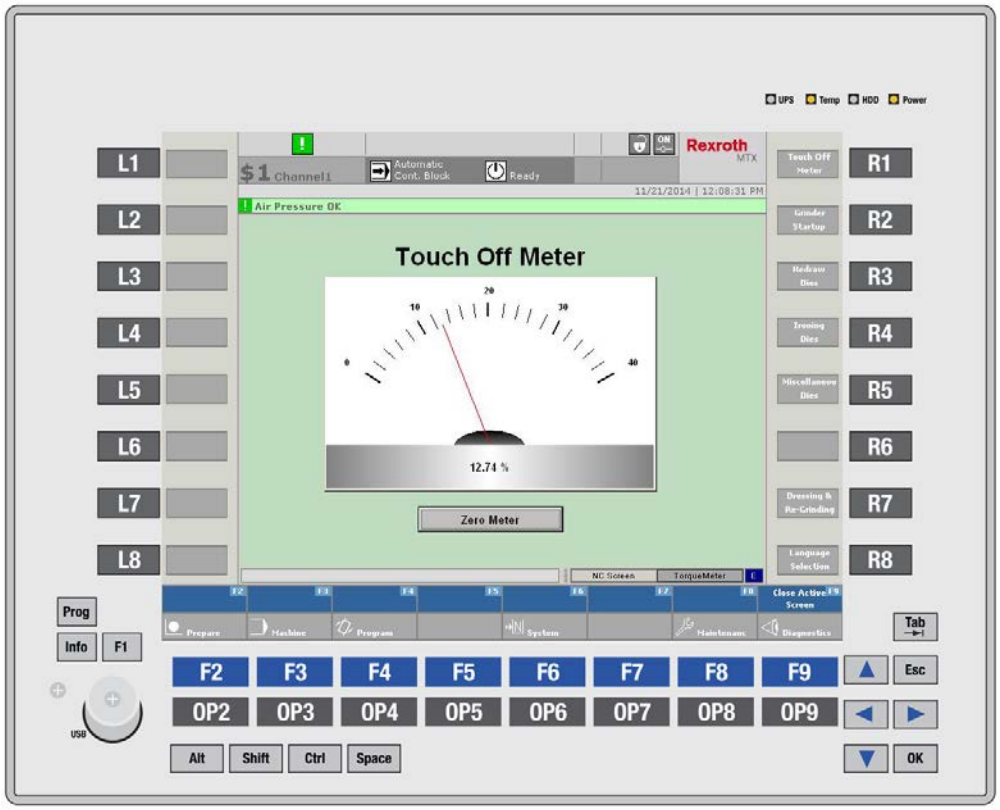
   Set A slide so that grinding wheel clears chuck at both ends of the stroke. Run magnetic chuck at 50 rpm and move in increments of .0001 inches.

Chuck should be fully energized. Do not exceed 50% on the grinding wheel. Use coolant while grinding.



SQUARING

6. Move “Z” back in to zero. Observe increased torque reading on spindle Touch Off Meter as “Z” axis is moved in.



Correct procedure allows spindle to extend and retract once for each .0001 inches (2.5 microns) that the "Z" axis is moved in. After feed in is complete, allow 2 additional spark out passes of the wheel head. Check chuck for clean up. If grinding wheel loads up during grinding, it must be redressed on the diamond.

7. Reset the tooling ball after grinding the chuck. See section 3.5 – C, X & Y Work Head

4.6 AIR BEARINGS

Do not attempt field repairs on the air bearings spindles.

The purpose of this section is to provide instructions for bearing exchange, should it become necessary, due to heavy contamination or accidental overload. In instances of minor contamination, normal operation can generally be restored by introducing a few drops of isopropyl alcohol into the air supply. This is done in the following steps:

1. Shut off air pressure.
2. Remove air line from cabinet bulkhead connection.
3. Add isopropyl alcohol to the air line.
4. Replace air line.
5. Build up air pressure to 80 psi (6 bar)
6. Rotate bearing by hand (do not force if it does not rotate freely).

The procedure for removing the air bearing is as follows:

7. Remove drive belt & quill (it is necessary to remove pulley from work head bearing).
8. Remove air line.
9. Remove air line port.
10. Loosen 2 clamping bolts (the center set screw can be used as a spreader to release tension on bearing assembly. Do not forget to back out the set screw during reassembly).
11. Slide bearing from housing.

Replace air bearing as follows:

12. Slide bearing into housing.
13. Center air port in housing cutout.
14. Flush the air line with isopropyl alcohol.
15. Change the air filter.

16. Install air line & build up air pressure.
17. Check to be sure that it turns freely before proceeding (allow bearing ½ hour to clear itself).
18. Tighten 2 clamping bolts to 120-150 inch pounds torque. (Make sure spacer bar is in place and center set screw has been backed out).
19. Replace drive belt.
20. Replace quill (quill should run within 0.0002 T.I.R.) Damaged air bearing can be quickly repaired by our service engineers in a few days.

WHEELHEAD AIR BEARING

4.7 ALIGNMENT OF GRINDER AXES

Note: Chuck jaws (6 Jaw Chuck) need to have been ground prior to alignment.

Work Head (Y Axis)

1. Install tooling ball fixture in chuck
2. Turn Key to the Off position.
3. Jog C to 0°. Shot pin C axis rotary base at 0°.
4. Mount indicator base on the grinder's rotary base with indicator resting on the near (operator side) of tooling ball face.
5. Move Y axis + and – indicating off near and far ends of the tooling ball face.
6. If indicator movement is within +/- 0.0003 inch (0.007 mm), axis is aligned. Skip to Wheel Head alignment. If not, proceed with steps 7 – 10.
7. Loosen work head air bearing housing bolts and remove front dowel pin. Keep rear pin as pivot.
8. Jog Y axis + and - while tapping in housing until aligned.
9. Tighten bolts and replace front dowel pin.
10. Verify alignment is within +/- 0.0003 inch (0.007 mm). If not, repeat steps 7-10. If aligned, proceed to Wheel Head alignment.

Wheel Head (A Axis)

1. Mount indicator on wheel head spindle.
2. Rotate indicator until it is pointing backwards and hold it in this position.
3. Turn Key to the OFF position (this key position holds the spindles and keeps them from rotating).
4. Remove shot pin from C axis rotary base and jog C to 90°.
5. Jog A & Z axis until indicator is resting on the near side of tooling ball face.
6. Jog A + and - indicating off near and far sides of the tooling ball face. If alignment is within +/- 0.0003 inch (0.007 mm) skip to step 10.
7. Loosen mounting bolts of Z base (Part 6-135). Keep front left bolt tightened for pivot point.
8. Jog A axis + and - while tapping in casting until alignment is within +/- 0.0003 inch (0.007 mm).
9. Tighten down bolts while verifying alignment.

10. Jog A to safe position.
11. Jog C to 0°.
12. Shot pin C axis rotary base at 0°.
13. Turn Key to the Manual position.
14. Jog X and Y so tooling ball is near center of C axis rotation pivot point.
15. Jog Z so wheel spindle center line is near center of C axis rotation pivot point.
16. Jog A in until indicator touches face of tooling ball. Sweep indicator around tooling ball face. If alignment is within +/- 0.0003 inch (0.007 mm), skip to step 20.
17. Loosen wheel head air bearing housing bolts and remove front dowel pin. Keep rear pin.
18. Sweep the tooling ball face while tapping in housing until alignment is within +/- 0.0003 inch (0.007 mm).
19. Tighten bolts while checking alignment, replace front dowel pin.
20. Jog A axis out to safe position.
21. Remove Shot Pin from C axis rotary base.

MODEL 30A GRINDER

PART IDENTIFICATION

PRIDE ENGINEERING

5. Part Identification

Pictures throughout the manual include part identification numbers. This section includes additional part identification information including consumable items and recommended spare components.

5.1 ACCESSORIES

Reference Section 2.2 for a list of accessories.

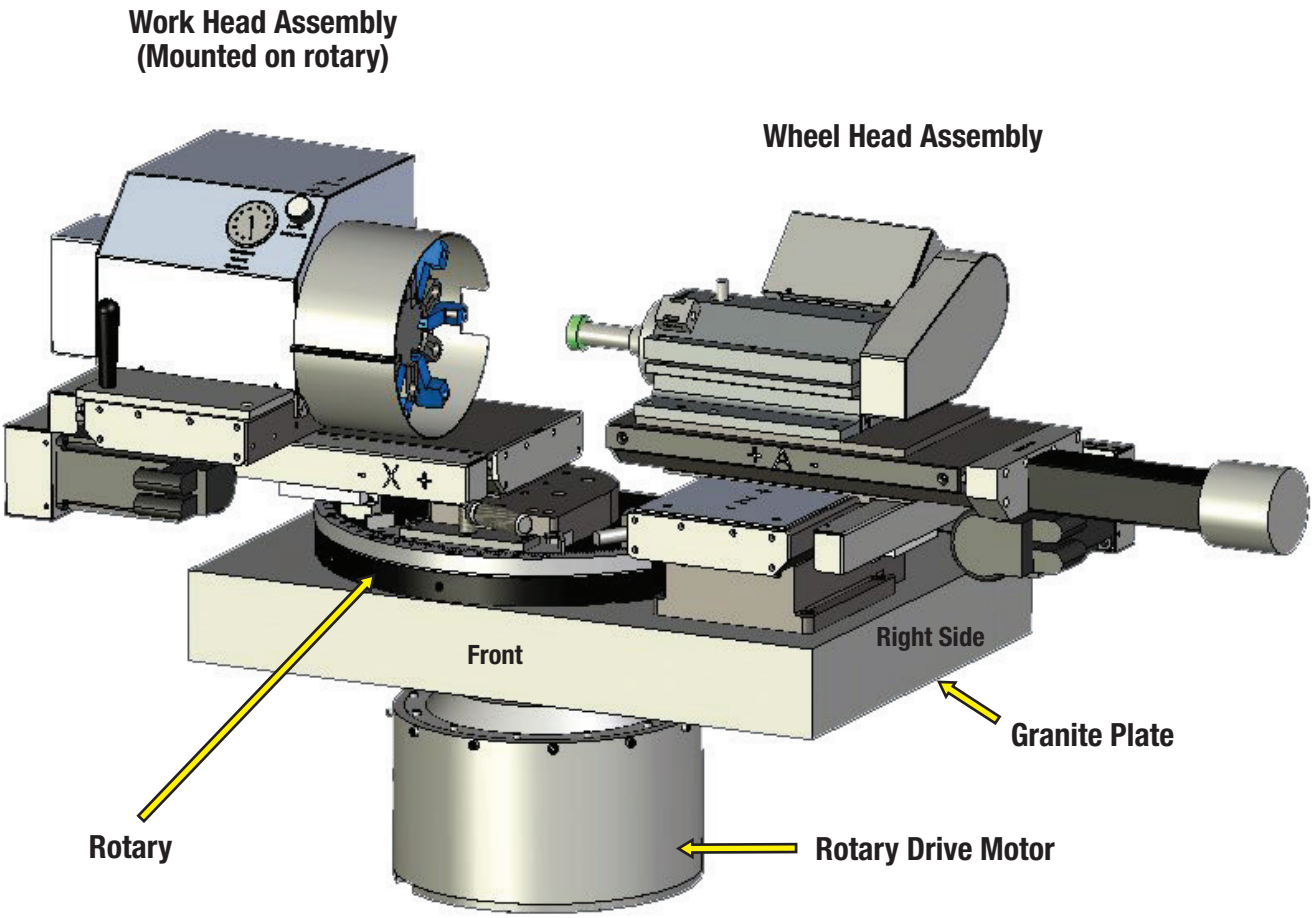
5.2 CONSUMABLES

Coolant, 5 Gal. . . . . 9-124 (Mix 30 Parts Water : 1 part Coolant)
Dresser Diamond 9-149
Diamond Wheel 9-201
Filter, Roll 19-114
Diamond Wheel, 1,000 Grit 9-178
Diamond Wheel, 800 Grit 9-143
Wheel, 6-Jaw Chuck Grinding 19-125
Wheel, 6-Jaw Chuck Facing 19-126
Grinding Wheel, Dress Wheel 19-110

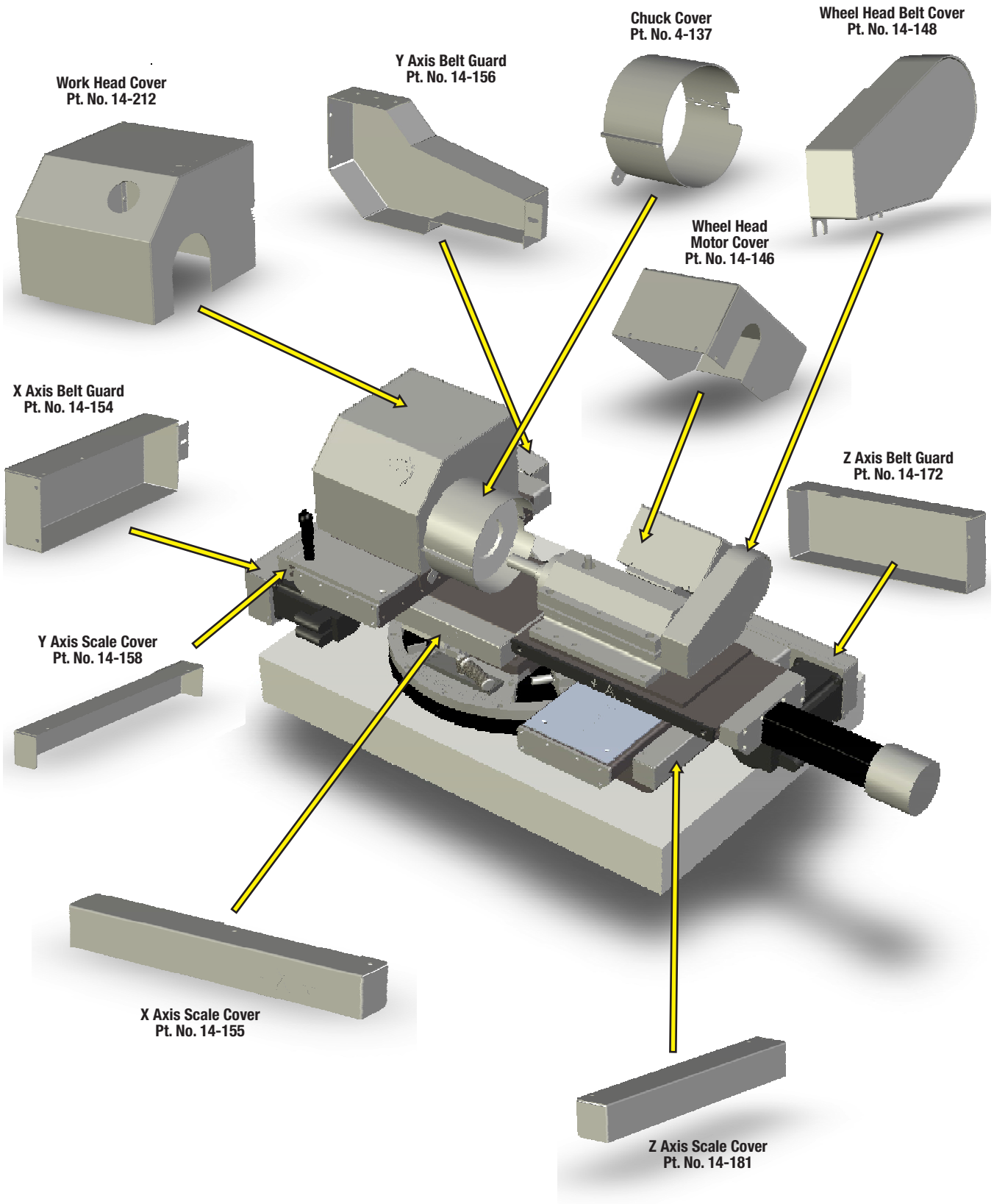
5.3 RECOMMENDED SPARES

Coolant Pre-Filter, (10 microns) 5-101
Pulley, Work Head Air Bearing 6-100
Drive Belt, Wheel Head Spindle 9-128
Lube Metering Valve (AA) (6 each) 12-103
A Axis Lube Metering Valve 12-104
Pulley, Y Axis Drive Motor 16-107
Sprocket, 30 Tooth Ball Screw Pulley X, Y & Z . 16-108
Drive Belt, X, Y and Z Slide Drives (3 each) 16-124
Pulley, Work Head Spindle Motor 16-139
Pulley, X Axis Drive Motor 16-140
Drive Belt, Work Head Spindle 16-143
Pulley, Wheel Head Air Bearing 16-151
Air Filter (3rd Oil Coalescer) 19-106
Air Filter (2nd Oil Vapor) 19-107
Float Valve (2 each) 19-108
Filter Roll (10 µm) (50 Yards each Roll) 19-114
Air Filter (1st water Separator) 19-118

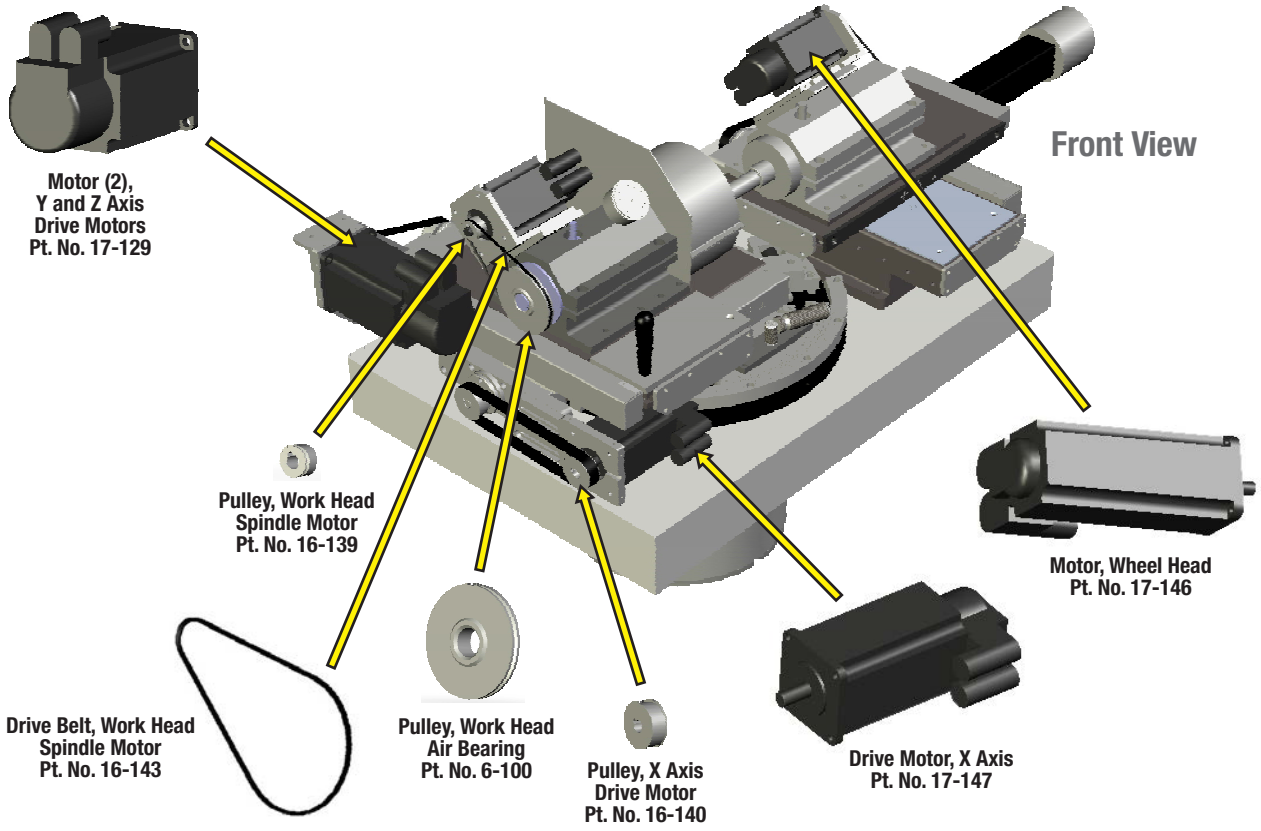
5.4 MECHANICAL COMPONENTS

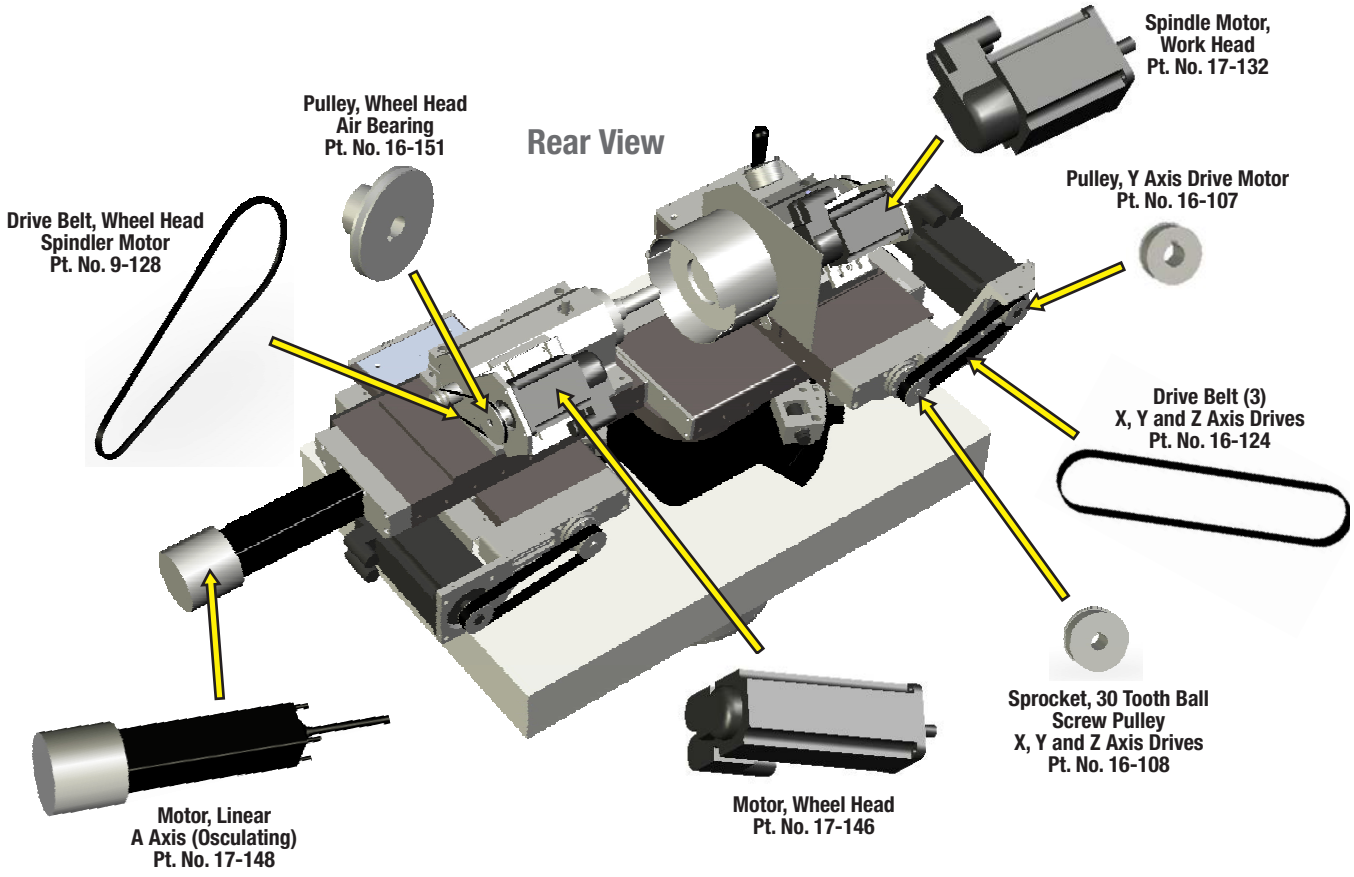


GRINDER GUARDS

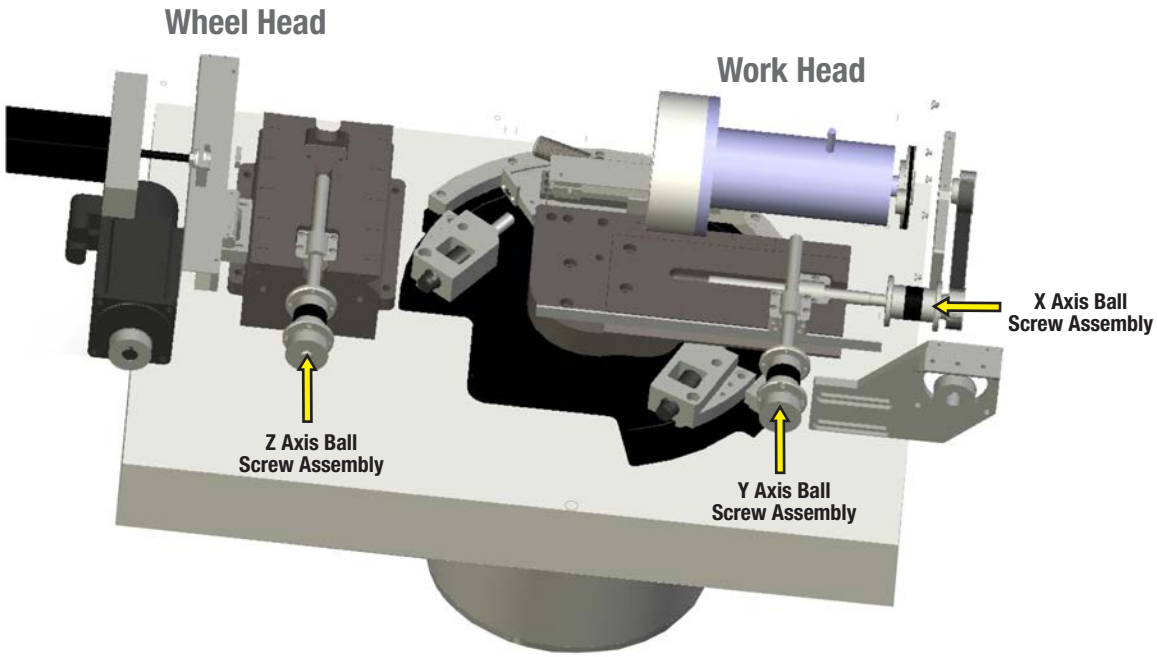


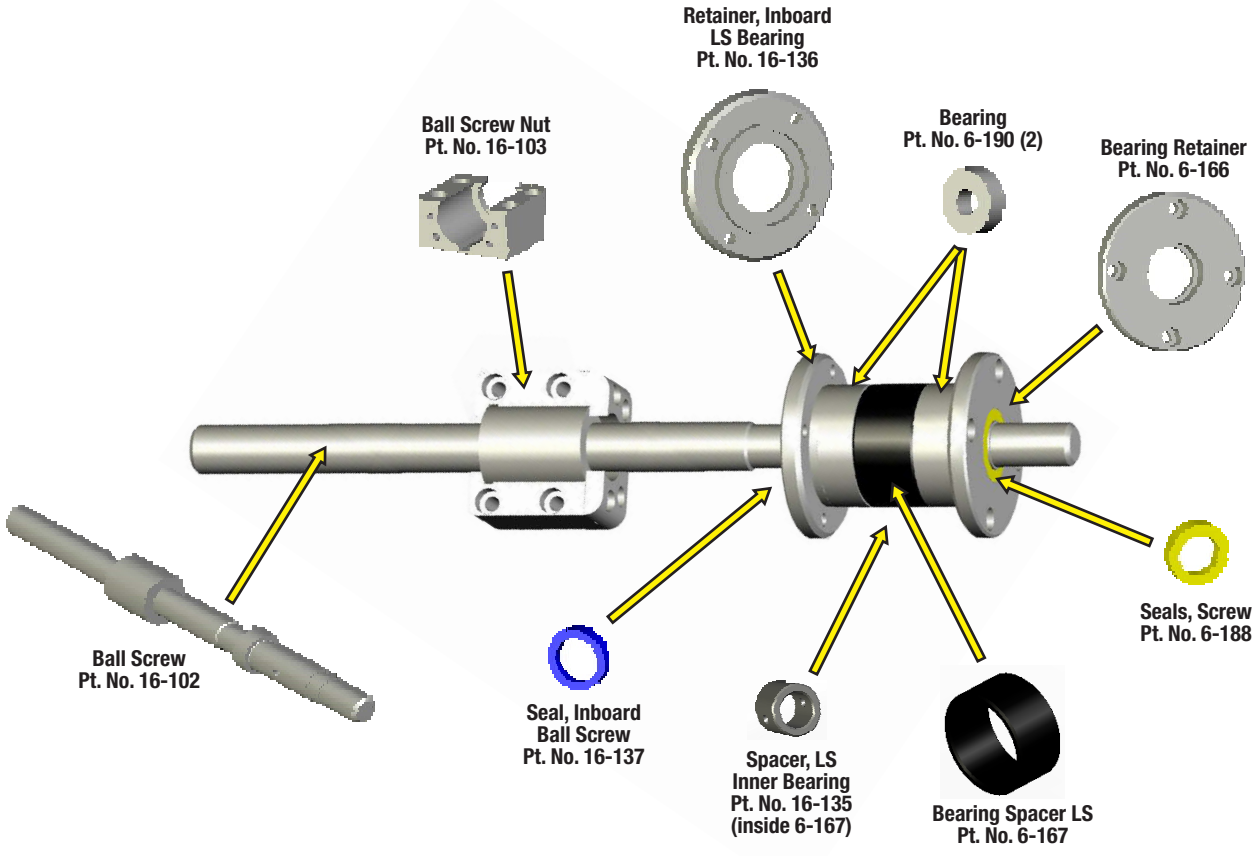
MOTORS, BELTS & PULLEYS



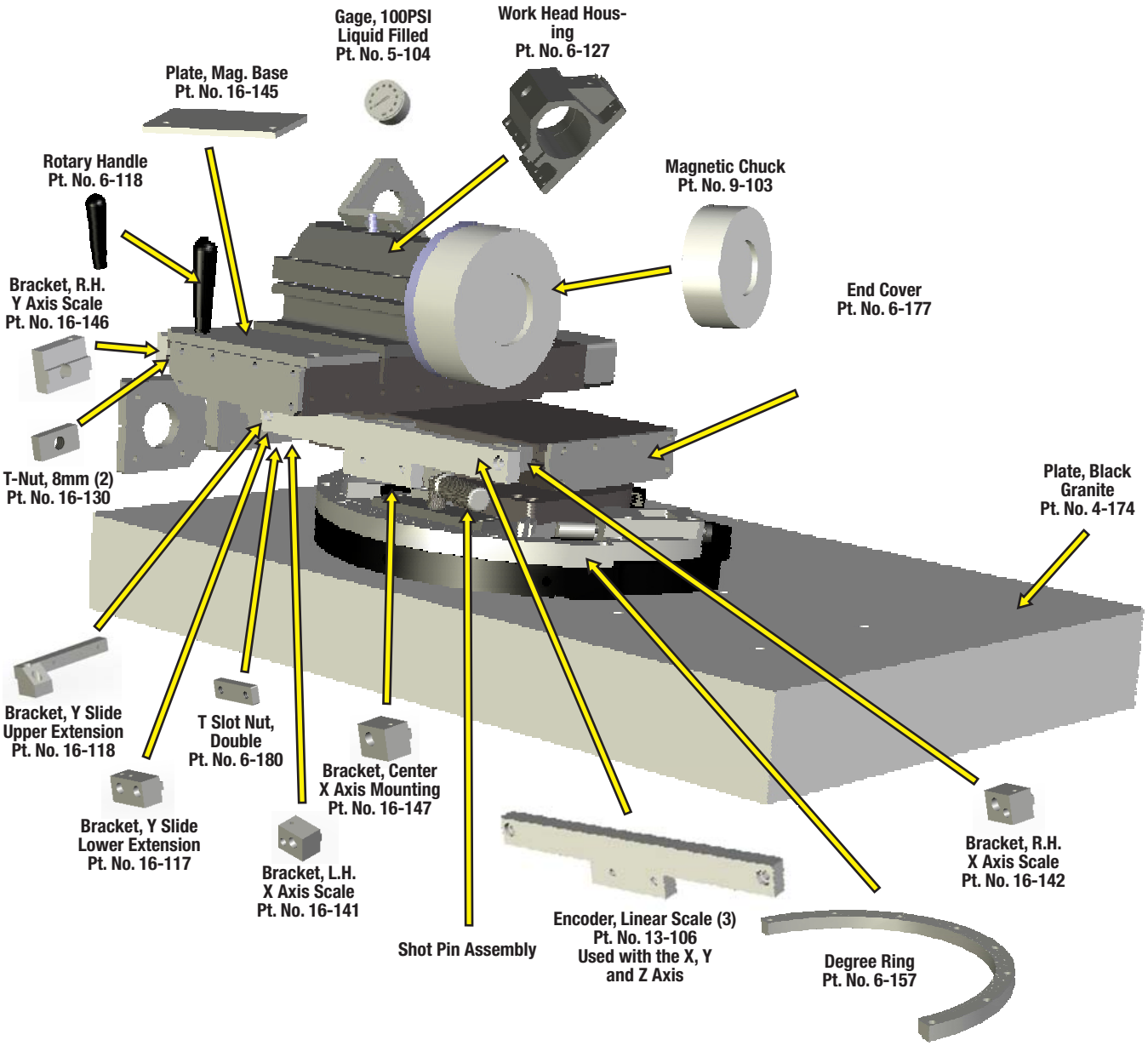


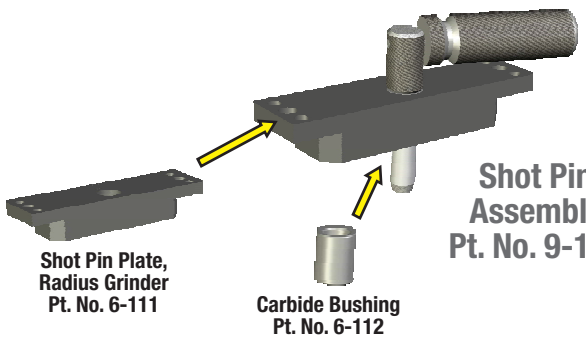
BALL SCREW ASSEMBLIES



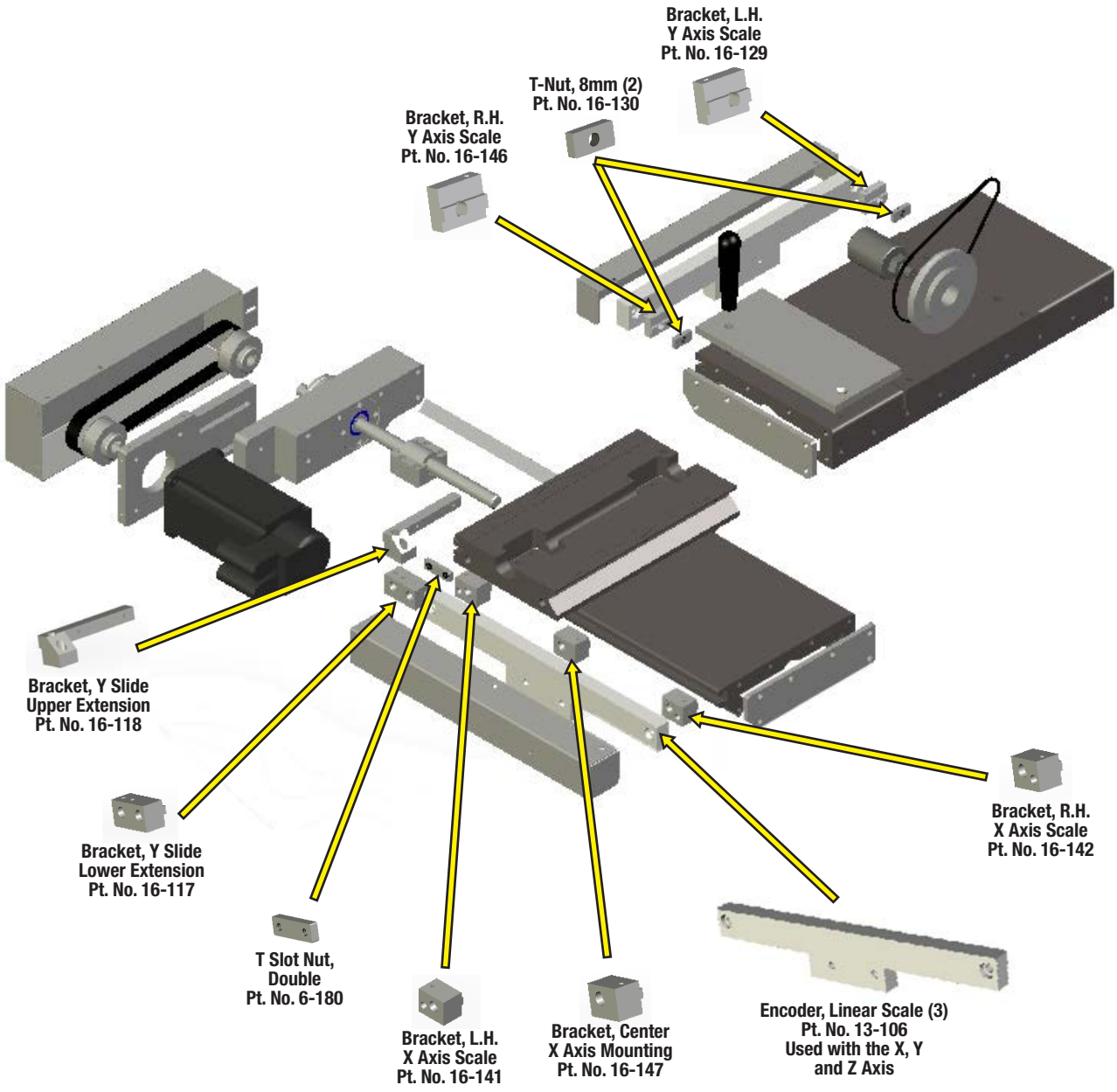


WORK HEAD
(Front View)

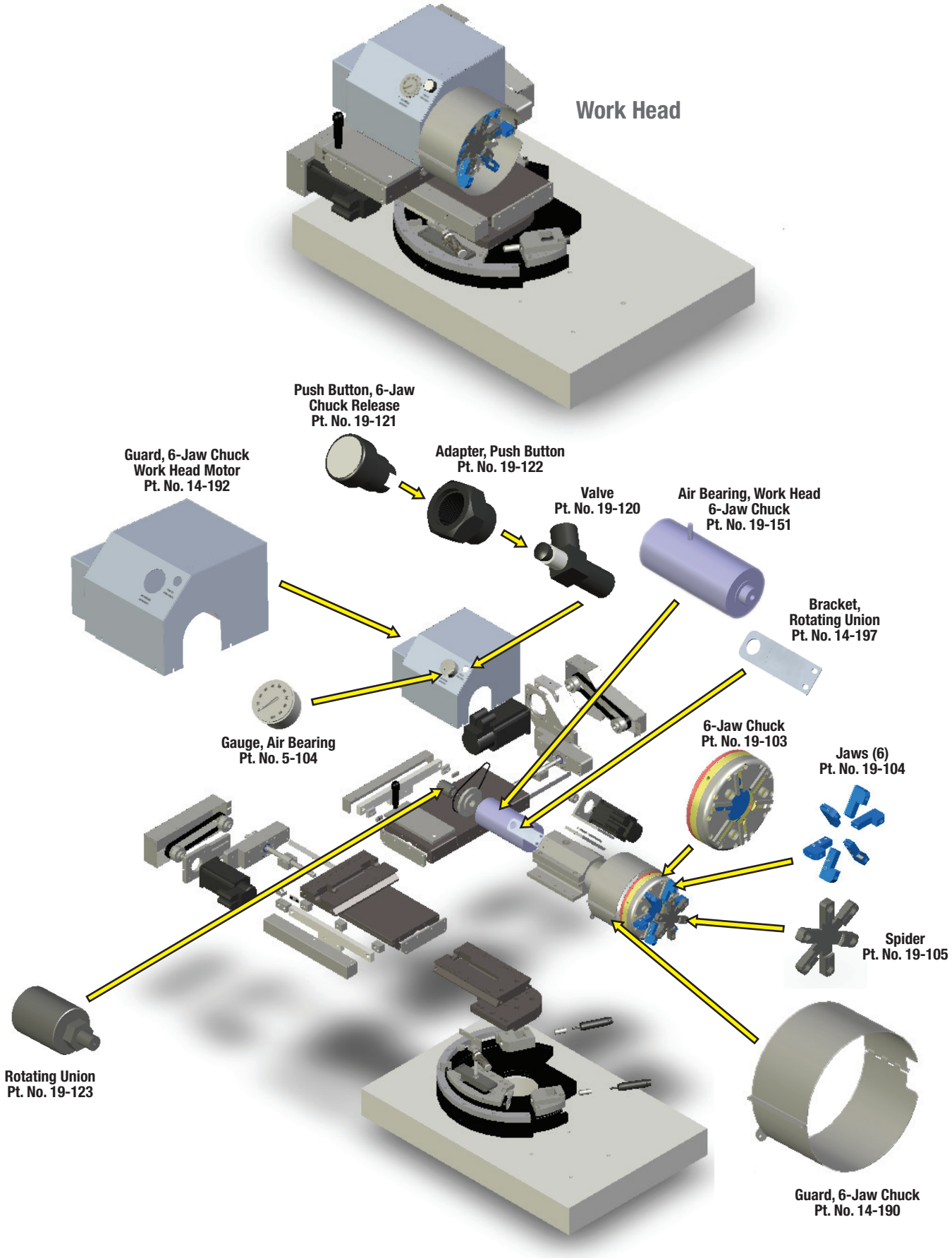




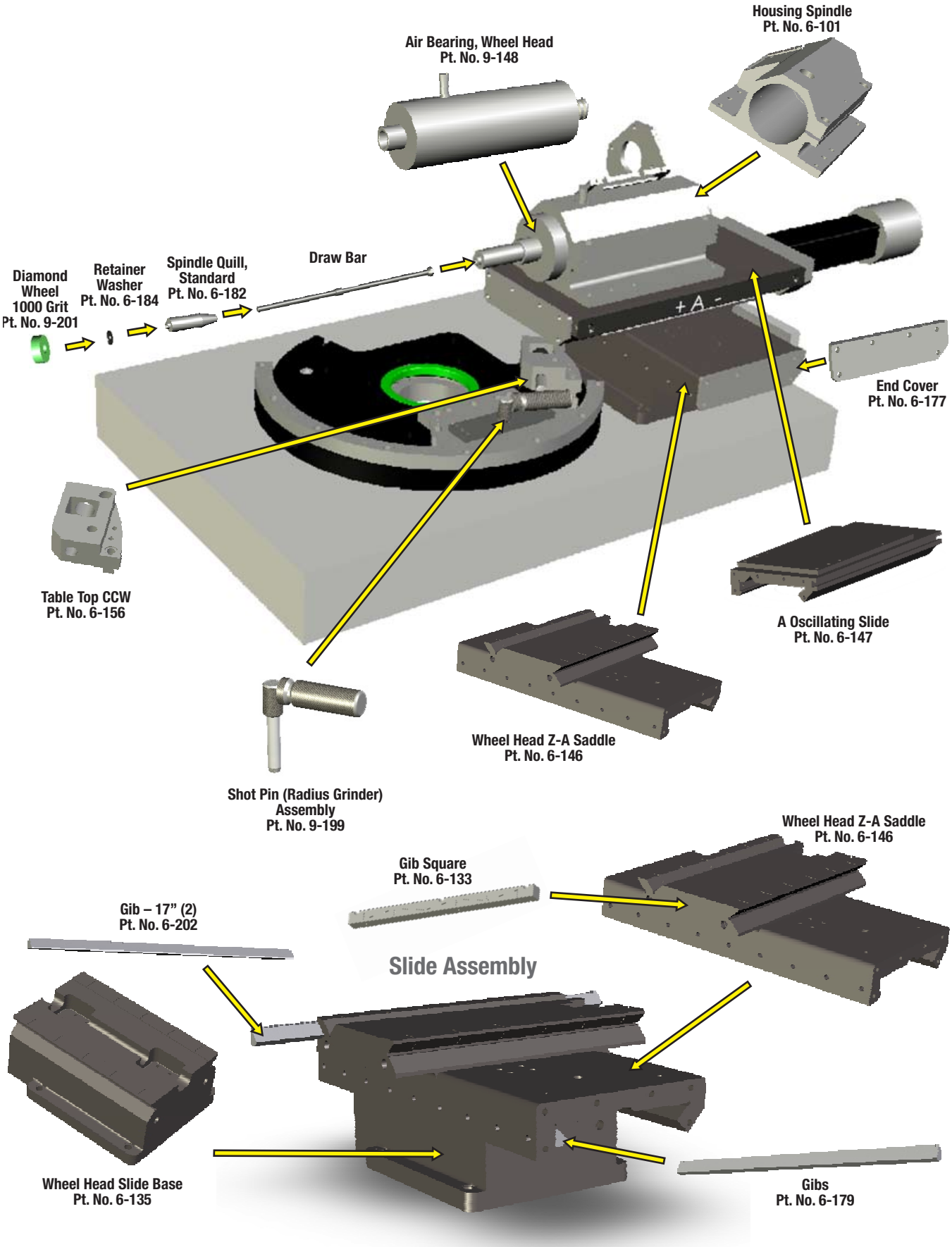
WORK HEAD
(Front View Detail)



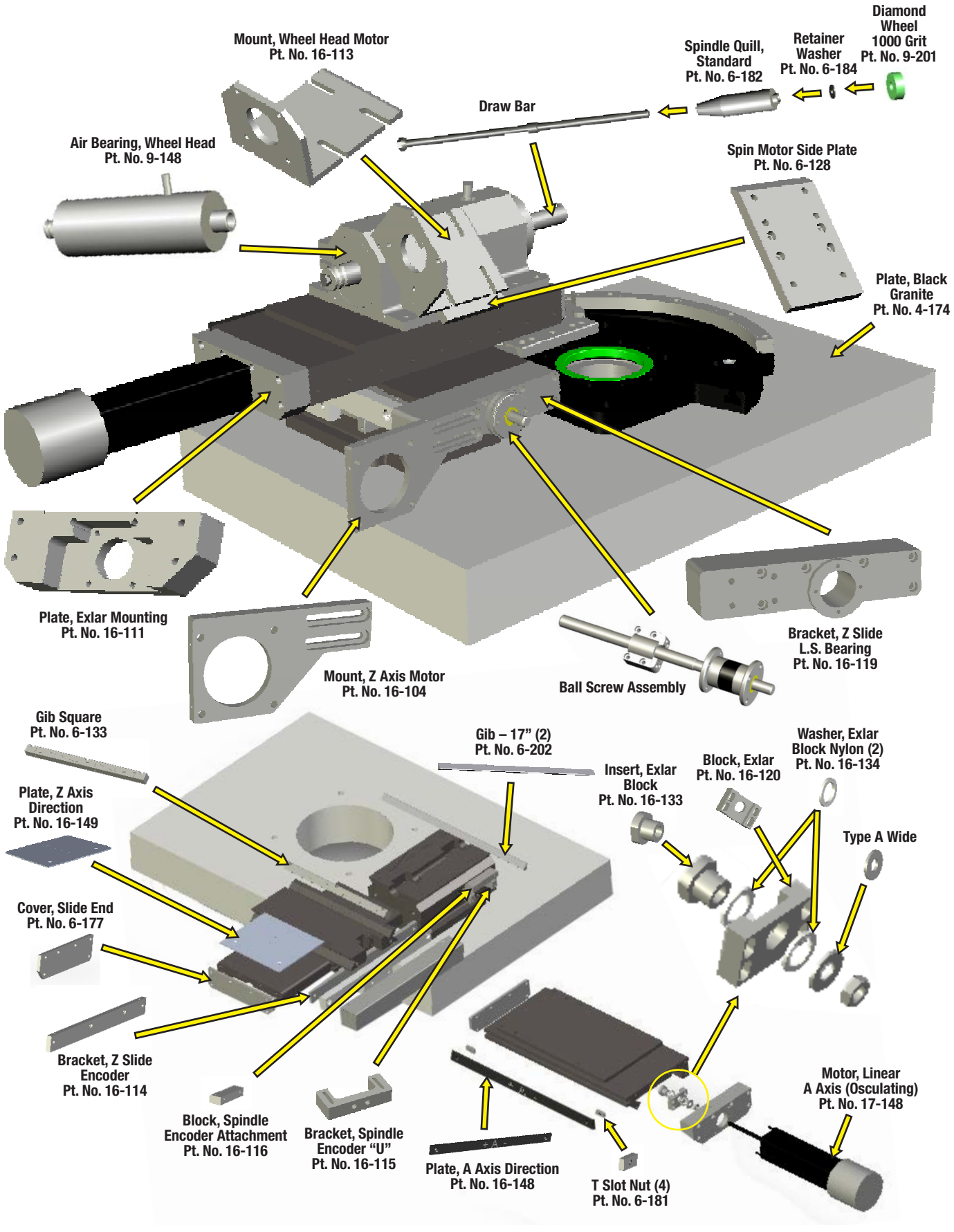
WORK HEAD, 6-JAW CHUCK OPTION



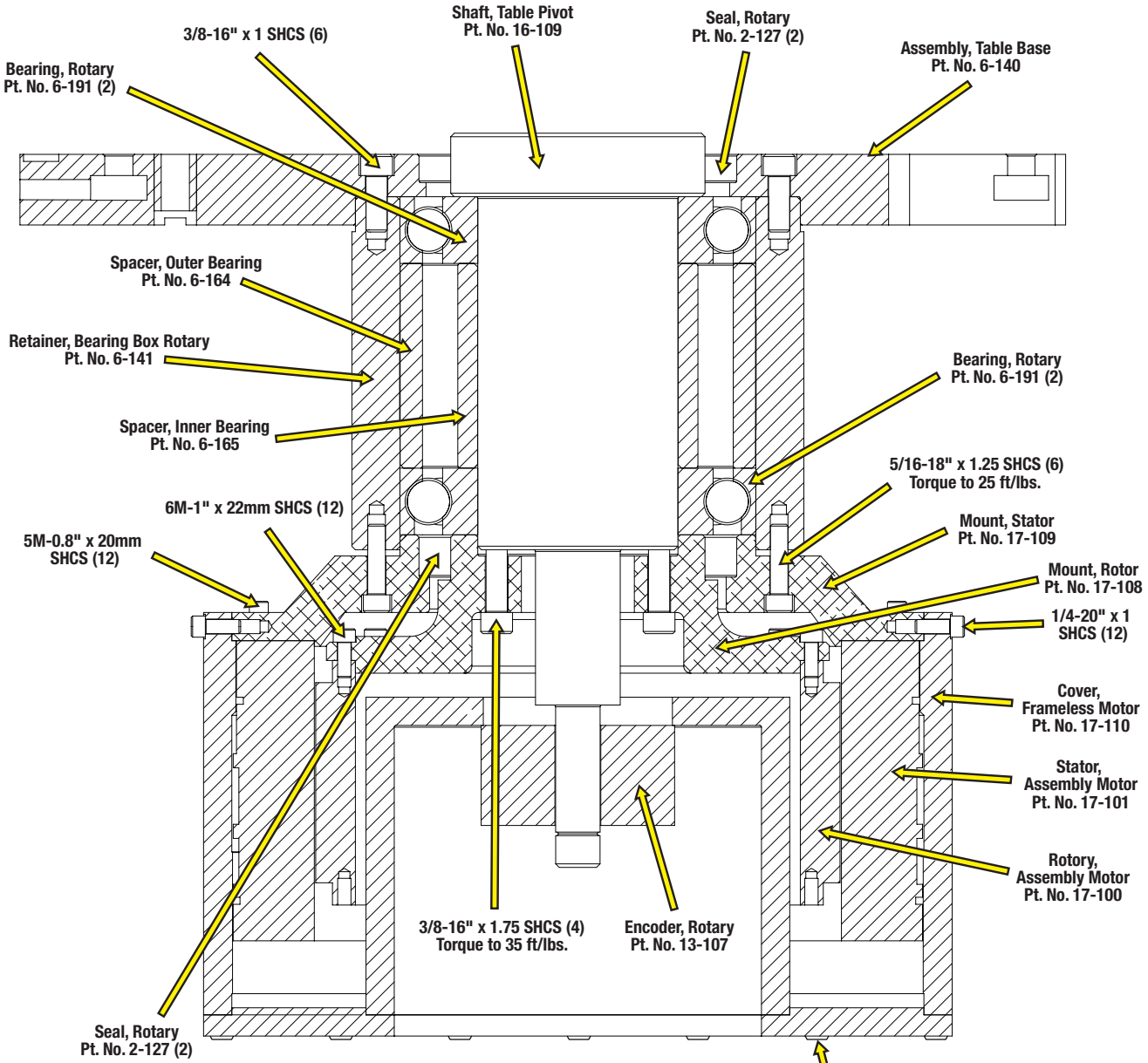
WHEEL HEAD
(Front View)

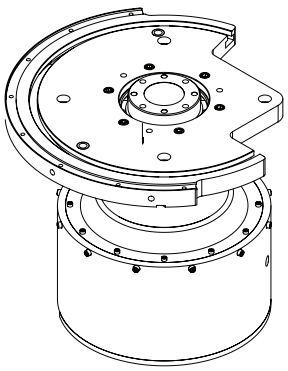


WHEEL HEAD
(Rear View)



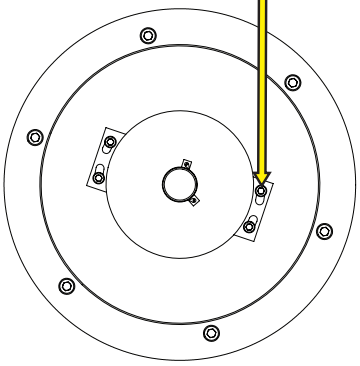
ROTARY ASSEMBLY





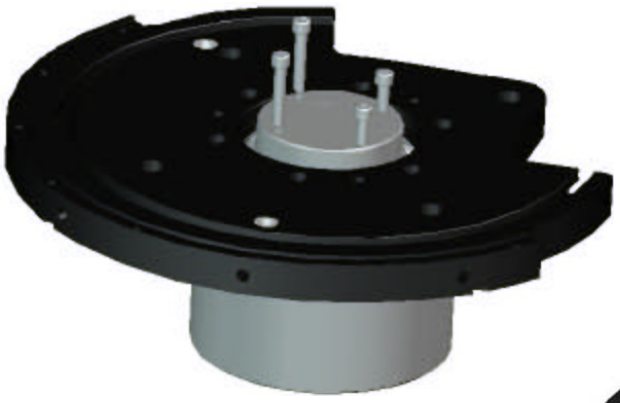
Top Angle View

Bottom View



Note: Torque Screws that hold Pt. No. 13-107 to Pt. No. 16-109 to 22-26.5 in/lbs.

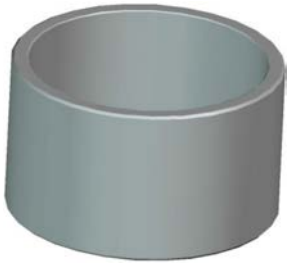
ROTARY ASSEMBLY



Shaft, Table Pivot
Pt. No. 16-109

Base Assembly Table
Pt. No. 6-140

Bearing Spacer
Pt. No. 6-164



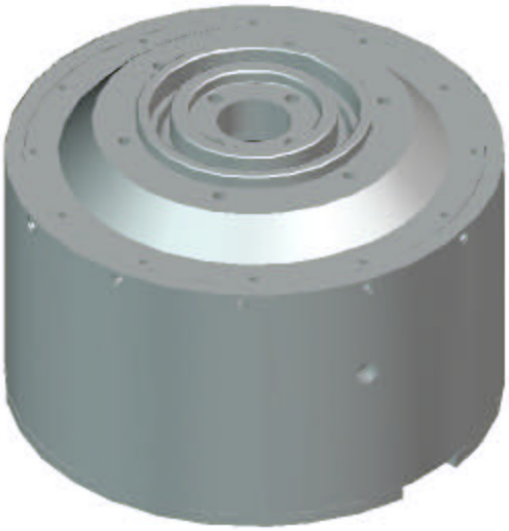
Bearing, Rotary
Pt. No. 6-191

Bearing, Spacer
Pt. No. 4-167

Retainer
Bearing Box Rotary
Pt. No. 6-141

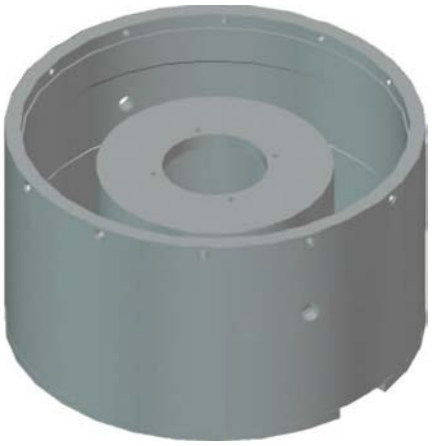
Bearing, Rotary
Pt. No. 6-191

Digital Direct Drive
Frameless Rotary Motor



FRAMELESS ROTARY MOTOR

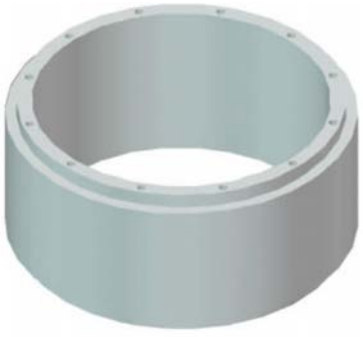
Cover, Frameless Motor
Pt. No. 17-110



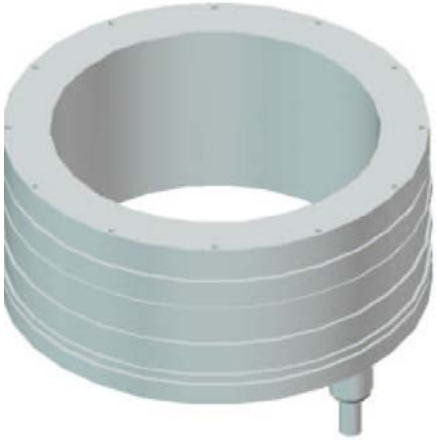
Mount, Stator
Pt. No. 17-109

Mount, Rotor
Pt. No. 17-108

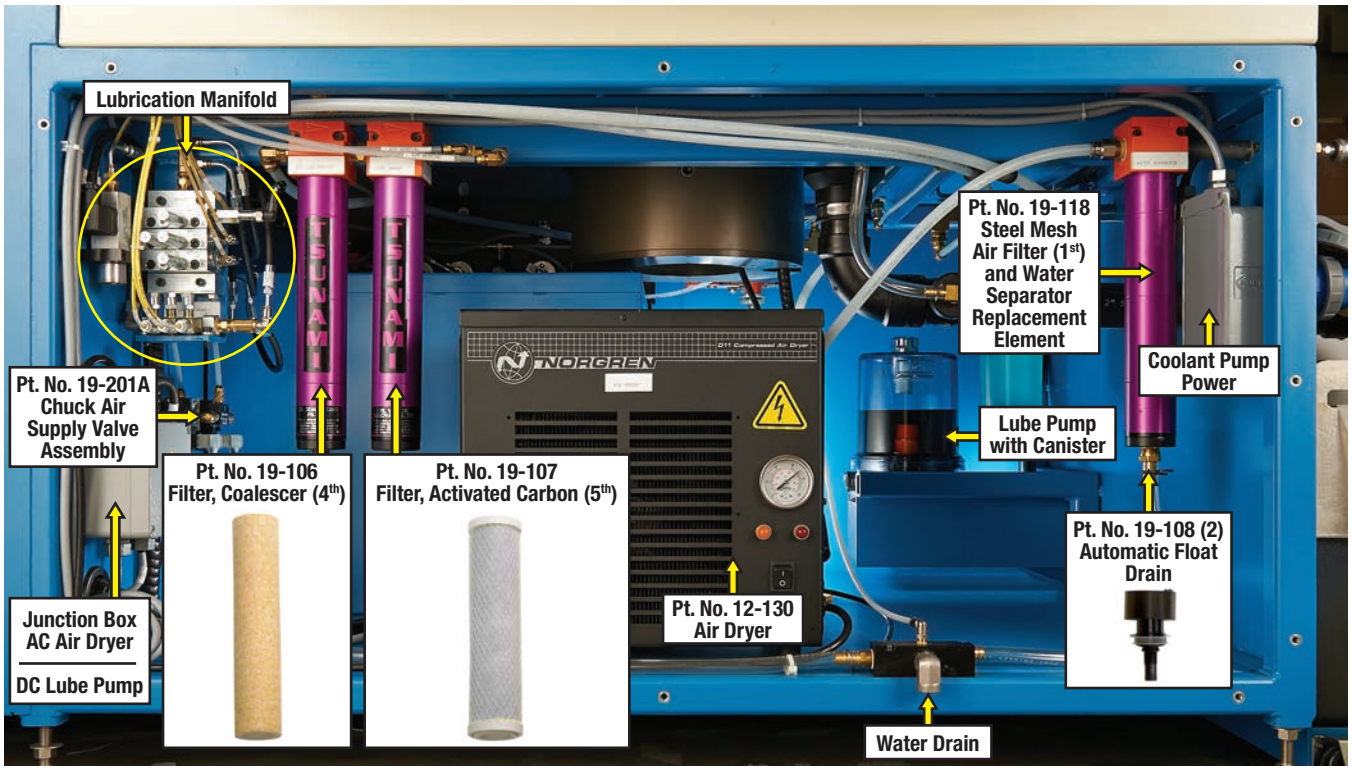
Rotor
Pt. No. 17-100



Stator
Pt. No. 17-101



CABINET – REAR ACCESS



Air Purification and Filtration System

This multi-stage filtration system insures long-lasting air bearings. The system removes oil, oil mist, water and vapor down to .001 PPM (.01micron). To maintain air bearing performance the supply of filtered air must be left on 24 hours a day.

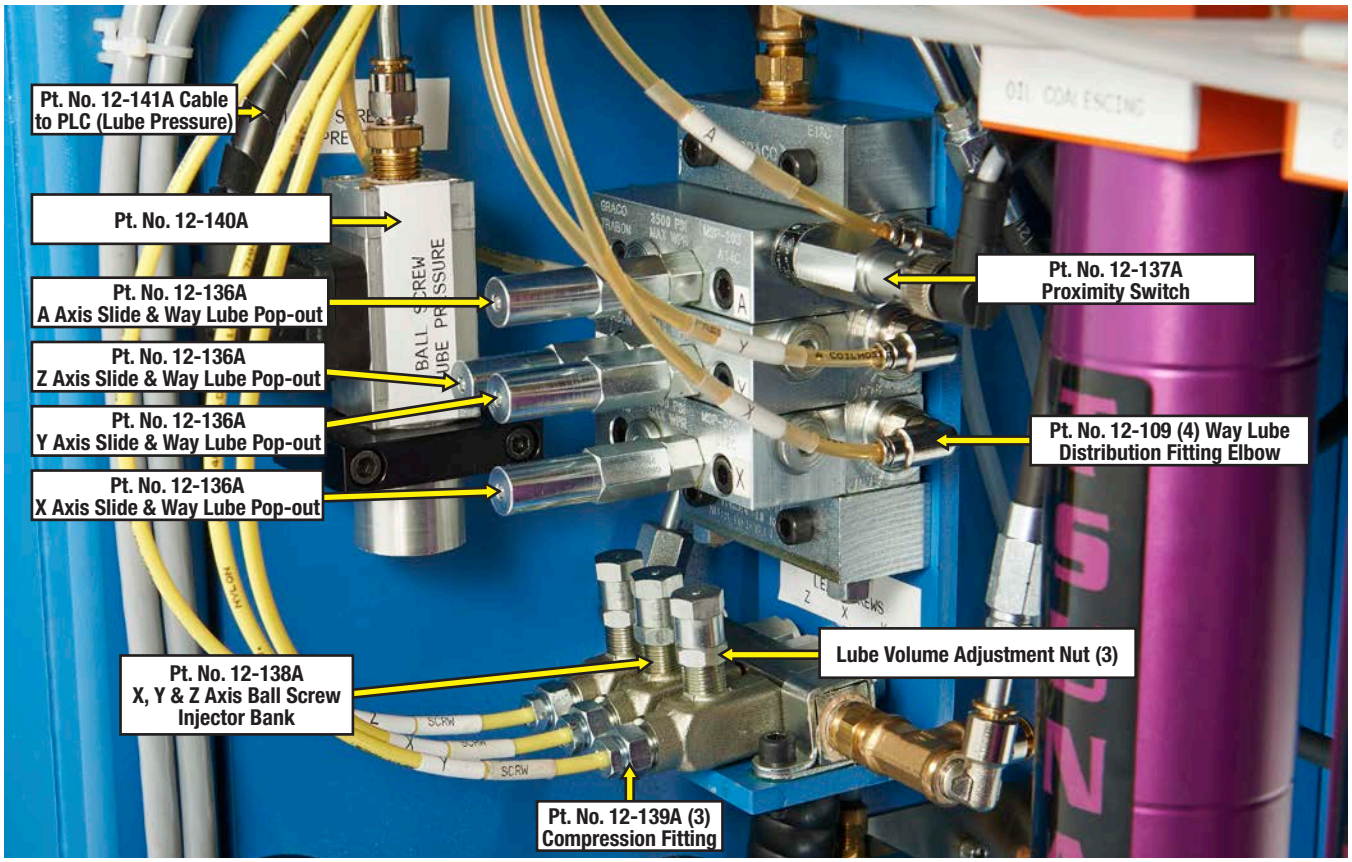
19-106 Filter, Coalescer - should be replaced every four (4) months

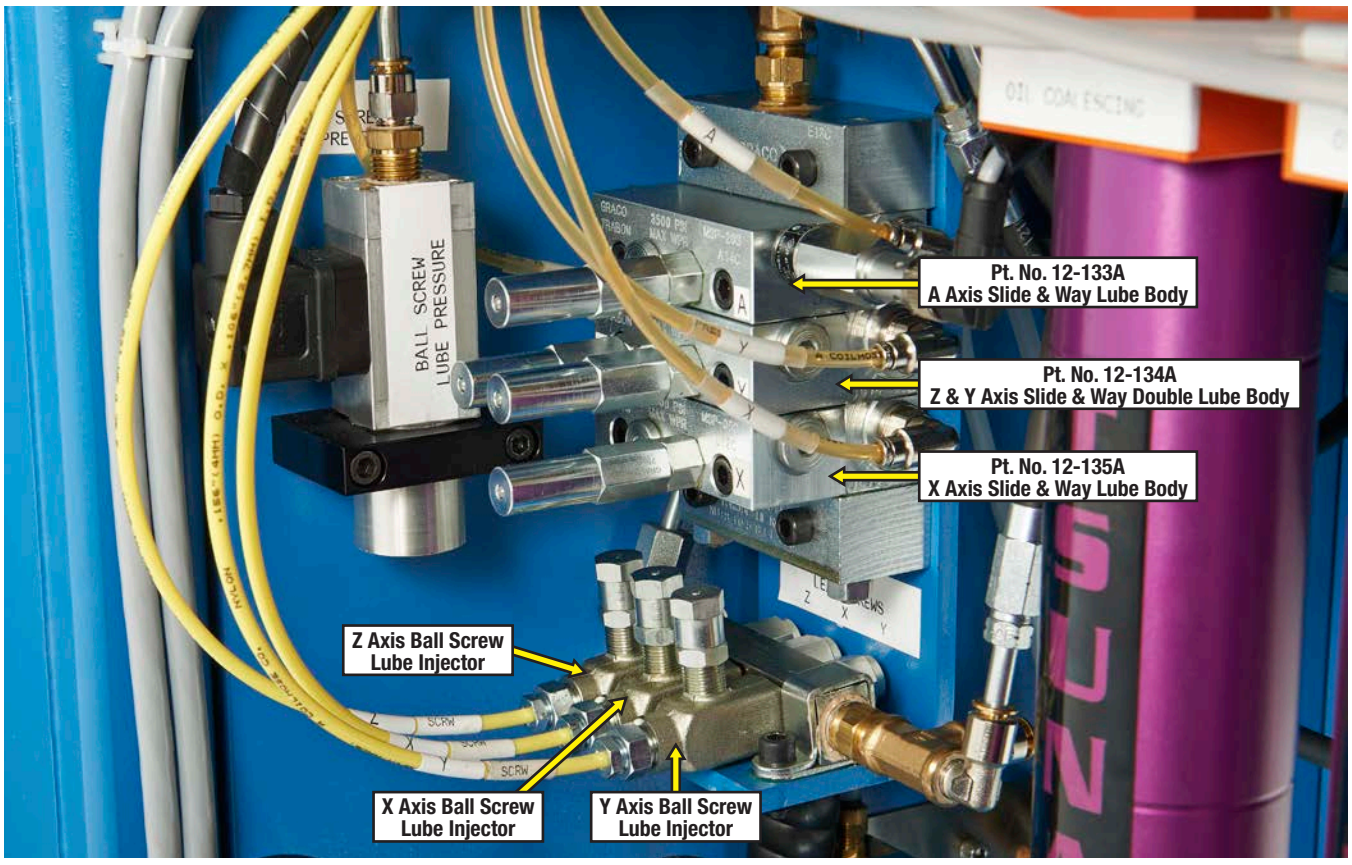
19-107 Filter, Activated Carbon - should be replaced every four (4) months

19-108 Float Valves – Replace as needed

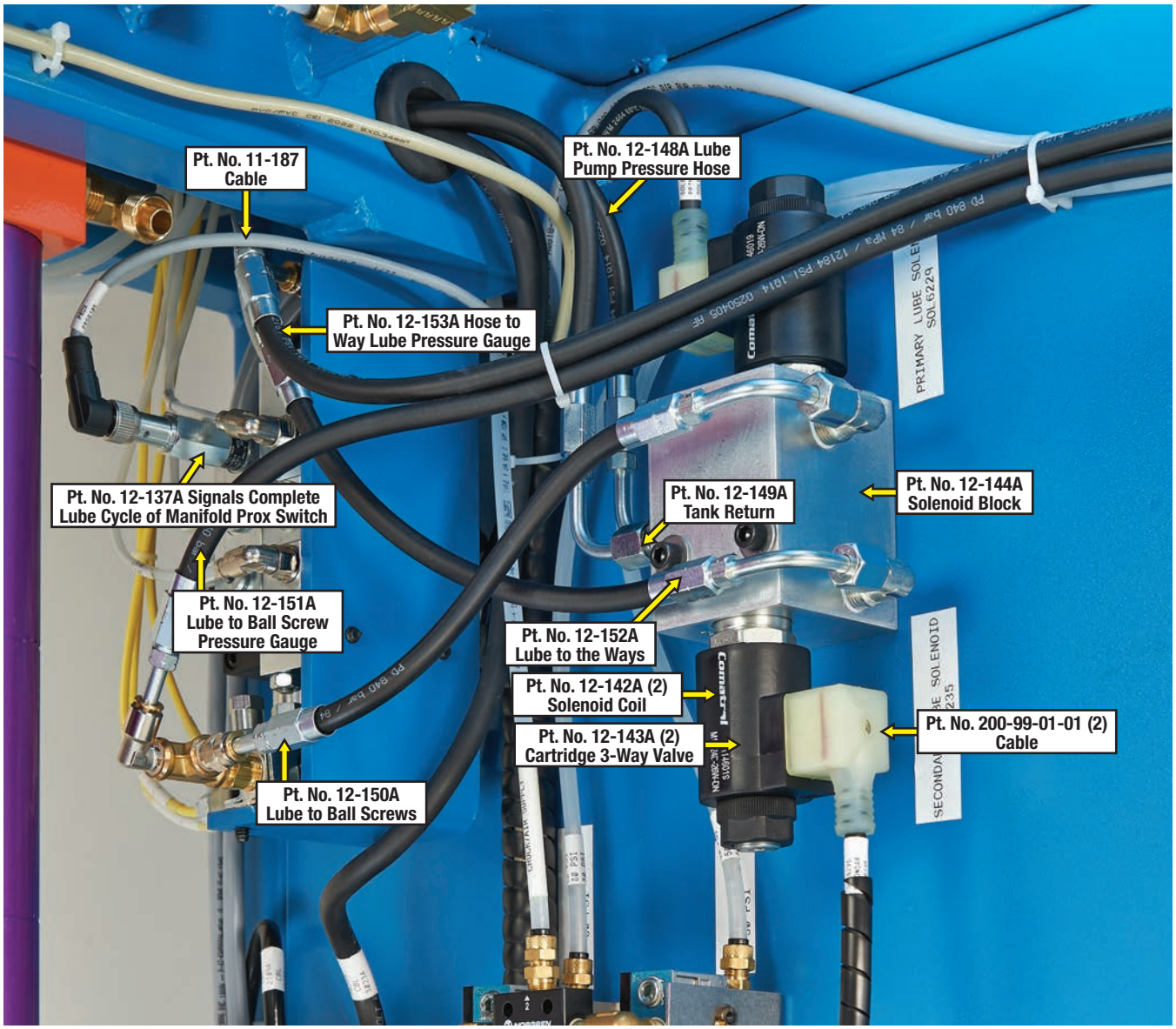
19-118 Steel Mesh – Should be disassembled and cleaned but should not require replacement

LUBRICATION MANIFOLD

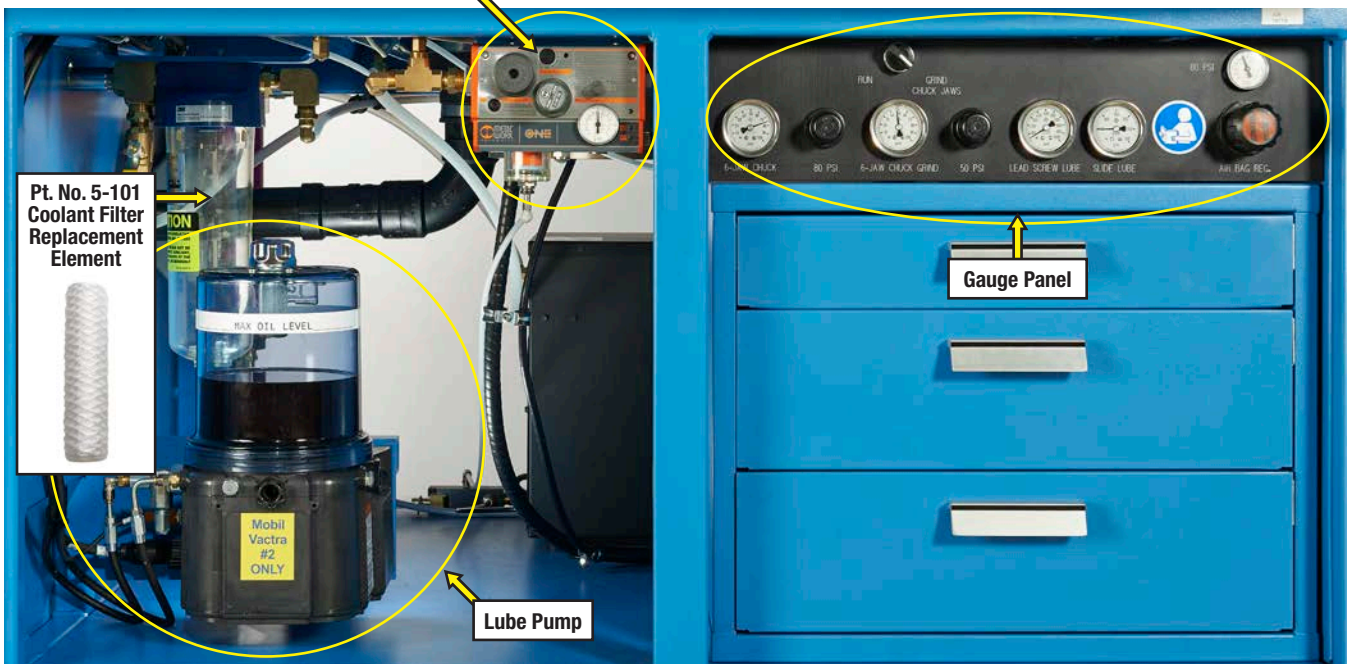




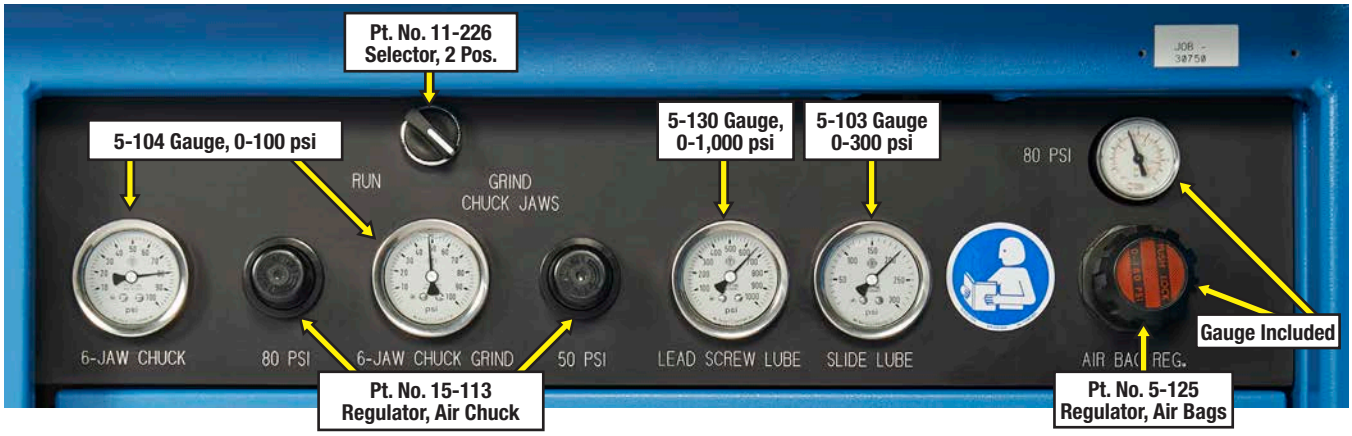
LUBE DISTRIBUTION WITH SOLENOIDS



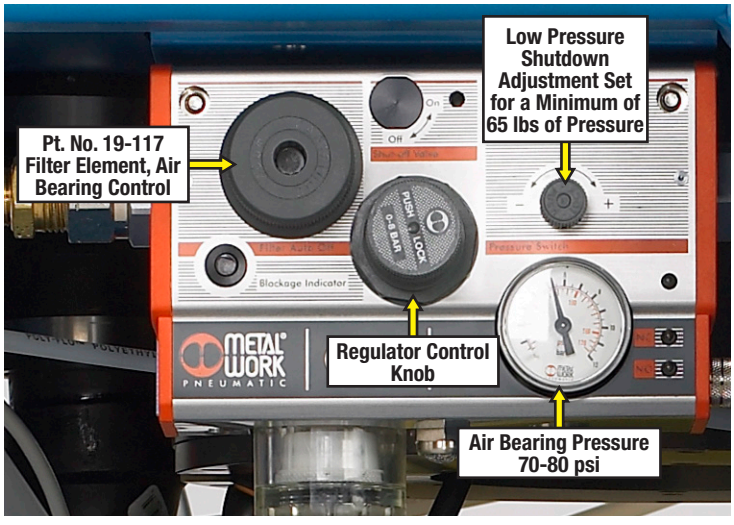
FRONT LOWER



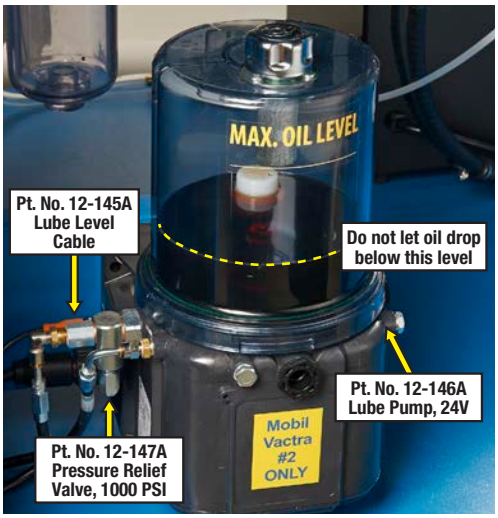
GAUGE PANEL



PT. NO. 15-107 AIR CONTROL – AIR BEARING

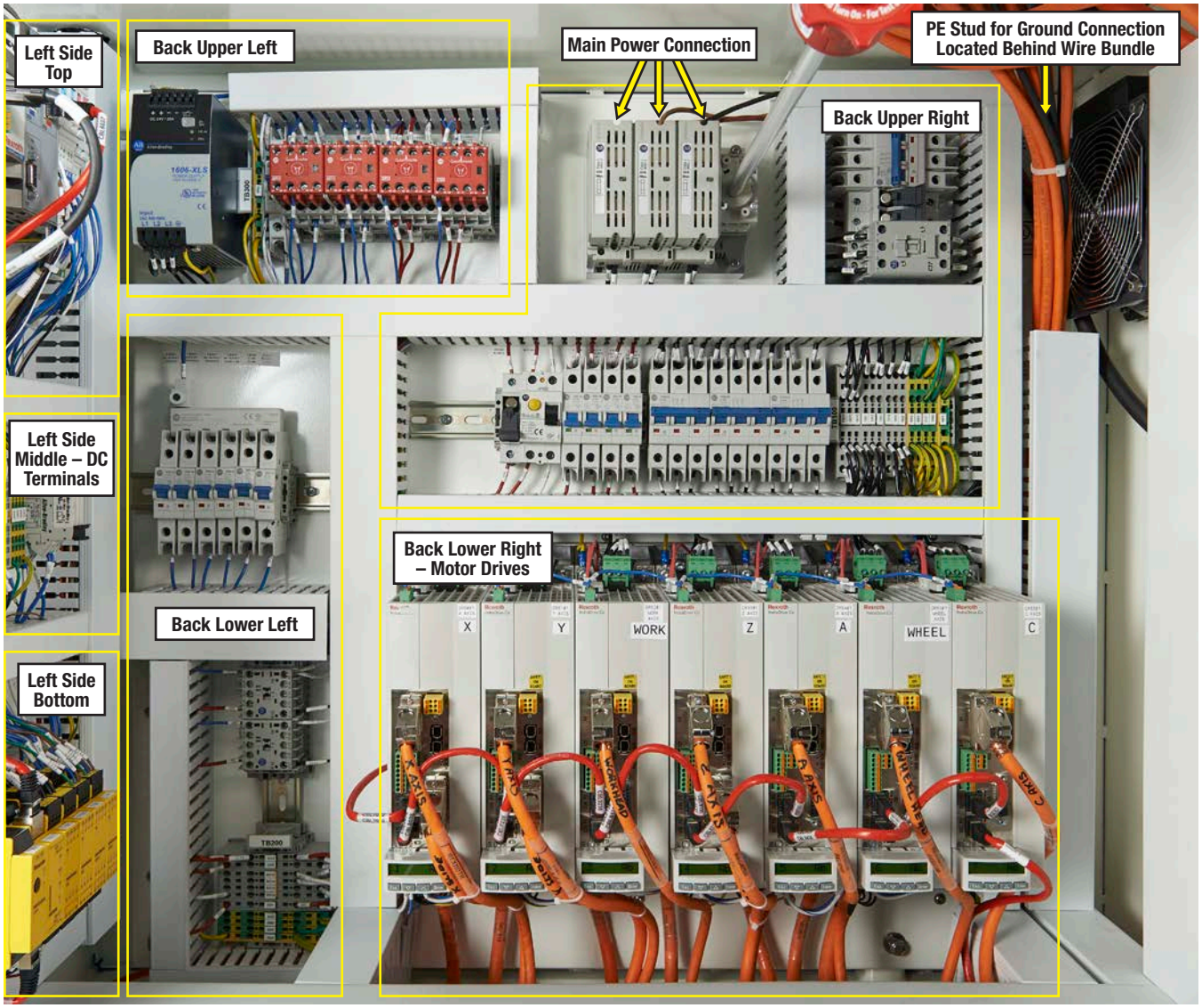


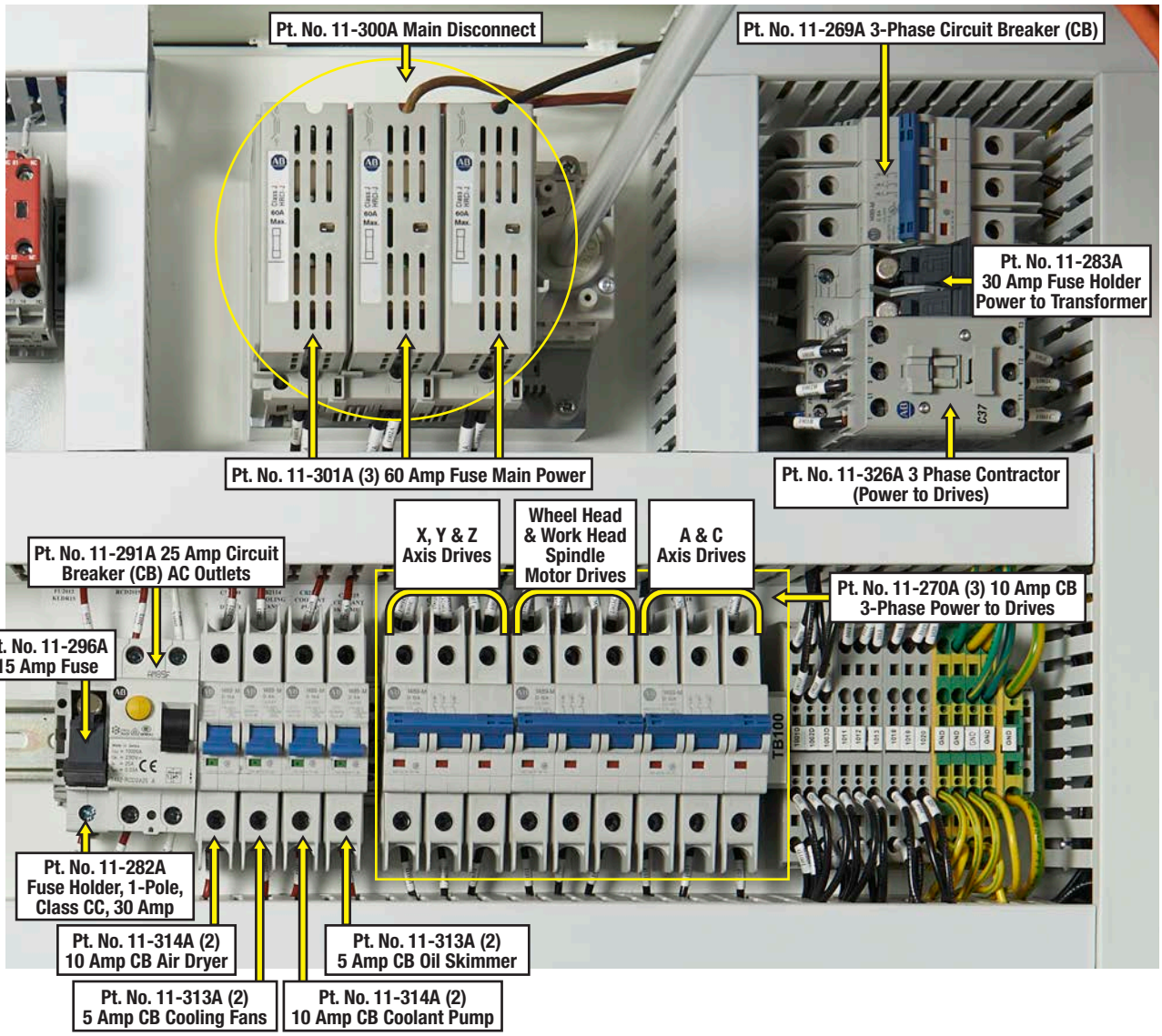
LUBE PUMP



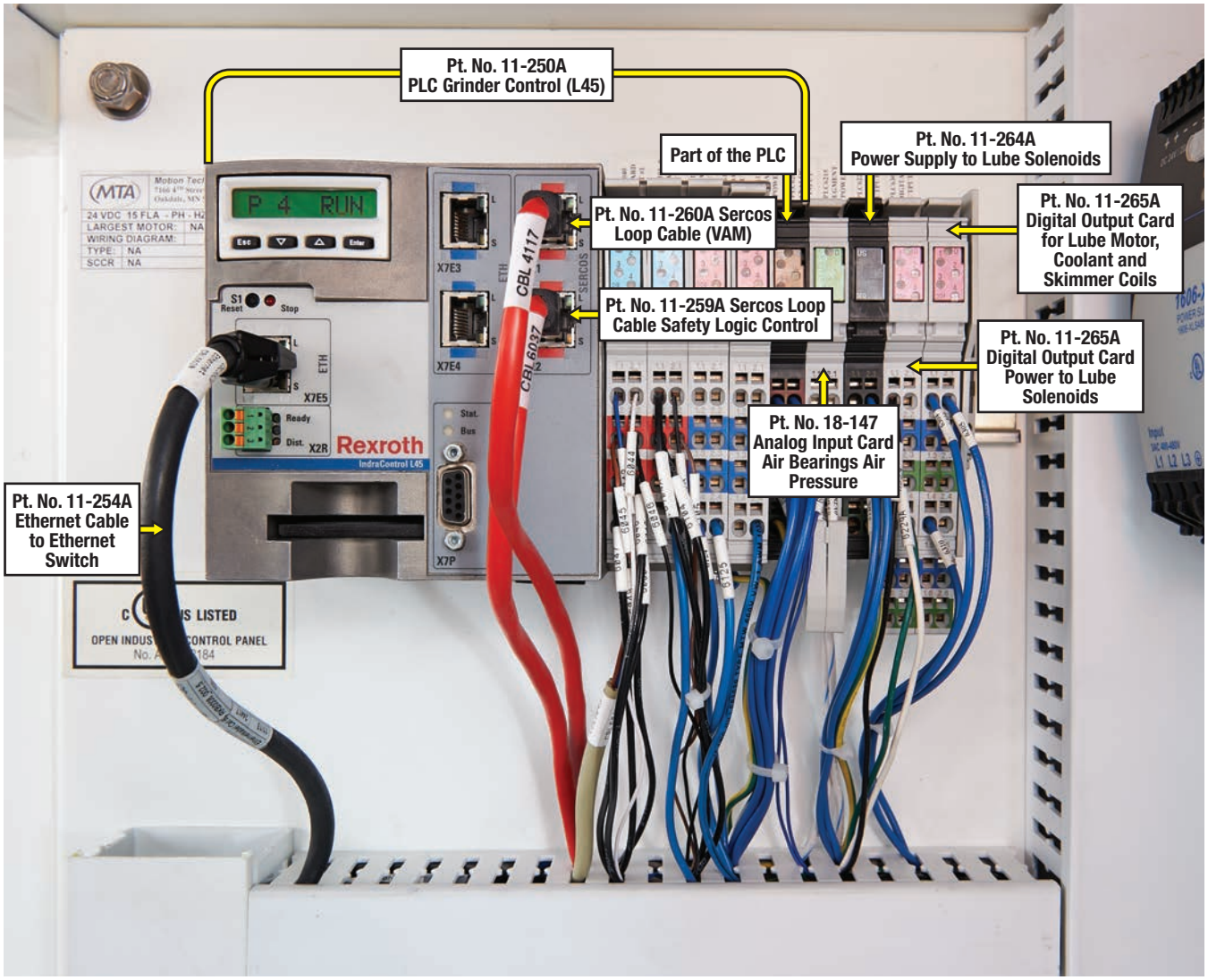
5.5 ELECTRICAL COMPONENTS

CONTROL CABINET

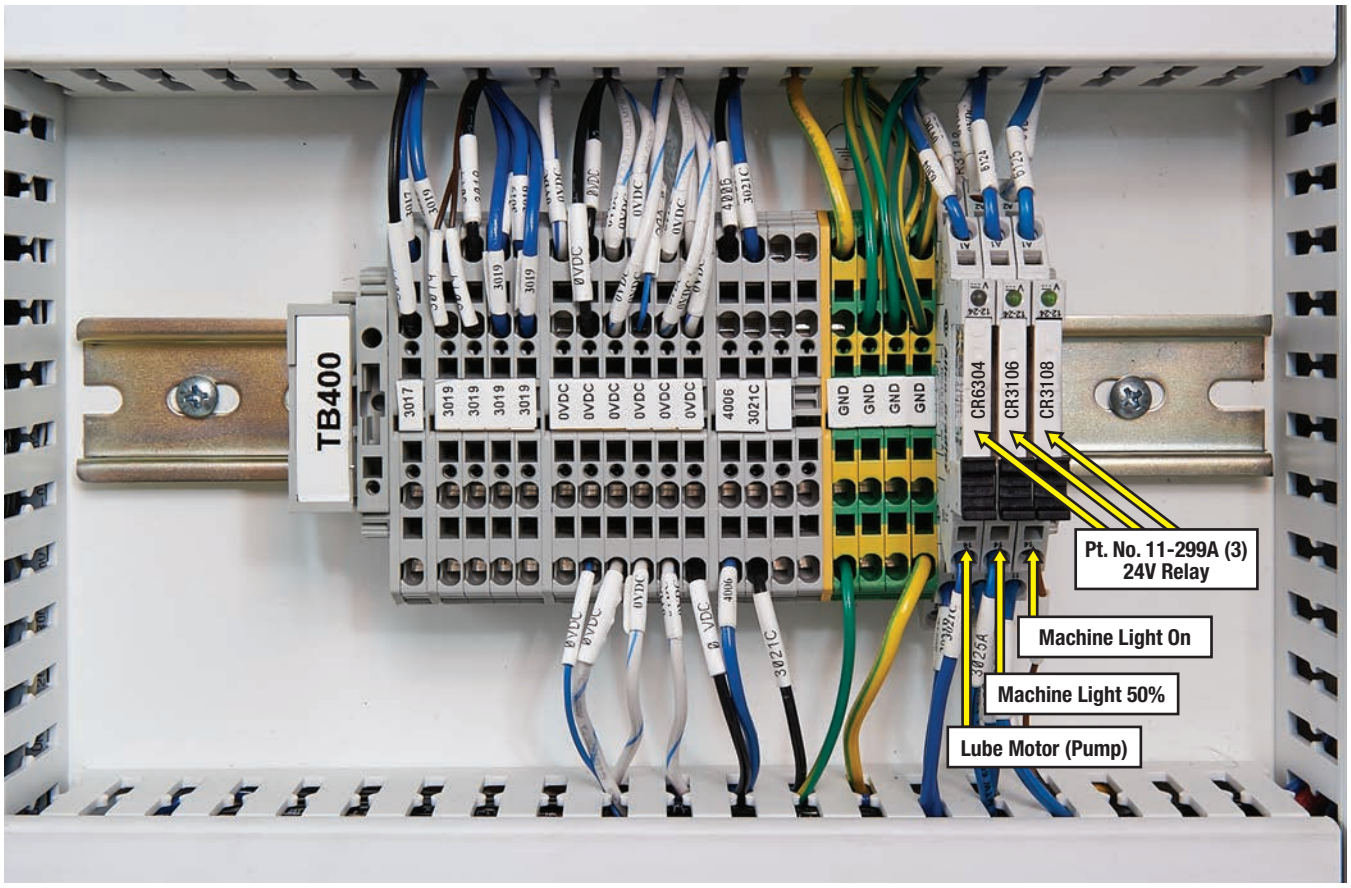



Pt. No. 11-300A Main Disconnect
Pt. No. 11-269A 3-Phase Circuit Breaker (CB)
Pt. No. 11-283A
30 Amp Fuse Holder
Power to Transformer
Pt. No. 11-301A (3) 60 Amp Fuse Main Power
Pt. No. 11-326A 3 Phase Contractor
(Power to Drives)
X, Y & Z
Axis Drives
Wheel Head
& Work Head
Spindle
Motor Drives
A & C
Axis Drives
Pt. No. 11-291A 25 Amp Circuit
Breaker (CB) AC Outlets
Pt. No. 11-270A (3) 10 Amp CB
3-Phase Power to Drives
Pt. No. 11-296A
15 Amp Fuse
TB100
Pt. No. 11-282A
Fuse Holder, 1-Pole,
Class CC, 30 Amp
Pt. No. 11-314A (2)
10 Amp CB Air Dryer
Pt. No. 11-313A (2)
5 Amp CB Oil Skimmer
Pt. No. 11-313A (2)
5 Amp CB Cooling Fans
Pt. No. 11-314A (2)
10 Amp CB Coolant Pump

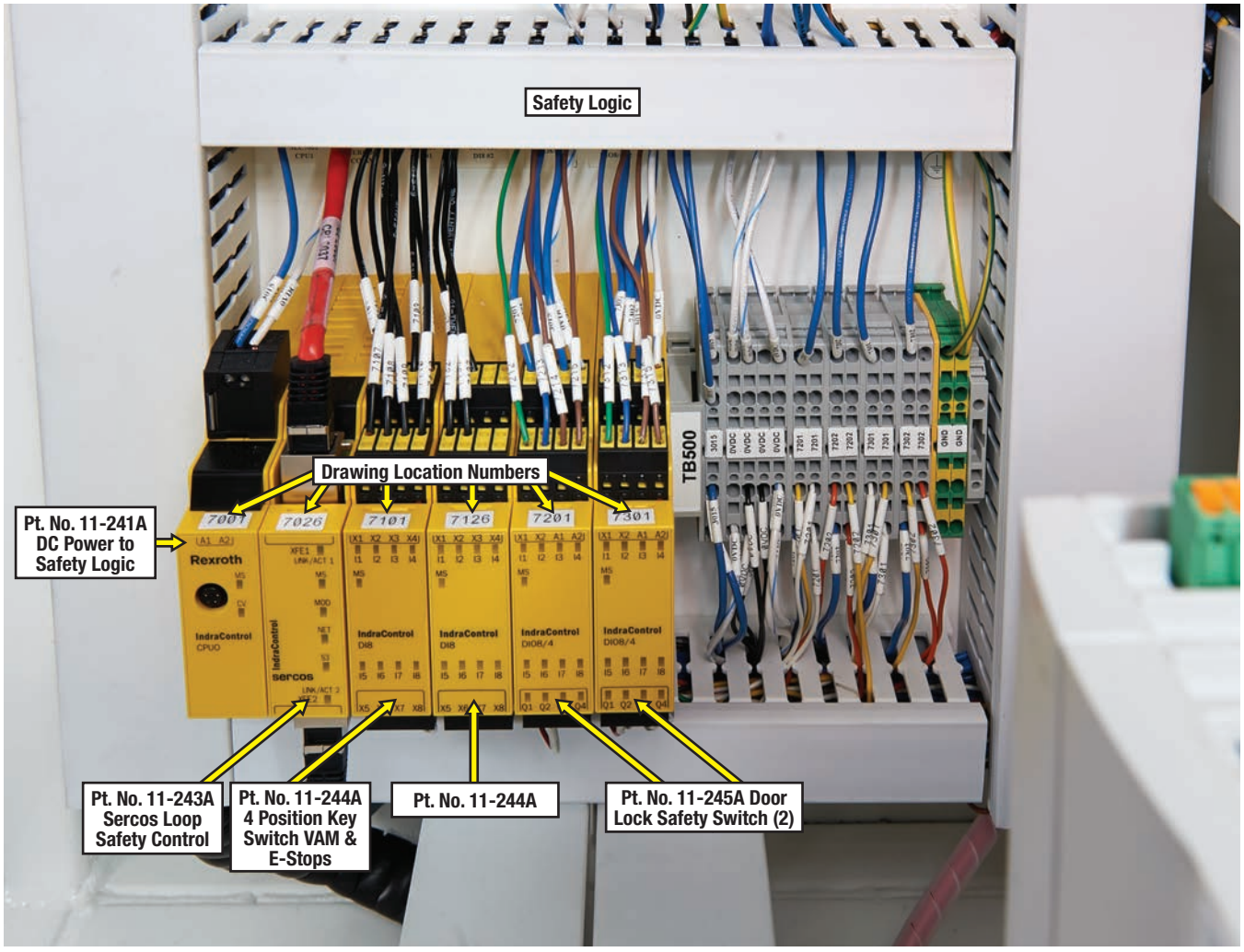
CONTROL CABINET – LEFT SIDE TOP



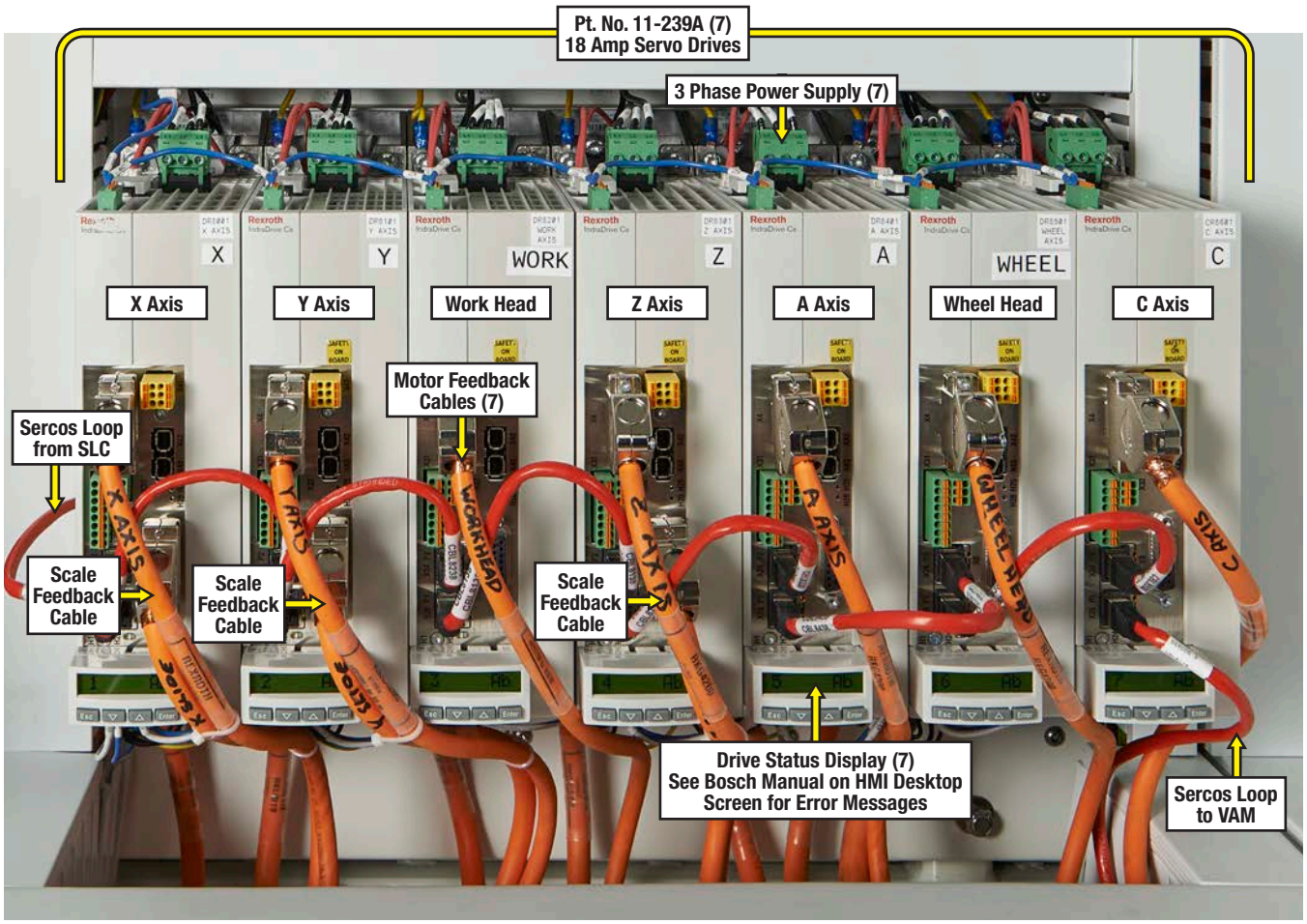
CONTROL CABINET – LEFT SIDE MIDDLE – DC TERMINALS



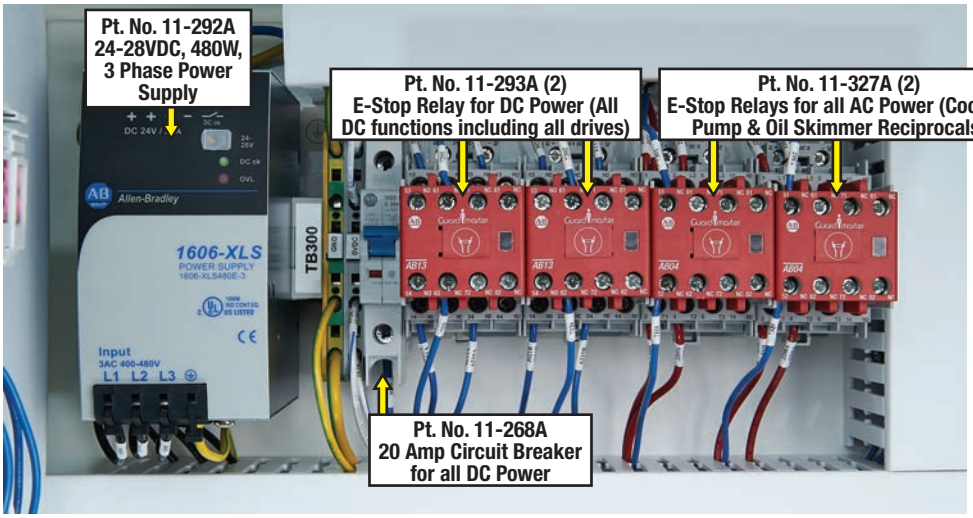
CONTROL CABINET – LEFT SIDE BOTTOM



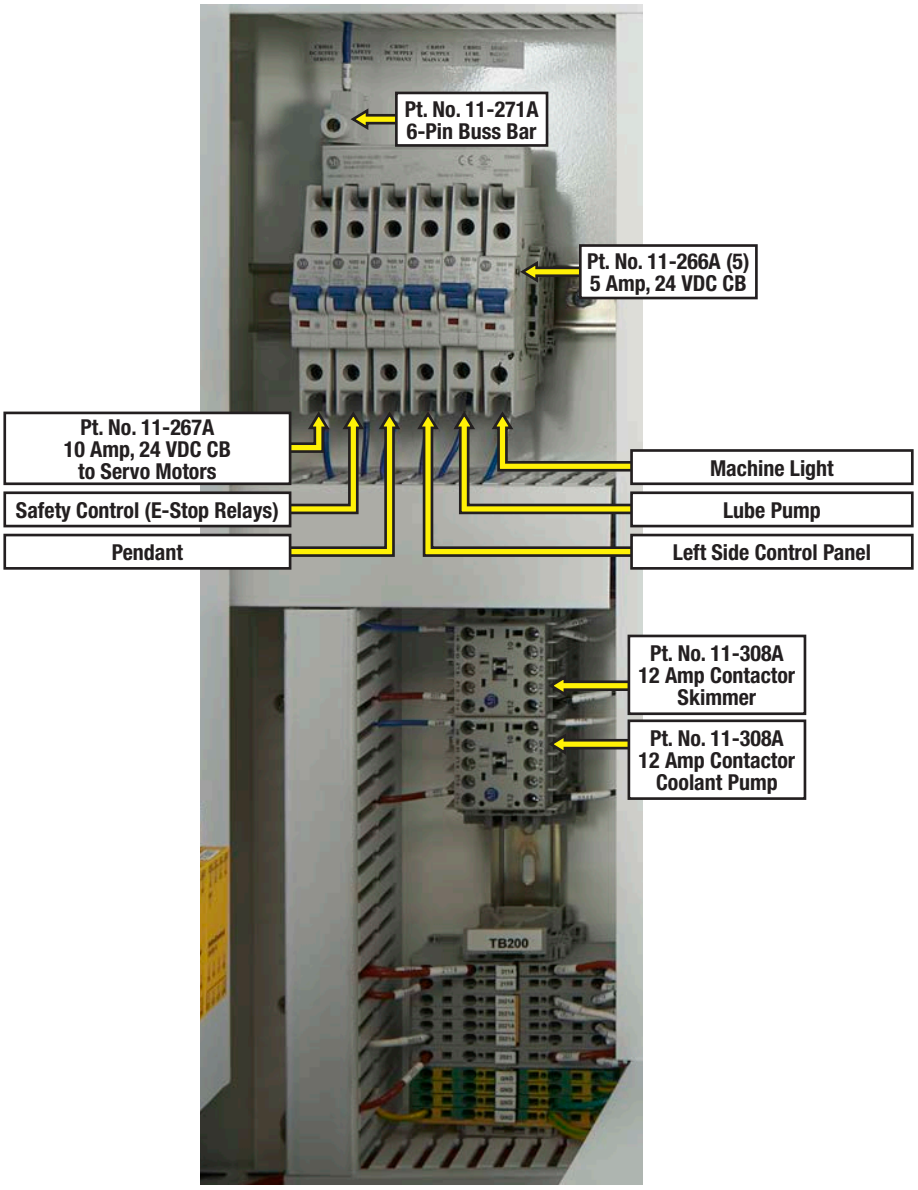
CONTROL CABINET – BACK LOWER RIGHT – MOTOR DRIVES



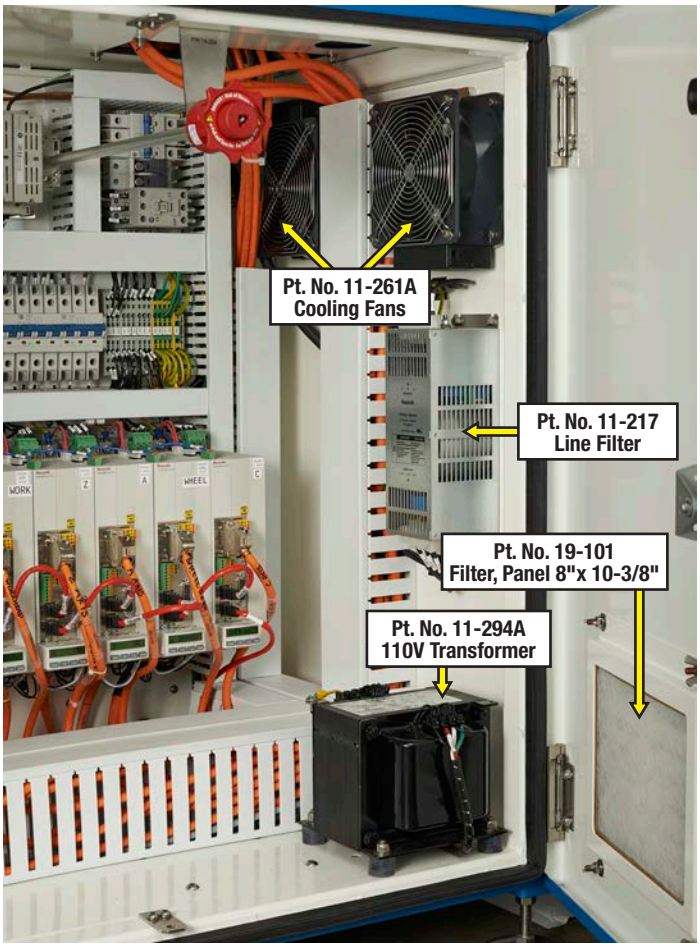
CONTROL CABINET – BACK UPPER LEFT



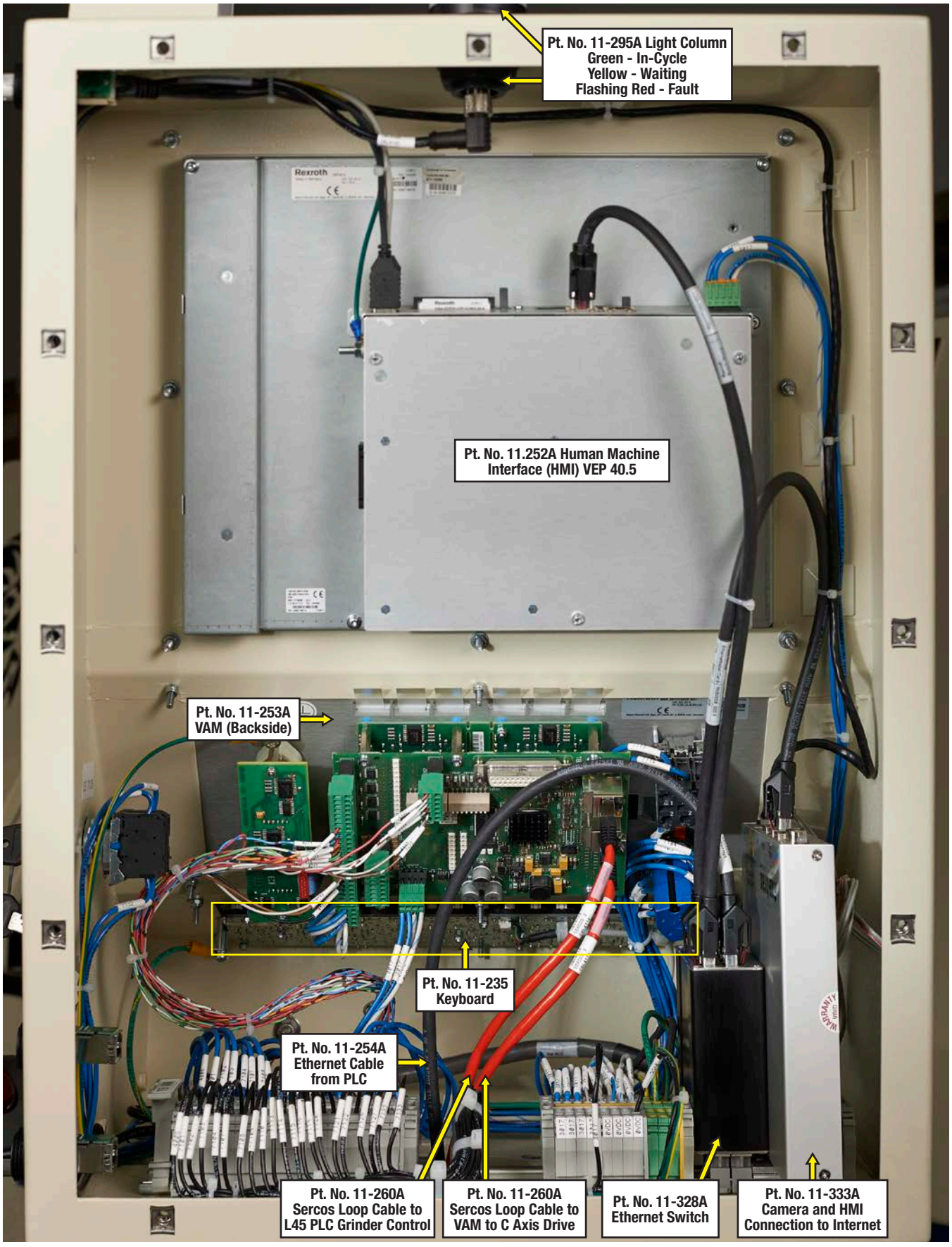
CONTROL CABINET – BACK LOWER LEFT



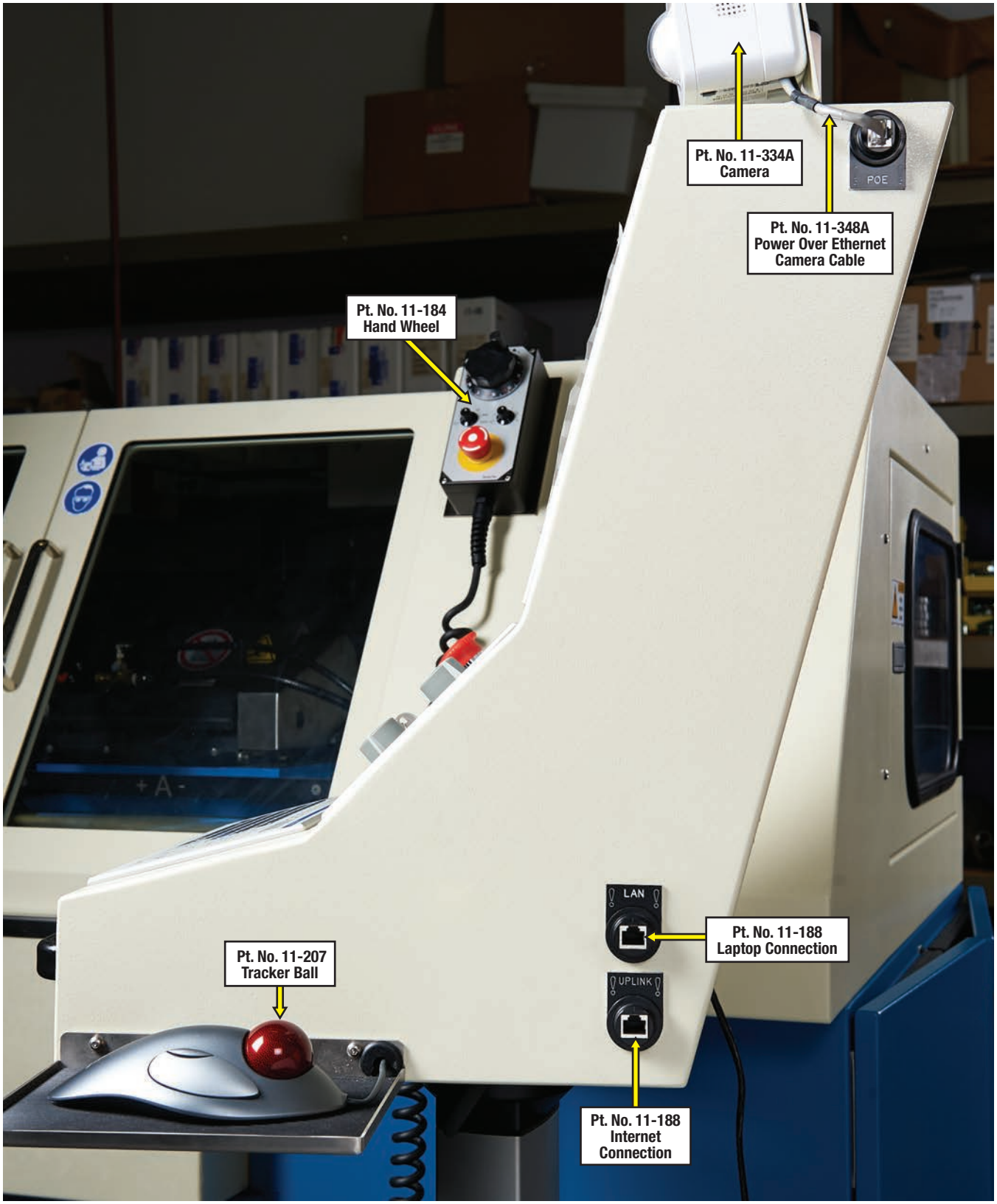
CONTROL CABINET – RIGHT SIDE



PEDESTAL COMPONENTS



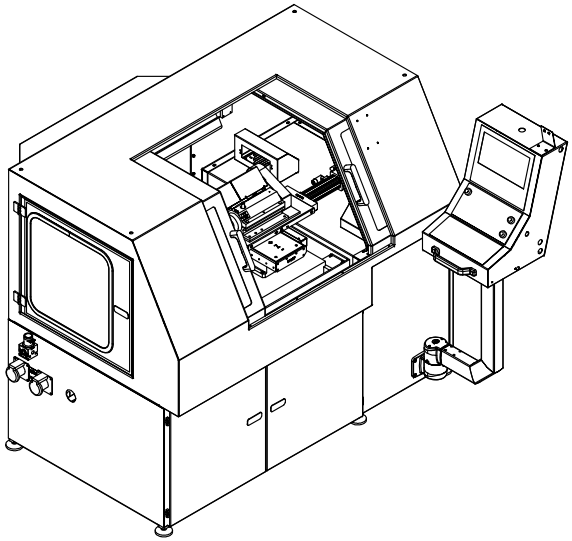
PENDANT SIDE LABELS



HAND WHEEL

01

PRIDE ENGINEERING



PRIDE ENGINEERING

9401 73rd Avenue North
Suite 200
Minneapolis, MN 55428
USA

CE

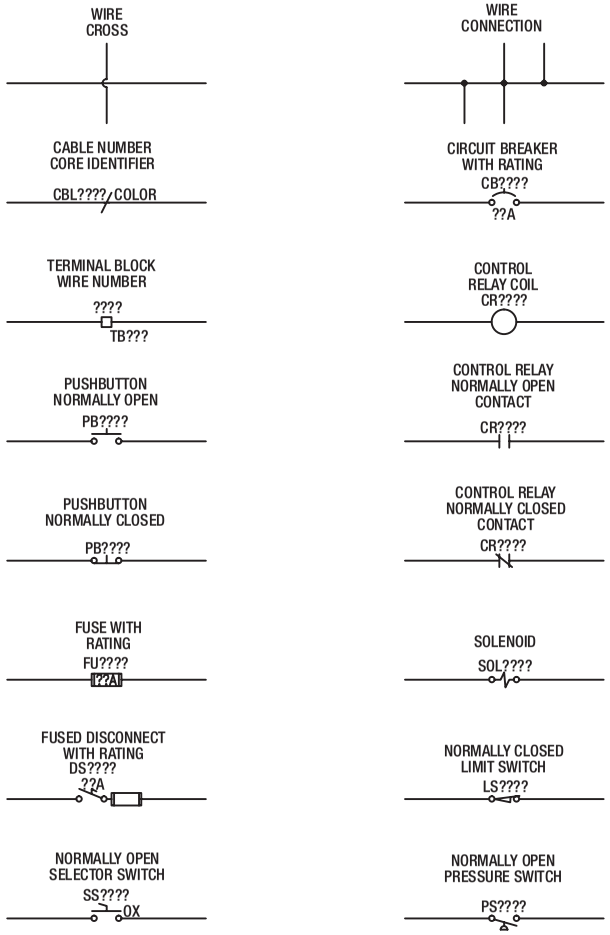
Serial No.		Mfg. Date	
Volts	480	Phase	3
F.L.A.	55.2	Freq.	50/60
MAX. DISC. AMPS			60
LARGEST LOAD AMPS			7.3
SCCR			5 kA
Model	MODEL 30A		
Type	AIR BEARING PRECISION GRINDER		
DRAWING #	100-30A-SCH		

PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	COVER PAGE	
CHECKED BY: SCP	REVISION: A	SHEET: 1 OF 43	FILENAME:	SCM01.DWG	DWG NO: 01

Drawing#	Description
1	Title Page
2-9	Schematic Descriptions
10	Power Distribution 480VAC
20	Power Distribution 120VAC
30	Power Distribution 24VDC
40	Machine Control
55	Communication/Networking
60	PLC I/O
70	Safety Circuit
80	Servo Control
100-101	Main Panel
102	Secondary Panel
103-104	HMI Layout
105	Junction Box TB700
106	Panel Dimensions
107	Terminal Block Layout

LOCATION	**DESCRIPTION**
(ME)	MAIN CLOSURE
(MP1)	MAIN ENCLOSURE INNER PANEL
(SP1)	MAIN ENCLOSURE INNER SUB PANEL
(PEN)	PENDANT/OPERATOR INTERFACE
(JB1)	JUNCTION BOX TB700
(F)	FIELD

LEGEND DESCRIPTIONS
NUMBERING CODE
XX???? = COMPONENT TYPE
??XX?? = SHEET
????XX = COLUMN



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	SCHEMATIC SHEET DESCRIPTIONS	
CHECKED BY: SCP	REVISION: A	SHEET: 2 OF 43	FILENAME:	SCM06.DWG	DWG NO: 06

Wire Reference	Color
BLK	BLACK
WHT	WHITE
BLU	BLUE
RED	RED
GRN	GREEN
ORG	ORANGE
BRN	BROWN
YLW	YELLOW

Wire Reference	Color
RED_GRY	RED w/ GREY STRIPE
GRY_RED	GRAY w/RED STRIPE
WHT_BRN	WHT w/BROWN STRIPE
BRN_WHT	BROWN w/WHITE STRIPE
WHT_GRY	WHITE w/GREY STRIPE
GRY_WHT	GRY w/WHITE STRIPE
RED_BLU	RED w/BLUE STRIPE
BLU/RED	BLUE w/RED STRIPE
RED/ORG	RED w/ORANGE STRIPE
ORG/RED	ORANGE w/RED STRIPE
RED/GRN	RED w/GREEN STRIPE
GRN_RED	GREEN w/RED STRIPE
BRN_RED	BROWN w/RED STRIPE
RED_BRN	RED w/BROWN STRIPE
WHT_GRN	WHITE w/GREEN STRIPE
GRN_WHT	GREEN w/WHITE STRIPE
WHT_BLU	WHITE w/BLUE STRIPE
BLU_WHT	BLUE w/WHITE STRIPE
WHT_ORG	WHITE w/ORANGE STRIPE
ORG/WHT	ORANGE w/WHITE STRIPE

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-8250

MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER		
PROJECT REF:	100-30A-SCH		
DESCRIPTION:			
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	
CHECKED BY: SCP	REVISION: A	SHEET: 3 OF 43	
FILENAME: SCM07.DWG		DWG NO: 07	

FUSE REPLACEMENT CHART

ITEM	TAGS	VOLTAGE	AMPERAGE	DESCRIPTION / AMP RATINGS	SC I/R	TYPE
1	FU1001	600	60	60AMP JTD SERIES FUSE JTD60ID	20kA	J
2	FU1014	600	7.5	7.5 AMP CLASS CC KLDR SERIES KLDR075	200kA	CC
3	FU2012	600	15	15 AMP CLASS CC KLDR SERIES KLDR015	200kA	CC

American Wire Guage (AWG)	Diameter (Inches)	Cross Sectional Area (mm^2)	Ampacitiy (75°C Copper)
6	0.162	13.29	65
8	0.1285	8.36	50
10	0.1019	5.26	30
12	0.0808	3.31	20
14	0.0641	2.08	15
16	0.0508	1.31	10
18	0.0403	0.82	7
20	0.032	0.52	5
22	0.0254	0.33	3

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A
CHECKED BY: SCP	REVISION: A	SHEET: 4 OF 43

MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION: WIRE/CABLE CROSS REFERENCE
FILENAME: SCM08.DWG
DWG NO: 08

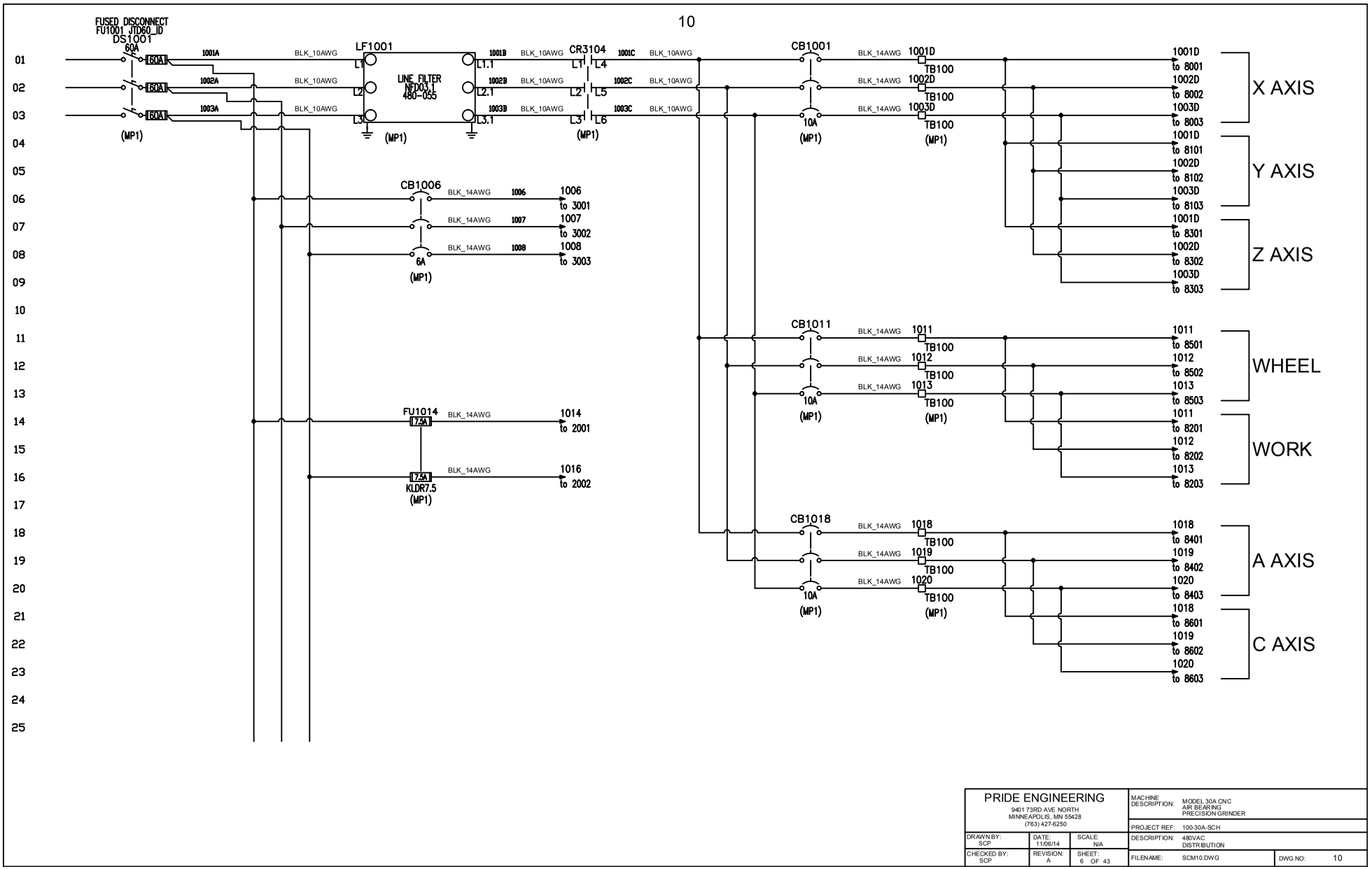
CABLE NUMBER	CABLE TYPE	PART NUMBER
CBL2109	14G3C	11-329A
CBL2109A	FACTORY CABLE	
CBL2114	14G3C	11-329A
CBL2116	14G3C	11-329A
CBL2118	18G3C	11-330A
CBL2118A	18G3C	11-330A
CBL2211	14G3C	11-329A
CBL2211A	14G3C	11-329A
CBL2215	14G3C	11-329A
CBL2215A	14G3C	11-329A
CBL3017	18G25C	11-331A
CBL3023	18G3C	11-330A
CBL3023A	FACTORY CABLE	
CBL3142	18GC3	11-330A
CBL3142A	FACTORY CABLE	
CBL4114	SERCOS	11-260A
CBL4117	SERCOS	11-260A
CBL4132	M12 MOLDED	11-298A
CBL4219	FACTORY CABLE	
CBL5516	ETHERNET	11-346A
CBL5518	ETHERNET	11-348A
CBL5520	ETHERNET	11-254A
CBL5522	ETHERNET	11-346A
CBL5608	ETHERNET	11-349A
CBL5608A	ETHERNET	11-348A
CBL5616	ETHERNET	11-346A
CBL6037	SERCOS	11-259A
CBL6043	FACTORY CABLE	
CBL6044	FACTORY CABLE	12-145A
CBL6047	18G3C	11-330A
CBL6048	18G3C	11-330A
CBL6104	FACTORY CABLE	12-141A
CBL6105	FACTORY CABLE	11-187
CBL6118	FACTORY CABLE	11-345A
CBL6119	FACTORY CABLE	11-345A
CBL6206	FACTORY CABLE	11-187

CABLE NUMBER	CABLE TYPE	PART NUMBER
CBL6207	FACTORY CABLE	11-187
CBL6229	FACTORY CABLE	200-99-01-01
CBL6235	FACTORY CABLE	200-99-01-01
CBL7032	SERCOS	11-263A
CBL7201	18G8C	11-332A
CBL7215	18G8C	11-332A
CBL7301	18G8C	11-332A
CBL7315	18G8C	11-332A
CBL8006	ENDAT FEEDBACK	17-155A
CBL8007	FEEDBACK Cs	17-143
CBL8009	ENDAT FEEDBACK	13-113
CBL8017	POWER Cs	17-156A
CBL8038	SERCOS	11-255A
CBL8106	ENDAT FEEDBACK	17-155A
CBL8107	FEEDBACK Cs	17-131
CBL8109	ENDAT FEEDBACK	13-113
CBL8117	POWER Cs	17-154A
CBL8138	SERCOS	11-255A
CBL8207	FEEDBACK Cs	17-141
CBL8217	POWER Cs	17-157A
CBL8238	SERCOS	11-255A
CBL8306	ENDAT FEEDBACK	17-155A
CBL8307	FEEDBACK Cs	17-139
CBL8309	ENDAT FEEDBACK	13-114
CBL8317	POWER Cs	17-153A
CBL8338	SERCOS	11-255A
CBL8407	FEEDBACK Cs	17-139
CBL8417	POWER Cs	17-153A
CBL8438	SERCOS	11-255A
CBL8507	FEEDBACK Cs	17-139
CBL8517	POWER Cs	17-153A
CBL8538	SERCOS	11-255A
CBL8607	ENDAT FEEDBACK	17-158A
CBL8614	FACTORY CABLE	
CBL8617	FACTORY CABLE	

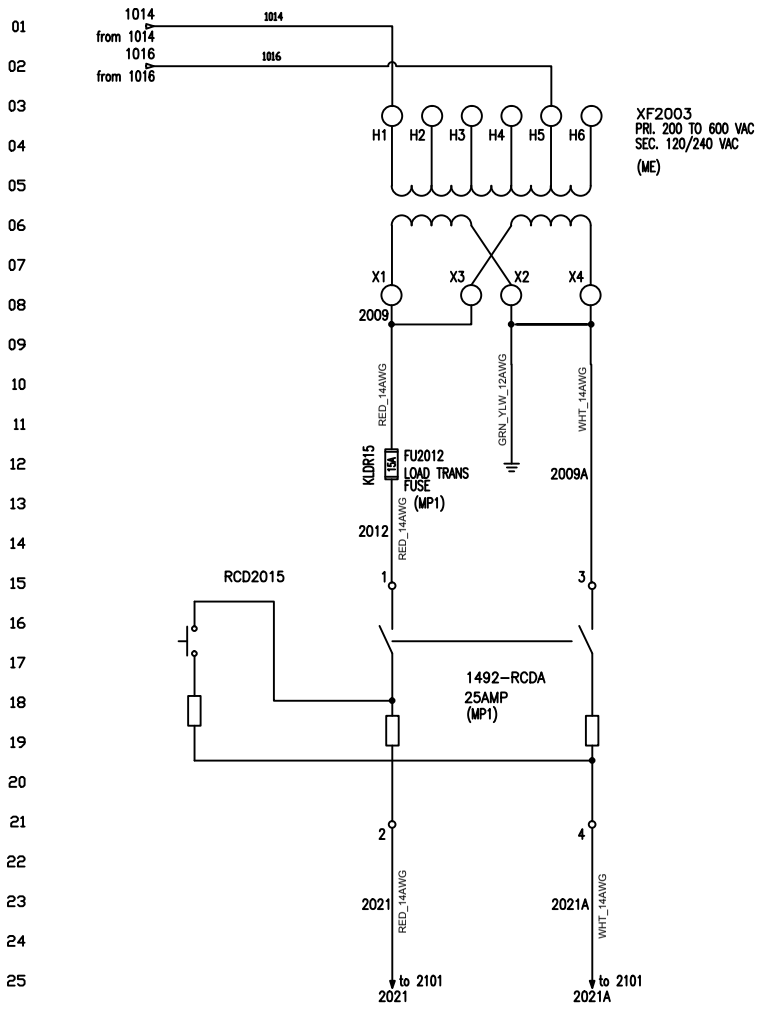
PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

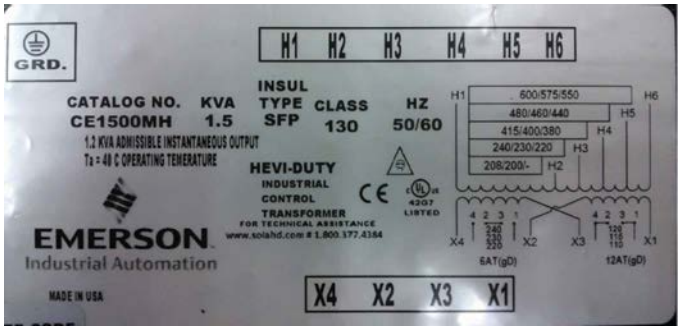
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A
CHECKED BY: SCP	REVISION: A	SHEET: 5 OF 43

MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION: CABLE CROSS REFERENCE
FILENAME: SCM09.DWG
DWG NO: 9

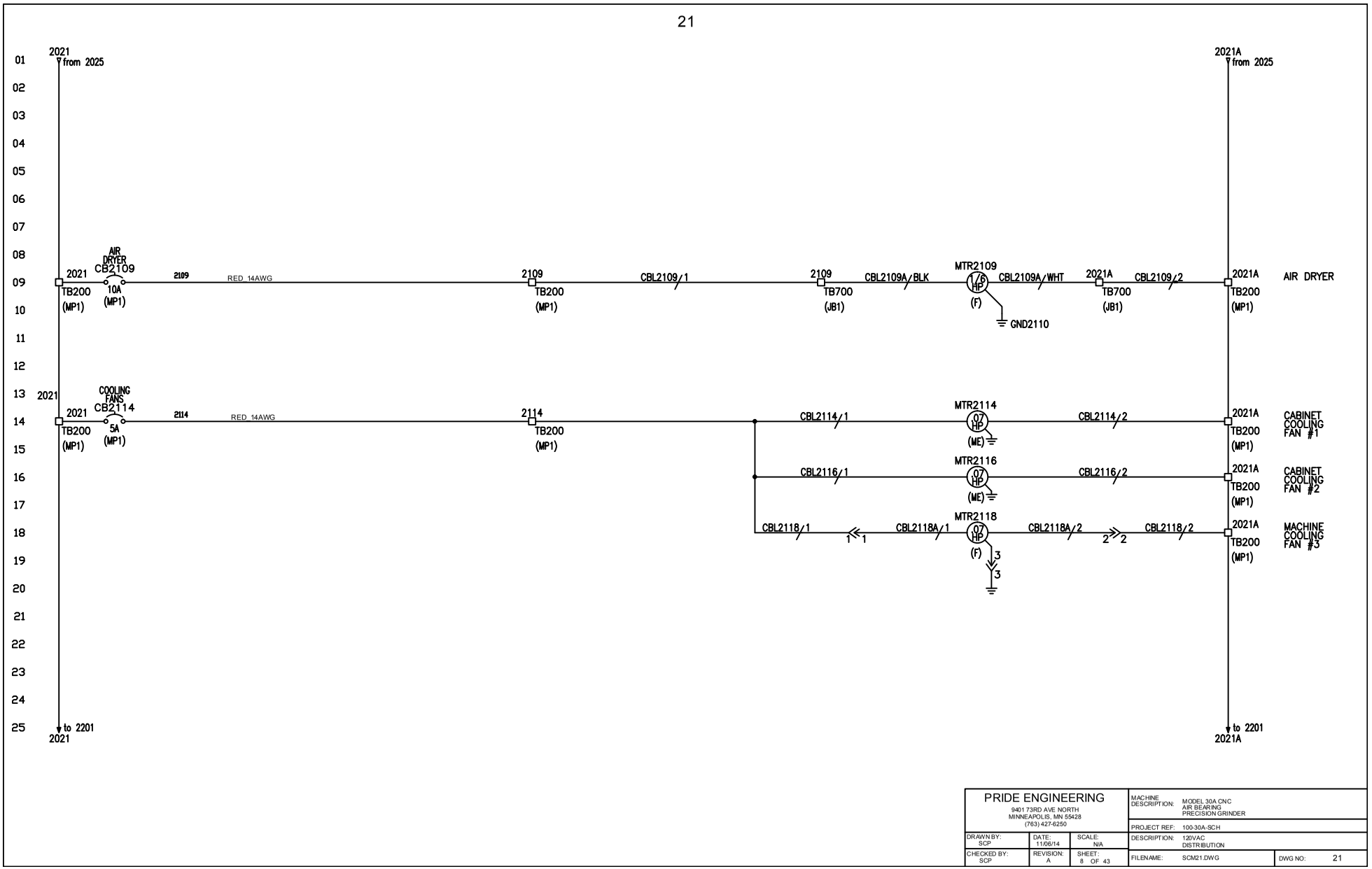


PRIDE ENGINEERING	MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250	PROJECT REF: 100-30A-SCH
DRAWN BY: SCP / DATE: 11/06/14 / SCALE: N/A	DESCRIPTION: 480VAC DISTRIBUTION
CHECKED BY: SCP / REVISION: A / SHEET: 6 OF 43	FILENAME: SCM10.DWG / DWG NO: 10

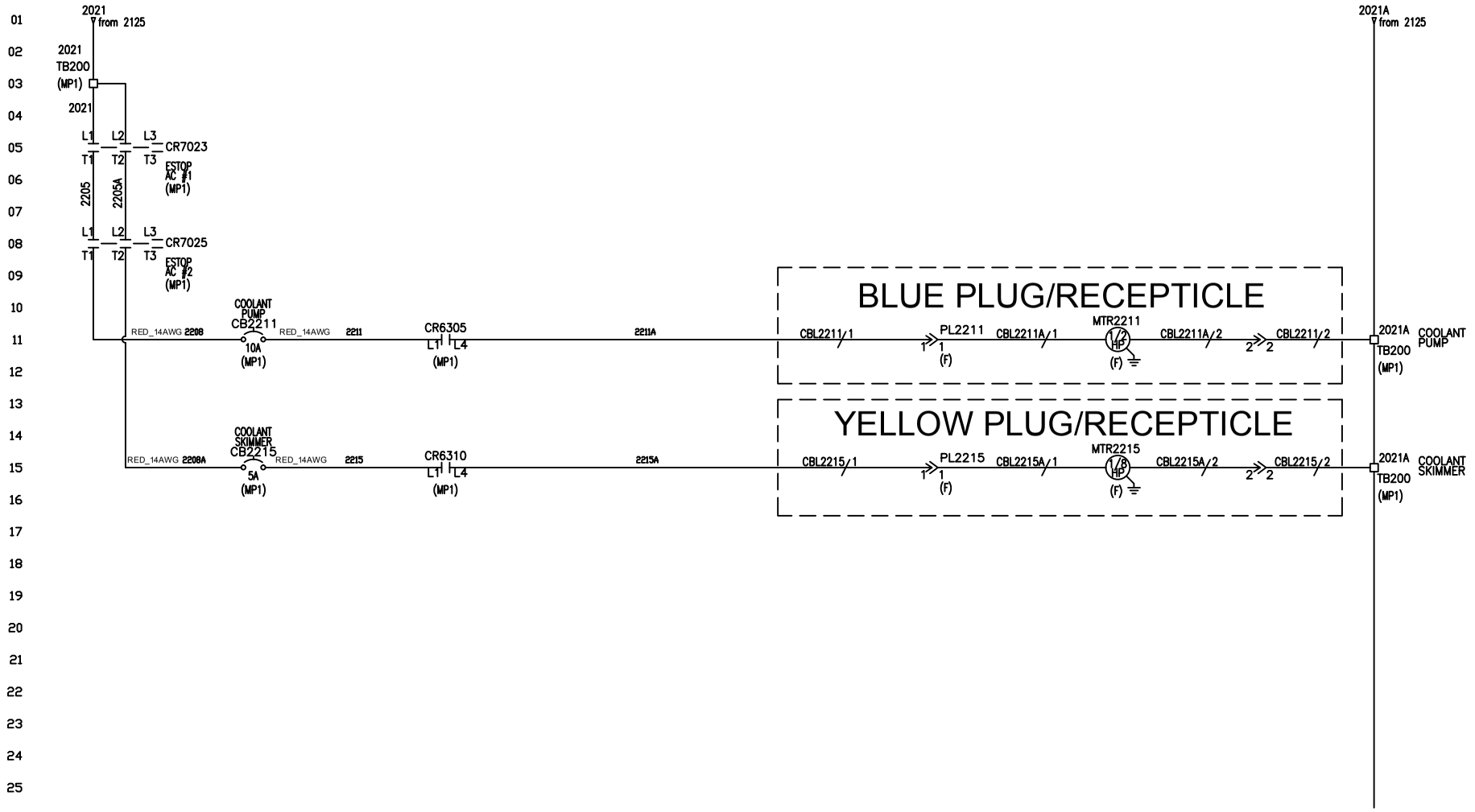




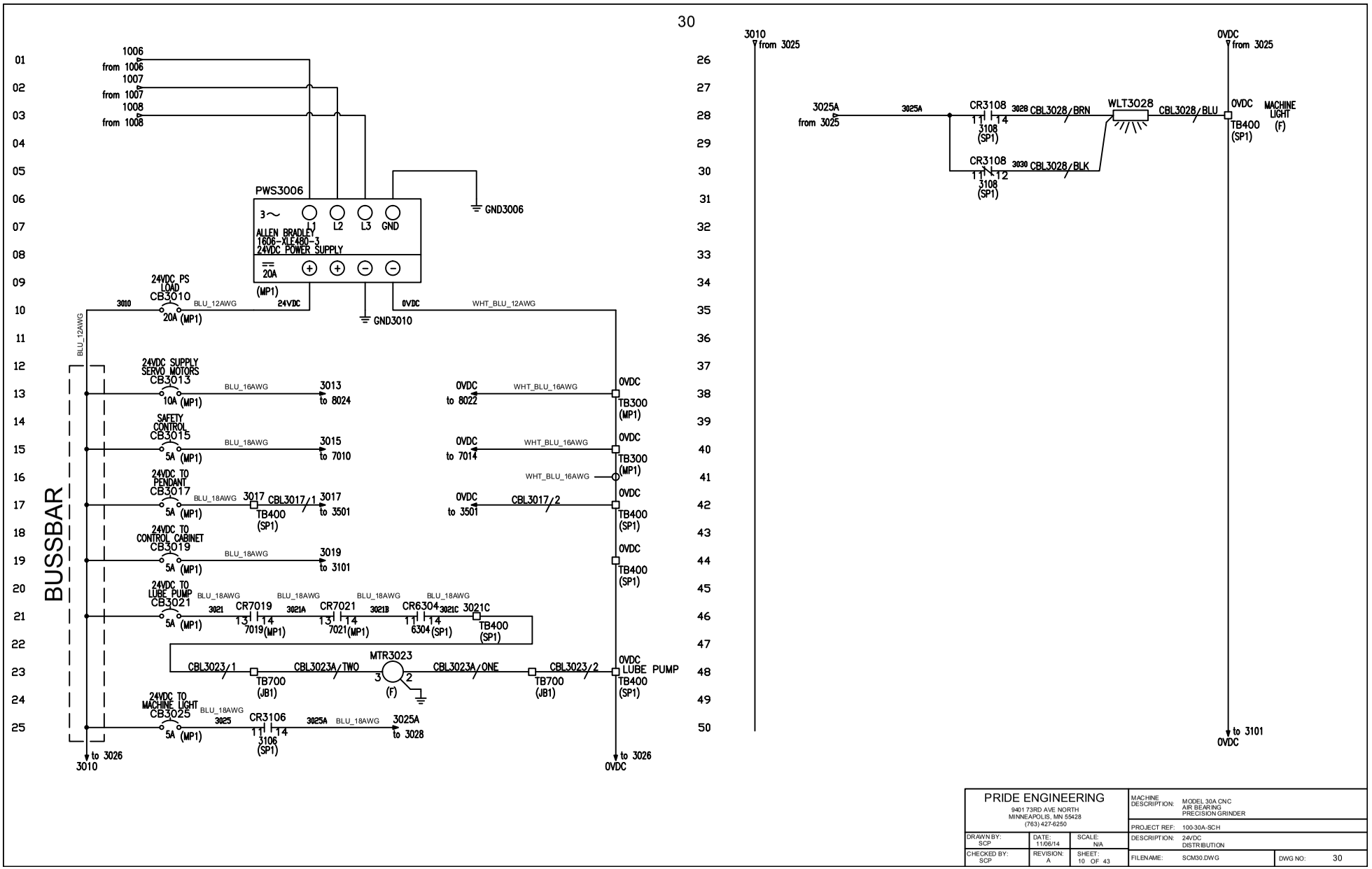
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: 120VAC DISTRIBUTION
CHECKED BY: SCP	REVISION: A	SHEET: 7 OF 43	FILENAME: SCM20.DWG — DWG NO: 20



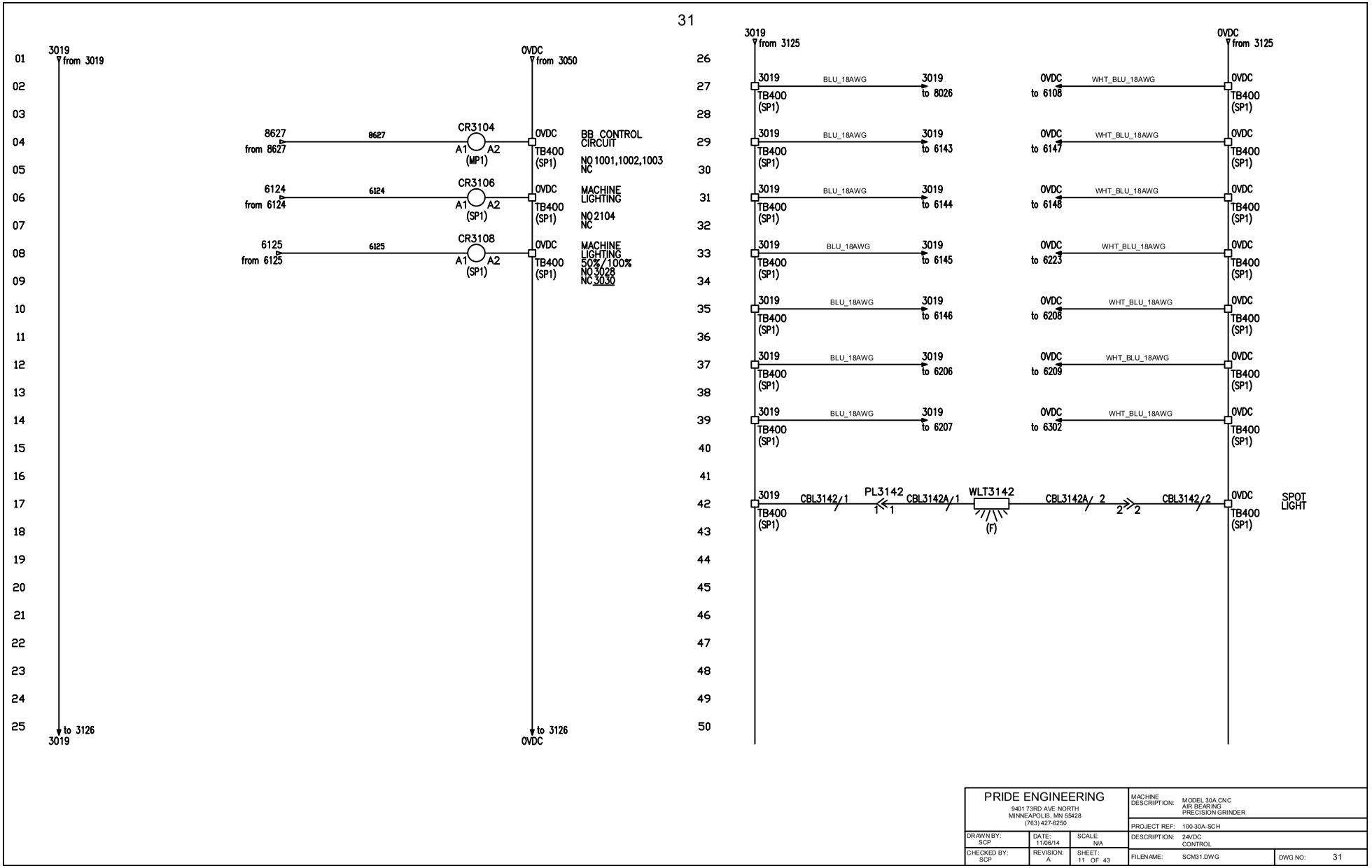
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: 120VAC DISTRIBUTION
CHECKED BY: SCP	REVISION: A	SHEET: 8 OF 43	FILENAME: SCM21.DWG — DWG NO: 21



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	120VAC DISTRIBUTION	
CHECKED BY: SCP	REVISION: A	SHEET: 9 OF 43	FILENAME:	SCM22.DWG	DWG NO: 22

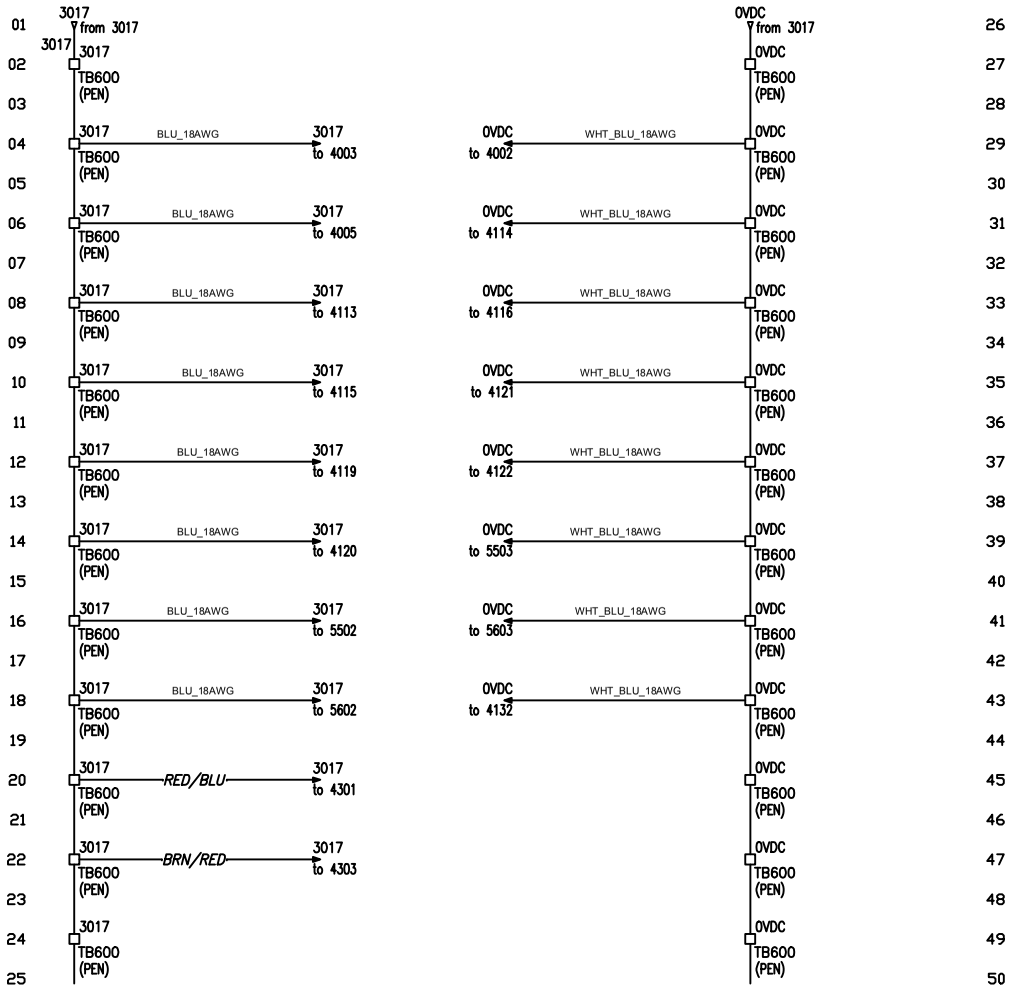


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	24VDC DISTRIBUTION	
CHECKED BY: SCP	REVISION: A	SHEET: 10 OF 43	FILENAME:	SCM30.DWG	DWG NO: 30

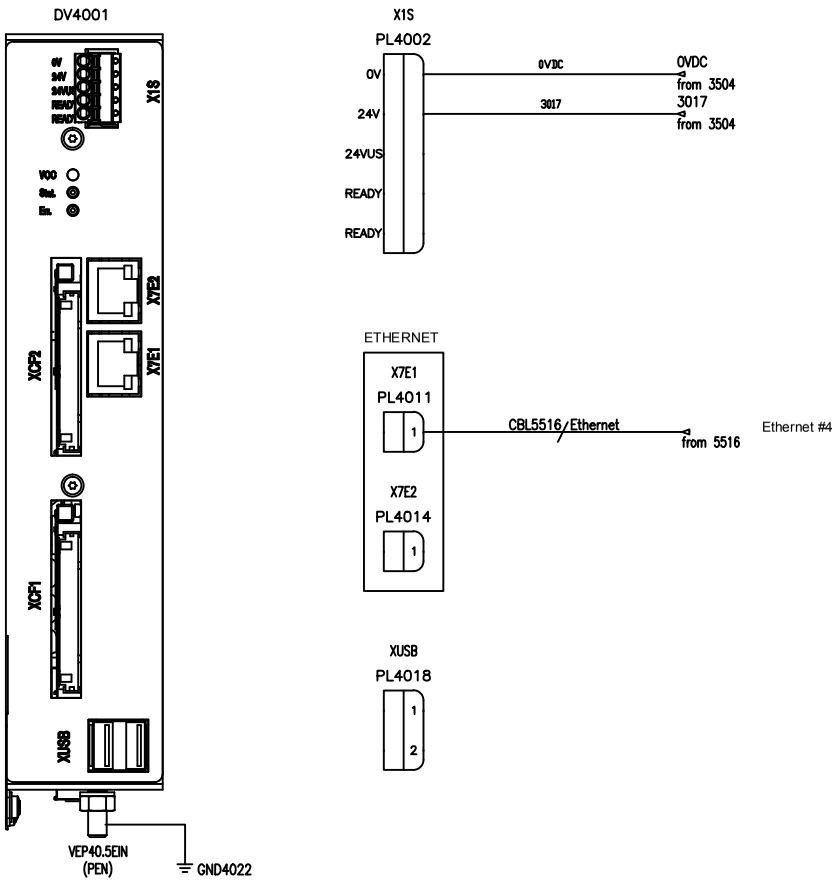


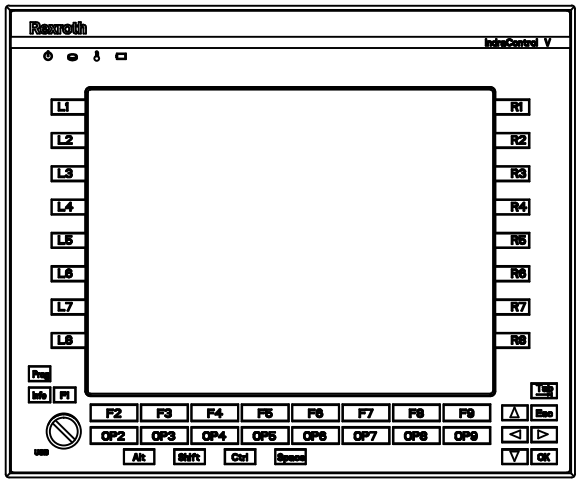
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	24VDC CONTROL	
CHECKED BY: SCP	REVISION: A	SHEET: 11 OF 43	FILENAME:	SCM31.DWG	DWG NO: 31

35



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250	MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
	PROJECT REF: 100-30A-SCH
DRAWN BY: SCP / DATE: 11/06/14 / SCALE: N/A	DESCRIPTION: 24 CONTROL PENDANT
CHECKED BY: SCP / REVISION: A / SHEET: 12 OF 43	FILENAME: SCM35.DWG / DWG NO: 35



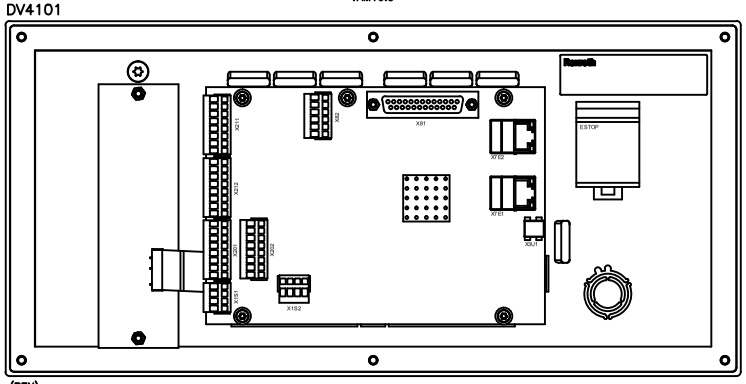


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	VEP INTERFACE	
CHECKED BY: SCP	REVISION: A	SHEET: 13 OF 43	FILENAME:	SCM40.DWG	DWG NO: 40

41

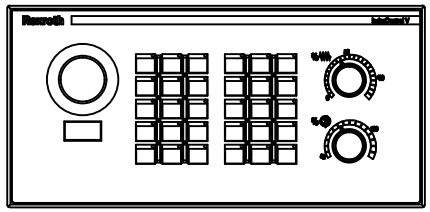
VAM10.3

DV4101



(PEN)

Designation	Connection Type
X1S1	DC 24V Power Supply
X1S2	DC 24V for Front Elements
X2O1	Dig. Output Terminal Q0-Q7
X2O2	Dig. Output Terminal Q8-Q15
X2I1	Dig. Input Terminal I0-I7
X2I2	Dig. Input Terminal I8-I15
X8I	External Hand-held Terminal
X8I	Internal Handwheel
X7E1	Sercos III/Profinet Interface
X7E2	Sercos III/Profinet Interface
ESTOP	Emergency Stop button



X1S1
PL4113

1	3017	3017 from 3508
2	0VDC	0VDC from 3506
3	3017	3017 from 3510
4	0VDC	0VDC from 3508

X1S2
PL4119

1	3017	3017 from 3512
2	3017	3017 from 3514
3	0VDC	0VDC from 3510
4	0VDC	0VDC from 3512

SERCOS

X7E1
PL4114
1 — CBL4114/SERCOS III → to 8638 — C Axis

X7E2
PL4117
1 — CBL4117/SERCOS III → to 6034 — L45

X201
OUT 0-7
PL4132

1	4132	CBL4132/BRN	LIGHT TOWER LT4132 (R)	CBL4132/BLU → 0VDC from 3518
2	4133	CBL4132/WHT	(A)	
3	4134	CBL4132/BLK	(G)	
4				
5				
6				
7				
8				

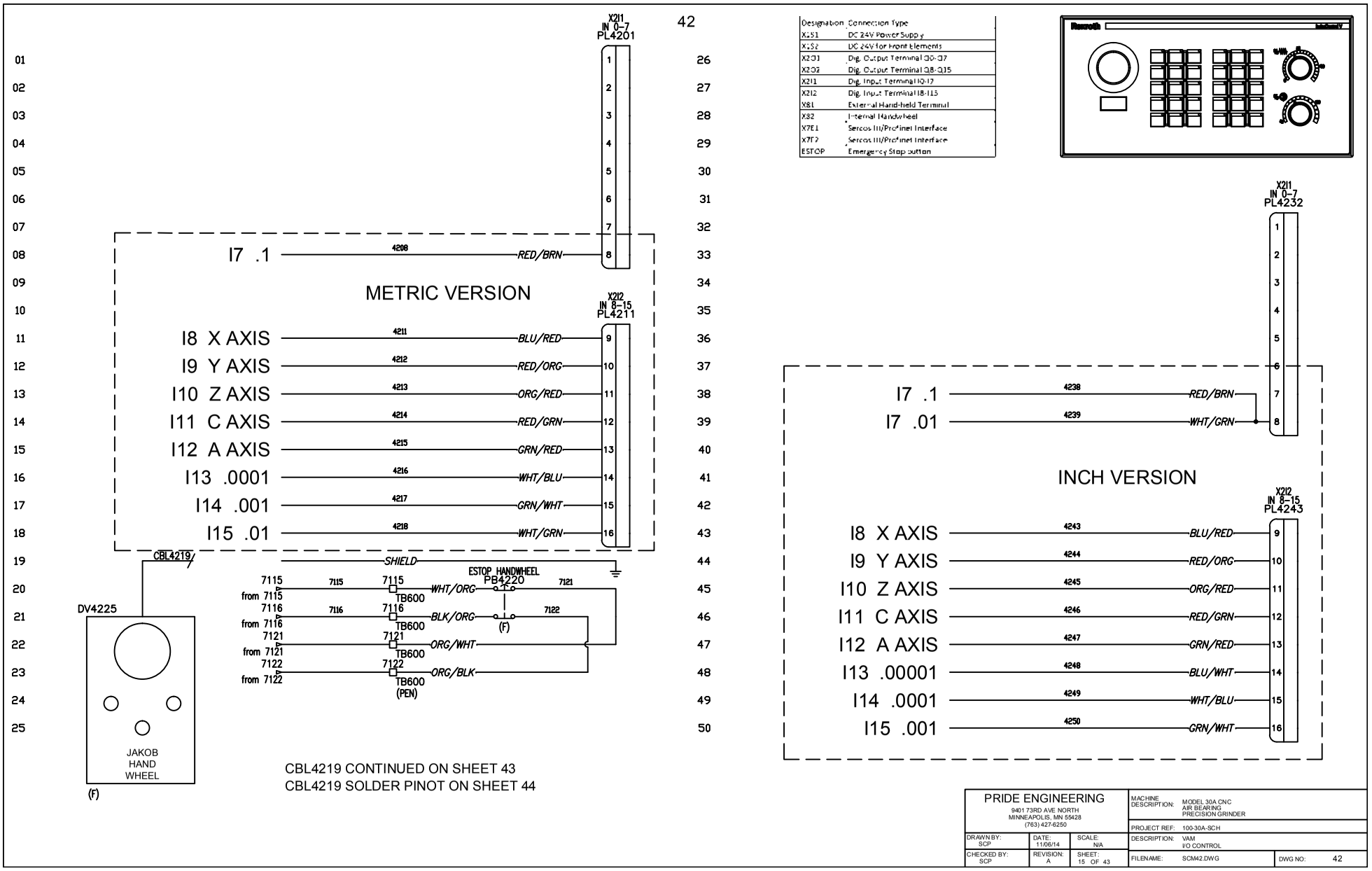
(PEN)

X202
OUT 8-15
PL4143

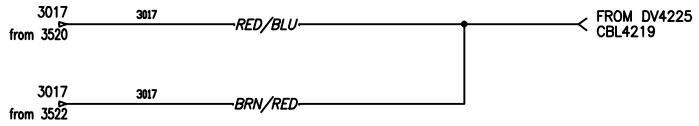
9	
10	
11	
12	
13	
14	
15	
16	

NOTE: VAM10.3 CONT. ON SHEET 42 AND 43

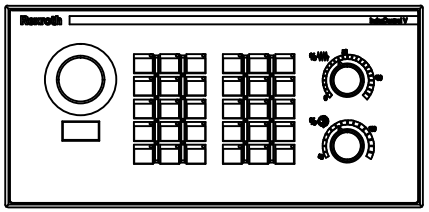
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: VAM
CHECKED BY: SCP	REVISION: A	SHEET: 14 OF 43	FILENAME: SCM41.DWG — DWG NO: 41

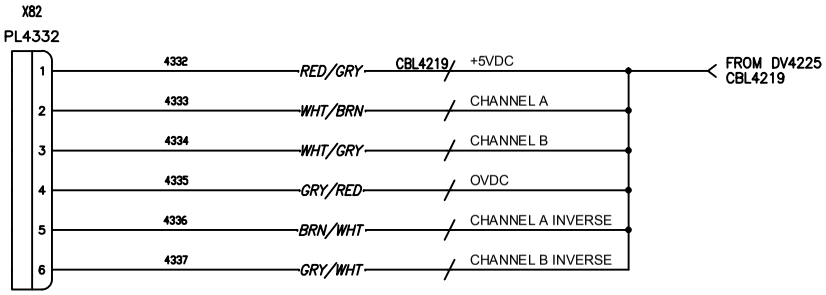

42
X2I1
IN 0–7
PL4201
X2I2
IN 8–15
PL4211
I7 .1
4208
RED/BRN
METRIC VERSION
I8 X AXIS
4211
BLU/RED
I9 Y AXIS
4212
RED/ORG
I10 Z AXIS
4213
ORG/RED
I11 C AXIS
4214
RED/GRN
I12 A AXIS
4215
GRN/RED
I13 .0001
4216
WHT/BLU
I14 .001
4217
GRN/WHT
I15 .01
4218
WHT/GRN
CBL4219
SHIELD
ESTOP HANDWHEEL
PB4220
DV4225
7115
from 7115
TB600
WHT/ORG
7121
7116
from 7116
BLK/ORG
7122
(F)
from 7121
ORG/WHT
from 7122
ORG/BLK
(PEN)
JAKOB
HAND
WHEEL
(F)
CBL4219 CONTINUED ON SHEET 43
CBL4219 SOLDER PINOT ON SHEET 44
Designation
Connection Type
X1S1
DC 24V Power Supply
X1S2
DC 24V for Front Elements
X2O1
Dig. Output Terminal Q0-Q7
X2O2
Dig. Output Terminal Q8-Q15
X2I1
Dig. Input Terminal I0-I7
X2I2
Dig. Input Terminal I8-I15
X81
External Hand-held Terminal
X82
Internal Handwheel
X7E1
Sercos III/Profinet Interface
X7E2
Sercos III/Profinet Interface
ESTOP
Emergency Stop button
Rexroth
X2I1
IN 0–7
PL4232
I7 .1
4238
RED/BRN
I7 .01
4239
WHT/GRN
INCH VERSION
X2I2
IN 8–15
PL4243
I8 X AXIS
4243
BLU/RED
I9 Y AXIS
4244
RED/ORG
I10 Z AXIS
4245
ORG/RED
I11 C AXIS
4246
RED/GRN
I12 A AXIS
4247
GRN/RED
I13 .00001
4248
BLU/WHT
I14 .0001
4249
WHT/BLU
I15 .001
4250
GRN/WHT
PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250
DRAWN BY: SCP
DATE: 11/06/14
SCALE: N/A
CHECKED BY: SCP
REVISION: A
SHEET: 15 OF 43
MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION: VAM I/O CONTROL
FILENAME: SCM42.DWG
DWG NO: 42

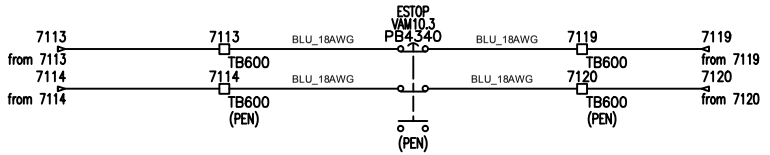
43

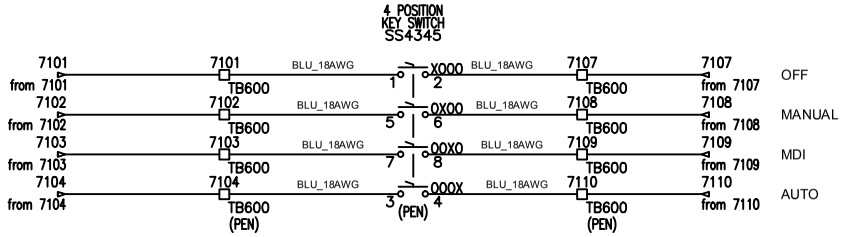


Designation	Connection Type
X1S1	DC 24V Power Supply
X1S2	DC 24V for Front Elements
X2O1	Dig. Output Terminal Q0-Q7
X2O2	Dig. Output Terminal Q8-Q15
X2I1	Dig. Input Terminal I0-I7
X2I2	Dig. Input Terminal I8-I15
X81	External Hand-held Terminal
X82	Internal Handwheel
X7E1	Sercos III/Profinet Interface
X7E2	Sercos III/Profinet Interface
ESTOP	Emergency Stop button

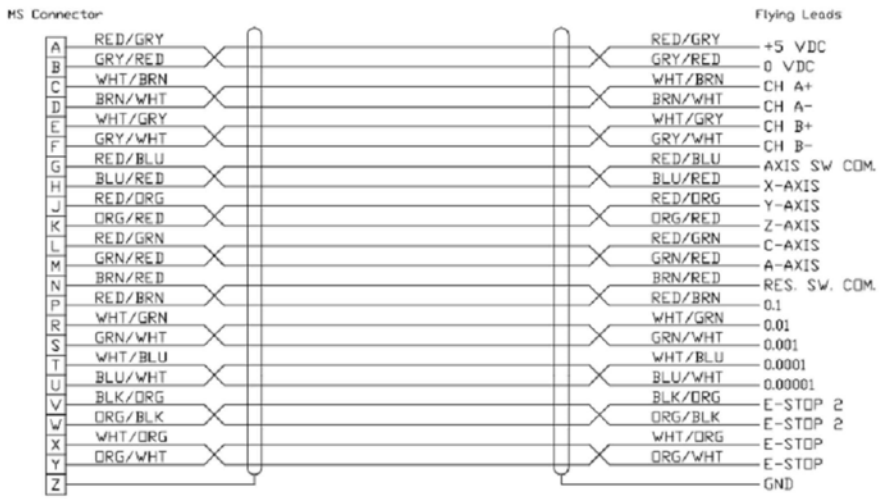


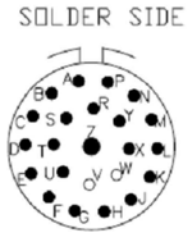






PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	VAM I/O CONTROL	
CHECKED BY: SCP	REVISION: A	SHEET: 16 OF 43	FILENAME:	SCM43.DWG	DWG NO: 43





CABLE BILL OF MATERIALS

ITEM#	QTY	PART NUMBER	DESCRIPTION
1	1	PT00E-16-23P	MS CONNECTOR (FLANGE MOUNT)
2	1	BELDEN 8112	SHIELDED CABLE, 12 TW. PAIR
3	1	LABEL	'AMPRO P/N 530032-B-003'
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

A	1	4/9/07	ORIGINAL ISSUE (P. WEBER)
	2	8/24/07	Add bulkhead solder-side (G.Andrews)
B	2	6/23/14	Additional E-Stop & change cable PN

USED ON BOM: 470006

MATING CABLE FOR USE WITH MODIFIED 5V GAM HANDWHEEL

JOB NUMBER | ACAD FILE NAME: 530032-B-003.DWG | SHEET 1 OF 1

AMPRO APPLIED MOTION PRODUCTS
APPLICATION ENGINEERING DIVISION
7840 COMPUTER AVE. BLOOMINGTON, MN 55435

B | AMPRO P/N: 530032-B-003

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

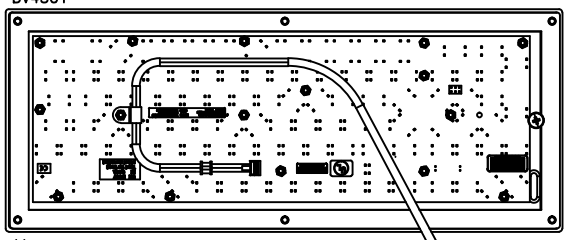
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A
CHECKED BY: SCP	REVISION: A	SHEET: 17 OF 43

MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION: CABLE PINOUT
FILENAME: SCM44.DWG
DWG NO: 44

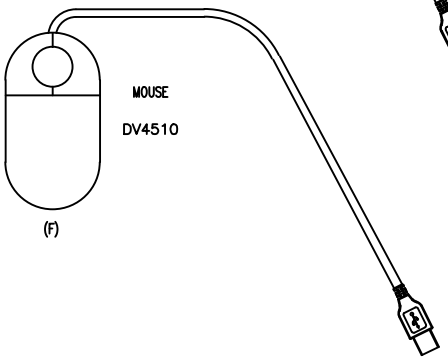
45

KEYBOARD
VAK11.2F

DV4501



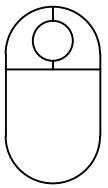
(F)

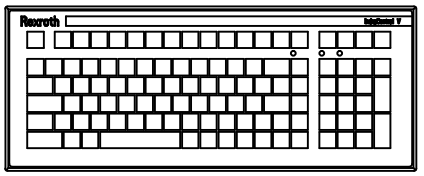


MOUSE

DV4510

(F)





01	26				
02	27				
03	28				
04	29				
05	30				
06	31				
07	32				
08	33				
09	34				
10	35				
11	36				
12	37				
13	38				
14	39				
15	40				
16	41				
17	42				
18	43				
19	44				
20	45				
21	46				
22	47				
23	48				
24	49				
25	50				

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A
CHECKED BY: SCP	REVISION: A	SHEET: 18 OF 43

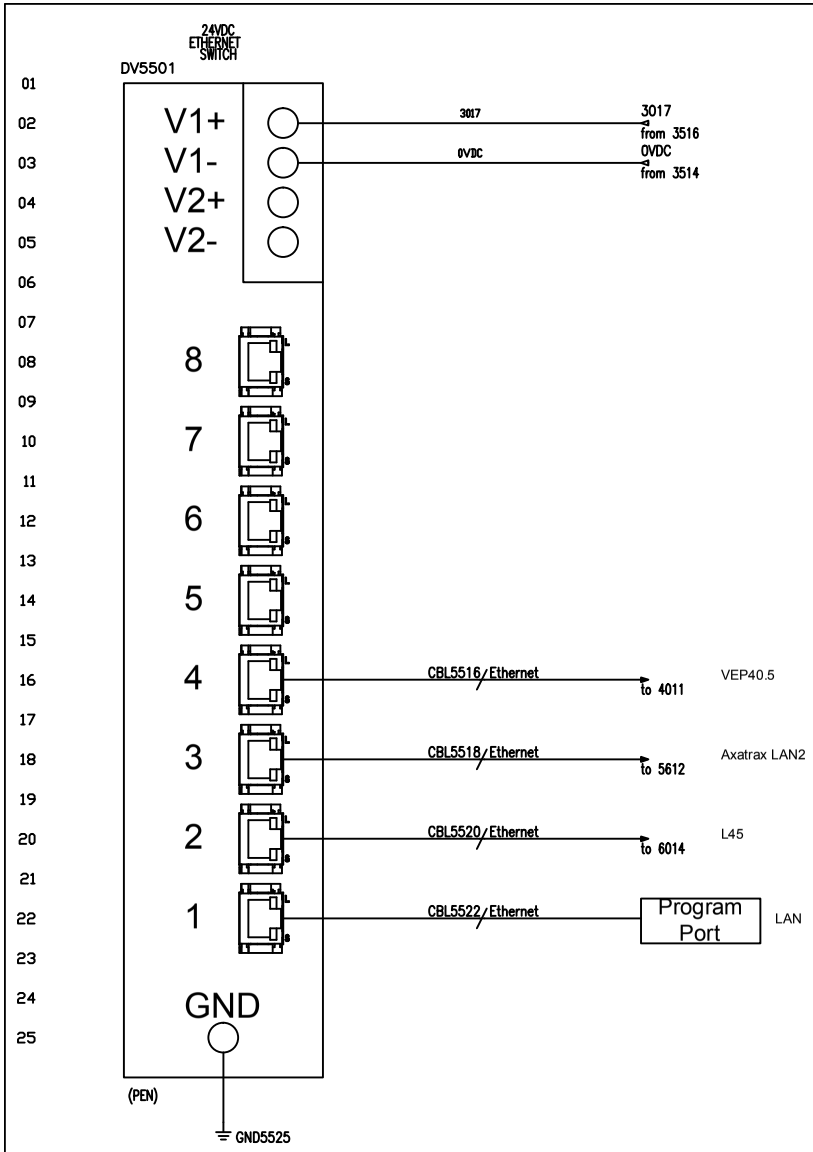
MACHINE DESCRIPTION: MODEL 30A CNC
AIR BEARING
PRECISION GRINDER

PROJECT REF: 100-30A-SCH

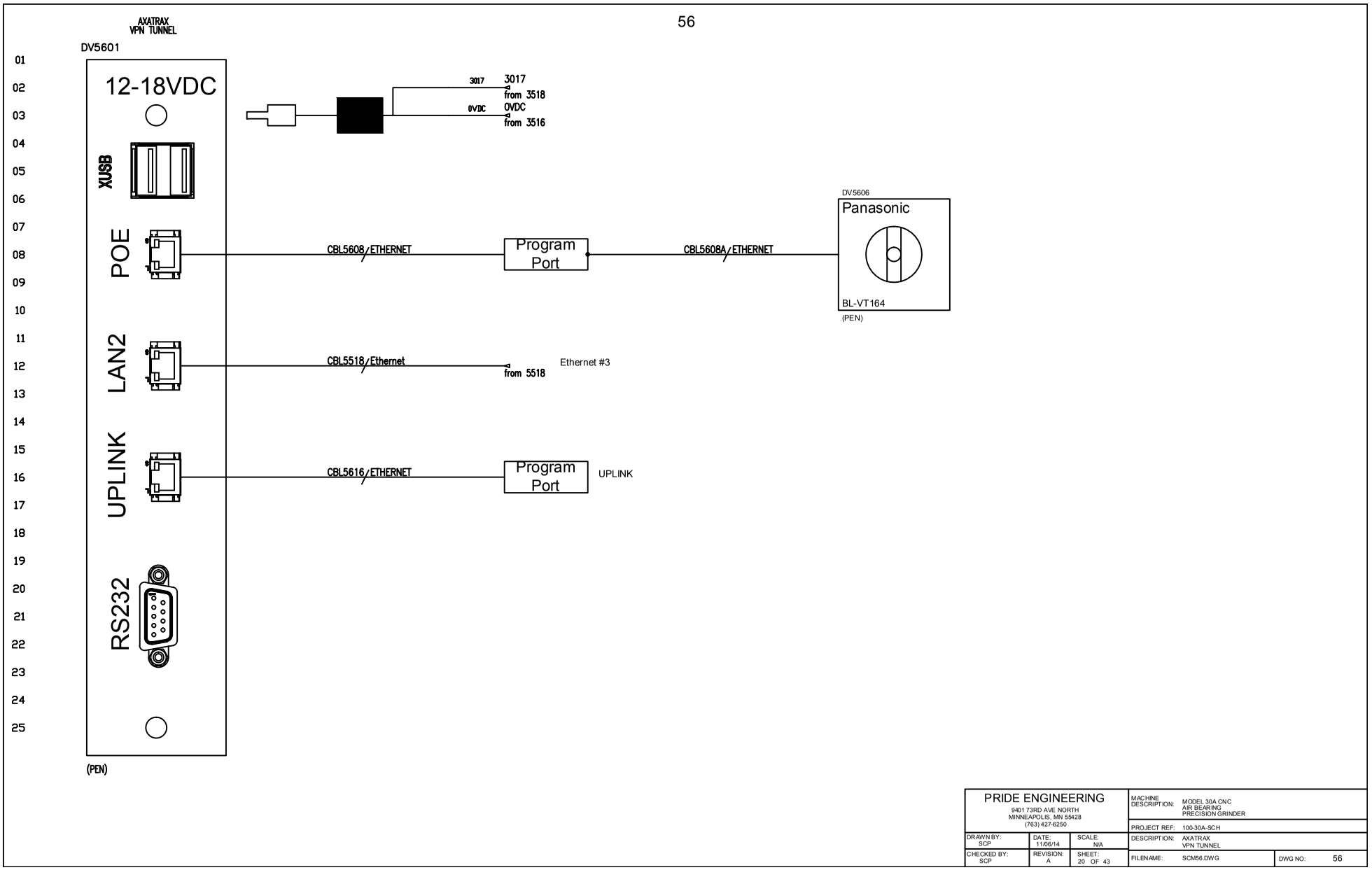
DESCRIPTION:

FILENAME: SCM45.DWG

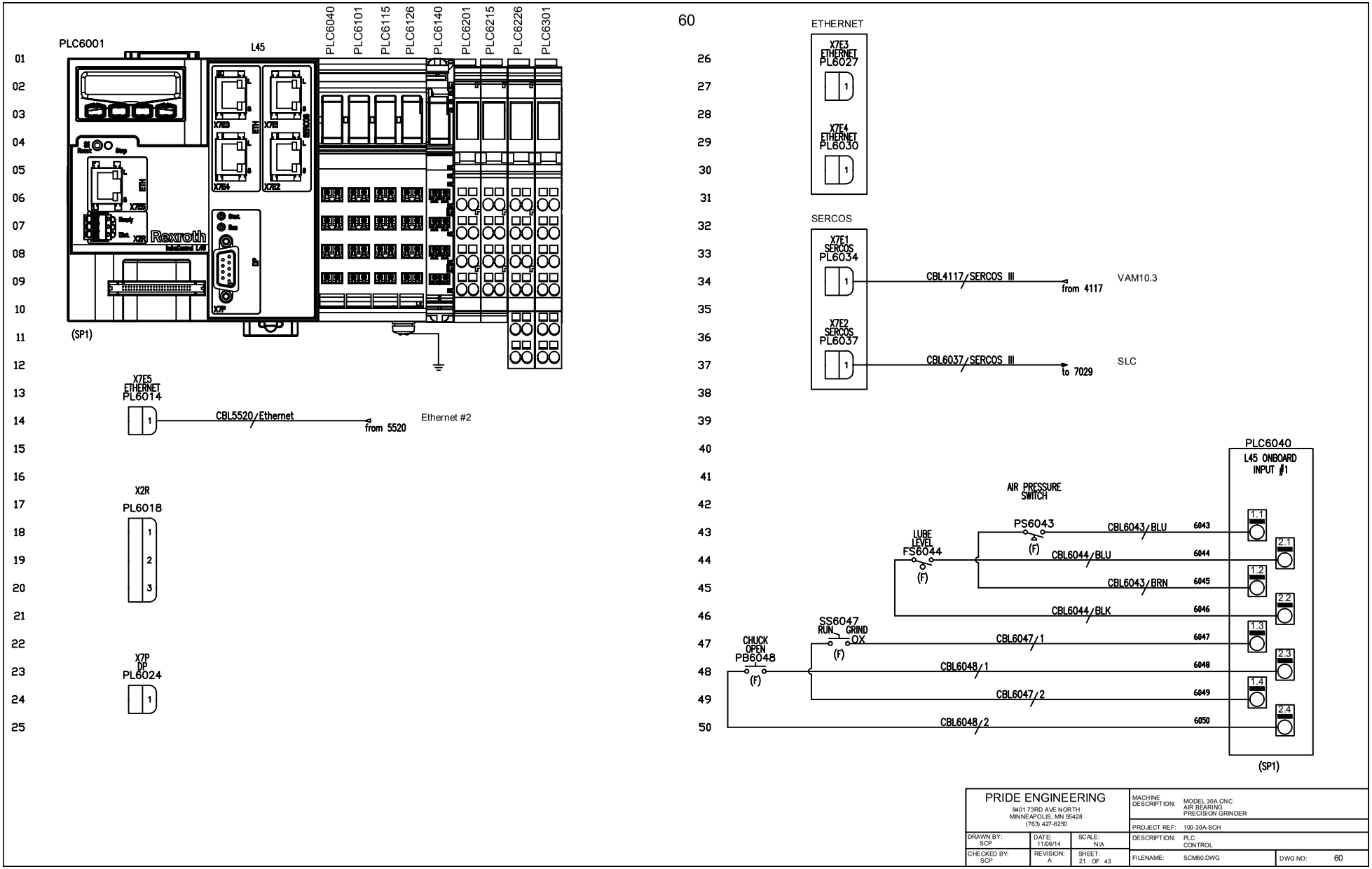
DWG NO: 45



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	ETHERNAT SWITCH	
CHECKED BY: SCP	REVISION: A	SHEET: 19 OF 43	FILENAME:	SCM55.DWG	DWG NO: 55

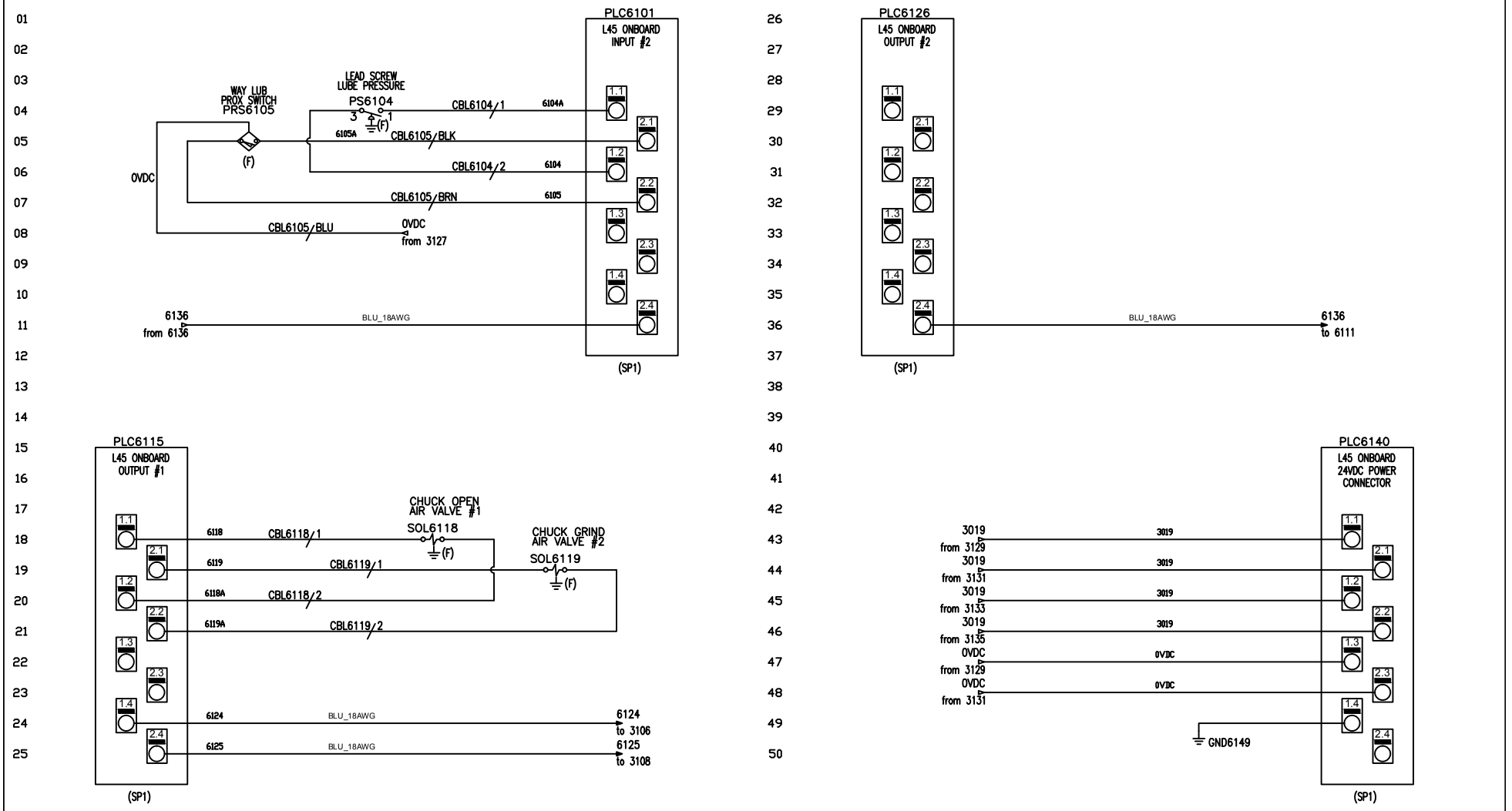


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: AXATRAX VPN TUNNEL
CHECKED BY: SCP	REVISION: A	SHEET: 20 OF 43	FILENAME: SCM56.DWG — DWG NO: 56

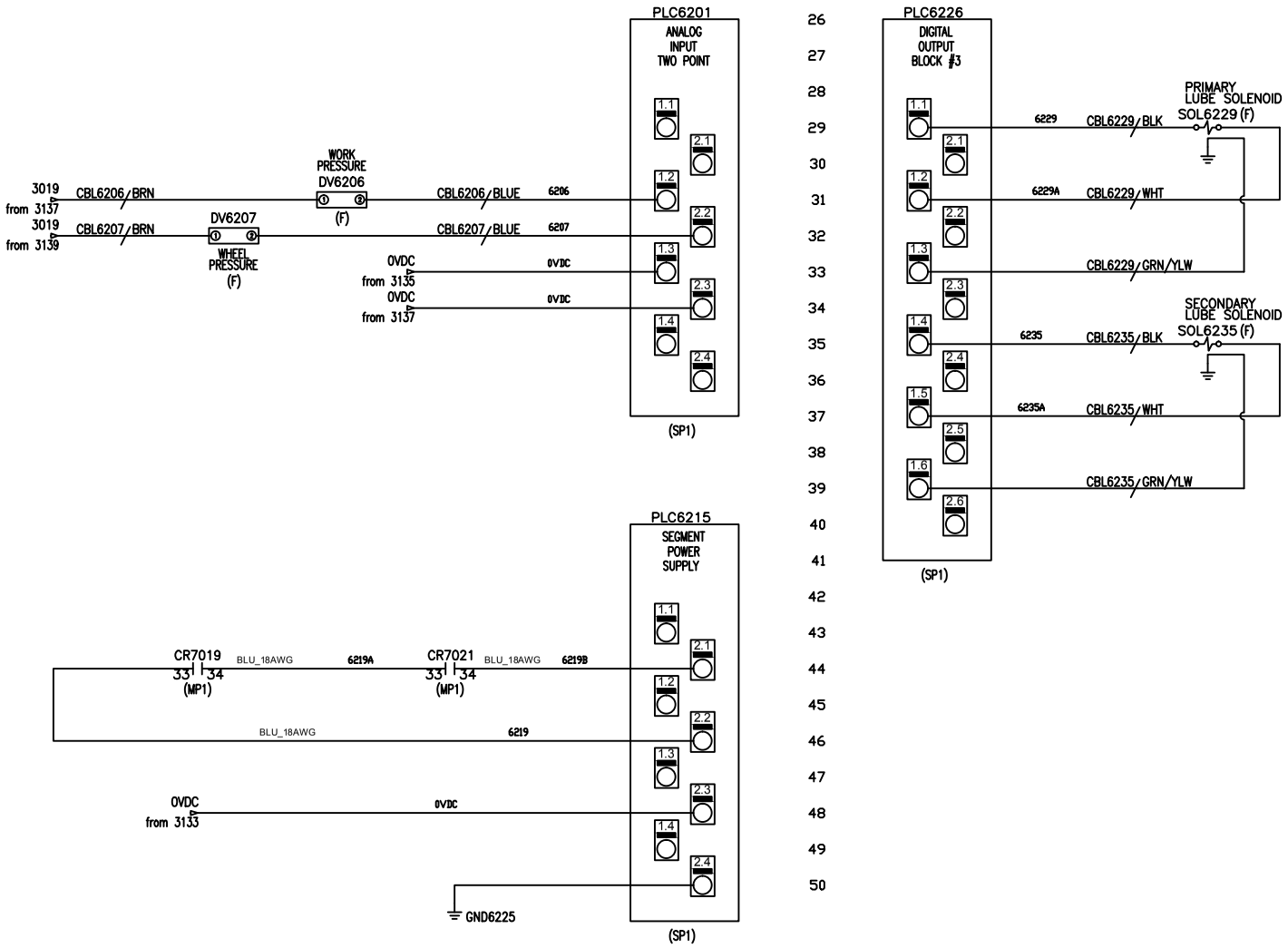


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250	MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER
	PROJECT REF:	100-30A-SCH
DRAWN BY: SCP / DATE: 11/06/14 / SCALE: N/A	DESCRIPTION:	PLC CONTROL
CHECKED BY: SCP / REVISION: A / SHEET: 21 OF 43	FILENAME: SCM60.DWG	DWG NO: 60

61

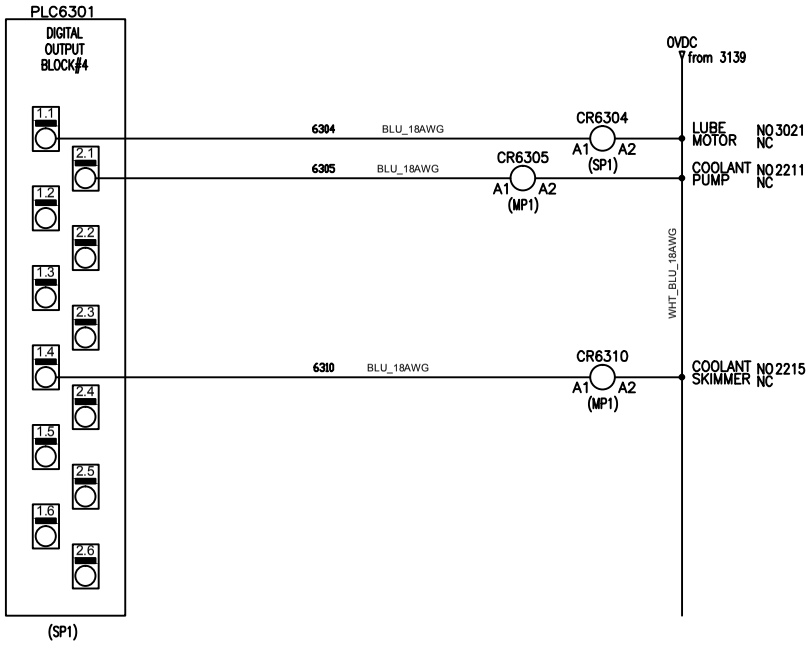


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	PLC CONTROL	
CHECKED BY: SCP	REVISION: A	SHEET: 22 OF 43	FILENAME:	SCM61.DWG	DWG NO: 61

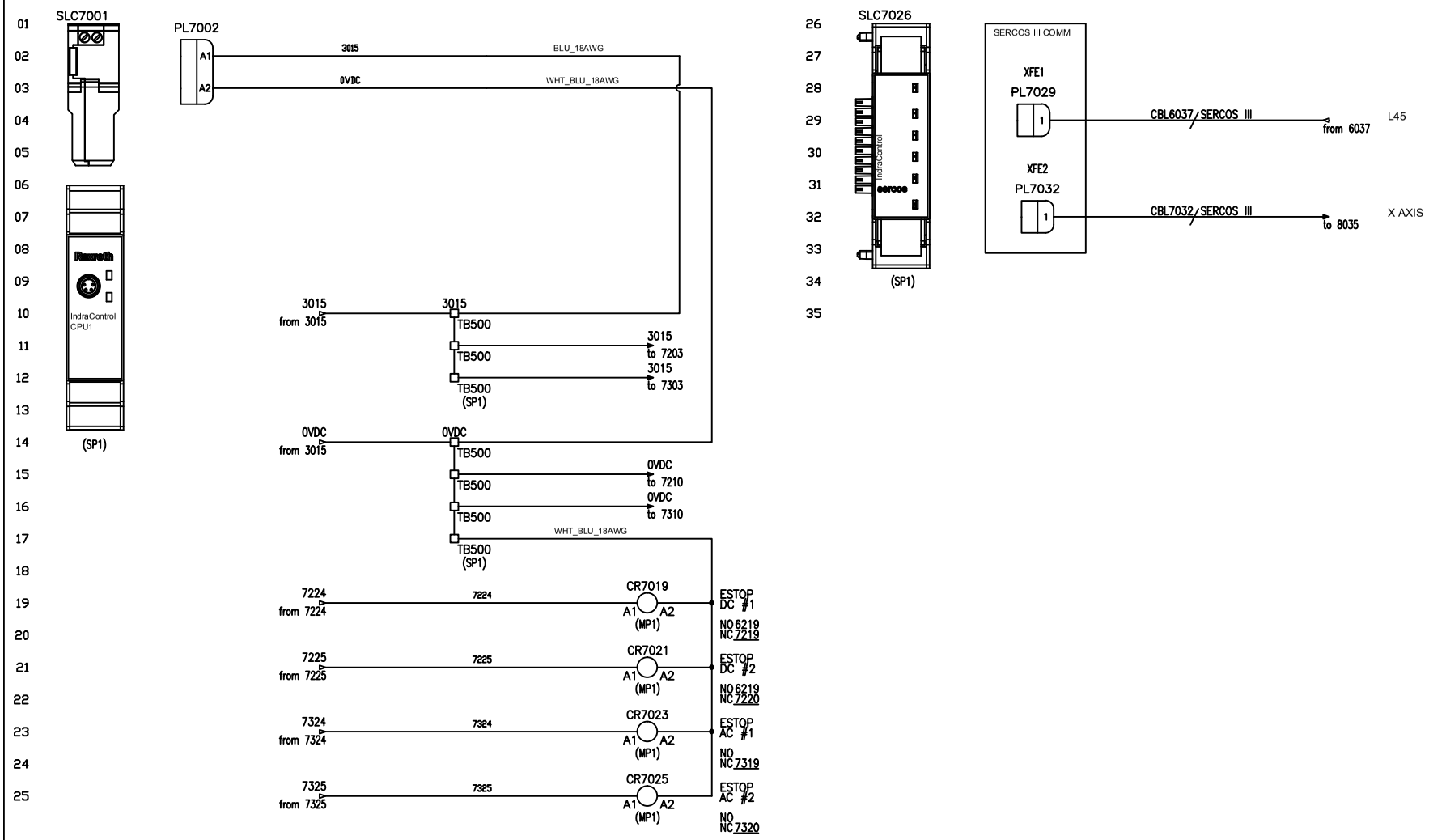


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: PLC CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 23 OF 43	FILENAME: SCM62.DWG — DWG NO: 62

63

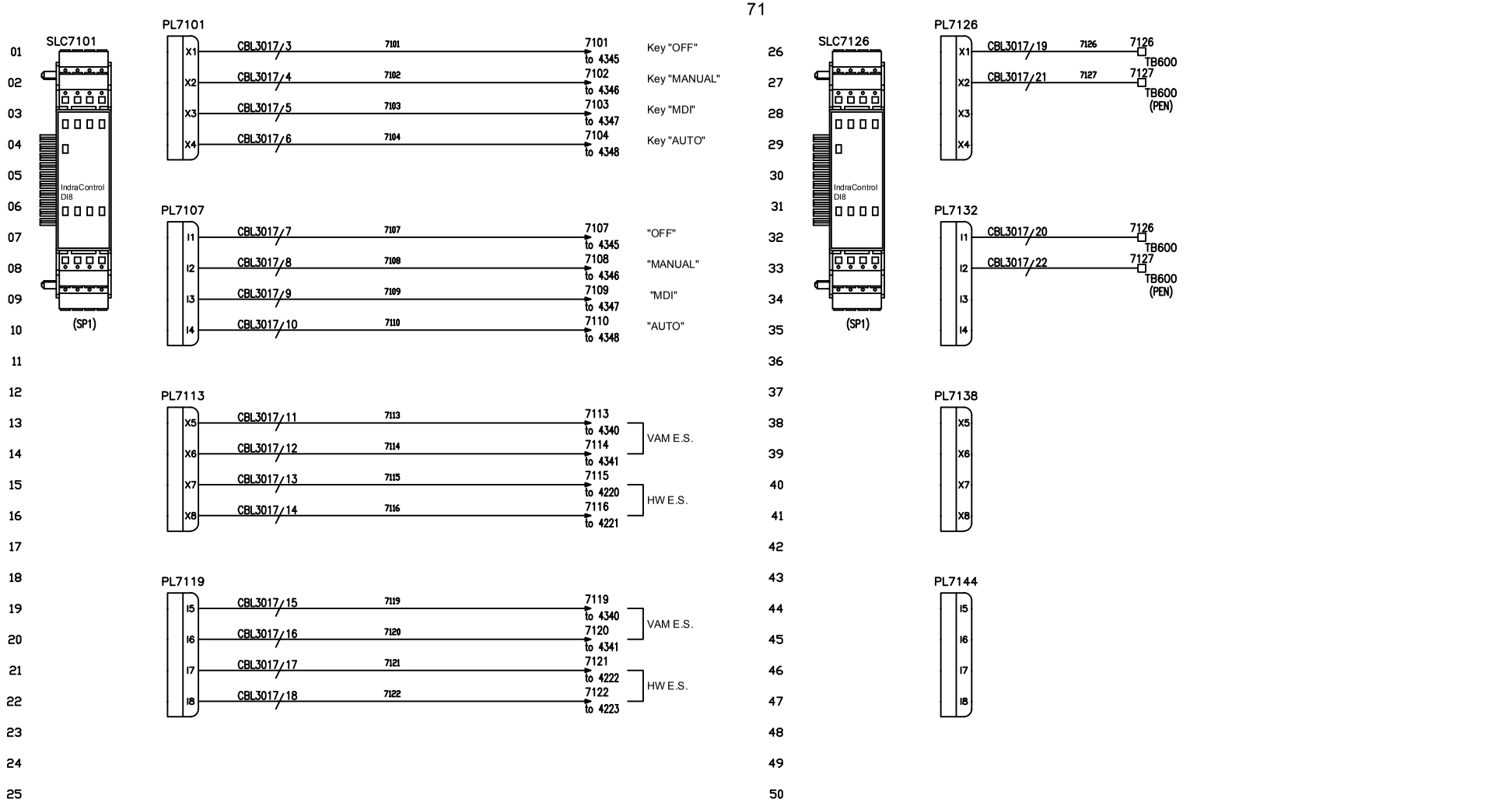


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250	MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
	PROJECT REF: 100-30A-SCH
DRAWN BY: SCP / DATE: 11/06/14 / SCALE: N/A	DESCRIPTION: PLC CONTROL
CHECKED BY: SCP / REVISION: A / SHEET: 24 OF 43	FILENAME: SCM63.DWG / DWG NO: 63

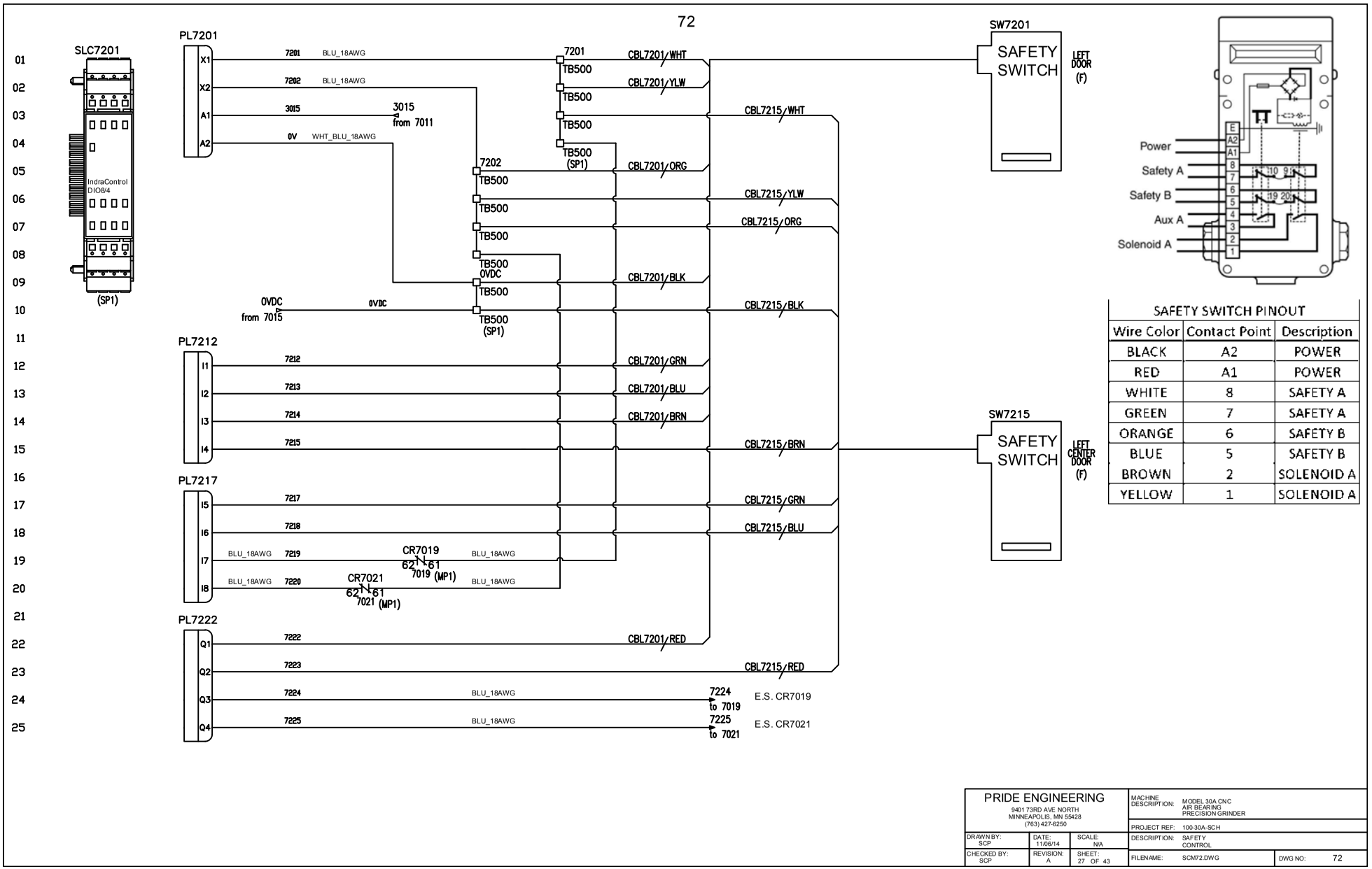


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	SAFETY CONTROL	
CHECKED BY: SCP	REVISION: A	SHEET: 25 OF 43	FILENAME:	SCM70.DWG	DWG NO: 70

71

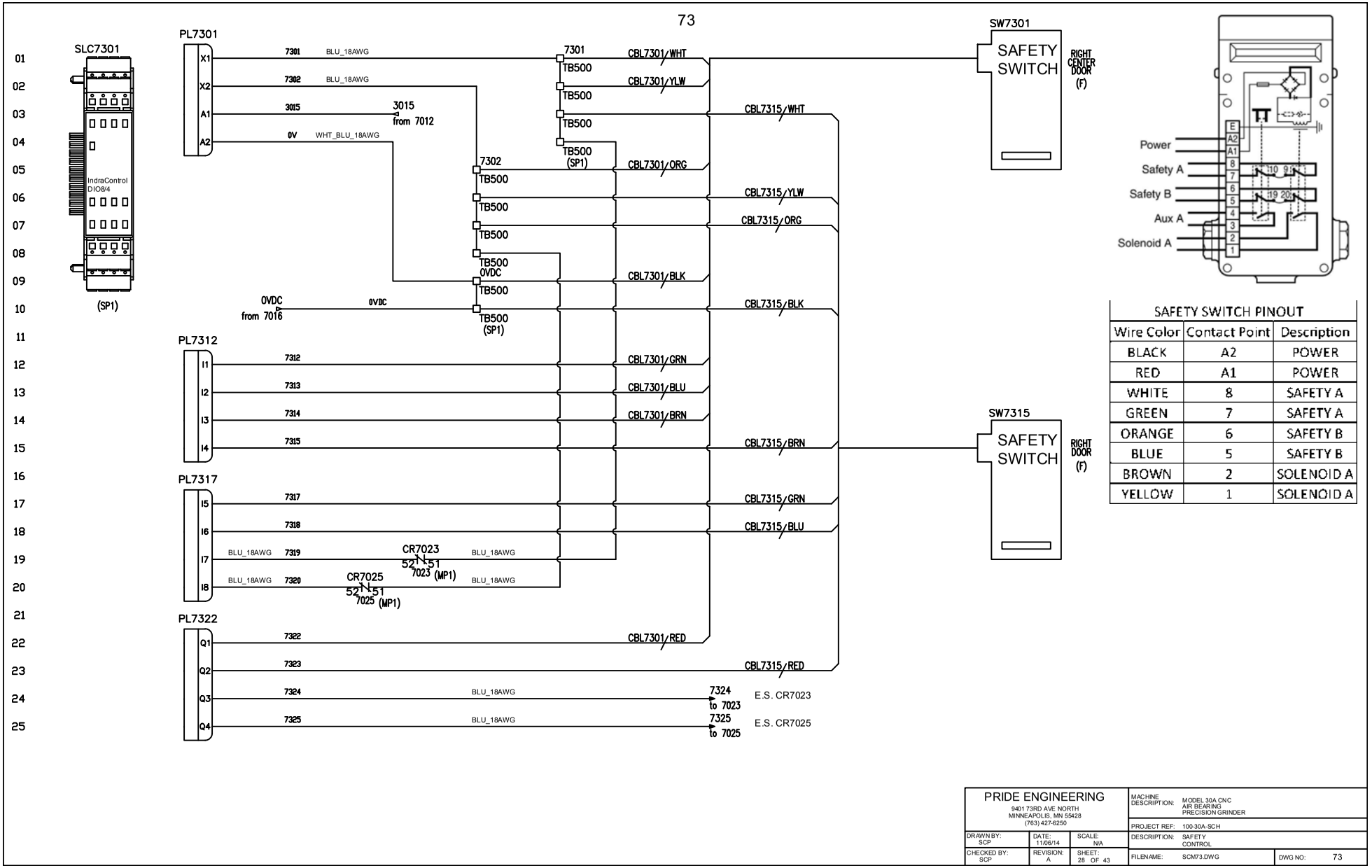


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SAFETY CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 26 OF 43	FILENAME: SCM71.DWG — DWG NO: 71



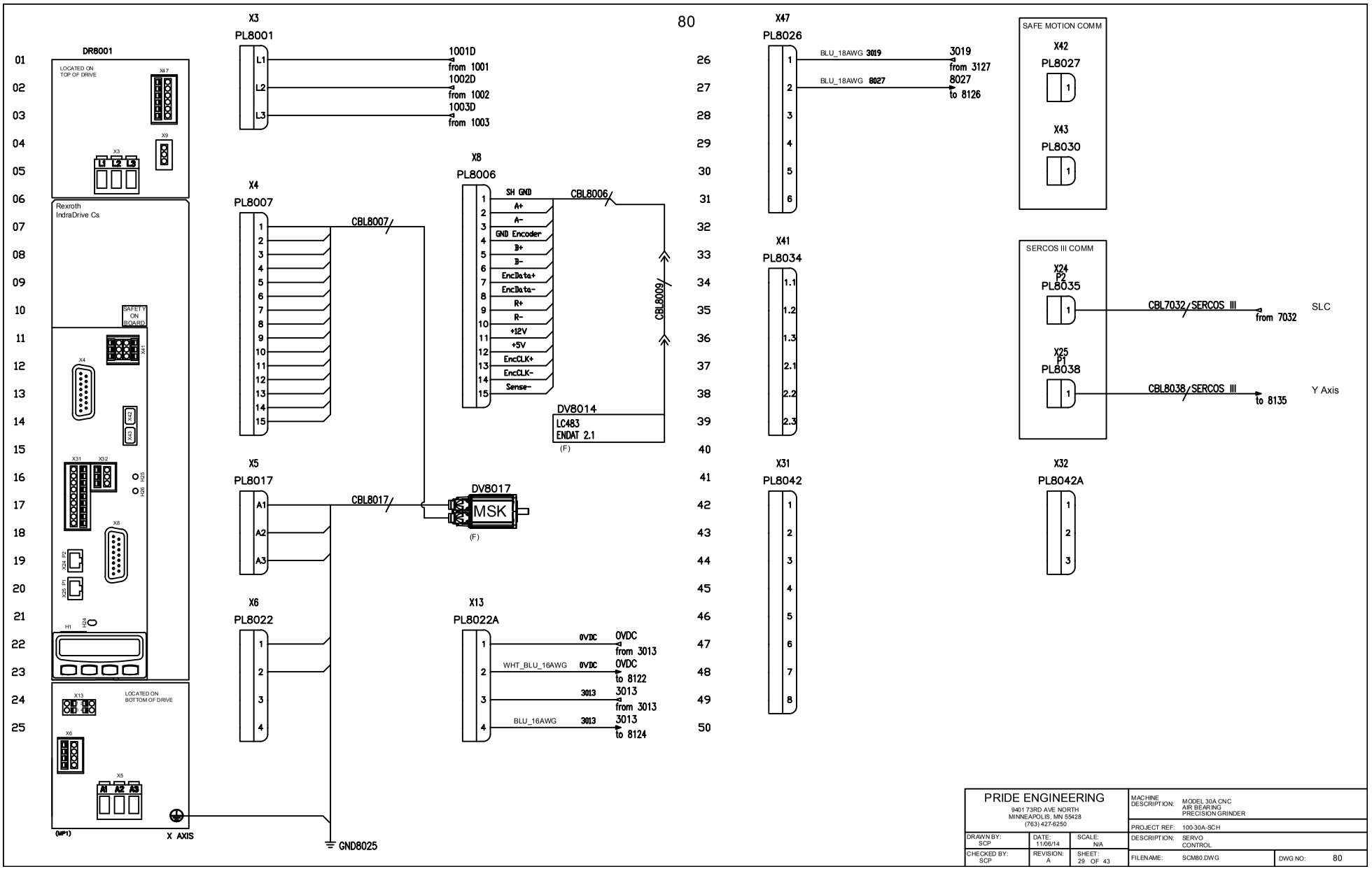
SAFETY SWITCH PINOUT		
Wire Color	Contact Point	Description
BLACK	A2	POWER
RED	A1	POWER
WHITE	8	SAFETY A
GREEN	7	SAFETY A
ORANGE	6	SAFETY B
BLUE	5	SAFETY B
BROWN	2	SOLENOID A
YELLOW	1	SOLENOID A

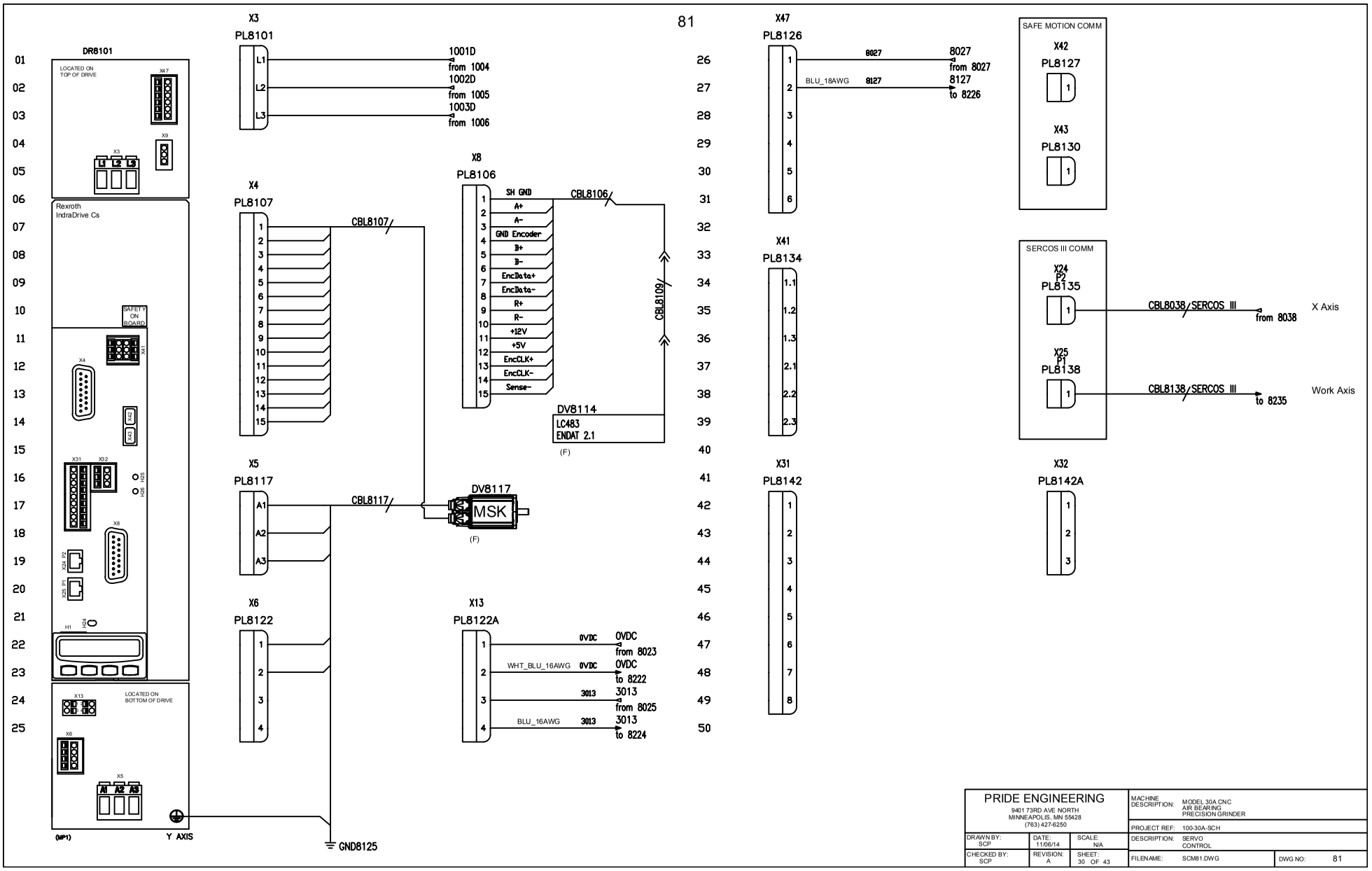
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SAFETY CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 27 OF 43	FILENAME: SCM72.DWG — DWG NO: 72



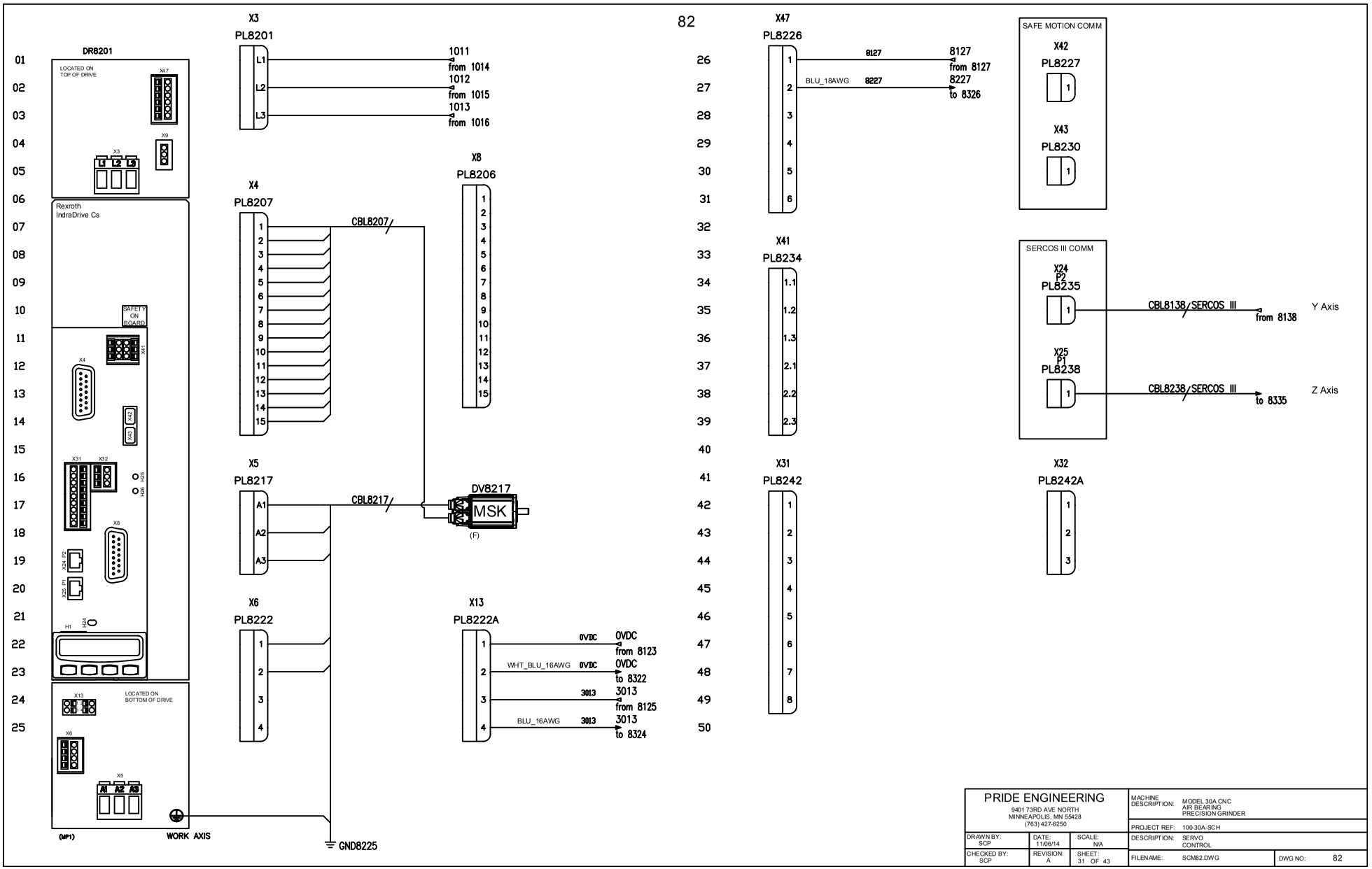
SAFETY SWITCH PINOUT		
Wire Color	Contact Point	Description
BLACK	A2	POWER
RED	A1	POWER
WHITE	8	SAFETY A
GREEN	7	SAFETY A
ORANGE	6	SAFETY B
BLUE	5	SAFETY B
BROWN	2	SOLENOID A
YELLOW	1	SOLENOID A

PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SAFETY CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 28 OF 43	FILENAME: SCM73.DWG — DWG NO: 73

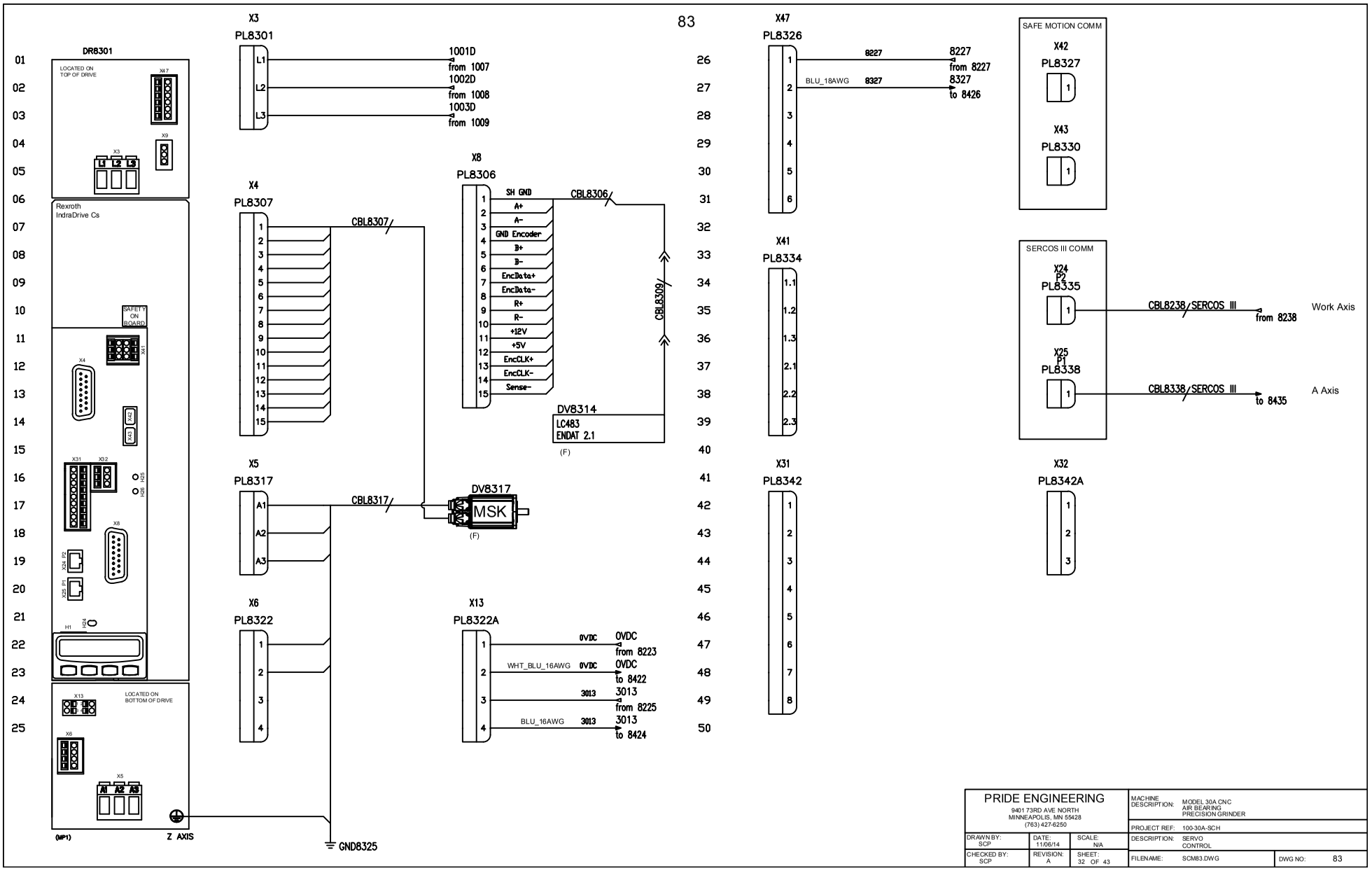

80
DR8001
LOCATED ON TOP OF DRIVE
X47
X9
X3
L1 L2 L3
Rexroth
IndraDrive Cs
SAFETY ON BOARD
X41
X4
X42
X43
X31
X32
X8
X24 P2
X25 P1
H1
LOCATED ON BOTTOM OF DRIVE
X13
X6
X5
A1 A2 A3
(MP1)
X AXIS
X3
PL8001
L1
L2
L3
1001D
from 1001
1002D
from 1002
1003D
from 1003
X4
PL8007
CBL8007
X8
PL8006
SH GND
A+
A-
GND Encoder
B+
B-
EncData+
EncData-
R+
R-
+12V
+5V
EncCLK+
EncCLK-
Sense-
CBL8006
CBL8009
DV8014
LC483
ENDAT 2.1
(F)
X5
PL8017
A1
A2
A3
CBL8017
DV8017
MSK
(F)
X6
PL8022
X13
PL8022A
0VDC
0VDC
from 3013
WHT_BLU_16AWG
0VDC
0VDC
to 8122
3013
3013
from 3013
BLU_16AWG
3013
3013
to 8124
GND8025
X47
PL8026
BLU_18AWG 3019
3019
from 3127
BLU_18AWG 8027
8027
to 8126
X41
PL8034
1.1
1.2
1.3
2.1
2.2
2.3
X31
PL8042
SAFE MOTION COMM
X42
PL8027
X43
PL8030
SERCOS III COMM
X24
P2
PL8035
CBL7032/SERCOS III
from 7032
SLC
X25
P1
PL8038
CBL8038/SERCOS III
to 8135
Y Axis
X32
PL8042A
PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250
MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION: SERVO CONTROL
DRAWN BY: SCP
DATE: 11/06/14
SCALE: N/A
CHECKED BY: SCP
REVISION: A
SHEET: 29 OF 43
FILENAME: SCM80.DWG
DWG NO: 80



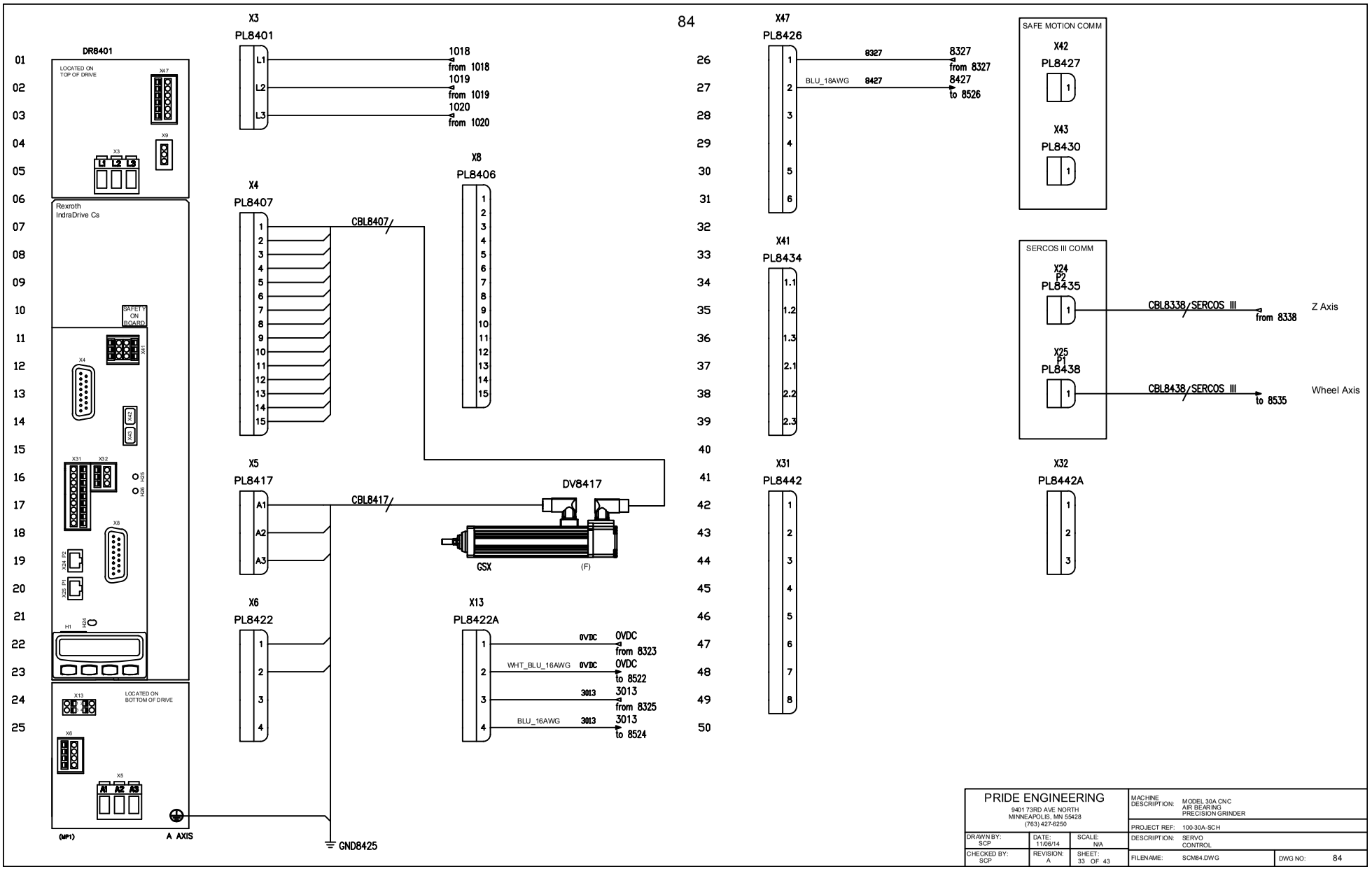
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SERVO CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 30 OF 43	FILENAME: SCM81.DWG — DWG NO: 81



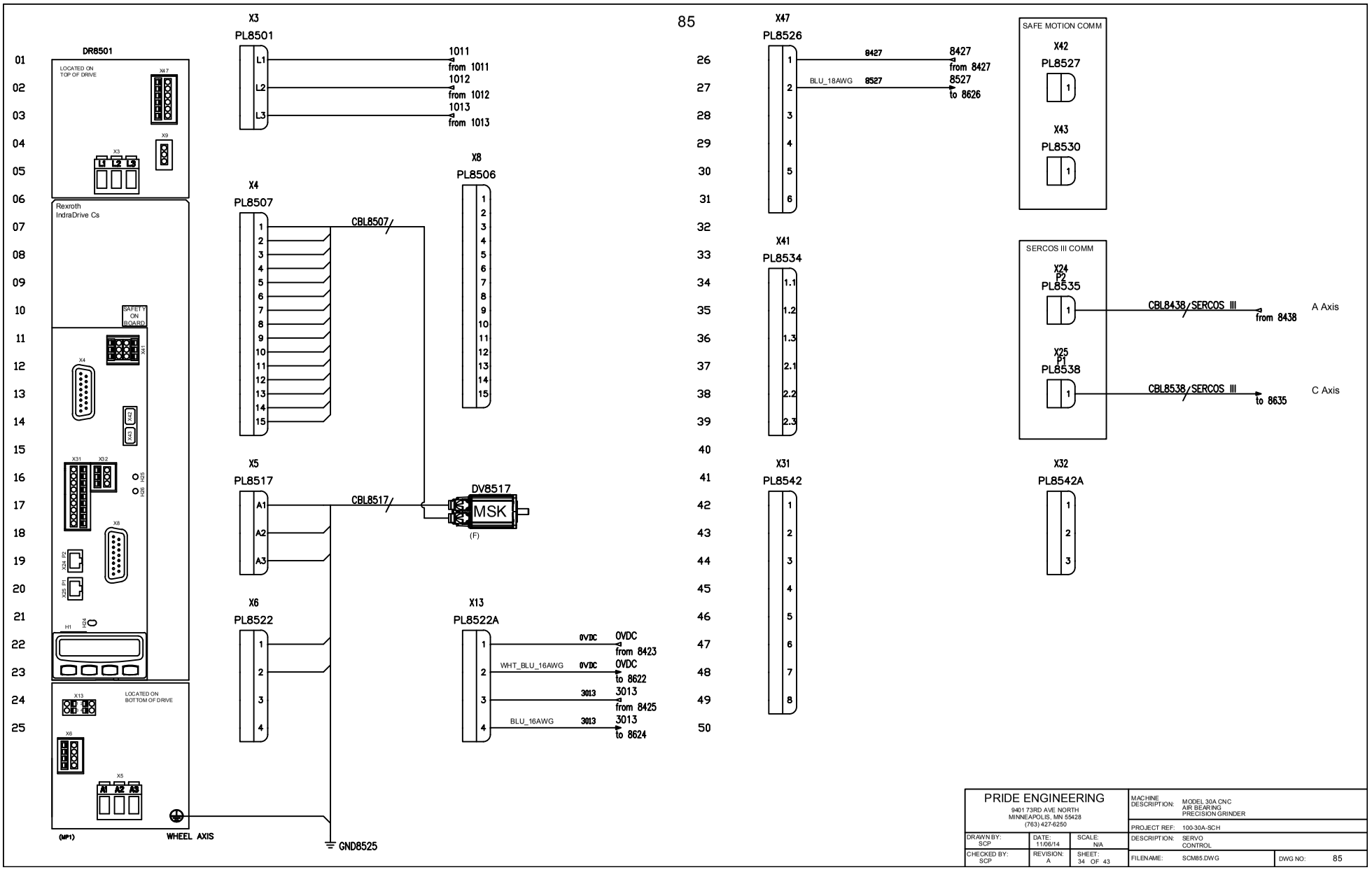
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SERVO CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 31 OF 43	FILENAME: SCM82.DWG — DWG NO: 82



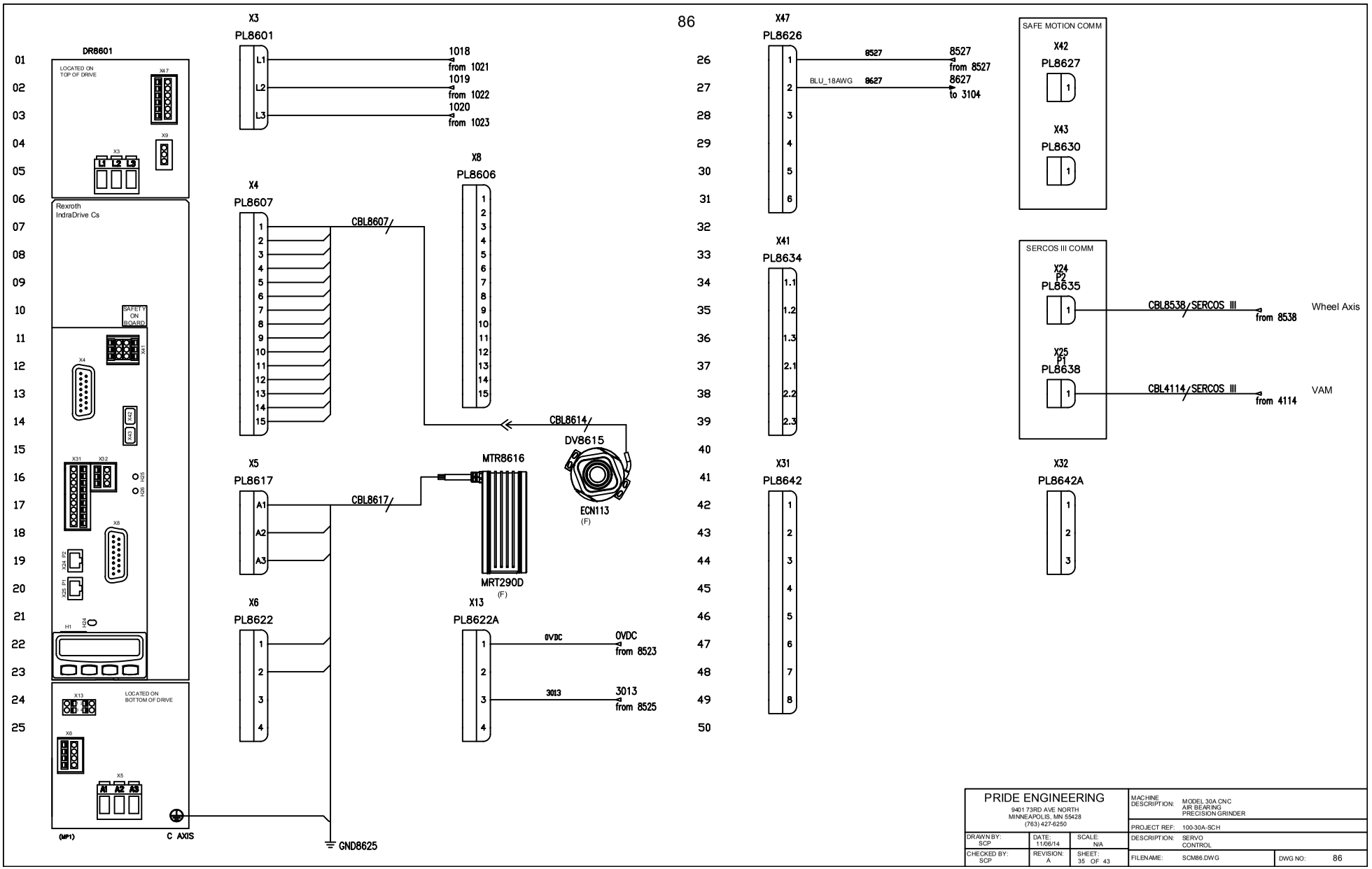
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SERVO CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 32 OF 43	FILENAME: SCM83.DWG — DWG NO: 83



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SERVO CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 33 OF 43	FILENAME: SCM84.DWG — DWG NO: 84

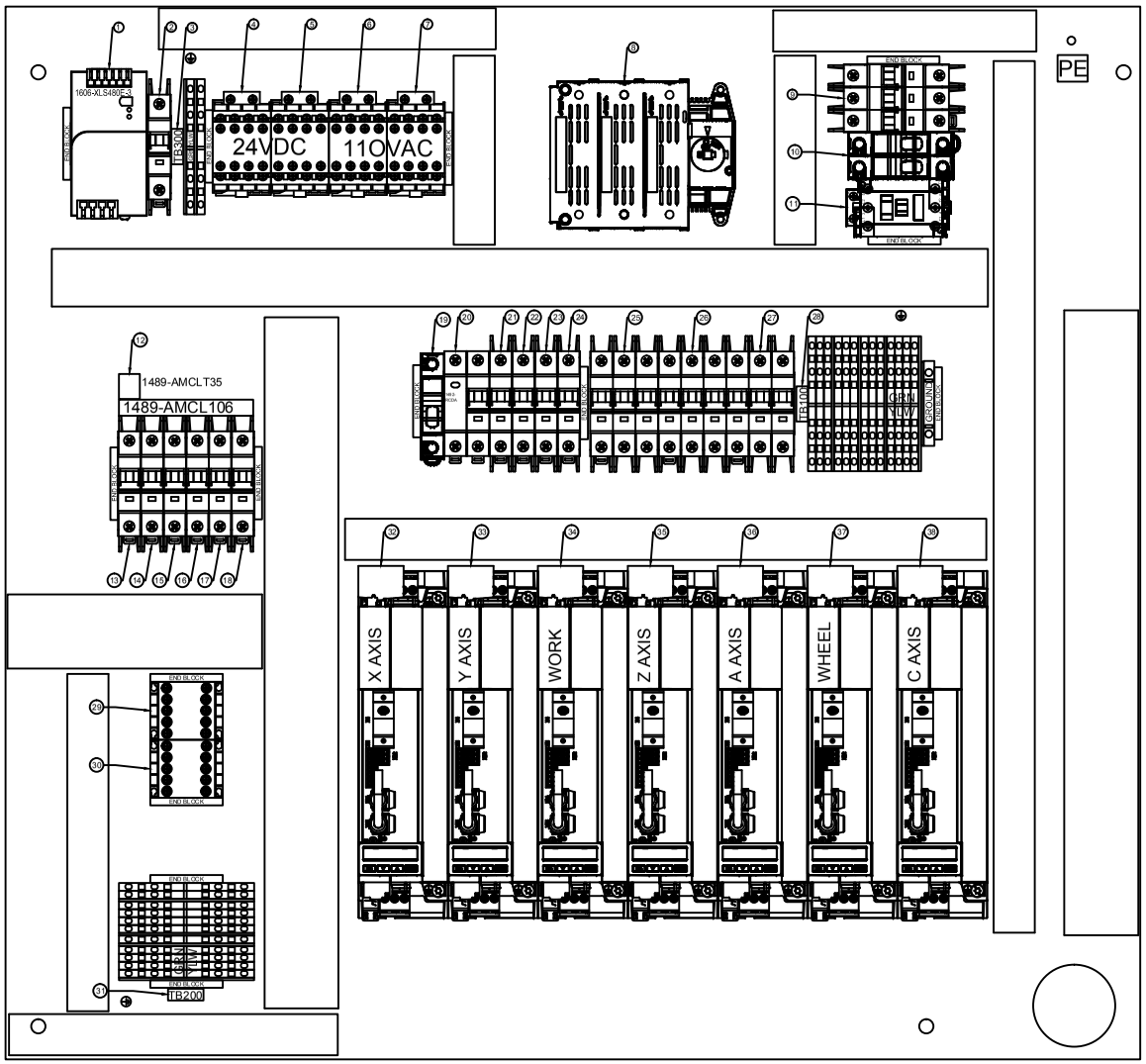


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SERVO CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 34 OF 43	FILENAME: SCM85.DWG — DWG NO: 85



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF: 100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SERVO CONTROL
CHECKED BY: SCP	REVISION: A	SHEET: 35 OF 43	FILENAME: SCM86.DWG — DWG NO: 86

100



PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	SUB PANEL 11-324A	
CHECKED BY: SCP	REVISION: A	SHEET: 36 OF 43	FILENAME:	SCM100.DWG	DWG NO: 100

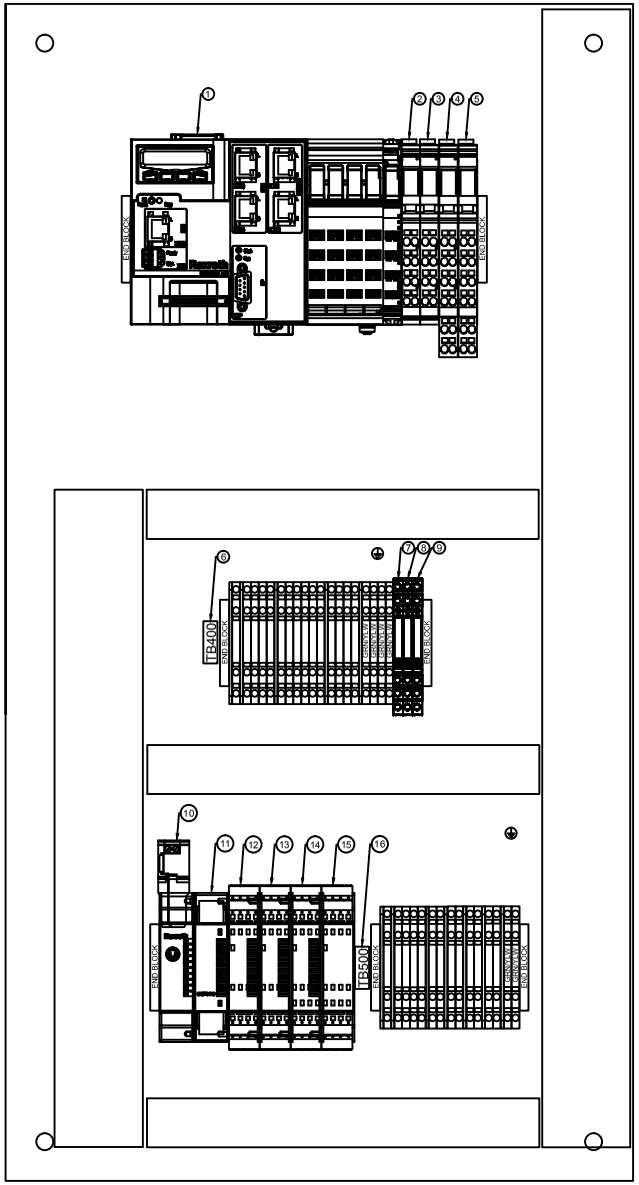
ITEM#	DRAWING CODE	PART NUMBER	DESCRIPTION	QTY
1	PSW3006	11-292A	24-28VDC,480W, 3 PHASE POWER SUPPLY	1
2	CB3010	11-268A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 20AMP	1
3	TB300	11-317A	GROUP MARKER	1
		11-286A	4 PLACE TERMINAL BLOCK	1
		11-279A	4 PLACE TERMINAL BLOCK END	1
		11-288A	4 PLACE TERMINAL BLOCK GROUND	1
		11-280A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-281A	END RETAINER	3
4	CR7019	11-293A	SAFETY CONTROL RELAY, 8-POLE, 24VDC	1
5	CR7021	11-293A	SAFETY CONTROL RELAY, 8-POLE, 24VDC	1
6	CR7023	11-327A	SAFETY CONTACTOR, 23AMP, 24VDC	1
7	CR7025	11-327A	SAFETY CONTACTOR, 23AMP, 24VDC	1
8	DS1001	11-300A	DISCONNECT, MAIN, 60AMP, KIT	1
		11-301A	60 AMP FUSE, JTD, INDICATING	3
9	CB1006	11-269A	CIRCUIT BREAKER, 3-POLE, C-CURVE, 6AMP	1
		11-281A	END RETAINER	2
10	FU1014	11-283A	FUSE HOLDER, 2-POLE, CLASS CC, 30AMP	1
		11-297A	KLDR SERIES, CLASS CC, 7.5AMP FUSE	2
11	CR3104	11-326A	CONTACTOR, 37A, 24VDC	1
12	BUSSBAR	11-271A	6 PINS, 6 CIRCUIT BREAKERS, 1-PHASE, BUSSBAR	1
		11-272A	PROTECTIVE SHROUD FOR UNUSED PINS	1
		11-273A	TERMINAL POWER FEED 35MM²	1
13	CB3013	11-267A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 10AMP	1
14	CB3015	11-266A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 5AMP	1
15	CB3017	11-266A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 5AMP	1
16	CB3019	11-266A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 5AMP	1
17	CB3021	11-266A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 5AMP	1
18	CB3025	11-266A	CIRCUIT BREAKER, 1-POLE, C-CURVE, 5AMP	1
19	FU2012	11-282A	FUSE HOLDER, 1-POLE, CLASS CC, 30AMP	1
		11-296A	KLDR SERIES, CLASS CC, 15AMP FUSE	1
20	RCD2015	11-291A	RESIDUAL CURRENT CB, 2-POLE, 25AMP	1
21	CB2109	11-314A	CIRCUIT BREAKER, 1-POLE, D-CURVE, 10AMP	1
22	CB2114	11-313A	CIRCUIT BREAKER, 1-POLE, D-CURVE, 5AMP	1
23	CB2211	11-314A	CIRCUIT BREAKER, 1-POLE, D-CURVE, 10AMP	1
24	CB2215	11-313A	CIRCUIT BREAKER, 1-POLE, D-CURVE, 5AMP	1
25	CB1001	11-270A	CIRCUIT BREAKER, 3-POLE, D-CURVE, 10AMP	1
26	CB1011	11-270A	CIRCUIT BREAKER, 3-POLE, D-CURVE, 10AMP	1
27	CB1018	11-270A	CIRCUIT BREAKER, 3-POLE, D-CURVE, 10AMP	1

ITEM#	DRAWING CODE	PART NUMBER	DESCRIPTION	QTY
28	TB100	11-317A	GROUP MARKER	1
		11-286A	4 PLACE TERMINAL BLOCK	9
		11-279A	4 PLACE TERMINAL BLOCK END	3
		11-288A	4 PLACE TERMINAL BLOCK GROUND	4
		11-280A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-315A	TERMINAL BLOCK GROUND, 6MM	1
		11-316A	TERMINAL BLOCK GROUND END, 6MM	1
		11-281A	END RETAINER	3
29	CR6310	11-308A	MINI CONTACTOR, 12AMP, 24VDC	1
30	CR6305	11-308A	MINI CONTACTOR, 12AMP, 24VDC	1
31	TB200	11-317A	GROUP MARKER	1
		11-286A	4 PLACE TERMINAL BLOCK	7
		11-279A	4 PLACE TERMINAL BLOCK END	3
		11-288A	4 PLACE TERMINAL BLOCK GROUND	4
		11-280A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-322A	4-POLE CENTER JUMPER	1
		11-281A	END RETAINER	4
32	DR8001	11-239A-X	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1
33	DR8101	11-239A-Y	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1
34	DR8201	11-239A-O	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1
35	DR8301	11-239A-Z	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1
36	DR8401	11-239A-A	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1
37	DR8501	11-239A-H	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1
38	DR8601	11-239A-C	18AMP SERVO DRIVE, SAFE MOTION, DUAL ENCODER	1
		11-240A	MACHINE TOOL FIRMWARE, v18, CLOSED LOOP	1

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER		
PROJECT REF:	100-30A-SCH		
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION: SUB PANEL 11-324A BOM
CHECKED BY: SCP	REVISION: A	SHEET: 37 OF 43	FILENAME: SCM101.DWG
DWG NO: 101			

102

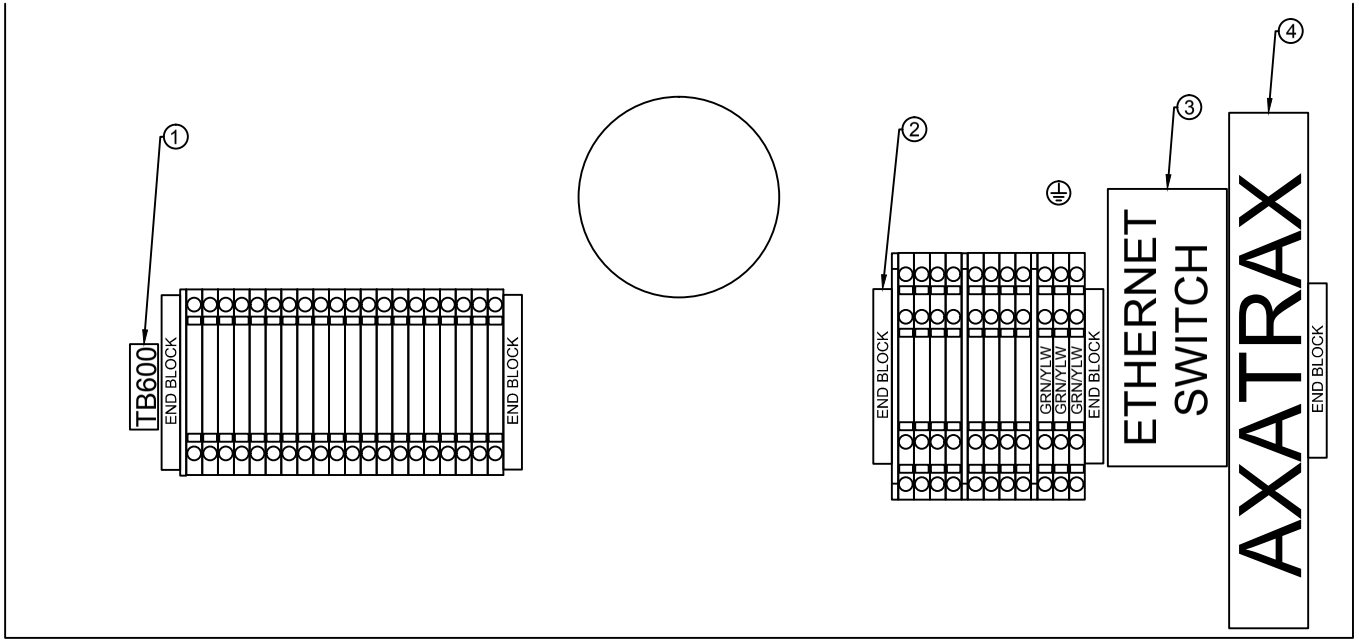


ITEM#	DRAWING CODE	PART NUMBER	DESCRIPTION	QTY
1	PLC6001	11-250A	CML45.1 PLC CONTROLLER	1
		11-251A	PLC FIRMWARE	1
		18-105	PLC CONNECTOR SET	1
		11-281A	END RETAINER	2
2	PLC6201	18-147	2 POINT ANALOG INPUT CARD	1
3	PLC6215	11-264A	SEGMENTED POWER CONNECTOR	1
4	PLC6226	11-265A	24VDC DIGITAL OUTPUT CARD	1
5	PLC6301	11-265A	24VDC DIGITAL OUTPUT CARD	1
6	TB400	11-317A	GROUP MARKER	1
		11-285A	4 PLACE TERMINAL BLOCK	15
		11-277A	4 PLACE TERMINAL BLOCK END	4
		11-287A	4 PLACE TERMINAL BLOCK GROUND	4
		11-278A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-275A	4 POLE CENTER JUMPER	1
		11-323A	6 POLE CENTER JUMPER	1
		11-281A	END RETAINER	2
7	CR6304	11-299A	24VDC RELAY	1
8	CR3106	11-299A	24VDC RELAY	1
9	CR3108	11-299A	24VDC RELAY	1
10	SLC7001	11-241A	SLC-3-CPU000300	1
		11-242A	SLC-3-MPL000301	1
11	SLC7026	11-243A	SLC-3-GS3500300	1
12	SLC7101	11-244A	SLC-3-XTDI80302	1
13	SLC7126	11-244A	SLC-3-XTDI80302	1
14	SLC7201	11-245A	SLC-3-XTIO84302	1
15	SLC7301	11-245A	SLC-3-XTIO84302	1
16	TB500	11-317A	GROUP MARKER	1
		11-285A	4 PLACE TERMINAL BLOCK	13
		11-277A	4 PLACE TERMINAL BLOCK END	6
		11-287A	4 PLACE TERMINAL BLOCK GROUND	2
		11-278A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-274A	2 POLE CENTER JUMPER	4
		11-275A	4 POLE CENTER JUMPER	1
		11-281A	END RETAINER	2

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	
CHECKED BY: SCP	REVISION: A	SHEET: 38 OF 43	

MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION: SUB PANEL 11-325A W/BOM
FILENAME: SCM102.DWG
DWG NO: 102



ITEM#	DRAWING CODE	PART NUMBER	DESCRIPTION	QTY
1	TB600	11-317A	GROUP MARKER	1
		11-284A	2 PLACE TERMINAL BLOCK	20
		11-276A	2 PLACE TERMINAL BLOCK END	1
		11-281A	END RETAINER	2
2		11-285A	4 PLACE TERMINAL BLOCK	8
		11-277A	4 PLACE TERMINAL BLOCK END	2
		11-287A	4 PLACE TERMINAL BLOCK GROUND	3
		11-278A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-275A	4 POLE CENTER JUMPER	2
		11-281A	END RETAINER	2
3	DV5501	11-328A	8 PORT, ETHERNET SWITCH	1
		11-281A	END RETAINER	1
4	DV5601	11-333A	VPN TUNNEL APPLIANCE	1
		11-334A	NETWORK IP CAMERA	1

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	
CHECKED BY: SCP	REVISION: A	SHEET: 39 OF 43	

MACHINE DESCRIPTION: MODEL 30A CNC
AIR BEARING
PRECISION GRINDER

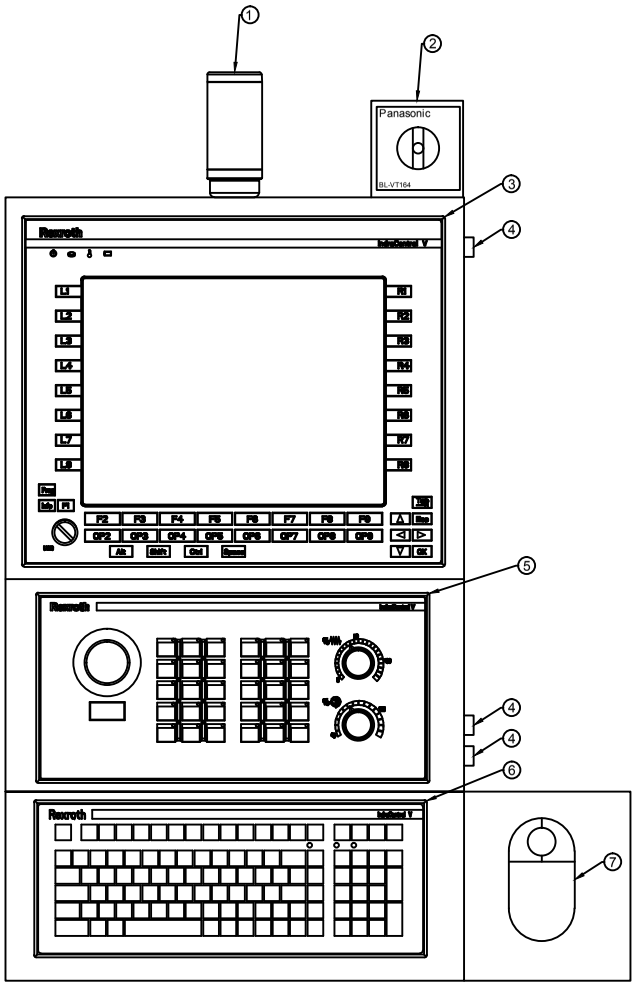
PROJECT REF: 100-30A-SCH

DESCRIPTION: PENDANT
LAYOUT W/BOM

FILENAME: SCM103.DWG

DWG NO: 103

104

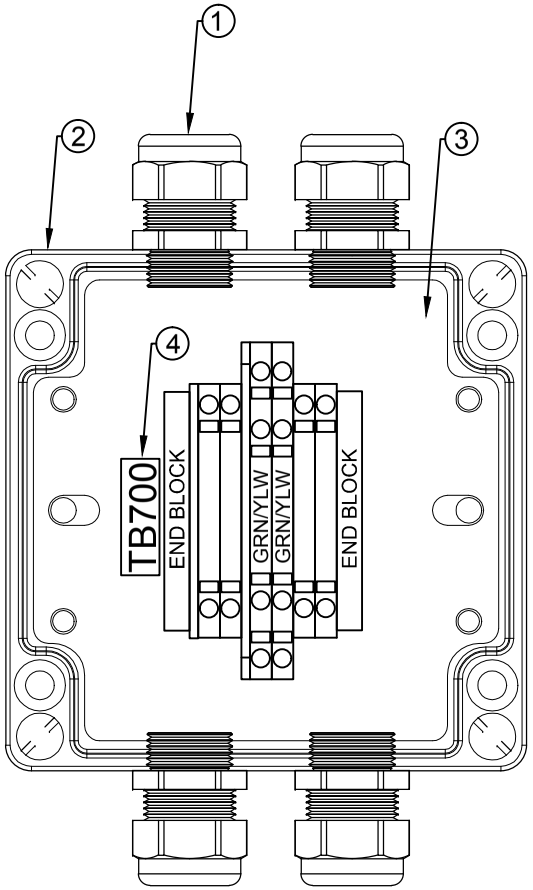


ITEM#	DRAWING CODE	PART NUMBER	DESCRIPTION	QTY
1	LT4132	11-295A	COLUMN LIGHT	1
		11-298A	4-PIN QUICK DISCONNECT CABLE	1
2	DV5606	11-324A	AXATRAX CABLE	1
3	DV4001	11-252A	VEP40.5 HMI INTERFACE	1
4		11-188	ETHERNET RECEPTACLE	3
5	DV4101	11-253A	VAM10.3 CONTROL PANEL	1
6	DV4501	11-235	VAK11.2 KEYBOARD	1
7	DV4510	11-207	TRACKBALL MOUSE	1

PRIDE ENGINEERING
9401 73RD AVE NORTH
MINNEAPOLIS, MN 55428
(763) 427-6250

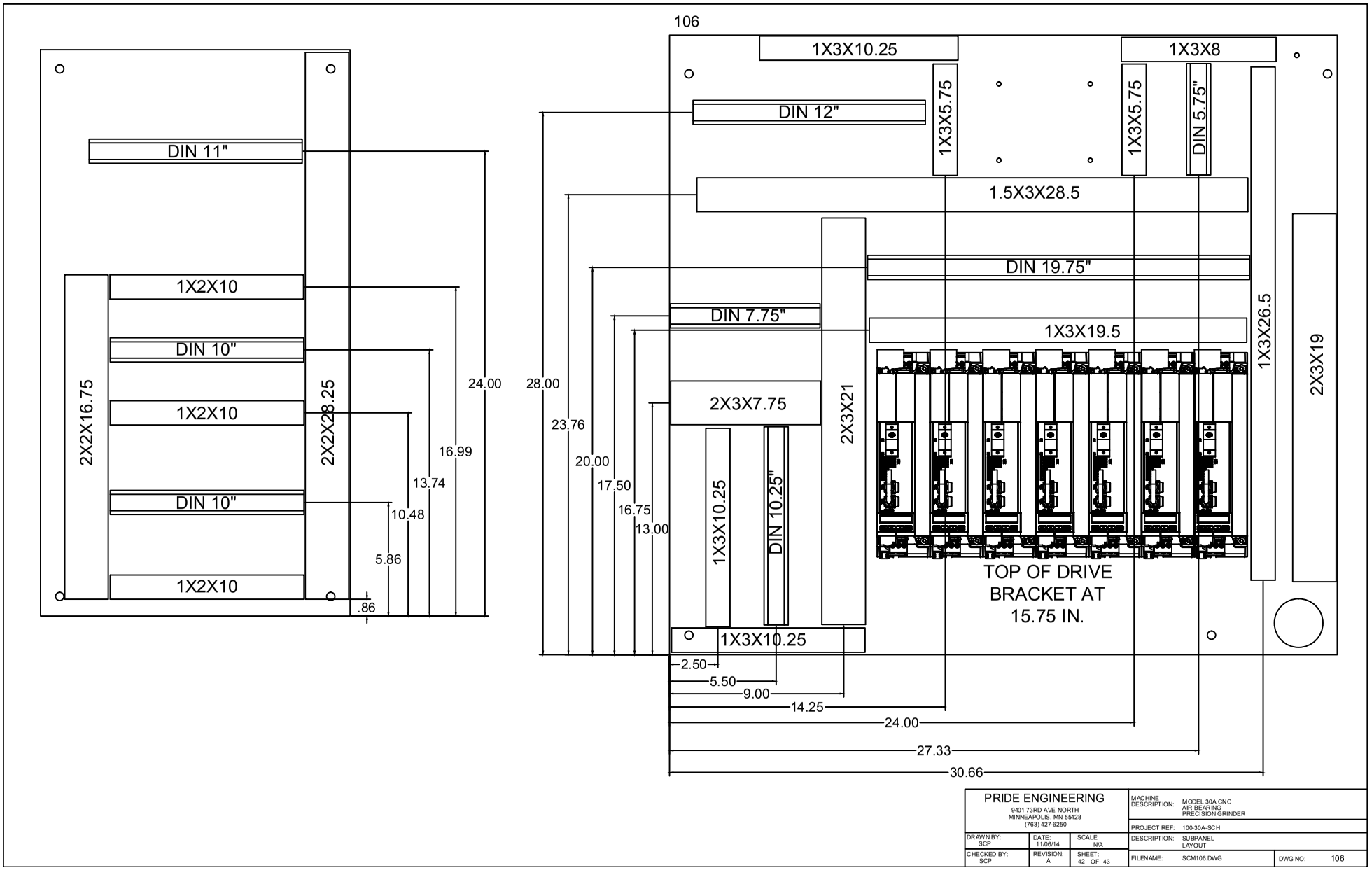
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A
CHECKED BY: SCP	REVISION: A	SHEET: 40 OF 43

MACHINE DESCRIPTION: MODEL 30A CNC AIR BEARING PRECISION GRINDER
PROJECT REF: 100-30A-SCH
DESCRIPTION:
FILENAME: SCM104.DWG
DWG NO: 104



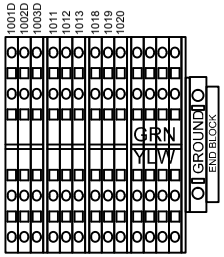
ITEM#	DRAWING CODE	PART NUMBER	DESCRIPTION	QTY
1			CABLE GLAND, 1/2 NPT	4
2		11-309A	JUNCTION BOX, ALUMINUM, 4.8X4.8	1
3		11-310A	INNER PANEL	1
4	TB700	11-317A	GROUP MARKER	1
		11-284A	2 PLACE TERMINAL BLOCK	4
		11-276A	2 PLACE TERMINAL BLOCK END	2
		11-287A	4 PLACE TERMINAL BLOCK GROUND	2
		11-278A	4 PLACE TERMINAL BLOCK GROUND END	1
		11-281A	END RETAINER	2

PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER
			PROJECT REF:	100-30A-SCH
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	DISTRIBUTION BOX LAYOUT W/BOM
CHECKED BY: SCP	REVISION: A	SHEET: 41 OF 43	FILENAME: SCM105.DWG	DWG NO: 105

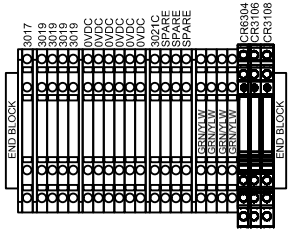


PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	SUBPANEL LAYOUT	
CHECKED BY: SCP	REVISION: A	SHEET: 42 OF 43	FILENAME:	SCM106.DWG	DWG NO: 106

TB100

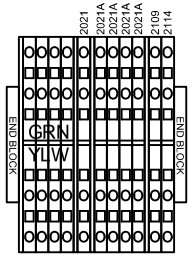


TB400

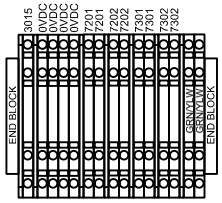


Note:
Interconnect all ground blocks

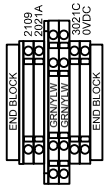
TB200



TB500



TB700



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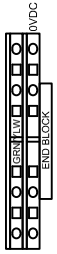

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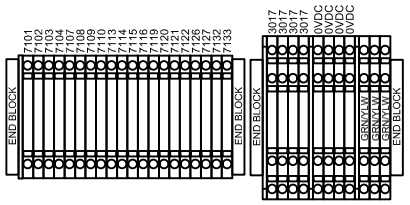
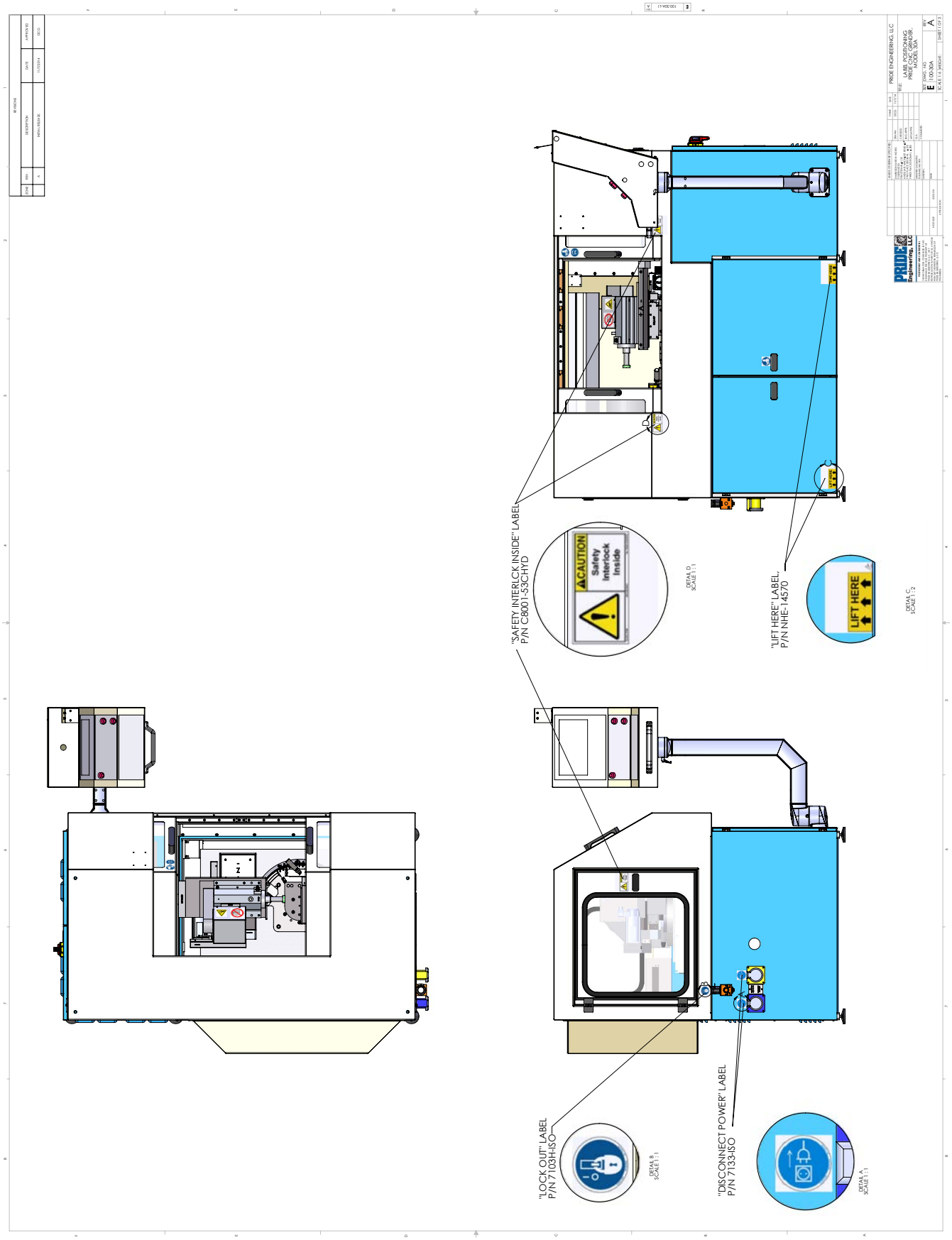
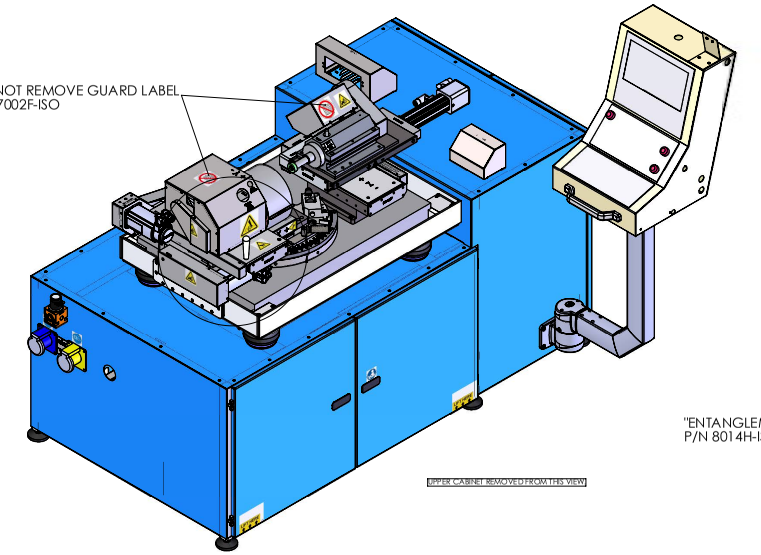


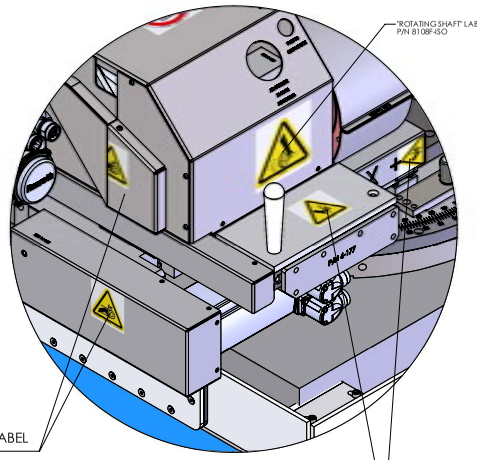
PRIDE ENGINEERING 9401 73RD AVE NORTH MINNEAPOLIS, MN 55428 (763) 427-6250			MACHINE DESCRIPTION:	MODEL 30A CNC AIR BEARING PRECISION GRINDER	
			PROJECT REF:	100-30A-SCH	
DRAWN BY: SCP	DATE: 11/06/14	SCALE: N/A	DESCRIPTION:	TERMINAL BLOCK DESCRIPTIONS	
CHECKED BY: SCP	REVISION: A	SHEET: 43 OF 43	FILENAME:	SCM107.DWG	DWG NO: 107

5.7 SAFETY ELEMENTS



REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	11/07/14	DCG



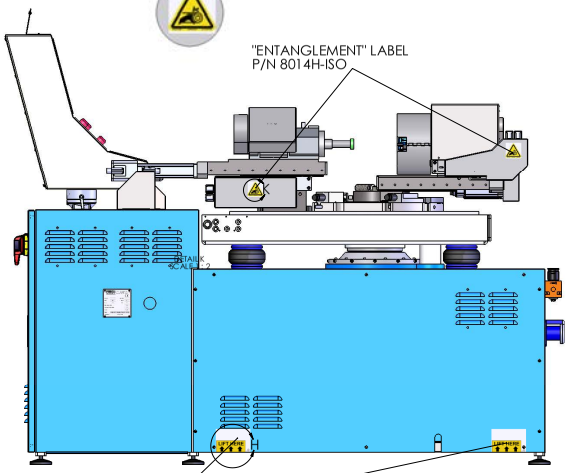


DETAIL G
SCALE 1 : 2

DETAIL J
SCALE 1 : 2

DETAIL H
SCALE 1 : 2

"ENTANGLEMENT" LABEL
P/N 8014H-ISO



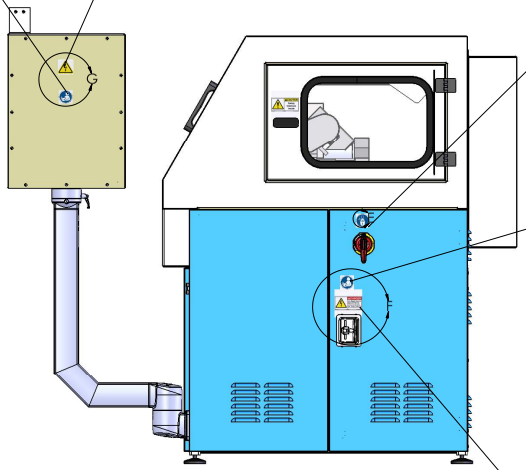
"READ MANUAL" LABEL
P/N 7104H-ISO

"ELECTRICAL SHOCK" LABEL
P/N 8002H-ISO

"LOCK OUT" LABEL
P/N 7103H-ISO

DETAIL E
SCALE 1 : 2

"READ MANUAL" LABEL
P/N 7104H-ISO



"ARC FLASH" LABEL
P/N C8002-42DHYD

DETAIL F
SCALE 1 : 2

"LIFT HERE" LABEL
P/N NHE-14570

PRIDE Engineering, LLC

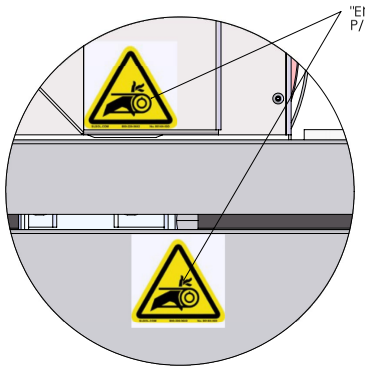
PRIDE ENGINEERING, LLC

TITLE: LABEL POSITIONING PRIDE CNC GRINDER, MODEL 30A

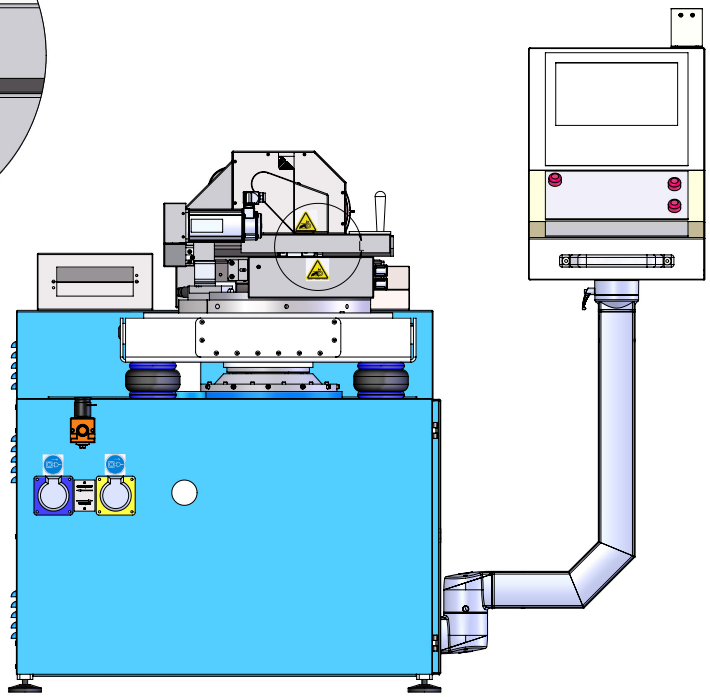
SIZE: E | DWG. NO.: 100-30A | REV: A

SCALE: 1.6 WEIGHT: | SHEET 2 OF 3

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	INITIAL RELEASE	11/07/2014	DCG



DETAIL L
SCALE 1 : 1



		UNLESS OTHER WISE SPECIFIED:		NAME	DATE	PRIDE ENGINEERING, LLC
		DIMENSIONS ARE IN INCHES	DRAWN	DCG	11/7/14	
		TOLERANCES:	CHECKED			TITLE:
		ANGULAR: ±	ENG APP'R.			LABEL POSITIONING
		TWO PLACE DECIMAL: ±	MFG APP'R.			PRIDE CNC GRINDER,
		THREE PLACE DECIMAL: ±	Q.A.			MODEL 30A
		DO NOT SCALE DRAWING	COMMENTS:			
		NEXT ASSY	USED ON			SIZE DWG. NO. REV
		APPLICATION				E 100-30A A
						SCALE: 1/4 WEIGHT: SHEET 3 OF 3

PRIDE Engineering, LLC

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: MOBIL VACTRA OIL NO. 2
Product Description: Base Oil and Additives
Product Code: 600494-00, 970716
Intended Use: Lubricant

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300
ExxonMobil Transportation No.	281-834-3296
Product Technical Information	800-662-4525, 800-947-9147
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use

mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulfur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >205C (401F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator

selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Color: Brown
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.883
Flash Point [Method]: >205C (401F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: N/D
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A

Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 68 cSt (68 mm2/sec) at 40 C | 8.6 cSt (8.6 mm2/sec) at 100C
Oxidizing Properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -6°C (21°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be

completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT) : Not Regulated for Land Transport

LAND (TDG) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The Following Ingredients are Cited on the Lists Below: None.

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

No revision information is available.

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only

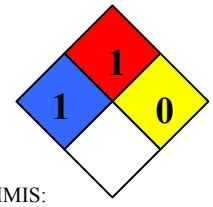
MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A

DGN: 2007221XUS (1014962)

MATERIAL SAFETY DATA SHEET

1. Identification of the material and supplier

Product name	CLC COOLANT 2224 EP
Product use	Metalworking coolant
Supplier	CLC Lubricants 0N902 Old Kirk Road PO Box 764 Geneva, IL 60134 630-232-7900
Emergency Phone : Infotrac	1-800-535-5053



HMIS:
HEALTH=1
FIRE=1
REACTIVITY=0
SPECIAL= NONE

2. Hazards identification

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200)
This product is not formulated to contain ingredients that have exposure limits exceeding those established by US agencies *See Section 8 for exposure limits.
Keep out of reach of children.
Eyes: May cause eye burns
Skin: May cause severe irritation
Ingestion: Harmful, damaging to mucous membranes
Inhalation: Vapors and/or aerosols which may be formed at elevated temperatures may be irritating to eyes and respiratory tract.
Not a sensitizer.

3. Composition/ information on ingredients

Ingredient	CAS#	%
Alkanolamines	May be one of the following: 102-71-6 124-68-5 27646-80-6 929-06-6 141-43-5 78-96-6 110-97-4	<30

Non-hazardous ingredients are treated confidentially.

4. First-aid measures

Eyes	If symptoms develop, immediately move individual away from exposure and into fresh air. Flush eyes gently with water for at least 15 minutes while holding eyelids apart; seek immediate medical attention.
Skin	Remove contaminated clothing. Flush exposed area with large amounts of water. If skin is damaged, seek immediate medical attention. If skin is not damaged but symptoms persist, seek medical attention. Launder clothing before reuse.
Ingestion	Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact physician, medical facility, or poison control center for advice about whether to induce vomiting. Do not leave individual unattended.
Inhalation	If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention.

5. Fire-fighting measures

Flash point	Will not flash
Extenguishing media	Carbon dioxide, dry chemical
Protection of fire-fighters	Fire-fighters should wear self-contained positive pressure breathing apparatus (SCBA) and full turnout gear.

6. Accidental release measures

Methods and materials for containment and cleanup	Dike to contain spill, cover with inert absorbent material, sweep up and place in a suitable container. Flush area well with water. Keep spills and cleaning run-off out of municipal sewers and bodies of water

7. Handling and storage

HANDLING: Keep containers closed. Avoid contact with eyes, skin or clothing. Wash hands after handling.
Empty container may retain product residue which may exhibit hazards of product.

8. Exposure controls/personal protection

Alkanolamines TLV- 5 mg/M3 OSHA/ACGIH

Personal protective equipment

Respiratory system	None required; however, use of adequate ventilation is good industrial practice.
Hands	Wear suitable gloves
Skin and body	Avoid contact with skin clothing. Wear suitable protective clothing.
Eyes	Safety glasses with side shields.

9. Physical and chemical properties

Physical state	Liquid
Color	Clear blue
Boiling point	<212°F
Freezing point	>32°F
pH (concentrated)	9-11
Solubility in water	Complete
Density	8.74 lbs/gal

10. Stability and reactivity

Stability	Stable under normal conditions
Incompatibility with various substances/ hazardous reactions	Avoid acids, acetone, aldehydes, aluminum, copper, halogenated hydrocarbons, ketones, strong alkalis, strong oxidizing agents, metals, organic anhydrides, organic halides.
Hazardous polymerization	Will not occur
Decomposition products	Oxides of Carbon, sulfur, and nitrogen

11. Toxicological information

For Alkanolamines:
Oral LD50, Rat: 2000-4000 mg/kg
Dermal LD50, Rabbit: >2000 mg/kg
Not a sensitizer
Not a carcinogen
Not mutagenic

12. Ecological information

For Alkanolamines:
Bacterial Toxicity EC50= 132 ppm
Acute Fish Toxicity, Bluegill Sunfish, 96 h LC50= 190 mg/l
Acute Fish Toxicity, Plaice, 96 h LC 50= 180 mg/l
Acute Toxicity, Daphnia magna, 48 h LC50= 193 mg/l
Acute Toxicity, Brown Shrimp, 96 h LC50= 179 mg/l
Bacterial Toxicity, Pseudomonas putida, EC10= 50 mg/l
LC50, Pimephales promelas, static, 96 h: 580 mg/l
EC50, alga Scenedesmus sp., 72 h: 270 mg/l

13. Disposal information

Materials contaminated must be disposed to a permitted hazardous waste management facility in accordance with the Clean Air and Clean Water Acts, Resources Conservation and Recovery Act, and all relevant laws or regulations regarding disposal. If it can be determined that spilled material and absorbent do not meet hazardous waste criteria, disposal may not be regulated.

14. Transport information

Not classified as hazardous for transport (DOT, TDG, IMO/IMDG, IATA/ICAO)

15. Regulatory information

SARA TITLE III SECTION 313: Not applicable
SARA 311/312: Acute Health Hazard
The chemical ingredients in this product are on the 8(b) TSCA Inventory Lists (40 CFR 710) or exempt.

16. Other information

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet. The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other tan for the stated application or applications without seeking advice from us.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. CLC Lubricants shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.