ROTTLER

H87AXY CNC HONE

MACHINE MAINTAINANCE AND PARTS MANUAL

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PARTS ORDERING

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For fastest service ordering parts or equipment, contact us via e-mail with the information below. For customers within the U.S., send emails to parts@rottlermfg.com, for customers outside of the U.S., use intlparts@rottlermfg.com

Have the following information on hand to expedite the ordering process:

1. Your name, business name, and contact number
2. Customer number, or your billing address if you do not have a customer number
3. Shipping address if different from the billing address
4. Machine model and serial number
5. Part number and description of the item(s) to order
6. Preferred method of shipment

For customers outside of the U.S. requiring faster service, contact your local distributor.

In some cases, you may be requested to send a photo of the part you are ordering if it is a replacement part or does not appear in our database.

If you are unsure which part you need to order, contact our service department, and ask to speak to one of our service consultants. They will assist you in determining which part(s) you require.

THERE IS A MINIMUM ORDER OF $25.00

MANUAL SECTIONS

INTRODUCTION

Contents

INTRODUCTION

READ THE SAFETY CHAPTER BEFORE INSTALLING MACHINE. THROUGHLY UNDERSTAND ALL SAFETY ISSUES BEFORE OPERATING MACHINE.

ATTENTION OWNER/BUSINESS MANAGER

To validate the warranty on your new Rottler machine, please be sure to sign and complete the "Installation Report" located in the Installation Chapter of this manual.

We suggest that the new user of the H87AXY read the CONTROL DEFINITIONS to get an idea how the machine operates.

The Operating Instructions chapter should be read in order to familiarize the user with the actual button pushing sequences required to carry out a job. These chapters in the manual should be considered an introduction. As the operators of the H87AXY series machines gain experience with using the different functions of the machine, complicated setups and programs will make more sense.

The rest of the manual contains information and part number reference on fixtures, cutting tools, and machine maintenance. The operator should read and become familiar with these areas as well.

Description

The model H87AXY Honing Machine is a wet, complete cylinder block and general purpose-honing machine

A Windows based touch screen panel provides easy and convenient control of the H87AXY. Block programs can be created and stored to memory for later recall, providing a quick set up for honing common blocks. All preferences such as dwell setting, cross hatch angle, and honing loads are automatically set up when a block program is selected at time of machine set-up.

The support carriage is mounted on linear rails to provide simple and easy hole-to-hole setup.

Convenient devices are provided to properly control honing operations and provide easy handling.

Fixtures are available for doing a large variety of engine types. Special fixtures and tooling for doing large industrial engine sleeves is also available.

A coolant tank is located under the main splash tank and a coolant pump is located behind the machine. A button is provided on the control panel to operate the coolant system.

Disclaimer

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Rottler Manufacturing and its employees or representatives are not responsible for any information regarding final specifications of any workpiece that is created as a final product when using Rottler equipment. It is the responsibility of the end user of Rottler equipment to determine the final dimensions and finishes of the workpiece that they are working on. Any information regarding final dimensions and finishes that appears in any Rottler literature or that is expressed by anyone representing Rottler is to be regarded as general information to help with the demonstration of or for operator training of Rottler equipment.

Limited Warranty

Rottler Manufacturing Company Model H87AXY parts and equipment is warranted as to materials and workmanship. This limited warranty remains in effect for one year from the date of installation or two years from the date of the original shipment from Rottler or whichever date occurs first. This only applies is the machine is owned and operated by the original purchaser and is operated and maintained as per

the instructions in the manual. A machine is warranted only if the Installation Report has been properly executed by a certified installation person and received by Rottler at the time of actual installation.

The products are warranted upon delivery to conform to their published specifications and to be free from defects in material and workmanship under normal use for a period of one year from shipment. Should a product not be as warranted, Rottler sole obligation shall be, at its option, to repair, correct or replace the product or to refund the amounts paid for the Product upon its return to a location designated by Rottler. No warranty shall extend to rapid wear Products (including tooling) or to Products which have been subject to misuse (including any use contrary to Rottler instructions), neglect, accident (including during shipment), improper handling or installation, or subject to any modification, repair or service not certified by Rottler. Rottler shall not be liable for any consequential, direct or indirect damages or for any other injury or loss. Buyer waives any right, beyond the foregoing warranty, to make a claim against Rottler. No warranty is provided for any Products not paid in full.

Merchandise cannot be returned to Rottler without prior approval. Customer must contact the Parts Department to get approval and to be issued a Return Goods Authorization number **(RGR#).** Merchandise authorized for return must be returned prepaid. If merchandise is returned with shipping charges collect, the actual amount of these charges may be deducted from any credit which may be due the customer. The **RGR #** assigned by the Parts Department should be written on the shipping label and must appear on a copy of the invoice(s) covering the original shipment. This invoice copy must be included in the box with the parts. Shipment must contain ONLY those items on the **RGR** as approved for return. Merchandise must be received within 10 days of the date of **RGR** or the **RGR** will be canceled. All returned merchandise may be subject to a 20% restocking fee on under $1,000.00 amount or 10% on any items over $1,000.00. Parts or tooling over 30 days old are considered as customer property and can only be returned with prior approval from Rottler Corporation Management.

The issuance of a **RGR DOES NOT** guarantee credit - it is only authorization for the return of the goods. Credit for return merchandise is at the sole discretion of Rottler. Credit will be issued only after inspection of returned goods.

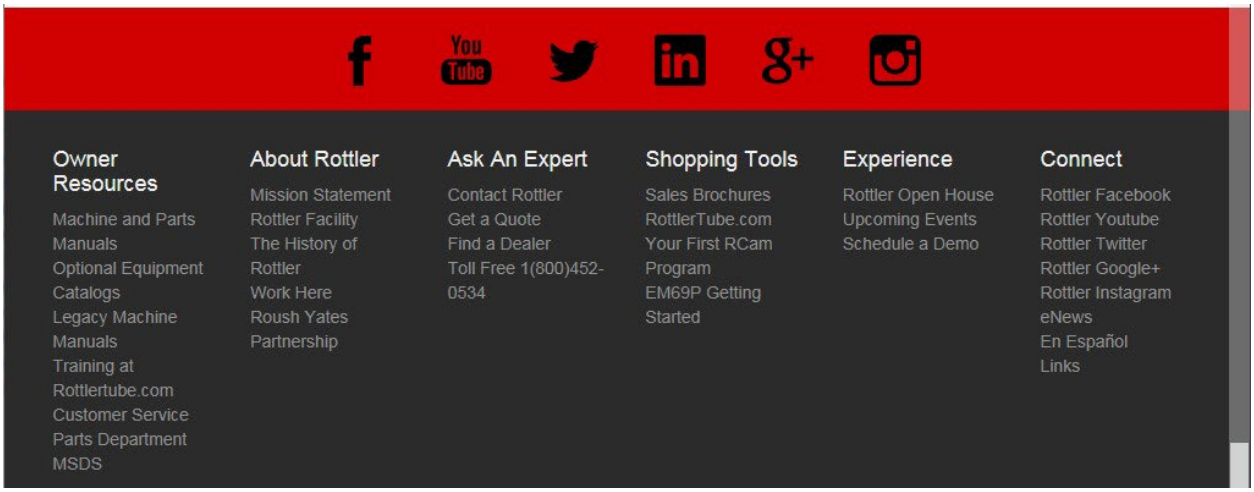
Tools proven to be defective within the warranty period will be repaired or replaced at the factory’s option.

We accept no responsibility for defects caused by external damage, wear, abuse, or misuse, nor do we accept any obligation to provide compensation for direct or indirect costs in connection with cases covered by the warranty.

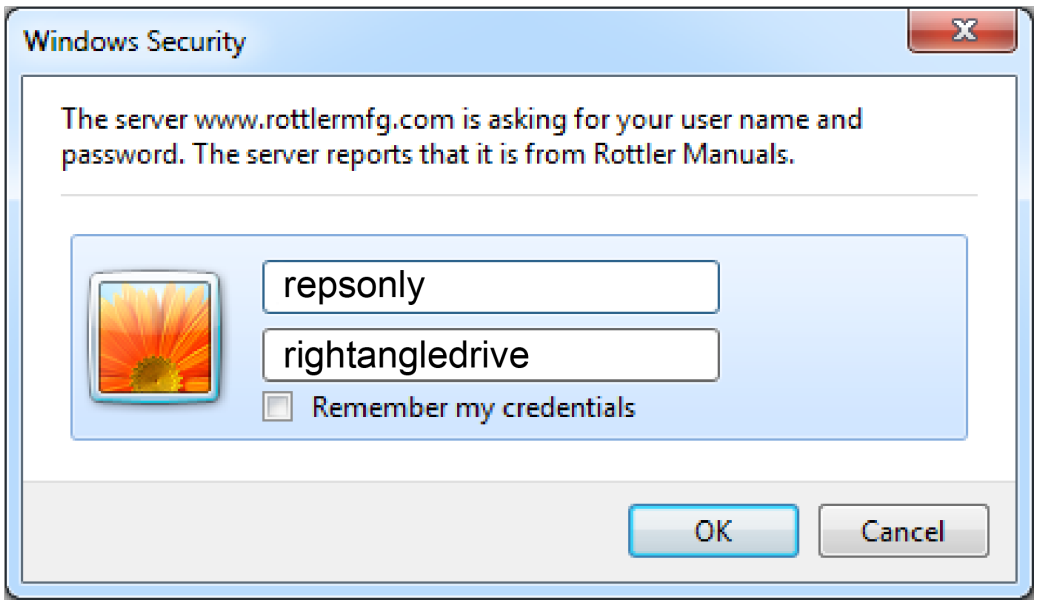
Online Documentation Access

Online documentation for machines and optional equipment can be accessed at the Rottler website. To access documentation open your browser and navigate to https://www.rottlermfg.com.

Scroll to the bottom of the page and under the Owner Resources title click the type of documentation you want to access.



If a log in window pops up asking for user name and password fill in the blanks as shown.



Specifications

H87AXY Machine Specifications	American	Metric
Control	CNC Touch Screen	
Machine Weight	3000 lbs	1045 kg
Spindle - Motor Torque	114in.lbs	53NM
Torque at Hone Head	585in.lbs	265NM
Workpiece Capacity - Length	55"	1400mm
Diameter Range	1.69" - 14.00"	43-355 - Xmm
Stroker Motor Torque	88.5in.lbs	40NM
Stroke System Acceleration	200in/sec^2	5m/sec^2
Spindle Stroke Speed	0-1500ipm	0-38m/min
Stroker Motor Power	3.3HP	2.47KW
Travel - Horizontal (X Axis)	38"	965mm
Spindle - Rotation Speed	1 to 400 RPM	
Spindle - Motor	3.7 HP	2.77 Kw
Coolant Capacity	70 Gallons	265 Liters
Maximum Length of Cylinder	38"	965mm
Stroke Length	40"	1016mm
Dimensions - Shipping	67D x 87W x 90" H	1.5D x 3.8W x 2235mm H
Electrical Requirements	208/240V, 30A, 50/60Hz, 3Ph	
Paint Color Code	RAL9002 (Grey White)	

INSTALLATION

Contents

ATTENTION OWNER/BUSINESS MANAGER

To validate the warranty on your new Rottler machine, please be sure to sign the installation report after the installation technician has installed the machine and verified the machine is operating correctly and given the operators operation and maintenance training.

Thank you for your cooperation and the opportunity to be of service to you.

ROTTLER MANUFACTURING

ROTTLER

INSTALLATION REPORT
H87 SERIES
REV 110519

OFFICE USE ONLY
Route to:
Parts _____ Service Mgr _____ Assem Mgr _____ Eng Mgr_____ Parts _____ Andy _____ Parts _____
Warranty Exp Date _____

ROTTLER MANUFACTURING MUST HAVE THIS REPORT RETURNED TO PROPERLY QUALIFY WARRANTY ON EQUIPMENT

Customer:_____ Address:_____
City:_____ State:_____ Zip:_____ Phone:_____
Country:_____

Machine Model:_____ Serial Number:_____

Representative:_____ **MACHINE INSTALLATION:** Electrical information MUST be complete to validate this report.

Customer responsibility prior to the arrival of Rottler Sales/Service technician. Please Initial each item when it is completed.

⚠ CAUTION **VERY IMPORTANT:** Modern design machines contain electronic low voltage circuitry that provides great advantages and a better machine life. BUT, you must have an excellent, stable power supply along with a good earth ground. If not, electrical noise problems are likely to interfere with machine operation unexpectedly.

Customer is responsible for providing electricity to machine in a manner that meets the local electrical code requirements.

_____Remove machine from truck. Weight: 2,500 lbs.
_____Provide solid foundation for machine.
_____Remove fixturing and misc. from machine and clean.
_____Install machine on foundation with jack pads under jacking bolts.
_____Level machine. When level all leveling bolts should have equal pressure on them.
_____This machine requires between 208 and 240 Volts AC, Three Phase, 50/60 Hz power supply.

IMPORTANT ***If this machine is being installed in a location without 3 phase power, follow the single phase wiring hookup shown in the installation section of the manual.***

_____Measure the incoming voltage between L1 and L2, L2 and L3, L1 and L3. Measure the incoming AC voltage at least twice during installation.
L1 to L2 _____ VAC L2 to L3 _____VAC L1 to L3 _____VAC
L1 to L2 _____ VAC L2 to L3 _____VAC L1 to L3 _____VAC
_____This machine should have an external breaker rated at 25 Amps, continuous draw.
_____Measure each leg of the incoming supply to ground. Sometimes you may find a “high” leg to ground. When this happens make sure the high leg is running to L3.
L1 to ground _____VAC L2 to ground _____VAC L3 to ground _____VAC

⚠ CAUTION Neutral and machine ground are not the same thing. You should measure an open circuit between Neutral and ground.

⚠ CAUTION **IF VOLTAGE IS OUTSIDE THE CORRECT RANGE AT ANY TIME THE MACHINE WILL NOT OPERATE PROPERLY AND MAY BE DAMAGED.**

_____Customer should attempt to have junk work piece available.
_____Make sure coolant will be available for set up.
_____Have the operator read through the operation manual before training begins. This will help him be familiar with the button pushing sequences. Have the operator read through the manual again after training and some of the sequences will make more sense.
_____Clean any rust inhibitor from the machine surfaces
_____Make sure that an Internet connection is available at the machine.

The following is the Rottler Sales/Service technician's responsibility

MACHINE START-UP

_____**BEFORE** turning power on to the machine. Check all wires for security by using the correct screw driver and turning CW until movement stops. Stranded wire can "spread" slightly from vibration during transport.
_____Install electrical component covers inside the electrical enclosure with fasteners provided.
_____The system is protected by fuses and circuit breakers located in the electrical enclosure. Show customer where they are located and confirm that spare fuses were shipped with machine.

⚠ CAUTION When starting the machine for the first time, it may move out of control. Make sure all hands are clear of machine parts. Be ready to press the Emergency Stop button if needed.

_____Explain the coolant filtration system and necessity of maintenance to that system.
_____Explain to the customer the injection oiler operation. The timer is controlled by the computer. Show the customer where the reservoir is located and explain what type of oil is required.
_____Turn Main power on at the power switch located on the electrical enclosure.
_____If any of the fuses blow, replace them, then call factory if further assistance is needed.
_____If any of the circuit breakers "trip", reset and call factory for possible trouble shooting.
_____If machine moves out of control, turn power off and contact factory for help in trouble shooting.
_____Install and test the Internet connection to the machine. DO NOT download any updates unless instructed to do so by Rottler.
_____Check oil lines to make sure they are fully primed. On machines with enclosure the back access panel will have to be removed. If oil lines are not fully primed with oil, run the manual priming procedure as described in maintenance section of the manual.

MACHINE MOVEMENTS

_____Remove hone head from machine for the following procedures.
_____Verify all machine movements are working correctly using the hand wheel.
_____Verify all machine movements are working correctly using the jog buttons.
_____Start spindle motor to verify correct direction of rotation.

INSTRUCTING THE OPERATOR:

Note: Rotter employees and representatives per company policy are not permitted to provide end user of Rottler equipment with any OEM specifications for the workpiece that is created by end user using Rottler equipment.

⚠ WARNING

_____ Explain to the customer and operator that at NO time is there to be any software or hardware other than Windows Auto Update and Rottler installed on this machine. This includes screen savers, anti-virus software, and any hardware device that installs software on the machine. Installation of screen savers and anti-virus software can cause dangerous control problems. Any installation of software or hardware will void the warranty on the machine.

_____Explain to the customer and operator that the machine should be hooked up to the Internet anytime it is on. The software on the machine will automatically connect to our server to send back useful information on machine status.

_____Connect customer supplied Internet to the machine. Verify that the Internet is accessible from the machine.

_____Once the machine has been fully setup and is ready for operation create a Skype account for the machine following the instructions in the Installation Section of the manual.

_____Explain to the customer and the operator how the to log onto Skype and communicate with Rottler when needed.

⚠ WARNING

_____ Computer Viruses will cause the machine control system to become unstable. This may cause the machine to make uncontrolled moves which could create a dangerous environment for the machine operator.

IMPORTANT

_____Refer to Chapter 4, Control Definitions of the Machine Manual, Section: Computer and Controller System Safety. Explain and discuss this section carefully with Owner/Manager/Operator and have them sign off. Failure to do so will result in the machine warranty being Null and Void.

_____

Signature / Title

_____Explain to the customer the importance of backing up the block profiles to a separate device. Any computer failure or possible operator input error can result in the loss of all block profiles that were created for the machine. Refer to Chapter 5 of the machine manual for detailed instructions on backing up and restoring block profiles.

_____Using the operating manual as a guide explain the function of all buttons.

_____Cycle all machine movements and supervise the handling of same by operator.

_____Demonstrate the differences of Manual and Auto operation.

_____If equipped with the auto rotate fixture explain how to set up and operate.

_____Explain selecting correct riser blocks for the block to be honed.

_____Fully explain the entire Auto Cycle.

_____Explain the need to Home the machine each time the hone head is changed or removed and reinstalled on the spindle.

_____Point out safety features to customer and operator. Do not push any buttons without thinking of safety first.

_____Explain to the customer the proper way to turn the machine off when it is not in use. Do not leave the machine on overnight. It is important to close all programs followed by shutting down

Windows before turning the main power switch off. Do not turn the main power switch off before shutting down Windows.

_____The following is a checklist of information needed prior to setting up a job.

- Finish bore size, cross hatch angle, and finish.
- Bore length.
- Center to center dimension of cylinders.
- If the job is a V type block, the pan rail to crank line center dimension, and cylinder offset between cylinder banks.

_____Demonstrate loading and roll over of V8 block.
_____Demonstrate in-line block clamp system.
_____Explain Optional block hold down arrangements.
_____Supervise the operator loading, cycling and unloading the block.
_____Develop the best block handling system you can for his shop.
_____Consider a block coolant drain area.
_____Examine several V8 blocks at the lower cylinder / bearing cap area and explain to the operator the necessity of setting the lower stop for maximum over stroke.
_____Explain the ABSOLUTE requirement for complete relief below the cylinder, which may include hand grinding.
_____Demonstrate removal and cleaning of cone in hone head.
_____Explain all stone options as well as hone head options.
_____Explain to the operator the methods for the fastest stock removal.
_____Explain the cause and cure of bad geometry and improper stone cutting.
_____Explain “breaking” the stones in.
_____Demonstrate proper stone dressing (refer to manual).
_____Explain the importance of maintaining the proper coolant mix.
_____Explain the importance of keeping the coolant clean.
_____Review the necessity of proper stone to coolant relationship.
_____Again review the operator manual, including all safety and emergency stop procedures.

MAINTENANCE SECTION

_____Review machine lubrication per manual.
_____Review coolant changing.
_____Review filter paper changing.
_____Review filling oil reservoir.

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General remarks on machine performance, adjustments as received and any further organization or parts required to complete the installation.

_____

_____

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_____

_____

_____

_____

Instructions given to:_____

Sales/Service Engineer: _____
Date_____

Shop Foreman/Superintendent or Owner: _____
Date_____

Once completed send this form to: Rottler Manufacturing attn: Parts Department
Alternately you may send this form via fax or e-mail:

8029 S 200 St
Kent, WA 98032 USA
fax: [+1] 253-395-0230
e-mail: parts@rottlermfg.com

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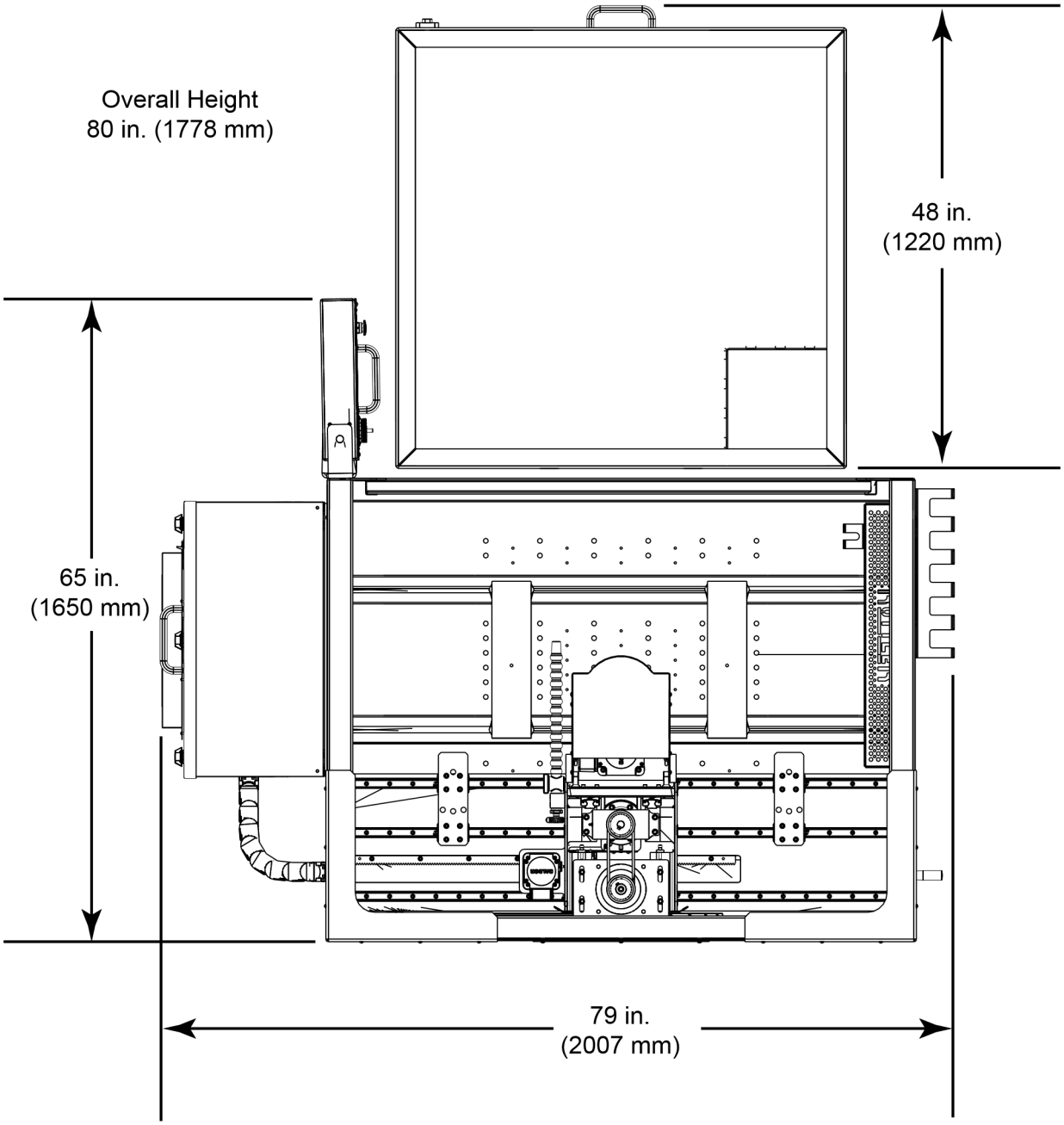
Machine Dimensions

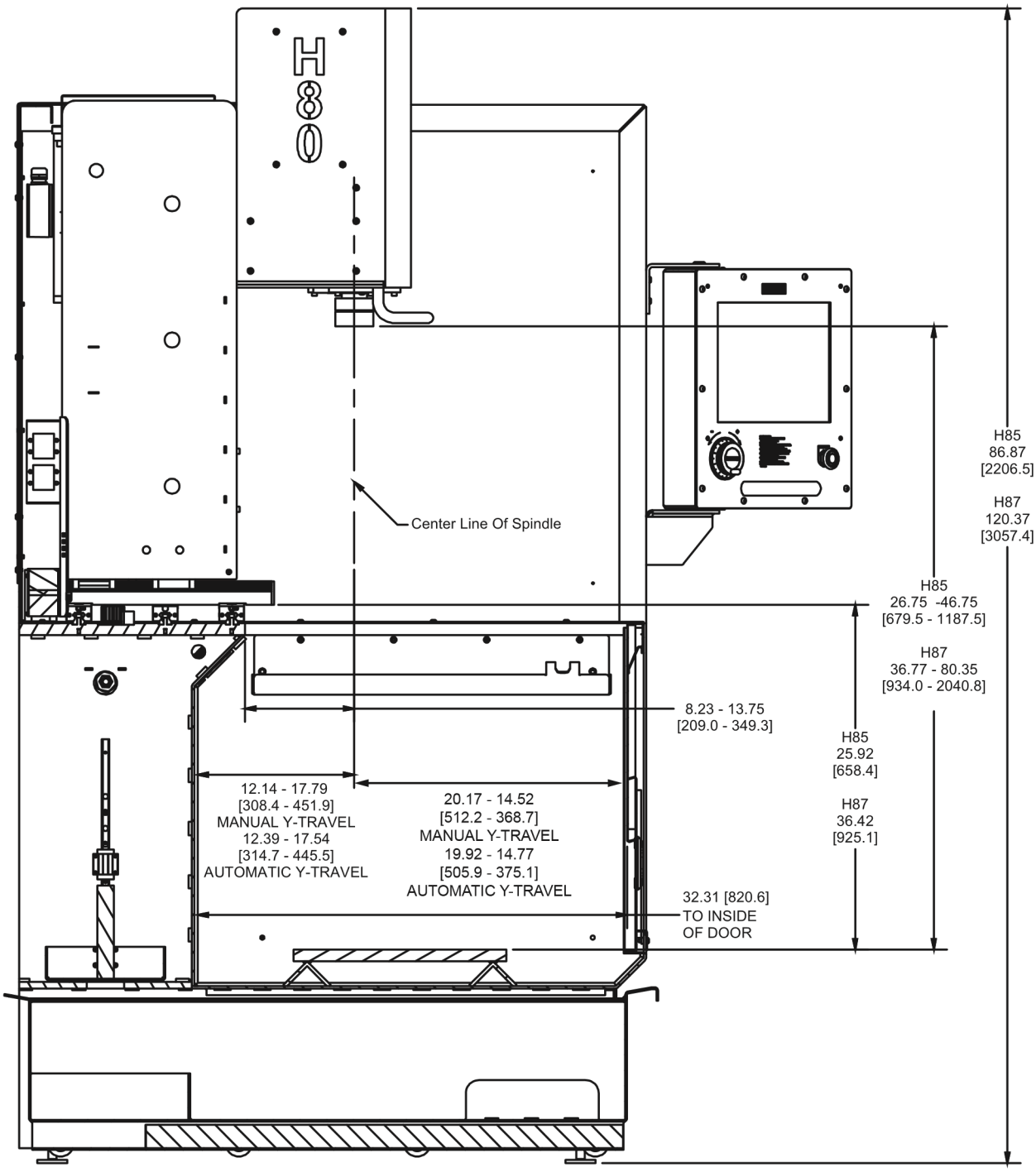


Work Envelope Dimensions

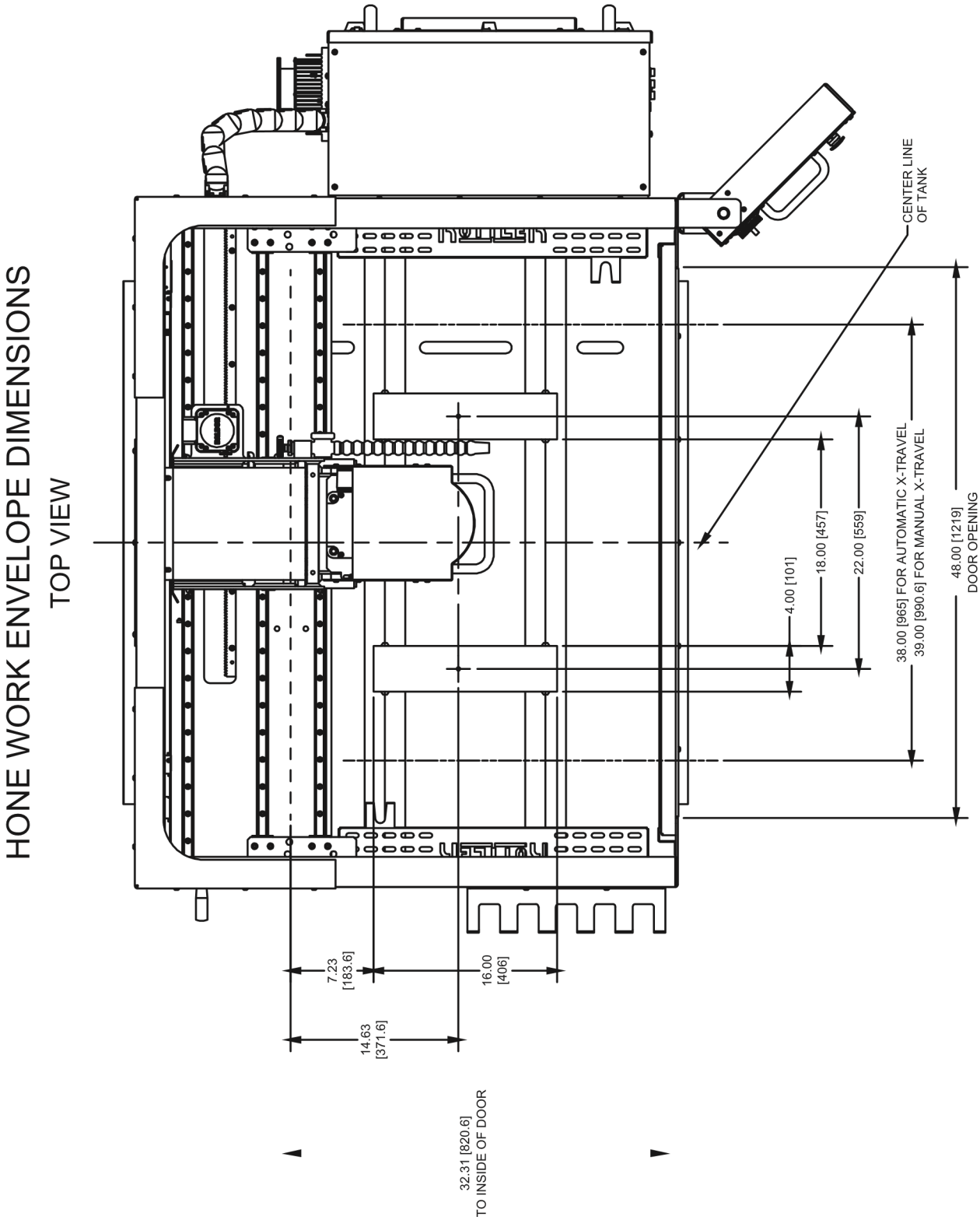
Side View

HONE WORK ENVELOPE DIMENSIONS

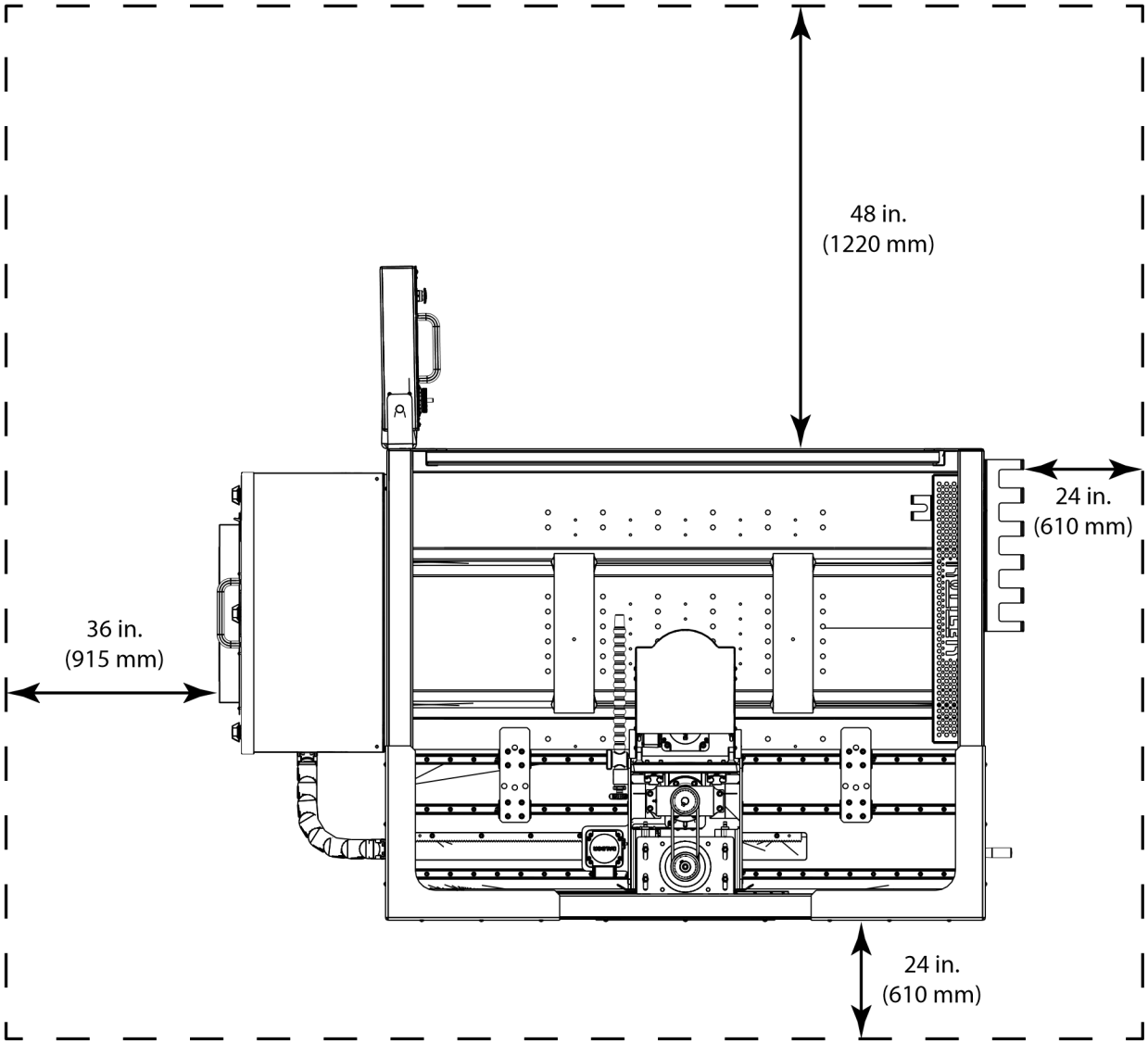
Side View


H80
Center Line Of Spindle
H85
86.87
[2206.5]
H87
120.37
[3057.4]
H85
26.75 -46.75
[679.5 - 1187.5]
H87
36.77 - 80.35
[934.0 - 2040.8]
8.23 - 13.75
[209.0 - 349.3]
H85
25.92
[658.4]
H87
36.42
[925.1]
12.14 - 17.79
[308.4 - 451.9]
MANUAL Y-TRAVEL
12.39 - 17.54
[314.7 - 445.5]
AUTOMATIC Y-TRAVEL
20.17 - 14.52
[512.2 - 368.7]
MANUAL Y-TRAVEL
19.92 - 14.77
[505.9 - 375.1]
AUTOMATIC Y-TRAVEL
32.31 [820.6]
TO INSIDE
OF DOOR

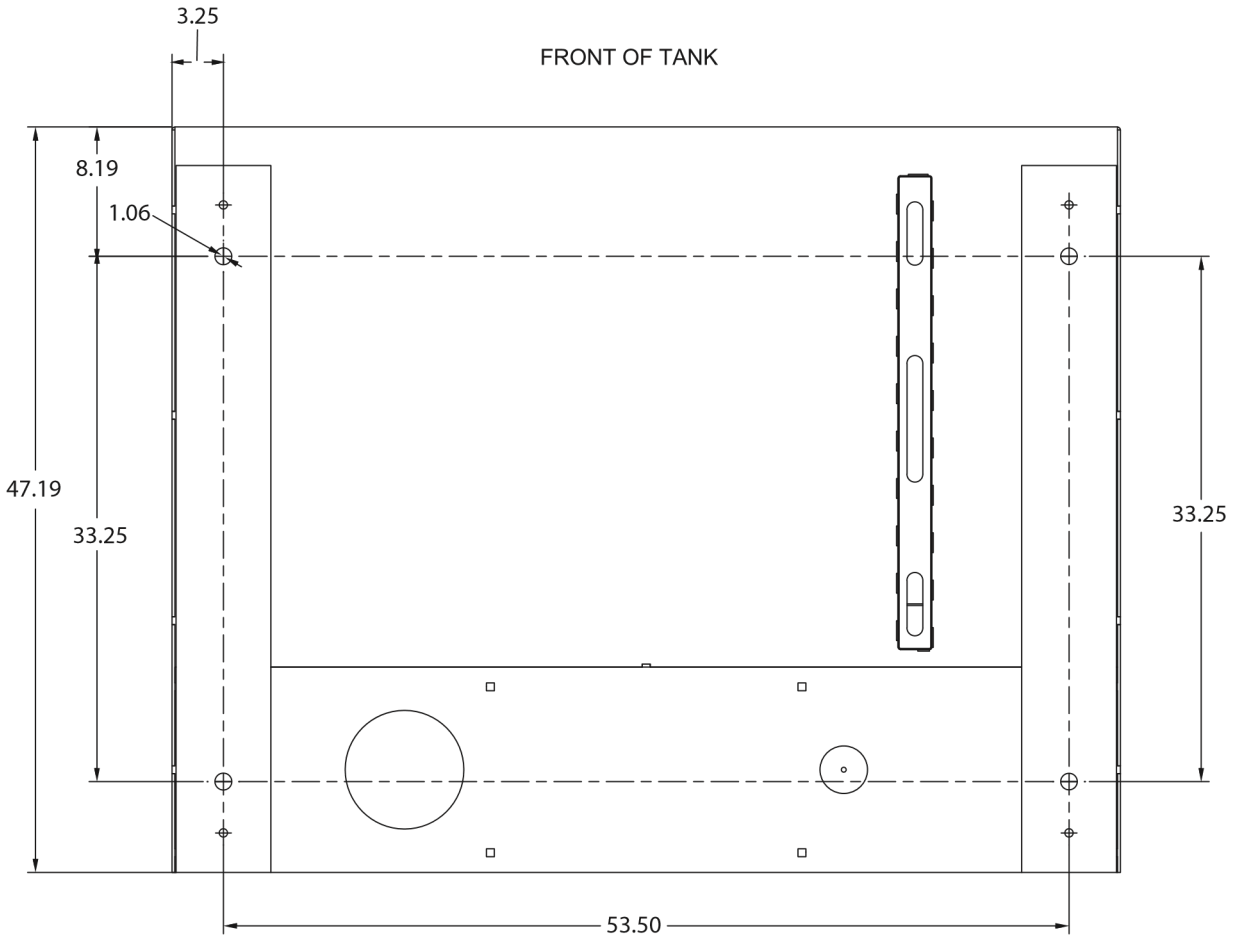
Top View


HONE WORK ENVELOPE DIMENSIONS
TOP VIEW
CENTER LINE OF TANK
4.00 [101]
18.00 [457]
22.00 [559]
38.00 [965] FOR AUTOMATIC X-TRAVEL
39.00 [990.6] FOR MANUAL X-TRAVEL
48.00 [1219] DOOR OPENING
7.23 [183.6]
16.00 [406]
14.63 [371.6]
32.31 [820.6] TO INSIDE OF DOOR

Machine Working Clearances



Optional Anchor Bolt Locations



Installation Procedure

Location

The productivity of this machine will depend to a great extent on its proper initial installation, particularly the means by which cylinder blocks are lifted into the machine as well as the material handling to and from other operations in your shop.

The proper loading arrangement and location for your H87AXY machine is extremely important.

A slow travel (6’ to 10’ per min.) power hoist, operated from either a bridge crane or a jib crane arrangement works very well. A 1000-lb. hoist is generally adequate for lifting the engine block. An air hoist with speed control makes an ideal method for fast, convenient loading.

If some production honing with this machine is anticipated, and the cylinder blocks are not directly loaded and unloaded from a conveyor, we would recommend considerable attention be given to the crane so that it covers an adequate area to allow the operator to back up and remove cylinder blocks without cluttering up his own area. If two machines are to be operated by one operator, we recommend that the open faces be placed at right angles to each other, with the machines approximately three feet apart.

Unpacking

Carefully uncrate the H87AXY Machine. Remove all equipment in splash tank.

Completely clean the machine exposed metal surfaces with solvent. Rust inhibitor is applied to the machine at the time of shipment and must be removed before operating the machine.

Leveling

Four cap screws and jam nuts are provided with the machine for leveling. Insert the screws from the bottom of the base. Place the jam nuts on top of the threaded hole in the base.

Using a precision level, level the upper table within .002” per foot in both directions (Except favor the high setting to the front for best coolant return).

Coolant

Refer to the Coolant section in Chapter 5 of this manual for proper coolant types and mixes. Be sure to read the MSDS section of this manual and exercise due caution concerning coolant hazard.

Power Supply

This machine has the following power requirements:

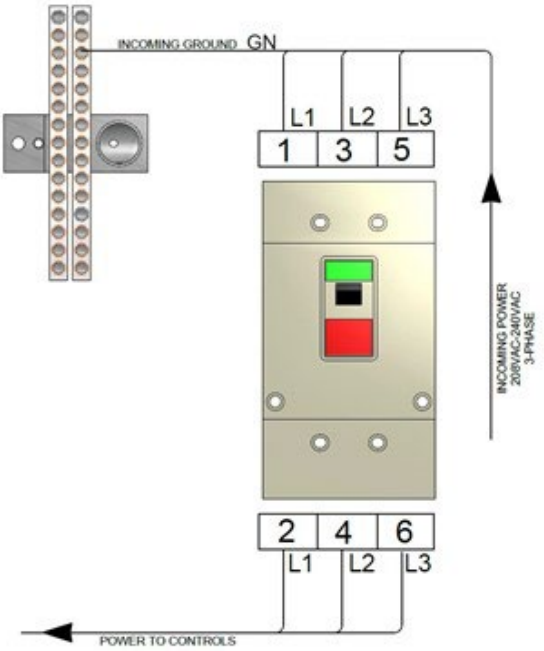
- 208 to 240 VAC
- Single or Three Phase Power
- 50 or 60 Hz
- 25 Amps

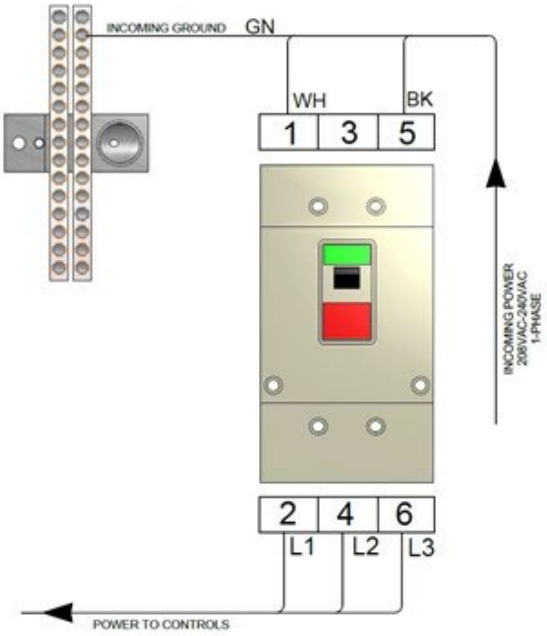
See illustration below for correct connection of incoming power. Measured power at the machine’s main breaker must be within the required range listed above. If incoming power is not within range, a transformer must be used. Failure to do so will cause the machine to function abnormally and cause permanent damage to the electronic control system.

Some electrical services contain a “Hot Leg, High Leg, or Wild Leg”, where one leg measures 208VAC to Ground instead of 120VAC. Use of the “Hot Leg, High Leg, or Wild Leg” is NOT permitted on this machine. If a “Hot Leg, High Leg, or Wild Leg” is present, connect the machine in the Single Phase configuration shown below.

IMPORTANT ***Electrically connect in accordance with national and local electrical codes.***

⚠ CAUTION ***Do not attempt to connect more 240VAC to this machine.***





Grounding

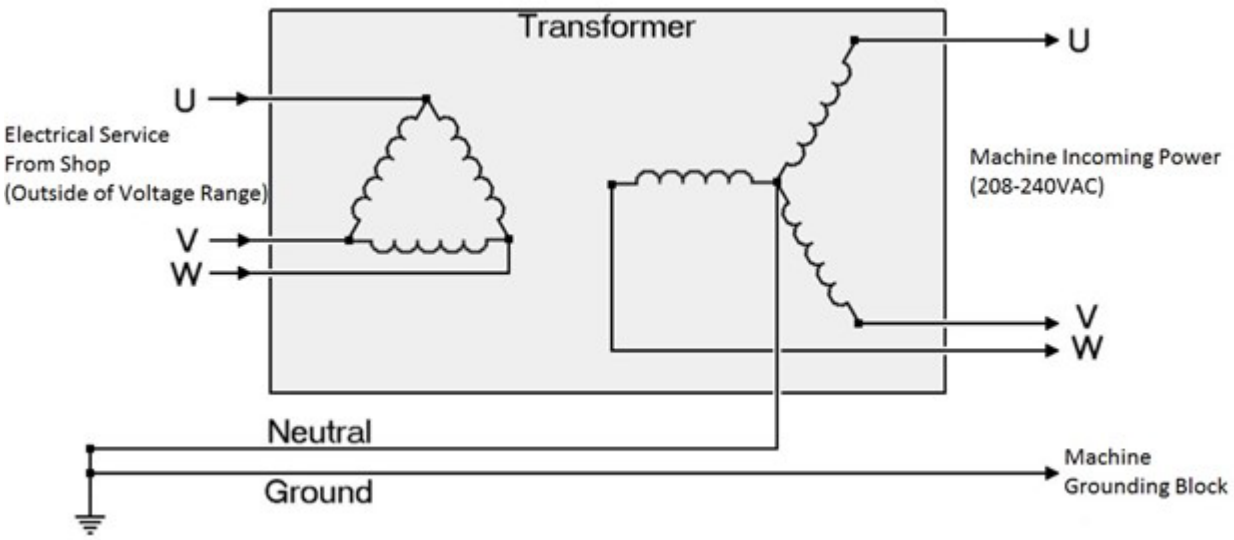
The machine requires a good earth ground. The grounding conductor from the incoming power source must be connected to the grounding block located inside of the electrical cabinet. A ground rod installed in addition to the electrical service grounding conductor is permitted, but must be connected directly to the grounding block inside of the electrical cabinet. Connecting the ground rod to the machine base is not permitted. Consult a Licensed Electrician in your area to assess the installation, and install the appropriate ground rod if necessary. Failure to do so may lead to an installation that is unsafe and does not meet national and local electric codes.

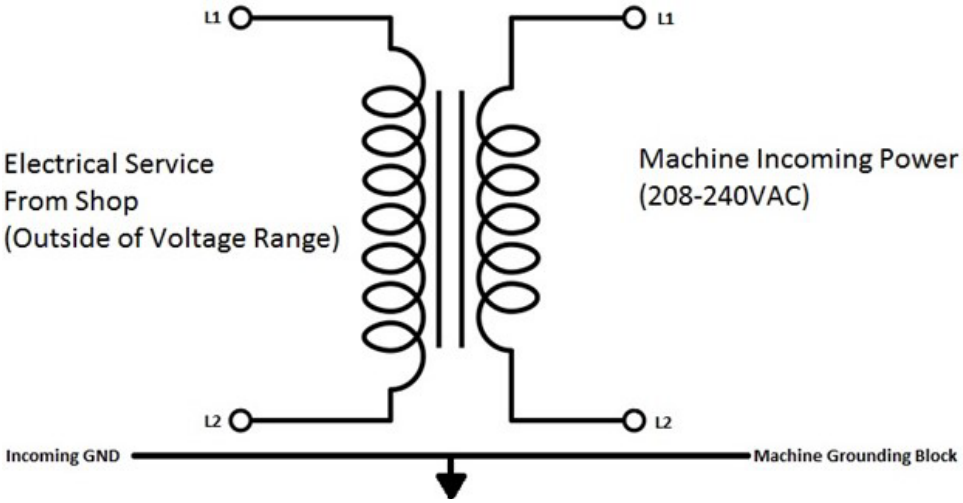
Transformer Connections

This machine has the following minimum transformer size requirement:

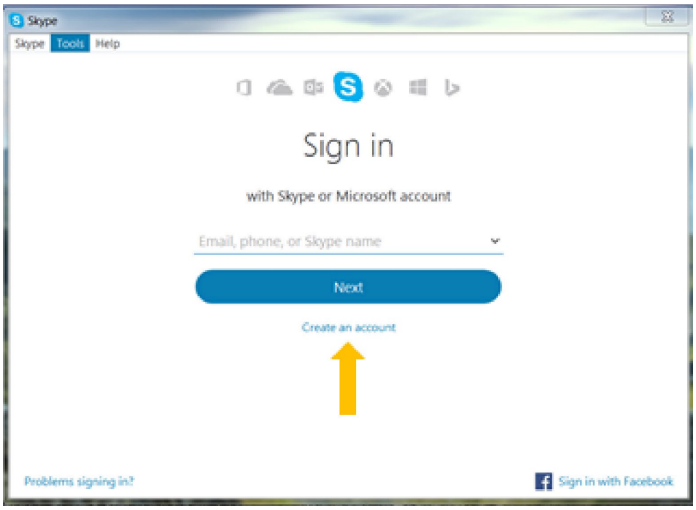
- 15 kVA

If a transformer is necessary for machine installation, please refer to the diagram below for connection information. Transformers must be sized to meet the minimum power requirements listed above. Consult a Licensed Electrician in your area for transformer selection and installation.

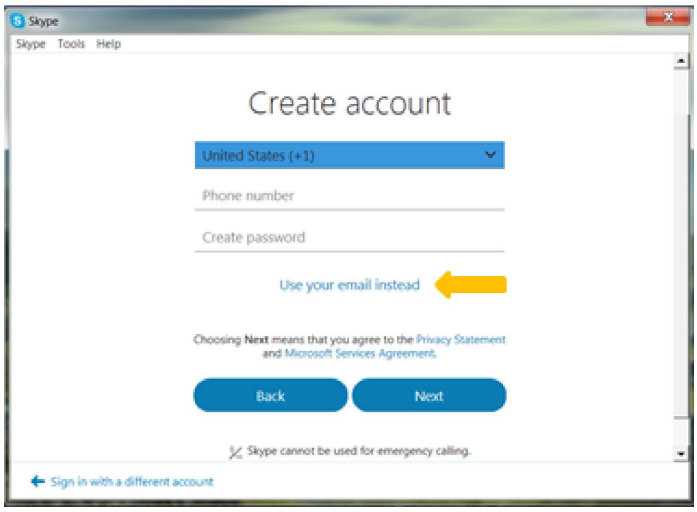




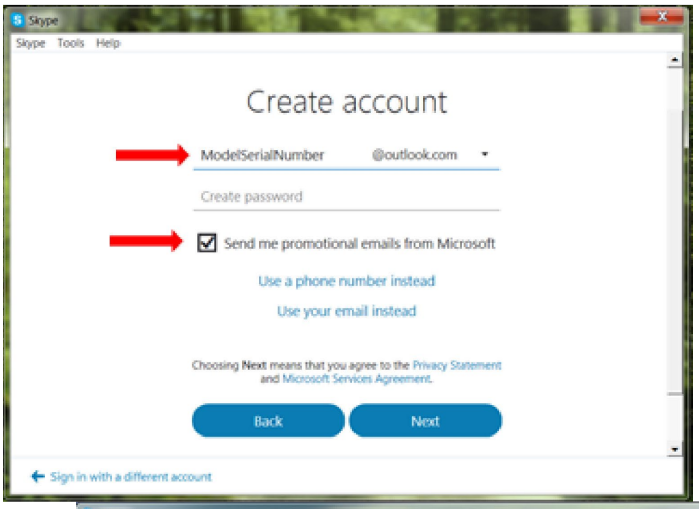
Creating a Skype Account

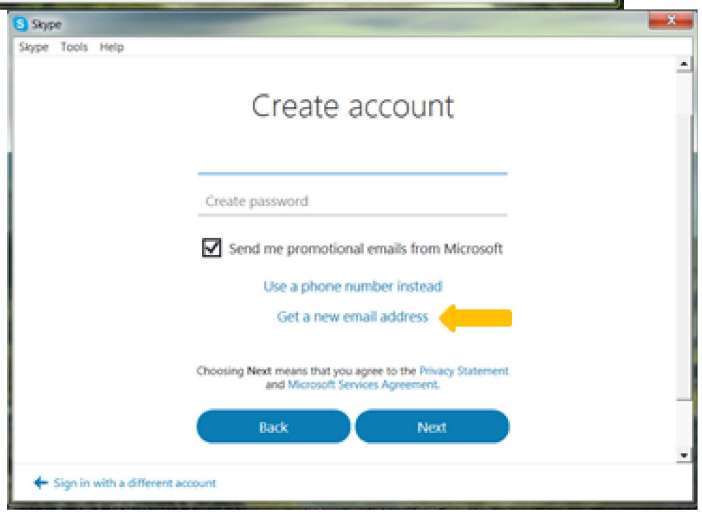


Click on create an account



Click on: Use your email instead

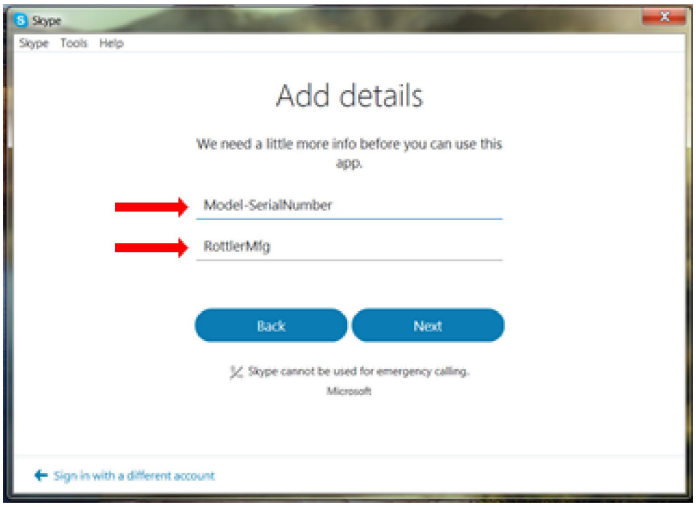




Click on: Get new email address Name the email account using the Rottler machine Model and Serial number. Ex: H85A111, EM69P001

Create a password that is easy to remember.

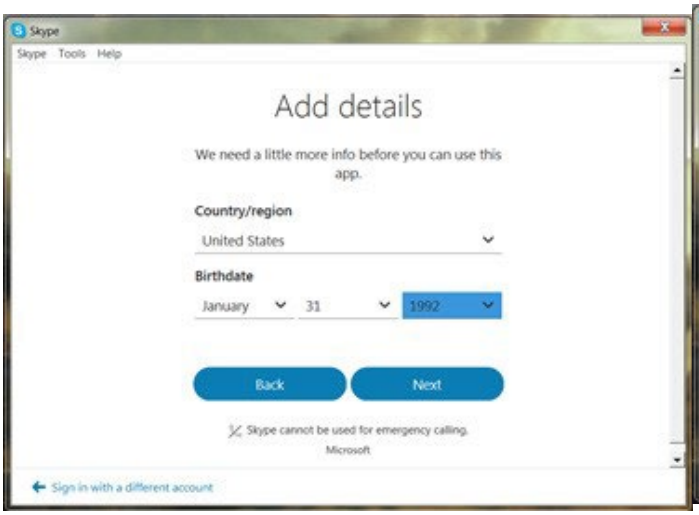
Uncheck the box to receive emails from Microsoft.



First Name: Model-Serial Number

Ex: H85A-111, EM69P-001

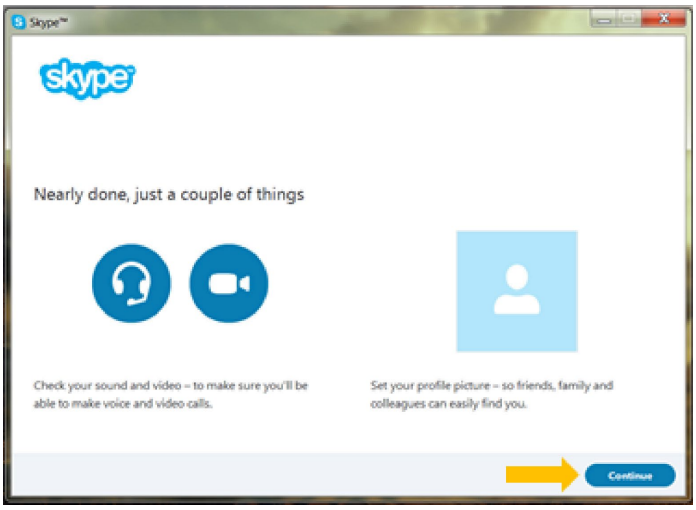
Last Name: RottlerMfg



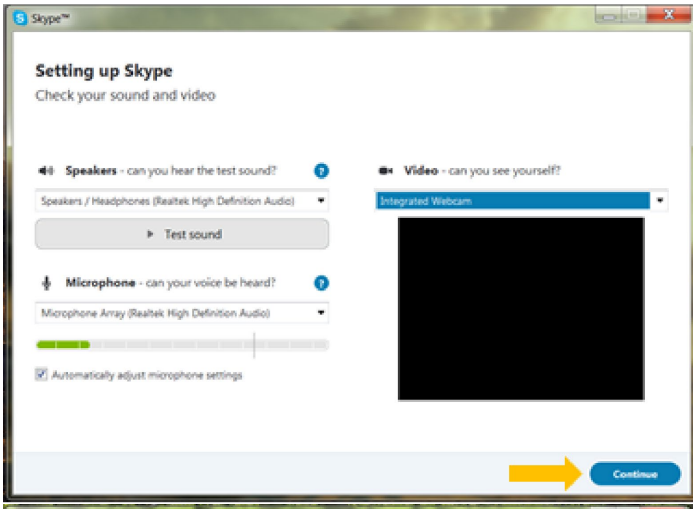
Select your Country/region

Birthday: Today's date, year 1992
Type the code exactly as it appears.

Click "Next"

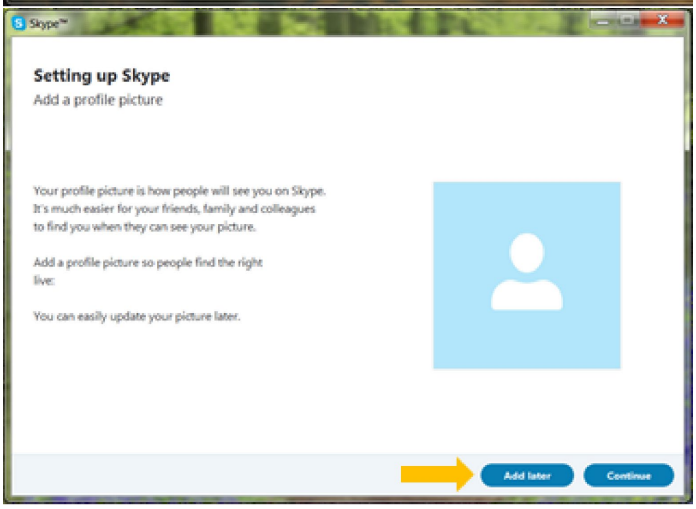


Click “Continue”



If your headset and/or web camera are hooked up you can verify that they are working here.

Otherwise, click “Continue”



Click “Add later” to skip this part.

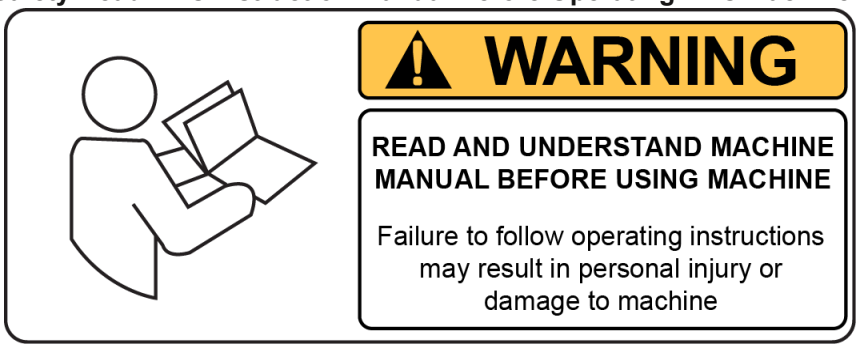
Your Skype account is set up and ready for use.

SAFETY

Contents

Safety Information

For Your Own Safety Read This Instruction Manual Before Operating This Machine.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER **DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

WARNING **WARNING indicates a potentially hazardous situation which, if not avoided, could result in serious injury.**

CAUTION **CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**

CAUTION **CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.**

WARNING **This machine is capable of causing severe bodily injury.**

Safety Instructions for Machine Use

KEEP GUARDS IN PLACE and in proper working order.

KEEP WORK AREA CLEAN. Clean spilled coolant from floor to avoid slipping hazard.

KEEP CHILDREN AND VISITORS AWAY. All children and visitors should be kept a safe distance from work area.

WEAR THE PROPER APPAREL. DO NOT wear loose clothing, gloves, rings, bracelets, or other jewelry which may get caught in moving parts. Non-Slip foot wear is recommended. Wear protective hair covering to contain long hair.

ALWAYS USE SAFETY GLASSES Everyday eye glasses only have impact resistant lenses, they are NOT safety glasses.

DO NOT OVER-REACH. Keep proper footing and balance at all times.

USE THE RECOMMENDED ACCESSORIES. Consult the manual for recommended accessories. The use of improper accessories may cause risk of injury.

CHECK DAMAGED PARTS. Before further use of the machine, a guard or other part that is damaged should be checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, breakage of parts, mounting, and other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.

NEVER OPERATE A MACHINE WHEN TIRED, OR UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.
Full mental alertness is required at all times when running a machine.

NEVER ALLOW UNSUPERVISED OR UNTRAINED PERSONNEL TO OPERATE THE MACHINE. Make sure any instructions you give in regards to machine operation are approved, correct, safe, and clearly understood.

IF AT ANY TIME YOU ARE EXPERIENCING DIFFICULTIES performing the intended operation, stop using the machine! Then contact our service department or ask a qualified expert how the operation should be performed.

CAUTION

No list of safety guidelines can be complete. Every shop environment is different. Always consider safety first, as it applies to your individual working conditions. Use this and other machinery with caution and respect. Failure to follow guidelines could result in serious personal injury, damage to equipment or poor work results.

Electrical Power

All electrical power should be removed from the machine before opening the rear electrical enclosure.

In the event of an electrical short, grounding reduces the risk of electric shock by providing a path of least resistance to disperse electric current.

Electrocution or a fire can result if the machine is not grounded correctly. Make sure the ground is connected in accordance with this manual. DO NOT operate the machine if it is not grounded.

CAUTION **No single list of electrical guidelines can be comprehensive for all shop environments. Operating this machinery may require additional electrical upgrades specific to your shop environment. It is your responsibility to make sure your electrical system comply with all local codes and ordinances.**

Machine Operator

Operator of this H87AXY Honing machine should be a skilled machinist craftsman: that is well versed in the caution, care, and knowledge required to safely operating a metal cutting tool.

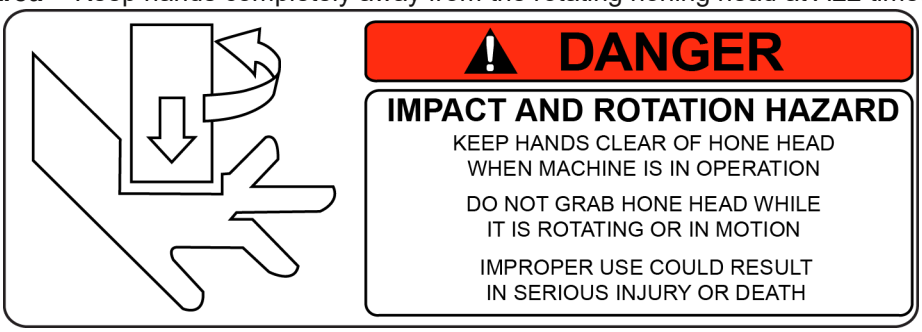
If the operator is not a skilled machinist, the operator must pay strict attention to the operating procedure outlined in this manual, and must get instruction from a qualified machinist in both the productive and safe operation of this H87AXY Honing Machine.

Rottler H87AXY Honing equipment has the following areas of exposed moving parts that you must train yourself to respect and stay away from when they are in motion:

Safety glasses are recommended while machine is running.

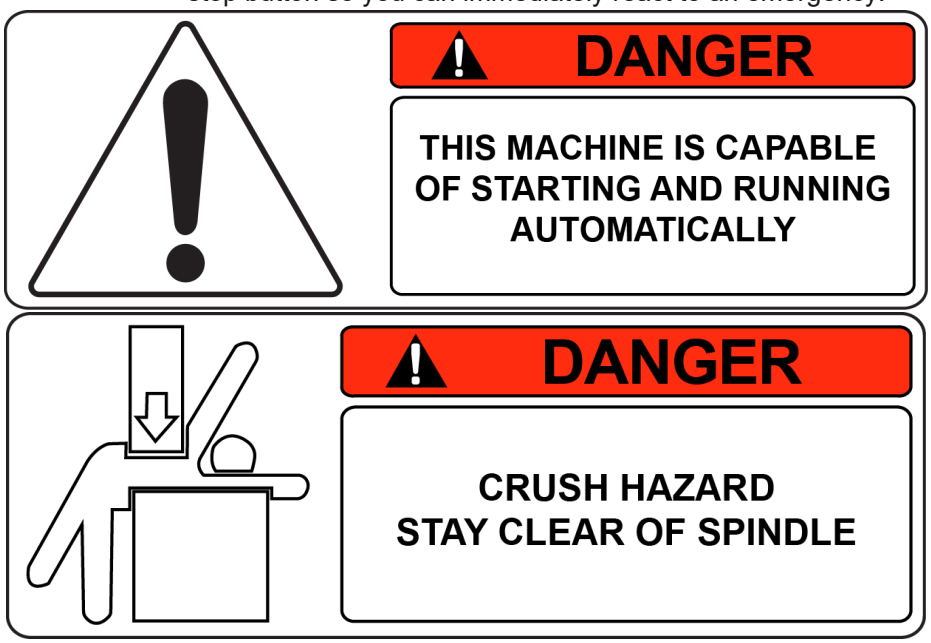
⚠ WARNING **Work Clamping** - Be sure work is clamped securely in accordance with the instructions.

Hone Head Area - Keep hands completely away from the rotating honing head at *ALL* times.



Honing - Do not engage rotation power when hone is out of a cylinder.

⚠ CAUTION **Operator Controls** - Familiarize yourself with the exact location of the e-stop button so you can immediately react to an emergency.



Keep clear of spindle when working in tank area. Spindle can drop if there is a failure in the machine. Move spindle out of work area when changing blocks or fixtures.

IMPORTANT

Remember

Machine tools have the speed and torque to severely injure any part of the human body exposed to them.

Computer and Controller System Safety

The computer and controller are located in the main rear electrical enclosure. This unit is a full computer, running Windows 7 64 Bit operating system. Contact the factory if more information on the computer system is required.

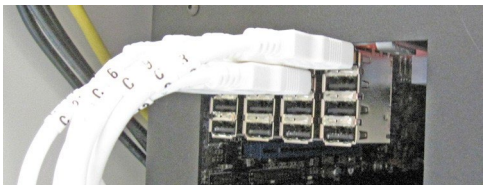
IMPORTANT: The computer in this machine has the ability to connect to the World Wide Web via Ethernet or Wireless using a USB wireless (Wi-Fi) adapter. Updating the Rottler software should ONLY be done when directed to do so by a Rottler service technician. Updating Rottler Software when not directed by Rottler personnel will result in a non-operational machine.

The machine should be hooked up to the Internet anytime it is on. The software on the machine will automatically connect to our server to send back useful information on machine status.

Any "IT" personnel should ALWAYS get approval from Rottler before doing ANYTHING on the computer.

⚠ DANGER This machine is capable of causing severe injury or death. Doing any of the following without Rottler's direct consent may cause severe injury or death.

⚠ WARNING Do not attempt to install USB devices in the PCI ports. These ports have high voltage and any attempt to connect a USB device in these ports will result in destruction of that device. There is also the possibility of damage to the computer system of the machine.



⚠ WARNING Downloading any program or changing any Rottler or Computer settings may cause the machine and/or software to become unstable. DO NOT install ANY screen saver, Anti-Virus, Spyware or any type of Security software on the computer. This could create a hazardous environment for the operator and personnel around the machine. Performing any of the above will also result in the machine warranty being NULL and VOID.

⚠ WARNING DO NOT connect any type of external hardware to the computer via USB or any other means. Do not install any type of Device Driver. This could create
a hazardous environment for the operator and personnel around the machine. Performing any of the above will also result in the machine warranty being NULL and VOID.

Electrical Safety Features Of Rottler DM Controlled Machines

All Rottler machines that use the DM operational control system are designed to comply with all applicable safety standards. This includes but is not limited to the following systems:

Thermal sensors in all motors and motor controls.

1. Current sensors in all motor control panels.
2. Electrical breakers to prevent voltage surges and spikes from reaching electrical system.
3. Electrical lockout on main electrical enclosure.
4. E-Stop that shuts down all operational systems in an event of an emergency.

All thermal and current limits for motors and motor controls are preset at the factory. In the event that any of those parameters are exceeded during operation of the machine, the machine control system will shut down the machine and a warning of the specific fault will appear on the control screen.

CONTROL DEFINITIONS

Contents

Control Definitions

The purpose of this section is to define the function of the buttons throughout the various screens. Certain button functions may not make sense right away in this section. As the operator reads through the Operating Instructions section of this manual, the function of these buttons will become clear.

NOTE: Not all modes of operation will be discussed in this Section. The function of several buttons and actions are the same in many modes. The description of a function or button operation will not be repeated if it exists in another mode. All modes of operation will be discussed in the Operations Section of this manual.

Computer and Controller System Safety for DM Controlled Machines:

The computer and controller are located in the main rear electrical enclosure. This unit is a full computer, running Windows 7 64 Bit operating system. Contact the factory if more information on the computer system is required.

IMPORTANT: The computer in this machine has the ability to connect to the World Wide Web via Ethernet or Wireless using a USB wireless (Wi-Fi) adapter. Updating the Rottler software should ONLY be done when directed to do so by a Rottler service technician. Updating Rottler Software when not directed by Rottler personnel could result in a non-operational machine.

It is recommended that the machine be hooked up to the Internet anytime it is on. The software on the machine will automatically connect to our server to send back useful information on machine status. It will also record performance parameters that will be used to evaluate any occurrence of a malfunction.

The Auto Update for the Windows Firewall (Security) and Windows Defender (Anti-Virus) is turned on. The computer will automatically download the updates and then install them when the computer is shut down every Friday night.

Any “IT” personnel should ALWAYS get approval from Rottler before doing ANYTHING on the computer.

⚠ WARNING Downloading ANY program from the Internet or by other means when not directed by Rottler is prohibited and will result in the machine warranty being NULL and VOID.

⚠ WARNING Downloading any program or changing any Rottler or Computer settings may cause the machine and/or software to become unstable. DO NOT install ANY screen saver, Anti-Virus, Spyware or any type of Security software on the computer. This could create a hazardous environment for the operator and personnel around the machine. Performing any of the above will also result in the machine warranty being NULL and VOID.

COMMON INTERFACE NOTICE

All Rottler machines using Direct Motion technology share a common control interface. This allows for a better environment for programing machine functions across a wide range of different machines. This also allows for easier deployment in shops already using Rottler Direct Motion machines.
Because of the common interface some machines may have buttons and menu tabs that may not be applicable to the machine that is being used. If the buttons or menu tabs are not mentioned in the control definitions section of the manual, they will not be used in machine operation.

Definitions Of Terminology Used In This Section

Screen: This is what appears on the monitor. There are different screens for setting up the machine and to operate it.
Icon: A small graphic that is located on the screen. The Icon is used to activate various programs related to machine operation.
Button: A small graphic that is located on the screen as part of group of buttons that is used to set up or operate the machine. A button has two different possible functions. One is when it is used as switch. When it is used as switch the button will either be on or off after it has been pressed and must be pressed again to revert to start status. The second is as contact switch. This is also called a momentary contact button. This button is active only while it is being pressed by the operator.
Click: This is a method of activating an icon or button using a computer mouse. On a touch screen such as the one that this machine is equipped with you can use your finger tip or a stylus to activate the icon or button.
Press or Touch: Use your finger tip to activate a button on the screen.
Activate: A way of indicating that button, menu title, or tab has been clicked on or pressed.
Tab: A small box located near the top of the screen. A tab will be labeled with the function of a screen that will appear when the tab is clicked or touched.
Value Box: This is where values that are needed to run a program are entered. Touching a value box will case a number pad to appear so that the desired value can be input.
Menu Title: A one or two word title that describes the contents of a menu. Clicking or touching an Option Title will cause a menu to appear below it.
Menu: A box that appears below an Option Title when it is activated. A menu will contain a number of functions that can be activated or deactivated by clicking or pressing the title. Or when activated another menu will open up with more functions that can be activated.
Pop Up Window: This is a box that will appear when certain buttons, menu titles, or value boxes are activated. These Pop Up Windows can be warnings, requests for input, or confirmation requests.

Hand Controls

E-STOP Switch

This switch is used in an emergency situation. Pushing the button in will disconnect the power to all the motors that run the machine except the coolant pump motor. The machine will stop dead in place when activated. To restore power to the machine turn the button clockwise until it pops out.

Handwheel

The handwheel is used to manually move the machine in different directions according to which axis is activated. The handwheel is also used to manually feed the stones in or out.

Boot Up Screen

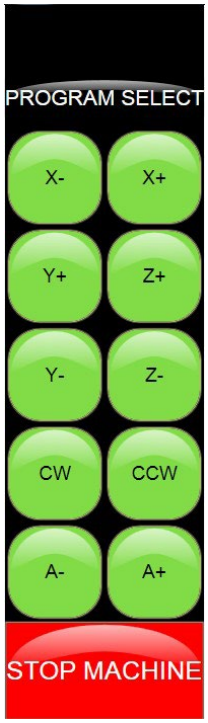
This is the screen you will see when first turn on the power.

Start Icon

Double Click or double press to start the Rottler operating program

Set Up Screen

Jog Button Panel



The jog buttons are momentary contact buttons. They activate rapid travel for the axis indicated on the button.

The X- button will move the carriage to the left.
The X+ button will move the carriage to the right.

The Z+ button will move the spindle up.
The Y+ button will move the carriage inward.

The Z- button will move the spindle down.
The Y- button will move the carriage outward.

The CW button will rotate the spindle clockwise.
The CCW button will rotate the spindle counter clockwise.

The A+ button will rotate the block fixture clockwise.
The A+ button will rotate the block fixture counter clockwise.

The Stop Machine button is used to stop the machine cycle before it has completed. The machine will complete a hone stroke and raise out of the cylinder.

When this icon replaces the Stop Machine button it indicates that the E-STOP switch is engaged and all motions buttons on the screen are disabled. The E-STOP switch must be released before any of the motion buttons on the display screen will respond.

Program Select Section Buttons

The Home button is use to index the hone head when it is installed on the machine. FIXTURE SELECT, and TABLE OF TOOLS buttons are not used on the H87AXY.

The New and Options, buttons are used for creating new engine block profiles that will be saved for later use. The Delete button is used for removing a block profile from the Program Select list.

Mode Select Sections Buttons and Menus.

Setup Software and Setup Electronics menu titles will open new options menus. These are mostly used for machine setup at the factory or for service. There are 2 options that an operator can select if needed and will be explained further on.

The Help menu title will open the help and instruction files for the machine.

New Button: This button is used to bring up a pop up screen where a machining process will be chosen for use. The process will appear below the Mode Select buttons.

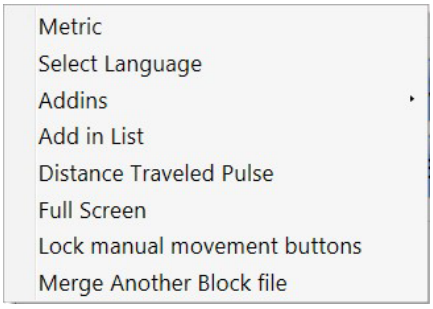
Std Setup Button: This button will insert all processes that are available for this machine in the area below the Mode Select buttons.

Options Button: This button will bring up a pop screen that will allow the operator to change the name of the process that was highlighted.

Delete Button: This button will delete any process that has been highlighted.

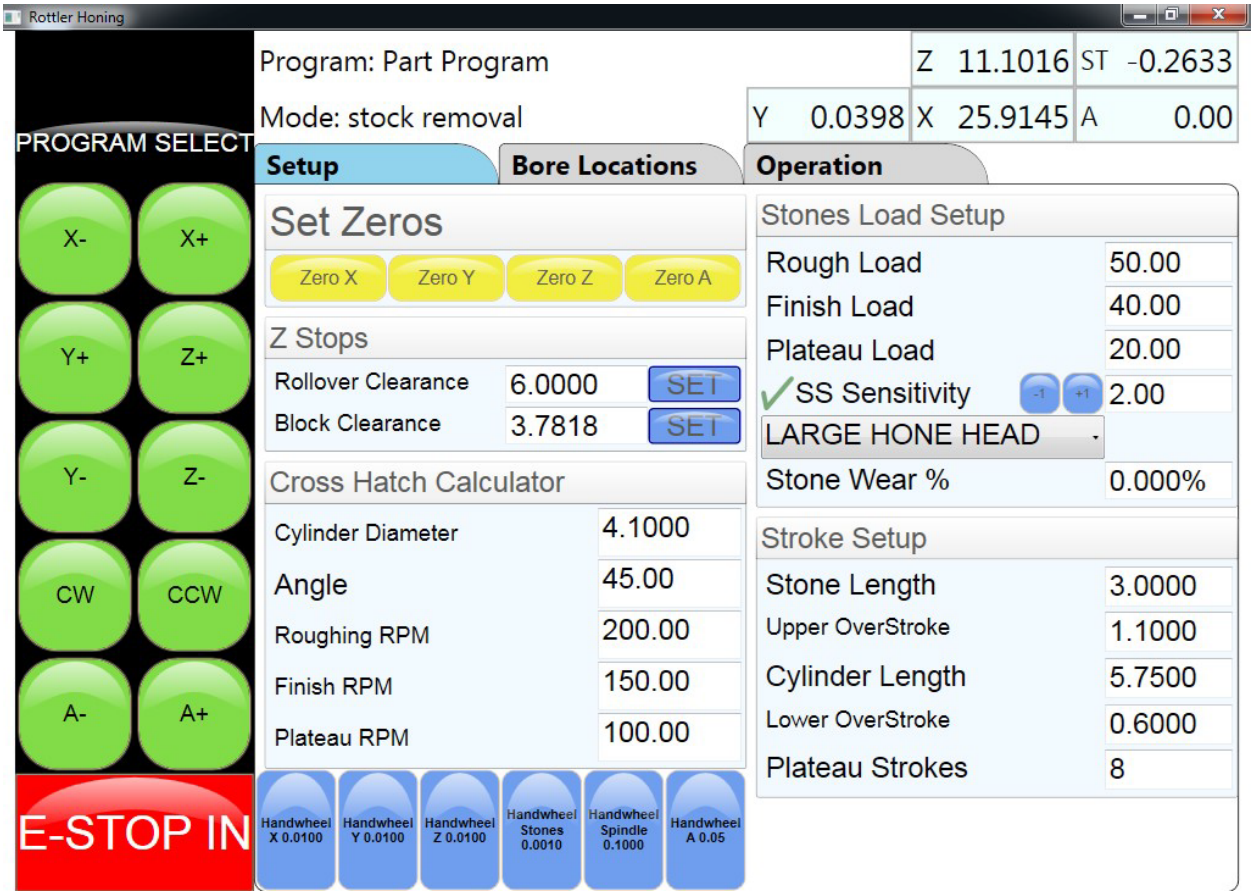
Select Button: This button will bring up the Operation Screen once a block program and a process have been highlighted.

Software Setup Menu



This is the menu that appears when the Setup Software title is touched. Here the operator can choose to change to metric display readings by checking the Metric title. Inch display readings can be restored by unchecking the Metric title box.
A different language can be used by touching the Select Language title and choosing for the languages that appear.

Operation Screen



At the top of the screen you will see the block and process that was selected. In the upper right section there is a readout of current location of the different axis's. ***All readings are plus or minus from the zero set points.*** (The A axis readout will only show a reading if the optional auto rotate fixture is installed)

Screen Tabs: When the Setup, Bore Locations, or Operation tab is touched the corresponding screen for that tab will appear. These different screens are used for programing and operation of the machine.

Handwheel Buttons

At the bottom of the screen are 4 buttons. When a button is touched and activated the operator will be able to control the axis indicated on the button by using the handwheel. The active button will turn red after it is touched.

Handwheel X Button: When this button is activated the operator will be able to move the carriage to the right or left using the handwheel. Each notch or click of the handwheel will move the carriage 0.010 of an inch. Turning the handwheel clockwise or to the plus side will cause the carriage to move to the right. Turning the handwheel counter clockwise or to the minus side will cause the carriage to move to the left.

Handwheel Y Button: When this button is activated the operator will be able to move the carriage inward or outward using the handwheel. Each notch or click of the handwheel will move the carriage 0.010 of an inch. Turning the handwheel clockwise or to the plus side will cause the carriage to move inward. Turning the handwheel counter clockwise or to the minus side will cause the carriage to move outward.

Handwheel Z Button: When this button is activated the operator will be able to move the spindle up or down using the handwheel. Each notch or click of the handwheel will move the spindle 0.010 of an inch. Turning the handwheel clockwise or to the plus side will cause the spindle to move up. Turning the handwheel counter clockwise or to the minus side will cause the spindle to move down.

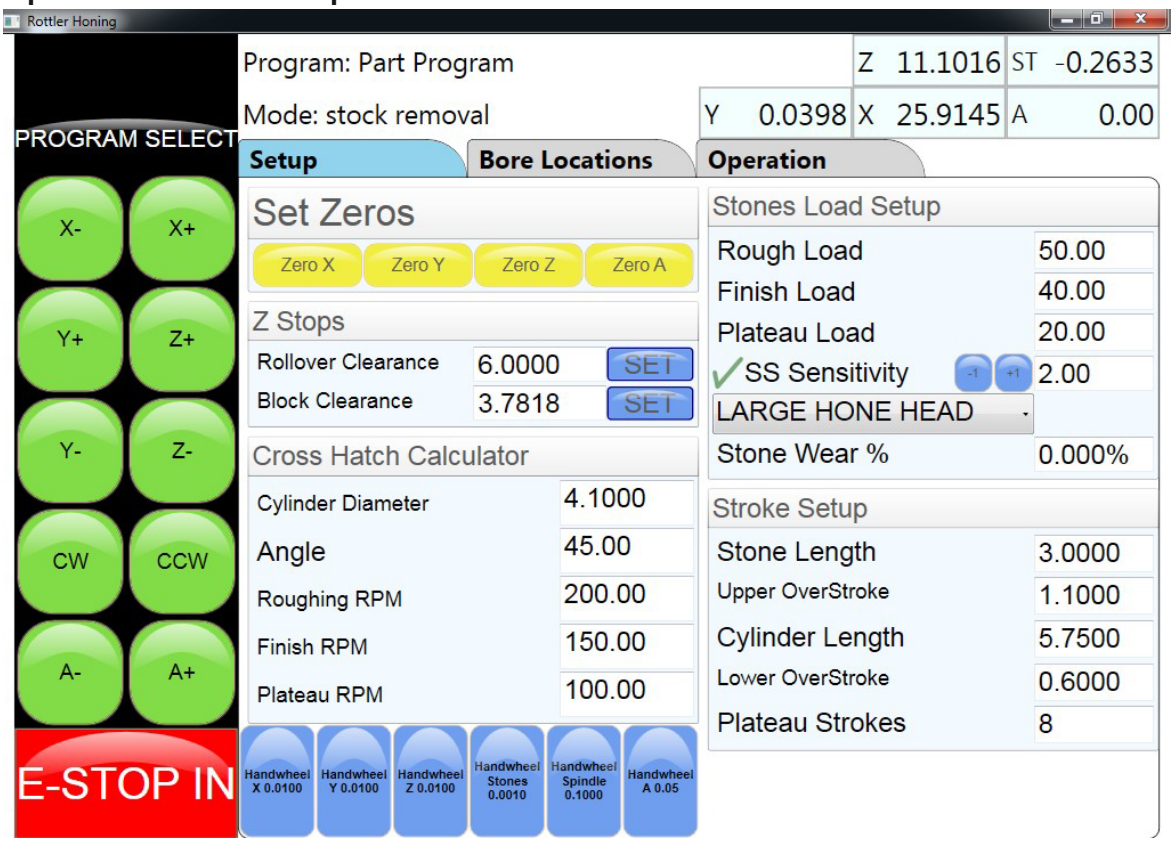
Handwheel Stones Button: When this button is activated the operator will be able to feed the stones in or out using the handwheel. Each notch or click will increase or decrease the diameter of the stones by

0.001 of an inch. Turning the handwheel clockwise or to the plus side will cause the stones in increase in diameter. Turning the handwheel counter clockwise or to the minus side will cause the stones to decrease in size.

Handwheel Spindle Button: When this button is activated the operator will be able to rotate the spindle clockwise or counter clockwise using the handwheel. Each notch or click of the handwheel will rotate the spindle 0.10 of an inch. Turning the handwheel clockwise or to the plus side will move the spindle clockwise. Turning the handwheel counter clockwise or to the minus side will move the spindle counter clockwise.

Handwheel A Button: When this button is activated the operator will be able to rotate the block fixture clockwise or counter clockwise using the handwheel. Each notch or click of the handwheel will rotate the spindle 0.050 of an inch. Turning the handwheel clockwise or to the plus side will move the cradle clockwise. Turning the handwheel counter clockwise or to the minus side will move the cradle counter clockwise.

Operation Screen: Setup Tab



Set Zeros Buttons

These button will set the zero point for each axis that is indicated on the button. When touched a conformation pop up screen will appear to confirm that the operator wants to set the zero point.

Z Stops

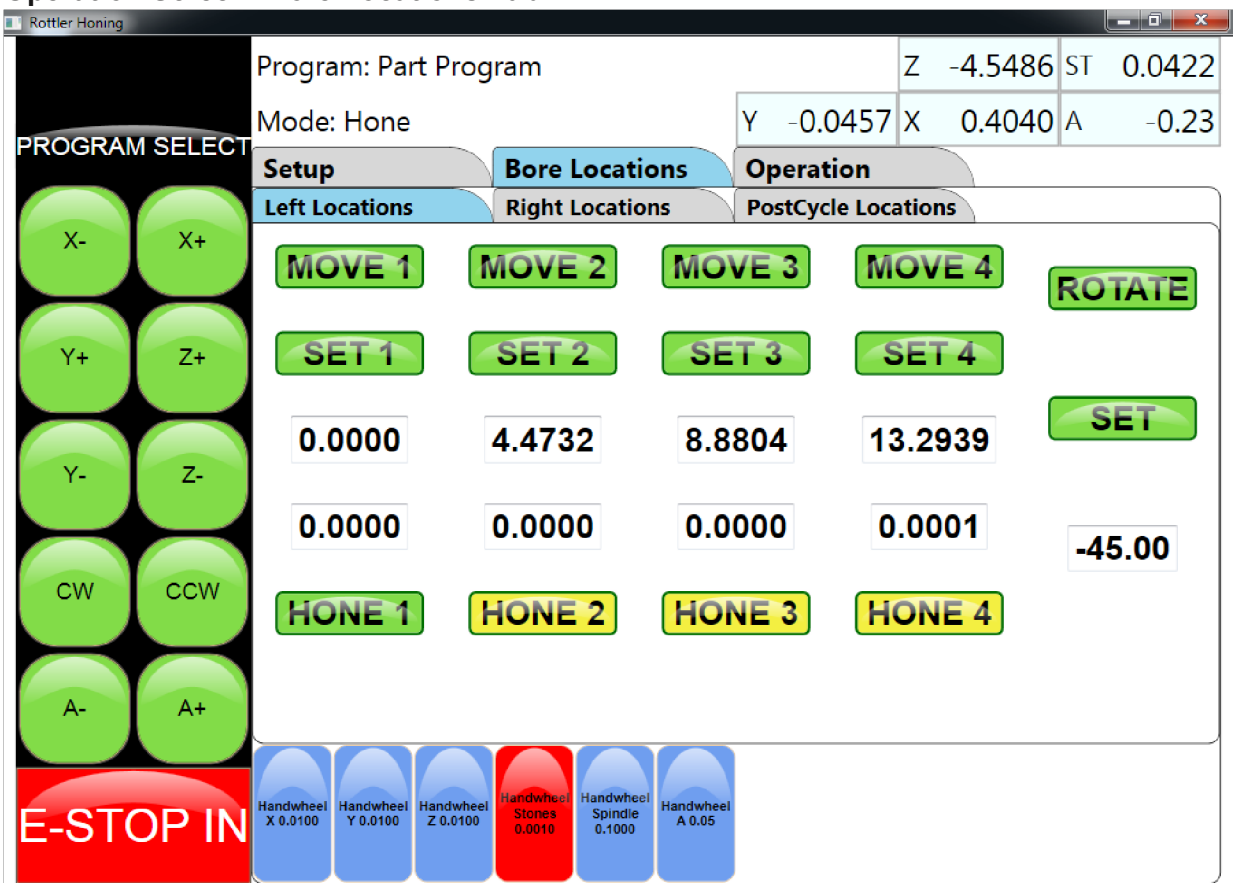
This section is where the clearance height for the hone head is set. A value can be entered by touching the value box and keying in the value on the pop up number pad. Or the hone head can be moved to the desired location using the Z Axis jog button or handwheel. When the hone head is in the desired position the operator can touch the set button to enter the value that is in the value box.

Cross Hatch Calculator
This section is where the operator will enter values into the appropriate boxes to set up the auto cross hatch function. The operator will input the cylinder diameter and desired crosshatch angle. The Roughing, Finish, and Plateau RPM's are also input in this section.

Stones Load Setup
This is the section where the operator will enter the desired running loads for different processes. Values are entered by touching the proper value box and entering the desired value on the number pad that appears. Short Stroke Sensitivity is set using the value box or by pressing the + or - buttons. The SS Sensitivity can be enabled or disabled by activating or deactivating the check mark. The operator will also indicate which hone head will be used for the job.

Stroke Setup
This is the section where the operator will enter information to determine how far the spindle will travel while it is stroking up and down. The bottom value box is where the number of strokes to be used in the plateau mode is entered.

Operation Screen: Bore Locations Tab



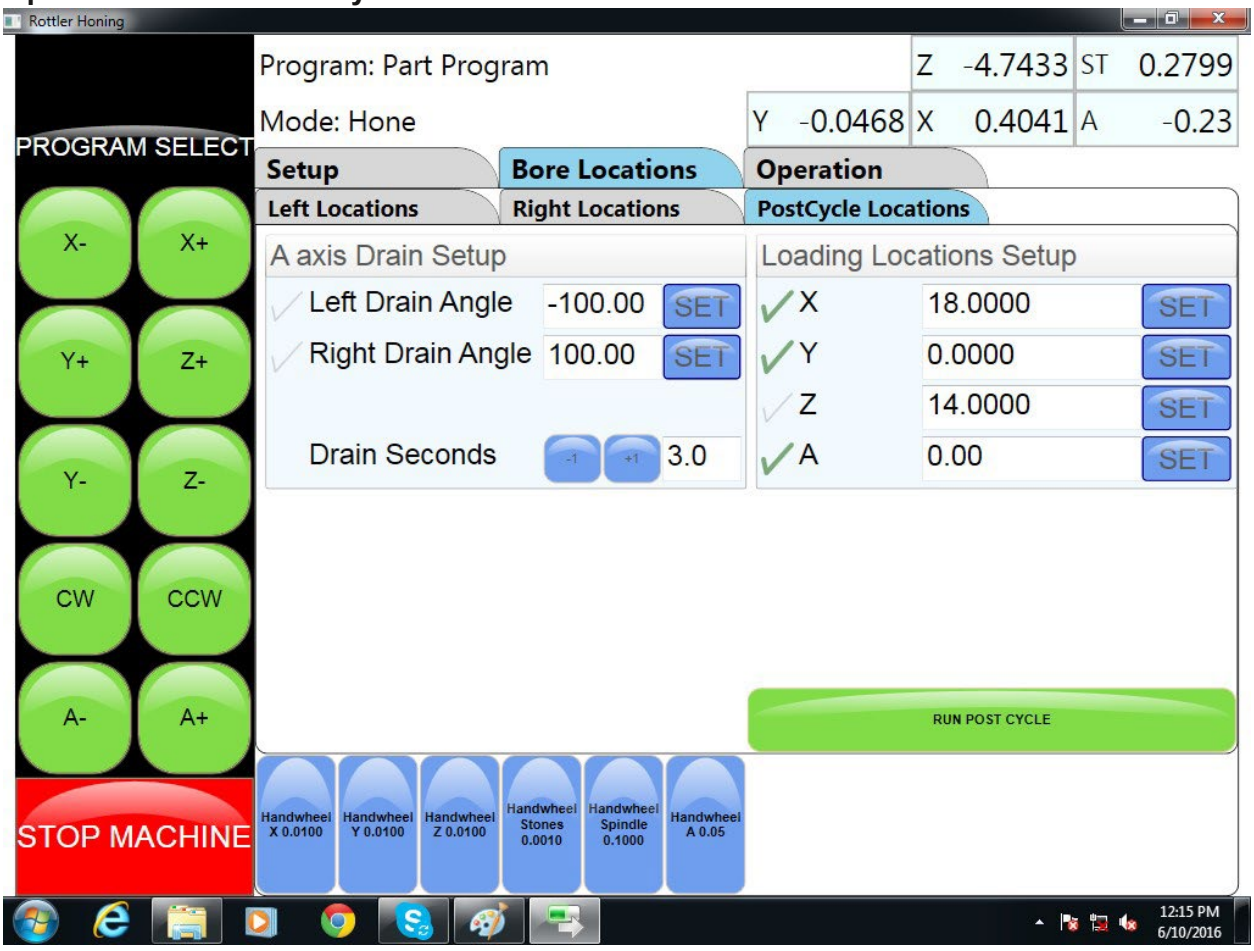
This is the screen where the operator will enter the values for center to center bore dimensions. This will enable the machine to move automatically from bore to bore. Move 1 value will be 0.000 since this is the start point for the honing process. Each succeeding value box will add the center to center bore dimension to the previous value.

Move Buttons
If the operator touches one of the Move buttons the carriage will move to the position that is entered in the value box below the bottom.

Hone Buttons
These buttons are used to determine if that cylinder will be honed during the auto honing process. When touched the button will turn yellow and indicated that the cylinder will not be honed during the auto honing process. Individual buttons can be deactivated if the operator wants to bypass honing a specific cylinder during the auto honing process.

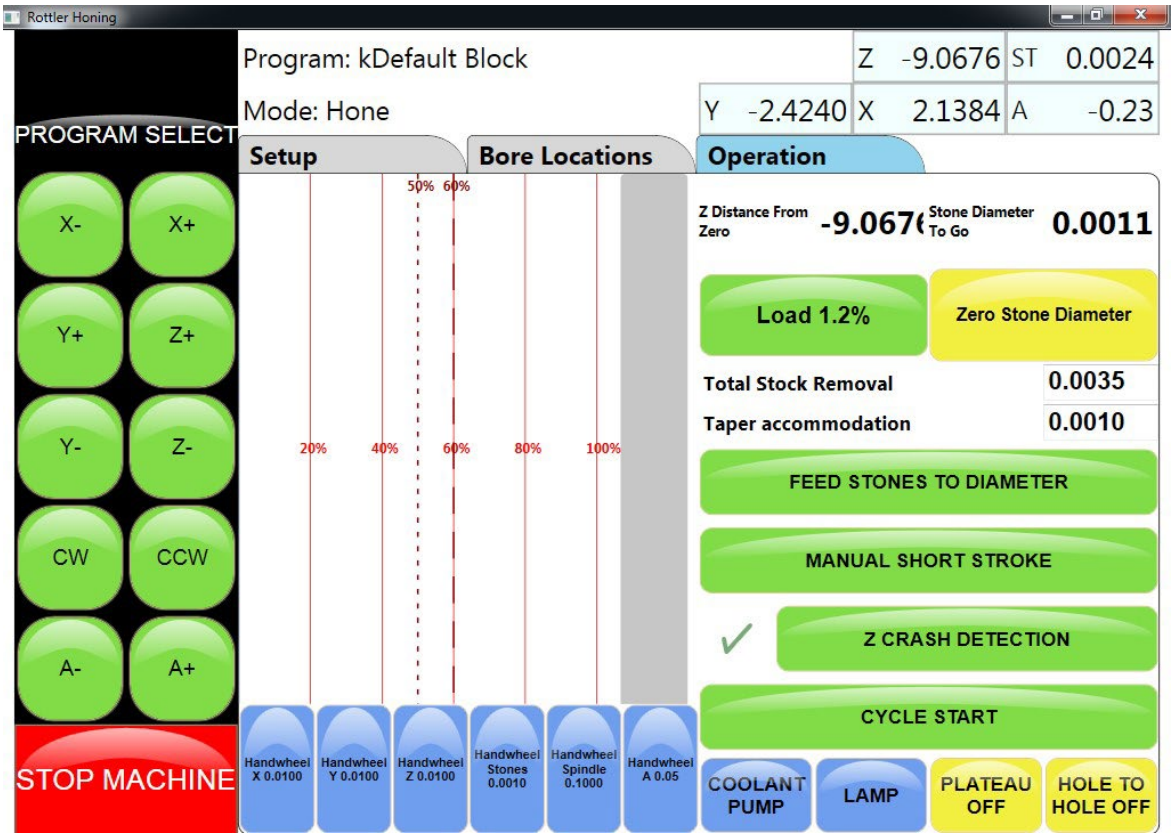
Left and Right Locations Tabs
If a V Block is to be honed then it will be necessary to enter values for the right side bank after touching the Right Locations tab to bring up the screen. The values will be different than for the left side since there will be a need to account for the cylinder offset from bank to bank. This will be covered fully in the Operations Section.

Operation Screen: PostCycle Locations Tab



This tab is only used if the machine is equipped with a automated block fixture. The operator will set values to over rotate the block for drainage purposes and amount of time to pause at each point. The operator will also set the axises values to move the carriage and set the block fixture for unloading of the block.

Operation Screen: Operation Tab



This is the screen where the honing operation will be run from. At the top under the Operation Tab are 2 readouts. The first is Z Distance From Zero. This reading shows the location of the spindle from the zero point. The second is Stone Diameter To Go. This readout shows how much the stones must still feed out to reach the Total Stock Removal setting.

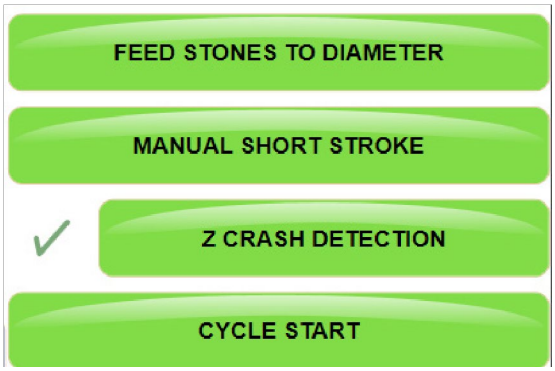
Load Reading Button
This is a non-functional button. This is where the spindle motor load reading is displayed. The button color will change as load increases. Green indicates that the motor load is in its optimal area. Yellow indicates that the motor load is slightly high. Red indicates that the motor load is excessive.

Zero Stone Diameter Button
This button is used to set the zero setting for the stone diameter.

Total Stock Removal Value Box
This is where the operator will enter a value for the amount of stock to be removed from a cylinder.

Taper Accommodation Value Box
If the block to be honed has taper present, then the amount of taper must be entered in this box to prevent the Z Crash Detection system from activating due to encountering a smaller than expected bore.

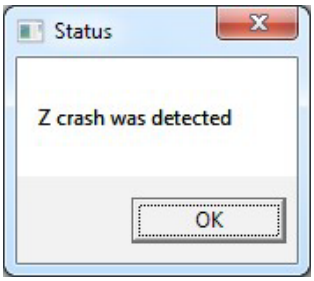
Operation Buttons



FEED STONES TO DIAMETER Button
When this button is active touching it will cause the spindle motor to start and the stones to feed out until the finish load setting is reached. When that occurs the spindle motor will shut off. This is the zero point for the stone diameter. The operator will touch the Zero Stone Diameter button to set the zero point for the stones. This button is active only if the check mark is visible next to the button. The check can be turned on or off by touching the check mark box.

MANUAL SHORT STROKE Button
When pushed and activated this button will cause the hone to short stroke ant the bottom of the bore for as long as the button is held on.

Z CRASH DETECTION Button
When this button is active the machine will automatically detect and interference points that will come in contact with the bottom of the stones. When auto cycle is started the machine will run a test to determine if there is any interference points on each cylinder before honing begins. If an interference point is detected the machine will stop. When the machine is moving from cylinder to cylinder the machine will detect if the stones are not properly entering the bore and stop before damage can occur.



If there is an occurrence of an interference point being detected the machine will stop and a pop up screen will appear on the screen.

CYCLE START Button
This is the button that is touched to begin the auto honing cycle process. The machine will complete the entire process of honing all the cylinders that have been tagged to hone. The machine can be stopped mid cycle by touching the Stop Machine button. If an emergency arises or if the screen does not respond to touch commands the E-STOP can be used to stop the machine.

COOLANT PUMP and LAMP BUTTONS

These buttons turn the coolant pump and lamps on or off. When they are on they will be red in color. The coolant pump and lamps have an independent power supply and will work even if the E-STOP is engaged.

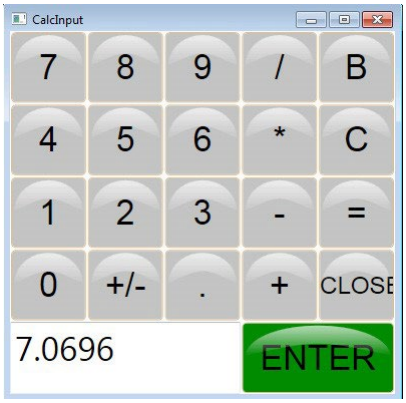
PLATEAU Button
This button will turn the Plateau mode on or off. When it is on the button will turn red and the numbers of strokes to be used for the process is displayed on the button.

HOLE TO HOLE Button

This button will turn on the automatic hole to hole honing process. When the button is red and ON is displayed the machine will automatically move to each hole in the programed process that is engaged by touching the CYCLE START button. When button is yellow and OFF is displayed on the button only the cylinder that is aligned with the stones will be honed.

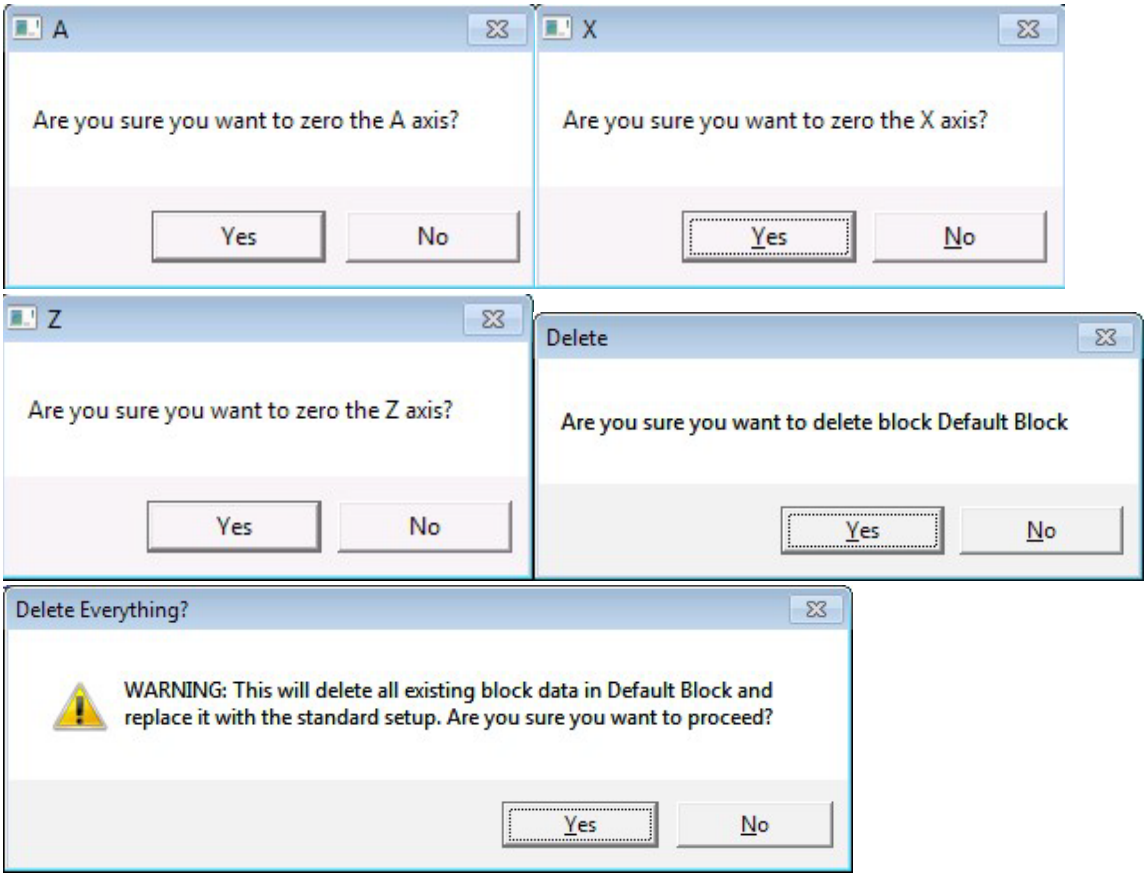
Pop Up Windows and Menus

Number Pad



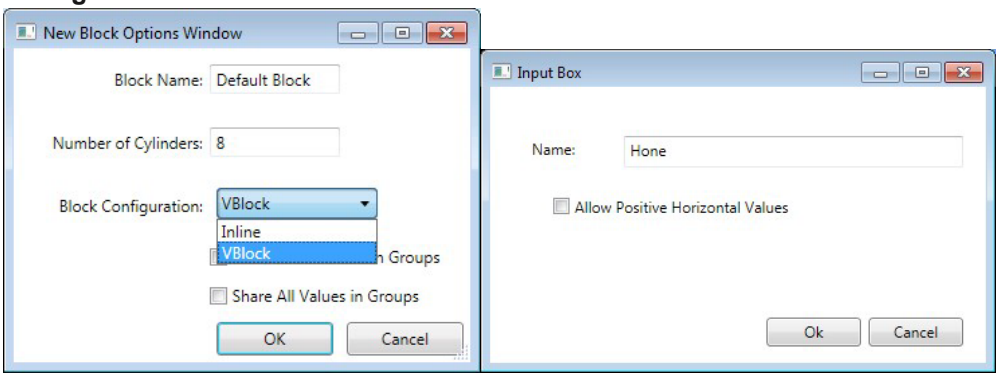
This window will pop up when the operator touches a value box. The operator will input the value desired and then touch ENTER to place the value in the value box.

Conformation Windows



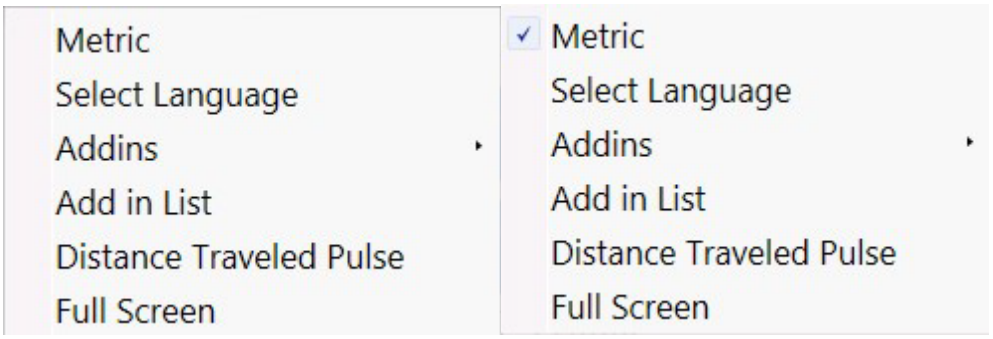
These windows will pop up to confirm that the operator wants complete an action.

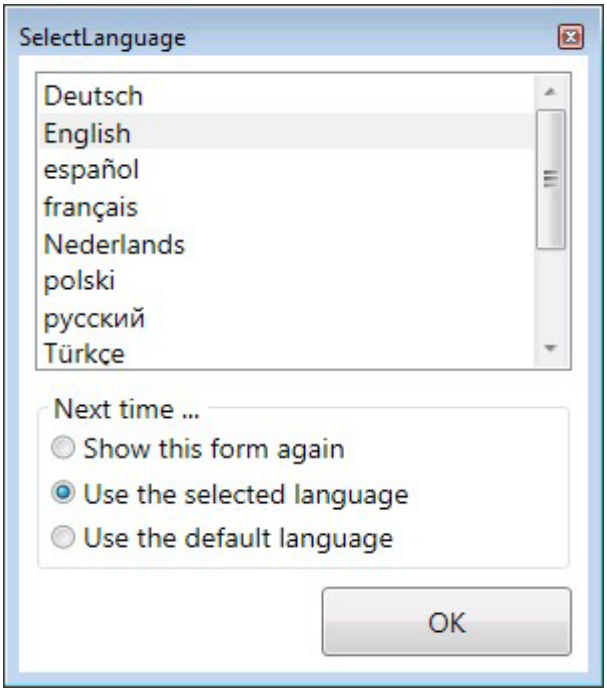
Change and Choose Windows



These windows will pop up when the operator wants to enter or change information.

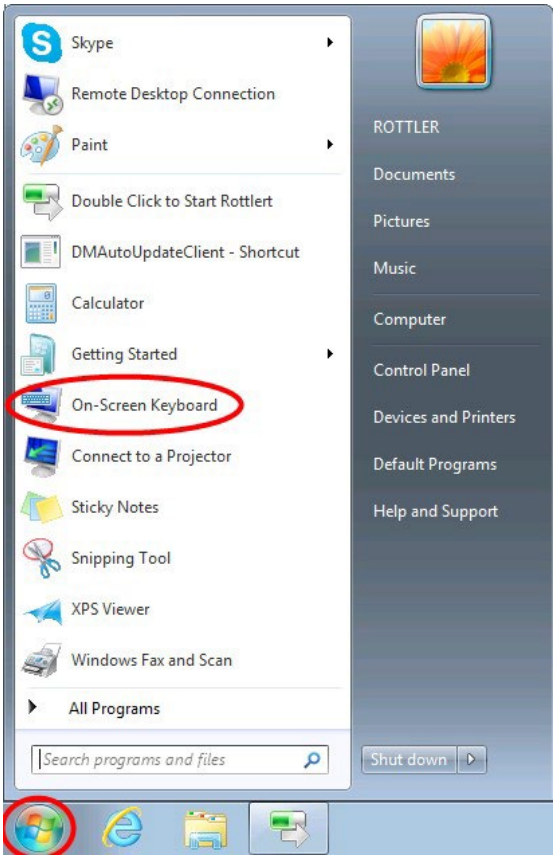
Software Set Menus

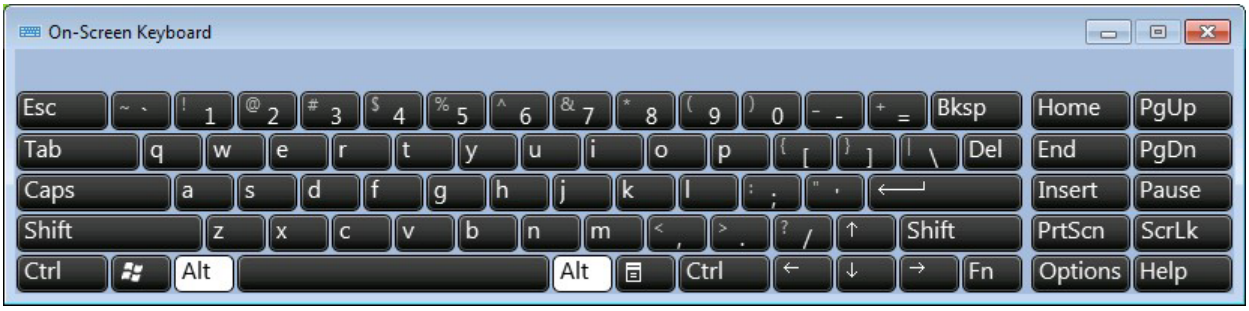




These menus are for selecting the metric screen readouts and language.

On Screen Keyboard





If a keyboard is not attached the machine an on screen keyboard can be used.
To access the on screen keyboard touch the Start button and then touch the On-Screen Keyboard Icon.

STONE HOLDER SIZE CHART H87AXY

MEDIUM HONE HEAD

Diameter (New Stones)

	0.312 Stones		0.200 Stones	
	Min	Max	Min	Max
514-10-13A	2.34	2.45	2.12	2.23
514-10-13F	2.44	2.55	2.22	2.33
514-10-13B	2.54	2.65	2.32	2.43
514-10-13G	2.64	2.75	2.42	2.53

514-10-13C	2.74	2.85	2.52	2.63
514-10-13H	2.84	2.95	2.62	2.73
514-10-13D	2.94	3.05	2.72	2.83

Diameter (New Stones) (Metric)

	7.925 Stones		5.08 Stones	
	Min	Max	Min	Max
514-10-13A	59.44	62.23	53.75	56.54
514-10-13F	61.98	64.77	56.29	59.08
514-10-13B	64.52	67.31	58.83	61.62
514-10-13G	67.06	69.85	61.37	64.16
514-10-13C	69.60	72.39	63.91	66.70
514-10-13H	72.14	74.93	66.45	69.24
514-10-13D	74.68	77.47	68.99	71.78

Diameter (New Brushes)

	0.550 Brushes		0.395 Brushes	
	Min	Max	Min	Max
514-10-13A	2.82	2.93	2.51	2.62
514-10-13F	2.92	3.03	2.61	2.72
514-10-13B	3.02	3.13	2.71	2.82
514-10-13G	3.12	3.23	2.81	2.92
514-10-13C	3.22	3.33	2.91	3.02
514-10-13H	3.32	3.43	3.01	3.12
514-10-13D	3.42	3.53	3.11	3.22

Diameter (New Brushes) (Metric)

	13.970 Brushes		10.033 Brushes	
	Min	Max	Min	Max
514-10-13A	71.53	74.32	63.65	66.45
514-10-13F	74.07	76.86	66.19	68.99
514-10-13B	76.61	79.40	68.73	71.53
514-10-13G	79.15	81.94	71.27	74.07
514-10-13C	81.69	84.48	73.81	76.61
514-10-13H	84.23	87.02	76.35	79.15
514-10-13D	86.77	89.56	78.89	81.69

LARGE HONE HEAD

Diameter (New Stones)

	0.312 Stones		0.200 Stones	
	Min	Max	Min	Max
514-9-6J	2.99	3.45	2.77	3.23
514-9-6A	3.17	3.63	2.94	3.41
514-9-6B	3.42	3.88	3.19	3.66
514-9-6C	3.67	4.13	3.44	3.91
514-9-6D	3.92	4.38	3.69	4.16
514-9-6E	4.17	4.63	3.94	4.41
514-9-6F	4.42	4.88	4.19	4.66
514-9-6G	4.67	5.13	4.44	4.91
514-9-6H	4.92	5.38	4.69	5.16
514-9-6K	5.17	5.63	4.94	5.41
514-9-6L	5.42	5.88	5.19	5.66
514-9-6M	5.67	6.13	5.44	5.91
514-9-6N	5.92	6.38	5.69	6.16
514-9-6P	6.17	6.63	5.94	6.41
514-9-6Q	6.42	6.88	6.19	6.66
514-9-6R	6.67	7.13	6.44	6.91
514-9-6S	6.92	7.38	6.69	7.16

Diameter (New Stones) (Metric)

	7.925 Stones		5.08 Stones	
	Min	Max	Min	Max
514-9-6J	75.92	87.73	70.23	82.04
514-9-6A	80.39	92.20	74.70	86.51
514-9-6B	86.74	98.55	81.05	92.86
514-9-6C	93.09	104.90	87.40	99.21
514-9-6D	99.44	111.25	93.75	105.56
514-9-6E	105.79	117.60	100.10	111.91
514-9-6F	112.14	123.95	106.45	118.26
514-9-6G	118.49	130.30	112.80	124.61
514-9-6H	124.84	136.65	119.15	130.96

514-9-6K	131.19	143.00	125.50	137.31
514-9-6L	137.54	149.35	131.85	143.66
514-9-6M	143.89	155.70	138.20	150.01
514-9-6N	150.24	162.05	144.55	156.36
514-9-6P	156.59	168.40	150.90	162.71
514-9-6Q	162.94	174.75	157.25	169.06
514-9-6R	169.29	181.10	163.60	175.41
514-9-6S	175.64	187.45	169.95	181.76

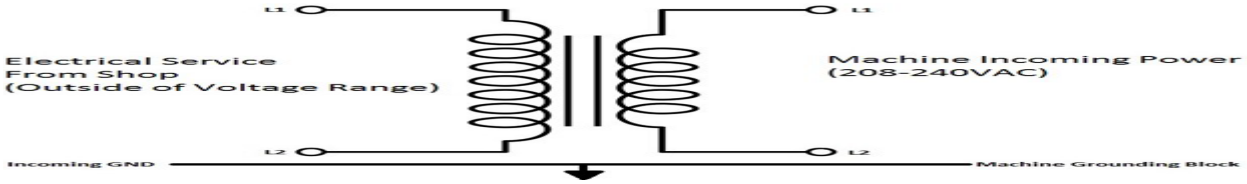
Diameter (New Brushes)

	0.550 Brushes		0.395 Brushes	
	Min	Max	Min	Max
514-9-6J	3.47	3.93	3.16	3.62
514-9-6A	3.64	4.11	3.33	3.80
514-9-6B	3.89	4.36	3.58	4.05
514-9-6C	4.14	4.61	3.83	4.30
514-9-6D	4.39	4.86	4.08	4.55
514-9-6E	4.64	5.11	4.33	4.80
514-9-6F	4.89	5.36	4.58	5.05
514-9-6G	5.14	5.61	4.83	5.30
514-9-6H	5.39	5.86	5.08	5.55
514-9-6K	5.64	6.11	5.33	5.80
514-9-6L	5.89	6.36	5.58	6.05
514-9-6M	6.14	6.61	5.83	6.30
514-9-6N	6.39	6.86	6.08	6.55
514-9-6P	6.64	7.11	6.33	6.80
514-9-6Q	6.89	7.36	6.58	7.05
514-9-6R	7.14	7.61	6.83	7.30
514-9-6S	7.39	7.86	7.08	7.55

Diameter (New Brushes) (Metric)

	13.970 Brushes		10.033 Brushes	
	Min	Max	Min	Max
514-9-6J	88.01	99.82	80.14	91.95

514-9-6A	92.48	104.29	84.61	96.42
514-9-6B	98.83	110.64	90.96	102.77
514-9-6C	105.18	116.99	97.31	109.12
514-9-6D	111.53	123.34	103.66	115.47
514-9-6E	117.88	129.69	110.01	121.82
514-9-6F	124.23	136.04	116.36	128.17
514-9-6G	130.58	142.39	122.71	134.52
514-9-6H	136.93	148.74	129.06	140.87
514-9-6K	143.28	155.09	135.41	147.22
514-9-6L	149.63	161.44	141.76	153.57
514-9-6M	155.98	167.79	148.11	159.92
514-9-6N	162.33	174.14	154.46	166.27
514-9-6P	168.68	180.49	160.81	172.62
514-9-6Q	175.03	186.84	167.16	178.97
514-9-6R	181.38	193.19	173.51	185.32
514-9-6S	187.73	199.54	179.86	191.67



OPERATING INSTRUCTIONS

Contents

Honing with a Rottler H87AXY

The basic process for honing with a Rottler H87AXY hone is as follows: select the required stones, create a program, set machining parameters, and run the cycle. The information in this section is designed to serve as guidelines for the various applications an operator may encounter.

While the H87AXY is running, the screen will show a representation of the hone head traveling up and down in the cylinder. The red lines along the sides of the hone head representation are an indication of the cylinder shape. The Rottler honing software senses the load on the hone stones to determine the straightness and diameter of the cylinder walls. “Tight” spots are indicated by the red lines being closer to the hone head image as it passes through the cylinder. If the software senses a significant “Tight” spot it will automatically run a series of extra strokes in the determined area to compensate and make the cylinder wall straightness within tolerance. This allows the H87AXY to not only create taper free bores, but it also will handle cylinders with non-uniform material density. Such cylinders may “breathe” which is a result of the cylinder walls deflecting away from the hone stones due to lack of structural support. The operator need not be concerned with attempting to manually compensate for this phenomenon as the Rottler software will handle it on its own.

The Rottler H87AXY’s default strategy is comprised of two-steps. The first step is the roughing cycle which attempts to remove as much material as possible in the shortest time while creating a straight, but undersized cylinder. The second step is the finishing cycle which brings the cylinder to its final dimensions and creates the pre-determined crosshatch pattern. If a plateau strategy is being used, then the finish cycle is also where this will be accomplished. The Rottler H87AXY will automatically switch from the roughing cycle to the finishing cycle once the cylinder diameter has reached its prescribed undersized amount. Any programs that the operator creates will automatically have these cycles, so there is no need for the operator to create 2 cycles for any cylinders.

Large Amount of Material Removal

Material Removal Amount: .010” (.254mm) or **MORE**

Strategy: Rough and Finish

Roughing Stone: 80 grit

Finishing Stone: Match to desired RA for cylinder wall

Process:

Begin by using the 80 grit stones and run a roughing cycle to bring the cylinders to within .005” of final diameter. Switch to the selected finish stones and run the finish cycle to remove the remaining material and create the desired crosshatch and surface finish.

Material Removal Amount: .005”-.010” (.127mm - .254mm)

Strategy: Rough and Finish

Roughing Stone: 270 grit

Finishing Stone: Match to desired RA for cylinder wall

Process:

Begin by using the 270 grit stones and run a roughing cycle to bring the cylinders to within .002” (.0508mm) of the final diameter. Switch to the selected finish stones and run the finish cycle to remove the remaining material and create the desired crosshatch and surface finish.

An alternative method for finishing would be to use the 270 grit stones to finish the cylinder to the final diameter. Then install the finishing stones and utilize the plateau honing feature to give the cylinder wall the desired surface finish.

Common Surface Finishes in Modern Engines

Today's modern engines are demanding smoother and more precise surface finishes. We can define the types of surface seen today into two groups, these groups are non-plateau and plateau finishes. The non-plateau finish is no longer the standard for engine cylinder bores. Most engines will specify a plateau finish. The differences between these finishes and how to achieve them with the Rottler H87AXY are described in the following sections.

***Note*: If the engine or ring manufacturer recommends a particular finish the engine manufacturers specifications or ring manufactures recommendation should be followed.**

Non-Plateau

A **non-plateau** finish may be defined as a cylinder surface that has been honed and the surface finish, when examined under a microscope has sharp peaks and valleys. **Non-plateau** finishes are the standard finish that is achieved from a conventional honing operation. The peaks are then knocked off and smoothed out during the engine break-in period thus creating small flats or "plateaus" where the peaks were prior.

The typical surface roughness as measured by the Ra conventional measurement for a non-plateau finish should be in the 16-24µin (.41-61µm) range. This surface roughness specification leaves adequate peaks to be knocked off during the engine break in period yet is not so rough as to cause oil burning problems before the cylinder walls have been plateaued by the rings. During initial start-up of the engine the rings will create the plateau by knocking off the peaks of a non-plateau finish.

Plateau

Plateau surface finishes have become the standard honing specifications for most modern engines. A **plateau** surface may be defined as a honed cylinder surface that when examined under a microscope the peaks have been flattened to create “flat” spots or **plateaus**. This type of surface resembles the finish of a cylinder post engine break-in cycle. The benefits of the **plateau** surface are less wear on the rings from the break in cycle, improved contact area for the rings, and it minimizes the amount of loose material that is removed during an engine break-in cycle that can become contaminants in the engines oil pan. **Plateau** finish surface roughness is also measured with more than just a conventional Ra measurement, the measurement standards are RpK, RK, Rvk and the Mr1 and MR2 values. An electronic gage to measure these criteria is highly recommended and the operator should take some time consulting both the ring manufacturer’s specifications and the device manual to understand how to attain these measurements. Beyond the measurements, ring manufacturers tend to specify requirements based on the engine type and intended use. Below are a set of guidelines that can be used for reference depending on the engine and application.

Blown and Turbo Charged applications:
RpK 8-14 microinch .20-.35 µm
Rk 30-40 microinch .76-1.02 µm Rvk 50+ microinch 1.27+ µm

Nascar and Prostock applications:

RpK	4-6 microinch	.10-.05 µm
Rk	18-22 microinch	.46-.59 µm
RvK	28-32 microinch	.71-.81 µm

Performance Street and Track (*longer life*):

RpK	8-10 microinch	.20-.25 µm
Rk	25-30 microinch	.64-.76 µm
RvK	35-40 microinch	.89-1.02 µm

The **plateau** finish has become very popular. A **plateau** finish involves the use of a roughing abrasive to obtain the Rvk parameters followed by a finer grit finishing abrasive to obtain the proper RpK value. When the finishing abrasive is used, only a few strokes are required to create the **plateau**. If you were to continue honing with the fine abrasive, the **plateau** finish would be eliminated, and the result will be a **non-plateau** finish.

Plateau Caution

In the past in order to obtain a good plateau finish and eliminate the torn and fragment metal left behind from the diamond abrasive. A three-step process would be implemented which would a use rough abrasive for base finish followed by a fine abrasive for the **plateau** effect then follow that up with **plateau** brush to remove any torn and fragmented material from surface. If the operator feels the need to implement such a process, then a **maximum of 6 plateau strokes** should be used **during the brush finish cycle. Using any more strokes will result in over-stroking which will lead to glazed cylinder walls!**

Tooling Strategies for Plateau Honing

The new technology for **plateau** honing uses a cubic boron nitride abrasive or what is known as CBN. This is a very sharp abrasive that cuts very cleanly and does not tear and fragment the surface of cylinder. This allows operator to eliminate the **plateau brush step**.

When CBN is not used for **plateau** honing, and instead a **diamond abrasive** is used. The operator should rely on the conventional 3-step process discussed above, which utilizes the plateau brush finishing cycle to remove any torn or fragmented surfaces from the cylinder walls

Using Diamond Abrasives

General

Diamond abrasives in combination with the Rottler Precision Honing Head make a very rigid honing head. The system will do an excellent job of truing tapered or out of round holes with little or no operator attention. An operator can set the roughing and finishing loads and expect the machine to hone the cylinder to size unattended with little or no attention. It is important to use proper stone pressure when using diamond abrasives. The roughing motor load setting should be in the 0 - 60% range. The finishing load should be set in the 15 – 25% area. Generally, the higher the roughing motor load reading the faster the stock removal. The lower the finishing load is set, the more accurate the bore will be. If plateau finishing is required then it is recommended to use the plateau brush finishing strategy to improve surface finish. Lastly it is important to use **Rottler Synthetic Coolant**, part number **514-4-71C**, when using **diamond stones**. It must be mixed with water and maintained properly to give optimal results.

Using CBN Abrasives

The CBN abrasive is a very clean cutting abrasive and doesn't leave the torn and fragmented metal in cylinder that diamond will leave. CBN in general does not have the longevity of diamond stones, therefore if the cylinder requires a large amount of material removal then using a diamond stone followed by CBN stones will typically provide the most economical and efficient process. If plateau finishes are required, we suggest using diamond to hone to size in the required grit specification followed by a CBN abrasive. If you are only doing a one grit finish, then we suggest again honing with diamond to within .0005 to .001 (.0127-.0254mm) and then following up with a CBN abrasive in that same grit size. Typically for a finish like this we would recommend a 400 grit CBN abrasive.

The H87AXY can remove a large amount of material from a cylinder in a relatively short amount of time. However, it is generally best practice to use an engine block machining center to bore the cylinders to .003" (.0762mm) undersized before finishing the bores to their final geometry with the H87AXY. This strategy allows for the operator to use CBN abrasives and get the most longevity out of the CBN stones

Mounting Stones and Brushes on Stone Holders

When mounting stone and brushes on stone holders make certain that the stones or brushes to be mounted are clean and burr free. Place the stones or brushes in the stone holders so that they are flush with the bottom of the holder. Tighten the retaining screws by hand.

⚠ CAUTION Do not exceed **36 in lbs (4nm)** of torque on the retaining screws. Exceeding **36 in lbs (4nm)** of torque could cause the stone holders to crack.

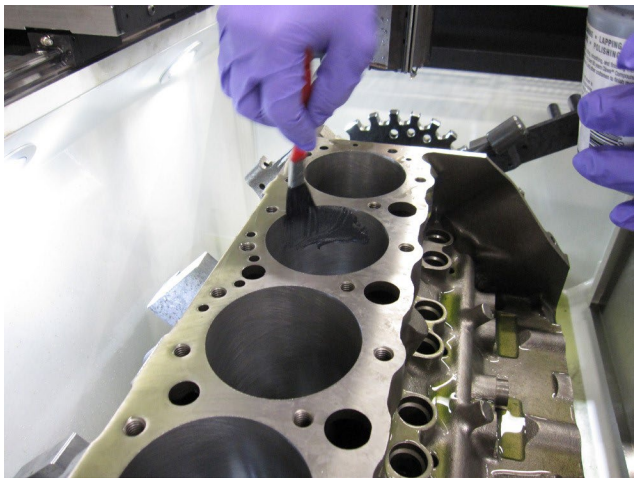
Note: Warranty is voided if torque values are exceeded of if non Rottler stones or brushes are used.

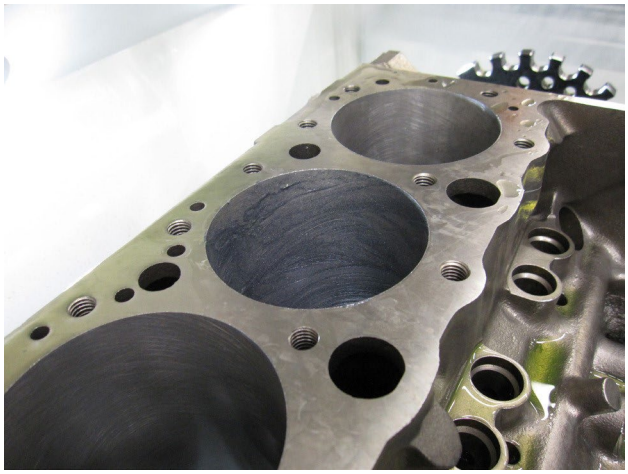
Breaking In A New Set of Diamond Abrasives

Rottler diamond abrasives are pre-radiused to minimize the breaking in period. When a new set of diamonds is installed the surface finish obtained on the first few blocks will be 5-10 (.13 -.25 µm) Ra rougher than after the break in period. **You must hone 2 - 5 blocks before the surface finish stabilizes.**

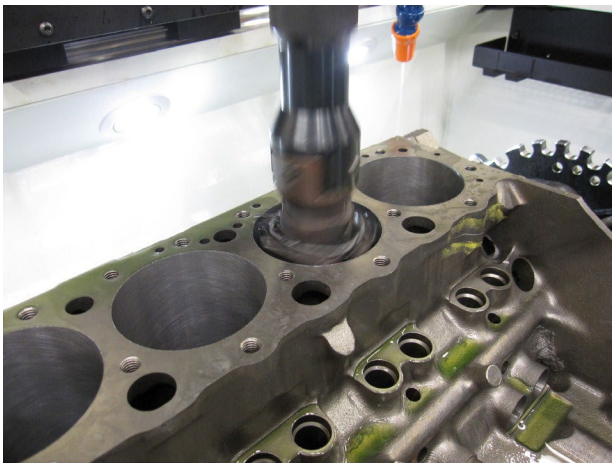
Truing New Diamond Abrasives

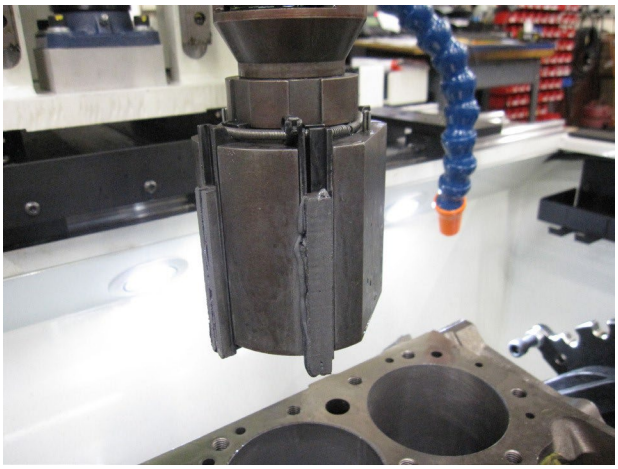
On grit sizes 500 and up to 1200 grit we recommend using the lapping compound that came with the machine to expedite the process. Use the following process to radius in a new set of stones.
To start take a small brush and apply the lapping compound into the cylinder.



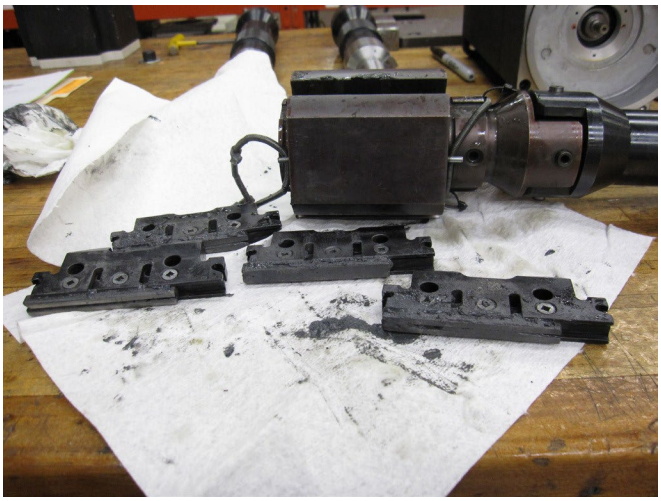


Set the cutting pressure in roughing and finishing mode to 20%. Set RPM to 80 rpm. You will need to set the stock removal for .010 to .015 in (.254 -.381mm) the stock removal window as abrasive will wear quickly with lapping compound. Insert hone head into bore. Start the machine with the coolant nozzle pointed away from the cylinder. Do not use the flow valve to shut off flow from the pump as that will cause the motor to overheat and trip out. You can shut the pump motor off in the Operation screen if you want. Run machine until it either shuts off or the DRO for stock removal stalls or quits moving. This indicates grit has either worn down or been swept from between cylinder wall and abrasive.





Remove hone head and clean the abrasive. Closely look at abrasive to determine if there is a solid line of contact the entire length of abrasive. If there is not a solid line contact on either the leading or trailing edge of abrasive then repeat the process again.
Once you have achieved the desired contact area you must clean the abrasive from the cylinder that was honed, diamond stones, stone holders and hone head. We recommend removing the stone holders, hone body and feed out cone rod from hone head and cleaning thoroughly to remove any lapping compound. If not completely removed, remaining lapping compound could cause excessive wear to moving parts in the hone head.



Dressing Diamond Abrasives
Diamond Abrasives use a metal bond to hold the individual diamond particles. Failing to dress the stones after honing 30 - 50 blocks will increase the pressure required to remove stock or the stock removal rate slows down significantly. This will result in finishes with excessive folded and torn metal. Undressed stones will also cause excess bore distortion and inaccuracies in the boring process. This is caused by the diamond abrasive dulling or the bond not breaking down. The edge of the stone will also become very sharp. This is a normal occurrence and is easily corrected by removing the holder/abrasive assembly, use a wire brush to dress the abrasive. A common method is to remove the stone holder from the hone head. Leave the stone in the stone holder and move the stone through a bench grinder wire wheel. The brush rotation should be across the narrow width of the stone. Turn the holder over and pass the stone through the wheel again. This process will return the abrasive to a like new cutting condition, and put a slight radius on the edge of the abrasive stick (approx. .005 inch .127mm).

Torn Metal
This is often caused by improper coolant mix, lack of dressing, or the use of high honing pressure during the finishing process. The Rottler hone head is capable of very high loads. If problems with torn metal are encountered verify the coolant mix, proper dressing of the abrasives, and reduce the finishing load during the final hone stage. If required make several strokes manually with minimum stone pressure (1020%).

Stock Removal Rate
The hardness of the cylinder you are honing will affect the stock removal rate. If you find the stock removal rate for a given cylinder is slower than normal check to make sure you have properly dressed the stones. Improperly dressed stones can increase honing time by as 50% or more. Improperly dressed stones will also produce an unacceptable finish.

Diameter Range
Because the diamond abrasives break down very slowly, a single set of stones is limited in its diameter range. One set of diamonds should be used for each stone holder range. A set of diamonds can not be

constantly changed from one stone holder size to another. The stones would constantly be in the breakin process and very poor performance or finishes will result.

Cross Hatch Angle and Washout

The ideal situation would be for a hone to change the direction it is traveling instantaneously. If this was possible the angle of the cross hatch would stay consistent through the entire cylinder. The Rottler H87AXY uses high speed electronics in cooperation with a ball screw drive to change the direction of travel. This reduces the amount of Cross Hatch wipeout considerably from a crank driven rocker arm. As a rocker arm changes direction, the rate of travel slows but the rotation speed of the hone head stays consistent. This is the cause of washout at the top and bottom of cylinders. Since the H87AXY has a linear travel spindle this condition does not exist.

Coolant:

Coolant types and Selection:

When using Vitrified honing stones you must use a petroleum based coolant. Such as Mobil Met 33 or Upsilon or any equivalent light honing oil. This is required since vitrified honing stones are not compatible with water based synthetic coolants.

Diamond stones will work with oil or water based synthetic coolants, but work most efficiently with the water based synthetic coolants. Rottler Manufacturing recommends the use of Rottler 514-4-71C water based, synthetic coolant for diamond only applications. This coolant works best when mixed to a 5% – 8% solution.

Refractometer:

A Refractometer is used to measure the amount of coolant to water ratio. A 5% to 8% ratio will read a 3 – 5 on the Refractometer. It is important not confuse the ratio with the actual Refractometer reading. Coolant to Water Ration is 1:20 thus 1 gallon of coolant to 20 gallons of water.

Coolant Pump System:

The coolant tank on the H87AXY will hold a maximum of 70 gallons of the selected coolant.

Scratching

Scratching in the cylinder looks as though a single grit of a larger abrasive particle has lodged between the cylinder wall and the hone head. Often the scratch will be less than one revolution of the hone head and it will follow the crosshatch angle of the honing machine. Several things can cause this problem.

Improper coolant mix

The ratio of water to synthetic additive to water will change after the initial mix is put in the coolant tank. A Refractometer can be purchased to accurately check the ratio. When the ratio is measured as a percentage it should be 5 – 8%. This corresponds to a reading of 3-5 on the Refractometer. It is important not to confuse the percentage with the true Refractometer reading.

Unacceptable synthetic coolant brand

Lack of abrasive dressing

Dirty Coolant

Honing Methods

Method 1: 2 Step Using CBN Stones

OEM Blocks And Other Standard Duty Applications

Roughing (large material removal):
Use a 270-325 grit diamond abrasive. Use the Hone process with a roughing load of 50% and a finish load of 40%. Hone the cylinder to size. If you experience out of roundness in OE blocks due to cylinder wall thickness variations reduce the roughing load to 40% and the finish load to 30%.

Finishing:
Use a 600 grit CBN abrasive for 4 strokes at 15% load. When plateau honing with fine abrasive, slow the rpm down to 80 rpm. The H87AXY machine will adjust the stroke speed to maintain the proper cross hatch angle during this process. Typical cross hatch angles range from 38 to 45 degrees included angle.

Performance Blocks and Darton Sleeves (Harder Materials)

Roughing:
Use a 170-200 grit stone to maintain a high enough initial RvK number to allow for some drop in the RvK number when following with fine abrasive. Use 50% roughing load and 40% finishing load to size. Reduce load setting if there is a problem with maintaining proper bore geometry.

Finishing:
Use a 600 grit CBN abrasive for 4 to 6 strokes at 15% load. When plateau honing with fine abrasive slow the RPM down to 80 rpm.

Method 2: 3 Step Using Plateau Brushes OEM

Blocks and Other General Duty Applications

Roughing:
Start with 270-325 grit Diamond abrasive and hone to size with roughing load of 50% and finish load of 40% unless cylinders become out of round then use 40% roughing and 30% finishing.

Finishing:
Use a 550 grit diamond abrasive as the second step of a three step process by using plateau mode at 15% load and 80 rpm for 4 strokes.

Brush Finishing:
Use plateau brushes for 3 strokes at 15% load in the plateau mode at 80 rpm.

Performance Blocks and Darton Sleeves (Harder Materials)

Roughing:
Start with 170-200 grit diamond stones and hone cylinder bore to size with 50% roughing load and 40% finishing load. Reduce load setting if there is a problem with maintaining proper bore geometry.

Finishing:
Next step is to follow-up in the plateau mode with 550 grit diamond abrasive at 15% load for 4 strokes at 80 rpm.

Brush Finishing:
Final step use plateau brushes at 15% load for 4 strokes at 80 rpm.

OEM Engines That Are Force Induction, Race Applications, Or Nitrous Powered

Method 1: 2 Step Using CBN Stones

Roughing:
Start by honing the cylinders with 170-200 grit diamond abrasive to size. Roughing load should be set at 50% and finish load at 40% unless cylinder become out of round. Then drop to 40% roughing and 30% finishing load. In this application most piston ring manufacturers want RvKs in the +50 microinch (1.27 µm) category.

Finishing:
Use 600 grit CBN abrasive with a load of 15% for 4 to 6 strokes at 80 rpm.

Performance Blocks And Darton Sleeves (Harder Materials) That Are Forced Induction, Race Applications Or Nitrous Powered

Roughing:
Start with 140-170 grit diamond abrasive and hone to size at 50% rough load and 40% finish load.

Finishing:
Use 600 grit CBN abrasive with load pressure of 15% with rpm of 80 for 4 to 6 strokes.
Method 2: 3 Step Using Plateau Brushes

Roughing:
Start with 170-200 grit diamond abrasive and hone to size at 50% roughing load and 40% finishing load. Reduce load setting if there is a problem with maintaining proper bore geometry.

Finishing:
Follow-up with 550 grit diamond abrasive in the plateau mode at 15% load for 4 strokes at 80 rpm.

Brush Finishing:
Continue with the plateau brushes in plateau mode at 15% load for 4 strokes at 80 rpm.

Nascar/Prostock Applications

Method 1: 2 Step Using CBN Stones

Roughing:
In this form of racing, only high-performance materials are used so there is no need to discuss OE blocks. Start by honing block to size with 270-325 grit Diamond abrasive at rough load of 50% and finish load of 40%.

Finishing:
Follow-up by using 800 grit Diamond abrasive for 4 to 6 strokes at 15% load with rpm of 80.

Special Procedure for Subaru Blocks

Roughing:
Use 80 grit stones, remove stock until .002” from finish size. Use 45% for the rough load and 35% for the finish load.

Finishing:
Hone to final size using 325-400 grit stones using 45% for the rough load and 35% for the finish load.

Plateau Finish:
Use 1000 grit stones in plateau mode at 80 RPM and load set at 20% for 2 - 3 strokes.

Brush Finishing:
Use plateau bushes in plateau mode at 80 RPM and the load set at 20% for 4 strokes.

Single Step Honing Process

There still may be a call for a simple one step process where you may use one grit size abrasive and follow up with a plateau brush for a few strokes. Typically, this is done with part number using 325-400 grit diamond abrasive to size, using 50% roughing load and 40% finishing load. This is then followed by 4 to 6 strokes in the plateau mode at 15% load with plateau brushes. This won't allow for much plateau or RvK, but it does produce a 18 to 24 microinch (.46 -.61 µm) Ra finish.

Honing Alusil, Silitec, and Lokasil Cylinders Using Synthetic Coolant

These instructions are for honing Alusil, Silitec and Lokasil cylinders with Rottler honing machines that have water based synthetic coolant in the sump tank.

Equipment And Parts Needed:

- **Machine**: Rottler HP6A, HP7A, H70 Series, H80 Series
- **Coolant**: Commercial honing oil with a low or medium viscosity.
- **Hone Head:** For HP6A and HP7A Rottler part # 514-9B, For H70 and H80 Series machines Rottler part # 514-9R.
- **Stone Holders:** Rottler parts determined by size of bore.
- **Abrasives:** Rottler 500 grit diamonds part # 514-9-14V (do not substitute different grit size)
  Rottler 600 grit diamonds part # 514-9-14G (do not substitute different grit size)
  KS finishing diamonds Rottler part# 514-9-18P (do not substitute different grit size)
  Rottler felt wipers part # 514-9-21E
  Rottler silicon compound part # 514-9-21F

Instructions for Honing Alusil, Silitec, and Lokasil Cylinders

Cylinders should be bored to within .002 with a PCD insert. This is very important to prevent fracturing of silicon particles below the finish surface of bore. If PCD isn't used the exposure of the silicon will result in a defective sliding surface for piston and rings.

Turn off the coolant motor. Use a spray bottle with honing oil to spray the cylinders during the honing process. Place a drip tray under the block to catch the honing oil runoff to prevent contaminating machine coolant.

Cylinders should then be honed using Rottler 500 grit diamond stones (514-9-14V no substitutes) to size with tolerance of +.0002 -.0000 (.00508 -.0000mm). Machine parameters should be set as follows: RPM 170 to 180, Honing loads should be set at 20% to 25% for roughing and 15% finish load.

**NOTE: When using the diamond stones they should be trued in to diameter of cylinder by using them in cast iron cylinder the same diameter of aluminum cylinder being honed. This includes the KS finish diamonds also.*

Next install the Rottler 600 grit finishing diamonds (514-9-14G no substitutes) and run one cycle in the plateau mode. The plateau mode parameters are different in each type of hone machine. You will need to change these parameters (see operating instructions) to 10 strokes per cycle and a honing load of 15%. Cylinders should already be to size from previous step. You are not trying to remove much material with this operation. The need for this operation is to lower the surface finish for the next step.

Next install the KS finishing diamonds (514-9-18P no substitutes) and run one cycle in the plateau mode. This operation will prepare the surface finish for the final step.

**NOTE: Chamfer or break the edge of the exposing stones prior to using them in bore. This will help prevent chipping on stone edges.*

The last step in the process is to expose the silicon particles by eroding the surrounding metal away from the silicon particles using Rottler felt pads part # 514-9-21E. These are used with Rottler silicon compound paste part # 514-9-21F. Take a small paint brush and apply paste to felt wipers and the entire cylinder. Install hone head in bore and hone for approximately 45 to 60 seconds per cylinder. Machine settings for this operation should be RPM 160 to 170, strokes per minute of 60, shut-off automatic stone feed up. Start machine and feed stones up manually until load reaches 15%. Let machine run for 45 to 60 seconds per cylinder. Reapply silicon compound to felt pads and to each following cylinder. There is no need to over stroke cylinder during this process so shorten stroke length accordingly.

Honing Alusil, Silitec, and Lokasil Cylinders Using Hone Oil

These instructions are for honing Alusil, Silitec and Lokasil cylinders with Rottler honing machines that have mineral based honing oil in the sump tank.

Equipment And Parts Needed:

- **Machine**: Rottler HP6A, HP7A, H70 Series, H80 Series
- **Hone Head:** For HP6A and HP7A Rottler part # 514-9B, For H70 and H80 Series machines Rottler part # 514-9R.
- **Stone Holders:** Rottler parts determined by size of bore.
- **Abrasives:** Rottler 500 grit diamonds part # 514-9-14V (do not substitute different grit size)
  Rottler 600 grit diamonds part # 514-9-14G (do not substitute different grit size)
  KS finishing diamonds Rottler part# 514-9-18P (do not substitute different grit size)
  Rottler felt wipers part # 514-9-21E
  Rottler silicon compound part # 514-9-21F

Instructions for Honing Alusil, Silitec, and Lokasil Cylinders

Cylinders should be bored to within .002 with a PCD insert. This is very important to prevent fracturing of silicon particles below the finish surface of bore. If PCD isn't used the exposure of the silicon will result in a defective sliding surface for piston and rings.

Cylinders should then be honed using Rottler 500 grit diamond stones (514-9-14V no substitutes) to size with tolerance of +.0002 -.0000 (.00508 -.0000mm). Machine parameters should be set as follows: RPM 170 to 180, Honing loads should be set at 20% to 25% for roughing and 15% finish load.

**NOTE: When using the diamond stones they should be trued in to diameter of cylinder by using them in cast iron cylinder the same diameter of aluminum cylinder being honed. This includes the KS finish diamonds also.*

Next install the Rottler 600 grit finishing diamonds (514-9-14G no substitutes) and run one cycle in the plateau mode. The plateau mode parameters are different in each type of hone machine. You will need to change these parameters (see operating instructions) to 10 strokes per cycle and a honing load of 15%. Cylinders should already be to size from previous step. You are not trying to remove much material with this operation. The need for this operation is to lower the surface finish for the next step.
Next install the KS finishing diamonds (514-9-18P no substitutes) and run one cycle in the plateau mode. This operation will prepare the surface finish for the final step.

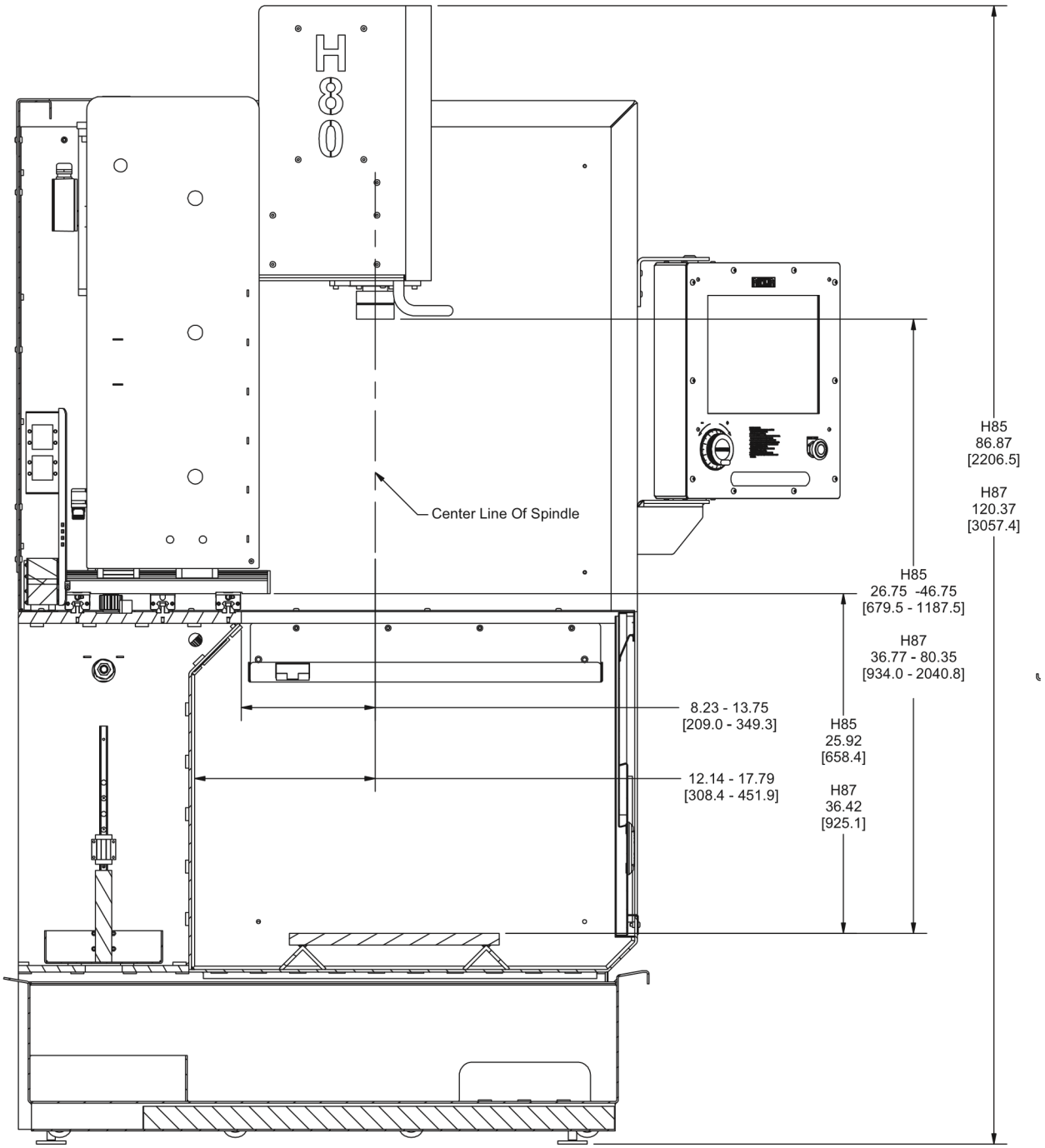
**NOTE: Chamfer or break the edge of the exposing stones prior to using them in bore. This will help prevent chipping on stone edges.*

Turn off the coolant motor for the final process.

The last step in the process is to expose the silicon particles by eroding the surrounding metal away from the silicon particles using Rottler felt pads part # 514-9-21E. These are used with Rottler silicon compound paste part # 514-9-21F. Take a small paint brush and apply paste to felt wipers and the entire cylinder. Install hone head in bore and hone for approximately 45 to 60 seconds per cylinder. Machine settings for this operation should be RPM 160 to 170, strokes per minute of 60, shut-off automatic stone feed up. Start machine and feed stones up manually until load reaches 15%. Let machine run for 45 to 60 seconds per cylinder. Reapply silicon compound to felt pads and to each following cylinder. There is no need to over stroke cylinder during this process so shorten stroke length accordingly.

Work Envelope Dimensions

Refer to the dimensions in the illustration below to determine if the machine can handle the intended work piece.



Honing a Cylinder Block

Introduction

The purpose of this section is to familiarize the operator with various features of the H87AXY.

The operator should have a working knowledge of honing and be familiar with using a power hone.

It is suggested that scrape block be used for the following walk-through.

Definitions of terms used in this section:

Button: A labeled icon on the control display screen.
Touch: To activate an icon button we will use the term touch. ie: Touch CYCLE START button to start the programed honing process. Some buttons will stay active once they have been touched and must be touched a second time to deactivate.
Touch and Hold: Some buttons are momentary buttons and you must maintain contact with the button to keep it active. ie: When the Z- button is touched and contact maintained the hone head will travel downward until contact with the button is released.
Value Box: A small box section of the screen that contains a number that indicates a value for the function listed next to it.

Safety Reminders:

When machine is idle the spindle should always be keep in the full up position and the E-STOP engaged. This deactivates touchscreen controls to prevent any accidental activation. The word E-STOP IN will be displayed on the red Stop Machine button at the lower left corner of the operation screen

The operator can stop the honing process at any time by touching the STOP MACHINE button. Touching the CYCLE START button again will restart the process.

If an emergency situation arises or if the touchscreen is not responding, pressing the E-STOP button will shut off power to all motors and solenoids and bring the hone to a stop. The word E-STOP IN will be displayed on the Stop Machine button. To release the E-STOP turn the button clockwise until it pops out.

Getting Started

Once the machine is set up and ready to run turn on power to machine by flipping the power switch to the on position.

It will be assumed that the machine is being operated without a keyboard or mouse attached.

The computer will start up and boot screen will appear on the monitor. This may take a few minutes if operating system is doing an update.

Double Touch the Start Rottler icon. The HOME screen will appear on the monitor.

This is the Home screen. Using the jog buttons touch the X+ button to move the carriage to the right side of the machine. Touch the Z+ button to raise the spindle all the way to the top. Now the machine is in its block loading position. Engage the E-STOP by pressing the red E-STOP switch.

The Stop Machine button now reads E-STOP IN. It is now safe to work inside the tank area.

Planning the Job

Block Specifications

- You will need to know the following information for the job you are planning:
- Finish bore size, cross hatch angle, and finish.
- Bore length.
- Center to center dimension of cylinders.
- If the job is a V type block, the pan rail to crank line center dimension, and cylinder offset between cylinder banks.

Tooling Selection

You will need to decide what honing process will be used and if there will be a final plateau process for the job. Based on that decision use the following charts to select which hone head, stone holders, stones, and if need brushes.

Now is also a good time to set your bore gauge to desired final size.

Stone and Brush Selection

Use the following charts to select the stones and brushes to obtain the desired finish
NOTE: Ra - Roughness Average. Value before Ra is in micro inches. Value in brackets um is micro meters. Long designates length of stone. Height designated thickness of stone.

Set of 4	**Set of 6**	**Diamond Stones, .312" (7.90mm) Height**
514-9-14F	514-9-32F	80 grit, 3" (76mm) long, 90Ra (2.25um)
514-9-14R	514-9-32R	80 grit, 3 1/2" (89mm) long, 90Ra (2.25um)
514-9-21R		80 grit, 4" (102mm) long, 90 Ra, (2.25um)
514-9-14W	514-9-32W	140/170 grit, 3" (76mm) long, 50-75Ra (1.25 - 1.875um)
514-9-21W		140/170 grit, 4" (102mm) long, 50-75 Ra, (1.25 - 1.875um)
514-9-14K	514-9-32K	170/200 grit, 3 (76mm) long, 45-60Ra (1.125 - 1.5um)
514-9-14M		170/200 grit, 3 1/2" (89mm) long, 45-60Ra (1.125 - 1.5um)
514-9-21M		170/200 grit, 4" (102mm) long, 45-60 Ra, (1.125 - 1.5um)
514-9-14J	514-9-32J	270/325 grit, 3" (76mm) long, 35-45Ra (.875 - 1.125um)
514-9-14T	514-9-33B	270/325 grit, 3 1/2" (89mm) long, 35-45Ra (.875 - 1.125um)
514-9-14Z		270/325 grit, 4" (102mm) long, 35-45Ra (.875 - 1.125um)
514-9-14E	514-9-32E	325/400 grit, 3" (76mm) long, 24-30Ra (.6 - .75um)
514-9-14Q		325/400 grit, 3 1/2" (89mm) long, 24-30Ra (.6 - .75um)
514-9-14X		325/400 grit, 4" (102mm) long, 24-30Ra (.6 - .75um)
514-9-14V		500 grit, 3" (76mm) long, 15-19Ra (.375 - .475um)
514-9-14C	514-9-32C	325/400 grit, 3" (76mm) long, 18-22Ra (.45 - .55um)
514-9-14P		500 grit, 3-1/2" (89mm) long, 18-22Ra (.45 - .55um)
514-9-14U		500 grit, 2 1/2" (64mm) long, 18-22Ra (.45 - .55um)
514-9-14L	514-9-32L	550 grit, 3" (76mm) long, 15-19Ra (.375 - .475um)
514-9-14N		550 grit, 3 1/2" (89mm) long, 15-19Ra (.375 - .475um)
514-9-14G	514-9-32G	600 grit, 3" (76mm) long, 8-12Ra (.2 - .3um)
514-9-14S		600 grit, 3 1/2" (89mm) long, 8-12Ra (.2 - .3um)
514-9-21G	514-9-33	800 grit, 3" (76mm)
	514-9-33A	800 grit, 3 1/2" (89mm)
	514-9-33C	800 grit, 4" (102mm)
514-9-21H		1000 grit, 3" (76mm)
514-9-21J	514-9-33J	1200 grit, 3" (76mm)
Set of 4	**Set of 6**	**Diamond Stones, .200" (5.10mm) Height**
514-9-14D	514-9-33B	325/400 grit, 3" (76mm) long, 18-22Ra (.45 - .55um)

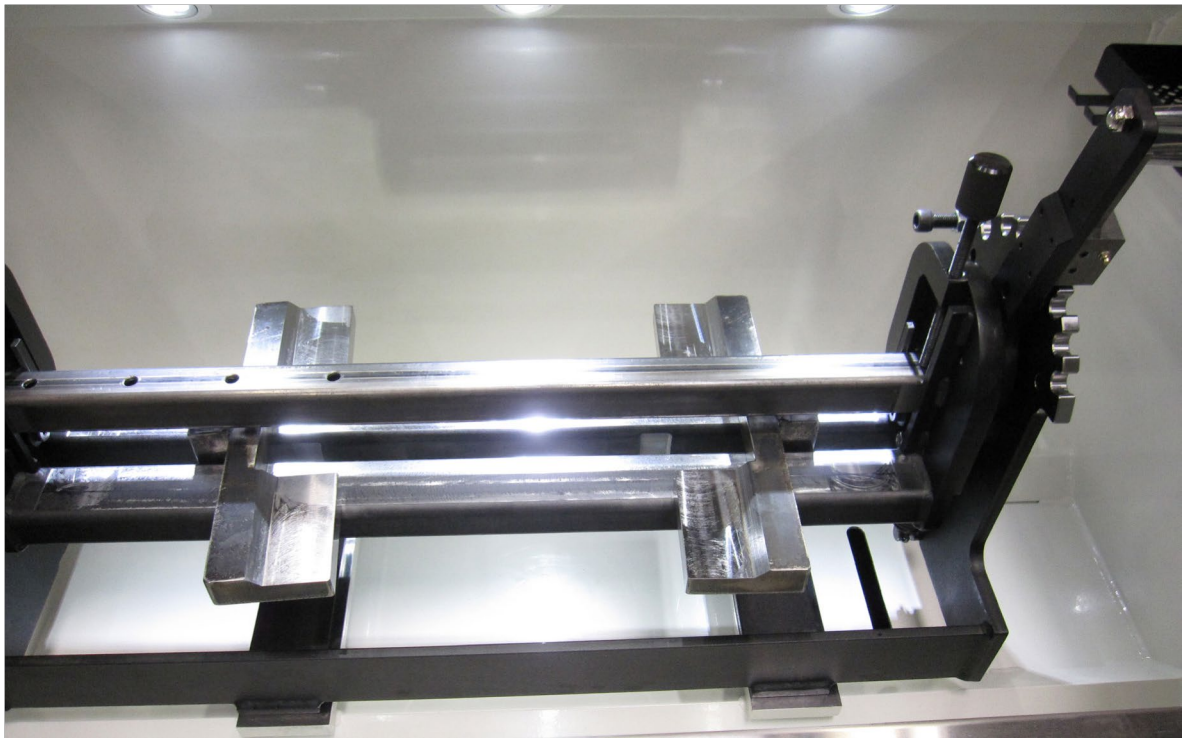
Set of 4	**CBN Stones, .321” (7.90mm) Height**
514-9-35C	CBN Stones, 320 grit, 3” (76mm) long
514-9-35D	CBN Stones, 400 grit, 3” (76mm) long
514-9-35B	CBN Stones, 600 grit, 3” (76mm) long
Set of 4	**Brushes for Plateau Finishing**
514-9-14H	Plateau Finishing, .550” (14mm) height, 3 1/2” (89mm) long, requires one or two size smaller stone holder compared to .312” (7.90mm) height diamond stone
514-9-14Y	Plateau Finishing, .395” (10mm) height, 3 1/2” (89mm) long, requires same or one size smaller stone holder compared to .312” (7.90mm) height diamond stone

Loading the Block

The next step is to load the block that will be honed onto the fixture. In this tutorial the optional auto rotate fixture is shown. The block loading procedure is the same for the manual fixture. Select the block that will be used. In this tutorial a small block V-8 will be used.

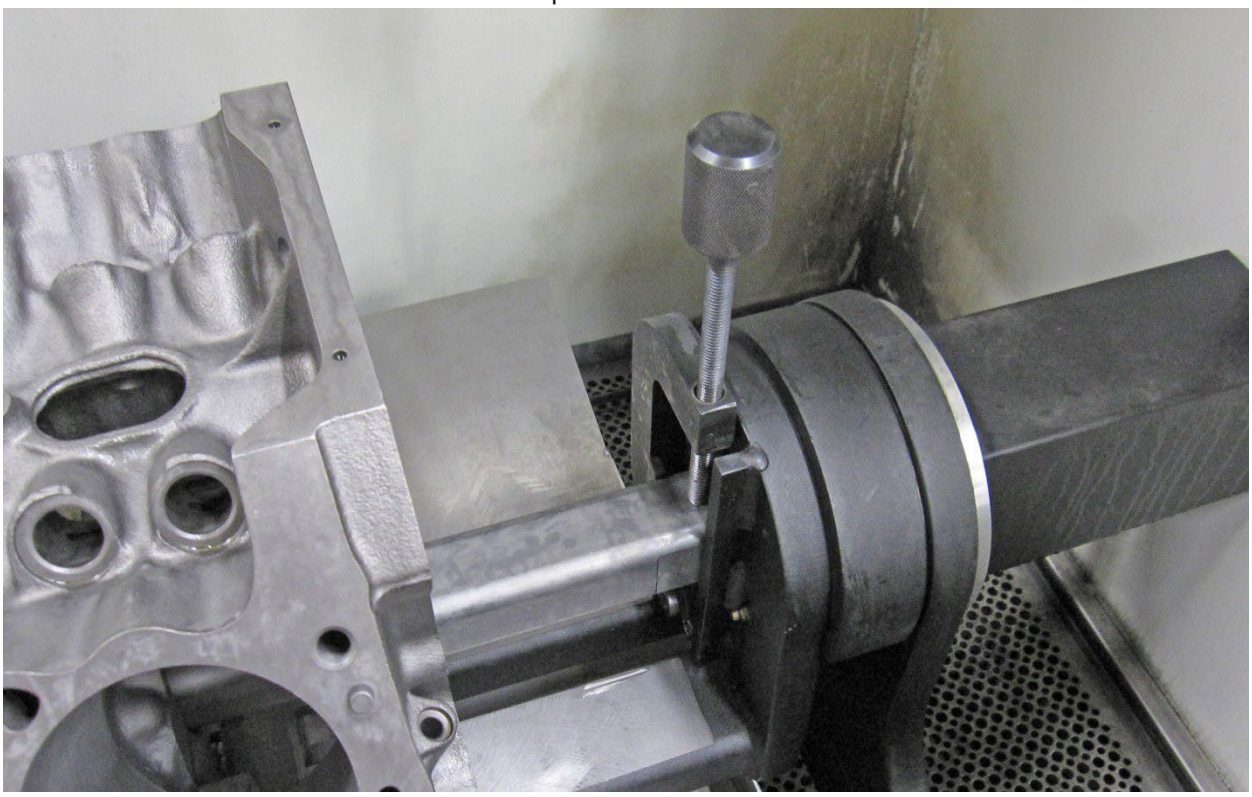
Set the riser blocks on the fixture cradle so that the pan rails are sitting on the surface that was determined to be closest to ideal.

⚠ CAUTION The main caps must be on when a V-Block is honed and on an Inline Block if the optional clamp arms are not be used.



Place the clamp bar tube through the main bore of the block. Be certain that the machined flats at the end of the clamp bar tube are in a vertical position.

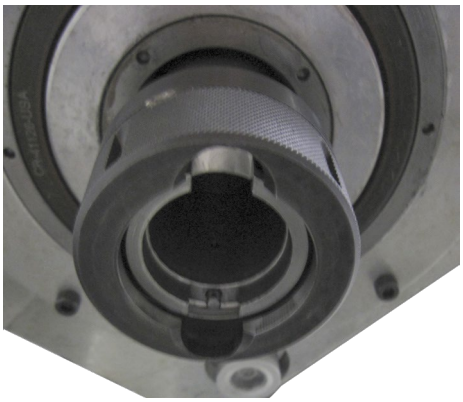
Use an appropriate method to place the block on the riser parallels with the front of the block facing left or away from the control pendent. Take care to align the clamp tube with the receiver slots on the cradle. Once the block is sitting on the riser blocks place the clamp bar lock downs over the tube and turn the knobs until the clamp tube is secured.



Programing Set Up

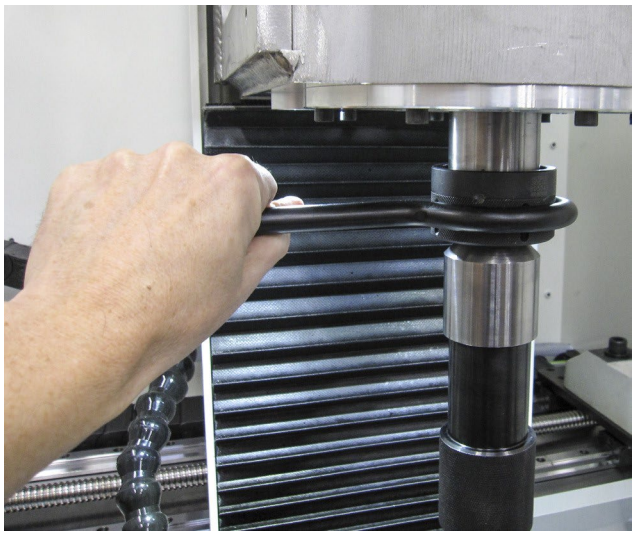
Now that the block has been placed on the fixture and tooling has been chosen, select the stones and holders to be used in the first process. Put holders and stones into the hone head and mount hone head on spindle of machine.
The H87AXY machines use a standard Kwik Switch mount system for the hone heads.

To mount a hone head confirm that the locknut is in the open position.



The hone head will have the standard locking tabs on the mounting adaptor and a drive coupler for adjusting the stones. When mounting the hone head it will be necessary to align the drive coupler with its receiver inside the drive spindle. Once they are aligned the adaptor tabs will fit into the receiver slots. The tabs will activate the release pin and the locknut will automatically turn to lock the hone head in place.

Due to design the nut will continue tighten during use. When it comes time to change or remove the hone head it may become so tight that the release wrench will be needed to loosen the locknut. Turn locknut clockwise to release the hone head.



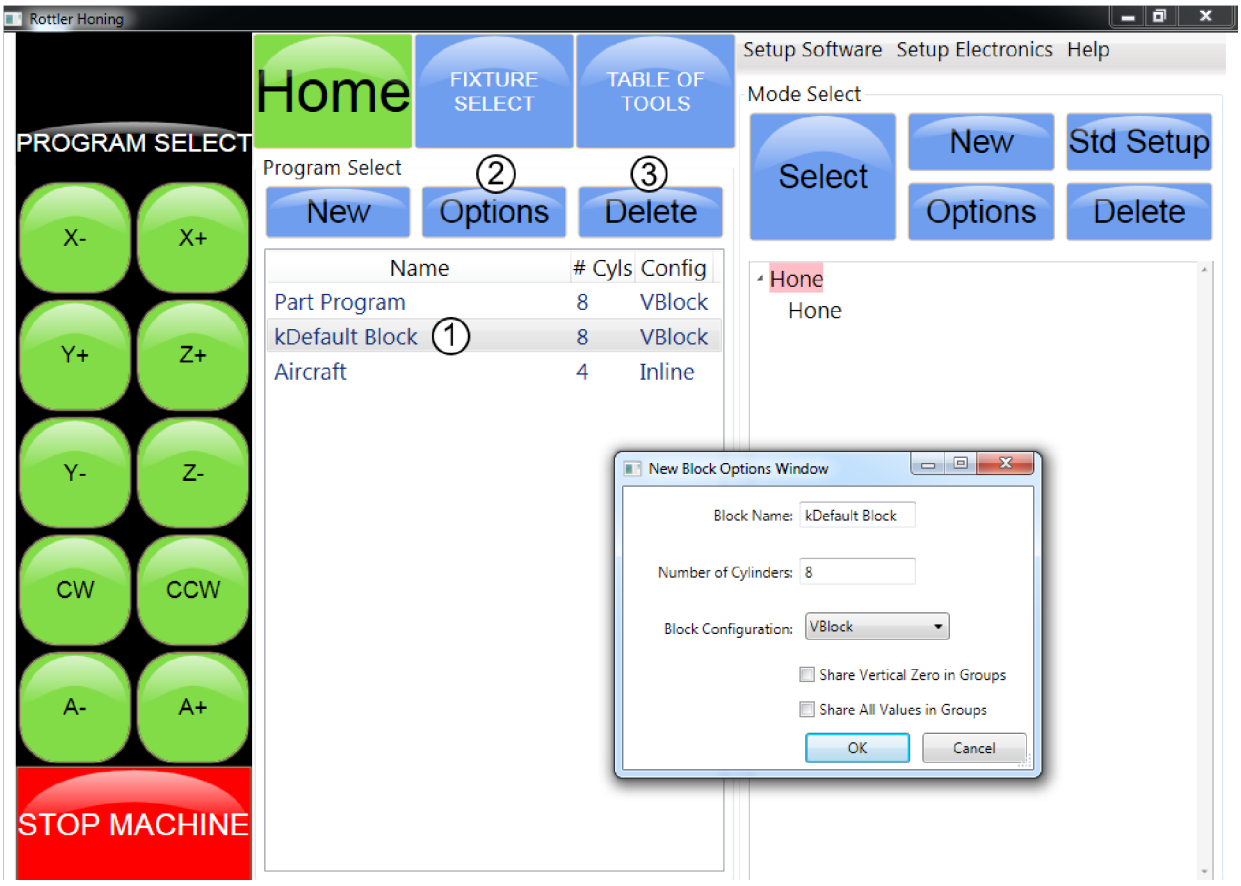
Consult the tooling charts in the previous section to determine which hone head and stone holders will be needed for the job you are setting up for.
Prior to hone head installation confirm that the con rod is at least 1/4”(6mm) up inside the hone body. This will assure that the homing procedure will function correctly.
Once the hone head is attached release the E-STOP switch and touch the Home button to calibrate the hone head set up to the machine program.
Once homing is complete, check that cone rod is all the way up inside the hone head before proceeding. ***THIS IS CRITICAL***. If for some reason the cone rod doesn’t reach it’s upper most travel point when homing is completed, then the bore size range will not be properly calibrated. This could result in the cone rod coming out of the hone body during operation and could potentially cause damage.

IMPORTANT: Whenever a hone head set up is changed the machine must be Homed.

Now that the machine is set up for honing we will construct a program to hone the block.

Creating a Program

On the home screen under the Program Select touch the New button (1) and the New Block Options Window will appear.
Name the block,(2) input number of cylinders (3) and choose VBlock or Inline.(4) Touch OK (5) when finished.
The new block program title (1) will appear on the list.
For this tutorial we will use the standard kDefault Block and its settings.



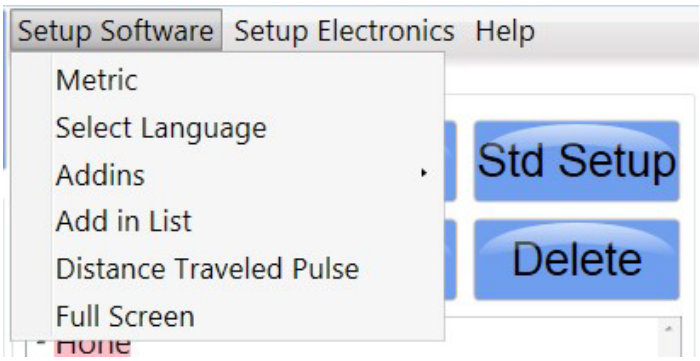
The Options button (2) will bring New Block Options Window back where you can edit information for the block that is highlighted. Highlight the block program you want to edit, then touch the Options button.

The Delete button (3) while bring up the Delete Window.(4) Highlight a block program and touch the Delete button.

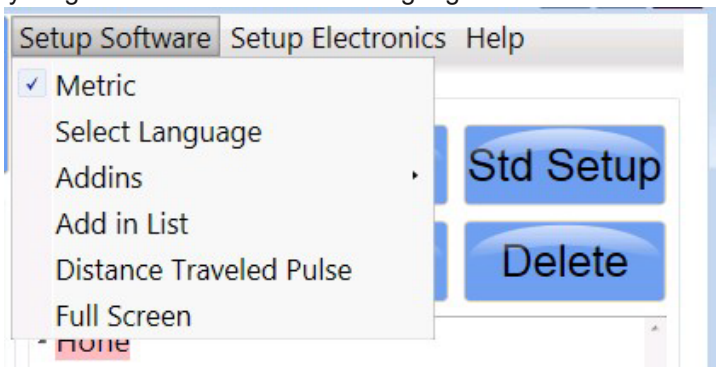
Touch the Yes button (5) if you want to delete the block that is highlighted.

Mode Select Section of Home Screen

Click the Setup Software menu tab and this drop down menu will appear.

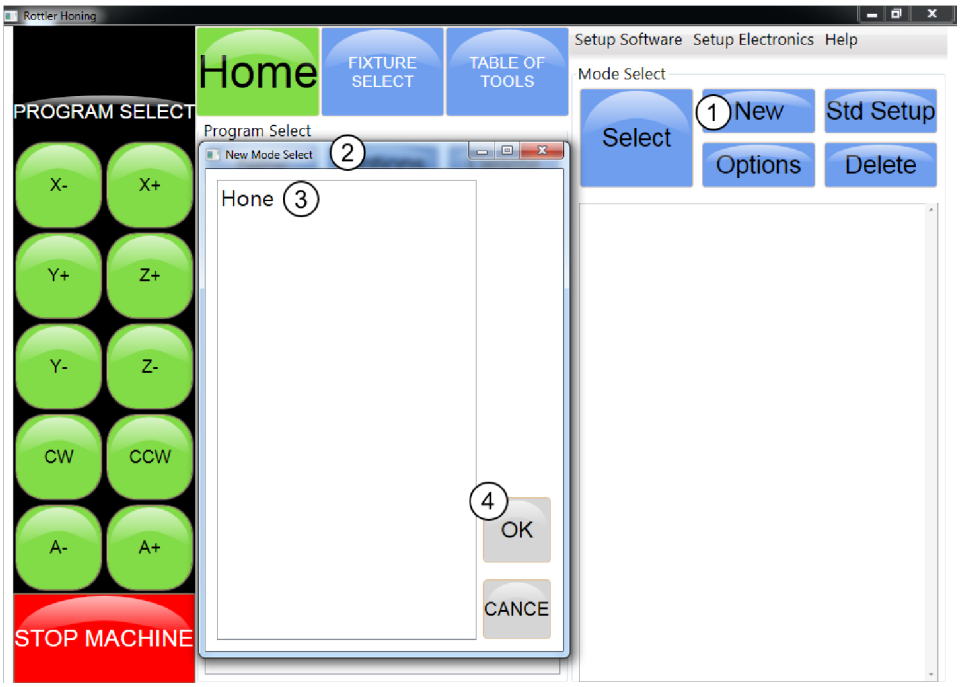


Operator should only concern themselves with the first two. Click on Metric and all readings and settings on the monitor will be metric. Uncheck Metric to return all readings and settings to inch. Click on Select Language to have everything on screen in a different language.



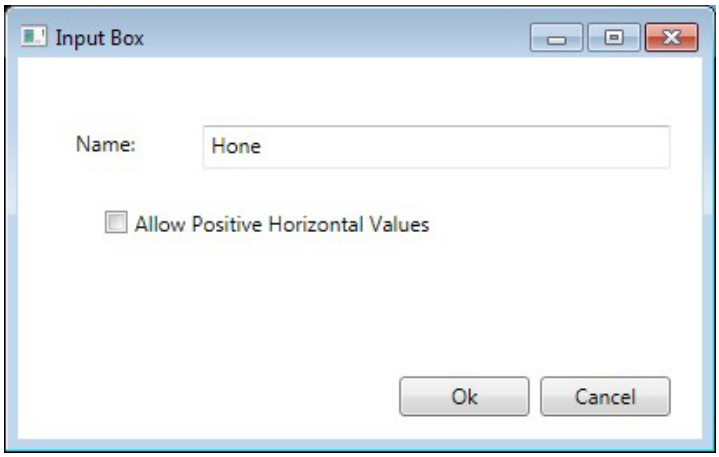
⚠ CAUTION The rest of the menu items and those of the Setup Electronics tag are used only for machine setup at the factory or for use by qualified service person when needed.

Touch the New Button (1) and the New Mode Select screen (2) will appear.

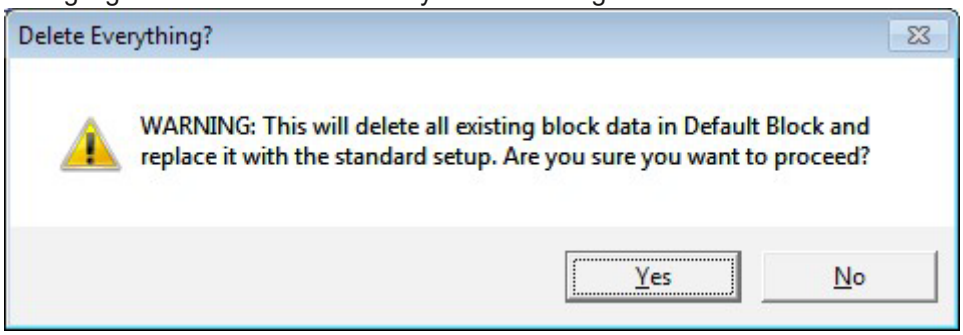


Highlight Hone (3) and touch OK.(4) The Hone program (5) will appear in the Mode Select section

Clicking the Options button (6) will bring the following window. Name of Hone process can be changed in this window.

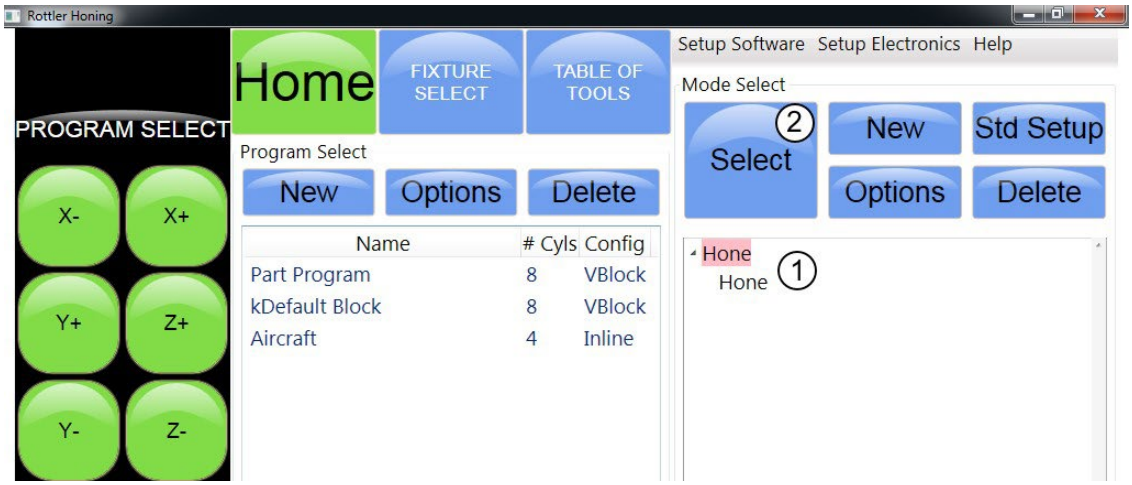


The Std Setup button (7) will bring up the following window. If you want to delete all settings in a block program that is highlighted and return the factory default setting click Yes.



If you choose the Std Setup the following Hone Modes will be loaded onto the Mode Select screen.

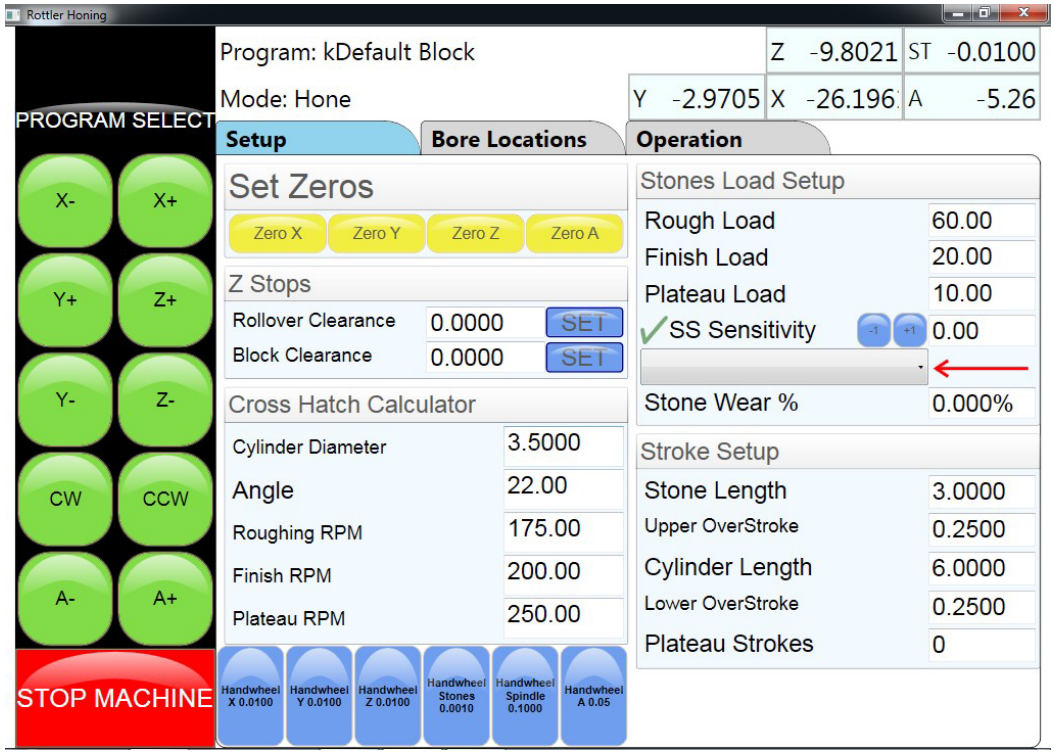
Highlight the Hone (1) process for the block program you just created. If the Std Setup was chosen select either Rough Hone or Finish Hone.



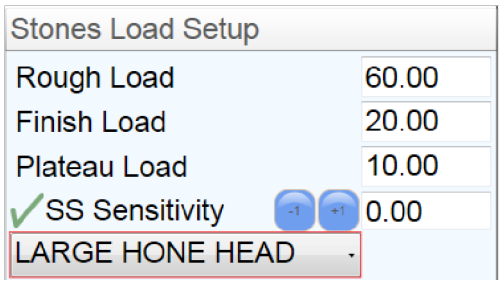
Click on the Select button (2) to bring up the Setup screen.

Operations Setup Screen

Setup Tab



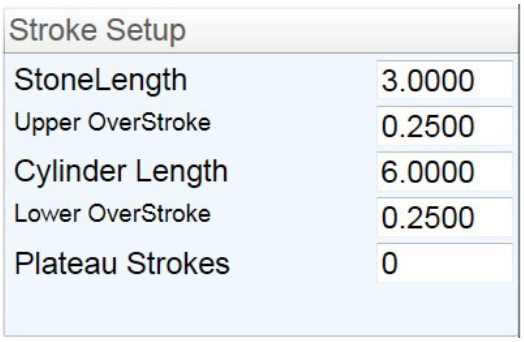
This is where machines setting are input.

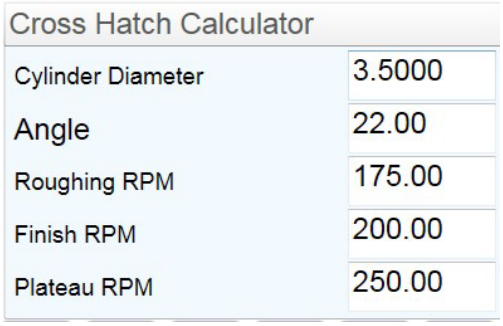


Begin be going to the Stones Load Setup section and inputting the values that will be used for the block you are going to hone. Touching one of the value boxes will bring up the number pad that can be used to input the value you wish to use. Set the short stroke sensitivity.

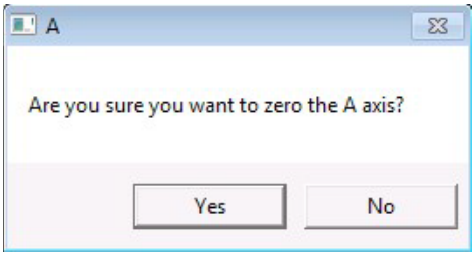
Select the hone head to be used by using the drop down menu.

Move down to the Stroke Setup section and input the values for this section. Cylinder Length is the measurement of the longest section of the cylinder. The amount of OverStroke is usually dictated by the clearance of bottom of the cylinder to the main web. When clearance is not an issue a setting of .250-.500 is a good place to start.



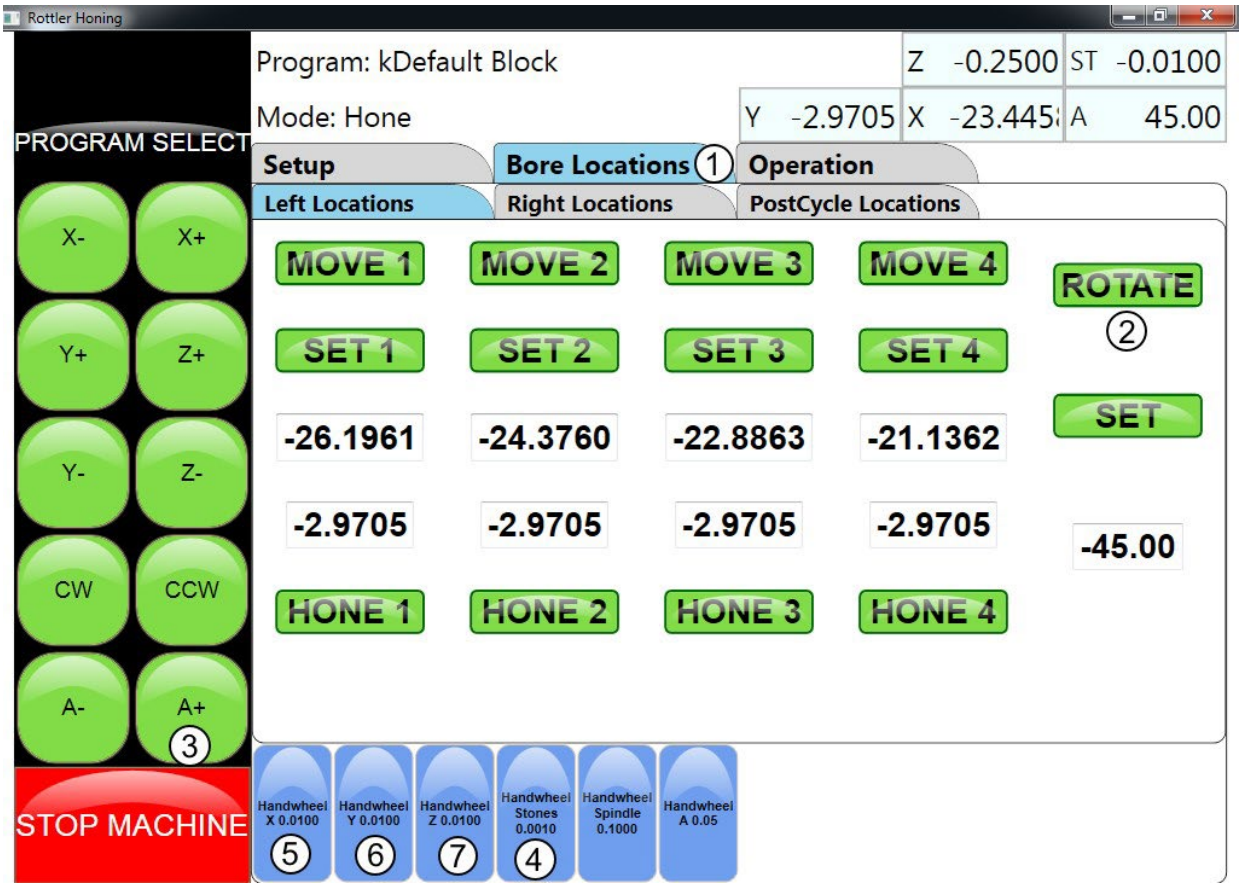


Move over to the Cross Hatch Calculator section and input the values for this section. Cylinder Diameter will be the finished size of the cylinders you are honing. Angle will be whatever angle specified by the ring manufacturer or requested by the customer. Roughing and Finish/Plateau RPM is generally set in the 120-200 range. Operator preference and experience will by the final determining factor.
.



With the auto rotate fixture you will have to set the zero point. Use a level and hand controls to rotate the cradle to its zero point. Once the cradle is level touch the Zero A button, then Yes on the confirm box to set the zero point.
Now touch the Bore Locations tab (1) and the following screen will appear.

Bore Locations Tab
Left Locations Sub Tab



The first thing to do is rotate the fixture so that the left cylinder deck of the block is level. This can be done 3 different ways.

1. Touch the ROTATE button (2) and the fixture will automatically rotate to the proper position.
2. Touch the 4th + button (3) and maintain contact until the proper position is reached.
3. Touch the Handwheel Forth button (4) to activate it. The button will turn red and you can then use the handwheel to rotate the fixture into position.

Note: If your machine is not equipped with the auto rotate fixture then you will simply use the handle lever to move the block from one bank to the other.

Once the left deck is level touch the Handwheel X button (5) to activate it. Using the handwheel or X- button move the carriage until it is over the number 1 cylinder. Activate the Y button (6) and using the handwheel move the carriage until the hone head is centered over the cylinder. Activate the Handwheel Z button (7) and using the handwheel lower the hone head down until the bottom is almost touching the deck. Carefully observe the position of the hone head. It should be aligned with the center of the bore. If needed the side to side position can be adjusted by activating the Handwheel X button (5) and using the handwheel to move the carriage until it is centered over the cylinder. Fore and Aft position can be set by activating the Y Axis button (6) and using the handwheel to move the carriage until it is centered over the cylinder.

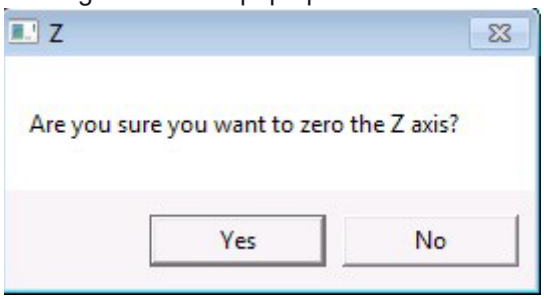
Now that the hone head is in its proper position activate the Handwheel Stones button.(4) Using the handwheel retract the stones until there is enough clearance for them to be lowered into the cylinder. Activate the Handwheel Z button (7) and using the handwheel lower the stones into the cylinder. Lower them until the top of the stones are flush with the deck.

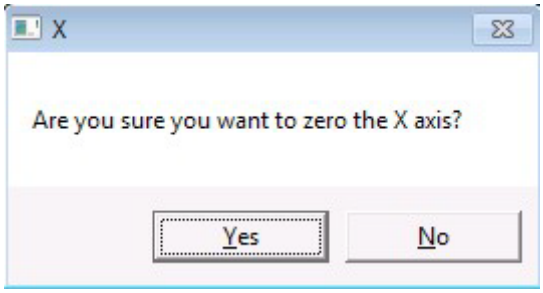
Activate the Handwheel Stones button (4) and feed the stones out until they are almost touching the cylinder wall. Again observe the position of the hone head in relation to the center of the bore. If needed make adjustments to get the hone head as near to center as possible.

Setting Zeros

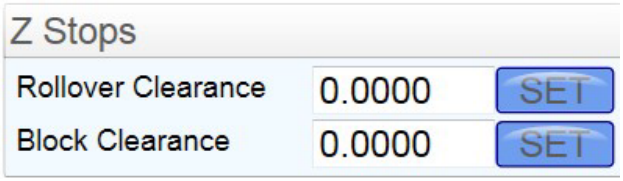
Touch the Setup tab to bring back the Setup screen.
In the Set Zeros section touch the Zero X button and then the Zero Z button.

You will get a confirm pop up for each. Touch Yes to continue.

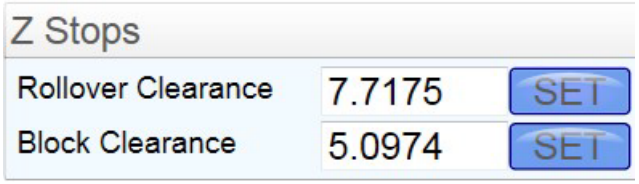




Using the handwheel raise the hone head out of the cylinder out of the bore until the bottom clears the deck by 1-2 inches. In the Z Stops section touch the SET button that is in the same line as the Block Clearance value.



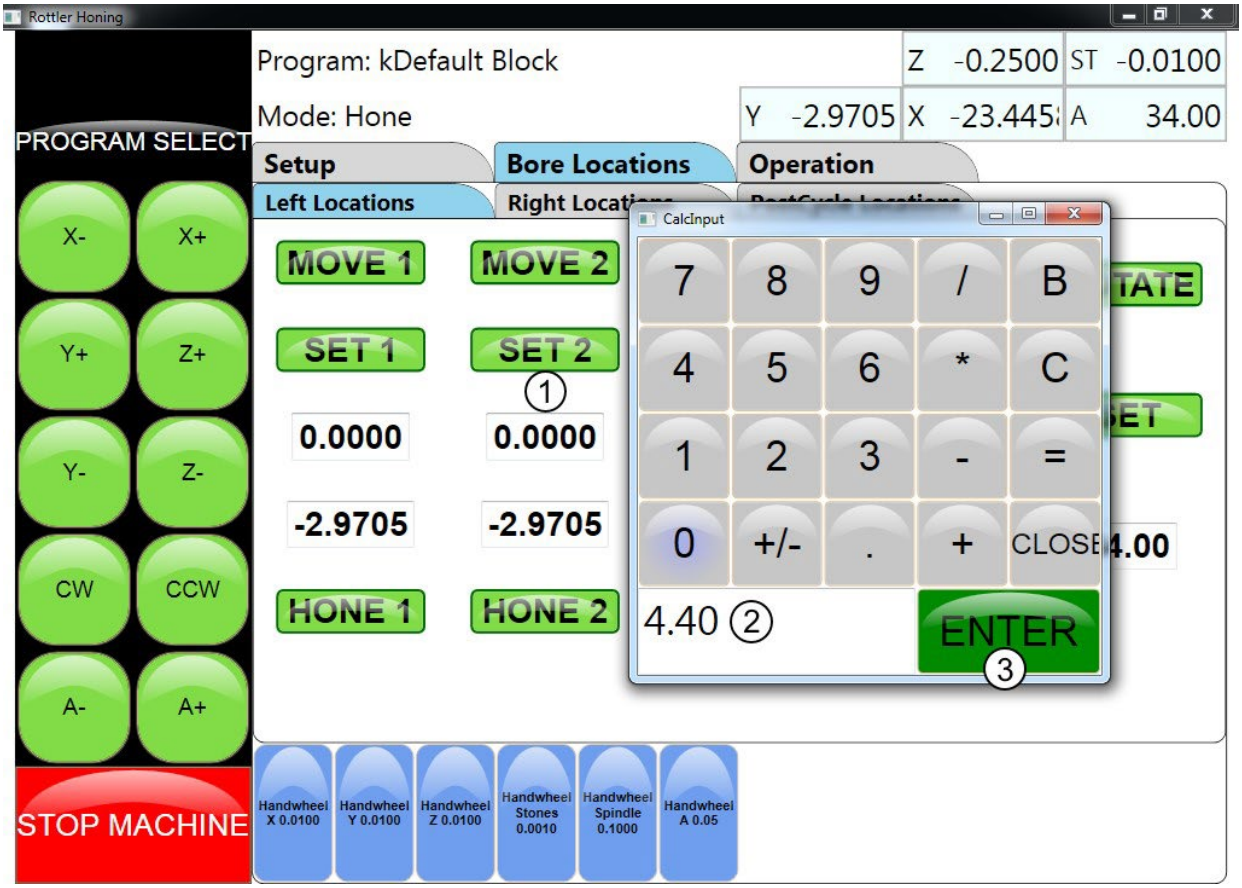
This will tell the machine how much to raise the hone head when it has completed honing a cylinder and will be moving to next during an auto cycle process. If you are honing a V type block then raise the hone head high enough to clear the block when the fixture is moved from one bank to the other. Touch the SET button that is on the same line as the Rollover Clearance value. It should look something like this.



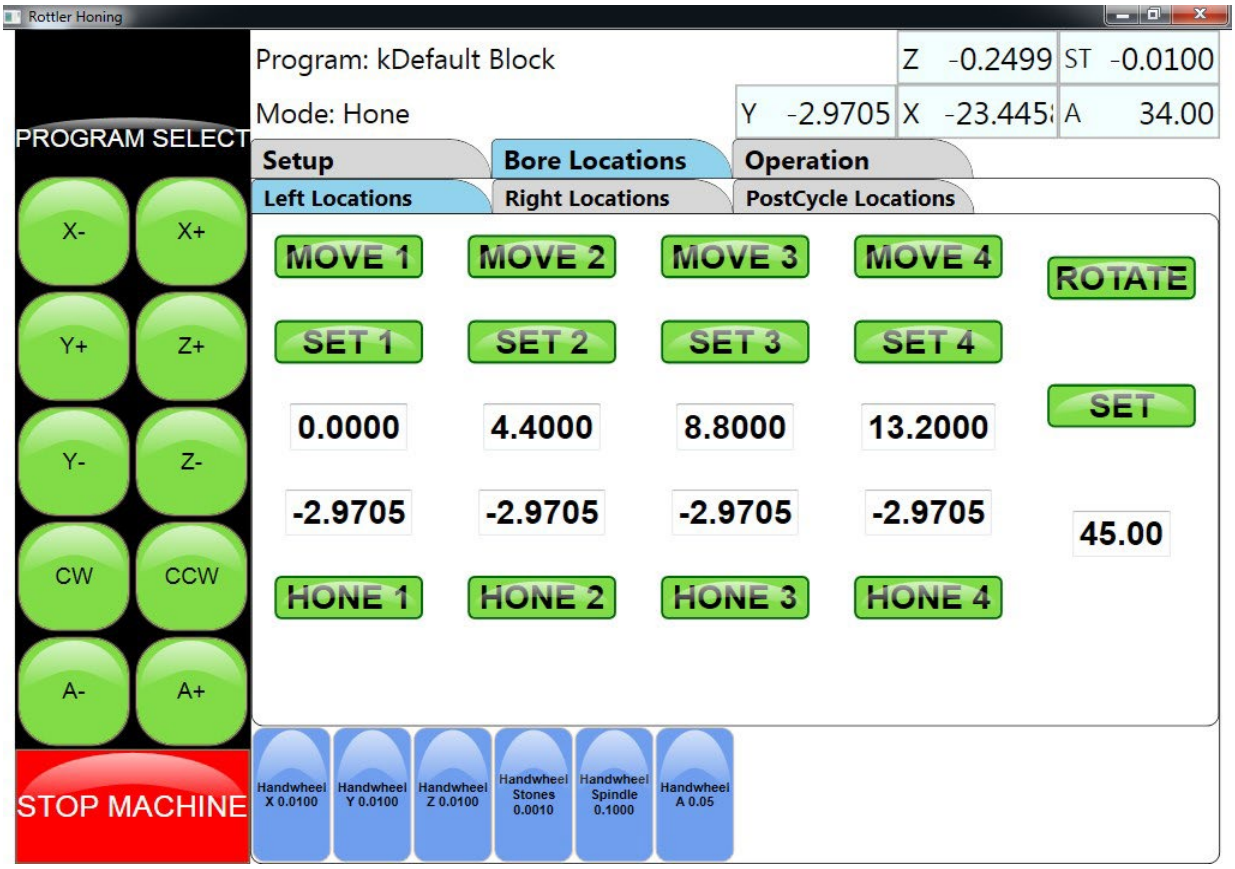
These settings also apply to the manual block fixture.
Touch the Bore Locations tab to return to the Bore Locations, Left Locations sub tab.

Setting Bore Locations

Now the bore locations will be entered for the left bank. Location 1 under the MOVE 1 button is 0.00 since that is the zero point that you set when you set the Zero X on the Setup screen. Touch the value box (2) under the MOVE 2 button and the number pad will appear.



Enter the center to center value (2) for the block you are honing and touch ENTER.(3) In this case the center to center distance is 4.40. Continue on to the next value boxes in line and add the value to the previous setting. In this case I will add 4.40 to 4.40 to obtain 8.80 for the value box under MOVE3. Finally I will add 4.40 to 8.80 to obtain the final value under the MOVE 4 button. When competed it will look like this.

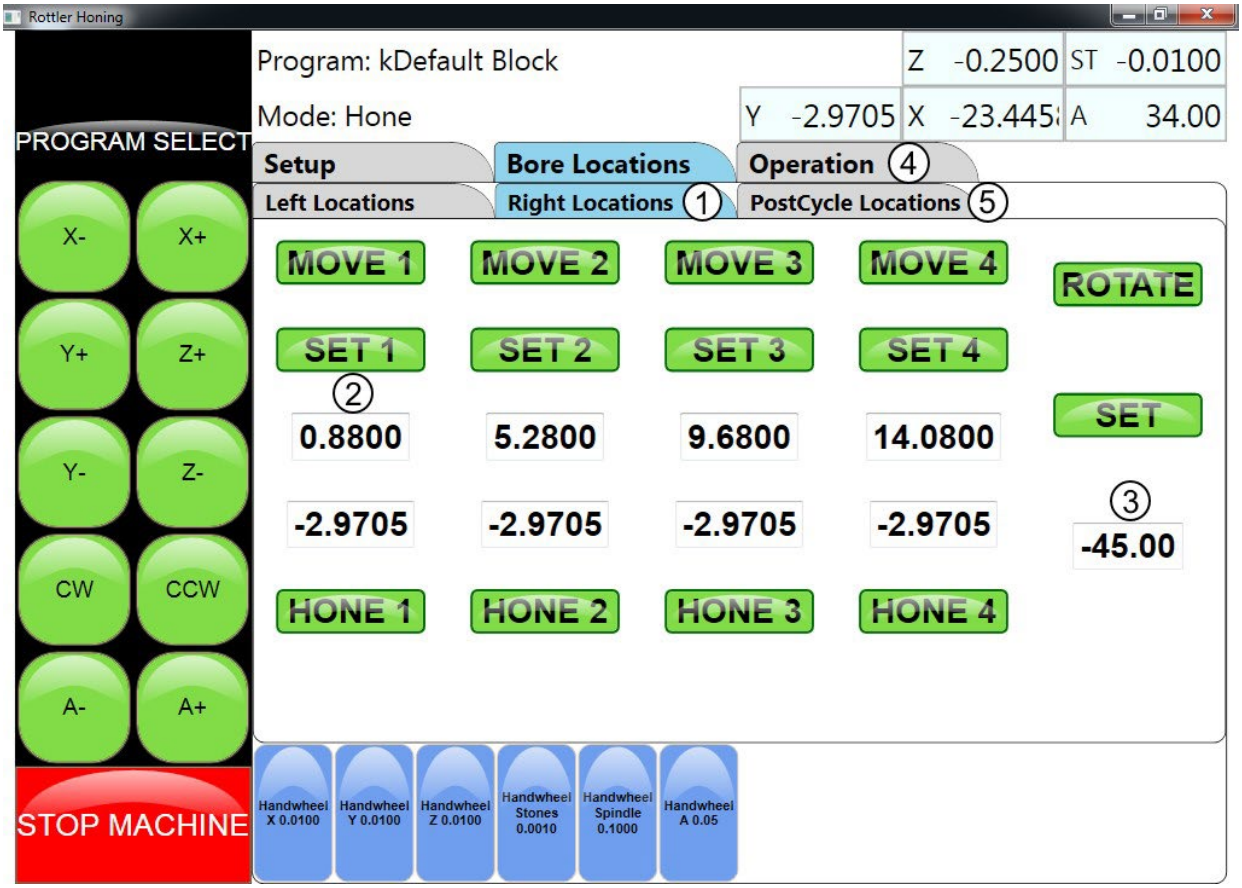


You can check your values by pressing any of the MOVE buttons. The carriage will move to the location that was touched and stop. Touch each button and visually check that the hone head is centered over the bore.

Press the Right Locations tab (1) to bring up the screen for Right Locations.

This is where you will use the bore offset dimension to calculate the bore locations for the right bank. If you do not know the bore offset dimension you can measure the width of the con rod big end and that will give you a close value for the bore offset. In this example the bore offset is .880. Enter .880 in the value box under the MOVE 1 button.(2) Note: The measurement of the width of the big end of the connecting rod only applies to engines where the two connecting rods share a common rod journal.

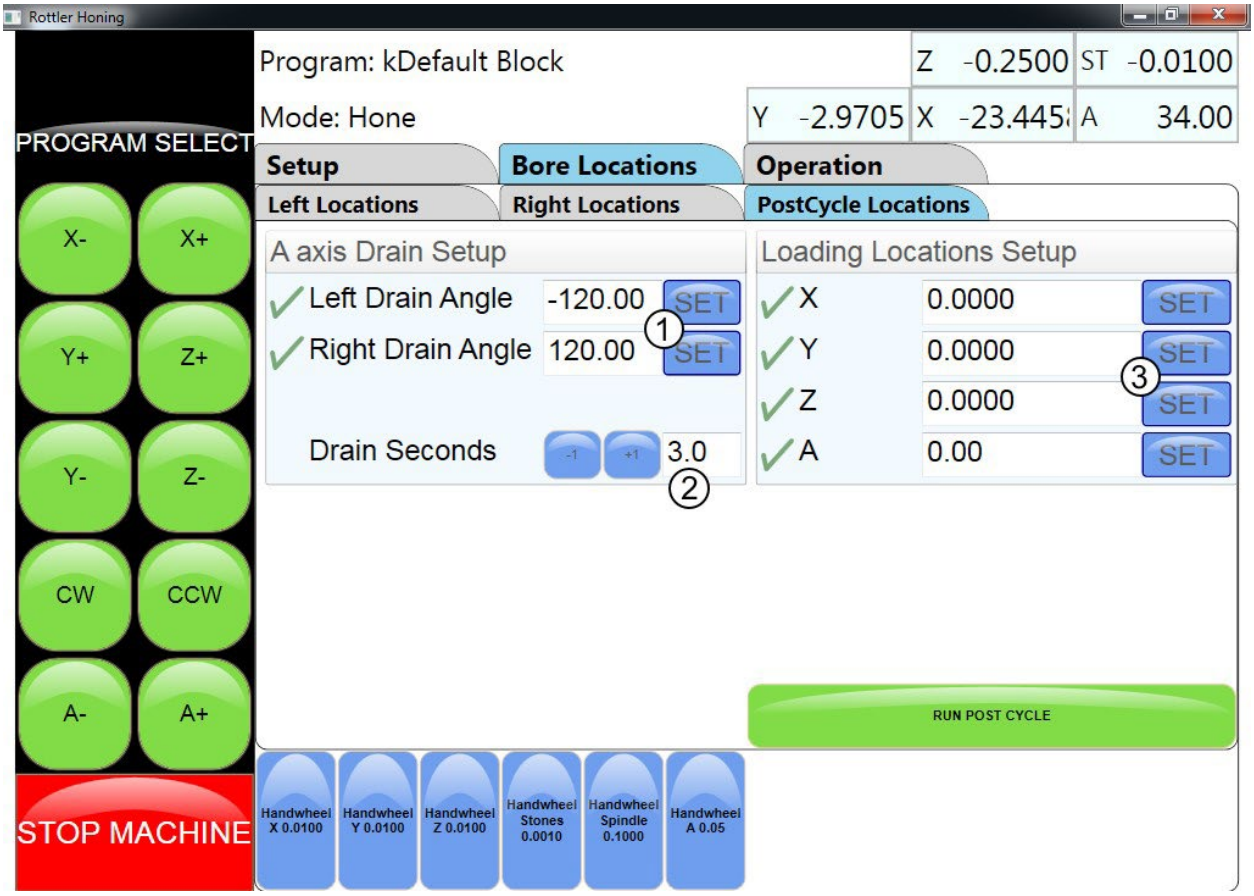
Continue to add the center to center value in each of the following value boxes. So in this example 4.40 will be added to .880 to obtain the value that is entered in the value box under the MOVE 2 button. When completed it will look like this.



Again verify the settings by touching each of the MOVE buttons and visually checking the location of the hone head.

On machines equipped with the auto rotate fixture touch the ROTATE button to verify that the fixture is moving to the proper bank and that deck is level. On blocks that have a bore angle other than 90º you will have to enter the values in the box under the ROTATE button.(3) For example if you are honing a 60º block you will enter -30.0 in the Right Locations section and 30.0 in the Left Locations section.

Touch the PostCycle Locations tab (5) to bring up the following screen.

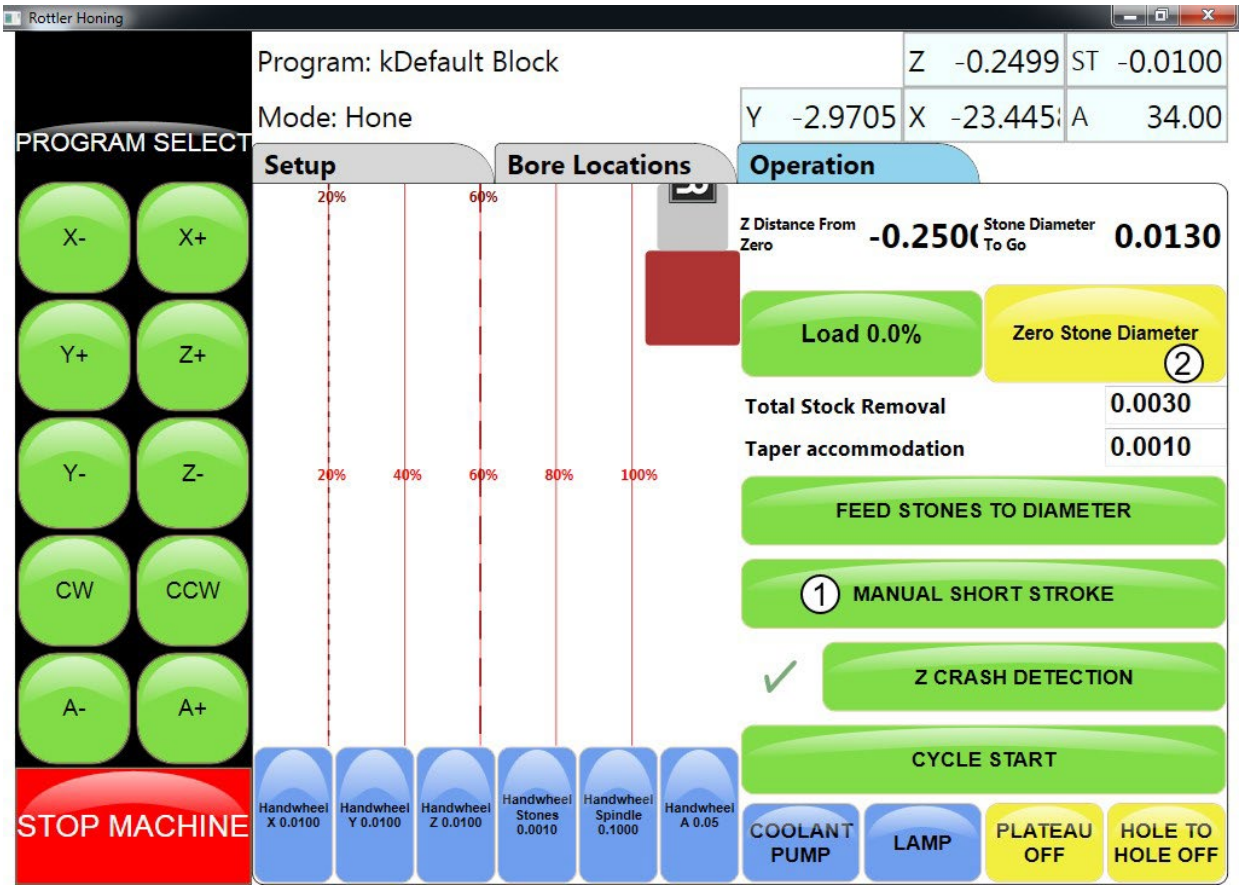


This screen only applies to machines that have the optional auto rotate block fixture installed.

Using the job buttons rotate the block fixture to a point that will allow coolant to drain from the block. Use the SET buttons (1) to lock in the locations. Enter the amount of time in seconds (2) that the block will maintain that position for drainage.

Using the jog buttons move the carriage and spindle to a position that will provide clearance for removing the block from the fixture. Use the SET buttons (3) to lock in the locations.

Operation Tab Settings



This is the screen where all honing operations take place.

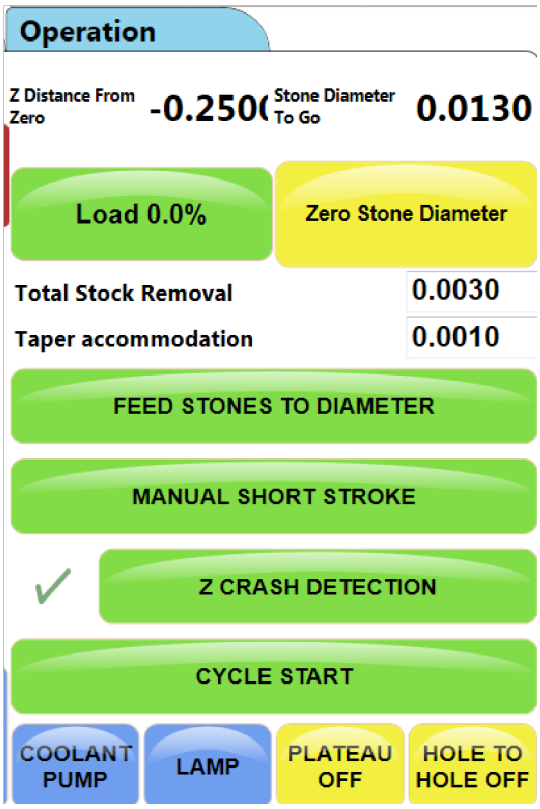
The final setting is the Zero Stone Diameter. This will establish the zero point for hone stone sizing. Move the hone head over the first cylinder of the left bank. This can be done by using the handwheel, however the most accurate way to locate the hone head is to go to the Bore Locations tab and touch the MOVE 1 button. This will move the carriage to the location that is indicated on the screen. Go back to the Operation tab and lower the hone head into the cylinder until the top of the stones are below the deck. Feed the stones out using the handwheel until they are almost touching the cylinder wall.

Touch the FEED STONES TO DIAMETER button.(1) The machine will start up feed the stones out until the preset load is reached. The machine will then shut off. Touch the Zero Stone Diameter button (2) to set the zero point for stone size. Touch the Yes button on the pop up conformation.

Setting Final Bore Size

To set the final bore size you will need to have the current and final desired bore size of the block you are honing. Use your preset bore gauge to determine how much material needs to be removed. Generally .003 is left in bored blocks to hone. In our example the final bore size will be 4.150. Current bore size is 4.147. This leaves .003 to be honed.

With the zero point set enter the amount of stock that needs to be honed to reach final size. In this example we will enter .0020 in the Total Stock Removal value box. We entered .0020 instead of .0030 in order to confirm stock removal rate for the stones being used.



Using the handwheel retract the stones a few thousandths Touch the CYCLE START button. The machine will start, the stones will feed out until the zero point is reached, then go to the bottom of the bore to check for any potential interference. If none is detected the machine will begin the honing process and continue until the amount of stock entered is removed.

When the cycle is completed the hone head will raise out of the cylinder. Move the carriage so that the bore can be checked with a bore gauge.

Note the amount still needed to be removed. In our example the reading is -0.00012 from zero. Go to the Total Stock Removal value box and enter the sum of the current value and amount still needed to be honed. In this case the new value will be 0.0032.

Go to the Bore Locations tab and touch the MOVE 2 button to locate the hone head over the next cylinder to be honed. Return to the Operation tab retract the stones slightly and lower the hone head into the cylinder. Touch CYCLE START to repeat the process done on the first cylinder.

If the bore gauge reading for cylinder 2 matches the desired final size the set up process is complete. If the size still doesn't match the final desired size repeat the process done on the second cylinder with the third cylinder. For our example we'll assume that the final size was obtained and we are ready to run the auto cycle.

Go to the Bore Locations tab and touch the HONE 2 button to deactivate it. It will turn yellow to indicate that it is inactive. The HONE 2 button is deactivated because it is already at its final size, so it doesn't need to be honed.

Return to the Operations tab and touch the HOLE TO HOLE button to activate the auto cycle process. The button will turn red and show ON to indicate that it is active.

Touch the CYCLE START button and the machine will automatically go to the first cylinder, lower the hone head into the bore, go through the setup process, then hone the cylinder to final size. After the honing is complete, the stones will be automatically retracted, the hone head will raise out of the cylinder, and move to the next cylinder and repeat the process. In this case since cylinder 2 is not active the carriage will move to cylinder 3.

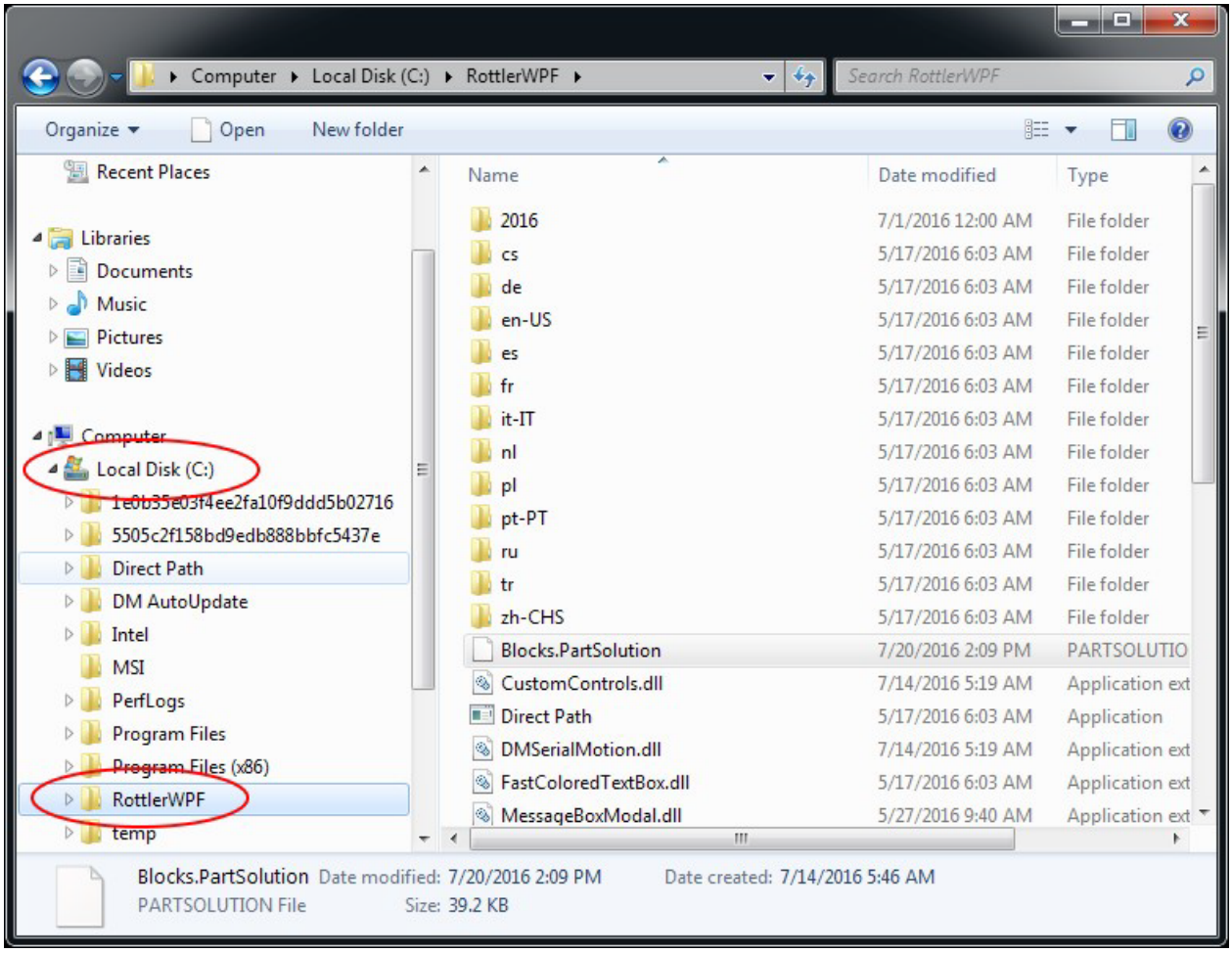
When the 4th cylinder is completed the hone head will raise to the rollover clearance height, the fixture will rotate to the other bank, and the 4 cylinders on that bank will be honed.

After the final cylinder is honed the hone head will raise out of the block and the auto cycle will be complete.

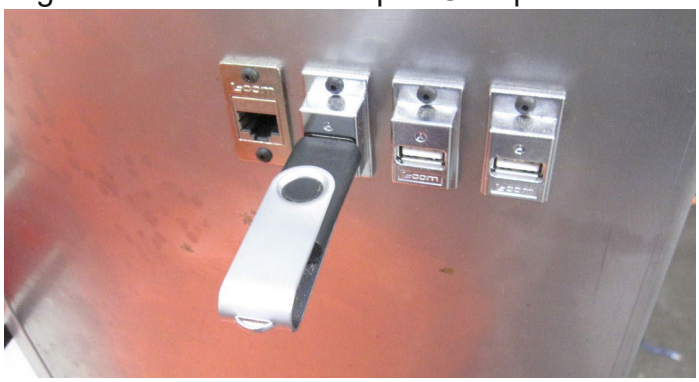
Backing Up and Restoring Block Profiles

This section will explain how to back up and restore the operator created block profiles for DM controlled machines for archival purposes or to transfer to a different machine.

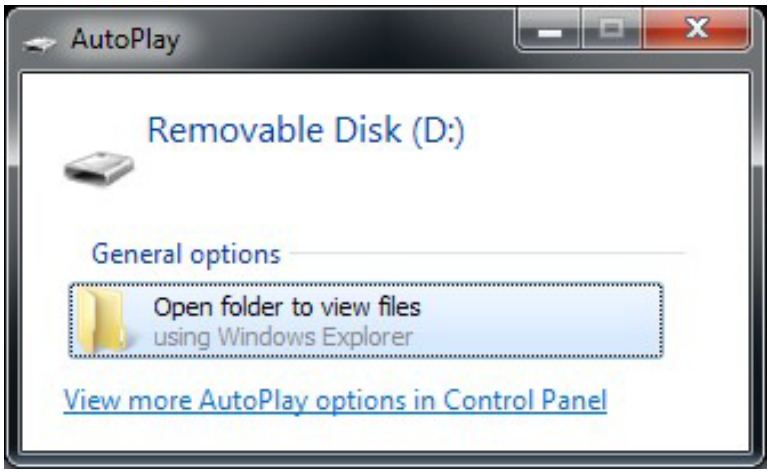
First step is to open your file bowser and locate the RottlerWPF file on the C disk drive.



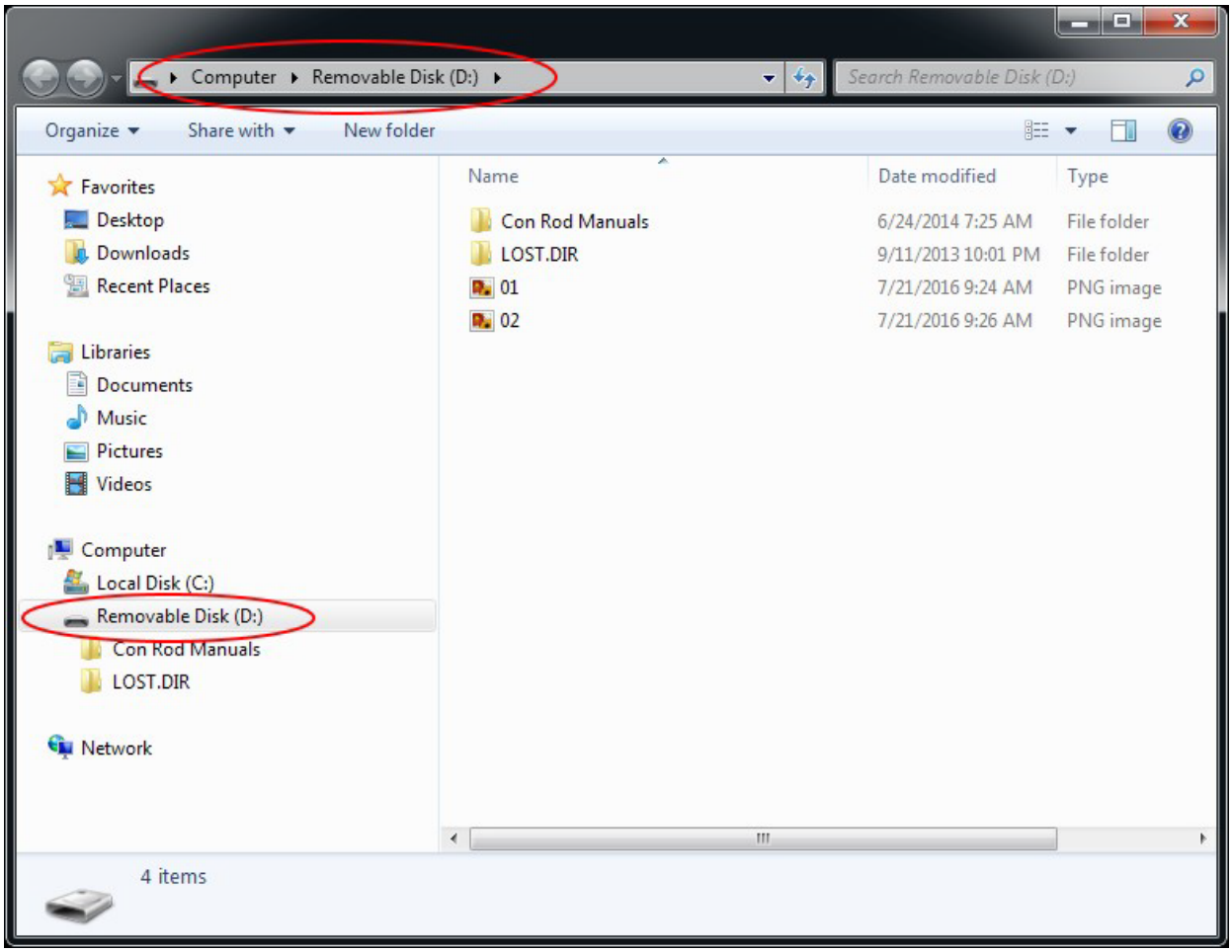
The next step is to plug in a flash drive to an open USB port



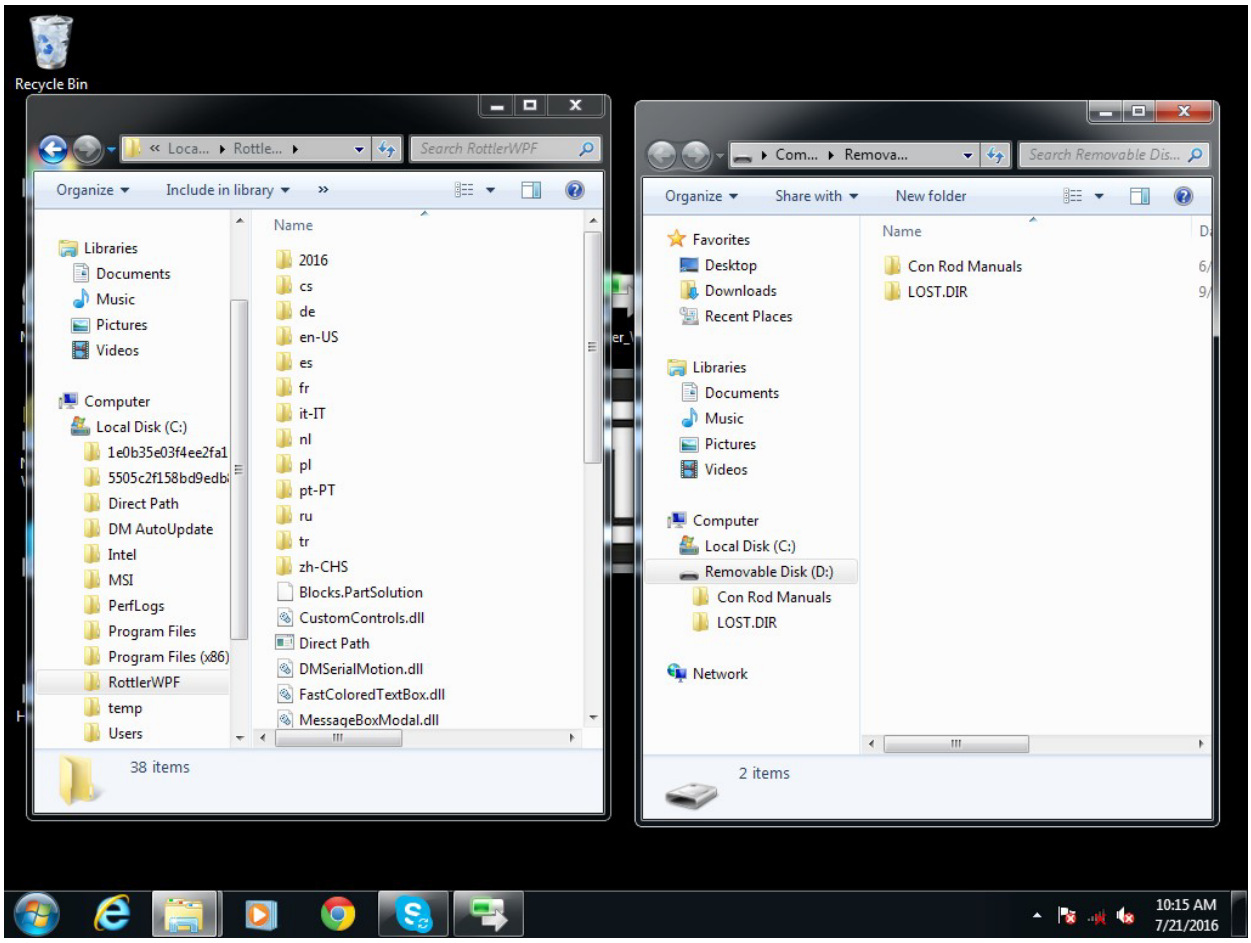
The following pop up box will appear on your screen.



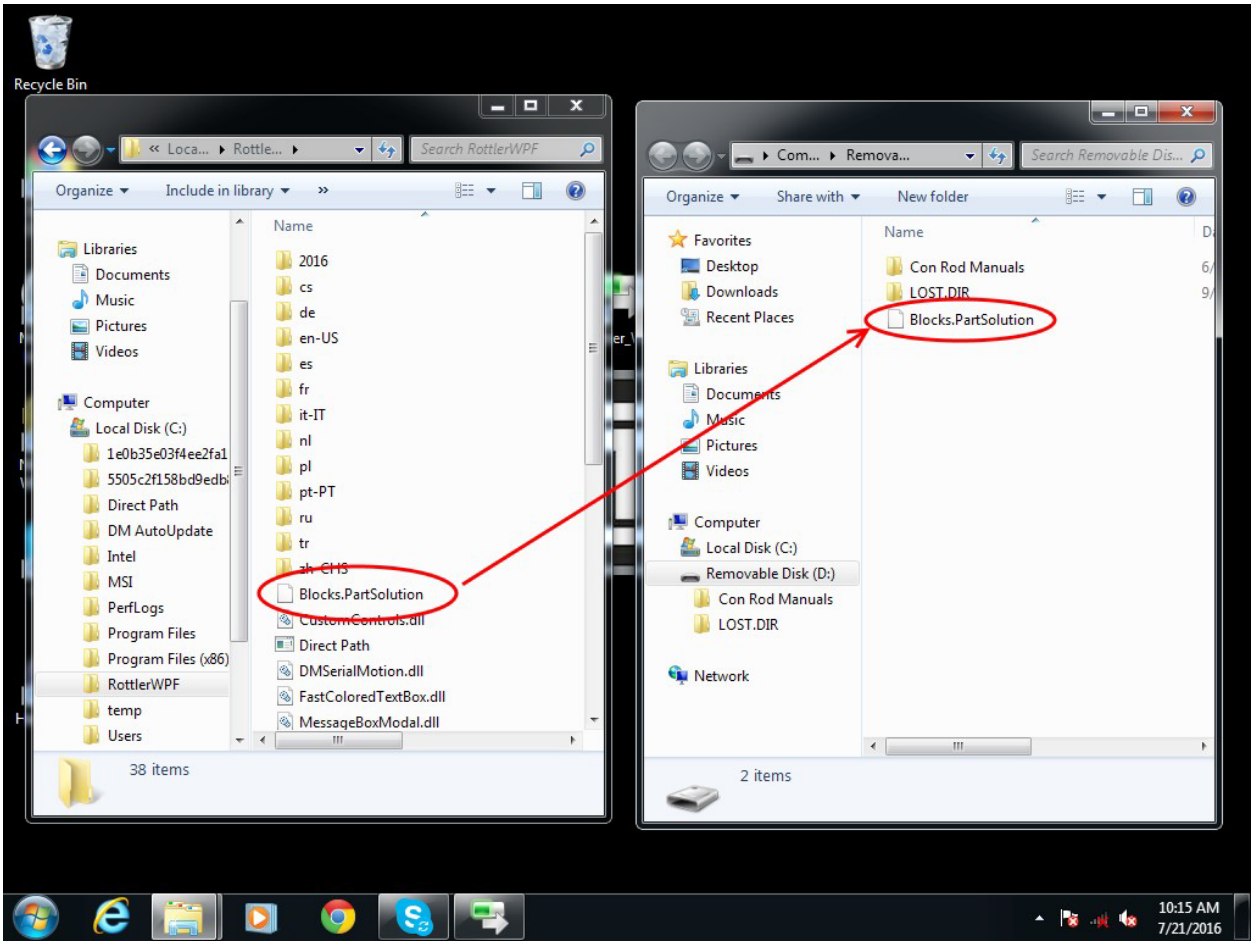
Click on the Open folder to view files option and the following screen will appear. This is the contents of the flash drive you just plugged in.



Next resize and arrange both file browsers so that they are side by side.



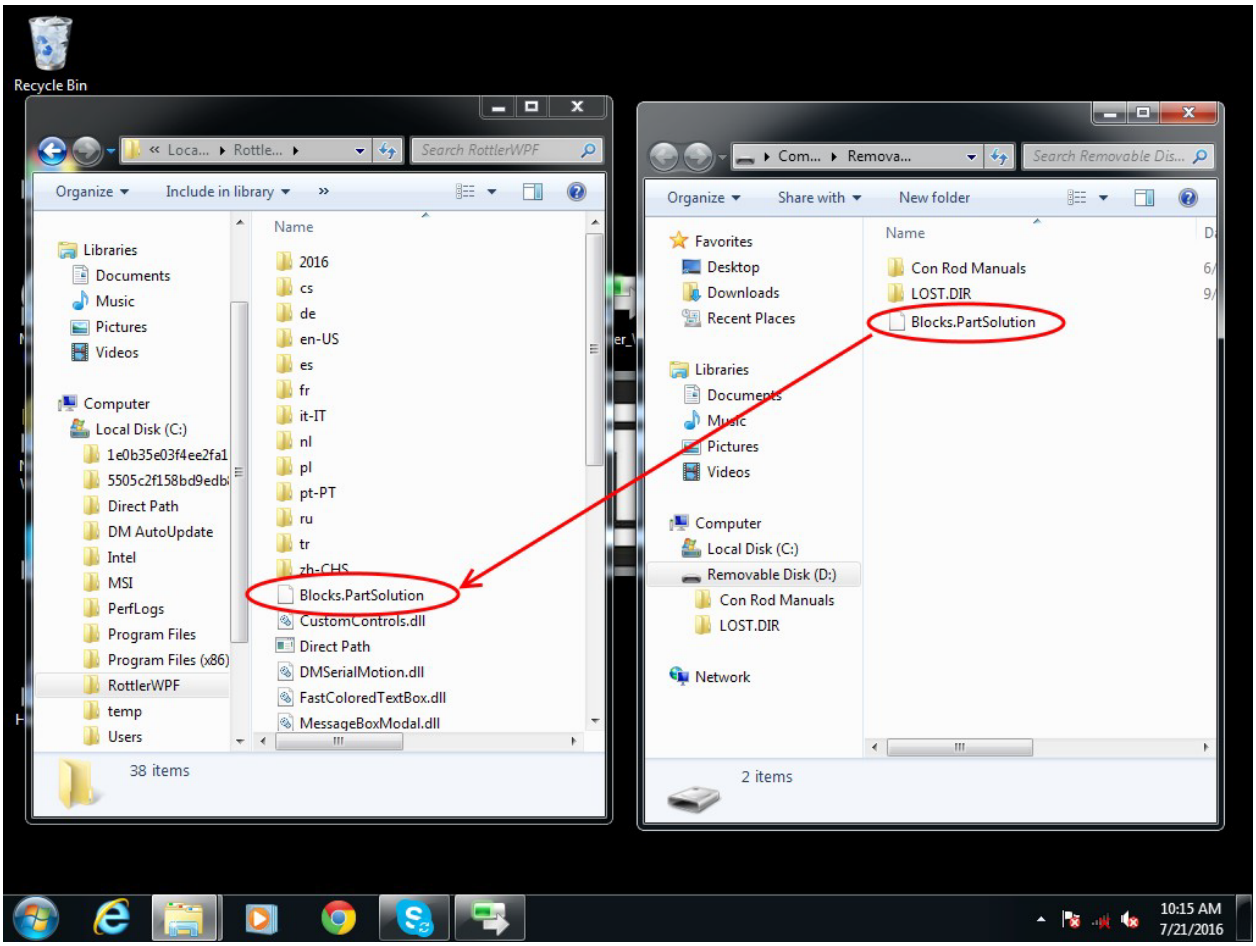
Block profiles are backed up each time the machine is run with the current profiles being shown in the RottlerWPF folder. All that needs to be done to back up the current profile is to simply drag it from the RottlerWPF folder to the flash drive folder. A copy of the file will be placed on the flash drive.



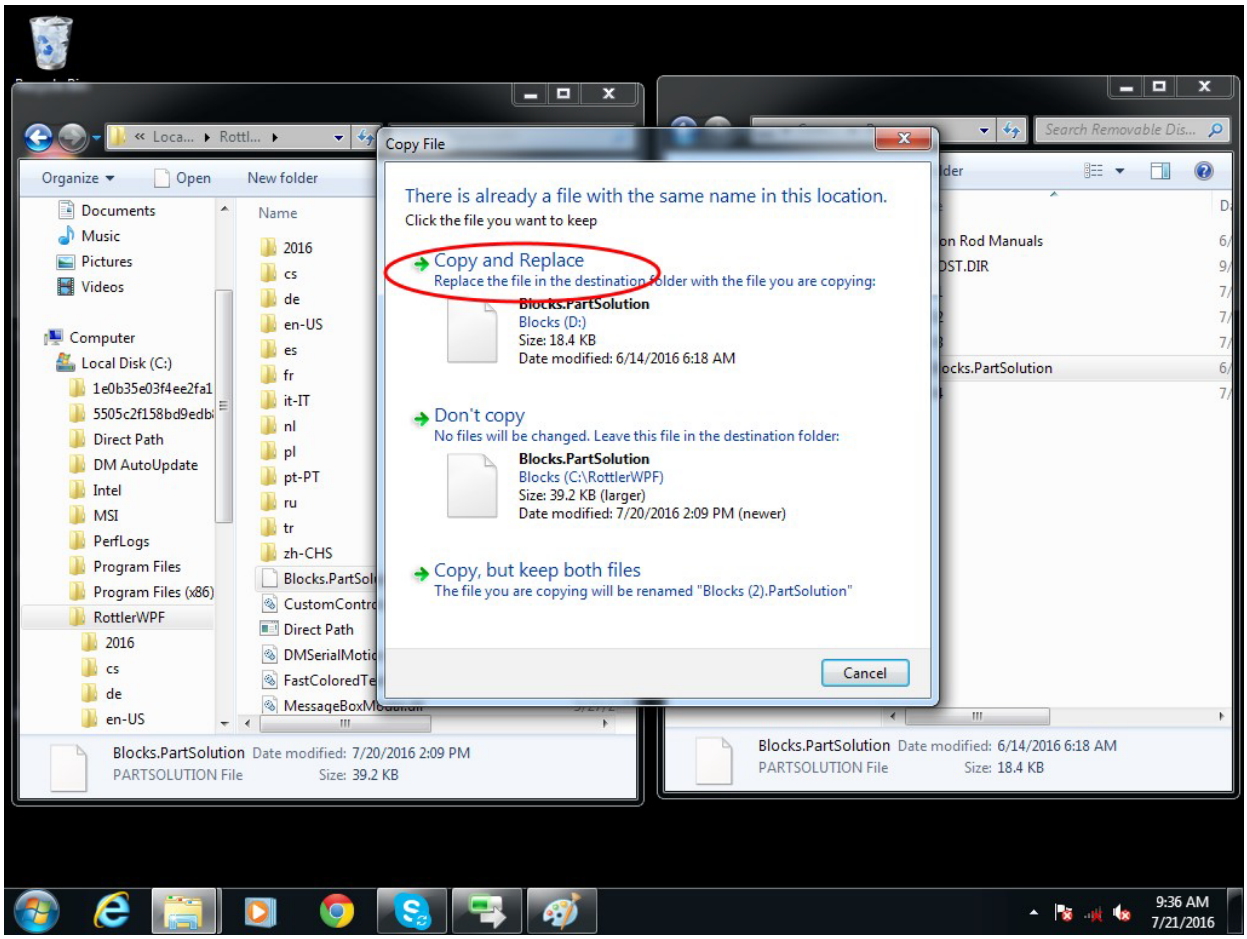
Backup is now complete. Close both file browser windows and remove the flash drive.

To restore or add block profiles go through the first 5 steps explained previously.

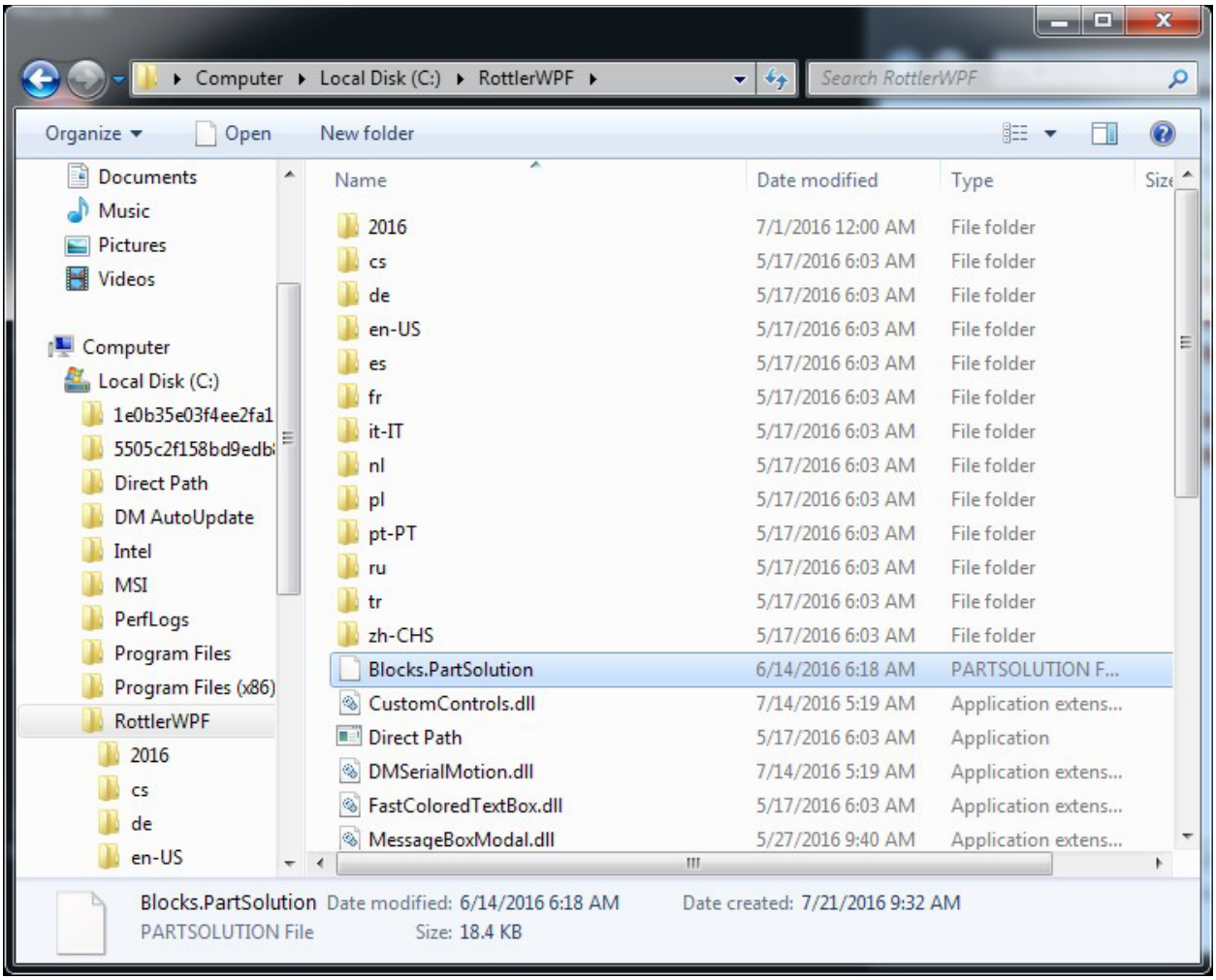
Highlight the block profiles file in the flash drive and drag it into the RottlerWPF folder on the local hard drive.



You will get a pop up window about there being a file of the same name in the destination folder. Click on the Copy and Replace option.



The archived block profiles will now be installed.



Close both browser windows and remove the flash drive. The restore process is now complete.

MAINTENANCE

Contents

Maintenance

Follow all relevant safety procedures as described in Section 3 of this manual before performing any maintenance or repair procedure.

Lubrication

⚠ CAUTION Refer to the Material Safety Data Sheets on the manual CD for information on proper use and handling of lubricants mentioned in this maintenance section.

Grease Fittings

There are grease fittings on the main carriage assembly, the optional clamp arm assemblies, and the optional Turn Over Fixture. See the following images for locations of grease fittings and intervals for adding grease.

These grease fittings should be greased, using NLGI #2 White Lithium Grease.

Automatic Lubricator

The oil injection lubricator is located on the back of the main base. The oil injector lubricates the ballscrews. The automatic injection lubricator is controlled by the machine program. The controller will activate the injection lubricator at a predetermined time interval

When needed, add lubrication oil to the reservoir. ***Use ISO VG 68 Way Oil.***

Electrical Enclosure

On a weekly basis check the door air filter and the aluminum finned heat sink and fan assembly. Replace the air filter when if becomes dirty. Blow off the heat sink and fan when it becomes covered in dust. Refer to the Machine Parts section of this manual for more details and for part number of the filter.

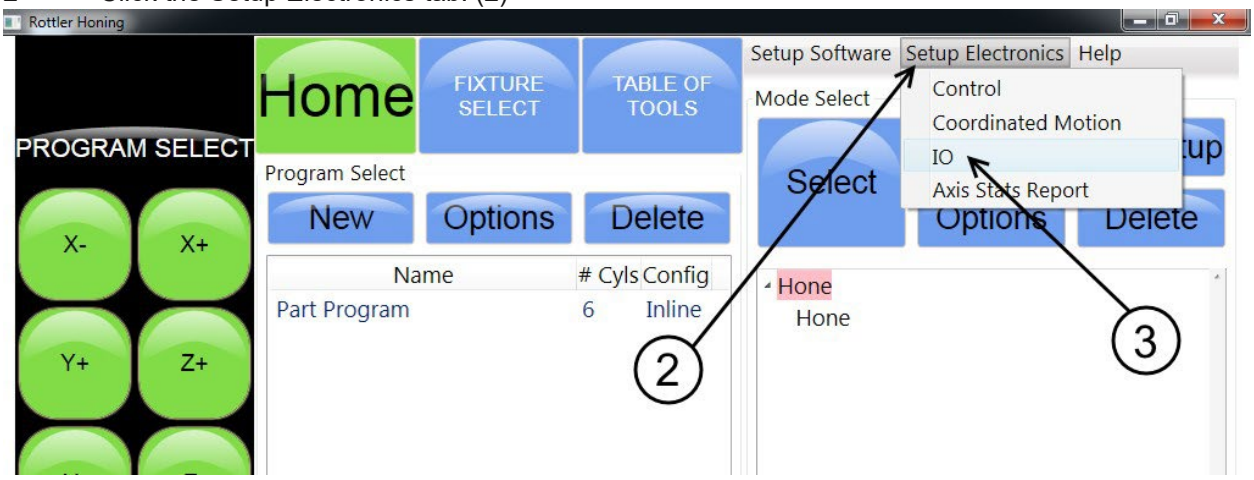
Priming Oil Lines

If there is ever the need to fill the oil lines that provide lubrication on the machine use the following procedure.

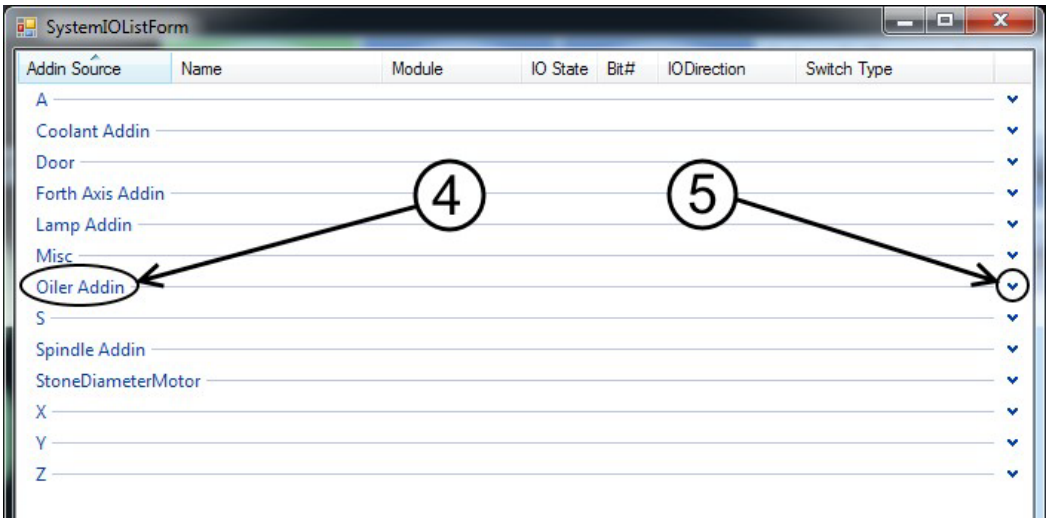
⚠ CAUTION ***Do this procedure with the E-STOP engaged to prevent any accidental activation of machine functions.***

1 Go to the Home screen.

2 Click the Setup Electronics tab. (2)

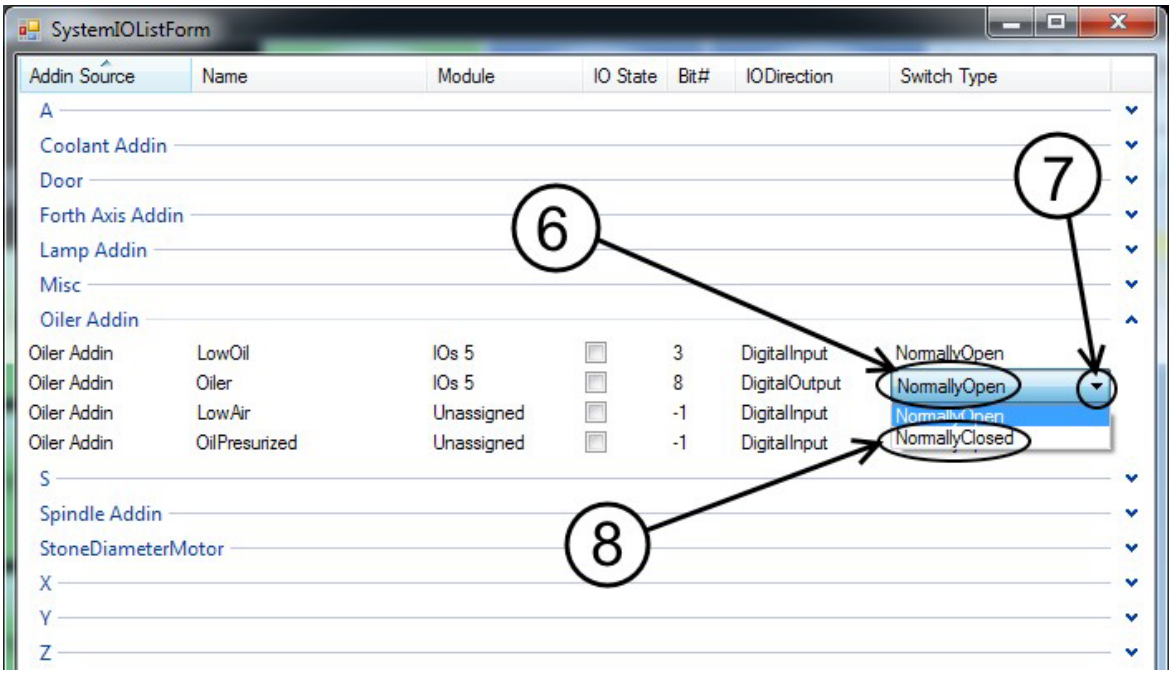


3 Select the IO tab (3) from the drop down menu. This will bring up the following screen.



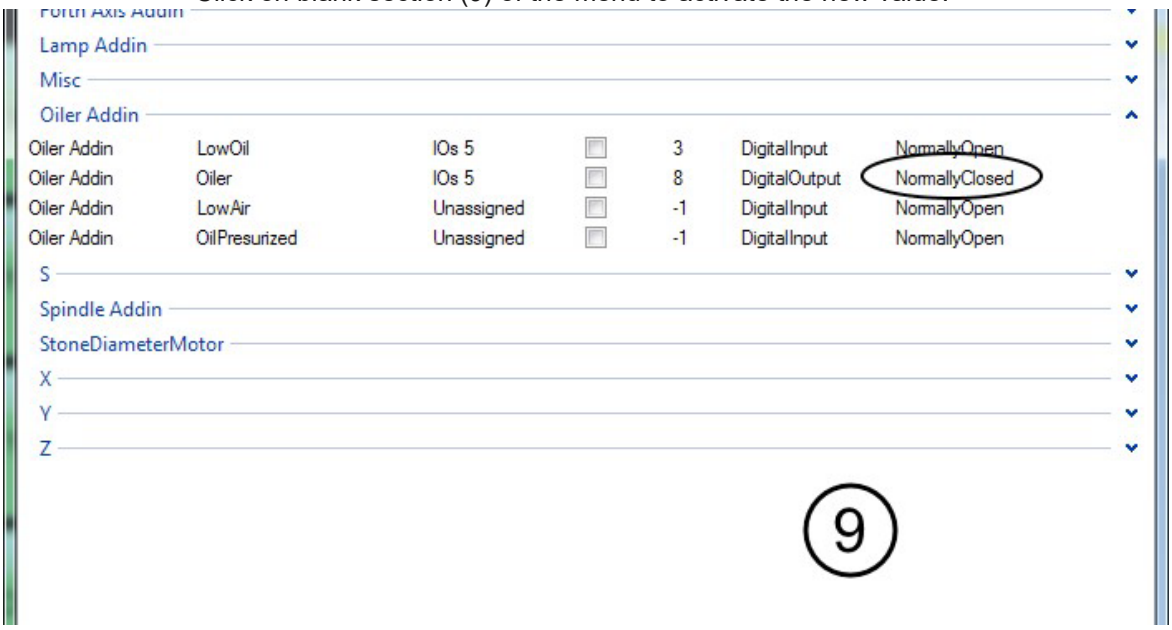
4 Go to the Oiler Addin line (4) and click the down arrow (5) to expand the section.

5 The second item on the expanded list is the control for the oiler. Click on NormallyOpen (6) and value box will appear.



6 Click on the down arrow (7) and the different values available will appear.

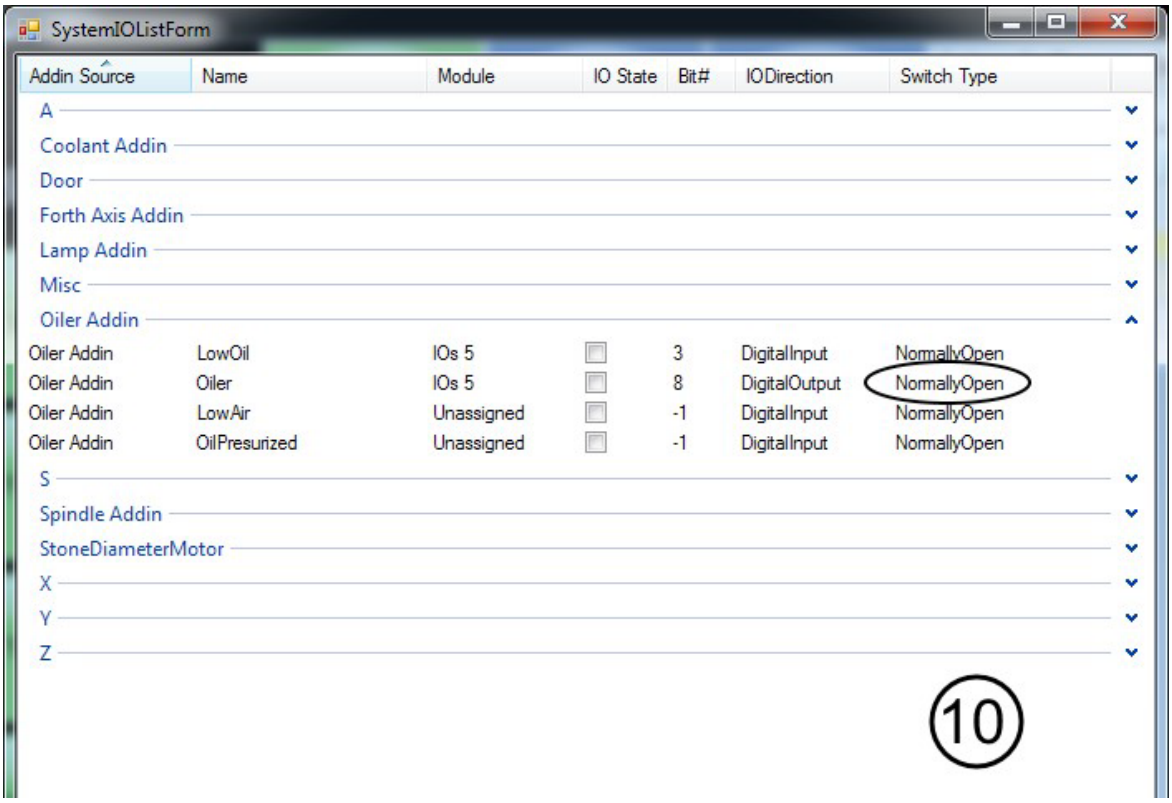
7 Click on NormallyClosed (8) and it should appear on the second line in place of NormallyOpen. 8 Click on blank section (9) of the menu to activate the new value.



9 Oiler should now be running. Observe the oil lines and wait for them to become filled with oil.

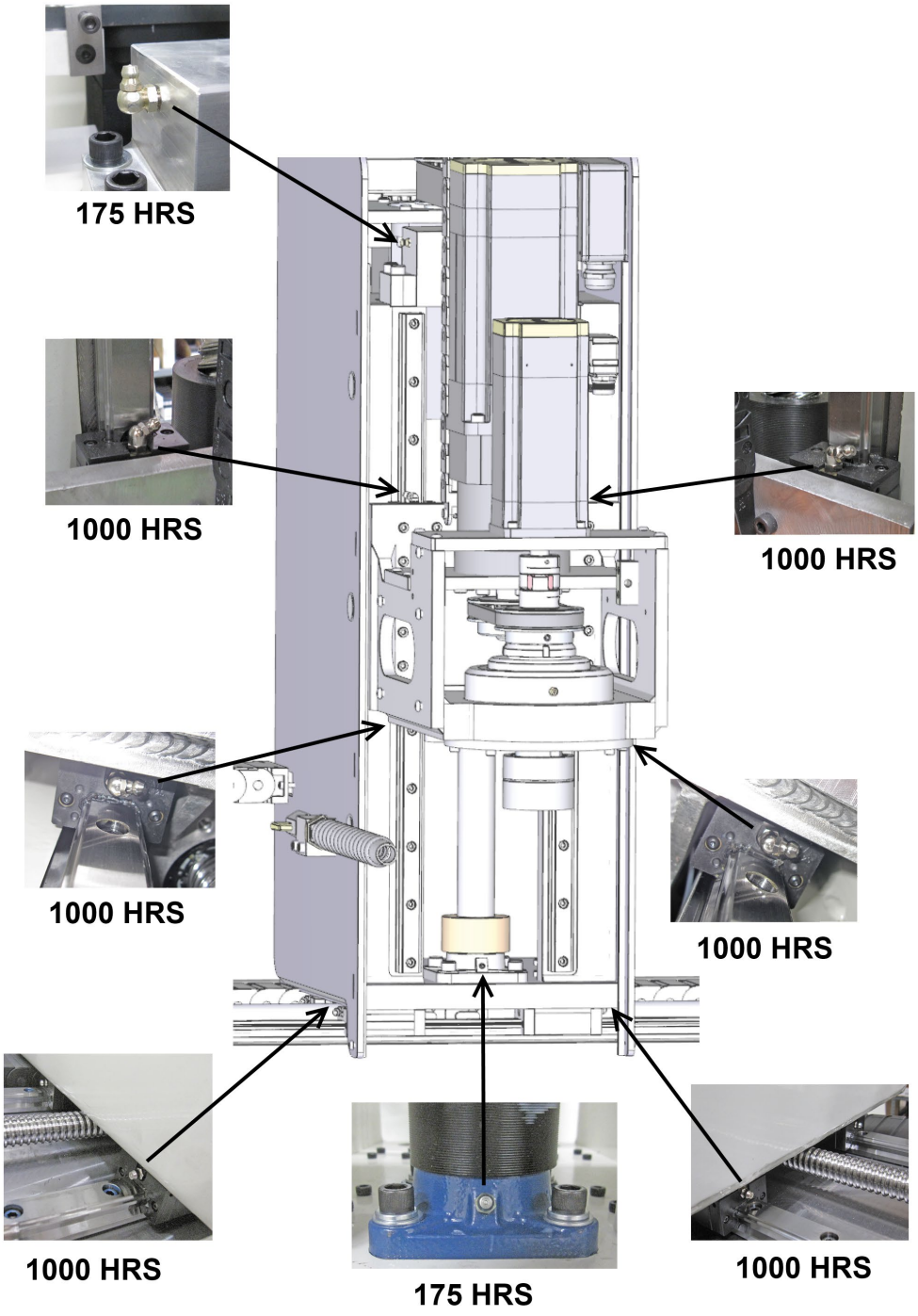
10 Once they are filled go back to the setup window.

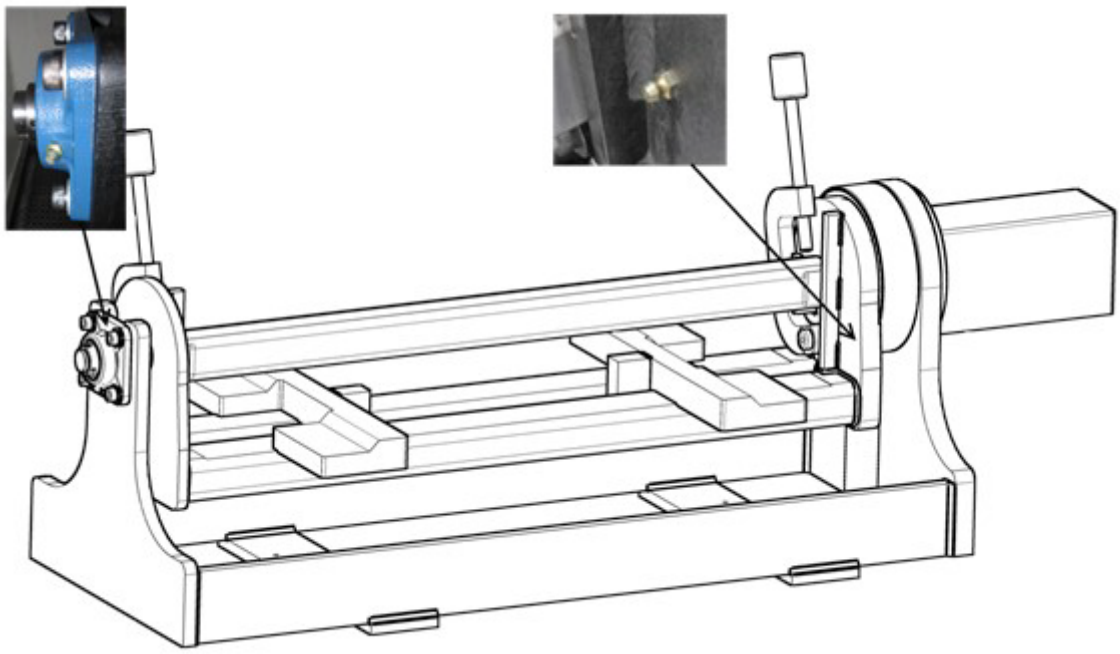
11 Click the NormallyClosed value, click the down arrow, then click NormallyOpen.



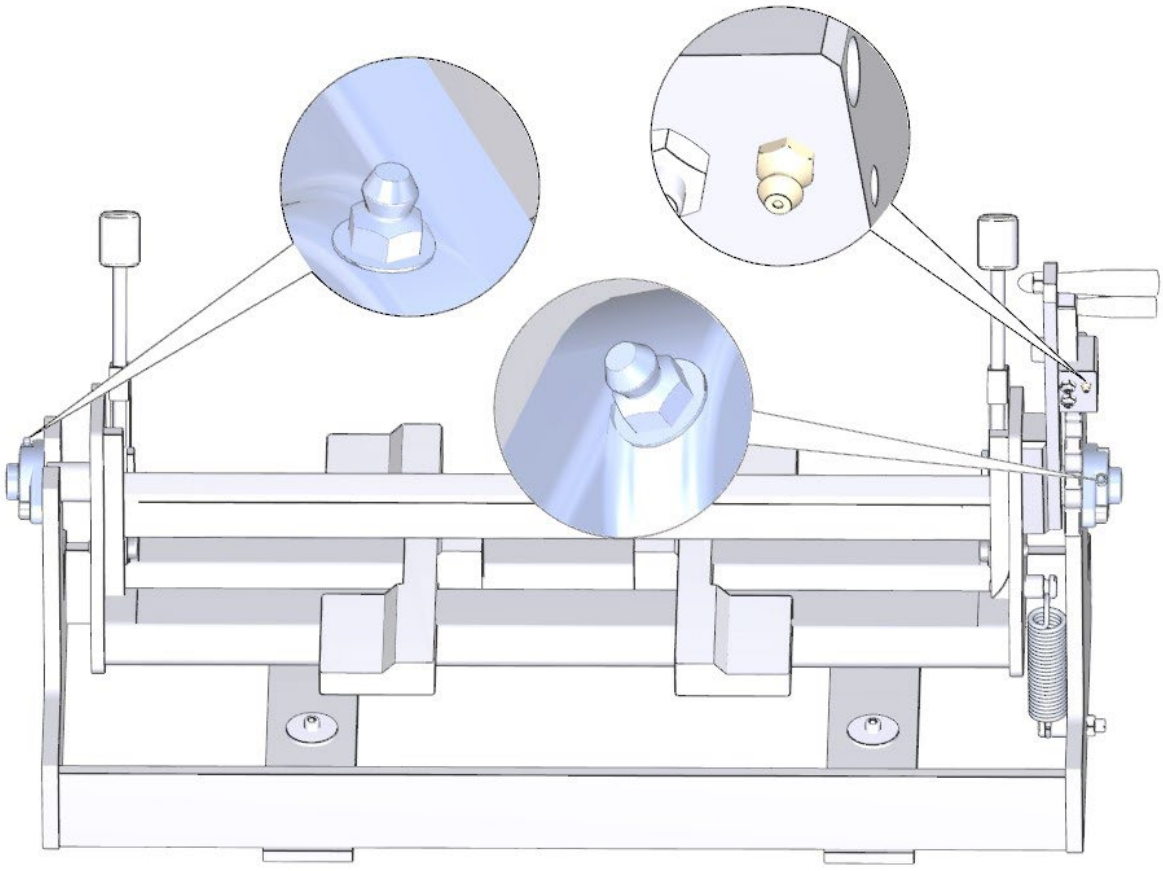
12 Click on a blank area (10) to set the NormallyOpen value.
13 Close the window.
14 Release the E-STOP.

Grease Fitting Locations





Grease should be added every 175 hours of service time.



Honing Coolant

The coolant pump is located in the back of the splash tank. The coolant drains under the block fixture into a sump under the machine.

Change the honing coolant when it gets dirty. When changing coolant, completely clean tank and filter screen. Refill with Rottler 514-4-71C coolant mixed with water to a reading of 3 – 5 on the Refractometer scale. If a Refractometer is not available then a static ratio of 5% - 8% is acceptable.
Ratio of coolant to water will be approximately 1:20 or 1 gallon of coolant for each 20 gallons of water.

Standard Coolant Filter Unit

Replace filter element in filter housing as needed.
Use the supplied 514-2-42D wrench to loosen the filter bowel from the housing. Remove old filter and replace with new filter (514-2-42C). Use wrench to retighten bowel onto housing. ***Do not over tighten.***

Magnetic Coolant Filter Unit

Clean unit when it becomes half full of honing particles.

Remove housing from base unit

Remove dirty magnetic element from housing

Place magnetic element on supplied stand

Using supplied scrapper, remove build up from magnetic element

Place cleaned magnetic element back into housing and reattach to base unit

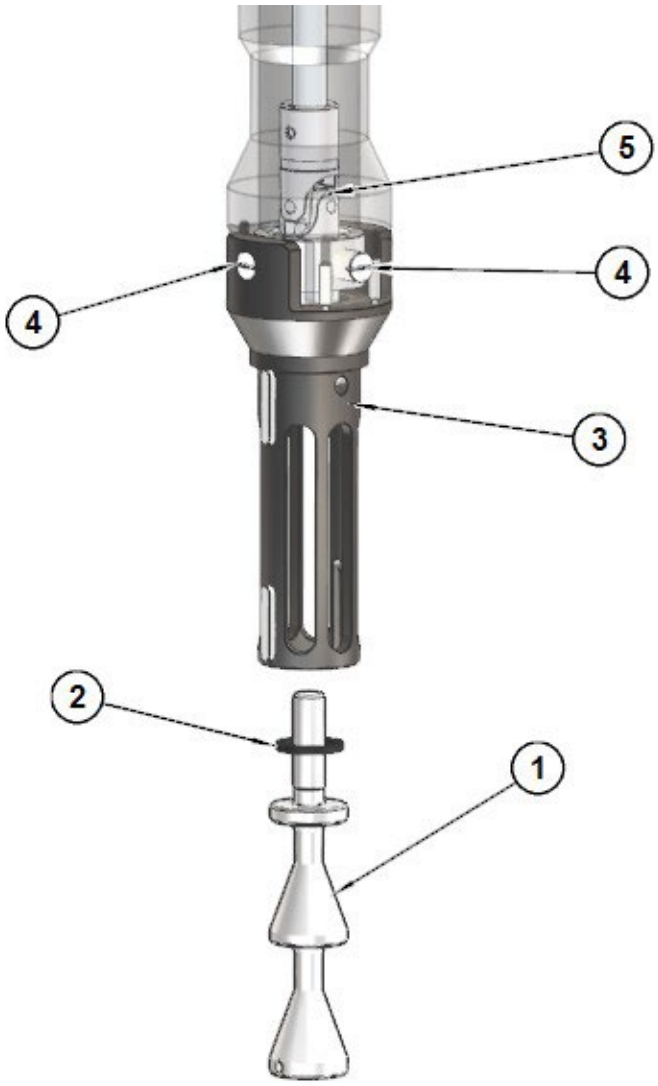
Hone Head Exploded View

(For Reference Only)

Hone Head Maintenance

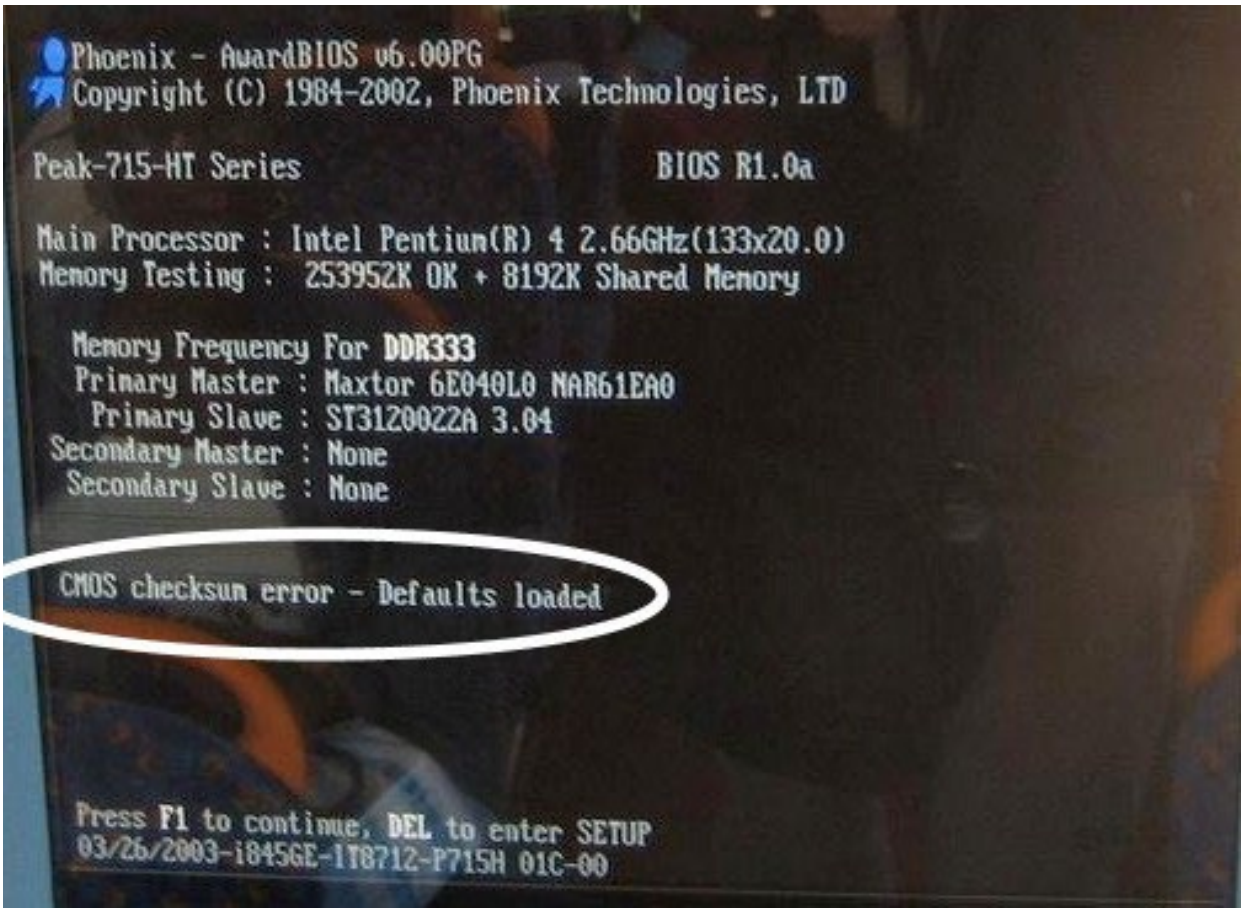
This procedure should be performed every 40 hours of machine operation or weekly, which ever comes first.

1. Remove cone rod (1) from body (3) and clean threads. Lubricate threads with high pressure grease.
2. Check rubber bumper (2) for damage. Replace if damaged.
3. Clean hone head body.(3)
4. Lubricate 4 pivot screws (4) with motor oil.
5. Lubricate feed nut universal (5) with motor oil.
6. Replace cone rod (1) and rubber bumper (2) into hone head body.(3)



Replacing the Motherboard Battery

If computer fails to boot up and you get a CMOS error message on the screen, then the battery on the computer motherboard has failed and needs to be replaced.



The following is the procedure for replacing the motherboard battery.

Turn off the power on the electrical enclosure and remove the enclosure cover.

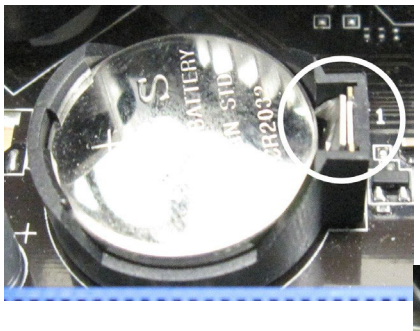
Locate the computer and check to see that the power light is not on. If it is on turn off the power switch.
Note: On some machines it may be necessary to unbolt the computer from the enclosure in order to gain access to the cover screws.

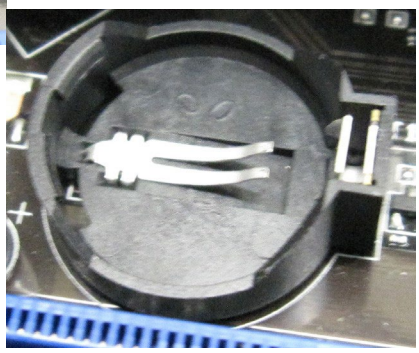
Remove the 6 screws indicated by the arrows from the cover.

Remove the cover.

Locate the battery on the motherboard.

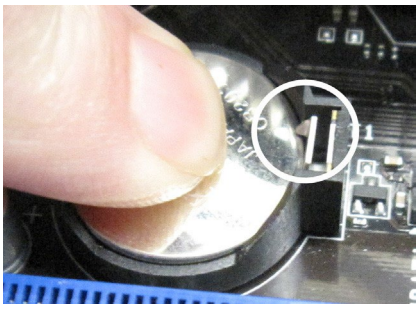
Push the battery retention clip away from the battery. When the clip is released the battery will pop up.





Remove the battery and place new battery in the battery holder.

Using your finger tip push down on the battery until the retention clip is in its lock position.



Replace computer cover and make sure that power switch on the computer is on.
Replace the enclosure cover and switch power back on.

Belt Tension Adjustment

Belt Tension settings for the Z-Axis motor and the spindle drive motor are critical and must be set properly for best performance and to avoid potential damage.

Belt Tension Specifications are as follows:

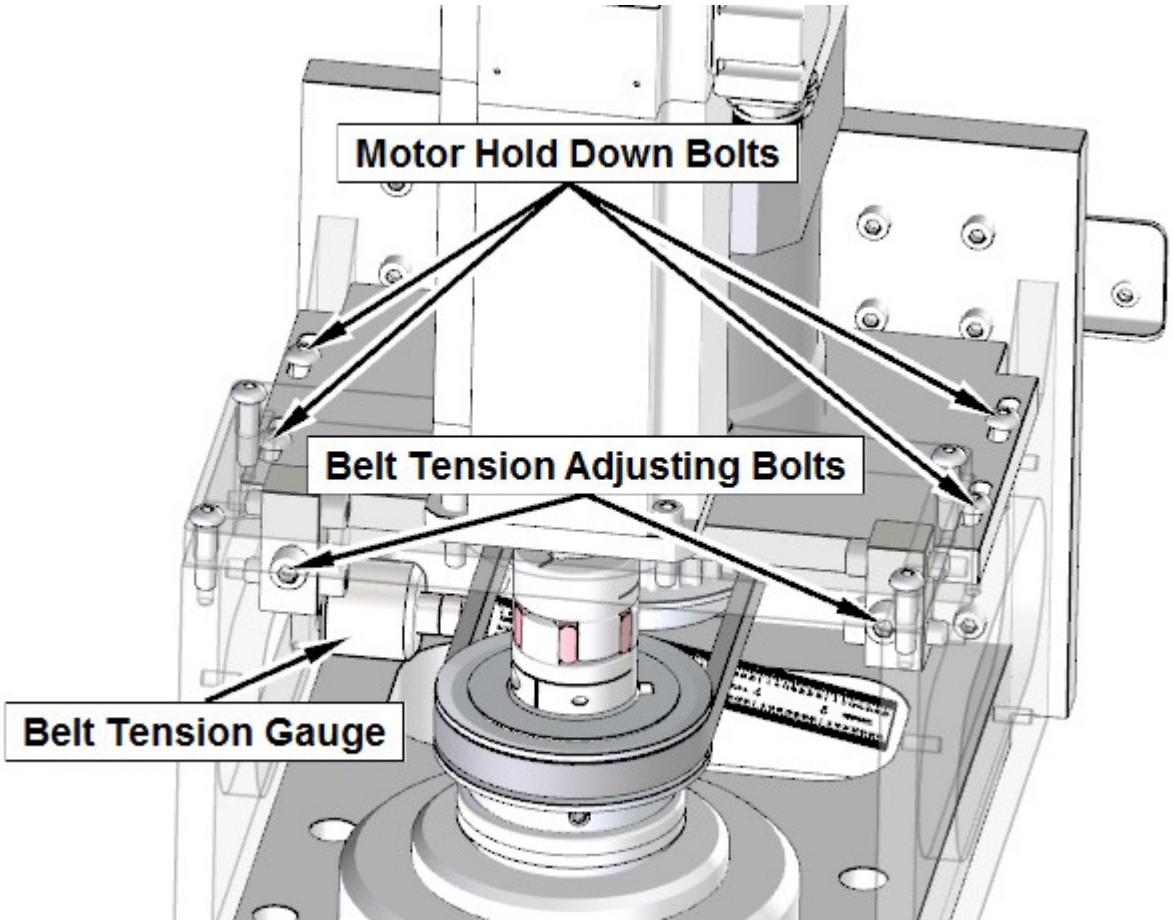
- Z-Axis motor belt tension, 5 lbs of tension should produce 1/2” of belt deflection.
- Spindle drive motor belt tension, 3 lbs of tension should produce 1/4” of belt deflection.

⚠ CAUTION ***Be sure that power is turned off before adjusting belt tension.***

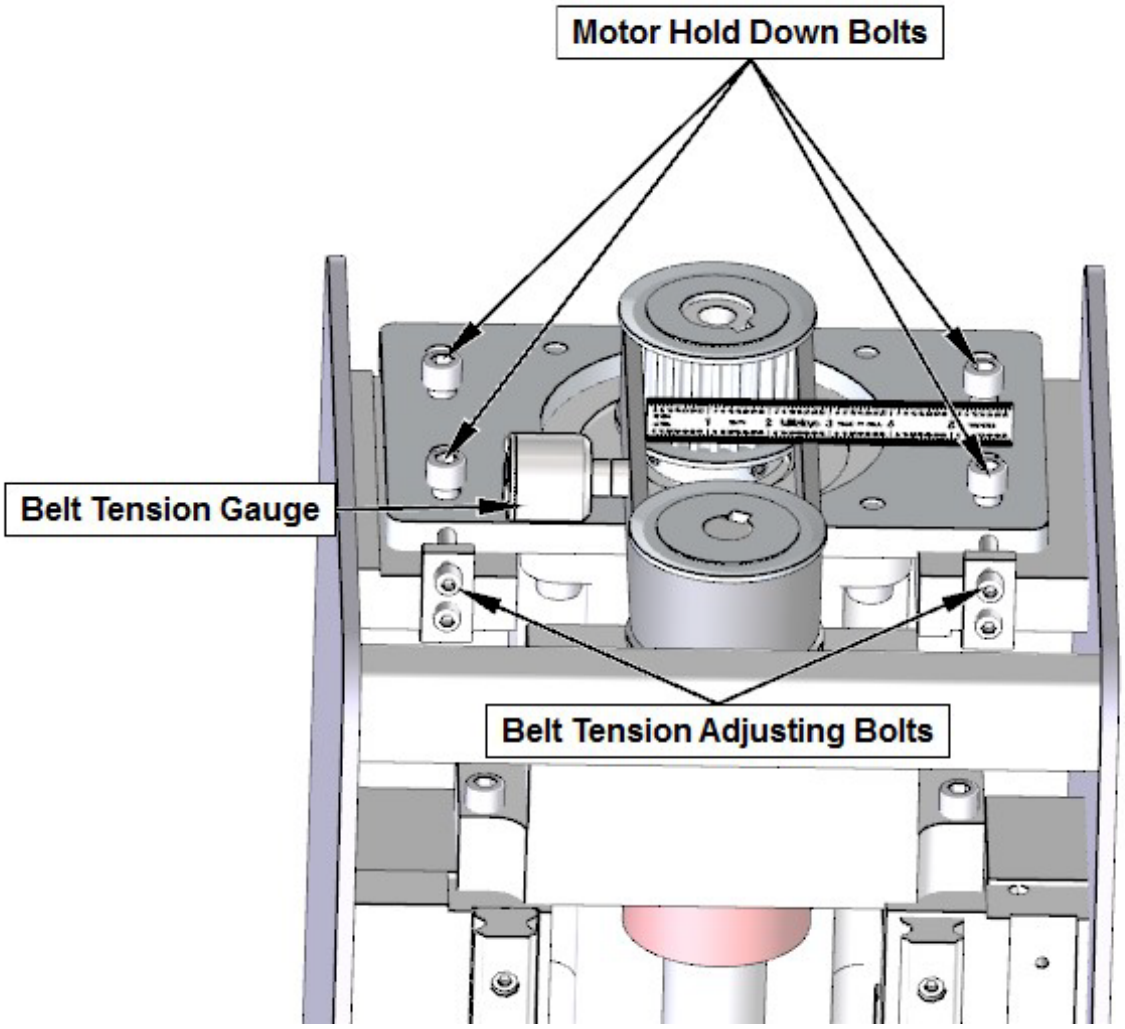
Adjustment on both motors is done by loosening the bolts that hold the motor in place and then tightening or loosening the belt tension adjusting bolts until the specification for that particular belt is reached.

Tighten motor hold down bolts after adjustment is completed.

Spindle Motor Belt Adjustment



Z-Axis Motor Belt Adjustment

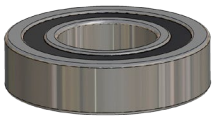


Ballscrew Assemblies Reference

Alignment Definitions for Angular Bearings and Belleville Washers

Bearing Alignment

VIEW OPEN END UP



VIEW CLOSED END UP

Belleville Washer Alignment

VIEW CUP UP

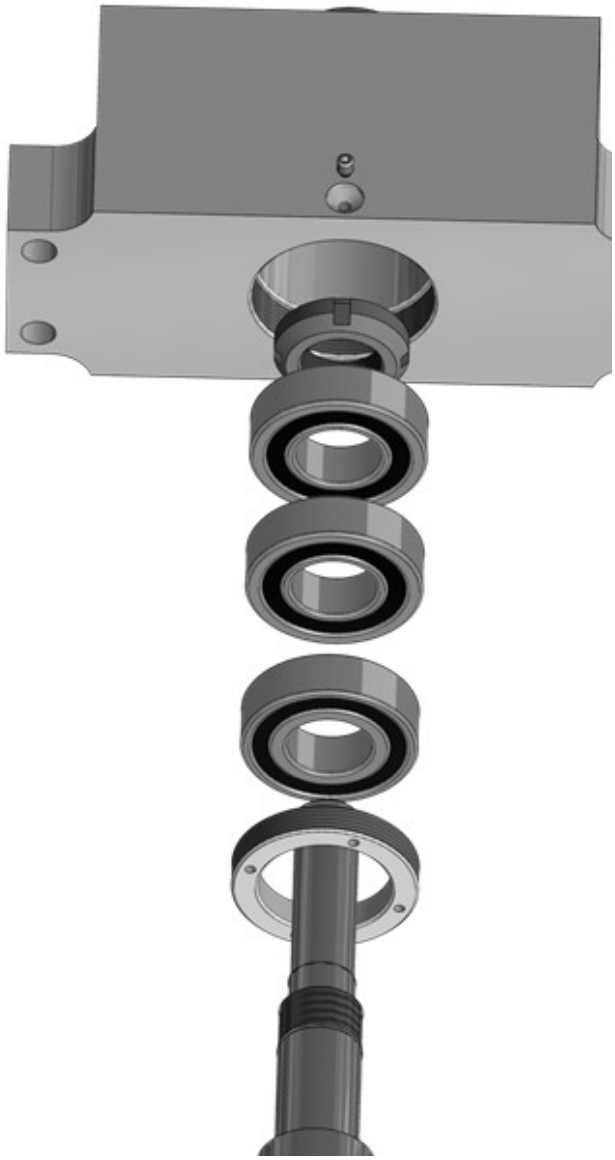
VIEW CUP DOWN

Z-Axis Bearing Installation Stacking Order

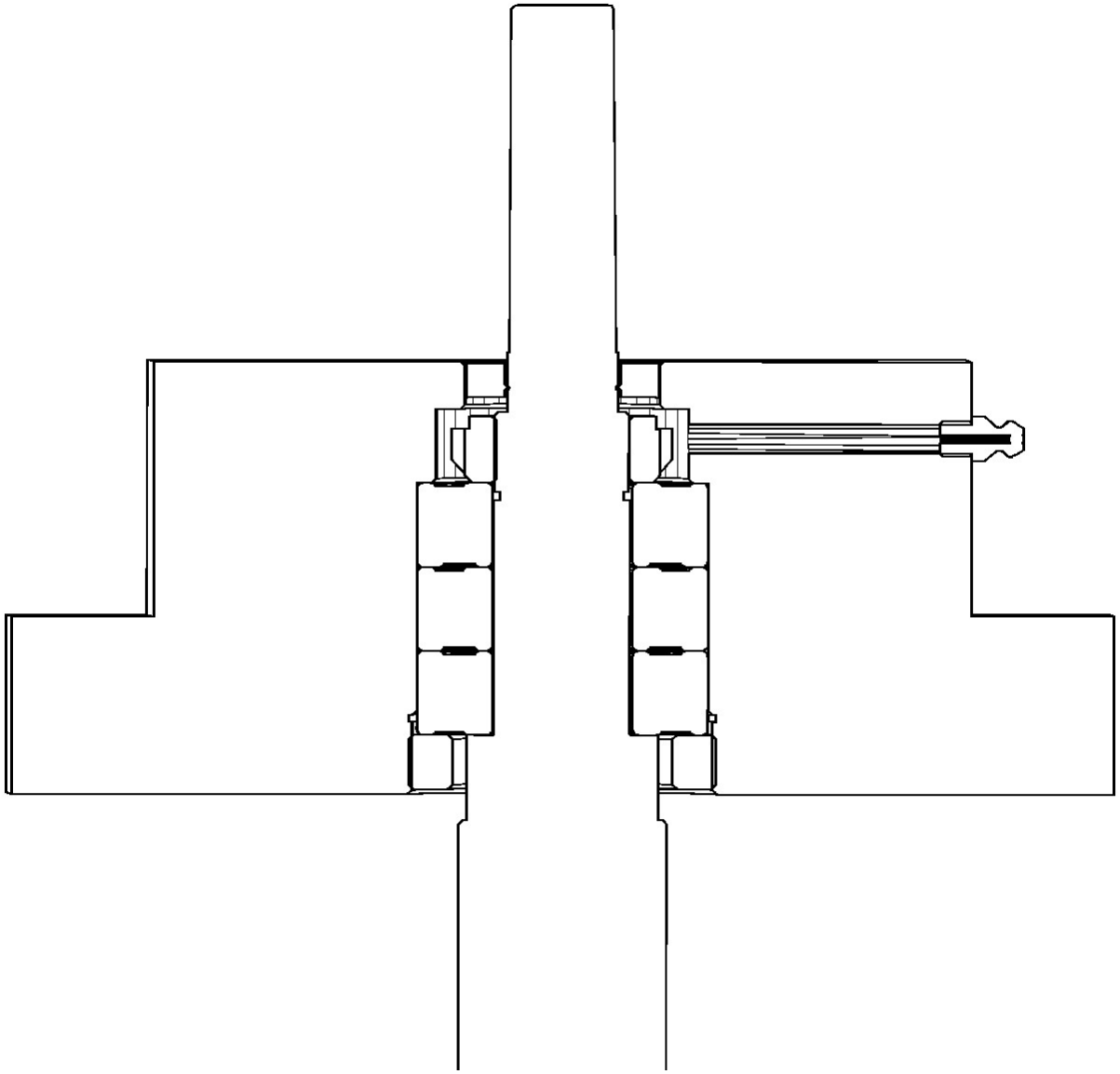
Z-Axis bearings have an asymmetrical inner race design. See illustration below for proper stacking order of bearings.

2nd and 3rd bearings are install with open end up towards locknut.

1st bearing is installed closed end up towards locknut.



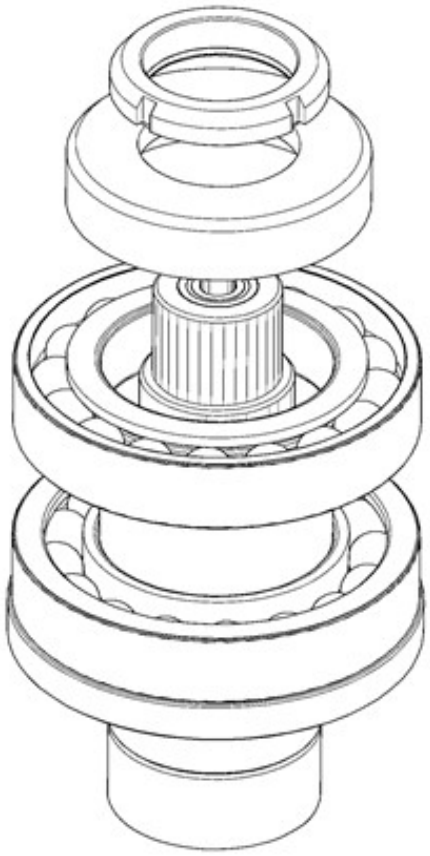
Z-Axis Bearing Installation Section View



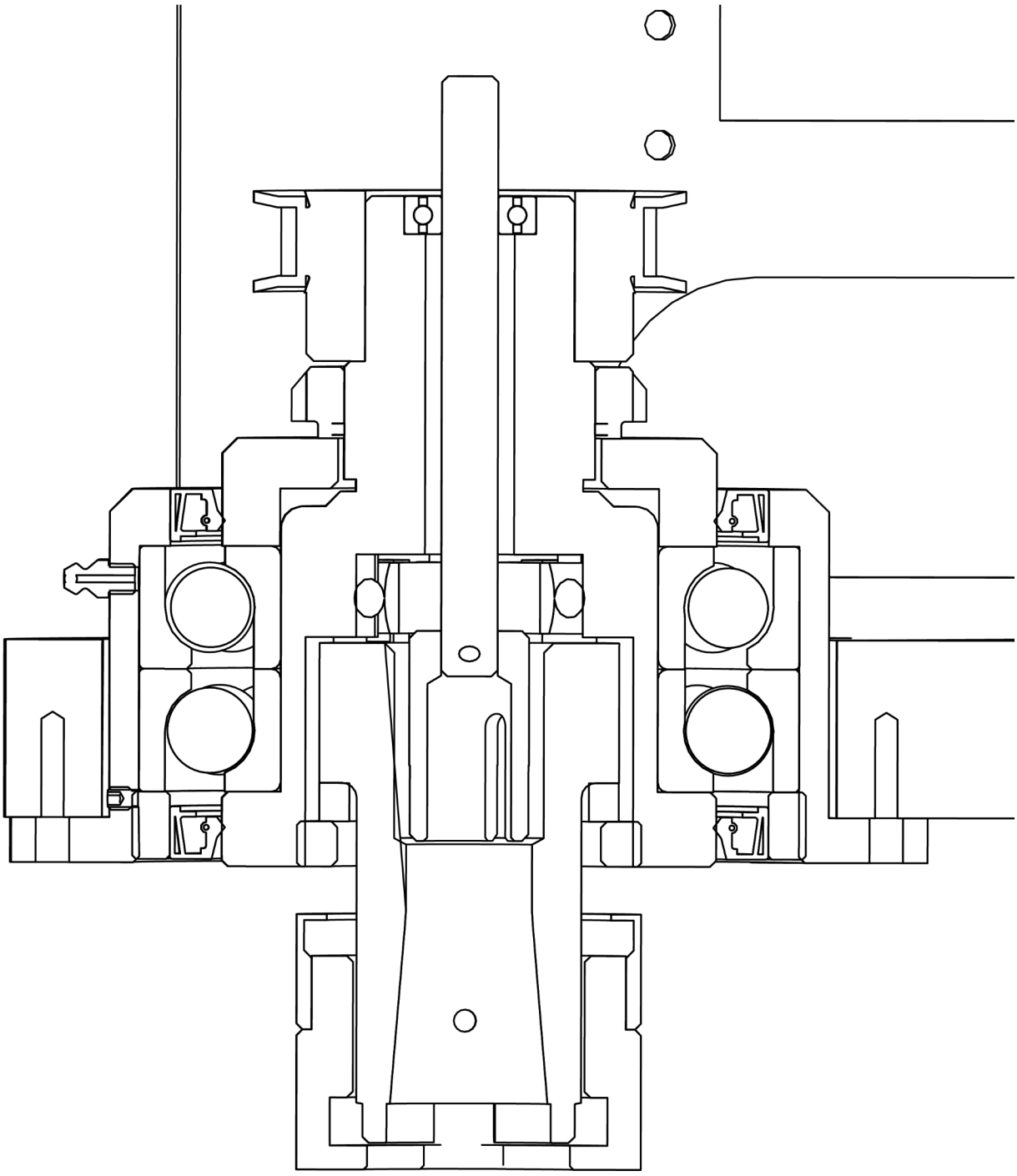
Spindle Housing Bearing Installation Stacking Order

2nd bearing is installed with closed end down towards flange.

1st bearing is installed with open end down towards flange.



Spindle Housing Bearing Installation Section View



TROUBLESHOOTING

Problem:

Icon on screen does not move to area touched.

Solution:

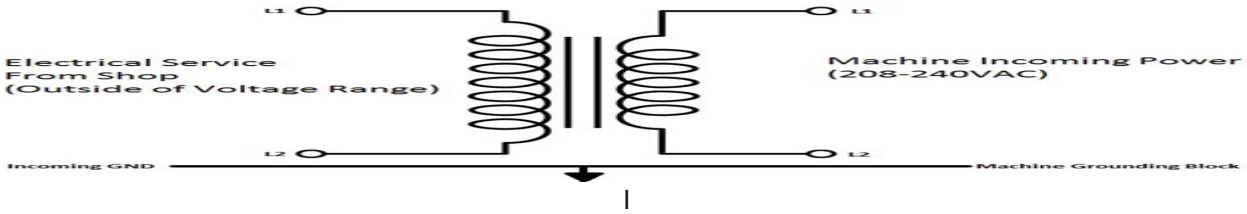
Follow the procedure below to recalibrate the touchscreen.

1. Get to the Alignment screen.
    1. If an Elo icon is available in the tool tray at the lower right side of the desktop, click it, then click Align.
    2. Otherwise, go to the Windows Control Panel, double-click Elo Touchscreen and click the Align button on the General tab.
        1. If Windows XP and no Elo icon, click the “Switch to Classic View” button on the left
        2. If Windows 7 and no Elo icon, look for “View by: Category” text toward the upper right; click it and select “Small icons”
2. Touch and release the upper left target; the target should jump to the lower right.
3. Touch and release the lower right target; the target should jump to the upper right.
4. Touch and release the upper right target; a check screen should appear.
5. Touch and release the green check mark; the check screen should disappear.
6. The cursor should now jump to the point of touch.
7. If the Elo Control Panel is open, close it and the Windows Control Panel.

For further assistance in troubleshooting:

Please visit the service tab of our web page at Send a Service Request www.rottlermfg.com or contact the Rottler Factory Service at service@rottlermfg.com for assistance and your service request.

You may also call Rottler at 1-800-452-0534 or 1-253-872-7050

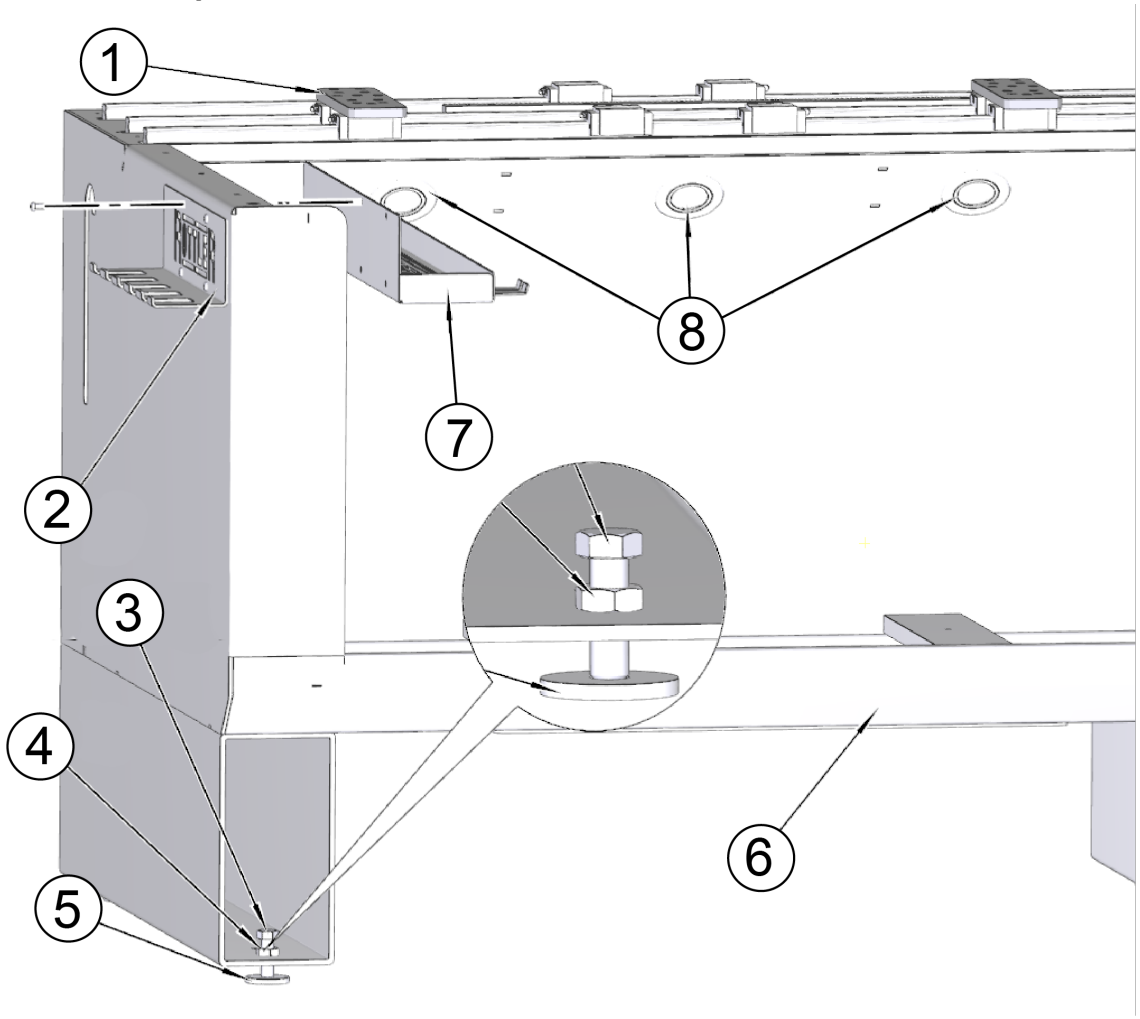


MACHINE PARTS

Contents

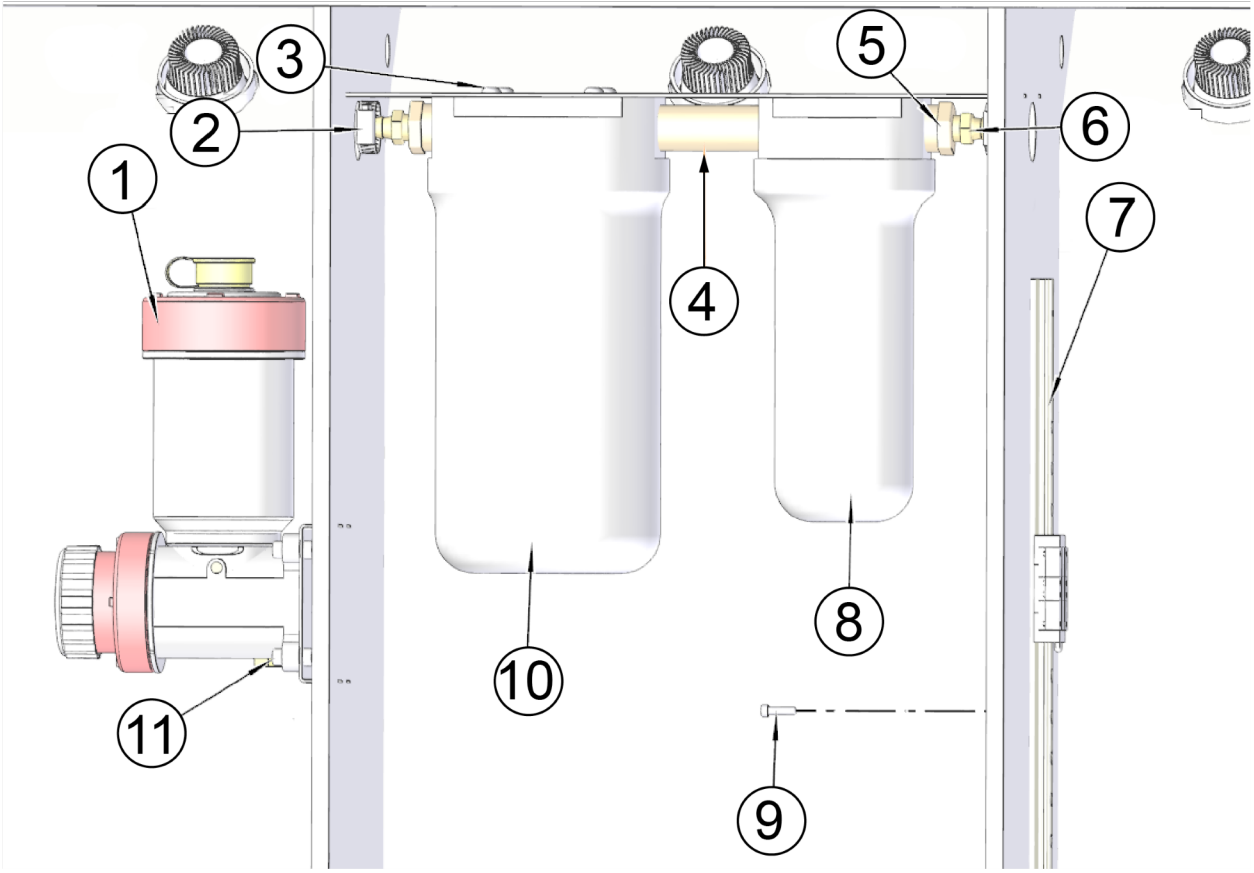
Machine Parts

Hone Tank and Components



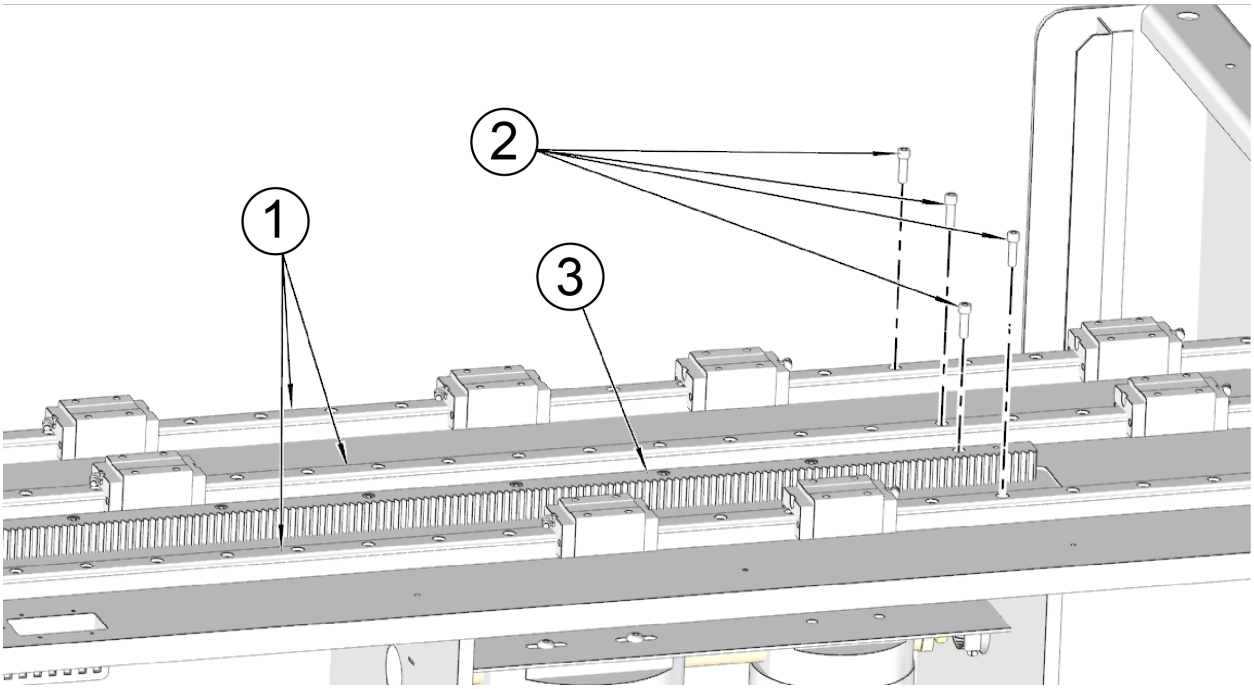
Oiler and Filter Assembly

ITEM	PART #	DESCRIPTION
1	514-14-43	PLATE, CLAMP ARM MOUNT
2	514-14-45	TOOL HOLDER
3		5/8-11 X 2 HEX BOLT
4	502-1-12G	NUT,JAM 5/8-11
5	502-1-12	PAD, LEVELING
6	514-14-50	TANK
7	514-14-45A	STONE TRAY
8	6457H	LED WORKLITE



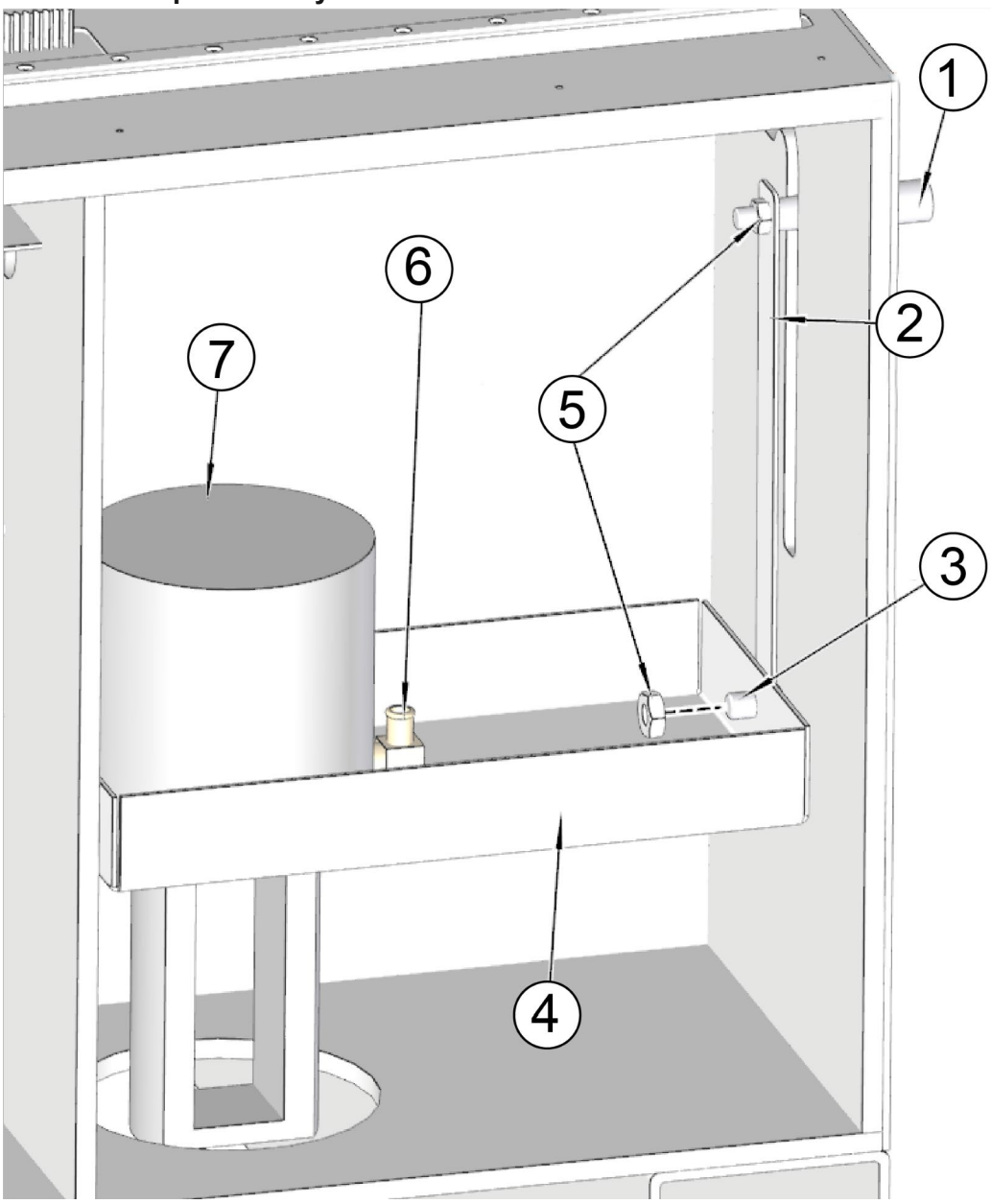
ITEM	PART #	DESCRIPTION
1	6349H	OILER, WAYS AND BALLSCREW
2	514-4-13F	CLAMP,HOSE-COOLANT HOSE (3/4 TO 1”)
3	MF-93A	SOCKET BUTTON HEAD SCREW 5/16-18 X 1/2”
4	514-2-42E	NIPPLE, BRASS ADAPTER
5	514-2-42F	ADAPTOR, BRASS
6	514-2-39U	BARBED FITTING 1/2 MPT X 5/8 HOSE ID
7	11033A	LINEAR RAIL
8	514-2-42A	FILTER, MAGNETIC (OPTIONAL)
9		M5X0.8 X 20 SOCKET HEAD CAP SCREW
10	514-2-42B	HOUSING, FILTER
11	MF-22	SOCKET HEAD CAP SCREW 5/16-18 X 3/4”

Linear Rails and X-Axis Rack



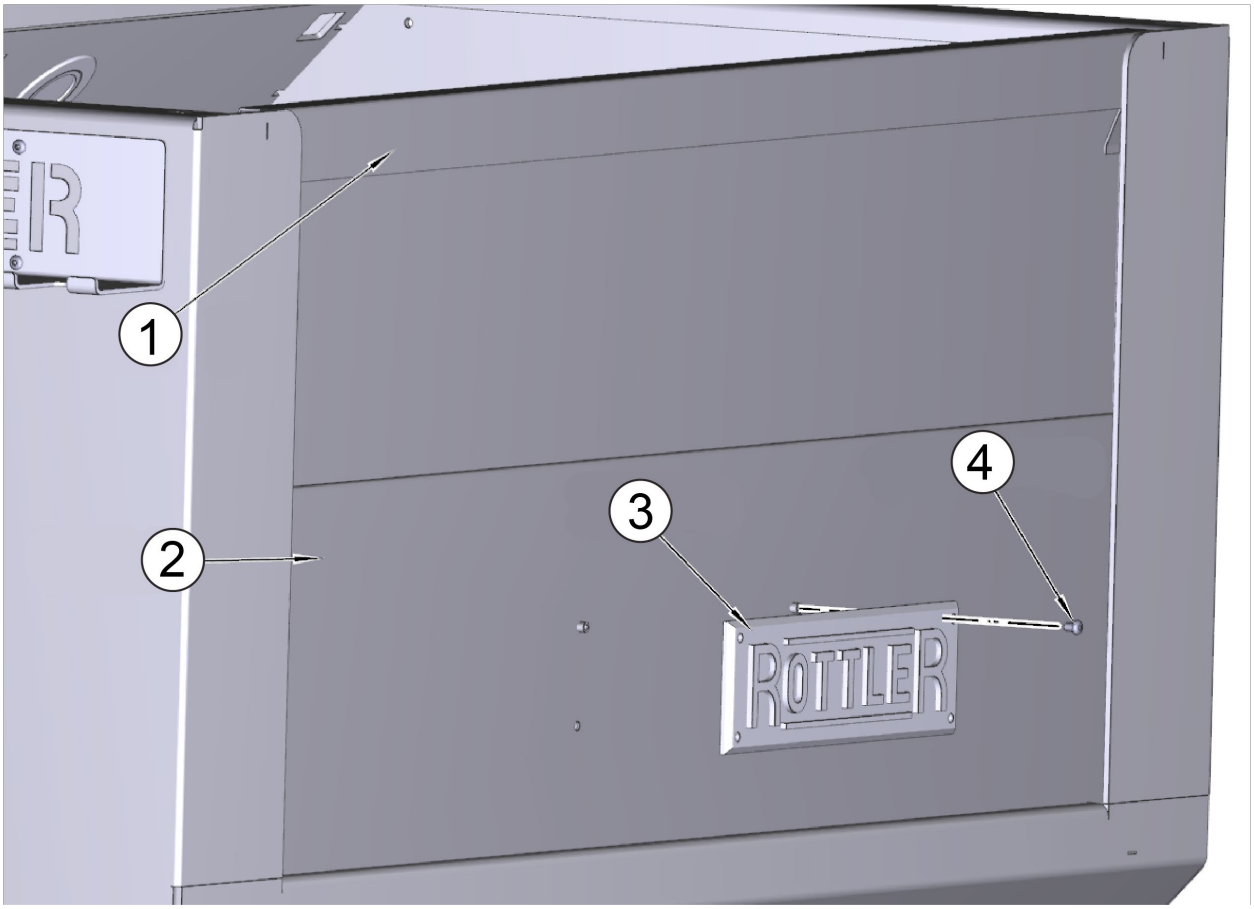
ITEM	PART #	DESCRIPTION
1	514-14-34A	LINEAR RAIL, X AXIS
2	MF-15A	1/4-20 X 7/8 SOCKET HEAD CAP SCREWS
3	514-14-41B	RACK, X AXIS

Coolant Pump Assembly



ITEM	PART #	DESCRIPTION
1	514-3-59B	HANDLE
2	514-14-47B	LEVER, COOLANT PUMP
3		1/2-13 X 5/8 BUTTON HEAD CAP SCREW
4	514-14-47A	MOUNT, COOLANT PUMP
5	MF-171	HEX JAM NUTS 1/2-13 NC
6	514-2-42G	BARB, 90 DEGREE BRASS
7	514-2-39K	PUMP-OPTIONAL FILTER ASSEMBLY

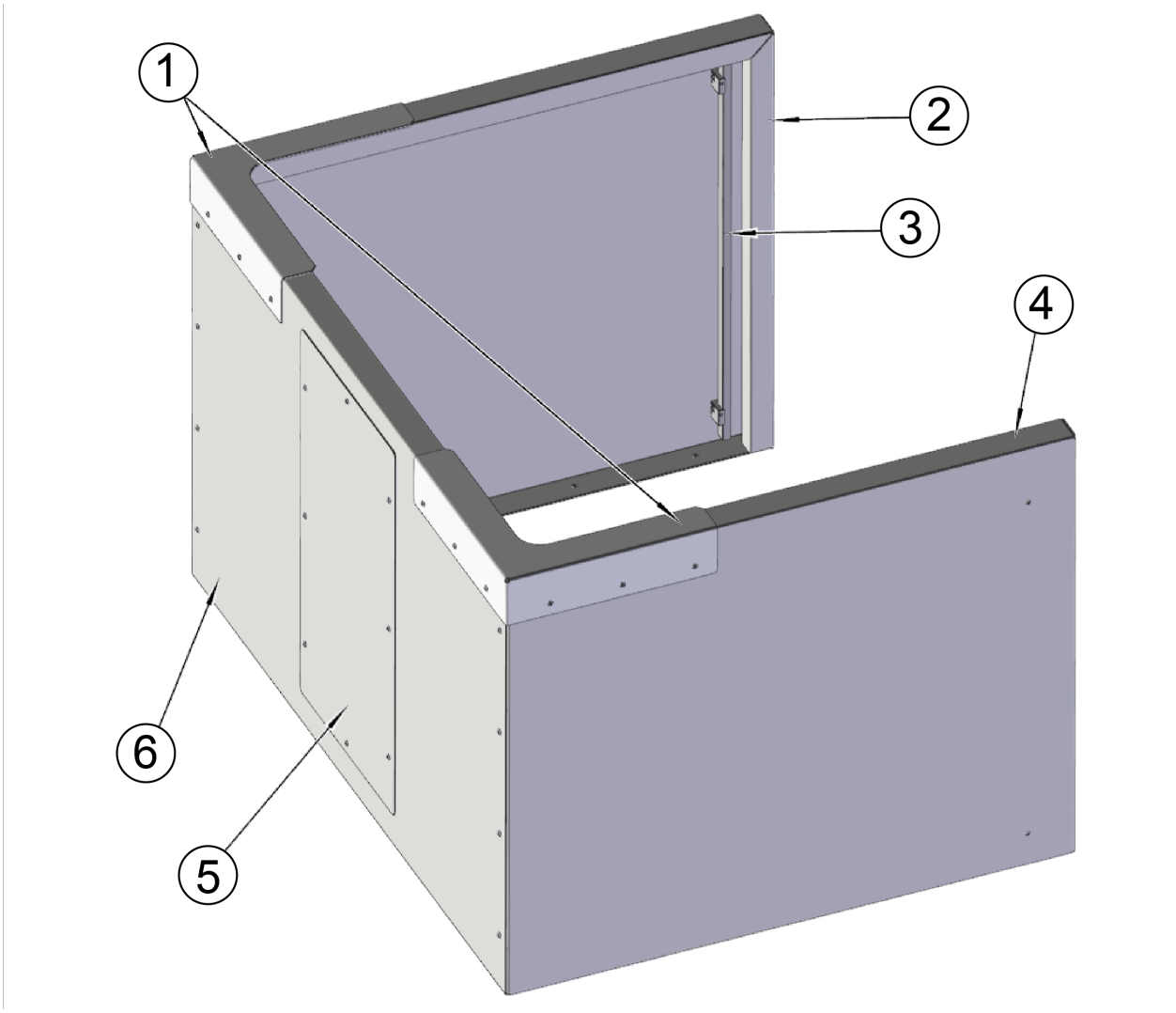
Doors



ITEM	PART #	DESCRIPTION
1	514-13-80G	TOP DOOR, SPLASH TANK
2	514-13-81G	BOTTOM DOOR, SPLASH TANK
3	502-1-19	NAMEPLATE, ROTTLER
4	MF-248	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/8”

Enclosure Parts

ITEM	PART #	DESCRIPTION
1	514-14-53D	ENCLOSURE, CORNER BRACKET
2	514-14-53A	ENCLOSURE, RIGHT SIDE
3	514-13-26	SAFETY LIGHT CURTAIN (OPTIONAL)
4	514-14-53B	ENCLOSURE, LEFT SIDE
5	514-14-53E	ENCLOSURE, ACCESS PANEL
6	514-14-53C	ENCLOSURE, BACK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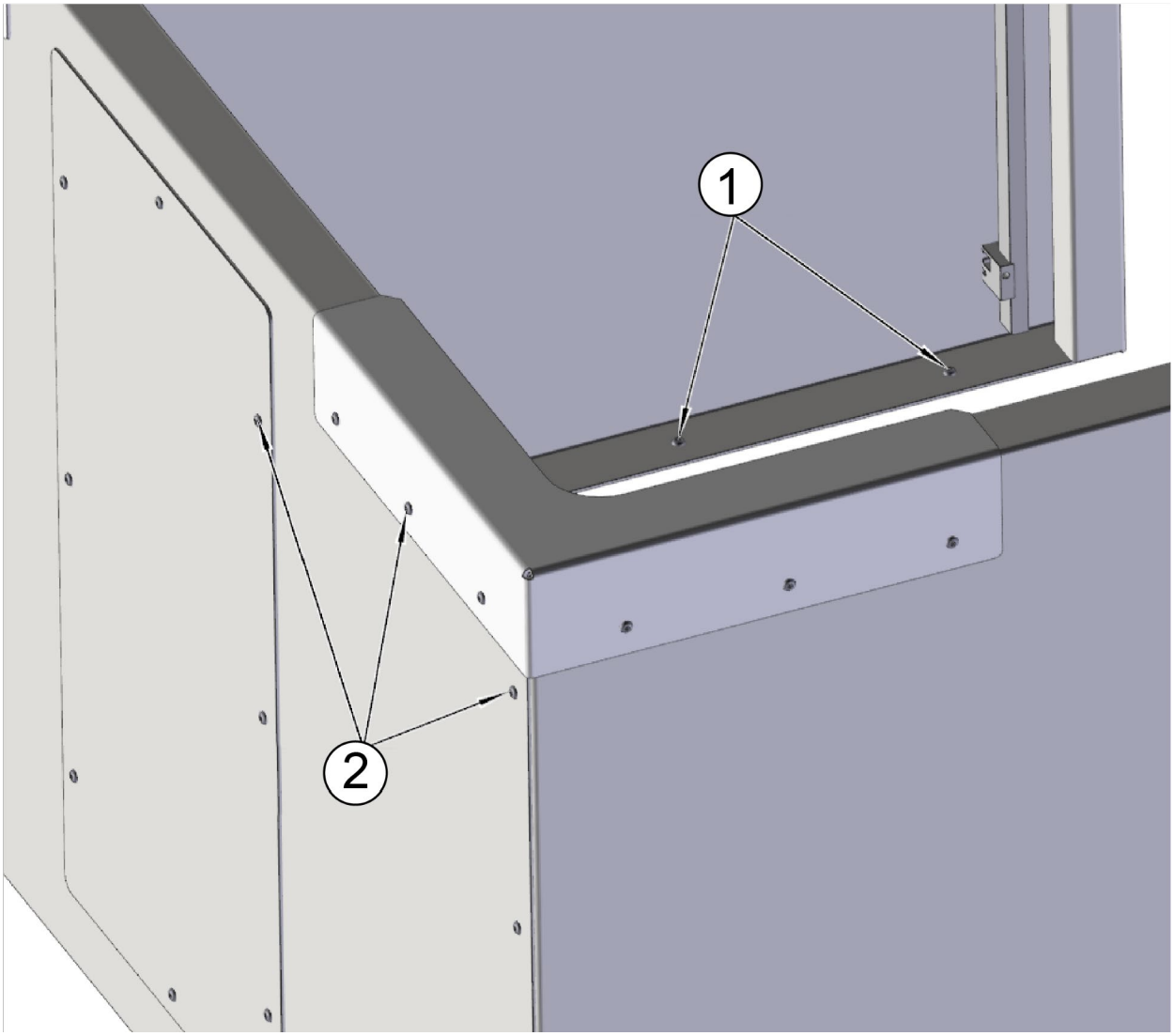
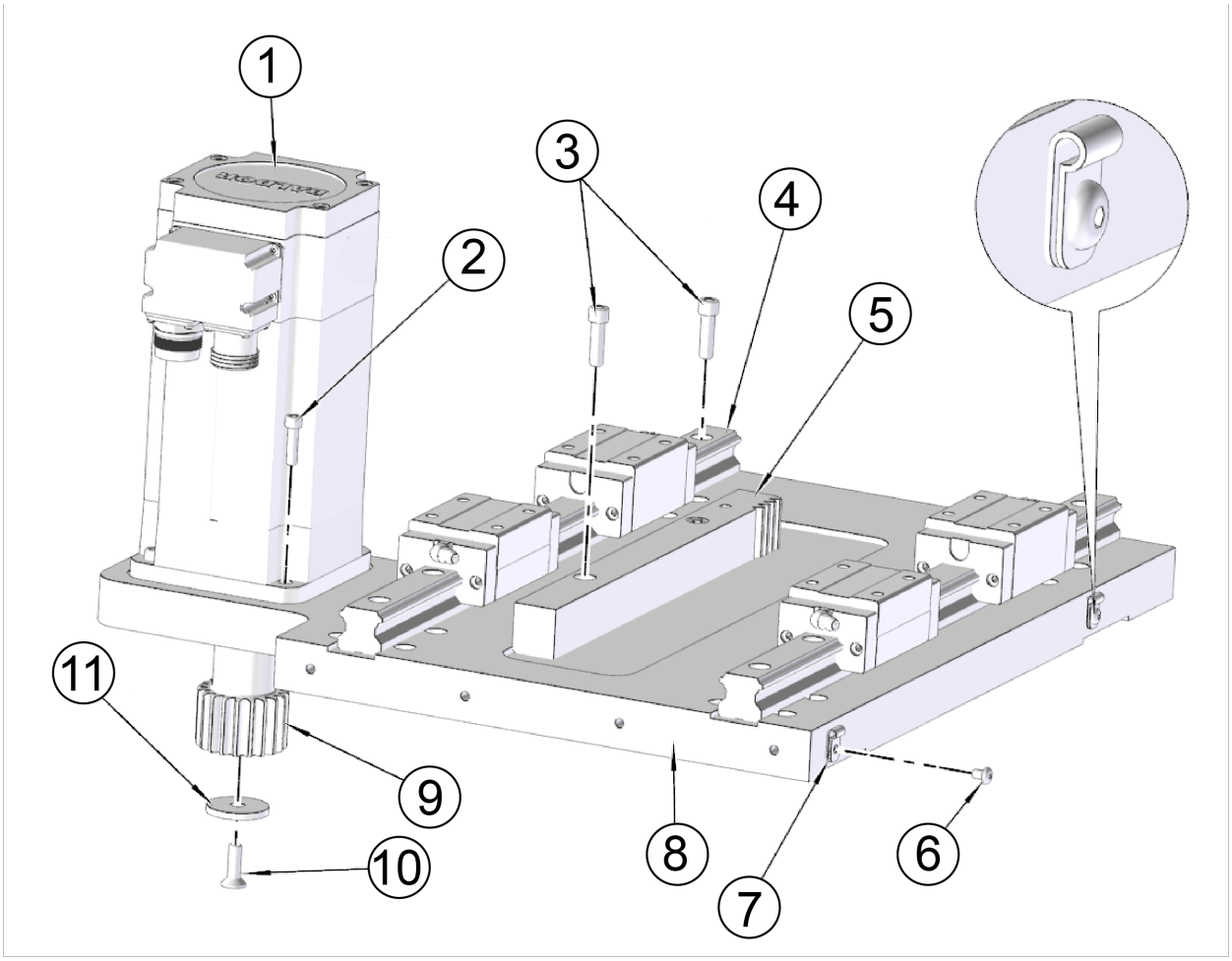


ITEM	PART #	DESCRIPTION
1	MF-90	SOCKET BUTTON HEAD SCREW 1/4-20 X 1/2”
2	MF-248	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/8”

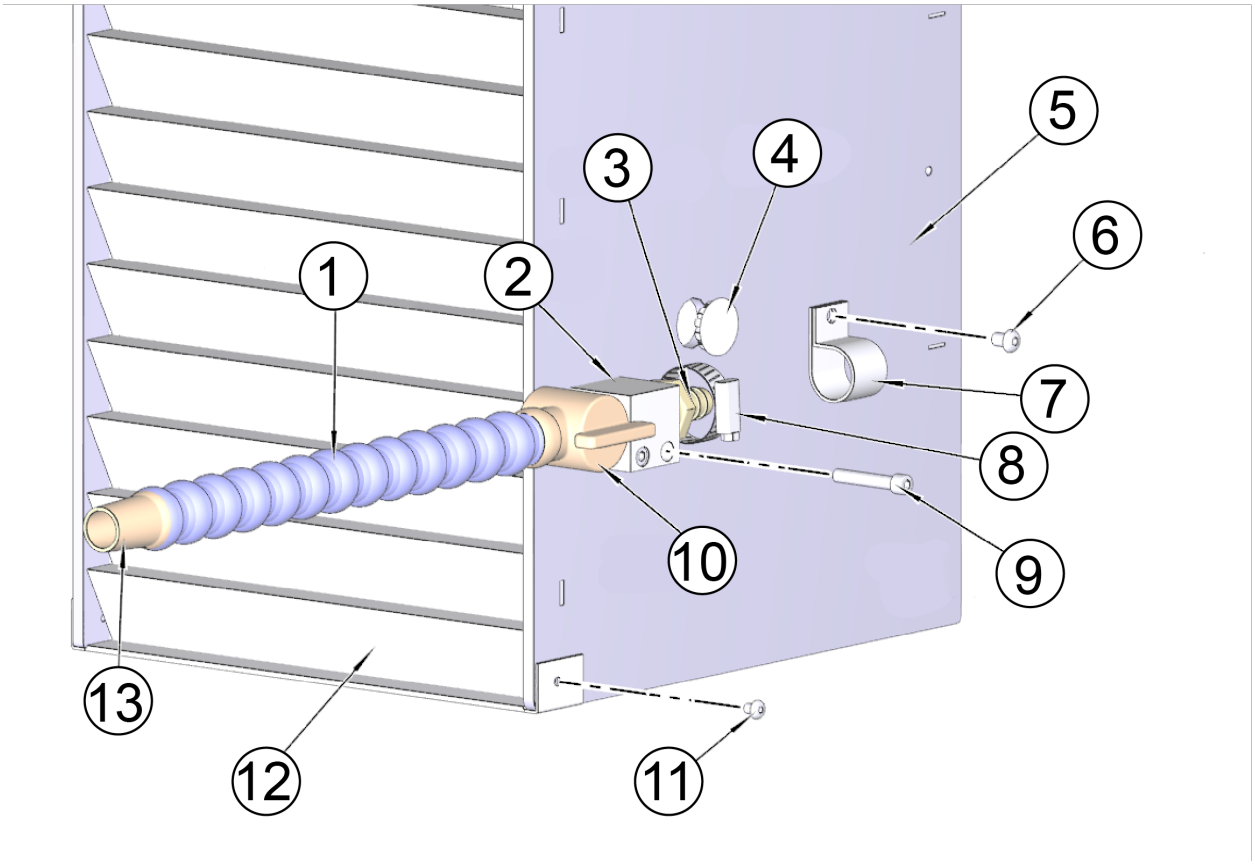
Base Plate Assembly



Carriage Assembly

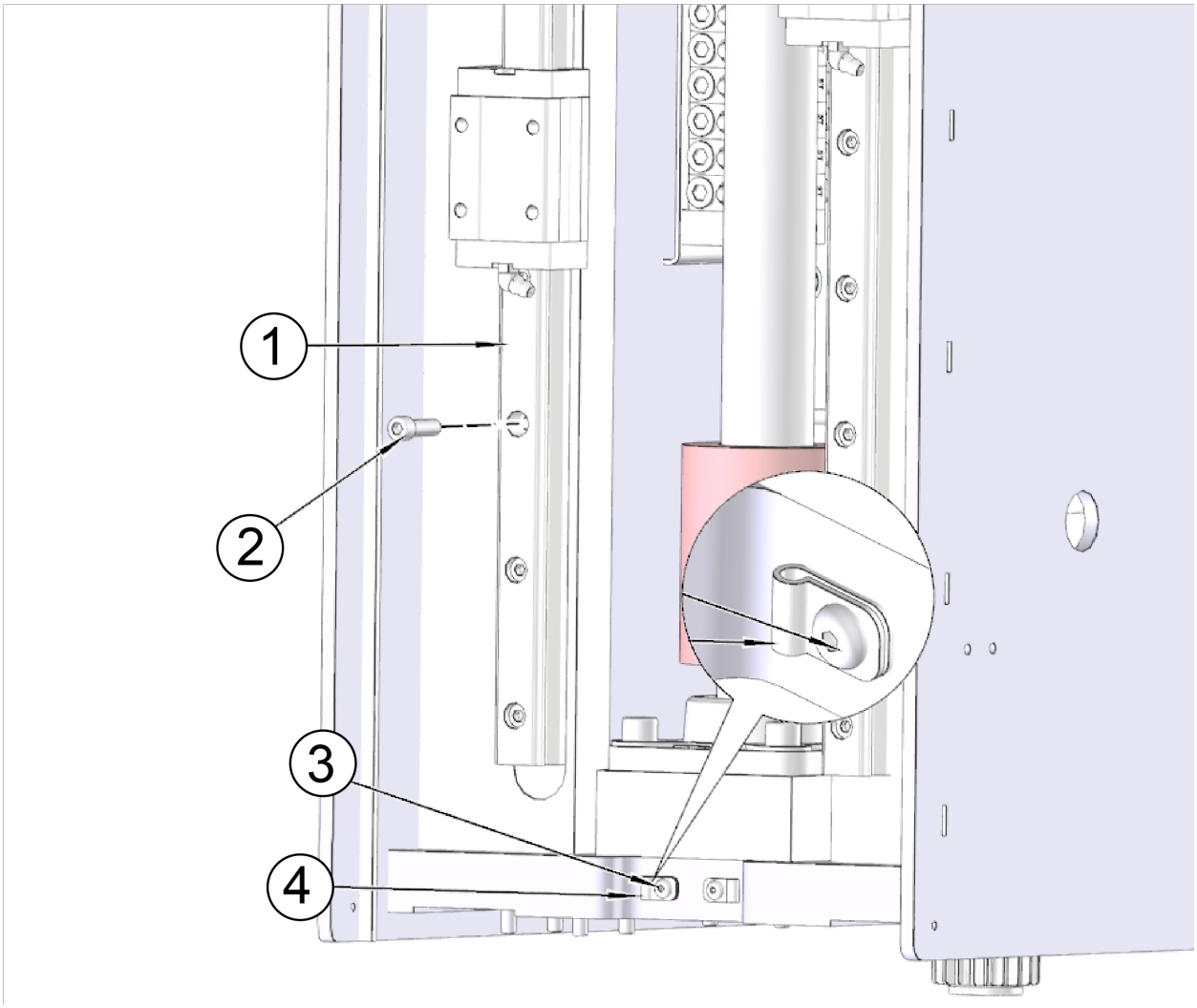
ITEM	PART #	DESCRIPTION
1	9020N	MOTOR WITH BISS ENCODER
2	MF-6	SOCKET HEAD CAP SCREW 10-24 X 3/4”
3	MF-15A	SOCKET HEAD CAP SCREW 1/4-20 X 7/8”
4	514-14-34C	LINEAR RAIL, Y AXIS
5	514-14-41C	RACK, Y AXIS
6	MF-86	SOCKET BUTTON HEAD SCREW 8-32 X 1/4”
7	502-12-12	CLAMP, OIL HOSE (1/8)
8	514-14-42A	PLATE, Y AXIS
9	514-14-41A	PINION, RACK
10		M6 X 20 FLAT HEAD CAP SCREW
11	514-14-41D	WASHER, PINION

Coolant Nozzle and Ballscrew Cover



ITEM	PART #	DESCRIPTION
1	514-4-12M	HOSE, 3/4” ID (1 FOOT LONG)
2	514-14-44	MOUNT, COOLANT
3	514-2-42H	FITTING, 3/4” NPT STRAIGHT 5/8” BARBED
4	506-4	PLUG, SNAP IN HOLE - 1”
5	514-14-54	CARRIAGE
6	MF-248	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/8”
7	514-14-36A	SUPPORT, COOLANT STRAIN
8	514-4-13F	CLAMP,HOSE-COOLANT HOSE (3/4 TO 1”)
9	MF-17	SOCKET HEAD CAP SCREW 1/4-20 X 1 1/2”
10	514-4-12L	VALVE, 3/4” COOLANT NOZZLE
11	MF-87	SOCKET BUTTON HEAD SCREW 10-24 X 1/4”
12	514-13-19J	BELLOWS
13	514-4-12N	TIP, 3/4” COOLANT NOZZLE

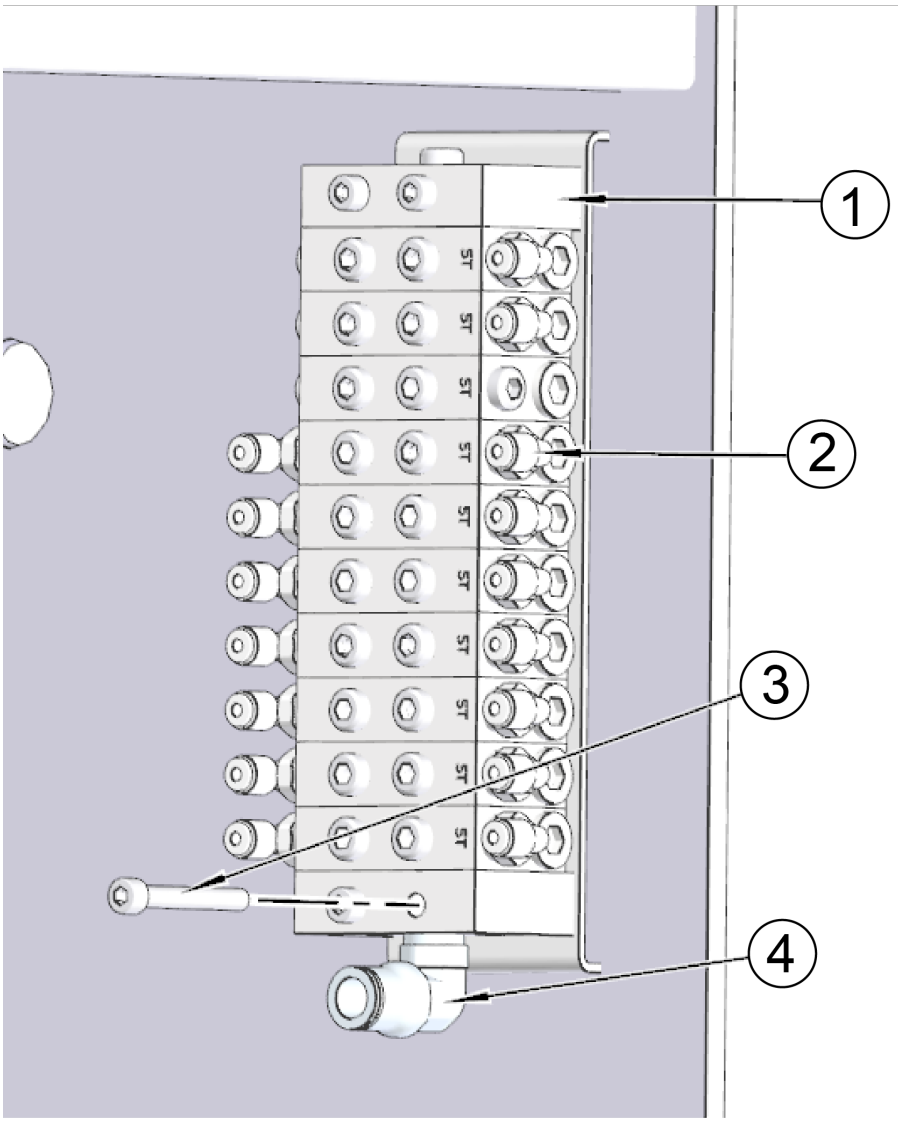
Linear Rails



Oiler Distribution Block

ITEM	PART #	DESCRIPTION
1	514-14-34B	LINEAR RAIL, Z AXIS
2	MF-3A	SOCKET HEAD CAP SCREW 8-32 X 7/8”
3	MF-86	SOCKET BUTTON HEAD SCREW 8-32 X 1/4”
4	502-12-12	CLAMP, OIL HOSE (1/8)

ITEM	PART #	DESCRIPTION
1	6349B	FEEDER,FLO-OILER
2	514-4-18	ELBOW-90 DEGREE 1/8 POLY TO 1/8NPT
3		10-24- X 1 1/2 SOCKET HEAD CAP SCREW
4	514-4-17Y	FITTING 1/4NPT X 1/4 POLY-90 DEGREE


1
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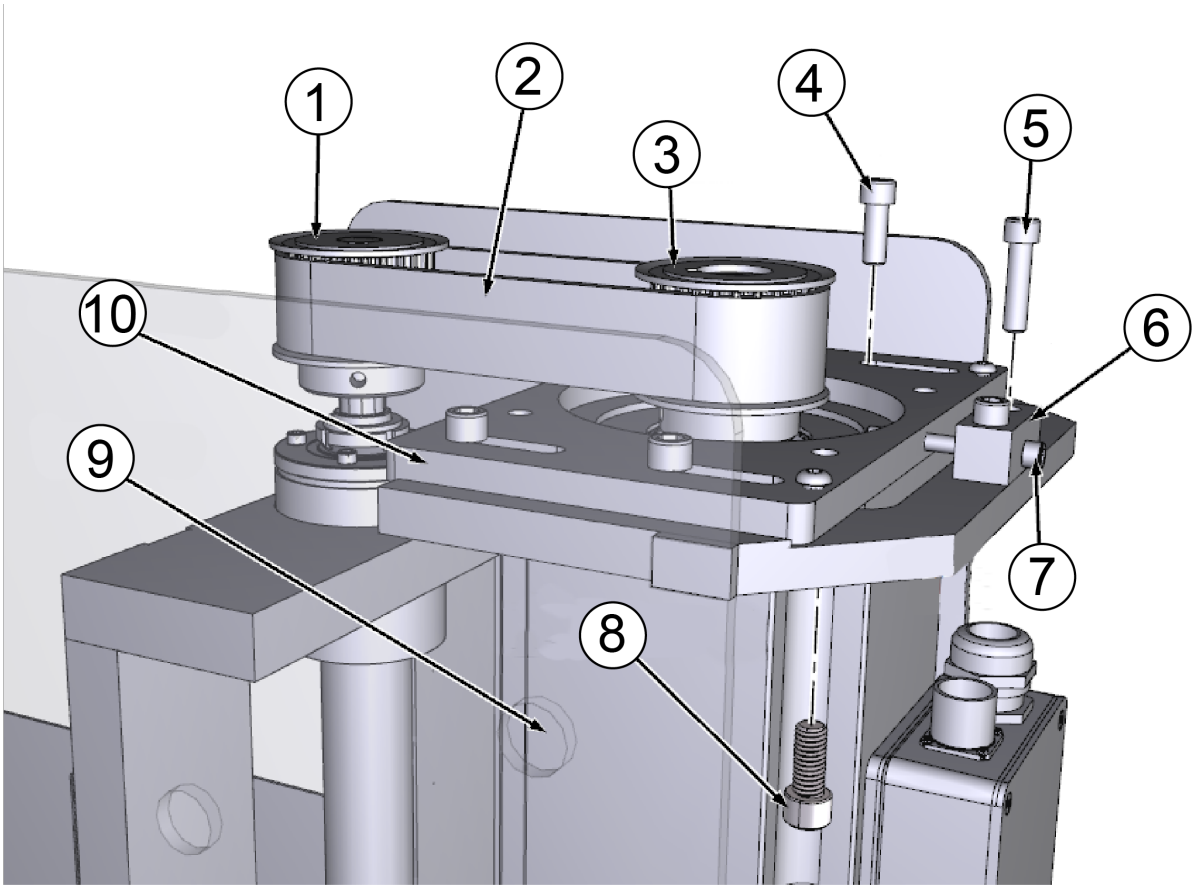
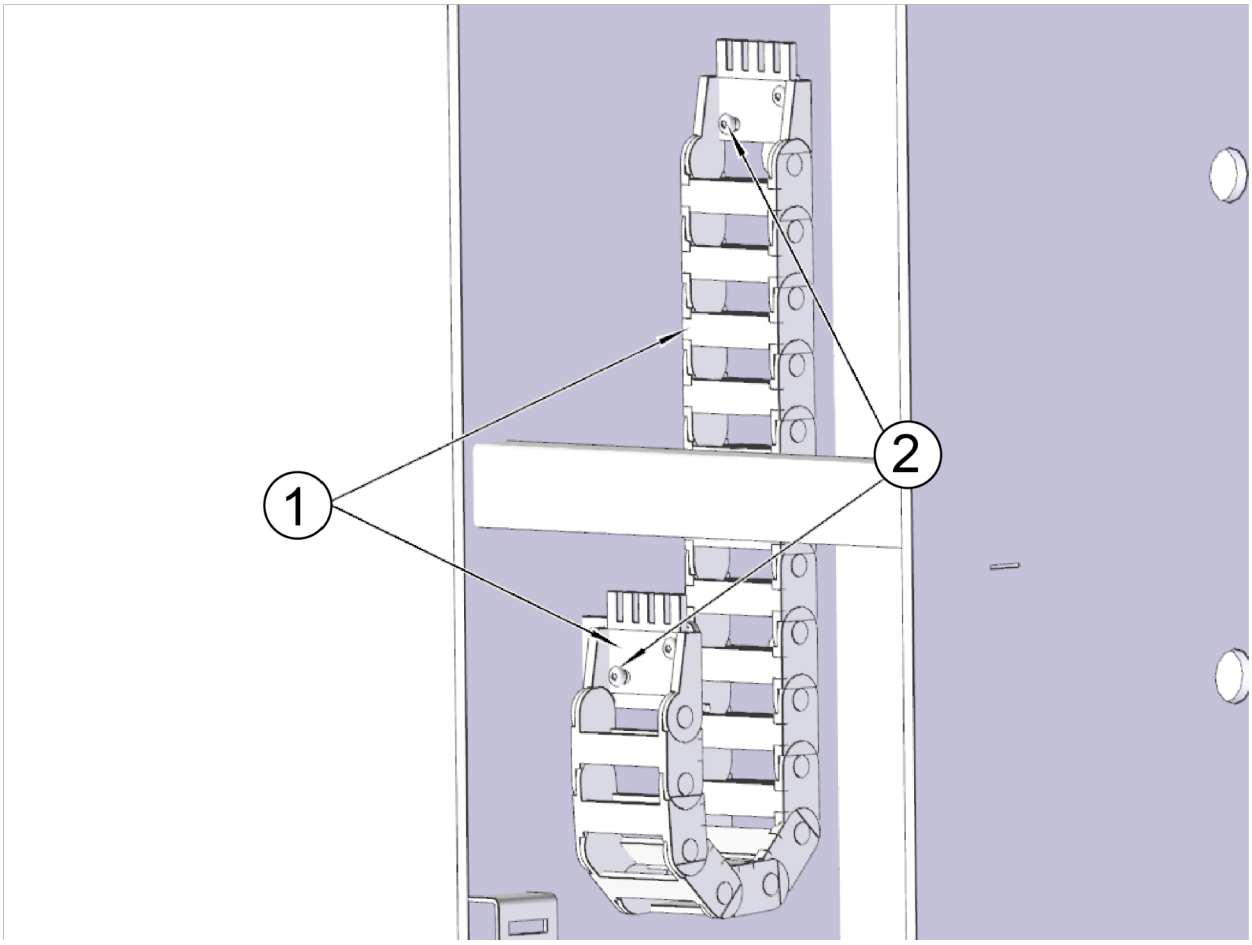
4

Z-Axis Motor Assembly



ITEM	PART #	DESCRIPTION
1	514-13-83D	PULLEY, BALL SCREW
2	514-13-83F	BELT, TIMING Z-AXIS
3	514-13-83C	PULLEY, Z-AXIS MOTOR
4	MF-31	SOCKET HEAD CAP SCREW 3/8-16 X 1”
5	MF-24	SOCKET HEAD CAP SCREW 5/16-18 X 1 1/4”
6	514-13-11G	BRACKET, ADJUSTING
7	MF-15	SOCKET HEAD CAP SCREW 1/4-20 X 1”
8	MF-39	SOCKET HEAD CAP SCREW 7/16-14 X 1”
9	514-13-6	MOTOR, Z-AXIS
10	514-13-11D	MOUNT, MOTOR Z-AXIS

Inner Wire Track Assembly

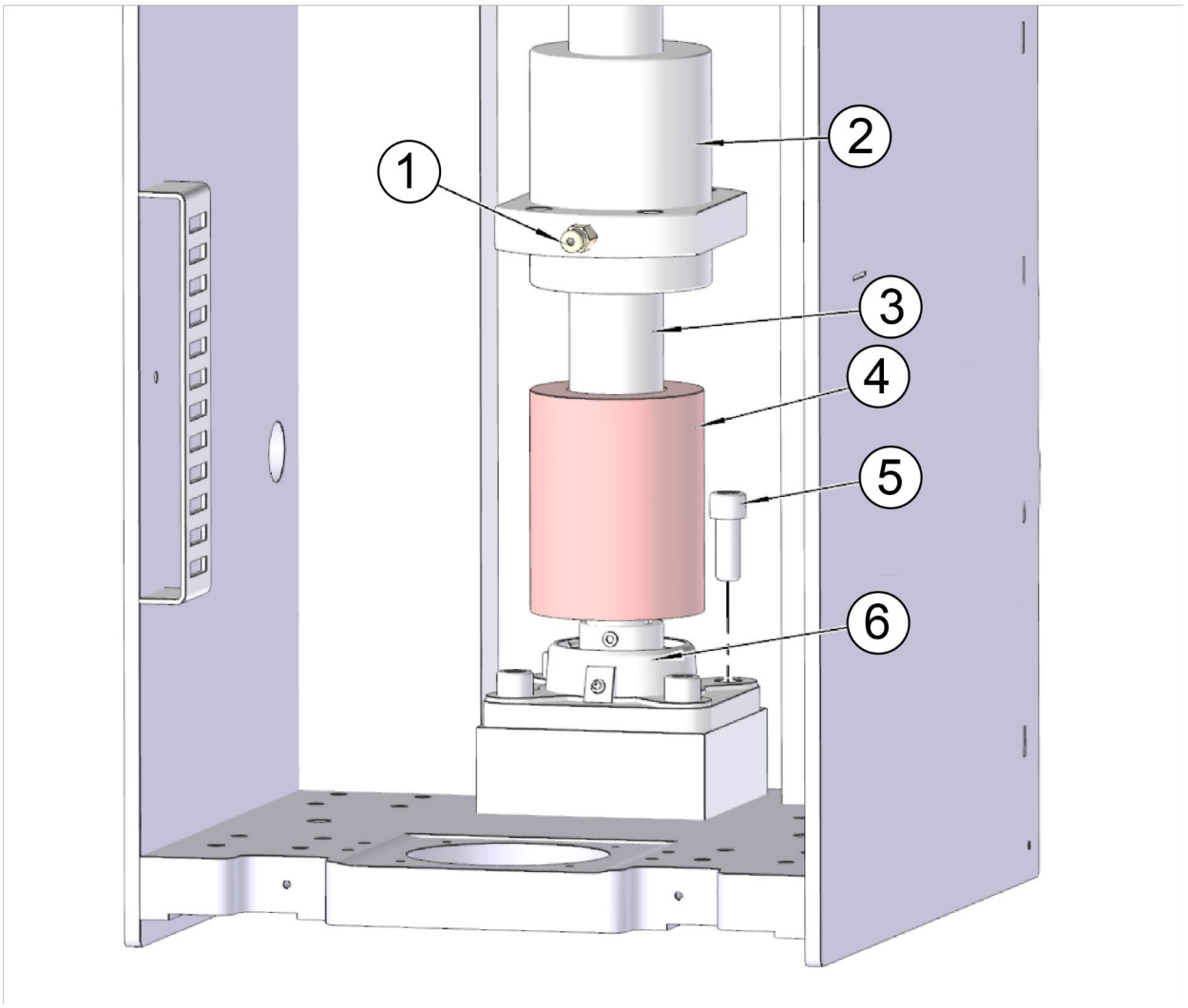


Z-Axis Ballscrew Assembly

Lower Section

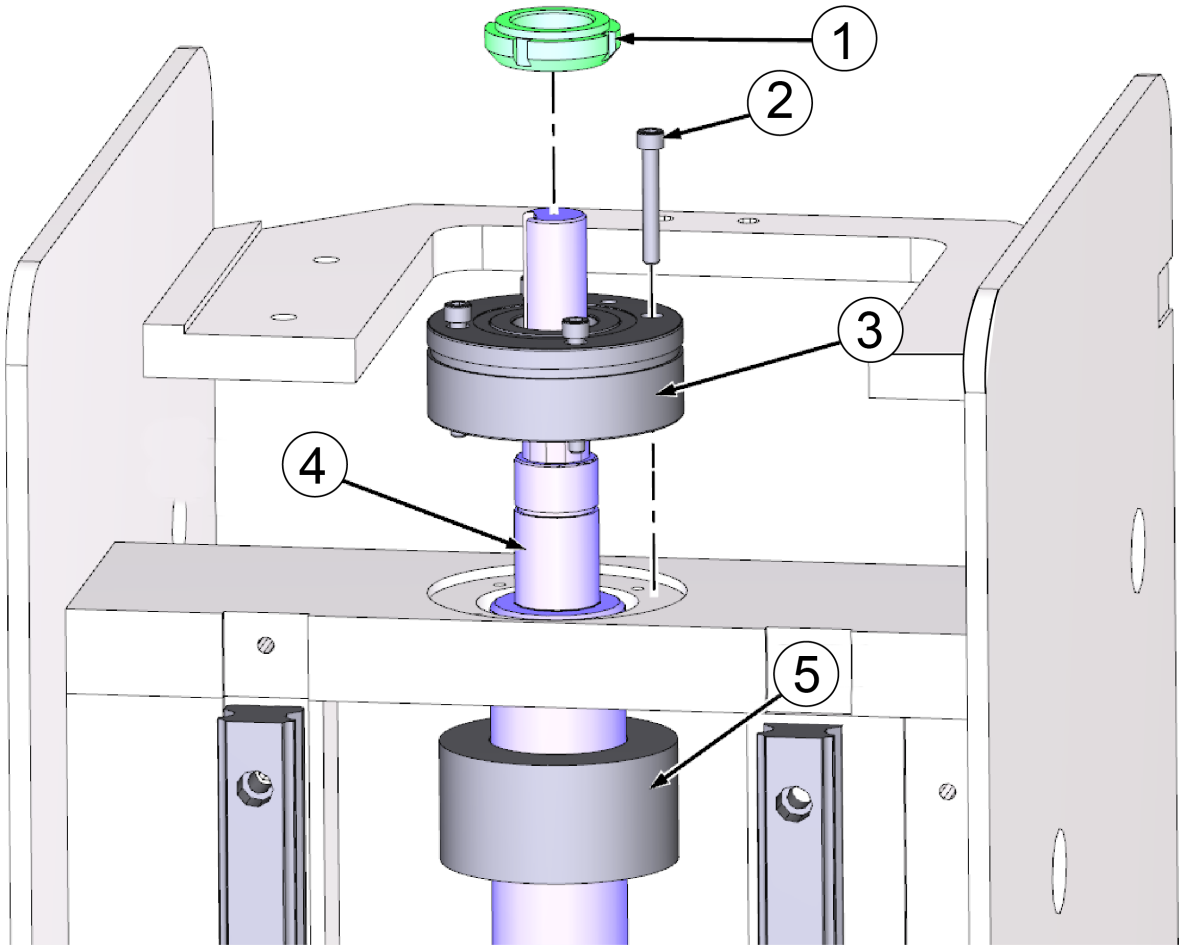
ITEM	PART #	DESCRIPTION
1	514-14-84C	CARRIER, Z-AXIS CABLE
2	MF-88	SOCKET BUTTON HEAD SCREW 10-24 X 3/8”

ITEM	PART #	DESCRIPTION
1	514-4-17J	CONNECTOR, MALE - 1/8” OD TO 10-32
2	514-13-60B	BALLSCREW NUT, Z AXIS
3	514-13-60A	BALLSCREW, Z AXIS
4	514-14-56B	BUMPER, LOWER Z AXIS
5	MF-31	SOCKET HEAD CAP SCREW 3/8-16 X 1”
6	514-13-60J	FLANGED, SQUARE BEARING



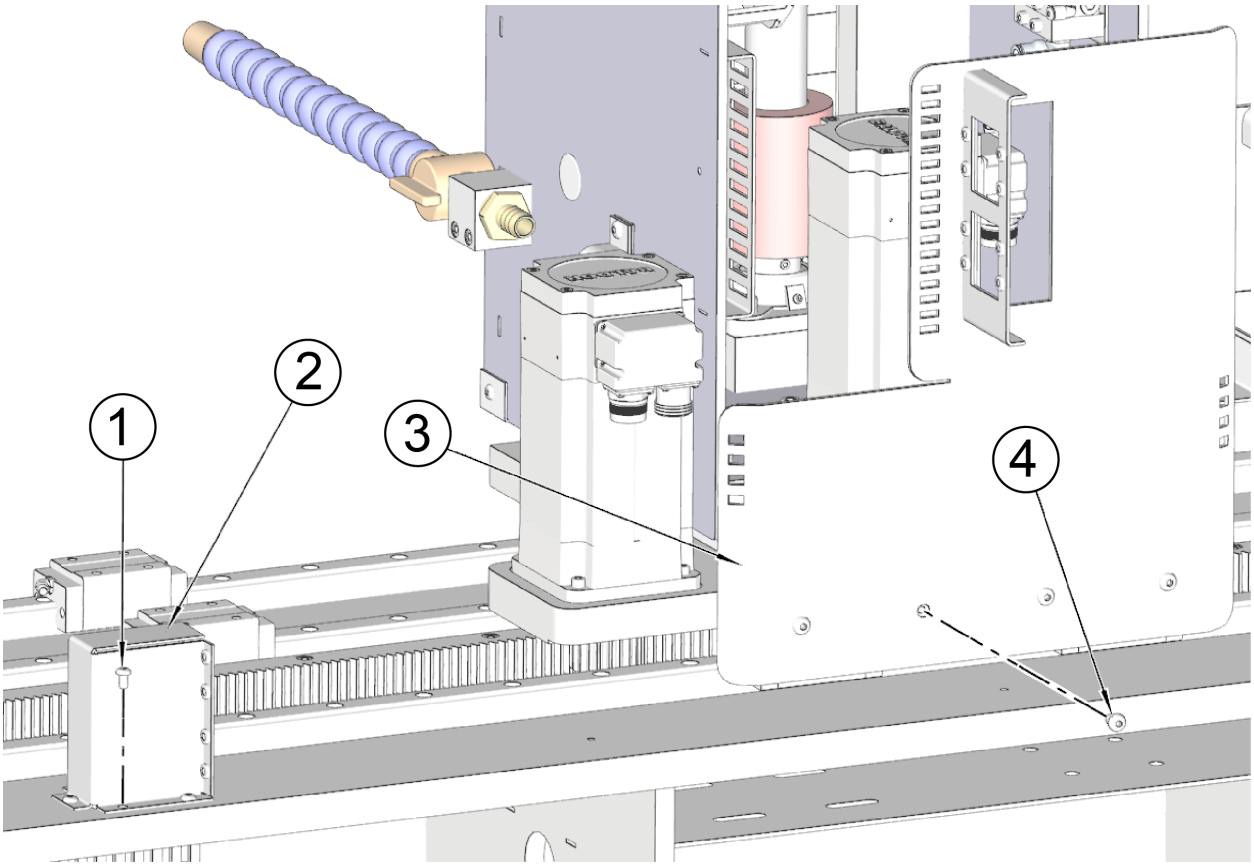
Upper Section

ITEM	PART #	DESCRIPTION
1	504-34-54	LOCKNUT BEARING
2		10-24 X 1 3/8 SOCKET HEAD CAP SCREW
3	514-14-85	BEARING, FACE MOUNT BALLSCREW
4	514-13-60P	BALLSCREW, Z AXIS
5	514-13-60K	Z AXIS LOWER BUMPER



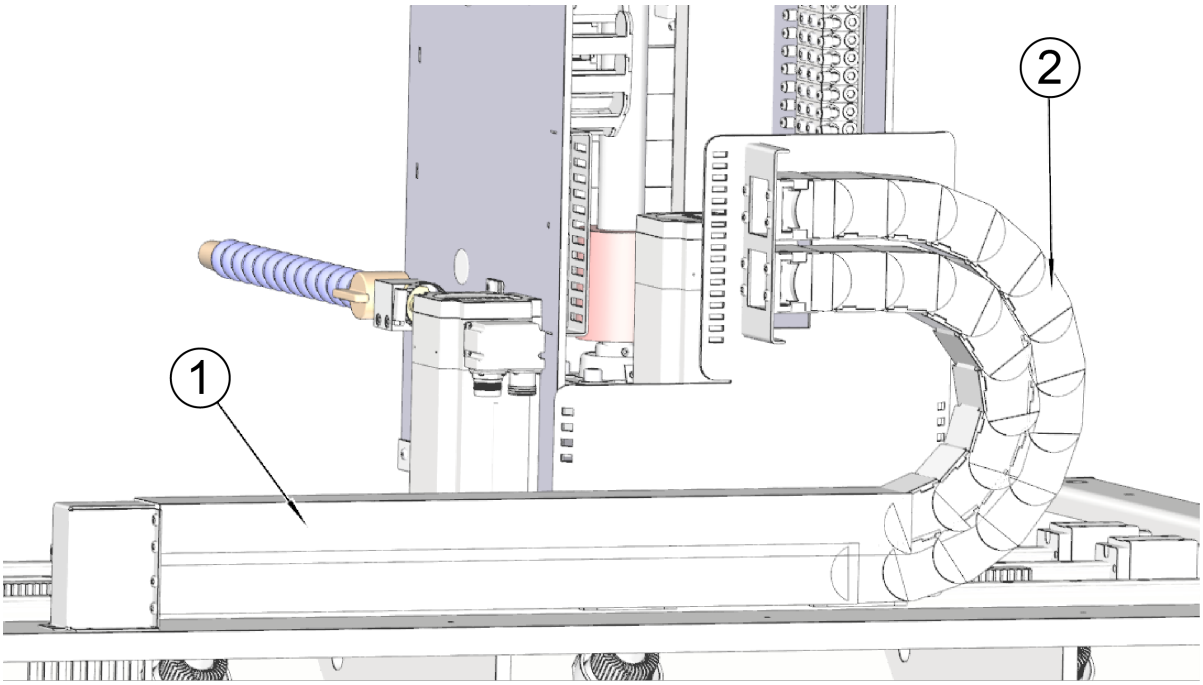
Outer Wire Track Assembly

Mounts



ITEM	PART #	DESCRIPTION
1	MF-88	SOCKET BUTTON HEAD SCREW 10-24 X 3/8”
2	514-14-48D	MOUNT, X AXIS CABLE CHAIN
3	514-14-40	MOUNT, CARRIAGE CABLE CHAIN
4	MF-11	SOCKET HEAD CAP SCREW 1/4-20 X 3/8”

Wire Tracks

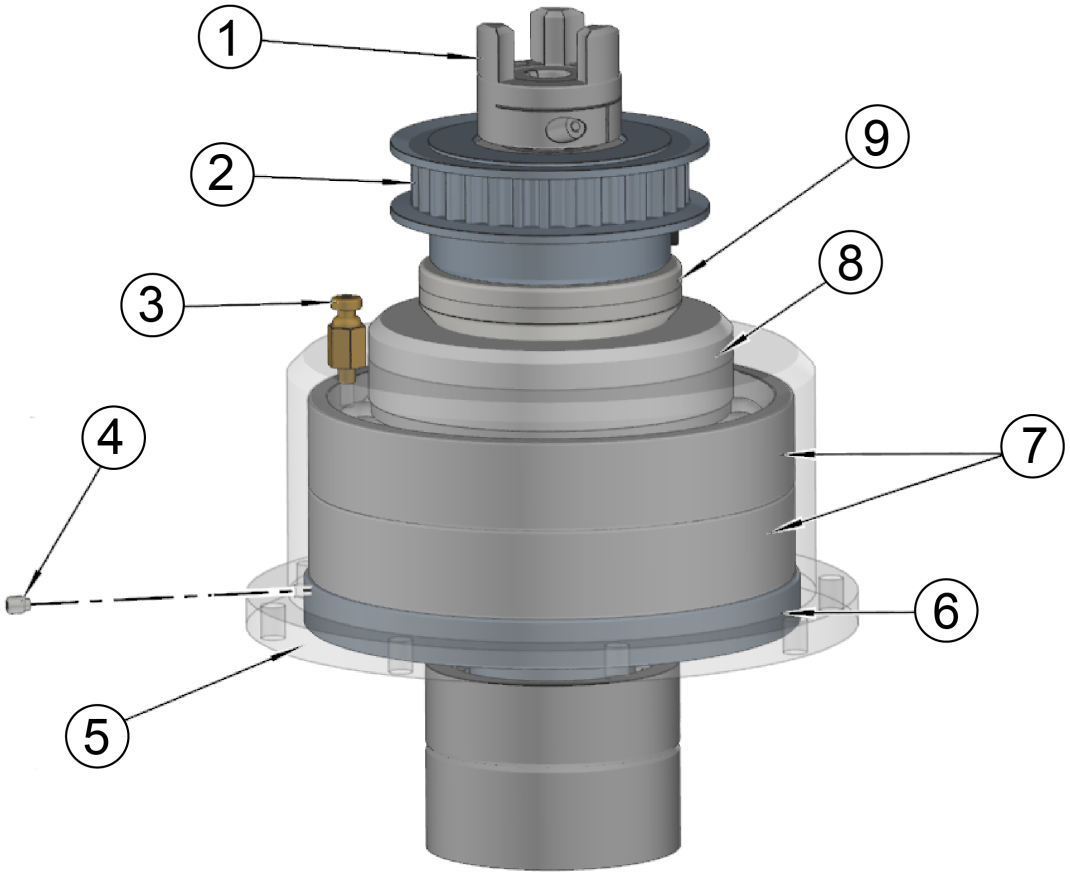


ITEM	PART #	DESCRIPTION
1	514-14-49A	CHAIN, X AXIS SHORT CABLE
2	514-14-49B	CHAIN, X AXIS LONG CABLE

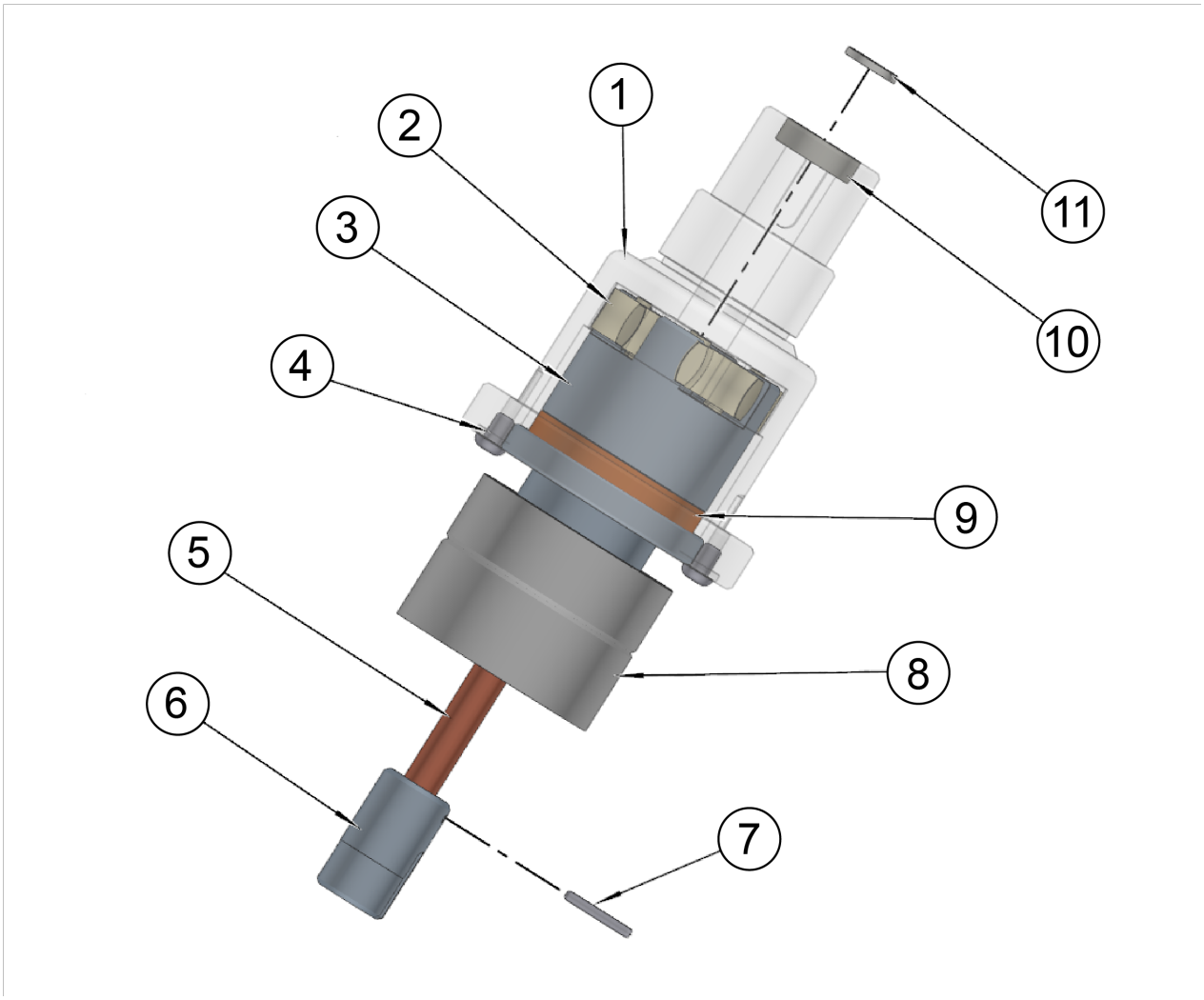
Spindle Drive Assembly

ITEM	PART #	DESCRIPTION
1	514-13-82B	COUPLING
2	514-13-83A	PULLEY, SPINDLE HUB
3	514-4-17J	CONNECTOR, MALE - 1/8” OD TO 10-32
4	100-82-2	SCREW,SET-BRASS GIB - 3/16” LONG
5	514-14-37	HOUSING, SPINDLE
6	514-14-38	NUT, HONE HOUSING SPANNER
7	514-13-70	BEARING
8	514-13-62	SPINDLE HOUSING
9	11001C	BEARING NUT

Outer Components



Inner Components

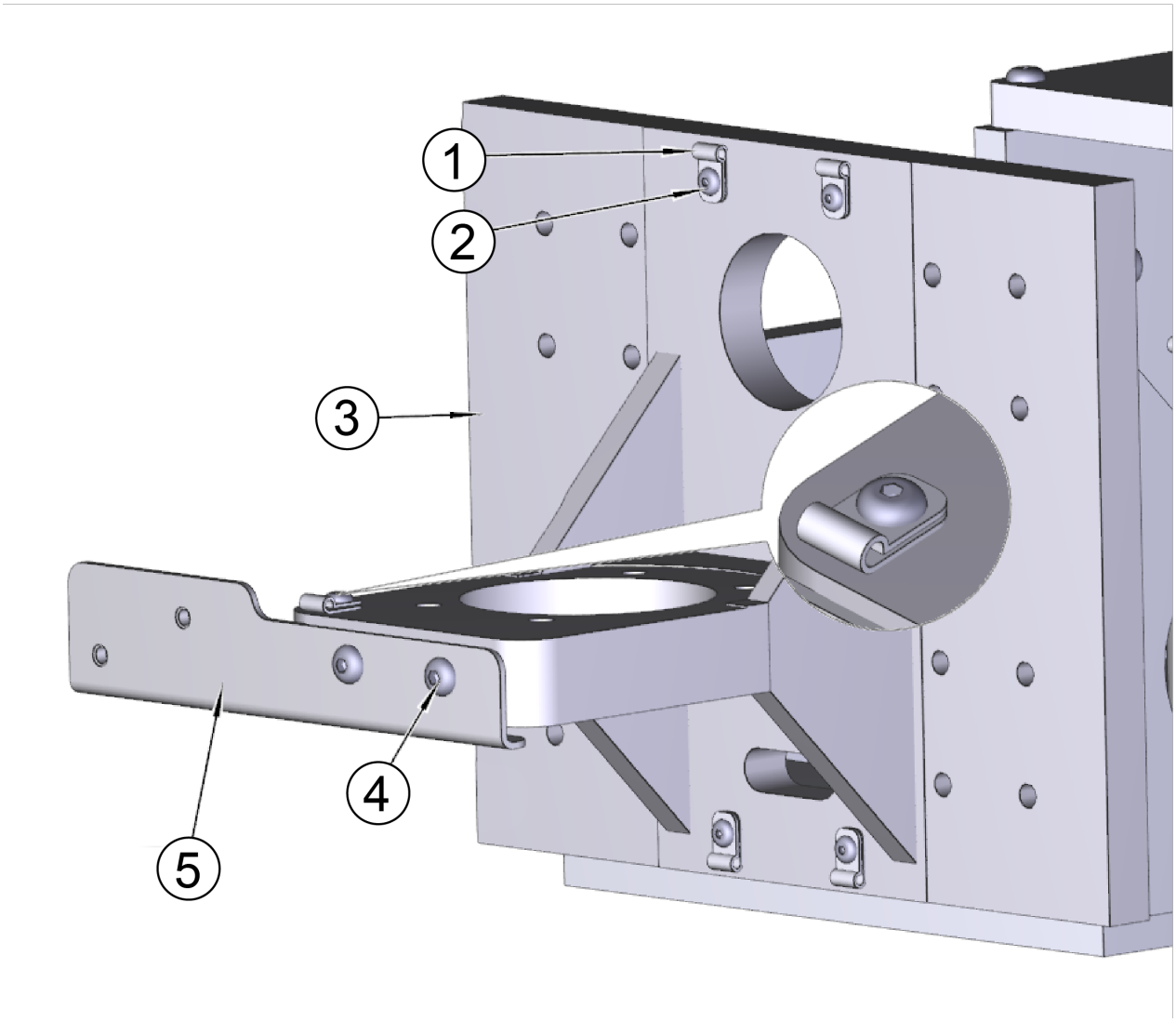


Spindle Drive Carriage Assembly

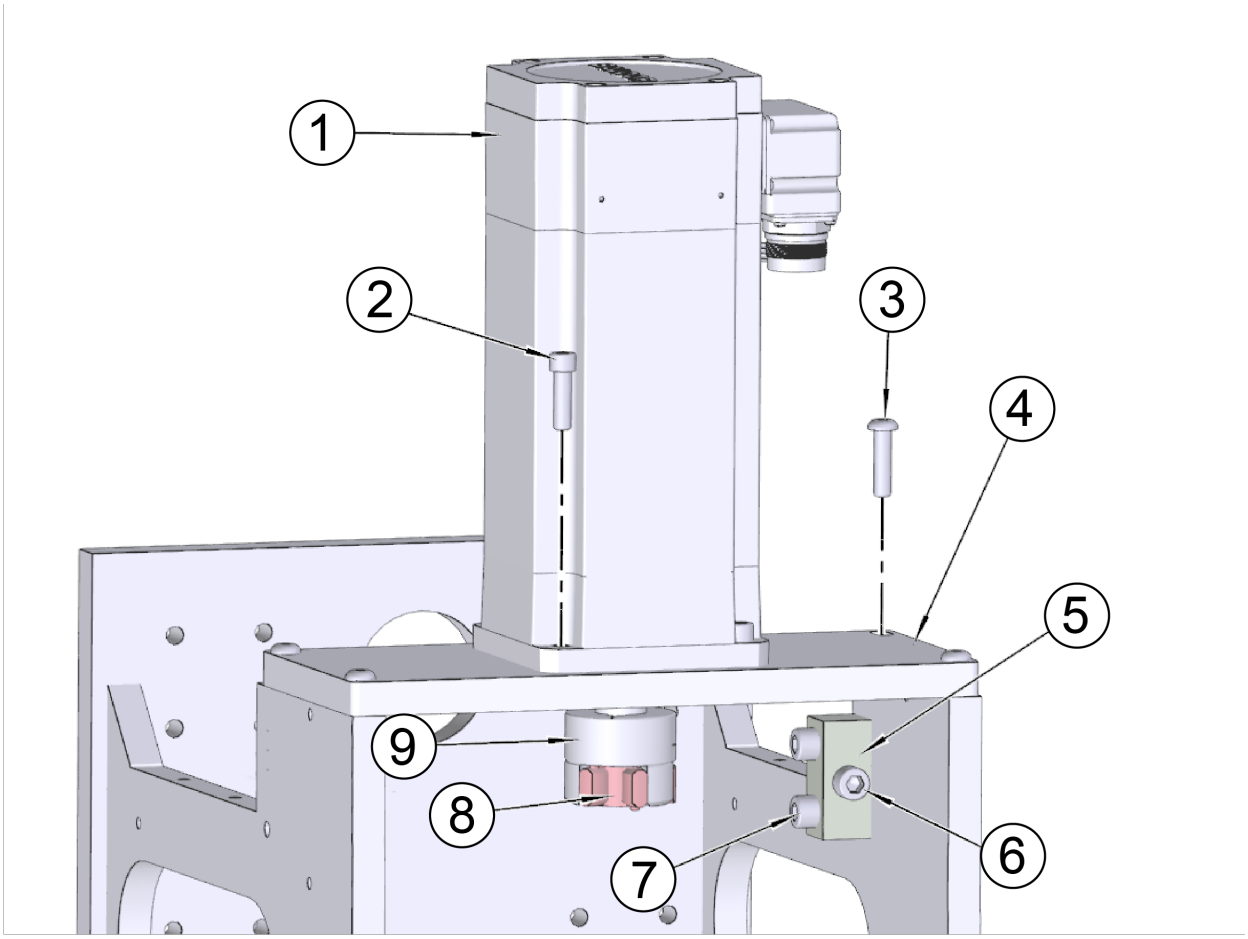
ITEM	PART #	DESCRIPTION
1	514-13-51	HUB, HONE DRIVE
2	514-13-50B	COUPLING, HONE
3	514-13-52	NOSE, SPINDLE
4	MF-248	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/8”
5	514-13-64	SHAFT, FEED OUT
6	514-13-65	COUPLER, FEED OUT
7		5/32 X 1 ROLL PIN
8	514-13-57	NUT, KWIK SWITCH
9	514-13-53	WASHER, URETHANE SPINDLE
10	514-13-50C	BEARING, HONE HEAD
11	514-13-64A	SPACER, COUPLING

ITEM	PART #	DESCRIPTION
1	502-12-12	CLAMP, OIL HOSE (1/8)
2	MF-86	SOCKET BUTTON HEAD SCREW 8-32 X 1/4”
3	514-14-57	CARRIAGE, SPINDLE
4	MF-248	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/8”
5	514-14-48	MOUNT, Z AXIS CABLE CHAIN

Oil Lines and Wire Track Attachments

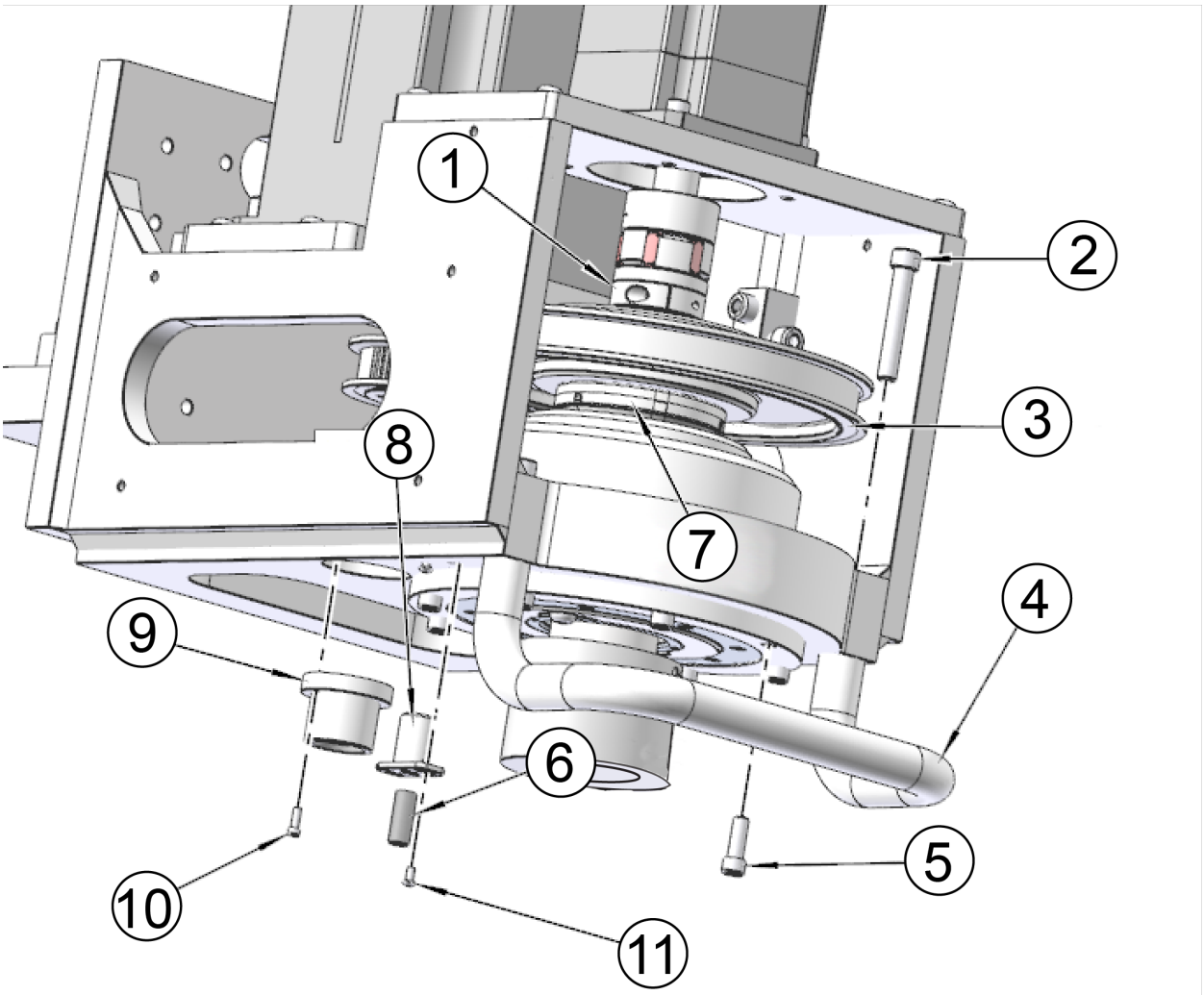


Feed Motor Assembly



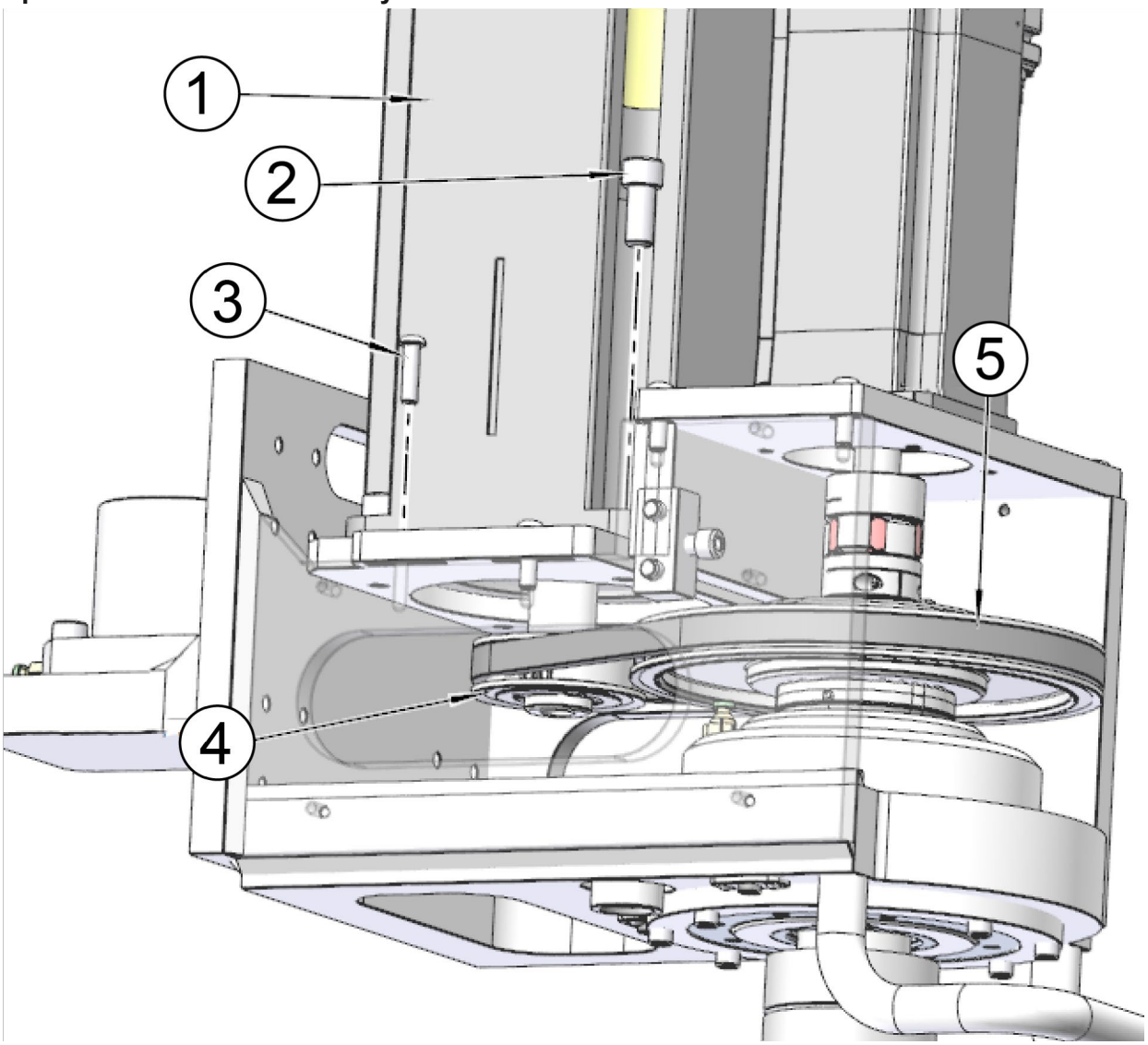
ITEM	PART #	DESCRIPTION
1	9020T	MOTOR, STONE FEED
2		1/4-20 X 7/8 SOCKET HEAD CAP SCREW
3		1/4-20 X 1 BUTTON HEAD CAP SCREW
4	514-13-11B	MOUNT, MOTOR FEED OUT
5	6451Q	BLOCK, ADJUSTING-BELT-SERVO MOTOR
6	MF-24	SOCKET HEAD CAP SCREW 5/16-18 X 1 1/4”
7	MF-23	SOCKET HEAD CAP SCREW 5/16-18 X 1”
8	514-13-82C	COUPLING, SPIDER
9	514-13-82A	COUPLING, MOTOR

Lower Section



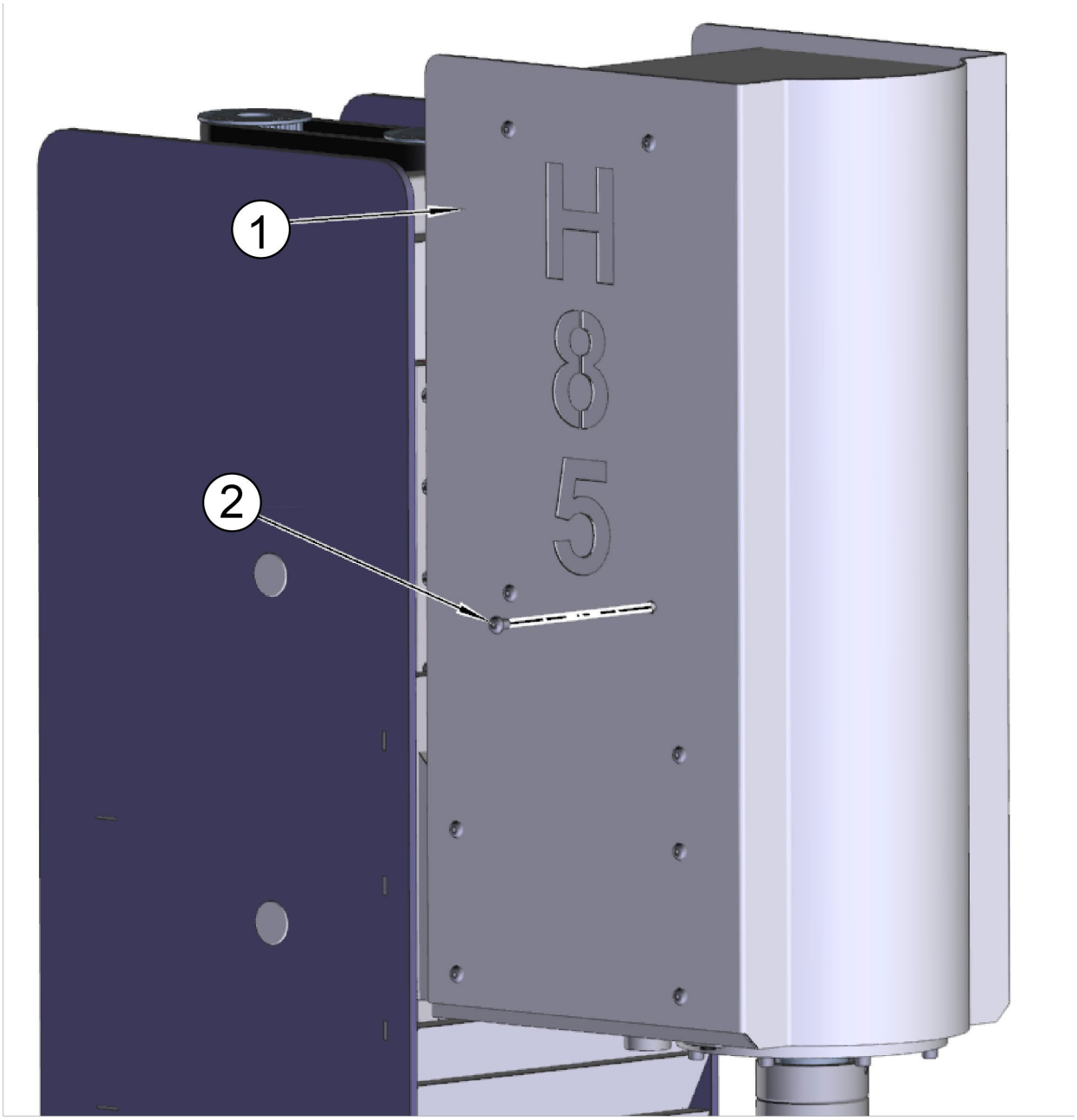
ITEM	PART #	DESCRIPTION
1	514-13-82B	COUPLING
2	MF-27	SOCKET HEAD CAP SCREW 5/16-18 X 2”
3	514-13-83P	PULLEY, SPINDLE
4	514-14-56D	HANDLE, CABINET
5	MF-14	SOCKET HEAD CAP SCREW 1/4-20 X 3/4”
6	514-14-37B	LASER, LINE
7	11001C	BEARING NUT
8	514-14-37A	HOUSING, LASER LINE
9	6457A	LIGHT, SPINDLE
10		4-40 X 3/8 SOCKET HEAD CAP SCREW
11		4-40 X 1/4 BUTTON HEAD CAP SCREW

Spindle Drive Motor Assembly



ITEM	PART #	DESCRIPTION
1	514-14-33	MOTOR, SPINDLE
2	MF-39	SOCKET HEAD CAP SCREW 7/16-14 X 1”
3		1/4-20 X 1 BUTTON HEAD CAP SCREW
4	514-13-83Q	PULLEY, SPINDLE MOTOR
5	514-13-83S	BELT, SPINDLE DRIVE

Spindle Drive Cover

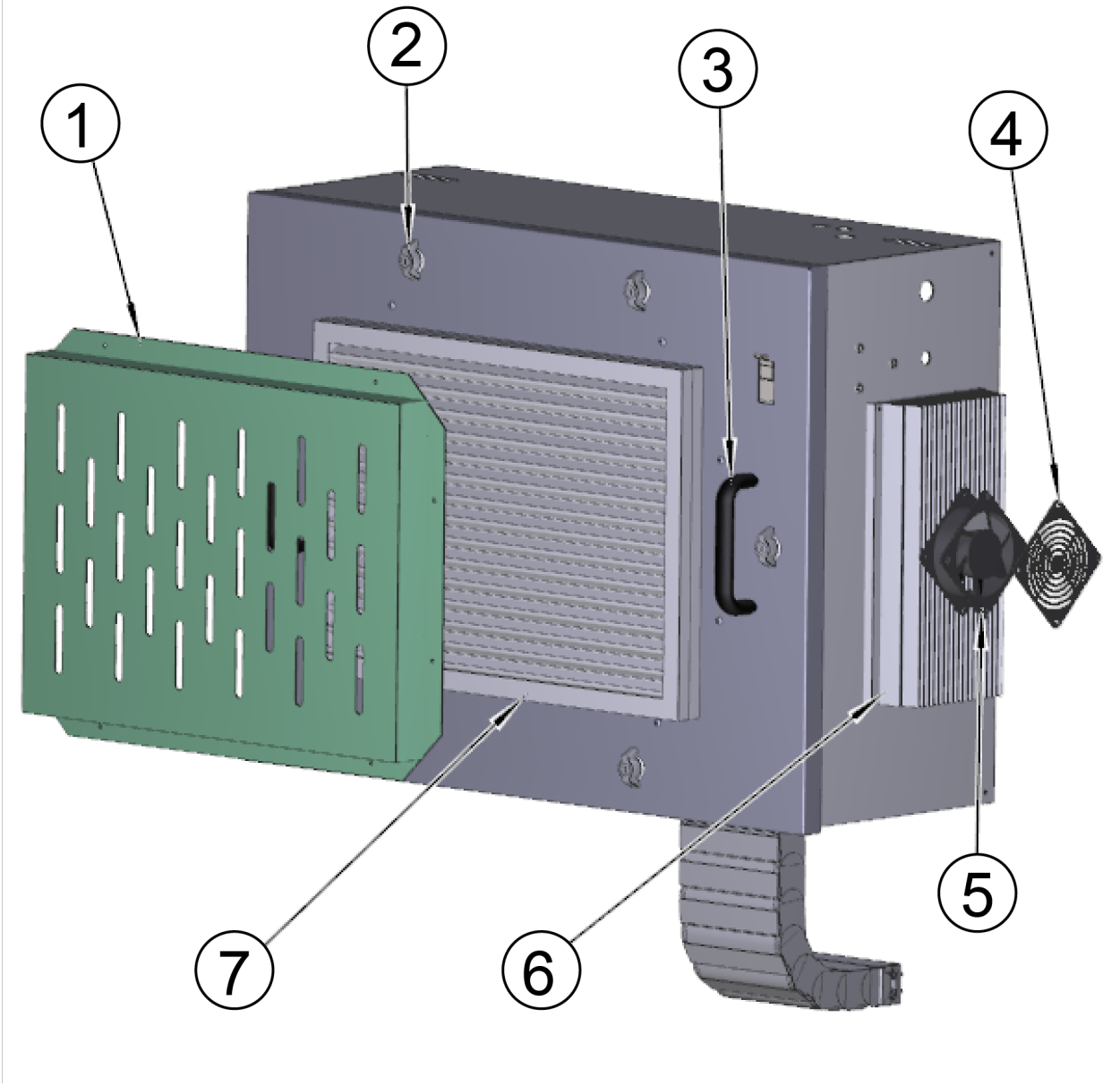


Electrical Enclosure

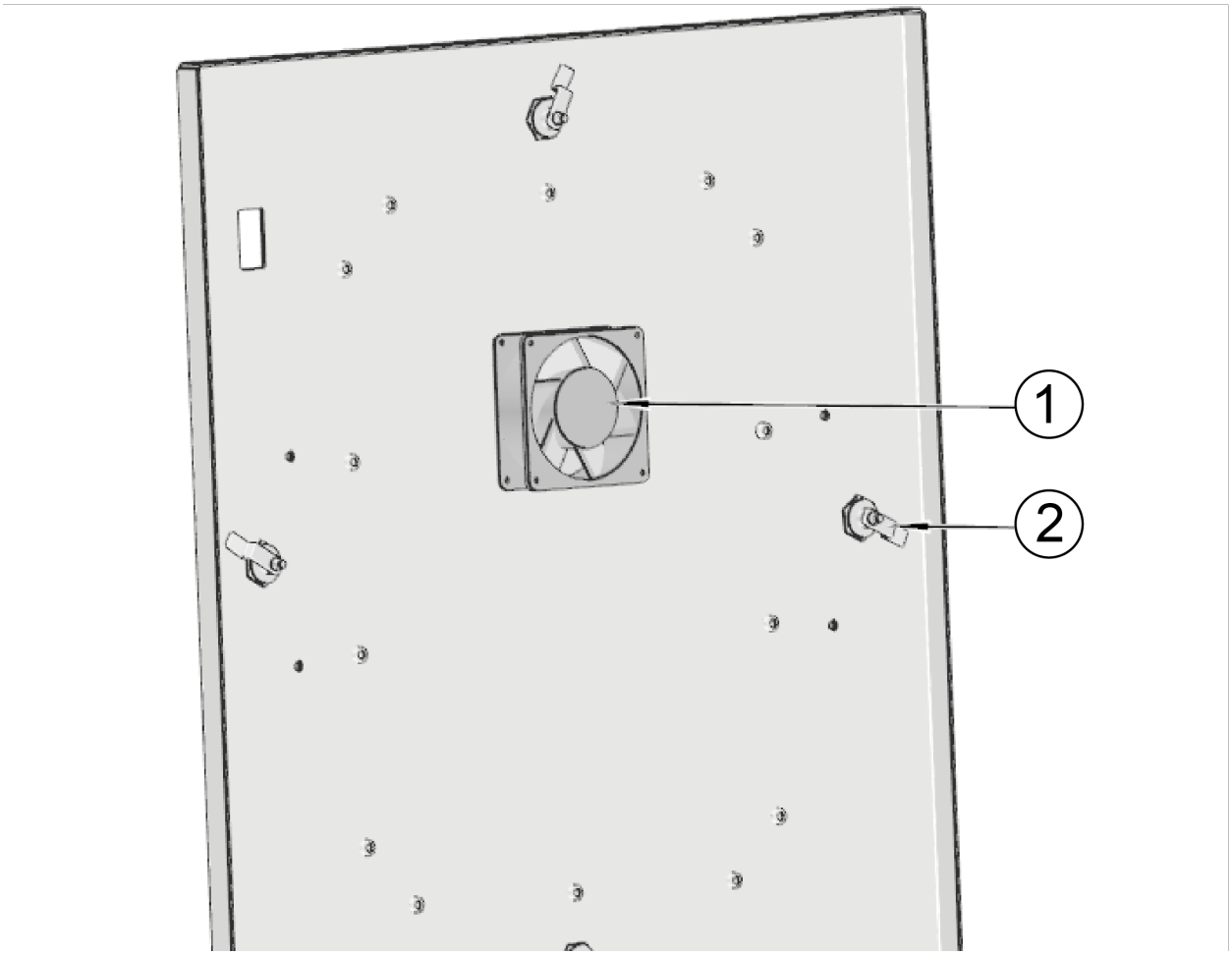
Door Assembly

ITEM	PART #	DESCRIPTION
1	514-14-46A	HOOD
2	MF-248	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/8”

Outside Parts

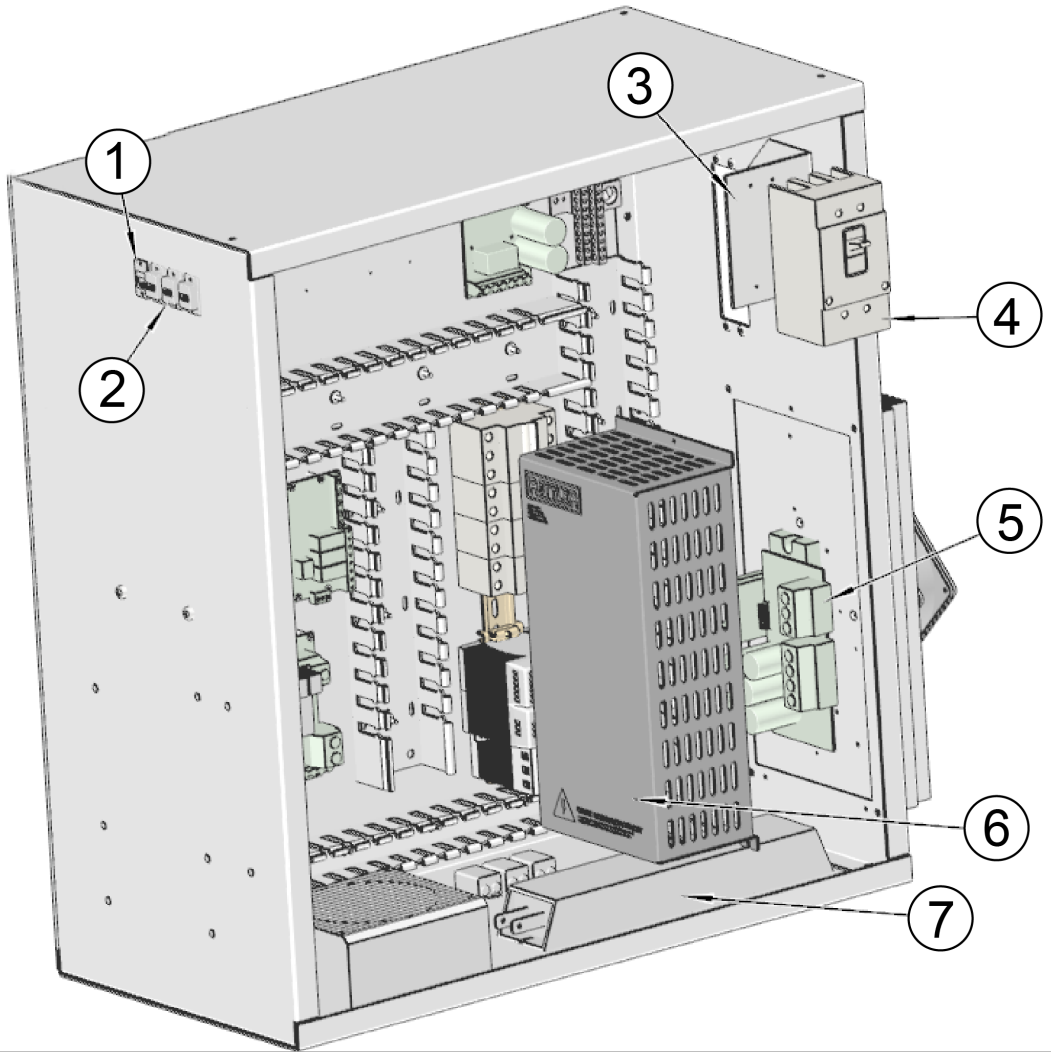


ITEM	PART #	DESCRIPTION
1	9030H	FILTER HOUSING
2	903E	DOOR LATCH
3	650-1-29G	HANDLE
4	7192B	GUARD, FAN
5	7192	FAN, ELECTRONIC ENCLOSURE
6	9023Z	SPINDLE AMP HEAT SINK
7	9030P	AIR FILTER



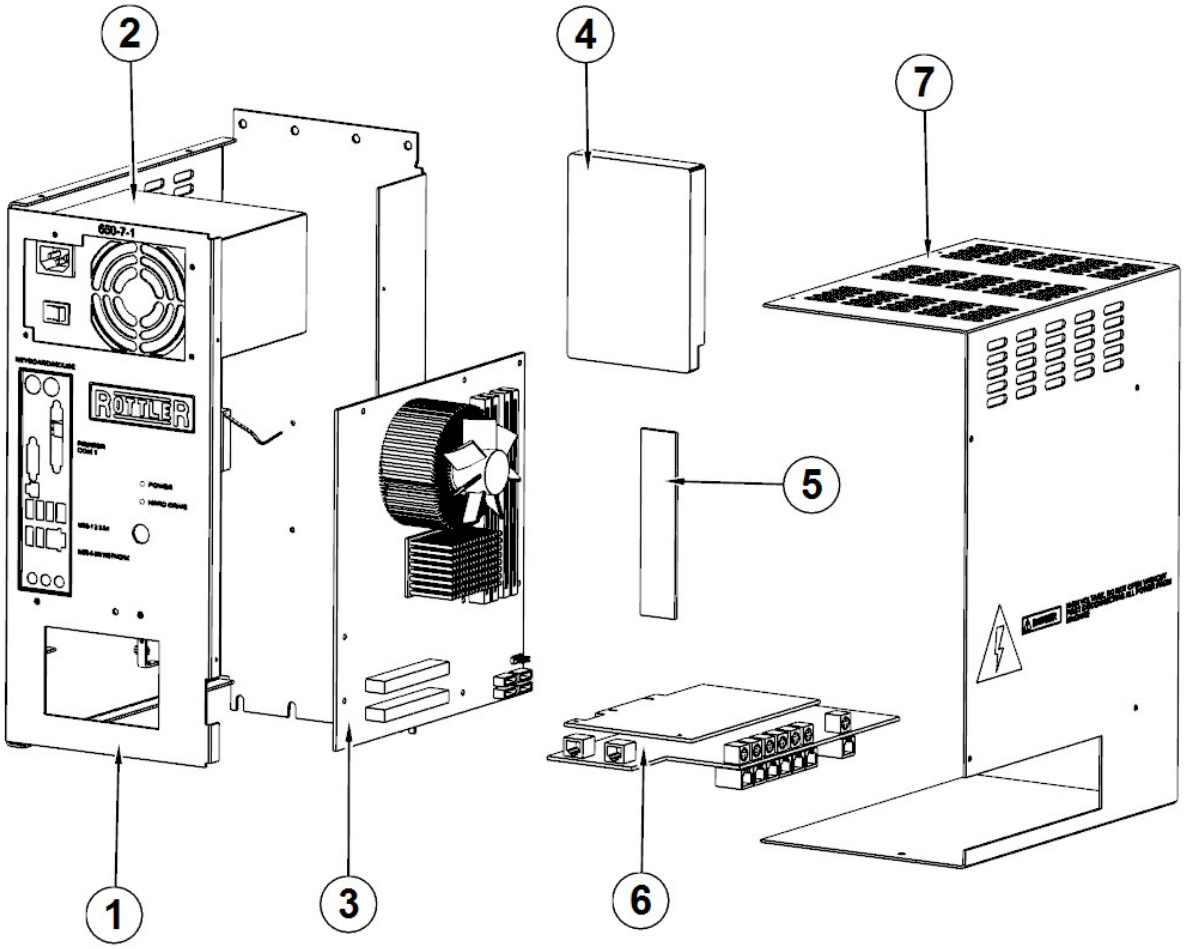
ITEM	PART #	DESCRIPTION
1	7192	FAN, ELECTRONIC ENCLOSURE
2	903E	DOOR LATCH

Inside Components



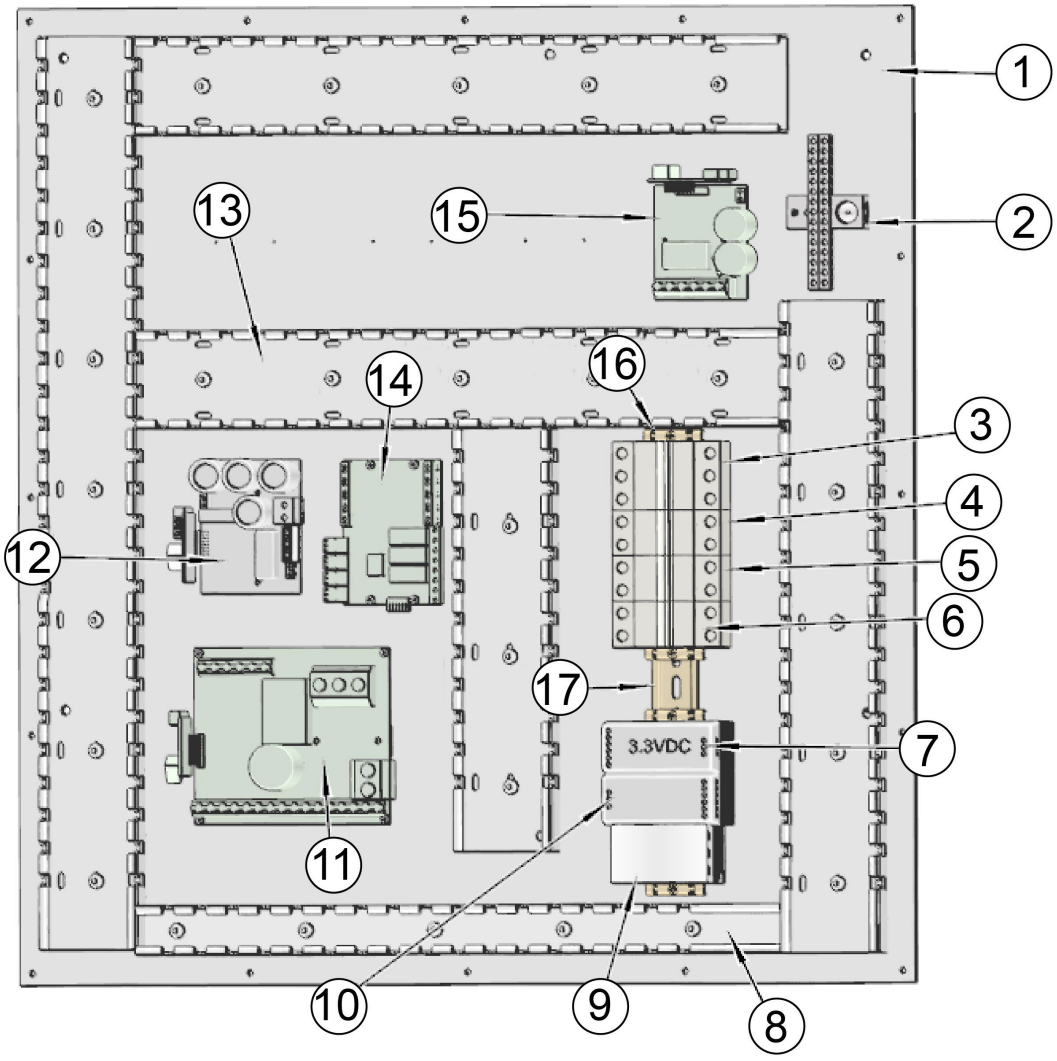
ITEM	PART #	DESCRIPTION
1		CAT5 DATA PORT
2		USB DATA PORT
3	9030T	BRACKET, SWITCH
4	9036B	BREAKER, 25A 3P DISCONNECT CIRCUIT
5	9034A	DM 75 AMP SPINDLE DRIVE
6	9023L	SPINDLE AMP DRIVE COVER
7	9038E	RESISTOR,BRAKING

Computer Components



Electrical Panel Assembly

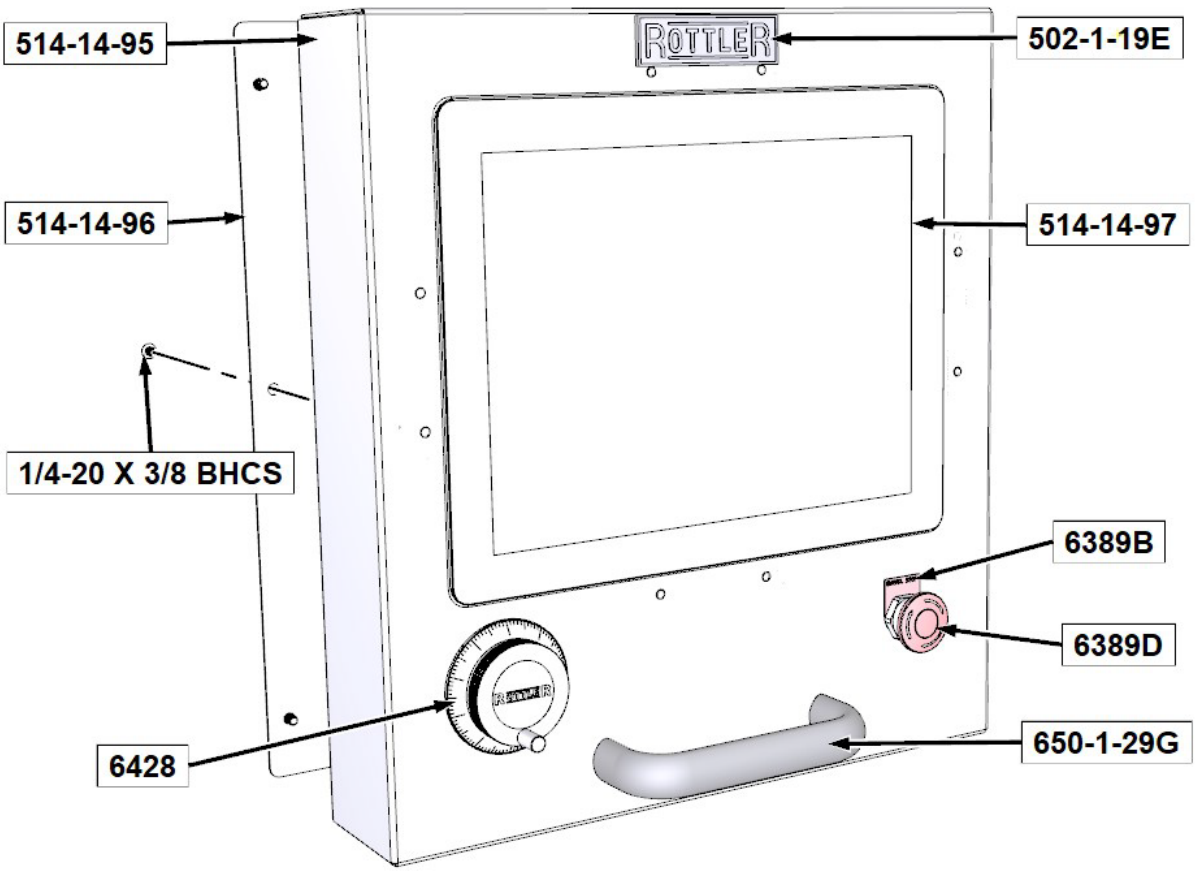
ITEM	PART #	DESCRIPTION
1	650-1-27Y	FRAME,COMPUTER CASE--SOLD IN ASSY #650-1-27X
2	650-7-1C	400W POWER SUPPLY
3	650-7-1A	MOTHER BOARD
4	650-7-1F	HARD DRIVE
5	650-7-2F	8GB DDR4 RAM
6	9035D	PCI E CARD - 16 LINK
7	650-1-27Z	COVER,COMPUTER CASE-SOLD IN ASSY #650-1-27X



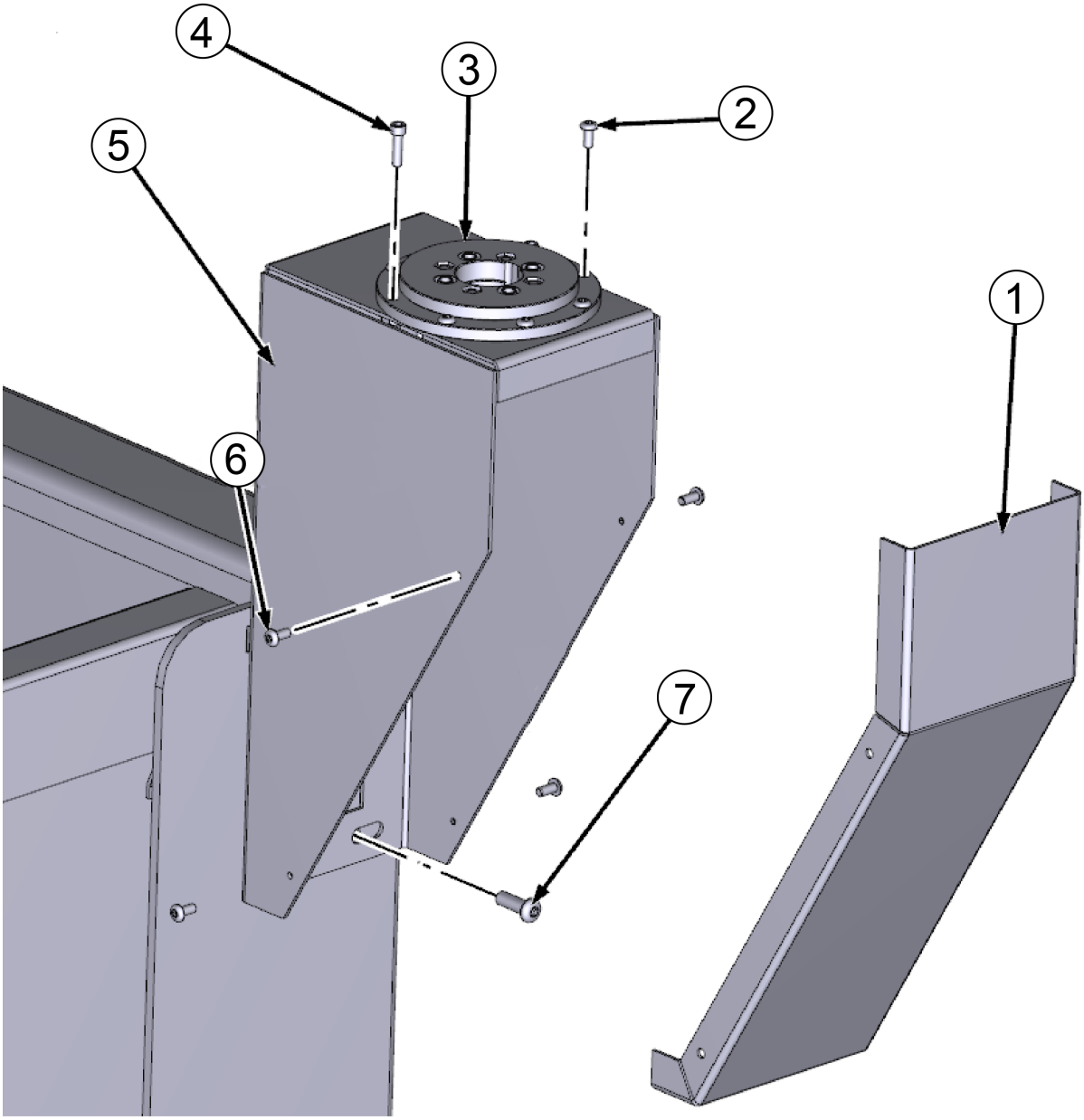
ITEM	PART #	DESCRIPTION
1	514-14-31F	PANEL , ELECTRICAL ENCLOSURE-HEAT SINK STYLE
2	6496J	TERMINAL,GROUNDING
3	6462K	BREAKER, 20 AMP
4	504-35-3U	BREAKER, CIRCUIT 7 AMP, 2 POLE ,D CURVE
5	504-35-3	BREAKER, CIRCUIT 2 AMP, 2 POLE
6	504-35-3Q	BREAKER, CIRCUIT 3 AMP, 2 POLE
7	504-35-3	BREAKER, CIRCUIT 2 AMP, 2 POLE
8	6554L	DUCT, WIRING (1 1/2” X 2”)
9	504-35-3K	POWER SUPPLY, 24 VOLT DC
10	504-35-12	ADAPTER,CUTTERHEAD 4 1/2” DIA
11	9034E	POWER BOARD-70 AMP, THREE PHASE
12	9034H	PCIe CARD- DM SERIAL CONTROL SYSTEMS
13	6554V	DUCT, WIRING (2 X 3”)
14	9035L	INPUT/OUTPUT BOARD
15	9034	DM 30 AMP AXIS DRIVE
16	504-35-3M	CAP, DIN RAIL
17	504-35-3F	DIN RAIL

Control Pendant Assembly

Outer Components

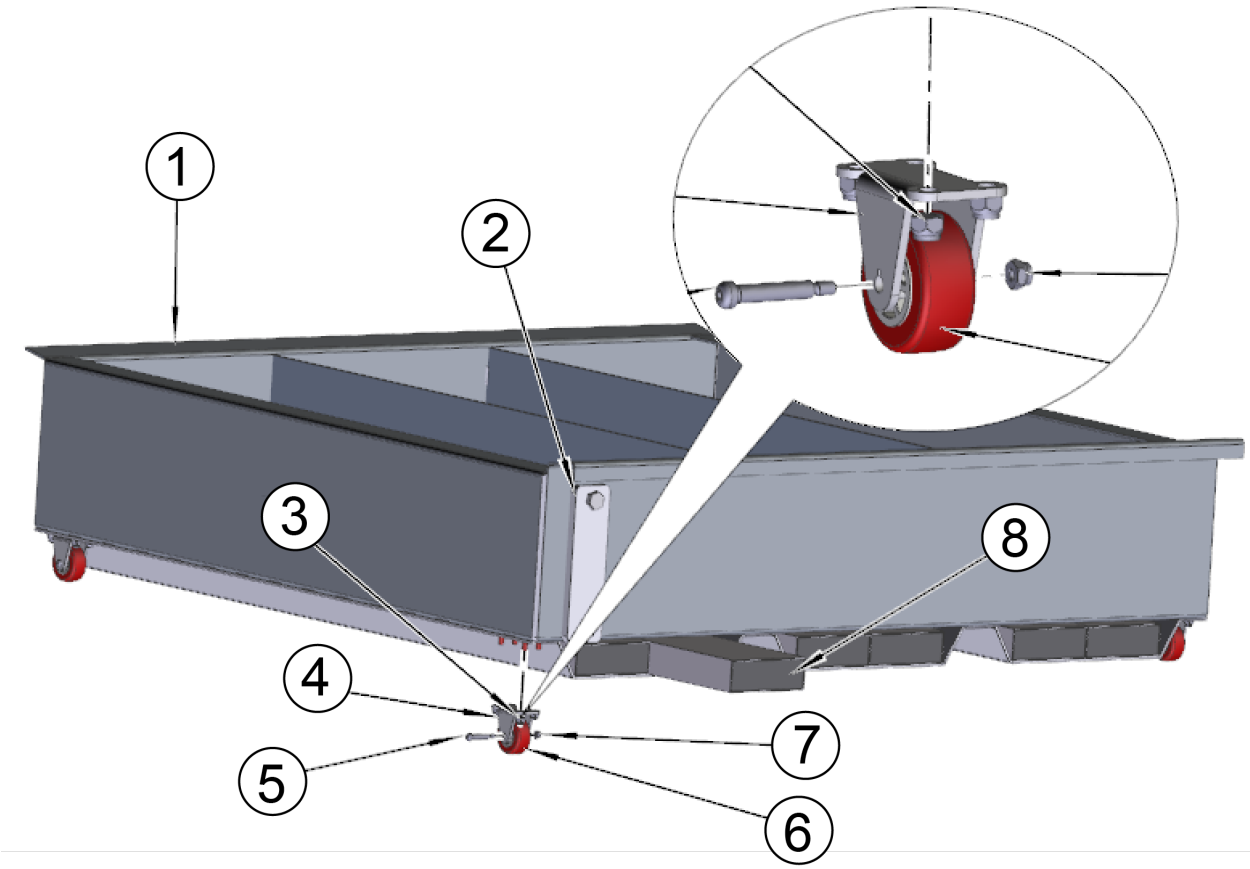


Pendant Mounts



Coolant Sump Tank

ITEM	PART #	DESCRIPTION
1	7322B	COVER, PENDANT SUPPORT
2	MF-86A	SOCKET BUTTON HEAD SCREW 8-32 X 3/8”
3	7322C	BEARING, SLEWING RING
4		8-32 X 5/8 SOCKET HEAD CAP SCREW
5	7322A	BRACKET, PENDANT SUPPORT
6	MF-86A	SOCKET BUTTON HEAD SCREW 8-32 X 3/8”
7	MF-92	SOCKET BUTTON HEAD SCREW 1/4-20 X 3/4”



ITEM	PART #	DESCRIPTION
1	514-14-52A	TANK, COOLANT
2	514-14-52C	GLASS, SIGHT
3	MF-186A	NYLOCK NUTS 1/4-20
4	514-14-52F	CASTER, WHEEL & BRACKET
5	502-3-37A	BOLT, SOCKET HS SHOULDER 1/4” X 1 1/4”
6	514-14-52B	WHEEL, 2” CASTER
7	514-6-26H	LOCKNUT, 10-24 FIN. NYLON PLTD
8	514-7-65T	MAGNET

OPTIONS

Optional Equipment

Optional Equipment Catalog and Parts Manual are located on the Manual CD shipped with machine.

SDS

The Safety Data Sheets list shown in this section are the substances and materials that an operator is most likely to come in contact with while using this machine.

Other substances and materials are used in the manufacture, testing, and shipping of this machine. A complete list of the Safety Data Sheets of substances and materials used by Rottler Manufacturing during manufacturing, testing, and shipping is located on the Manual flash drive shipped with the machine. Safety Data Sheets are also located on the company web site: http://www.rottlermfg.com/documentation.php

1) Rottler Honing Coolant 514-4-71C (Yumate SC-870C)

2) Multi-Way Oil

Yushiro Manufacturing America, Inc.

SAFETY DATA SHEET

Issue Date 17-Dec-2015 **Revision Date:** 29-Apr-2016

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION

Product identifier

Product Name YUMATE SC-870C

Other means of identification

Product Code YUMATE SC-870C
Synonyms None

Recommended use of the chemical and restrictions on use

Recommended Use Water soluble metalworking fluid.
Uses advised against No information available

Details of the supplier of the safety data sheet

Manufacturer Address
Yushiro Manufacturing America, Inc.
783 West Mausoleum Road
Shelbyville, IN 46176
Telephone: 317-398-9862

Emergency telephone number

Emergency Telephone Chemtrec 1-800-424-9300

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (repeated exposure)	Category 2

Label elements

Emergency Overview

Danger

Hazard statements
Causes serious eye damage
May cause an allergic skin reaction
Suspected of damaging fertility or the unborn child
May cause damage to organs through prolonged or repeated exposure
Harmful to aquatic life with long lasting effects

Appearance No information available **Physical state** liquid **Odor** Amines

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
Do not breathe dust/fume/gas/mist/vapors/spray
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical advice/attention
Specific treatment (see .? on this label)
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse

Precautionary Statements - Storage
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
Other Information
• May be harmful if swallowed
Unknown acute toxicity 1.9 % of the mixture consists of ingredient(s) of unknown toxicity

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No	weight-%	Trade Secret
Triethanolamine	102-71-6	10 - 30	*
Monoethanolamine	141-43-5	1 - 5	*
Boric acid	10043-35-3	1 - 5	*

Some specific chemical identities and the exact percentages of composition have been withheld as trade secrets.

4. FIRST AID MEASURES

First aid measures

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin Contact Wash off immediately with soap and plenty of water. Wash contaminated clothing before reuse. If symptoms persist, call a physician.

Inhalation Remove to fresh air.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Dry chemical, foam, carbon dioxide, water spray or fog is recommended.

Unsuitable extinguishing media CAUTION: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical No information available.

Hazardous combustion products Incomplete combustion and thermolysis may produce gases of varying toxicity such as carbon monoxide, carbon dioxide, various hydrocarbons, aldehydes and soot. These may be highly dangerous if inhaled in confined spaces or at high concentration.

Explosion data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with eyes and skin. Use personal protective equipment as required. Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions Avoid release to the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional Ecological Information. Dispose of contents/container to an approved waste disposal plant.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.
Methods for cleaning up Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Use personal protective equipment as required. Avoid contact with skin, eyes or clothing. Ensure adequate ventilation, especially in confined areas.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep from freezing. Protect from extremes of temperature and direct sunlight. Keep container tightly closed in a dry and well-ventilated place.

Incompatible materials Acids. Strong oxidizing agents. Nitrites and nitrosating agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines .

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Triethanolamine	TWA: 5 mg/m^3	-	-
Monoethanolamine	STEL: 6 ppm TWA: 3 ppm	TWA: 3 ppm TWA: 6 mg/m^3 (vacated) TWA: 3 ppm (vacated) TWA: 8 mg/m^3 (vacated) STEL: 6 ppm (vacated) STEL: 15 mg/m^3	IDLH: 30 ppm TWA: 3 ppm TWA: 8 mg/m^3 STEL: 6 ppm STEL: 15 mg/m^3
Boric acid	STEL: 6 mg/m^3 inhalable fraction TWA: 2 mg/m^3 inhalable fraction	-	-

Appropriate engineering controls

Engineering Controls	Showers Eyewash stations Ventilation systems.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles). Avoid contact with eyes.
Skin and body protection	Wear protective gloves and protective clothing. Avoid contact with skin and clothing. Selection of protective clothing depends on work conditions.
Respiratory protection	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
General Hygiene Considerations	Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	liquid		
Appearance	No information available	**Odor**	Amines
Color	light yellow	**Odor threshold**	No information available

Property	**Values**	**Remarks • Method**
pH	8.85	
Melting point / freezing point	No information available	
Boiling point / boiling range	No information available	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	No information available	
Flammability Limit in Air		
Upper flammability limit:	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific Gravity	1.059	@ 20°C
Water solubility	Miscible in water	

–

Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
Explosive properties	No information available
Oxidizing properties	No information available

Other Information

Softening point	No information available
Molecular weight	No information available
VOC Content (%)	No information available
Density	8.8 lbs/gal
Bulk density	No information available

10. STABILITY AND REACTIVITY

Reactivity
No data available

Chemical stability
Stable under recommended storage conditions. **Possibility of Hazardous Reactions** None under normal processing.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid
Extremes of temperature and direct sunlight.

Incompatible materials
Acids. Strong oxidizing agents. Nitrites and nitrosating agents.

Hazardous Decomposition Products
No hazardous decomposition products if stored and handled under normal conditions.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information	No data available
Inhalation	Inhalation of vapors at high concentration may cause mild irritation of respiratory system.
Eye contact	Contact with eyes may cause serious eye damage.
Skin Contact	Repeated or prolonged skin contact may result in dermatitis. May cause sensitization by skin contact.
Ingestion	May be harmful if swallowed.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Triethanolamine	= 4190 mg/kg (Rat)	> 20 mL/kg (Rabbit) > 16 mL/kg (Rat)	-
Monoethanolamine	= 1720 mg/kg (Rat)	= 1 mL/kg (Rabbit) = 1000 mg/kg (Rabbit)	-
Boric acid	= 2660 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 0.16 mg/L (Rat) 4 h

Information on toxicological effects

Symptoms No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	Repeated exposure may cause skin dryness or cracking.
Serious eye damage/eye irritation	Risk of serious damage to eyes.
Sensitization	May cause sensitization by skin contact.
Germ cell mutagenicity	No information available.
Carcinogenicity	This product does not contain any components at concentrations at or above 0.1% that are listed as carcinogens or potential carcinogens by OSHA, IARC or NTP.
Reproductive toxicity	Product contains boric acid. Animal ingestion studies in several species indicate that, at high doses, boric acid may cause reproductive and developmental effects. Human epidemiological studies have not shown a negative effect on human fertility.
STOT - single exposure	No information available.
STOT - repeated exposure	May cause damage to kidneys and liver through prolonged or repeated exposure.
Aspiration hazard	No information available.

Numerical measures of toxicity - Product Information

Unknown acute toxicity 1.9 % of the mixture consists of ingredient(s) of unknown toxicity **The following values are calculated based on chapter 3.1 of the GHS document.**

ATEmix (oral) >3,000 mg/kg

12. ECOLOGICAL INFORMATION

Ecotoxicity
Harmful to aquatic life

Persistence and degradability
No information available.

Bioaccumulation
No information available.

Other adverse effects
No information available

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated packaging Do not reuse container.

Chemical Name	California Hazardous Waste Status
Boric acid 10043-35-3	Toxic

14. TRANSPORT INFORMATION

DOT Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDSL	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

US Federal Regulations

SARA

313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product contains substances classified as oil under Section 311 of the Clean Water Act and the Oil Pollution Act of 1990. Discharge or spills which produce a visible sheen on surface water or waterways leading to surface water must be reported to the National Response Center at 800-424-8802.

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals (Trace impurities, <<0.1%)

Chemical Name	California Proposition 65
Diethanolamine - 111-42-2	Carcinogen
N, N-Diethanolamine - 111-42-2	Carcinogen
1,2-dichloroethane - 107-06-2	Carcinogen
1,4-dioxane - 123-91-1	Carcinogen
Ethylenimine - 151-56-4	Carcinogen
Ethylene oxide - 75-21-8	Carcinogen Developmental Female Reproductive Male Reproductive
Propylene oxide - 75-56-9	Carcinogen

U.S. EPA Label information

EPA Pesticide registration number Not Applicable

16. OTHER INFORMATION

Issue Date 17-Dec-2015

Revision Date: 29-Apr-2016
Revision Note
No information available
Disclaimer
The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing,

storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200), Health Canada HPR (SOR/2015-17), and Mexico NOM-018-STPS-2015

SECTION 1: Identification

Product Identifier	**Multi-Way Oil HD**
Other means of identification	Phillips 66 Multi-Way Oil HD 32 Phillips 66 Multi-Way Oil HD 68 Phillips 66 Multi-Way Oil HD 220
Code	**LBPH817776**
Relevant identified uses	Way Oil
Uses advised against	All others
24 Hour Emergency Phone Number	CHEMTREC: 1-800-424-9300 CHEMTREC México 01-800-681-9531

Manufacturer/Supplier
Phillips 66 Lubricants
P.O. Box 4428
Houston, TX 77210

SDS Information
URL: www.phillips66.com/SDS
Phone: 800-762-0942
Email: SDS@P66.com

Customer Service
U.S.: 800-368-7128 or International: 1-832-765-2500
Technical Information
1-877-445-9198

SECTION 2: Hazard identification

Classified Hazards

No classified hazards

Hazards Not Otherwise Classified (HNOC)

PHNOC: None known

HHNOC: None known

Label elements

No classified hazards

SECTION 3: Composition/information on ingredients

Chemical Name	CASRN	Concentration
Distillates, petroleum, hydrotreated heavy paraffinic	64742-54-7	>40
Distillates, petroleum, solvent-dewaxed heavy paraffinic	64742-65-0	>45
Residual oils, petroleum, solvent-dewaxed	64742-62-7	>10

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation: First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion: First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Inhalation of oil mists or vapors generated at elevated temperatures may cause respiratory irritation. Accidental ingestion can result in minor irritation of the digestive tract, nausea and diarrhea. Prolonged or repeated contact may dry skin and cause irritation.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

SECTION 5: Firefighting measures

NFPA 704: National Fire Protection Association

Health: 0 **Flammability:** 1 **Instability:** 00 =

minimal hazard
1 = slight hazard
2 = moderate hazard
3 = severe hazard
4 = extreme hazard

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

Special protective actions for fire-fighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with

inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

SECTION 7: Handling and storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Spills will produce very slippery surfaces. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: Exposure controls/personal protection

Occupational exposure limits
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

Chemical Name	ACGIH	OSHA	Mexico	Phillips 66
Distillates, petroleum, hydrotreated heavy paraffinic	TWA: 5mg/m^3 STEL: 10 mg/m^3 as Oil Mist, if Generated	---	---	---
Distillates, petroleum, solvent-dewaxed heavy paraffinic	TWA: 5mg/m^3 STEL: 10 mg/m^3 as Oil Mist, if Generated	---	---	---
Residual oils, petroleum, solvent-dewaxed	TWA: 5mg/m^3 STEL: 10 mg/m^3 as Oil Mist, if Generated	---	---	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Biological occupational exposure limits

Note: This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye/face protection is not normally required; however, good industrial hygiene practice suggests the use of eye protection that meets or exceeds ANSI Z.87.1 whenever working with chemicals.

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals. Suggested protective materials: Nitrile rubber

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen **4/6** _
deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

Note: Unless otherwise stated, values are determined at to 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended be specifications.

Appearance: Amber, Transparent
Physical Form: Liquid
Odor: Petroleum **Odor Threshold:** No data **pH:** Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data
Evaporation Rate (nBuAc=1): No data
Particle Size: Not applicable
Percent Volatile: No data
Flammability (solid, gas): Not applicable
Solubility in Water: Insoluble

Flash Point: > 320 °F / > 160 °C
Test Method: Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Initial Boiling Point/Range: No data
Vapor Pressure: <1 mm Hg
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: < 5 °F / < -15 °C
Auto-ignition Temperature: No data
Decomposition Temperature: No data
Specific Gravity (water=1): 0.86 - 0.89 @ 60ºF (15.6ºC)
Bulk Density: 7.2 - 7.4 lbs/gal
Viscosity: 5 - 20 cSt @ 100°C; 29 - 235 cSt @ 40°C
Pour Point: < 5 °F / < -15 °C

SECTION 10: Stability and reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition. Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

Information on Toxicological Effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5 mg/L (mist, estimated)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated)
Oral	Unlikely to be harmful		> 5 g/kg (estimated)

Likely Routes of Exposure: Inhalation, eye contact, skin contact

Aspiration Hazard: Not expected to be an aspiration hazard

Skin Corrosion/Irritation: Not expected to be irritating. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Not expected to be irritating.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Lubricant Base Oil (Petroleum)

Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including severe hydrocracking/hydroprocessing to reduce aromatics and improve performance characteristics. All of the oils meet the IP-346 criteria of less than 3 percent PAH's and are not considered carcinogens by NTP, IARC, or OSHA.

SECTION 12: Ecological information

GHS Classification:
No classified hazards

Toxicity: All acute aquatic toxicity studies on samples of lubricant base oils show acute toxicity values greater than 100 mg/L for invertebrates, algae and fish. These tests were carried out on water accommodated fractions and the results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material are greater than 5.3, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of the hydrocarbon constituents in soil and sediment.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle used oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

SECTION 14: Transport information

U.S. Department of Transportation (DOT)
UN Number: Not regulated
UN proper shipping name: None

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Transport hazard class(es): None
Packing Group: None
Environmental Hazards: This product does not meet the DOT/UN/IMDG/IMO criteria of a marine pollutant
Special precautions for user: If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds)
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CERCLA/SARA - Section 313 and 40 CFR 372
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds)
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65

This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

SECTION 16: Other information

Issue Date:	Previous Issue Date:	SDS Number	Status:
16-Apr-2018	23-Jun-2016	LBPH817776	FINAL

Revised Sections or Basis for Revision:
Exposure limits (Section 8); Regulatory information (Section 15)

Legend (pursuant to NOM-018-STPS-2015):
The information within is considered correct but is not exhaustive and will be used for guidance only, which is based on the current knowledge of the substance or mixture and is applicable to the appropriate safety precautions for the product.

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; HPR = Hazardous Products Regulations; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.