December 5, 2008 Rev 2

SF7A & SF8A

AUTOMATIC SURFACING MACHINES

MACHINE SERIAL NUMBER

_____

OPERATIONS AND MAINTENANCE
MANUAL

MANUFACTURED BY:

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NOTE: WHEN ORDERING REPLACEMENT PARTS,
PLEASE GIVE THE MODEL AND SERIAL NUMBER.

ORDER BY PART NUMBER.
THERE IS A MINIMUM ORDER OF $25.00

Chapter 1 Introduction / Safety / Installation:

Introduction:

This manual is divided into sections as listed in the table of contents.

It is required that the new user of the SF7A & SF8A read this manual, in particular the sections concerning safety, before operating the machine.

Description:

The model SF7A & SF8A surfacing machine is a precision, high speed surfacing unit.
The model SF7A & SF8A can be equipped with tooling and accessories for surfacing most American passenger car and truck, inline, 90 and 60 degree V-type blocks as well as cylinder heads.
SF7A & SF8A machines may be readily tooled to resurface a wide variety of engines, including European and Asian models, as well as perform various other surfacing operations.

This machine is designed for two purposes:

1. The alignment of the deck surface to the pan rails and main bearing locations, as have been done in the original factory surfacing.
2. A considerable savings in surfacing time and operator involvement as a result of fast block clamping, and convenient controls.

Change over or resetting time required to set up V-type or in-line engines is a minimum, making this machine highly suited to the jobber shop where engines cannot be run through, in model lots.
All feeds and rapid travels are power operated and controlled from the conveniently located control panel.
Power required is 230 volt, single phase. This provides power to the variable speed AC motor controller, the horizontal S.C.R. drive, and various relays and solenoid valves that actuate mechanical controls on the machine to engage feeds and travels.

Limited Warranty:

Rottler Manufacturing Company Model F65 parts and equipment is warranted as to materials and workmanship. This limited warranty remains in effect for one year from the date of delivery, provided the machine is owned and operated by the original purchaser and is operated and maintained as per the instructions in the manual.

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.

Freight charges on warranty items (non-air shipment only) will be paid by Rottler Manufacturing for a period of 60 days only from the date of installation or set-up by a qualified service technician or sales representative.

Freight charges after the 60 day period are the customer's responsibility.

Safety Information:

⚠ DANGER This machine is capable of causing severe bodily injury or death if EXTREME care is not used when operating!

The operator of the SF7A & SF8A should be a skilled machinist craftsman who is well versed in the caution, care, and knowledge required to safely operate metal cutting tools.

⚠ WARNING When boring the machine is capable of throwing metal chips over 10- feet from the cutting area. Always use the guards. Eye protection must be worn at all times by the operator and all other personnel in the area of the machine.

⚠ CAUTION The SF7A & SF8A operates under computerized control and, as is all computerized equipment, and is susceptible to extraneous electrical impulses internally for externally produced. The machine may make moves out of the operator control at any time. The operator should work in and around the machine with caution at all times.

The operator and nearby personnel should be familiar with the location and operation of the Emergency Stop Button.

Electrical Power:
Make sure all electrical equipment has the proper overload protection. The SF7A & SF8A should have ***a fully isolated*** power supply to prevent damage and uncontrolled movement of the machine. If the SF7A & SF8A is on the same power lines that are running to other electrical equipment (grinders, welders, and other AC motors) electrical noise can be induced into the SF7A & SF8A electrical system. Electrical noise can cause the controller to see false signals to move. Not supplying a fully isolated supply to the machine may void factory warranty. Refer to the Power supply section later in this chapter for voltage and amperage requirements of the.

Machine Operator:
The operator of the SF7A & SF8A should be a skilled machinist craftsman who is well versed in the caution, care, and knowledge required to safely operate metal cutting tools. ***Eye protection must be worn at all times by the operator and all other personnel in the area of the machine.***

If the operator is not a skilled machinist he/she must pay strict attention to the Operating Instructions outlined in this manual, and get instruction from a qualified machinist in both production and operation of this machine.

The SF7A & SF8A machines have the following areas of exposed moving parts that you must train yourself to respect and stay away from when they are in motion:

Cutting Tool Area – Any operation involving hands in the cutter head area, such as inspection or alignment of the cutter head or tools, requires the power to be turned off.

Surfacing – Eye protection must be worn during this operation. Hands must be kept completely away from the cutter head. All chip guards must be kept in their normal operating position.

Operator Panel and Controls – Learn to identify and independently operate these controls by habit, while developing an awareness of keeping fingers and hands clear of moving machinery.

Machining – Eye protection must be worn during all operations of the machine. Hands must be kept completely away from the cutter head. All chip guards must be in position during machine operations.

Work Loading and Unloading – Carefully develop handling methods of loading and unloading work pieces so that no injury can result if hoist equipment or lift connection should fail. Periodically check lift components for damage that may cause failure of Block Handler Assembly. Lifting Eye can eventually fail if the eye is reset in line with the 502-1-80 lift channel. ***Eye must be at a right angle.***

Machine Maintenance – Any machine adjustment, maintenance or parts replacement absolutely requires a complete power disconnection from the machine, ***this is an absolute rule.***

Emergency Procedure:

Assuming one of the following has occurred: Work piece or spindle base not clamped, depth of cut not set correctly, these mistakes will become obvious the minute the cut starts

PRESS THE EMERGENCY STOP BUTTON (on the front control panel) IMMEDIATELY!

"REMEMBER" metal cutting tools have the speed and torque to severely injure any part of the human body exposed to them.

Machine Installation:

Location:

The productivity of this machine will depend a great deal on it's proper initial installation, particularly the means by which cylinder blocks/heads 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 SF7A & SF8A machine is extremely important.

A slow travel (6 to 10 feet / 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 surfacing with this machine is anticipated, and the cylinder blocks/heads are not directly loaded and unloaded from a conveyor, we 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/heads 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 about three feet apart.

Unpacking:

Use care in removing the crate from the SF7A & SF8A machine, do not use force on any part of the spindle unit.

Remove the tool box, parallels, and optional tooling, located at the lower portion of the machine and completely clean these articles, as well as the machine base pads and upper table, with solvent. Rust inhibitor is applied to the machine at the time of shipment, any of this inhibitor left on the machine will result in considerable collecting of cast iron dirt.

Shipping Hold Down Bolt:

Remove cover (#7036E) from the rear of the spindle base by removing it's four mounting screws. Remove the bolt located in the front bottom of the spindle base. Replace the cover and tighten the four mounting screws.

Leveling:

Four square head set screws (502-1-12A), jam nuts (502-1-12F), and chamfered washer (502-1-12), are provided with the machine for leveling. Insert the screw and nut at the base support points, being careful that the screw point seats in the washer.

Use a precision level and level the upper table within .0005" per foot in both directions and make sure that the machine weight is equally supported at the four support points of the base.

Air Supply:

It is very important the air source for the SFOE machine be moisture free. Water and oil in the line will result in early cylinder and valve failure. ***Our recommendation is the installation of a water trap at the machine.***

Attach a 100 P.S.I. air source to the appropriate intake at the air filter on the side of the rear control enclosure.

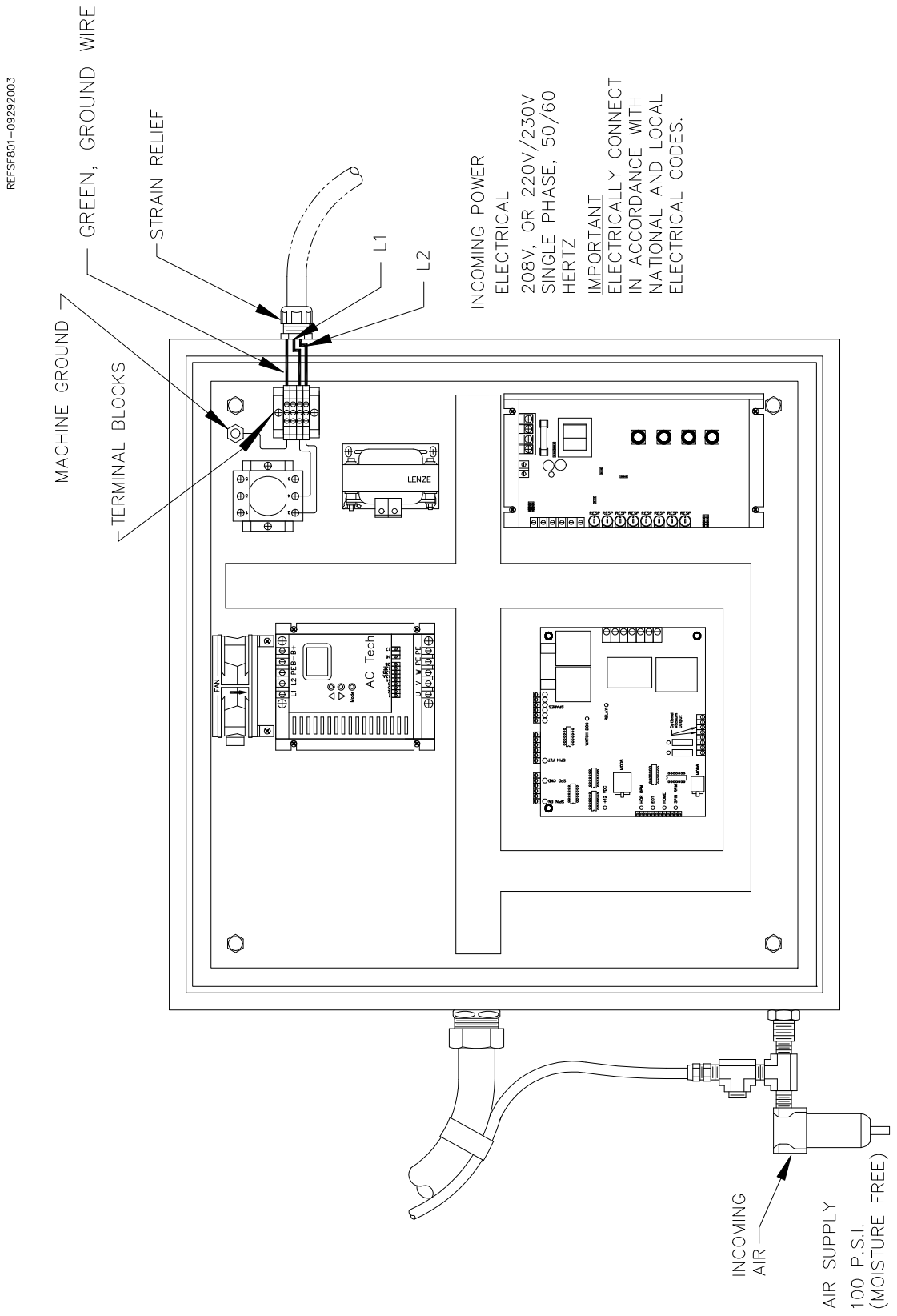
Power Supply

This machine requires 208 to 240 VAC single phase, 50/60 Hz, (measured between L1 and L2). Current required is 15 amps.
When using two legs of a three phase supply the voltage from each leg to ground must be between 100-120 VAC. Connect per following electrical hook-up instructions. ***If the voltage is outside this range the machine will not operate properly and may be damaged.***

⚠ CAUTION Do not attempt to attach three phase voltage to this machine. The three phase spindle motor receives it's power from a three phase variable frequency drive in the rear enclosure. The frequency inverter is powered by single phase.

Connect single phase wiring to the blue and grey connection terminals in the upper right hand side of the rear enclosure. The machine is not neutral / hot leg sensitive so two legs of three phase 208-240 VAC can be used.

⚠ CAUTION This machine must be connected to a good earth ground. Connect the earth ground wire to one of the green/yellow terminals in the upper right hand side of the rear enclosure.


REFSF801-09292003
GREEN, GROUND WIRE
STRAIN RELIEF
L1
L2
INCOMING POWER
ELECTRICAL
208V, OR 220V/230V
SINGLE PHASE, 50/60
HERTZ
IMPORTANT
ELECTRICALLY CONNECT
IN ACCORDANCE WITH
NATIONAL AND LOCAL
ELECTRICAL CODES.
MACHINE GROUND
TERMINAL BLOCKS
LENZE
AC Tech
INCOMING
AIR
AIR SUPPLY
100 P.S.I.
(MOISTURE FREE)

Chapter 2 Control Definitions

The purpose of this chapter is to define the function of buttons on the front control panel. Certain button functions may not appear clear when first reading this chapter. As the operator reads through the Operating Instructions chapter of this manual, these functions will become clear.

CPU Control:

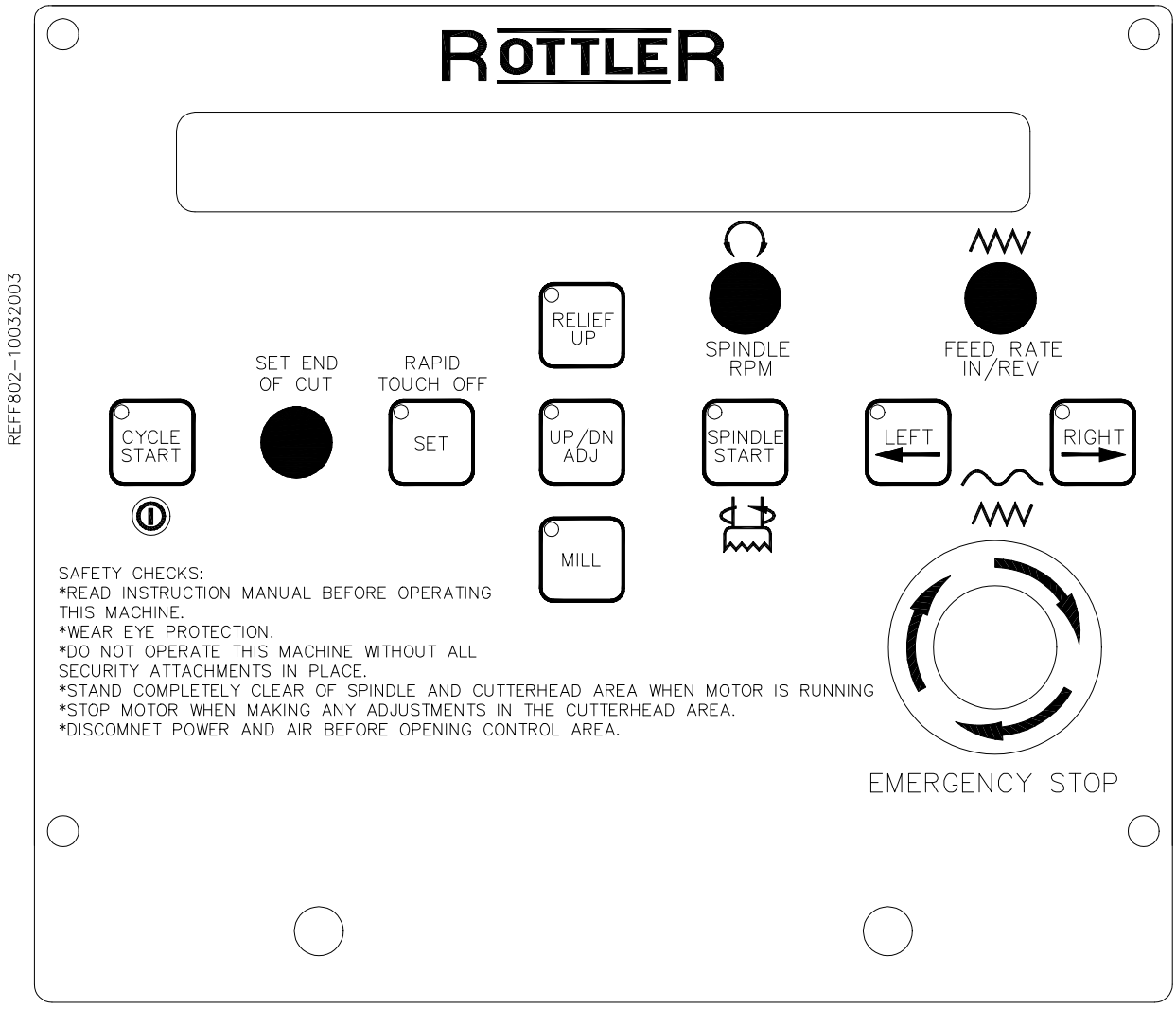
This machine is under control of a CPU located in the rear enclosure

Master Power On/Off Switch:

This switch is located on the upper right hand side of the rear electrical cabinet. This switch must be in the Off position to open the rear enclosure.

When first applying power to the machine it will take a short while for the system to be ready for operation. Do not press any buttons on the control panel until the display show the standard operating screen.

Button Definition:



Emergency Stop:

IF the Emergency stop is pushed, all power to the spindle and horizontal drive is removed. Display will still have power and will display “EMERGENCY STOP”. To release the emergency stop, turn the button to the right and it will “POP” out. Give the machine a minute to power up before pressing any buttons on the control panel.

Homing:

When the machine is first powered up it needs to be homed. The left and right buttons flash. The display also tells you to home the machine. Press and hold the Left and Right buttons for two (2) seconds. The machine will travel to the right at 50 inches per minute to find the home sensor.

Right:

This button has two functions. When pressed the machine will travel to the right at 120” per minute. Travel will continue until the button is pressed again or the right end of travel is reached.

If the spindle is on when this button is pressed, the machine will Feed to the right at the rate shown in the display. Travel will continue until the button is pressed again or the right end of travel is reached.

Left:

This button has two functions. When pressed, and held, the machine will travel to the left at 120” per minute until the button is released or the Left end of travel is reached.

If the spindle is on when this button is pressed, the machine will Feed to the left at the rate shown in the display. Travel will continue until the button is pressed again or the left end of travel is reached.

Note: When the machine is running an automatic cycle the Rapid Travel rate is at 160” per minute.

Spindle Start:

This button will start the spindle at the speed shown in the display. The spindle will continue to run until the button is pressed again.

The spindle will not start if any of the rapid travel or cycle buttons are active.

Relief Up:

This button will put the spindle and upper housing in the full up position, about .020”. This is used at the end of the cut in conjunction with the right travel button. It’s purpose is to allow travel to the right without the cutter dragging back across the milled surface. The Relief Up function will operate if the spindle is turning, but not if Feed is active. Pressing this button cancels the Up/Dn Adjust and Mill buttons.

Up/Dn Adjust:

This button needs to be pressed before you use the manual hand wheel. Activating this button will put a small amount of air pressure on the lift cylinders to counteract the weight of the spindle and upper housing, this will make the handwheel easier to adjust. The Up/Dn Adjust function will operate if the spindle is turning, but not if Feed is active. Pressing this button cancels the Relief Up and Mill buttons.

Mill:

This button clamps the outer spindle to keep it from moving during a cut. The Mill button should be pressed before starting a feed move. The Mill button will work if the spindle is turning, but not if the Feed is active. Pressing the Mill button while in Relief Up will de-energize the Relief Up solenoid, allowing the spindle to drop the .020”. A half a second later the spindle will be clamped. The Mill button cancels the Up/Dn Adjust mode.

Rapid touch off Set:

This button is used to set the Rapid Touch Off point. The Rapid Touch Off point is a distance, set by the operator, from the right home position to the start of the work piece. Every time this button is pressed the

display will zeroed out and that position remembered at the Rapid touch Off position. More about the use of this button will be discussed later in this chapter under Auto Cycle and again in the Operating Instructions chapter of this manual.

End of Cut Knob:

This knob is used to set the length of the mill cut. Turning this knob will change the display either negative or positive. This value will be the length of the cut from the Rapid to Touch Off position. More about the use of this button will be discussed later in this chapter under Auto Cycle and again in the Operating Instructions chapter of this manual.

Feed Rate:

The feed rate knob will change the feed rate shown in the display. The available feed rate is from .001" to .080" per revolution of the spindle.

Spindle RPM:

The Spindle RPM knob will change the RPM shown on the display. The available RPM is 350 to 1800.

Cycle Start:

Pressing this button will start an automatic cycle. To start an automatic cycle the machine must be at home or at the Rapid Touch Off position. If the machine is at the home position when Cycle Start is pressed, the spindle will rapid travel over to the Rapid touch off position and then pause. The pause is for the operator to adjust the height of the spindle using the manual handwheel. If the Cycle Start is pressed when the machine is at the Rapid to Touch Off position the machine will go into Mill mode, Start the spindle at the RPM showing on the display. When the spindle gets to the desired speed, Feed to the Left will start at the rate shown on the display.

Feed will continue until the End of Cut is reached. The spindle will lift to the Relief Up position, Spindle rotation will be turned off and the machine will Rapid travel right to the home position.

⚠ WARNING Even though the Spindle has been turned off, it will continue turning as it slows down and travels to the right. Keep all body parts away from the cutting area when in the automatic cycle. The Spindle Start light will blink until the spindle has come to a full stop.

Surface Depth Dial Indicator:

This dial indicator is mounted on the surface of the cutterhead guard. When properly adjusted this indicator will show the position of the cutting insert relative to the surface to be cut.

Machine Parameters:

To access the machine parameters press and hold the SET button then press LEFT. This will bring you to the Password, you must still hold the set button, turn the Spindle RPM knob to read 311 then release the SET button.

The following is a list of parameters for the machine:

1) Board serial number.
2) Input Test – a solid square below the label means the input is active.
3) Machine Type = English.

Note: You change the type by using the LEFT and RIGHT buttons.

4) Machine Type = Automatic
5) Total Horizontal Length = SF8 = 42.5, SF7 = 32.5 These will be set when the machine does the Self Set-Up.
6) Horizontal Encoder Pulses per Inch = 2500

Note: To change numeric values press and hold the SET key while rotating the SPINDLE RPM knob.

7) Spindle Self Set-Up
8) Spindle RPM at full drive - A = 2774
9) Horizontal Self-Set-Up
10) Horizontal Frequency at full drive – A = 8429
11) Horizontal Acceleration = 120 In/Min
12) Horizontal Rapid jog speed – A = 120 in/min
13) Horizontal Auto Jog speed – A = 160 in/min
14) Spindle Maximum RPM – A = 1800
15) Horizontal Homing Speed = 50 in/min
16) Output Test – Relief Up – LEFT = on, RIGHT = OFF
17) Output Test – Mill
18) Output Test – Vacuum
19) Horizontal Enable
20) Spindle Enable
21) Spindle Monitor
22) Horizontal Monitor
23) Spindle KBaud Rate – 1786

To exit the programming mode press and hold SET then RIGHT buttons.

Spindle Auto Set-Up:

To run Spindle Self set-up. Press and hold the SET, UP/DN and SPINDLE START button for two seconds. The SET button will flash and the SPINDLE START button will light. Press and hold the SET button. The spindle will enable and drive to maximum speed, the speed will be measured by the controller and the drive will then decal and turn off the enable. Release the SET button. Press and hold the SET button then press the RIGHT button. This will leave the Spindle Self Set-up.

Horizontal Auto Set-Up:

To run the Horizontal Self set-up, press and hold the SET, UP/DN and LEFT buttons for two seconds. The SET button will flash and the LEFT and RIGHT buttons will light. Press and hold the SET button. The Horizontal drive will enable and Home if necessary. The control will then drive the spindle base to the left to measure the length of the base. The Control will then drive the spindle base at full speed to the right and then to the left to measure maximum encoder frequency. Release the SET button. Press and hold the SET button then press the RIGHT button. This will leave the Horizontal Self Set-up.

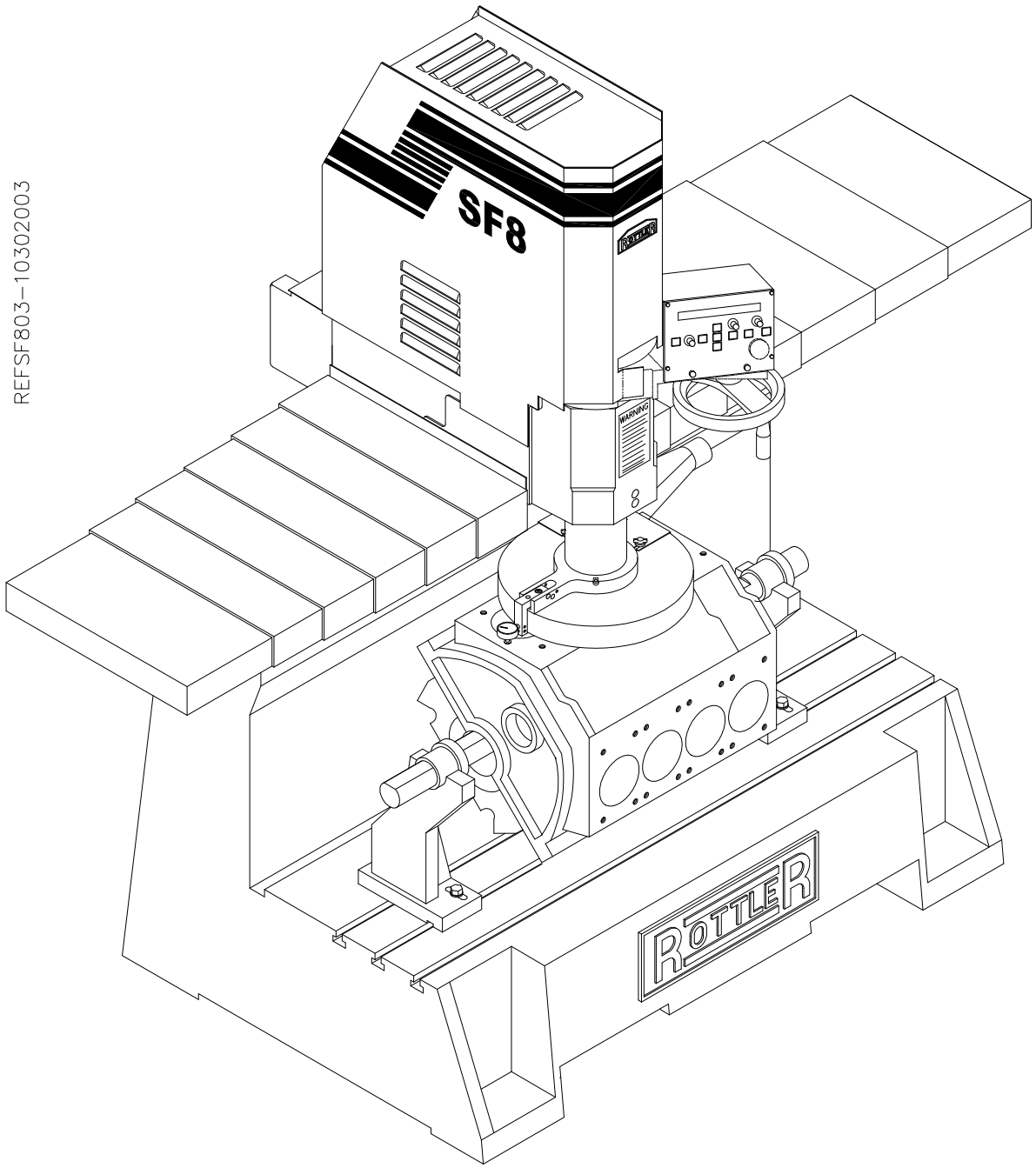
Manual Power Up:

To Manually power up the Spindle and Horizontal drive regardless of any error messages, press and hold the SET, UP/DN, LEFT and RIGHT for two (2) seconds. Press and release the E-Stop to exit this mode.

Chapter 3 Operating Instructions:

Included in this chapter is a general description of how to use this machine for surfacing, whether it cylinder head, block or other type of job. For details of operating specific fixtures available on this machine refer to the Optional Surfacing Fixtures and Tooling section of this manual.

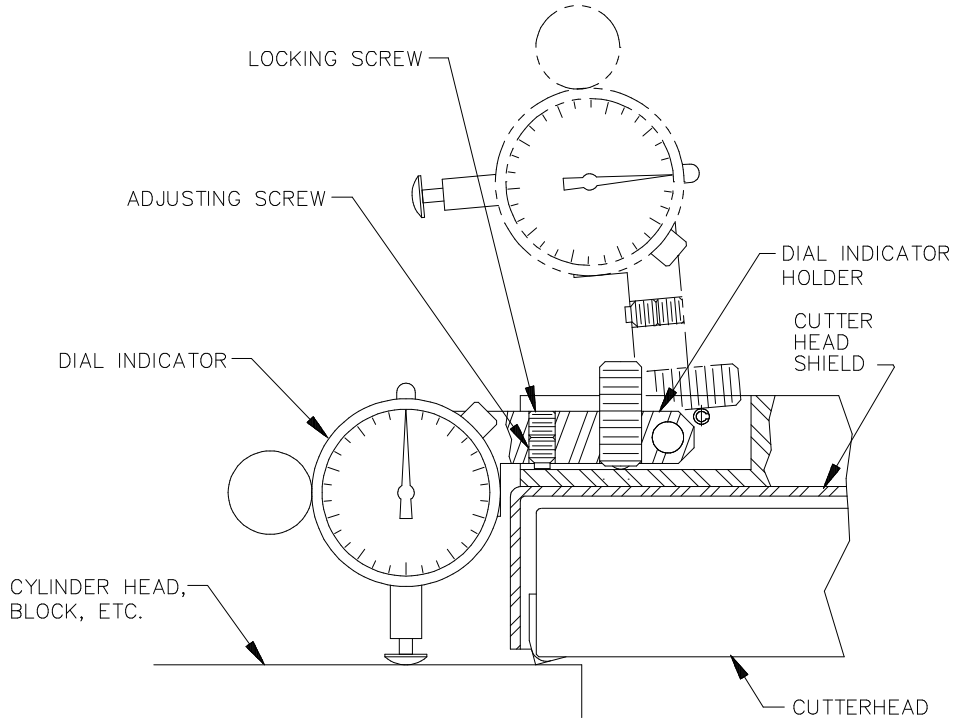
There are



There are several ways to use the SF machine cutting system depending on the type of work you do and your personal preferences. Following are some details and descriptions that will help you decide which method is best suited to your application.

Manual Operation:

Press the Left rapid travel button and move the spindle over to the starting position. The starting position is just before the cutterhead guard passes over the work piece. Push the dial depth indicator, on the guard, down onto the top of the work piece. Assuming the dial indicator has been properly adjusted (see the Maintenance chapter of this manual for adjustment instructions) it will indicate the depth of the cut at your current height setting.



Press the Up/Dn Adjust button, adjust the depth of the cut using the manual handwheel. Press the Mill button to clamp the spindle. Adjust the Feed Rate and Spindle RPM knob for the desired finish. Press the Spindle Start button and the Feed Left button. The machine will start Feeding across the work piece.

When the machine has finished cutting, press the Left travel button to stop the feed, then the Spindle Start button to stop the spindle. Press the Relief Up button to raise the spindle up, then the press the right travel button. The spindle will rapid travel to the right home switch and stop.

Automatic Operation:

Press the right travel button so the machine will move to the Home position. Press the Left rapid travel button and move the spindle over to the starting position. The starting position is just before the cutterhead guard passes over the work piece. Press the Rapid Touch Off button. This will zero the Rapid Touch Off display. This also sets the Rapid Touch Off point for the next pass.

Push the dial depth indicator, on the guard, down onto the top of the work piece. Assuming the dial indicator has been properly adjusted (see the Maintenance chapter of this manual for adjustment instructions) it will indicate the depth of the cut at your current height setting.

Press the Up/Dn Adjust button, adjust the depth of the cut using the manual handwheel. Press the Mill button to clamp the spindle. Adjust the Feed Rate and Spindle RPM knobs for the desired finish.
Turn the Set End of Cut knob until the desired length of cut is displayed. Press the Cycle Start button, the spindle will start. Once the spindle is up to speed the left feed will start, cutting will continue until the Set End of Cut number is reached. The spindle will lift .020", spindle will turn off and rapid travel right to the home position.

Pressing the Cycle Start button from the home position will cause the spindle base to rapid over to the last know Rapid Touch Off position. You can manually adjust the depth of the cut at this point and then press Cycle Start again. The machine will finish the cut and return home as described above.

⚠ CAUTION Be careful when using the Rapid Touch Off feature, if the work piece is not placed in the same location relative to the Home position a crash could occur.

Cutting Inserts:

Rottler offers several different 3/8" and ½" IC negative rake inserts for the SF machine. Below is a description of each.

6303B

A round 3/8" IC, double sided, CBN Insert. An excellent, long life insert for surfacing cast iron heads and blocks -round shape gives many cutting edges on each side of insert. When using a 14" cutterhead (SF, F65, F80) speeds range from 900-1200 RPM. When using an 18" cutterhead (F80) speeds range from 600-800 RPM.

6303M

A round 3/8" IC, single sided, PCD Insert. For use on aluminum only - heads and blocks without liners. This insert has a thin layer of PCD applied to a carbide disk. The diamond appears to be a shiny black wafer. The hardness of the diamond resists the abrasive nature of the silica in aluminum heads and blocks. RPM speeds with a 14" cutter range from 900-2000 RPM.

6303K

A round, 3/8" IC, single sided, coated carbide Insert. This is a very economical, general purpose insert for surfacing aluminum. It is advisable to use this insert for rough cutting to remove welding or contaminants before. A PCD insert should be used for the final cut to give the super fine finish required for MLS (multi layer steel) head gaskets. RPM speeds with a 14" cutterhead range from 600-1000 RPM.

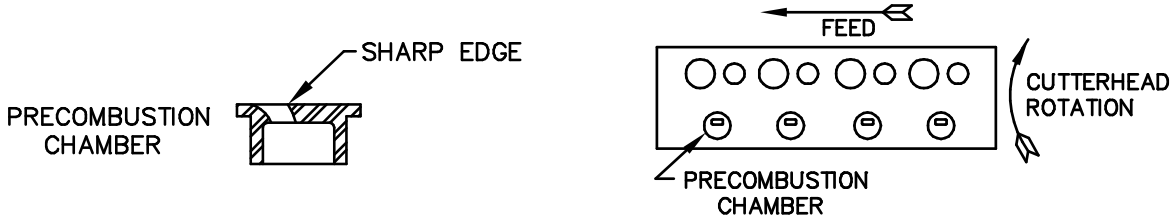
6303S

A round 3/8" IC, single sided, CBN Insert. For use on aluminum blocks with iron liners and aluminum heads with steel pre-combustion chambers. When cutting aluminum heads with pre-combustion chambers it is best to use Rottler Manufacturing's spray mist coolant system. RPM speeds with a 14" cutter range from 650-750 RPM.

6303R

A round 3/8" IC, single sided, CBN Insert. For use on cast iron heads with steel pre-combustion chambers. RPM speed with a 14" cutter range from 600-700 RPM and with a 18" cutter range from 500-600 RPM.

It is critical that the heads be mounted in the fixture correctly. If the head is not mounted in this way, the inserts will chip when they contact the sharp of the pre combustion chamber.



Note: There are at least two different materials used in the manufacture of the pre-combustion chambers. Rottler Manufacturing has experimented with only one of these materials. Rottler cannot guarantee cutting all materials.

501-29-6E R2

This is a 3/8" IC square carbide insert with a purple ceramic coating. This carbide insert is normally used for high speed boring. It works well as an economical insert for rough surfacing or heavy stock removal of cast iron. A CBN insert should be used for the final finish cut.

6301J

A square 3/8" IC, 1/16" Radius, double sided, CBN Insert. The 1/16" radius of this insert will produce a more accurate (flatter) finish than a round insert typically used for surfacing. This insert is often used on F80-Series machines when surfacing large diesel blocks which are high in nickel. The square surfacing insert is intended for F80 applications where it may encounter heavier cuts and greater interrupted cuts. When using an 18" cutter speeds range from 600-800 RPM, and with a 14" cutter speeds range from 900-1200 RPM.

6303P

A round 1/2" IC, single sided, PCD Insert. For use on aluminum only - heads and blocks without liners. This insert has a thin layer of PCD applied to the top of a carbide disk. The diamond appears to be a shiny black wafer. The hardness of the diamond resists the abrasive nature of the silica in aluminum heads and blocks. RPM speeds with a 14" cutter range from 1000-2000 RPM. This insert gives the maximum productivity when cutting aluminum. Requires the purchase of 1/2" negative rake tool holders. The standard Rottler 3/8" IC tool holders will not hold this insert.

6303Q

A round 1/2" IC double sided, CBN Insert. An excellent insert for machining cast iron heads and blocks. Round shape gives many cutting edges on each side of insert. Requires the purchase of 1/2" negative rake tool holders. The standard Rottler 3/8" IC tool holders will not hold this insert.

⚠ CAUTION The pre-combustion chambers in some heads have a very loose fit and may come loose during the machining process resulting in damage to the insert.

One Insert vs. Two Inserts:

Rottler SF machines can be rum effectively with either one or two inserts installed in the cutterhead.

Note: Never remove one tool holder that holds the insert and run the machine with one insert. This will create an out of balance situation.

If two inserts are installed and aligned within .0001 of an inch the feed rate can be run 2 times faster than if using only one insert.

The depth of the grooves made by the inserts for a typical finish is approximately .0003. Therefore for a second insert to be of any advantage in obtaining a smoother finish for a given feed rate or a similar finish at a higher feed rate the inserts must be aligned within .0003. Aligning them within .0001 will give you a significantly smoother finish than aligning them within .0002. Therefore for maximum quality and consistency Rottler recommends aligning the inserts within .0001 in a vertical plane, alignment of the horizontal plane within .002 is sufficient.

If aligning the inserts within .0001 is too time consuming we recommend mis-aligning them between .0003 and .0015. With the inserts mis-aligned you will get the same finish for a set RPM and feed rate that you would using one insert. The benefit on using two inserts is for stock removal. Since the one mis-aligned insert is removing some material the depth of cut can be increased up to .010 and acceptable tool life obtained.

If one insert is used (50 percent of our customers use one insert) you do not have to worry about alignment. It makes it very easy to change from CBN to coated carbide inserts. The following data assumes you are using a 3/8" diameter insert, either CBN or coated carbide.

General Information

Rottler CBN and PCD Inserts are laser marked with our part number on one side. On single sided inserts, the part number is on the back side of the insert.

Rottler surfacing insert toolholders are designated IC (inscribed circle) which means they can hold square and round inserts with the same IC, for example, a 3/8" IC round and 3/8" IC square insert will fit into the standard 3/8" IC Rottler toolholders.

Rottler SF, F65 and F80 Series machines are supplied standard with Rottler 3/8" IC toolholders fitted to our surfacing heads. Optional 1/2" tool holders are interchangeable with 3/8" toolholders.

Cutting Speed Calculation

Inserts are designed to cut within a speed range (S.F.P.M.). In order to convert from cutting speed to RPM, use the following formula:

$$RPM = \frac{S.F.P.M. \times 3.82}{DIAMETER}$$

S.F.P.M. = Surface Feet per Minute
RPM = Revolutions per Minute
DIAMETER in Inches

	One Insert	Two Inserts Set within .0015" - .0003	Two Inserts Set within .0001"
RPM 1000 Feed Rate .002" Per Rev	12 rms	12 rms	10 rms
RPM 1000 Feed Rate .005" Per Rev	20 rms	20 rms	15 rms
RPM 1000 Feed Rate .010" Per Rev	30 rms	30 rms	25 rms
RPM 1000 Feed Rate .020" Per Rev	60 rms	60 rms	40 rms
RPM 1000 Feed Rate .030" Per Rev	90 rms	90 rms	60 rms

Chapter 4 Maintenance

Lubrication:

Refer to the illustrations on the following pages.

Ballscrew Nut:

The ballscrew nut is located under the Spindle base inside the Main Base.
Every 175 hours, Grease the ball screw nut using **F2 Multi-purpose Grease, or Unoba F1 Grease**, or equivalent. Wipe a small amount of grease on the screw just ahead of the nut.

Outer Spindle:

The Outer Spindle is the cylinder that travels up and down. It is supported in outer spindle bushings.

Every 40 hours, The Outer Spindle should be cleaned with **Kerosene**. And occasionally a **light weight** oil applied to prevent excessive dryness.

Inner Spindle:

The Inner Spindle is located inside the Outer Spindle. The Inner Spindle is directly connected to the cutterhead.
Every 40 hours, Add 2 or 3 drops of oil, **Union oil 315 Klondyke oil, or any SAE #10 oil (non detergent motor oil).**
Every 175 hours, Add one shot of, **Union oil - Unoba F1 or F2 lube, Lubriplate #930 AAA, Mobil oil - Mobilith A.W. grades 1 or 2, Chevron Durolith EP1 or EP2**, or any equivalent lithium barium grease. Run the spindle down near the lower limit and you will see a flush type grease fitting in the keyway. Add lubrication here. If the inner spindle is removed clean the lower bearing and repack it with grease.

Vertical Adjustment Nut:

This nut is what makes the spindle travel up and down when the handwheel is turned.
Every 40 hours, Add 3 squirts of **spindle oil** to the flush type grease fitting located as shown on the **illustration. Lubrication 2-Axis Universal Machine Table 7119Q:**

Every 175 hours, Add 2 or 3 shots of grease to the grease fittings shown.
Every 40 hours, clean and apply grease to the bearing surfaces of the journals.
Every 1,000 hours, Disassemble, clean and grease the spherical washer.
Use **F2 Multi-purpose Grease, Chevron Durolith**, or equivalent.

Cleaning The Way Surface:

Do not clean way surfaces with abrasive or harsh cleaners, The sliding way material used under the spindle base, must “break in” which will deposit a small amount of the material into the top of the main base. Discoloration will occur in slides. If the way surface is cleaned of these deposits, the “break in” action will start all over. If this cycle is repeated premature wear will result.

Spindle Lock Cylinder:

The outer spindle on the SF series machines have an air operated lock system. This cylinder is nickel plated to help avoid rust but the water still needs to be drained occasionally.

Every 6 months, Drain the water from the spindle lock cylinder. Disconnect the air line from the machine. Remove the two 1/2” pipe plugs located in the front of the spindle base near the bottom edge. Reconnect the air line. Press the Mill button, and let the air run out for a few moments. Press the Relief up button, and let the air run out for a few moments. Disconnect the air line again and replace the two pipe plugs, tighten, operate as normal.

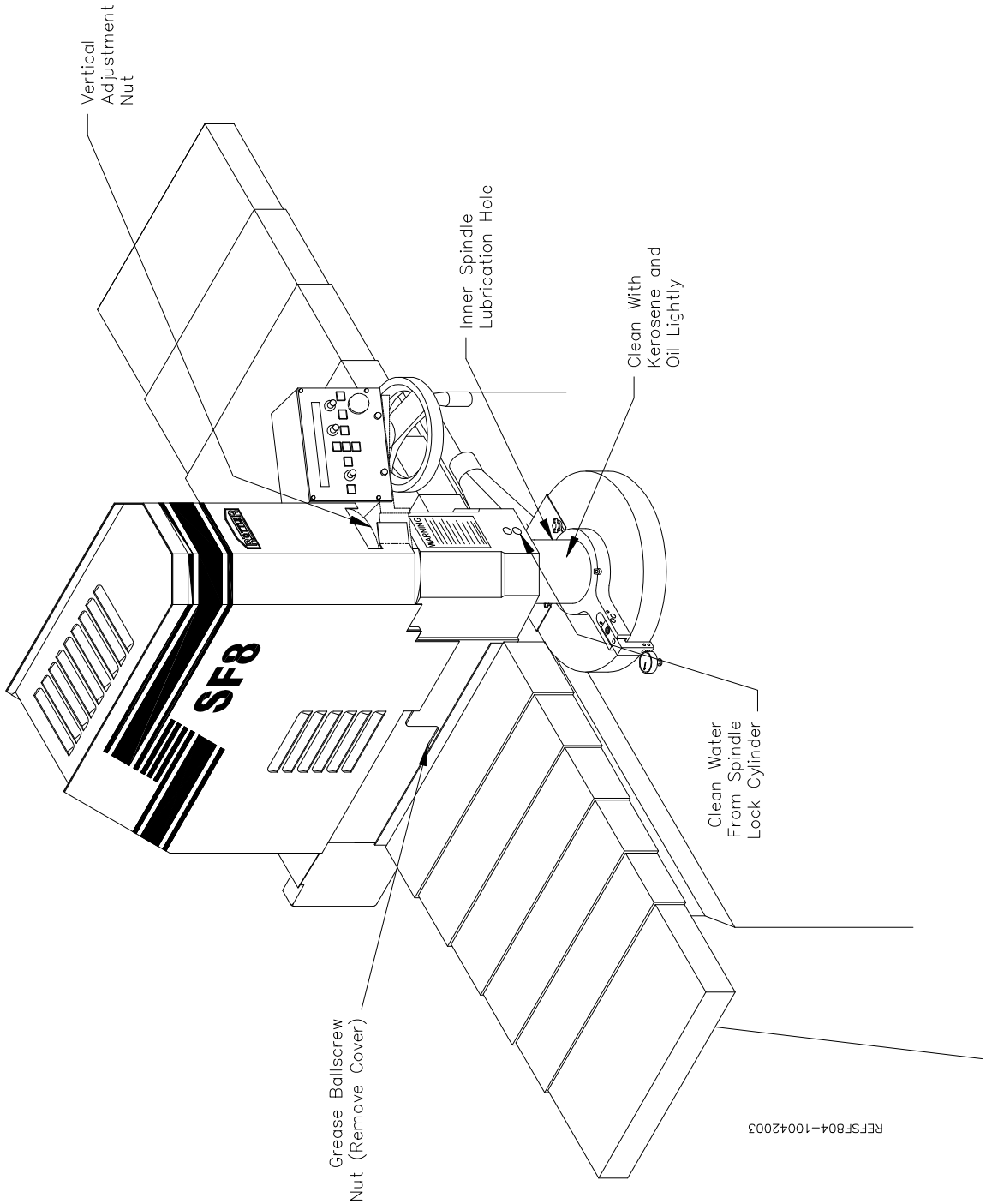
⚠ WARNING This system is under pressure, machine damage and or personal injury may occur if the plugs are removed without first disconnecting main air supply.

Lubrication – Quick Reference Chart:

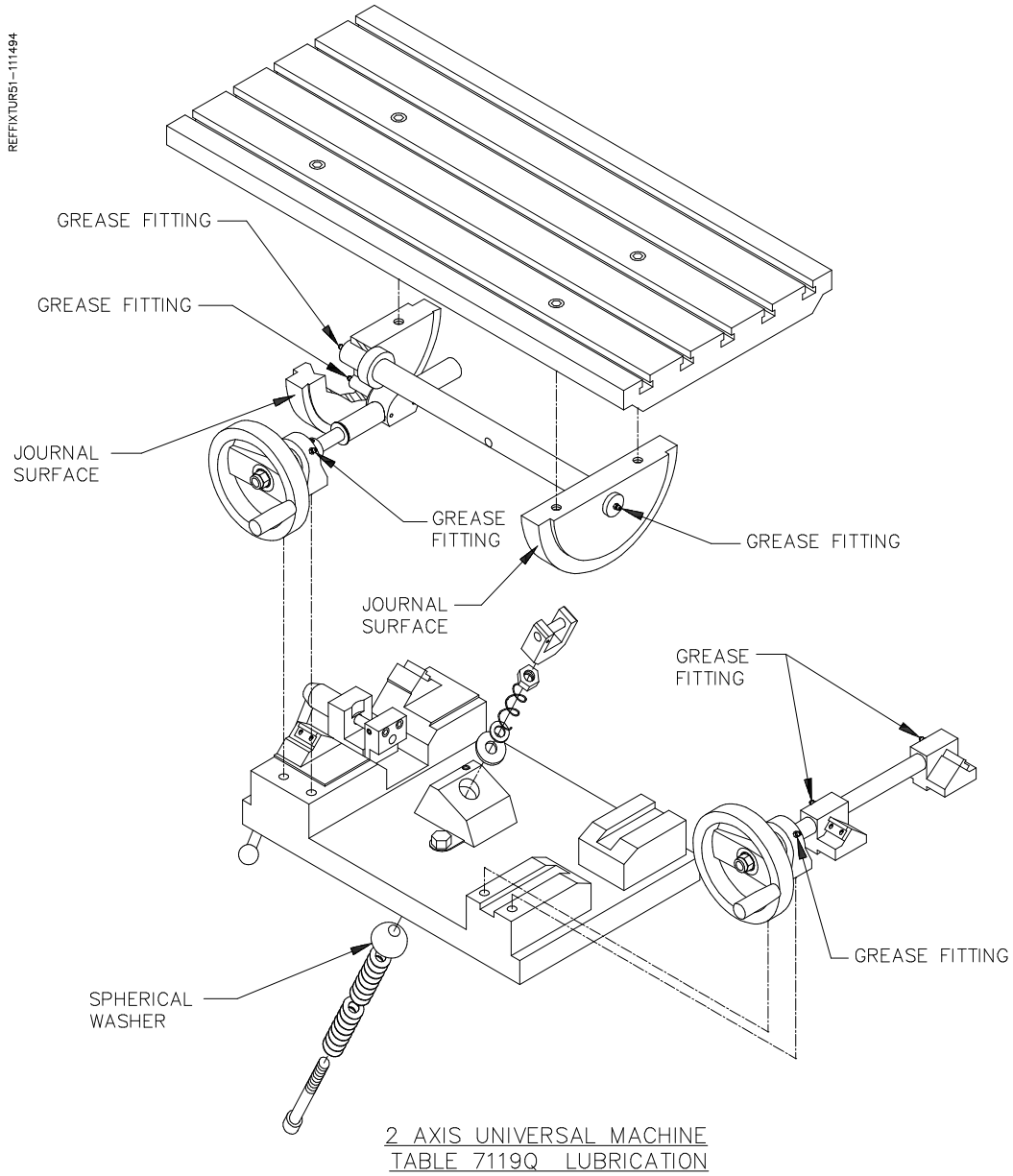
Refer to the previous page for types of lubrication to be used.

Assembly	Frequency	Lube Operation
Ballscrew Nut	Every 175 hours	Grease ballscrew nut
Outer Spindle	Every 40 hours	Clean and wipe with oil
Inner Spindle	Every 40 hours	Add 2 to 3 drops of oil
Inner Spindle	Every 175 hours	Add Oil
Vertical Adjustment Nut	Every 40 hours	Add Oil
Vertical Adjustment Nut	Every 175 hours	Grease, grease fitting
Vertical Adjustment Nut	Every 40 hours	Apply Grease
Vertical Adjustment Nut	Every 1,000 hours	Clean and Grease spherical washer
Way Surface	Every 175 hours	Wipe and oil way surface
Spindle Lock Cylinder	Every six months	Drain spindle lock cylinder

SF7A -8A Machine Lubrication Illustration:



2 Axis Universal Machine Table 7119Q – Lubrication Illustration:



Setting Cutting Tool Inserts

Press the Mill button. Travel the spindle base approximately to the center of the main base.

⚠ CAUTION Turn off all power to machine before proceding.

Remove vacuum housing from chip shield. Attach a dial runout indicator to a cylinder head or engine block, etc.

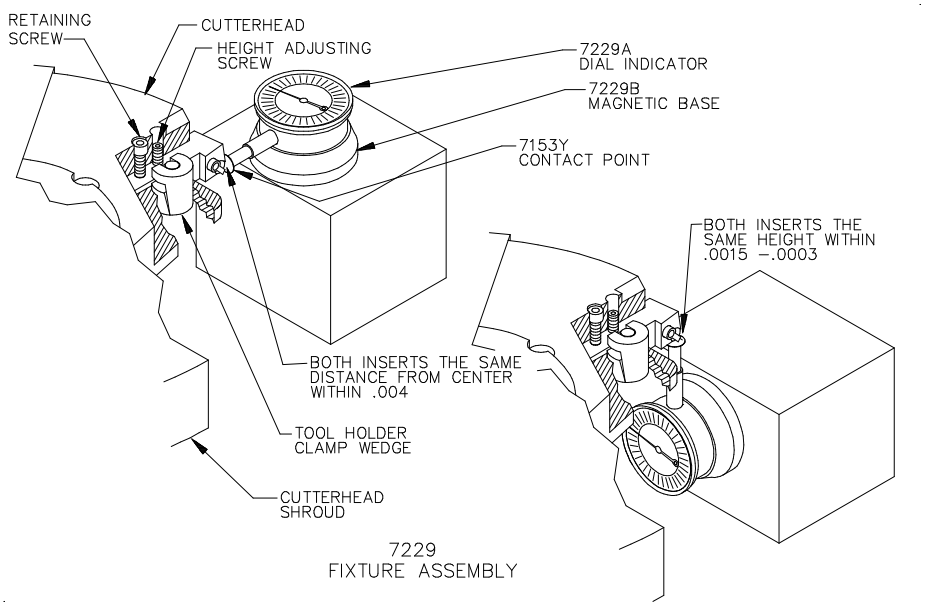
Rotate cutter head and check to see that both inserts are the same distance from the center of the spindle, within .004. If adjustment is necessary loosen the tool holder clamp wedge, and the height adjustment screw. Move tool in or out the required distance. Tighten the clamp wedge. Snug up the height adjustment screw. There is a set screw located at the bottom of the toolholder, it locks a dowel pin in place. When the in-out adjustment is set, loosen the set screw, the pin will pop out and hit the back of the slot. Tighten the set screw. This way, when a tool holder is removed and then replaced, it will be located very nearly where it was. Insert height will still need to be adjusted.

Rotate cutter head and check to see that both inserts are the same height within .0015-.0003. If adjustment is necessary loosen the tool holder clamp wedge, then alternately loosen and tighten the height adjusting screw and the retaining screw, until both inserts are set as desired. Retighten the tool holder clamp wedge, and recheck both inserts.

Production Cutting

Aluminum & Cast Iron:

For fast tooling set-up, this machine can be set-up with one cast iron cutting insert and one aluminum cutting insert. Set the cast iron insert with no down or out adjustment. Set the aluminum style insert .02 further out and .005 lower than the first insert. With the cutter head set up this way, aluminum work can be easily cut. To cut cast iron simply remove the aluminum cutting insert from its holder.



Dial Indicator Setting

If chip shield, cutting insert, or dial indicator have been moved, the dial indicator should be reset.

To reset press the up/down adjust button. With the surfacing cutter in the fore and aft position, press the left travel button until the cutterhead overlaps a test piece by about 1/2” when rotated.

⚠ CAUTION Turn off all power to the machine whenever handling the cutter head.

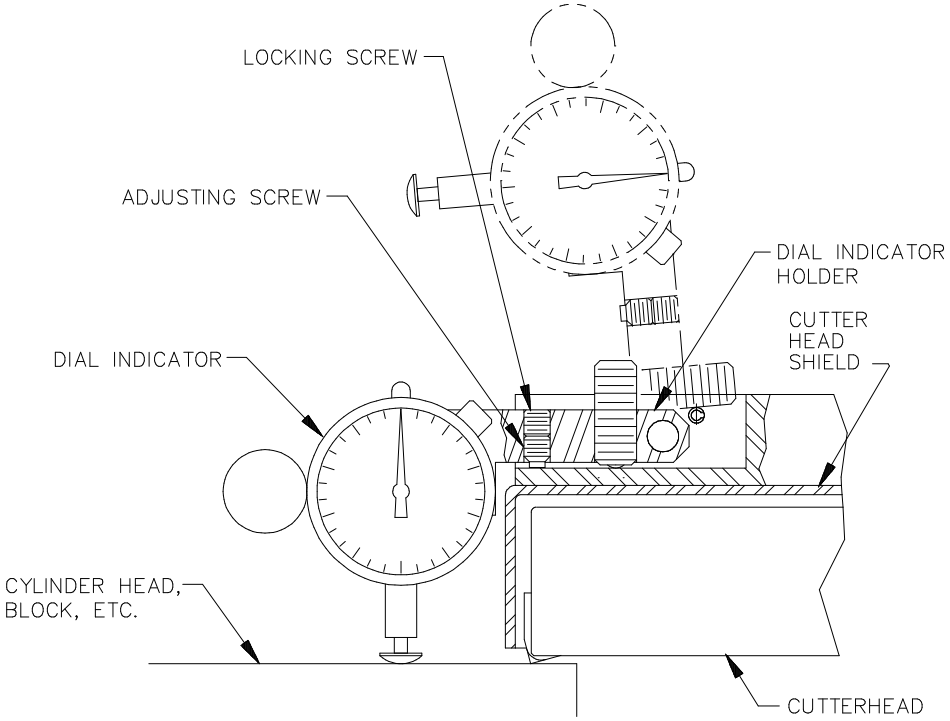
Touch off surface, by turning hand wheel clockwise until cutter insert just touches test piece surface when rotated back and forth.

Note: Do not lower the cutter head directly onto surface, it may chip the cutting tool insert.

Make a very light cut on your test piece about one inch in. Back out and without adjusting the height press the dial indicator down on this surface. Adjust it by: Removing the lock screw. Then turn adjusting screw up or down until the dial indicator is half way between its minimum and maximum range.

Replace the lock screw and tighten firmly.

Set dial to zero.



Vertical Travel Chain Removal and Replacement:

⚠ CAUTION Turn off all power to the machine before continuing.

Remove the two screws securing the control panel, lay the panel and the enclosure aside.

Remove four screws from the chain cover, and lift it off.

Remove the access panel at the rear of the machine enclosure. Remove the six screws mounting the enclosure to the machine. Four screws are located inside the enclosure and are accessed through the rear opening. The other two screws are in the front and the front right side, from the outside. Lift cover off the machine carefully. (As cover is lifted slide forward and up to clear motor and belt case.)

Loosen the locknut, and the two bolts, on the adjusting block. Move the sprocket all the way in by turning the adjusting bolt.

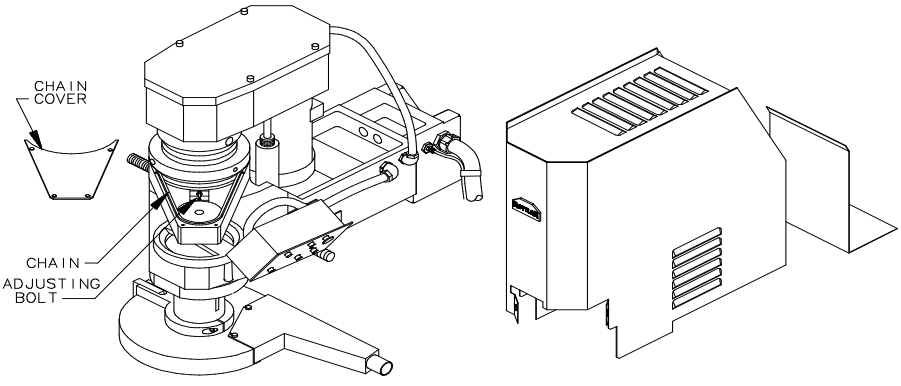
Locate a master link in the chain and remove it. Remove the chain. Slide the new chain through the opening around the large sprocket and reconnect the master link.

Place the chain over both sprockets, and take up the slack by turning the adjusting bolt. The chain should have approximately 1/4 inch play measured midway between the sprockets.

⚠ CAUTION Do not over tighten the chain or the vertical spindle positioning system could fail.

Lock the adjusting bolt with the locknut. Tighten the two bolts in the adjusting block.

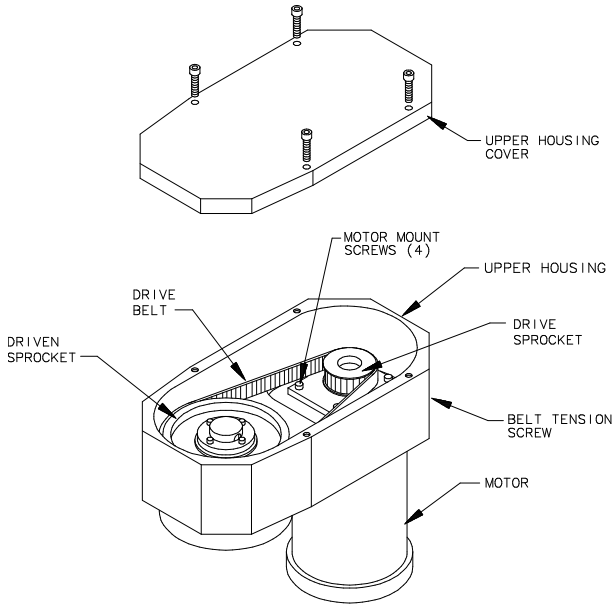
Replace both covers, and place the control panel back in position and tighten its mounting bolts.



Drive Belt Replacement:

⚠ CAUTION Turn off all power to the machine before continuing.

Remove the access panel at the rear of the machine enclosure. Remove the six screws mounting the enclosure to the machine. Four screws are located inside the enclosure and are accessed through the rear opening. The other two screws are in the front and the front right side, from the outside. Lift cover off the machine carefully. (As cover is lifted slide forward and up to clear motor and belt case.)
Remove the four screws holding the upper cover. Lift cover off.
Loosen the four motor mount screws.
Loosen the belt tension screw.
Lift the belt off. Replace with new belt (7014F).
Tighten belt tension screw, until belt has 1/8 to 3/16 inch deflection, with 1-1/2 to 3 pounds pressure, measured in the middle of the belt.
Tighten the four motor mount screws.
Replace the upper housing cover and tighten the four screws.
Replace the machine enclosure and tighten the mounting screws.



Drive Sprocket / Motor Removal and Replacement:

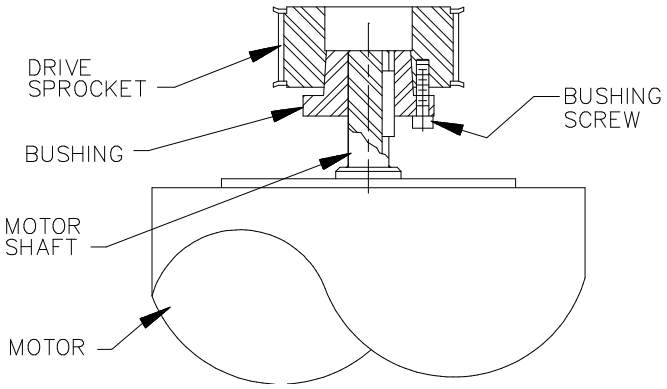
⚠ CAUTION Turn off all power to the machine before continuing.

Removal of Drive Sprocket:

(Small sprocket)
Remove the upper housing cover, and drive belt, as explained on page 4.7.
Place something under the spindle drive motor to support it. Remove the four 3/8 -16 motor mounting screws from inside the upper housing. Lower the motor, with the drive sprocket attached, out of the upper housing.
Remove three screws, located on the bottom of the sprocket bushing, between the bushing and the motor. Use three screws, in the threaded holes in the bushing, to loosen the bushing from the sprocket. Lift off sprocket.

Replacement of Drive Sprocket:

(Small sprocket)
Clean bushing, and sprocket. Do not use any lubrication on bushing, sprocket, or screws.
Locate BUSHING flush with the end of the motor shaft. Tighten the #10-24 unc screws in the bushing EVENLY to 5 to 6 ft. lbs.
Install motor back into upper housing and tighten the four motor mounting screws.
Replace the drive belt, and adjust, as indicated in drive belt replacement.
Replace upper housing cover and tighten the four screws.



Driven Sprocket Removal and Replacement:

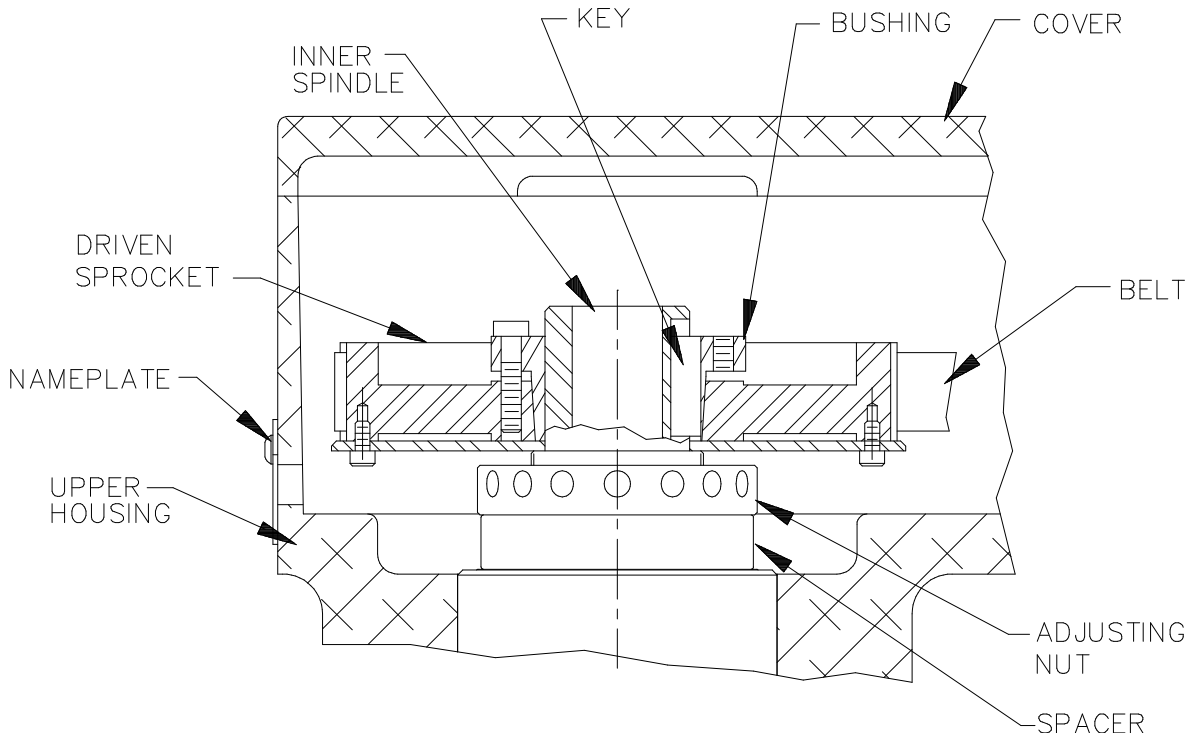
⚠ CAUTION Turn off all power to the machine before continuing.

Removal of Driven Sprocket:

(Large Sprocket)
Remove the upper housing cover, and drive belt, as explained on page 4.7.
Remove the three 1/4-20 screws located on top of the sprocket bushing. Insert these bolts into the threaded holes in the top of the bushing. Turn these screws in evenly to force the bushing and sprocket apart.
Remove driven sprocket, the bushing, and the key.

Replacement of Driven Sprocket:

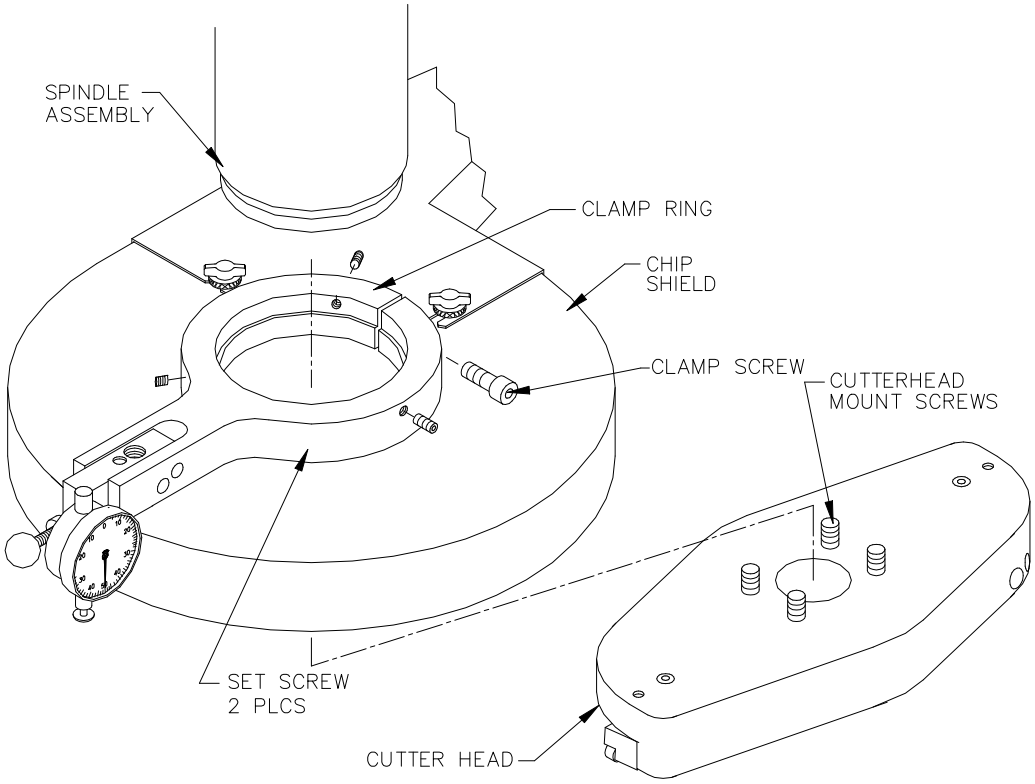
(Large Sprocket)
Clean bushing, and sprocket. Do not use any lubrication on bushing, sprocket, or screws.
Align the driven sprocket so that the bottom edge is slightly lower than the drive sprocket. Tighten the four 1/4-20 screws, located on top of the driven sprocket bushing, EVENLY to 9 to 10 ft. lbs. Check to see that it does not wobble.



Cutterhead and Chip Guard Removal:

⚠ CAUTION Turn off all power to the machine before continuing.

Mark cutterhead and spindle so they can be reassembled in the same position.
Remove cutterhead by removing its four 3/8-16 screws. Remove chip guard by removing its two 1/4-20 set screws that go into the clamp ring at an angle, and loosen the 3/8-16 capscrew in the split line of clamp ring.
Remove cover.



Upper Housing Removal:

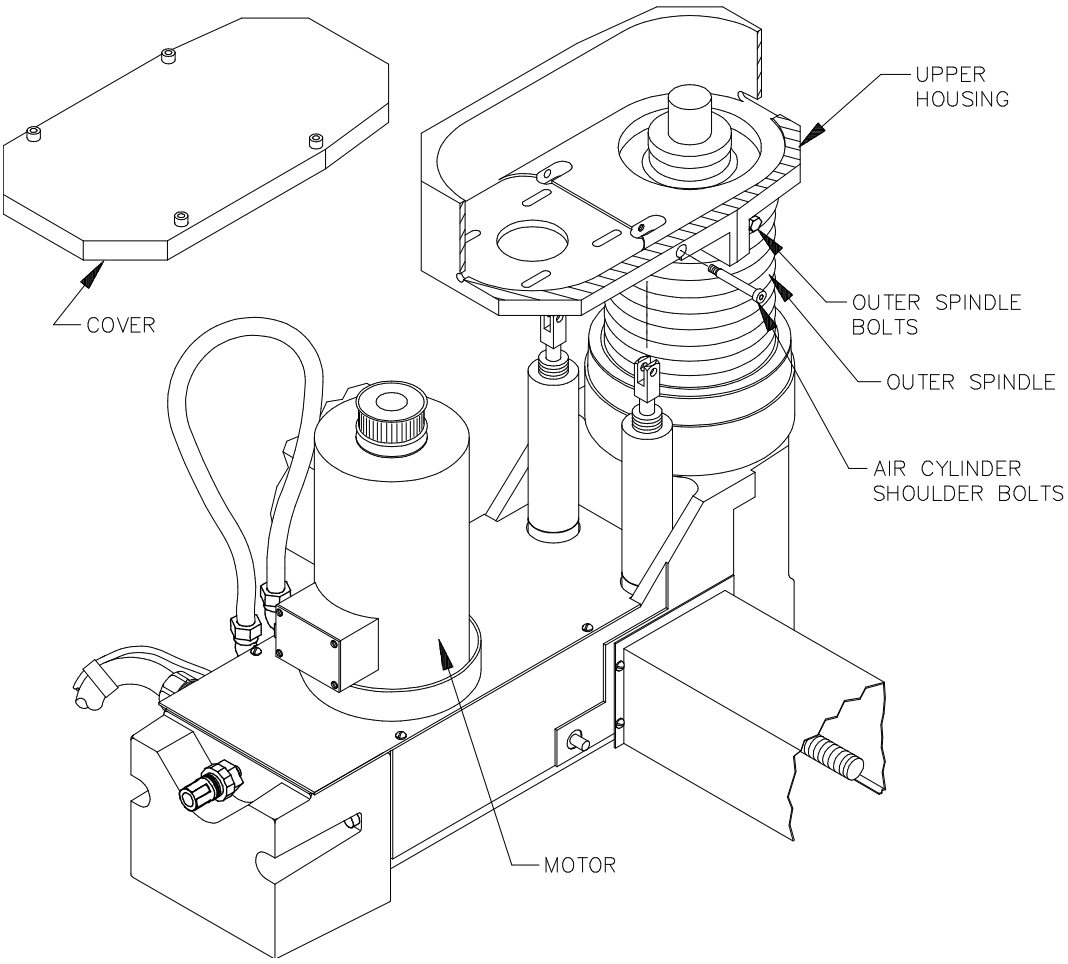
⚠ CAUTION Turn off all power to the machine before continuing.

Remove the Drive Belt, Motor and Driven Sprocket and described earlier in this chapter.

Remove the shoulder bolts holding the top of the air cylinders to the upper housing. Compress the air cylinders and lay them out of the way.

Remove the mounting screws holding the outer spindle Boot to the Upper Housing. Remove the two bolts, located at the top of the Outer Spindle. The Upper Housing will lift off. It may require some turning as you lift to get it off.

Reassembly is the opposite of disassembly. Be sure the Outer Spindle and Upper Housing mating surfaces are clean and free from burrs.



Outer Spindle Removal:

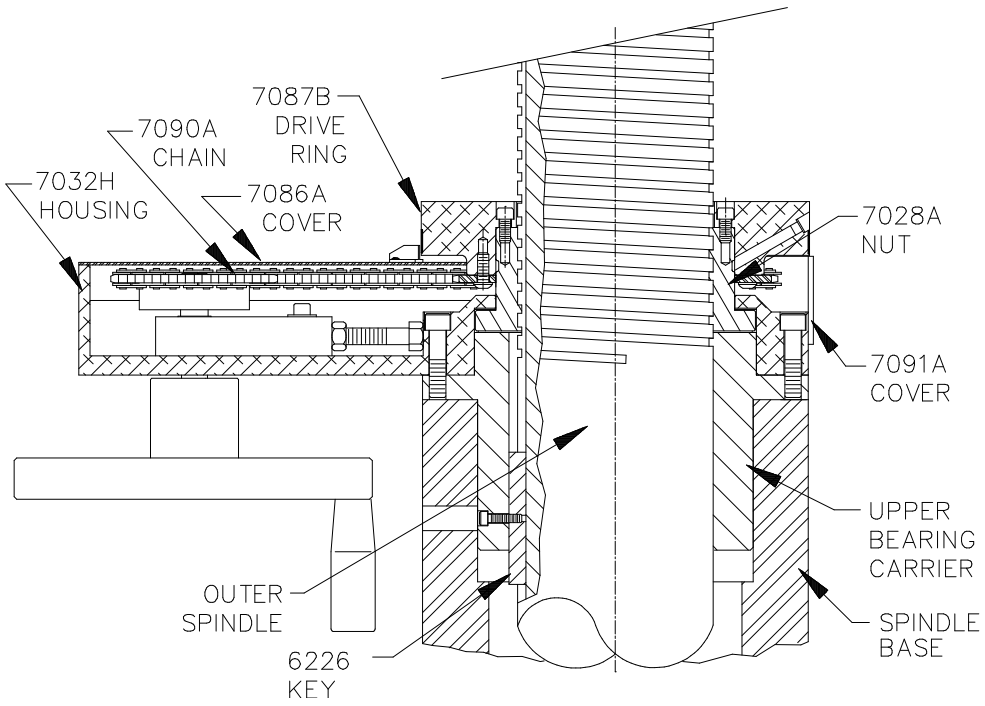
⚠ CAUTION Turn off all power to the machine before continuing.

Remove the cutter head and cover as described earlier in this chapter. Remove the upper housing as described earlier in this chapter.

Remove the screws in the retainer, holding the outer spindle boot and lift off the boot and the retainer.
Remove the Vertical Drive Chain as described on page 4.6 Remove the screws holding the drive ring to the outer spindle nut. Lift the drive ring off.
Remove the mounting screws of the chain drive housing and lift it off the outer spindle.

At this point the outer spindle nut is holding the spindle up, keeping it from falling out. The spindle key, retaining screw must be removed. The key should slide down the key slot and end up inside the spindle base. Looking in the hole inside the spindle base, turn the spindle counter-clockwise 90 degrees. You should be able to see the key and remove it. The spindle is now free to lift out. Lift straight up so you don't bind it in its guide bushings.

To reassemble: Slide the spindle assembly straight into the bushings. Slide it down until a couple inches of the outer spindle keyway is extending from the bottom of the spindle base. From the top of the upper bushing, below the nut, insert the key in the keyway. Slide it into the matching keyway in the bushing. As it starts into the bushing, turn the spindle with your hand to put a slight drag on the key, or it will fall all the way through. Lightly tap the key down into the bushing until you can thread the screw into the key.



Inner Spindle Removal:

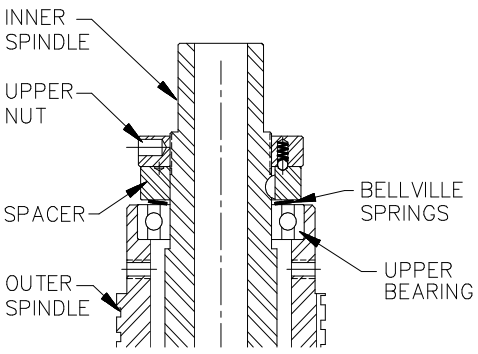
⚠ CAUTION Turn off all power to the machine before continuing.

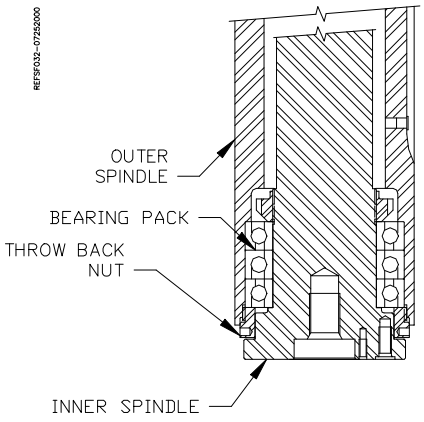
Remove the upper housing cover, and drive belt, as explained on page 4.7.
Remove the driven sprocket as explained on page 4.9.
Remove the cutterhead and chip guard as explained on page 4.10.
Crank spindle up to its full up position.
Remove the Rottler nameplate from the front of the upper gear housing.
Insert a rod or punch through this opening and into the upper adjusting nut (7020). Holding the cutterhead, loosen this nut by turning it counter-clockwise. Remove nut, spacer (7019), key (6043), and two Belleville spring washers (7052).
Thread upper adjusting nut (7020) back onto inner spindle to keep the spindle from falling out, after throwback nut is unthreaded.

Take a rod or punch and insert it into one of the holes in the outside of the throwback nut. This nut is located between the bottom of the outer spindle and the lower flange of the inner spindle.
Turn the nut counter-clockwise to loosen. As you back off the nut, tap on top of the inner spindle with a soft mallet. Do this until the nut is threaded out of the outer spindle.
Place something under inner spindle, then unthread the upper adjusting nut.
Slowly lower the inner spindle out of the outer spindle.

Upper Spindle Bearing Removal:

Use a puller or a long bar from inside the outer spindle, to carefully remove the upper bearing.





Spindle Lock Removal:

⚠ CAUTION Turn off all power to the machine before continuing.

It is not necessary to remove the outer spindle before removing the spindle lock assembly.

Remove rear spindle base cover. Locate the two air lines and fittings, located in the very front of the spindle base. Disconnect by pushing the plastic ring and pulling the tubing at the same time. (Be sure you mark the air lines correctly for reassembly). After the air lines are removed rotate the fittings in toward the outer spindle.

Remove the screws holding the lower retainer in place. Pull the retainer off, be careful not to lose the rubber wipers or the felt packing.

Loosen the three set screws in the lower front and both sides of the spindle base. Loosen and remove the bolts coming up from the bottom of the lower bushing.

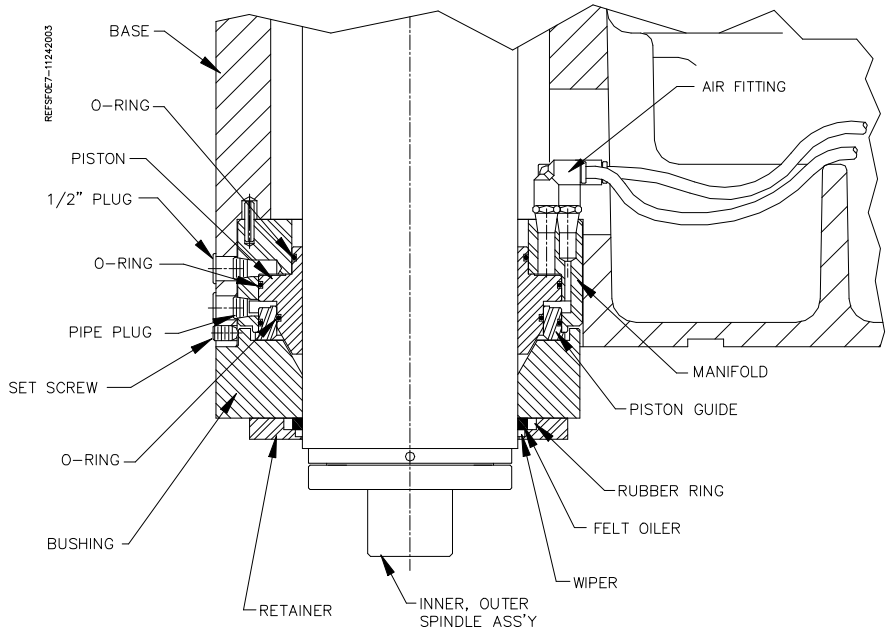
⚠ CAUTION the bushing, Piston guide and manifold will all come out at the same time. These are precision parts, do not drop.

Reassembly:

Inspect parts for damage and excessive wear. Replace the O-rings on the piston and guide. Reinstall the parts carefully, Do Not damage the o-ring seals.

Assemble the piston into the bottom of the manifold. Next assemble the piston guide. A small amount of lubricant may be necessary to get the o-rings to slide. Extending from the top of the manifold is a roll pin. This pin fits into a hole up in the spindle base. Slide the lower bushing up in place and secure with its mounting bolts.

Follow the procedure described later min this chapter to adjust the cutter head tilt.



Spindle Sensor Adjustment:

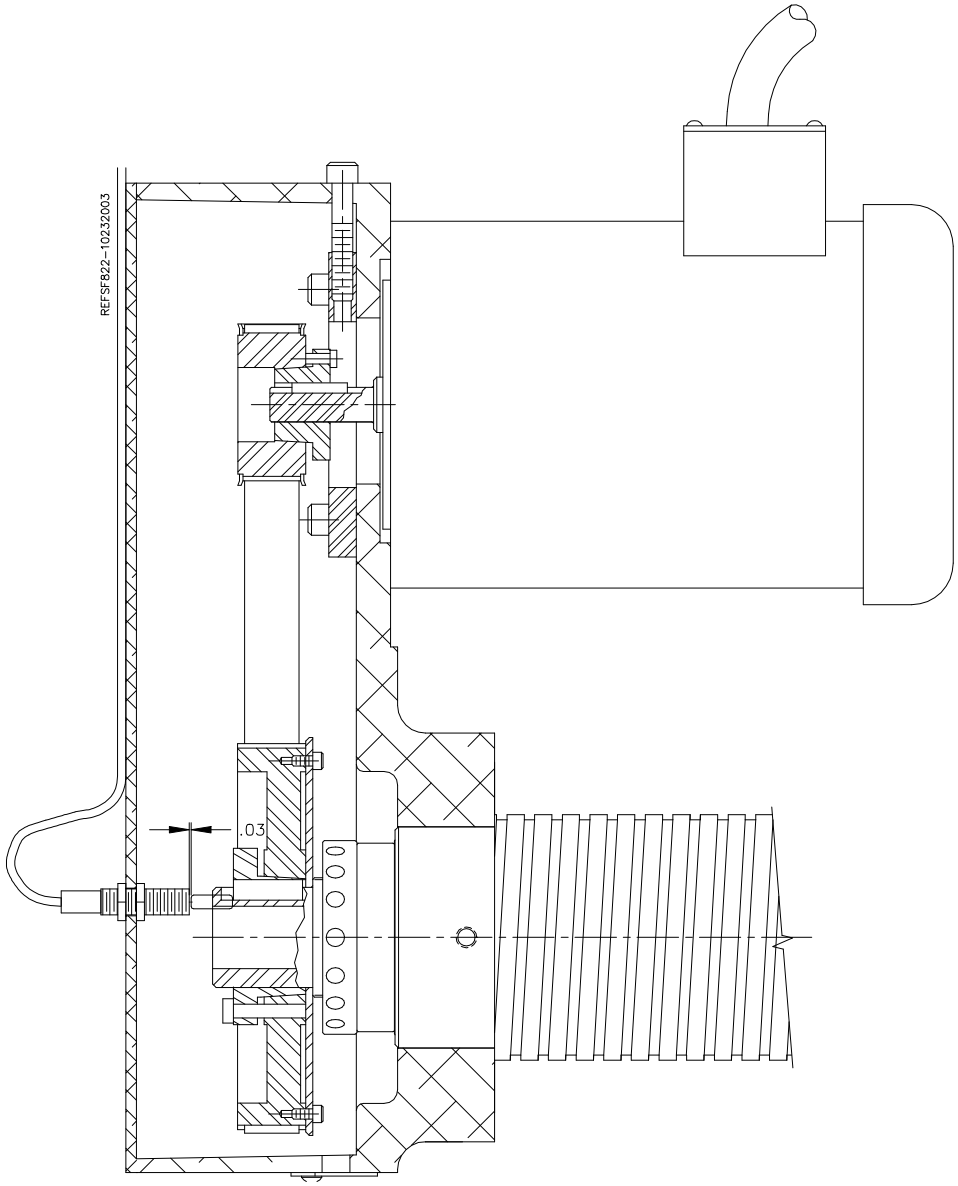
⚠ CAUTION Turn off all power to the machine before continuing.

Remove the spindle sensor from the spindle housing lid.

Rotate the spindle until the dowel pin on the end of the inner spindle can be seen. Measure the distance between the dowel pin and the top of the lid.

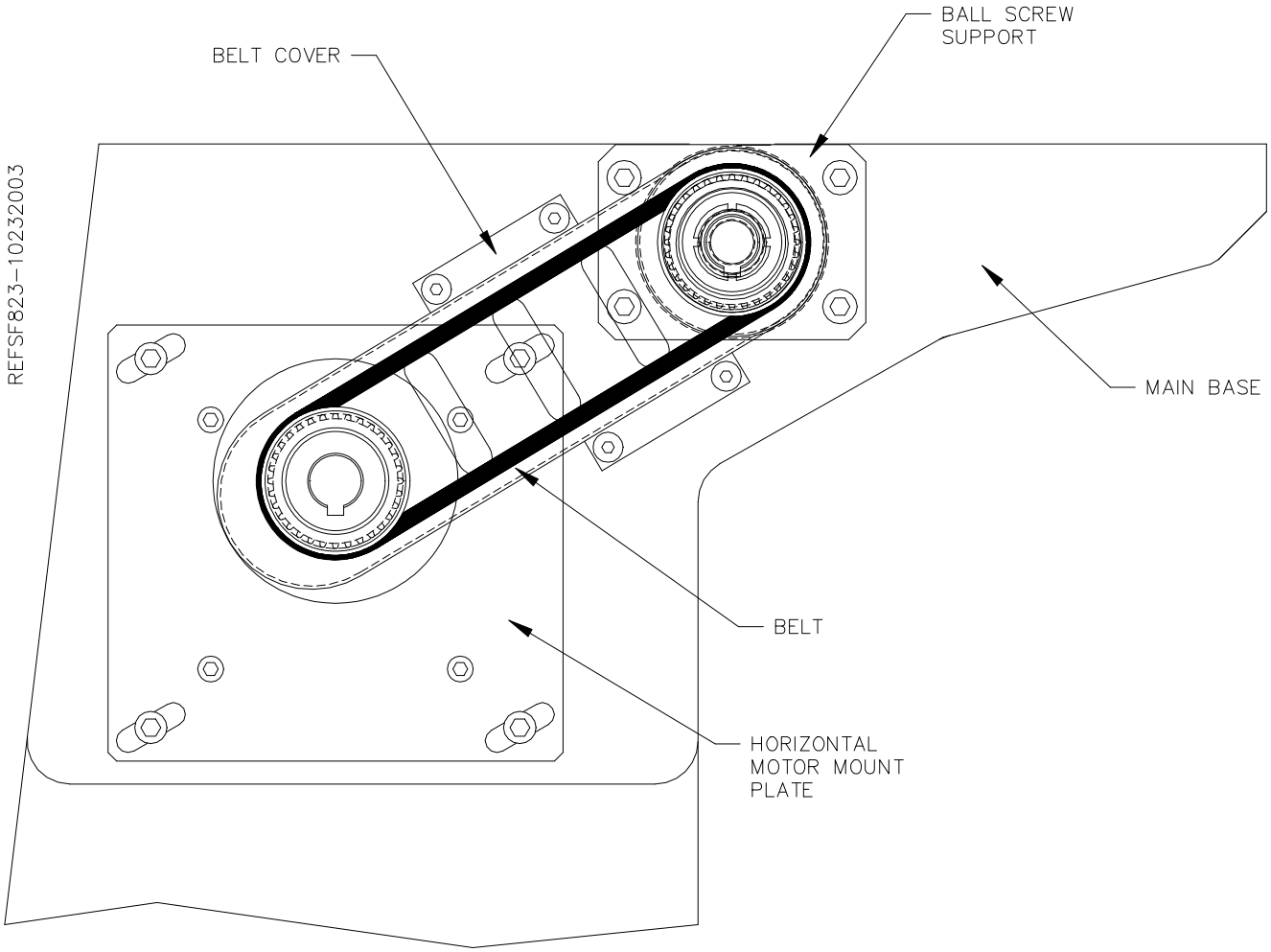
Adjust the upper nut on the sensor to match the measured distance minus .030". Install the sensor from the top and then tighten the lower nut on the sensor.

Turn the spindle by hand to make sure the dowel pin is not coming in contact with the sensor.



Horizontal Ball Screw and Belt Alignment and Adjustment:

1) The Way Covers do not need to be removed to align the ballscrew or adjust the belt tension. They can be accessed underneath the way covers at each end.
2) Move the spindle unit to the middle of it's travel.
3) Loosen the four mounting bolts on the Horizontal Motor Mount Plate.
4) Remove the belt.
5) Loosen the four mounting bolts on both of the ballscrew supports (one at each end).
6) Move the machine to the home position (all the way right). Tighten the four mounting bolts on the right hand ballscrew support.
7) Move the machine to it's full left hand travel. Tighten the four mounting bots on the left hand ballscrew support.
8) Install the belt onto the ballscrew and motor pulleys. The motor mount bolts should still be loose at this point.
9) Let the weight of the motor tighten the belt. This is sufficient tension on the belt. Tighten the four motor mount bots.



Air Adjustment of the SF7A – 8A Mahcine:

Up-Relief, Air Setting:

1. Press up / down adjust button.

2. Adjust, relief up air regulator, to 0 pressure.

3. Press relief up button.

4. Adjust relief up regulator pressure until the spindle lifts (Note air pressure reading).

5. Continue to adjust air pressure up until the vertical handwheel does not turn smoothly. (Note air pressure reading).

6. Set the regulator half way between these two readings.

7. This pressure should be approximately 50 to 60 psi.

Up / Down Adjust, Air Setting:

1. Press up / down adjust button.

2. Turn up / down adjust air regulator to 0 pressure.

3. Increase regulator pressure until vertical handwheel can be turned clockwise with moderate resistance. (Note air pressure reading.)

4. Continue to adjust air pressure up until the spindle will snap up into a relief position while the vertical handwheel is turned counter-clockwise vigorously. (Note air pressure reading.)

5. Set the regulator half way between these two readings.

6. This pressure should be approximately 9 to 15 psi.

Note: Maximum 20 psi

Relief Valve, Setting:

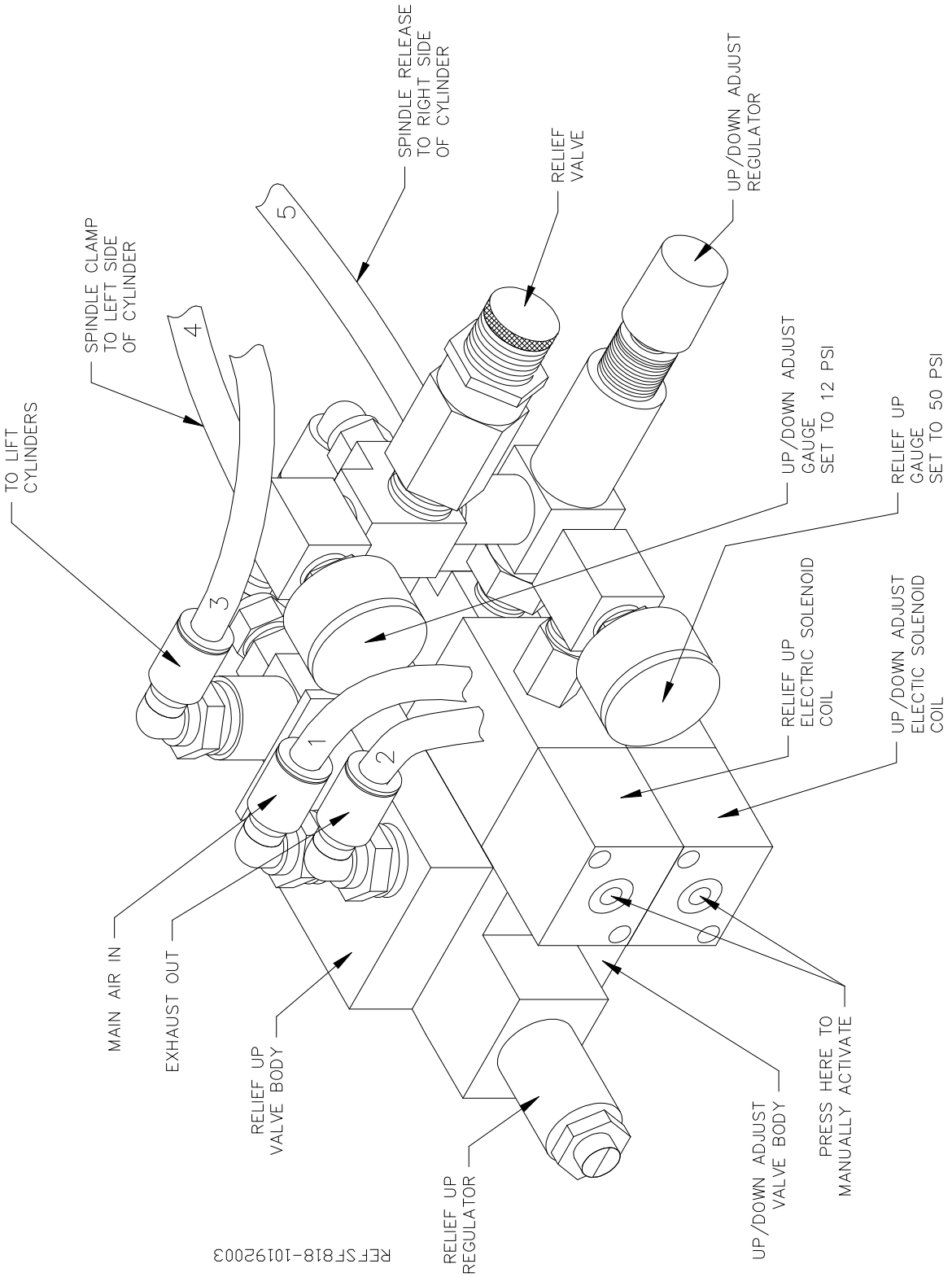
1. Note: up / down adjust, air setting, procedure must be completed first.

2. Press up / down adjust button.

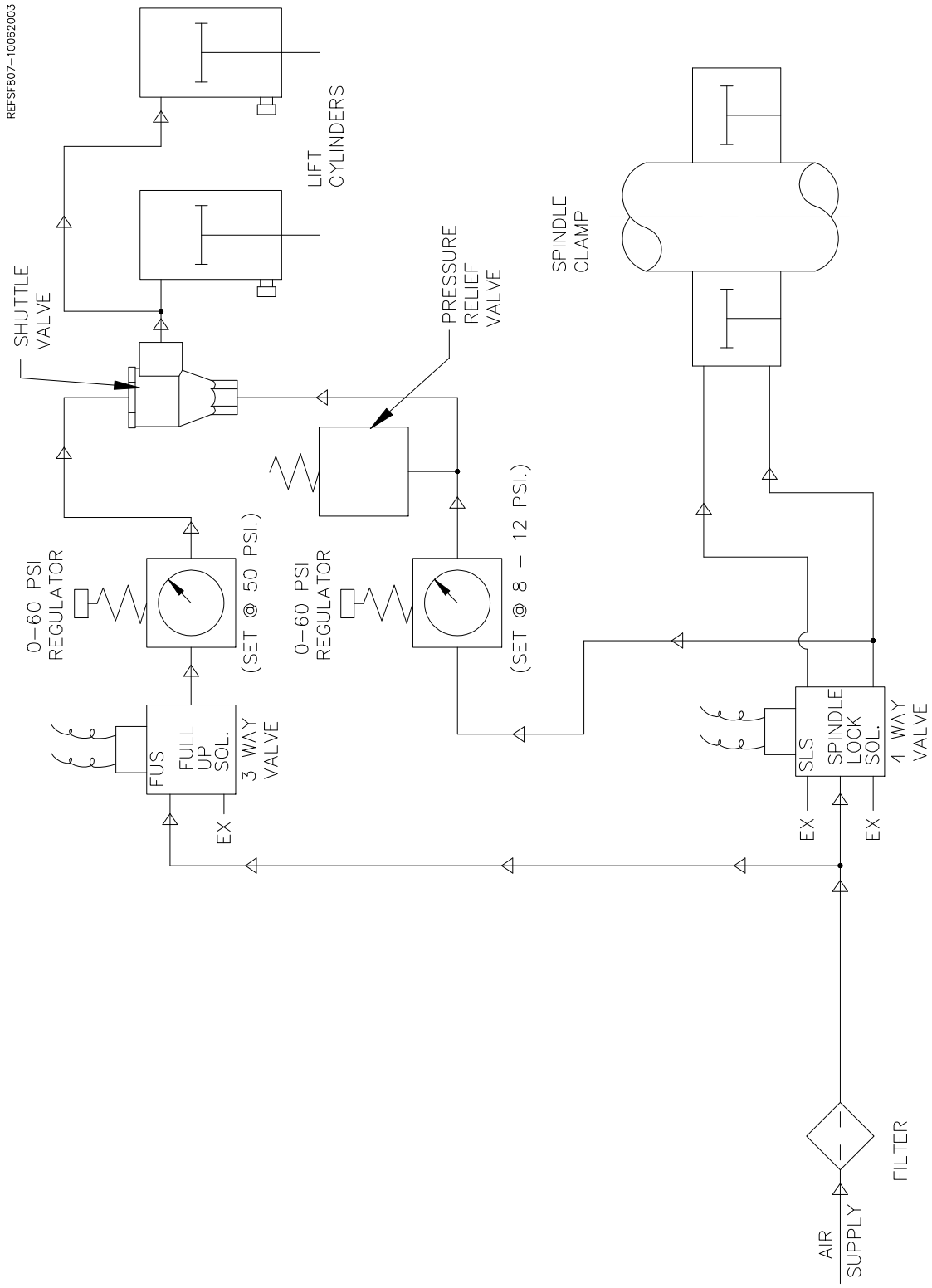
3. Adjust relief valve clockwise until air is heard escaping. Then turn counter-clockwise until air just barely hisses out.

4. While viewing the up / down adjust, air regulator gauge, crank the vertical handwheel rapidly counter-clockwise several turns. (Note air pressure reading.) If the setting is correct there should be an increase of 5 to 7 psi.

Air Adjustments Illustration:



Pneumatic Control Diagram:



Cutterhead Tilt Adjustment:

Remove all work pieces, fixturing and parallels, from the lower surface of the main base. Travel the spindle unit over to the center of the main base.

⚠ CAUTION Turn off all power to the machine before continuing.

Remove one tool holder from the cutterhead. Insert 7202J holder, fitted with a dial indicator, in the open tool holder slot. Using the handwheel, adjust the cutterhead down until you are in the middle of the dial indicator's range. The dial indicator will be indicating from the lower deck surface. Zero the dial indicator. Manually rotate the cutterhead clockwise. The left, leading edge, of the cutterhead should be .0025 to .004 inch lower than the right, trailing edge, of the cutterhead.

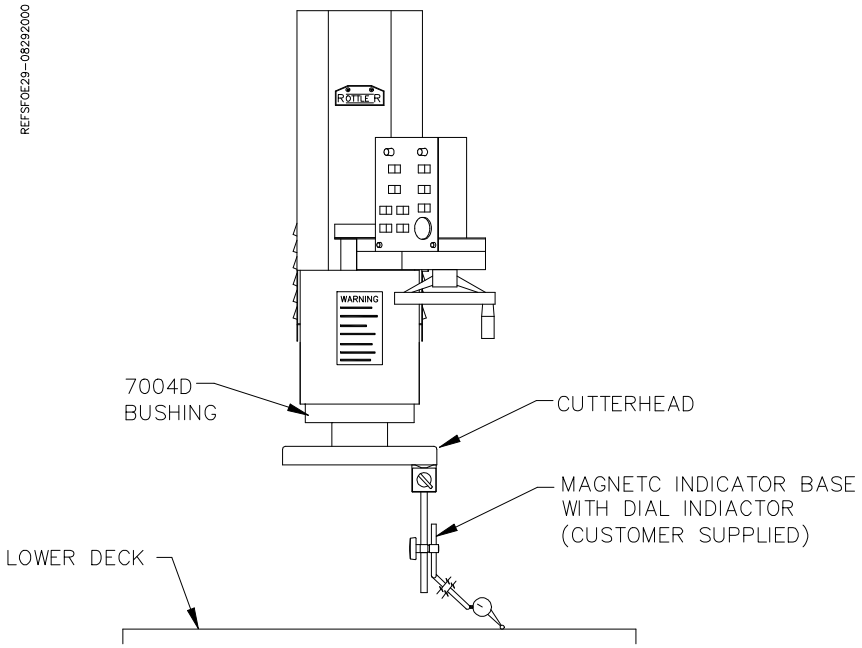
If the tilt is not within this tolerance, it will need to be adjusted. Loosen the six allen head bolts holding the 7004D bushing to the bottom of the spindle base. (See illustration on page 5.8) Snug the bolts up very lightly.

Use the three set screws, located just above the lower bushing, near the lower edge of the spindle base, to move the bushing for the proper tilt. If the spindle needs to tilt to the left, loosen the left set screw and tighten the right, the opposite is true if the tilt needs to be to the right.

Tighten the six allen head bolts firmly, Snug all set screws to prevent them from backing out.

Recheck tilt with dial indicator to be sure it is correct.

Remove the indicator holder from the cutterhead. Replace tool holder. Turn the power back on and operate normally.



Inner Spindle Adjustment:

⚠ CAUTION Turn off all power to the machine before continuing.

Remove the two screws holding the small nameplate (502-1-19C) to the front of the upper housing. Inside the exposed opening is the spindle adjustment nut (7020). The spindle adjustment nut has holes drilled around its perimeter to accept an adjustment rod.

Insert an adjustment rod into the spindle adjustment nut. The adjustment rod should be 1/4 - 5/16 inch diameter and 8 to 10 inches long.

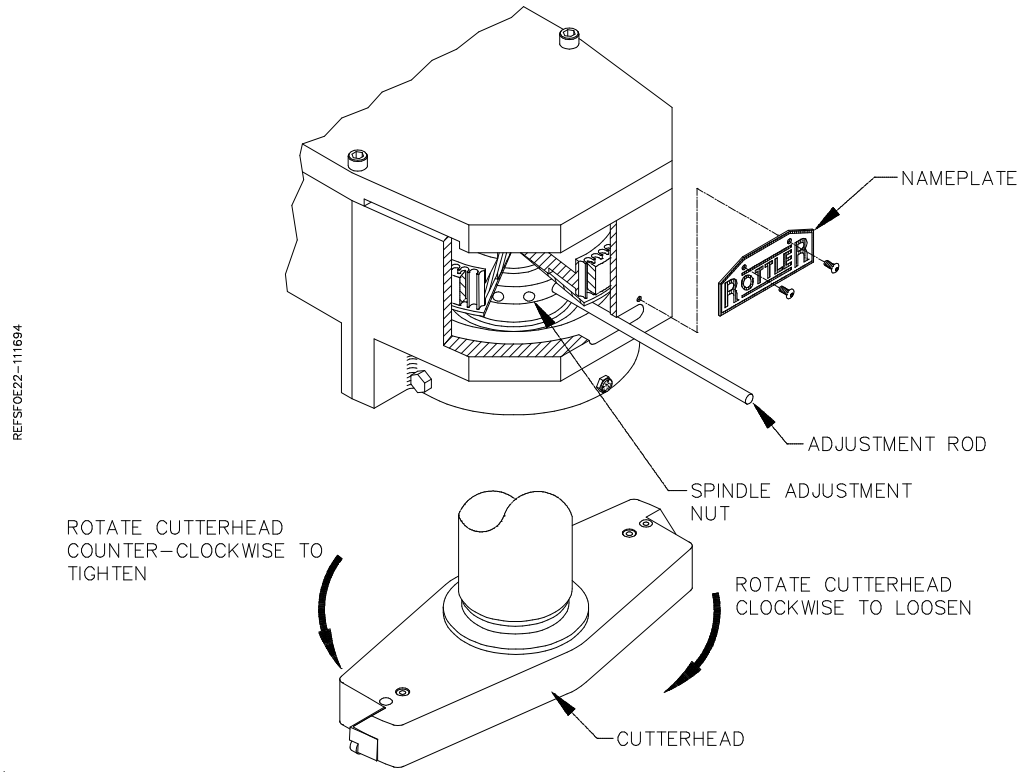
Carefully rotate the cutterhead counter-clockwise, (looking from above the cutterhead) letting the adjustment rod move against the end of the slot. This tightens the inner spindle adjustment. The cutterhead will be easy to turn and you should be able to feel the spring loaded detent in the adjustment nut.

At some point the torque required to turn the cutterhead will sharply increase, immediately stop turning the cutterhead.

⚠ CAUTION Do not over tighten or severe bearing damage will occur.

Turn the cutterhead clockwise one or two detents.

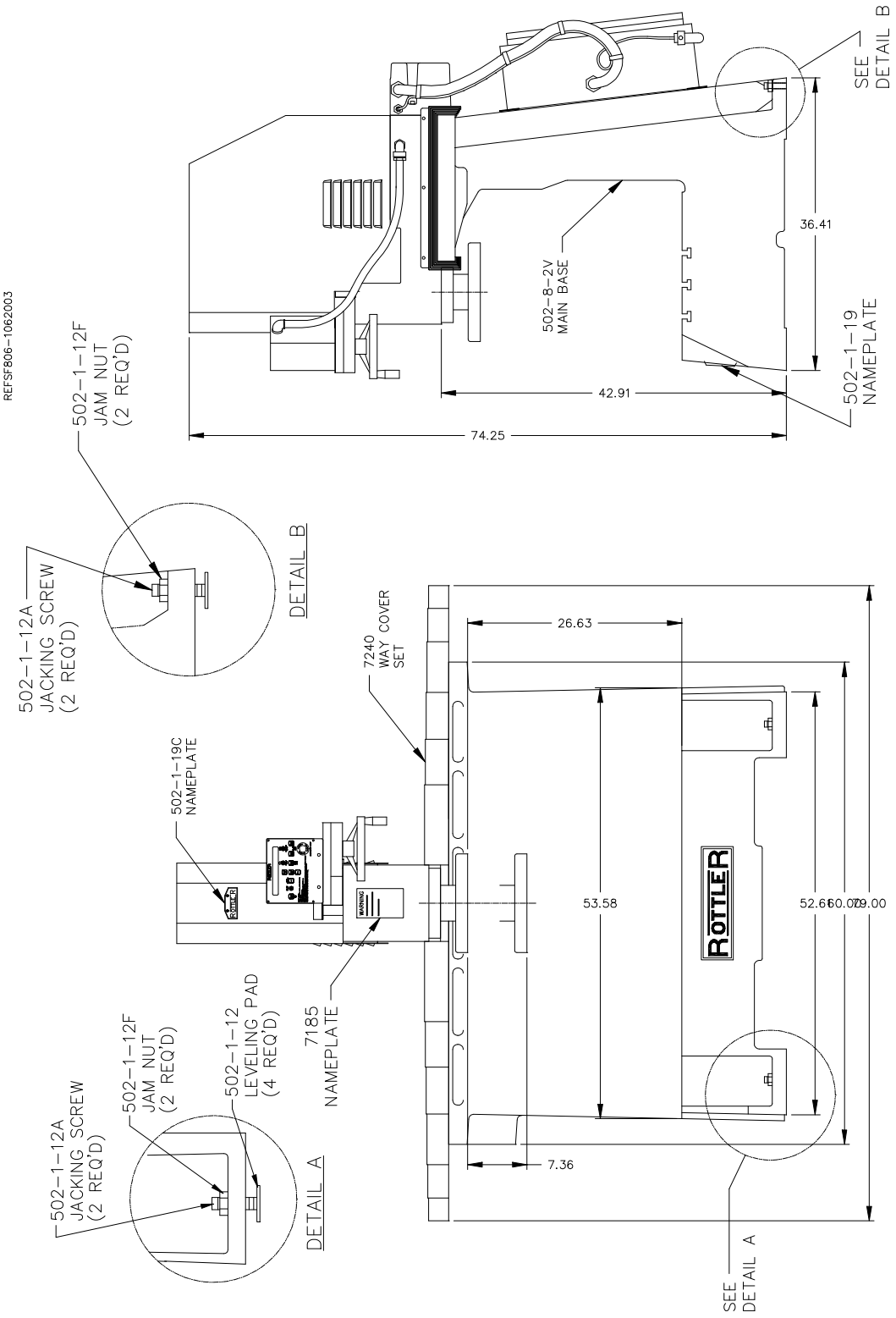
Remove the adjustment rod and replace the nameplate



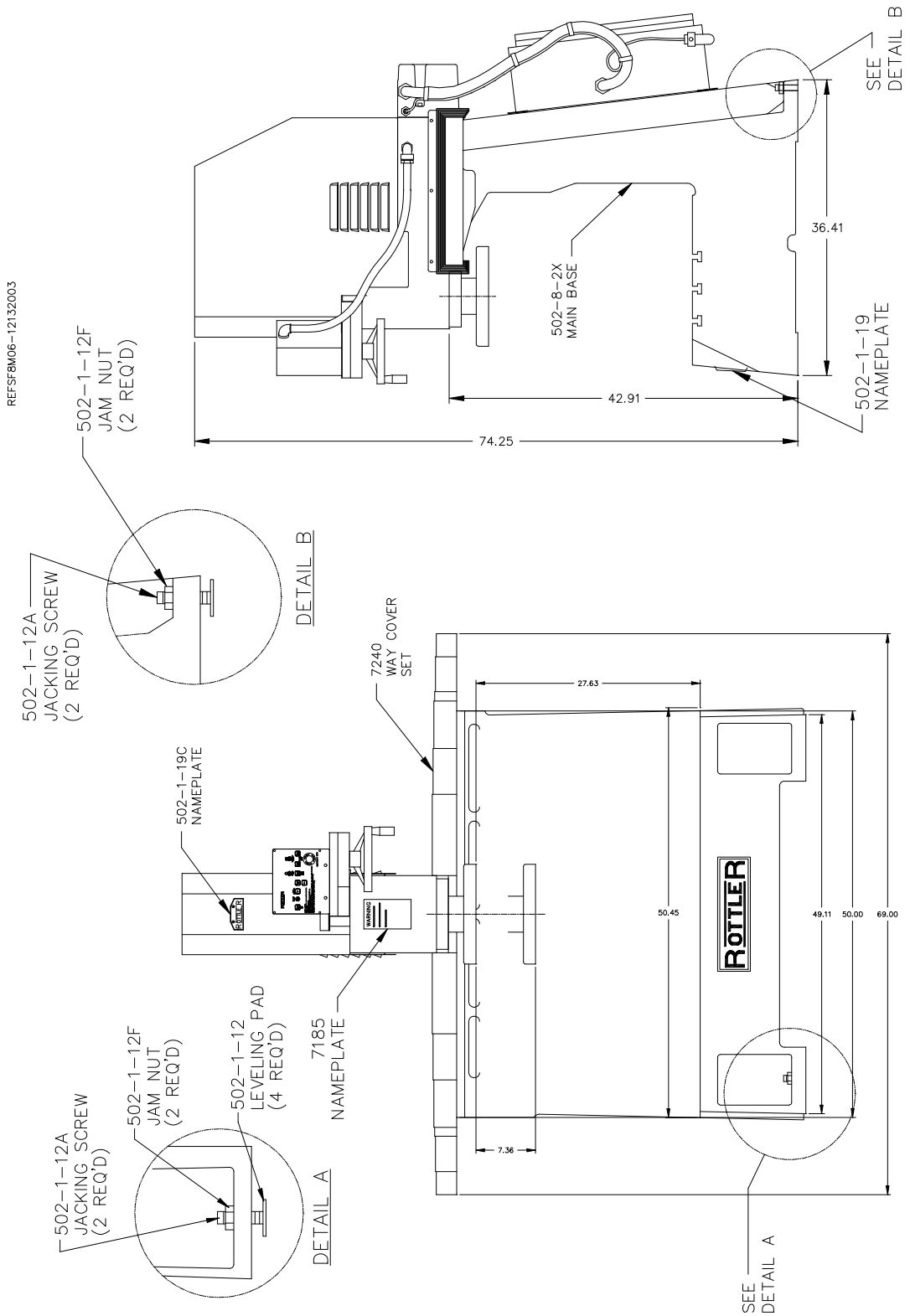
Chapter 5 Troubleshooting:

Chapter 6 Machine Parts:

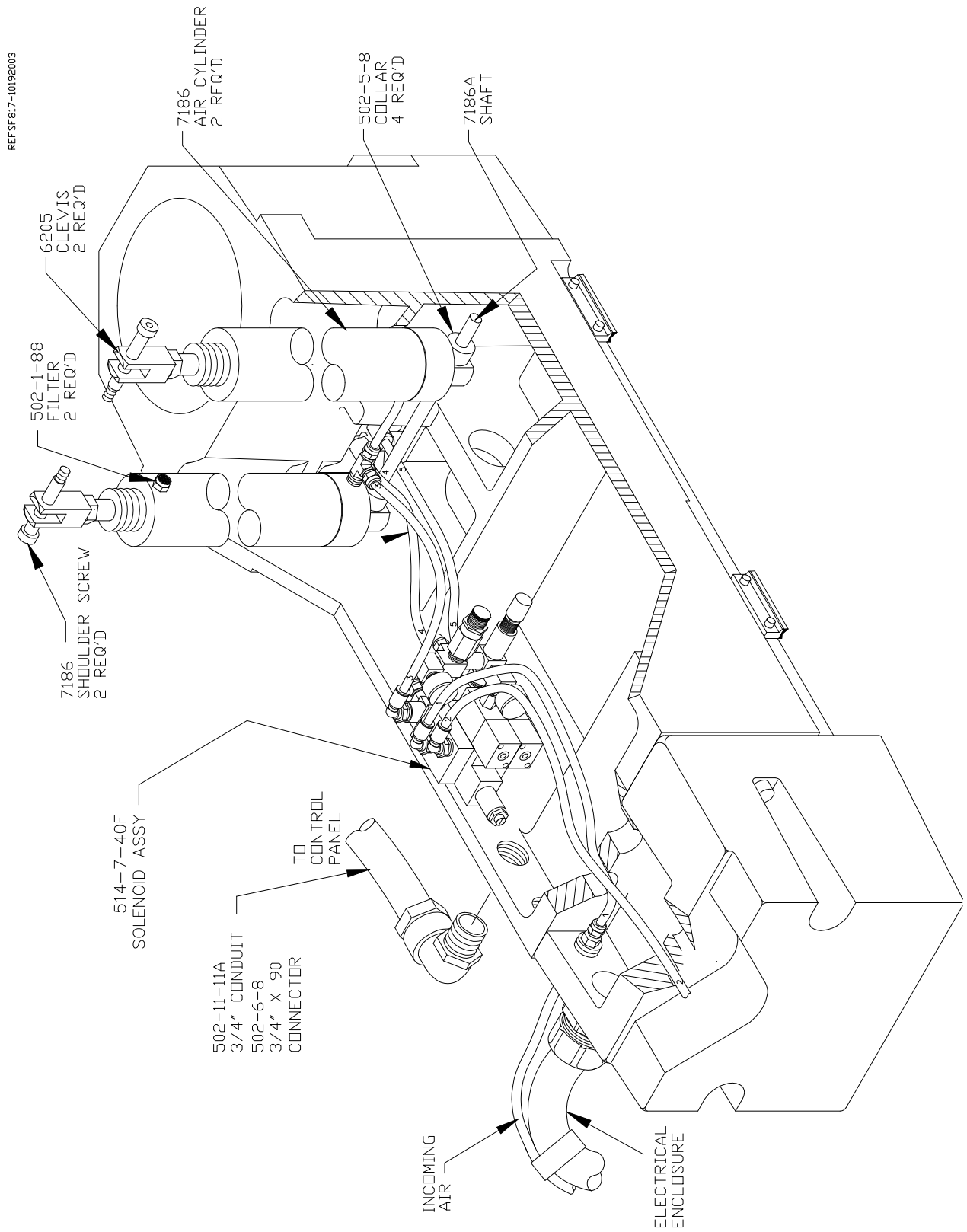
Front / Right Side View SF8A:



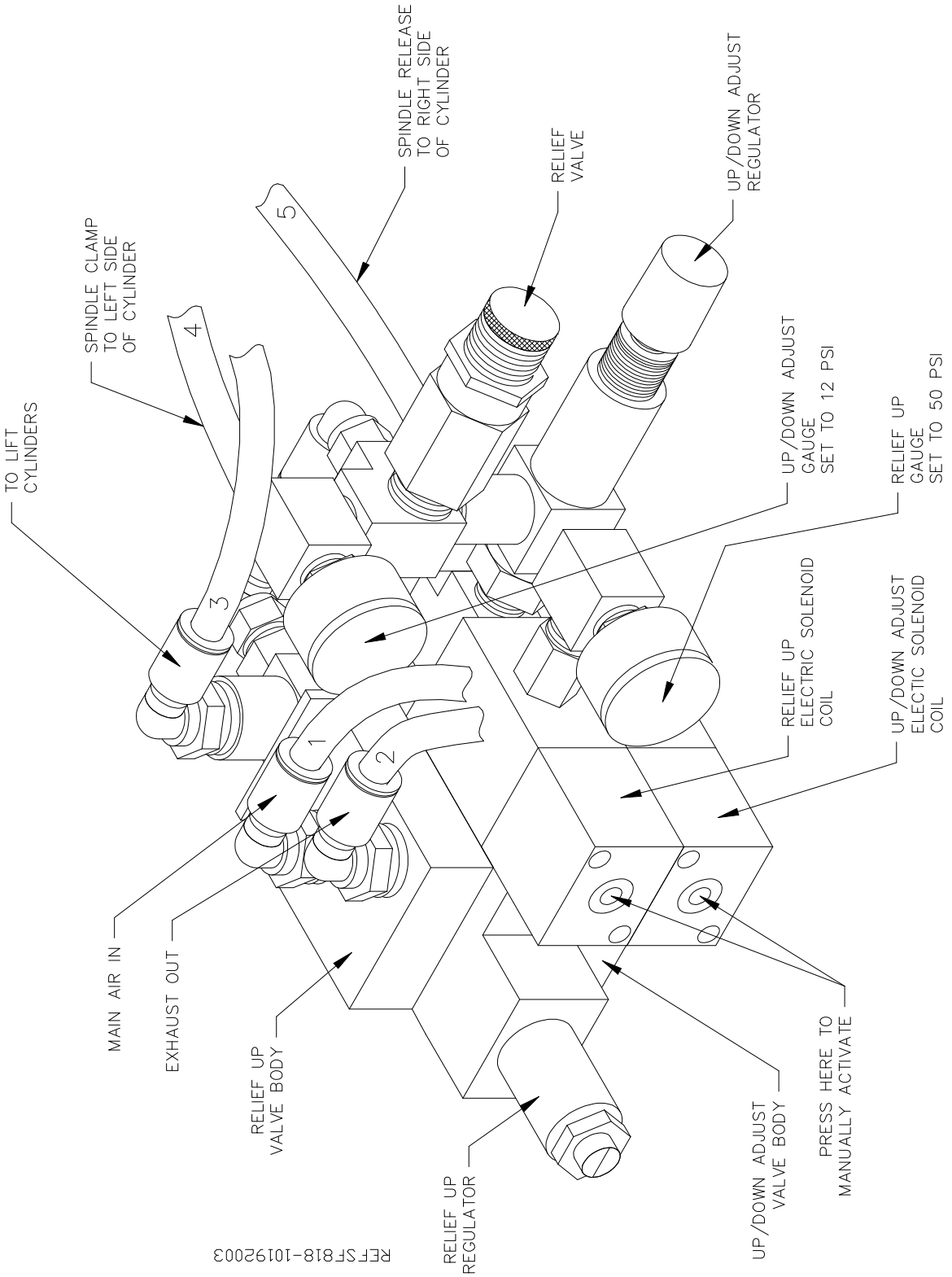
Front / Right Side View SF7A:



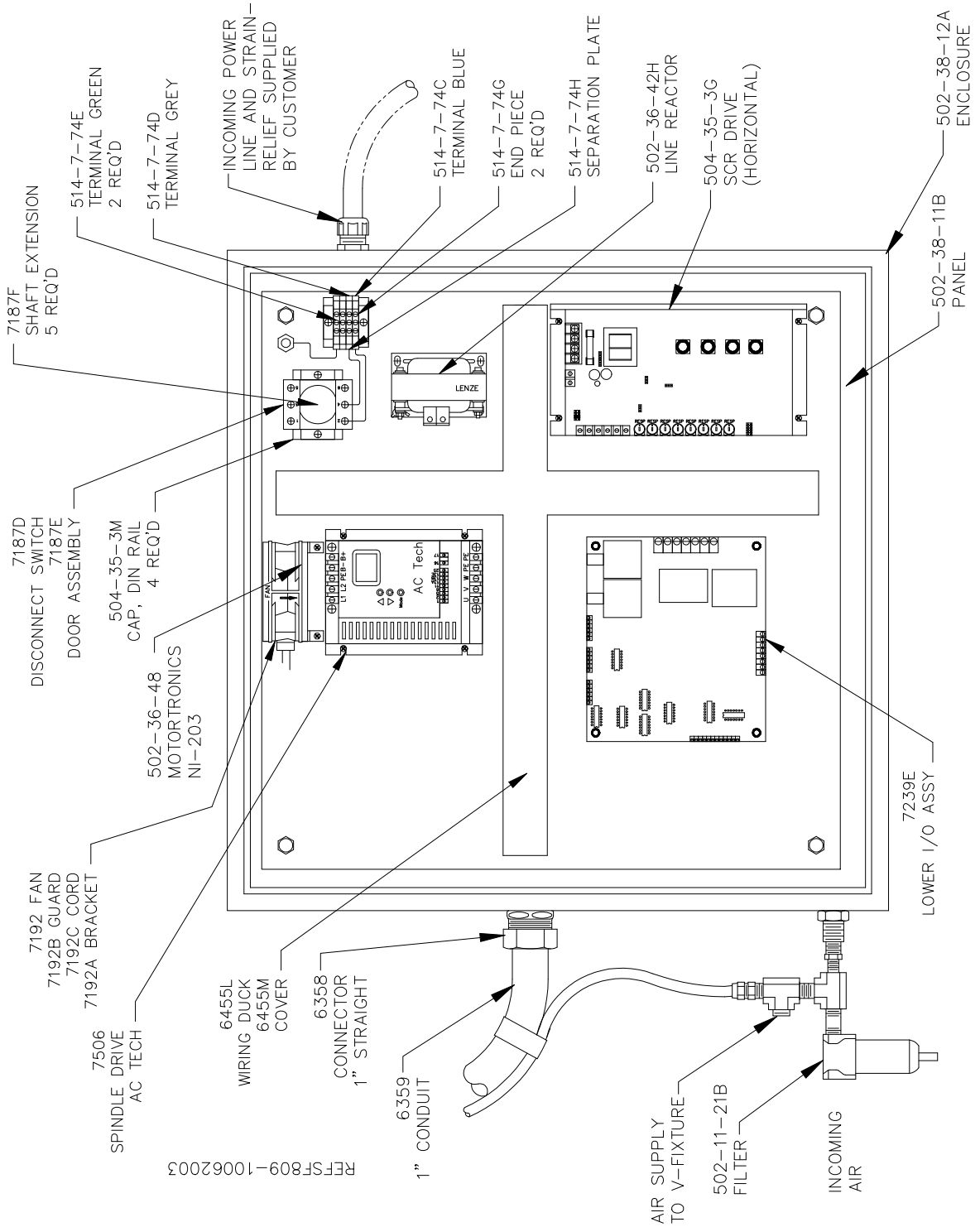
Pneumatic Assembly:



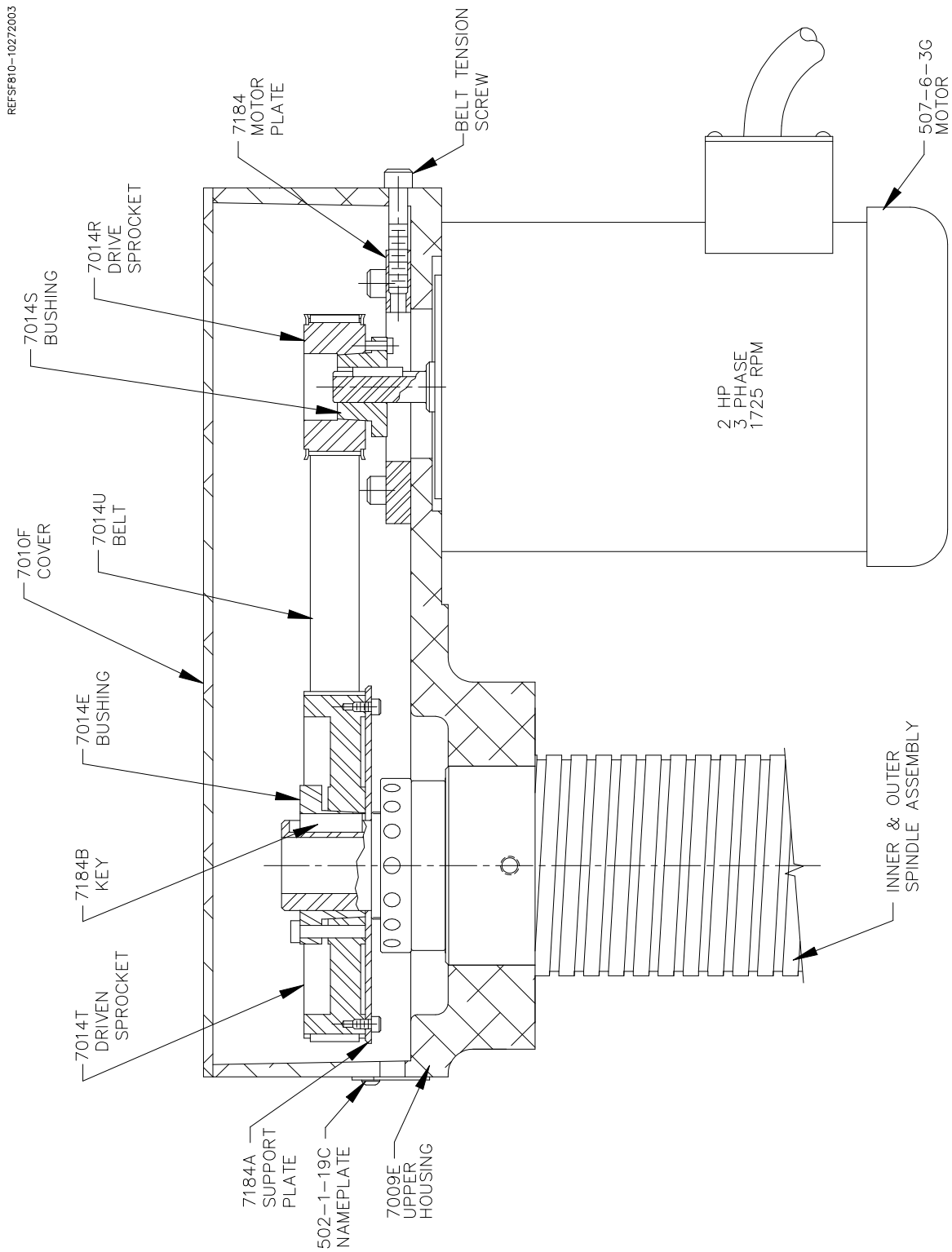
Solenoid Assembly:



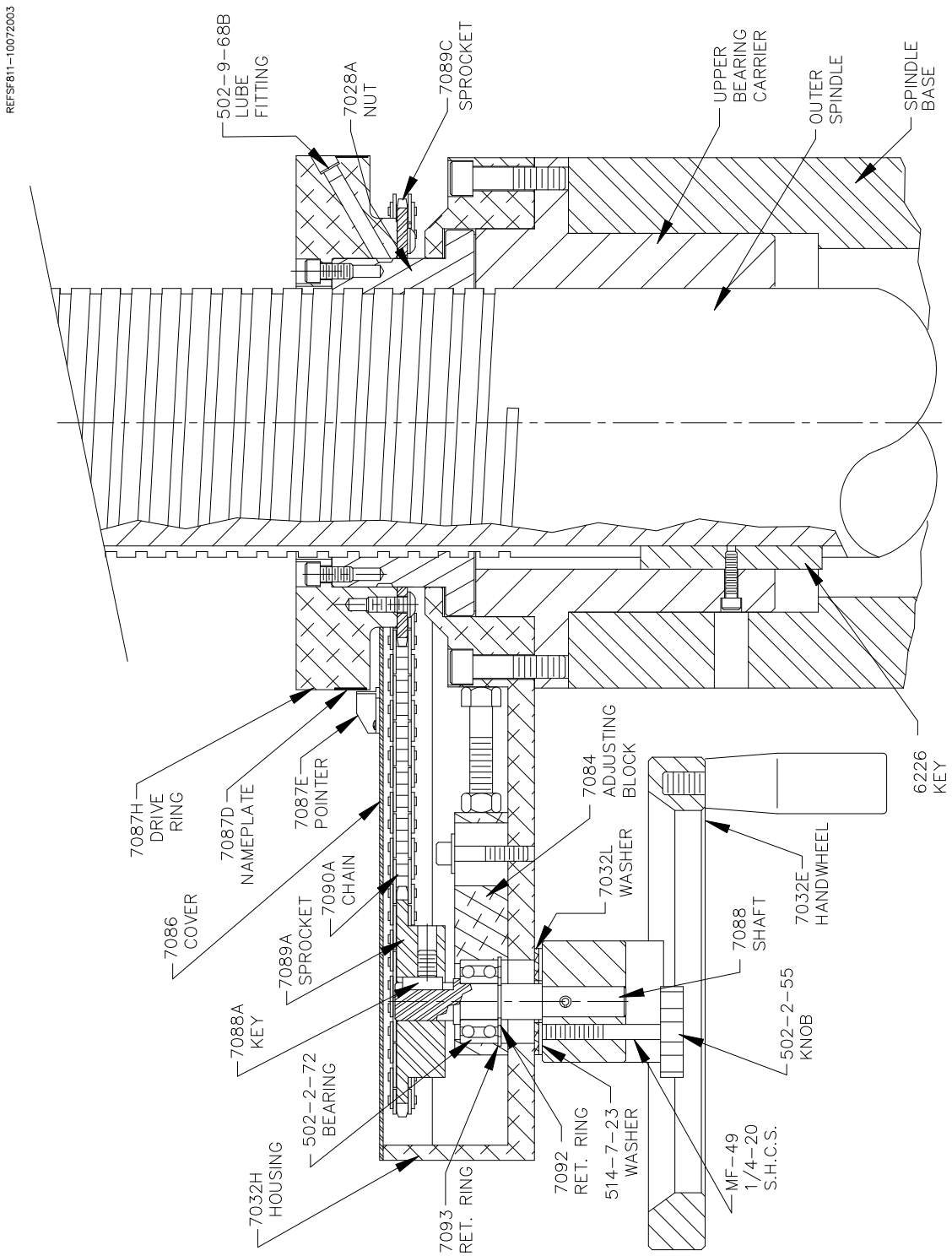
Electrical Enclosure:



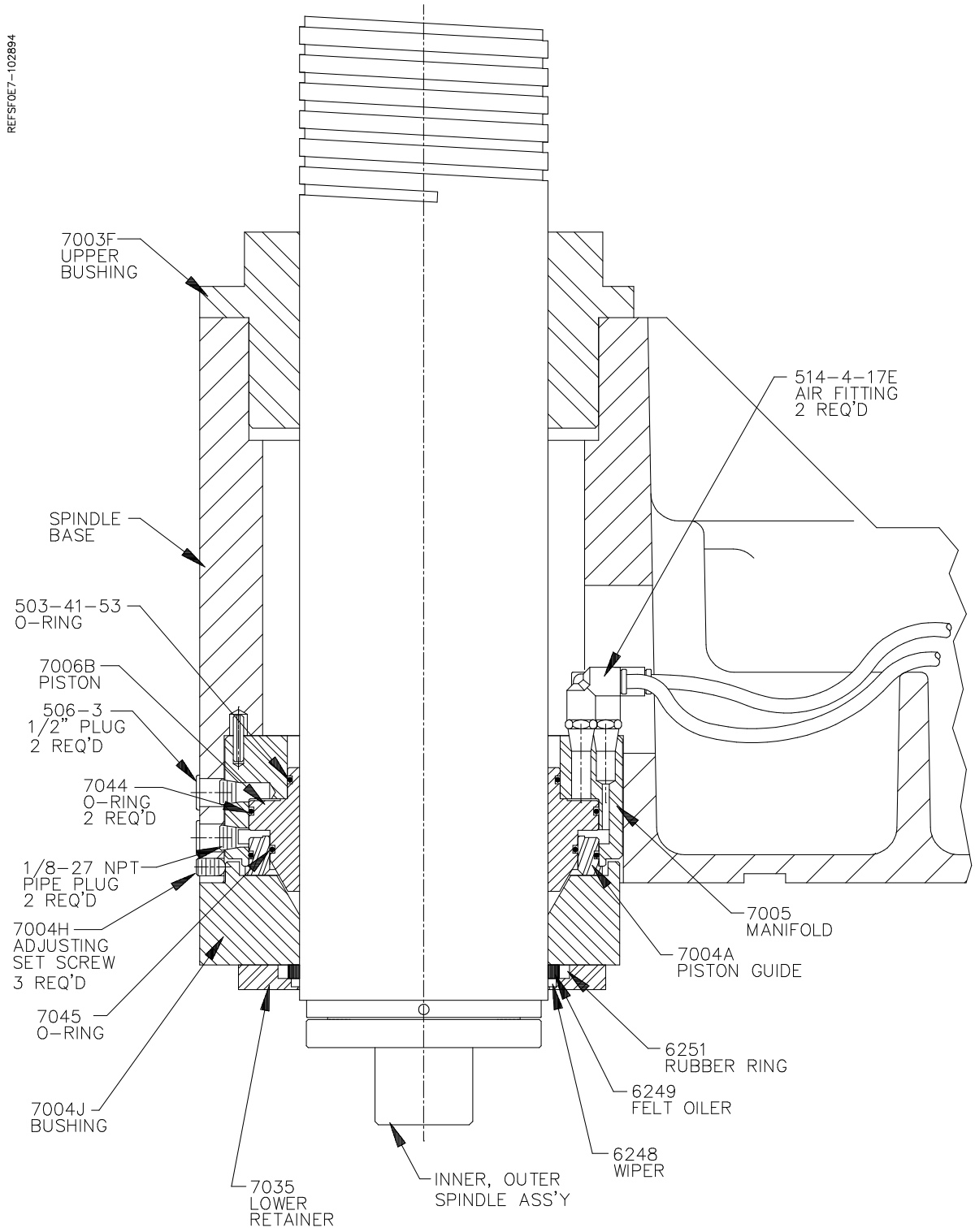
Upper Housing:



Vertical Adjustment (Chain):

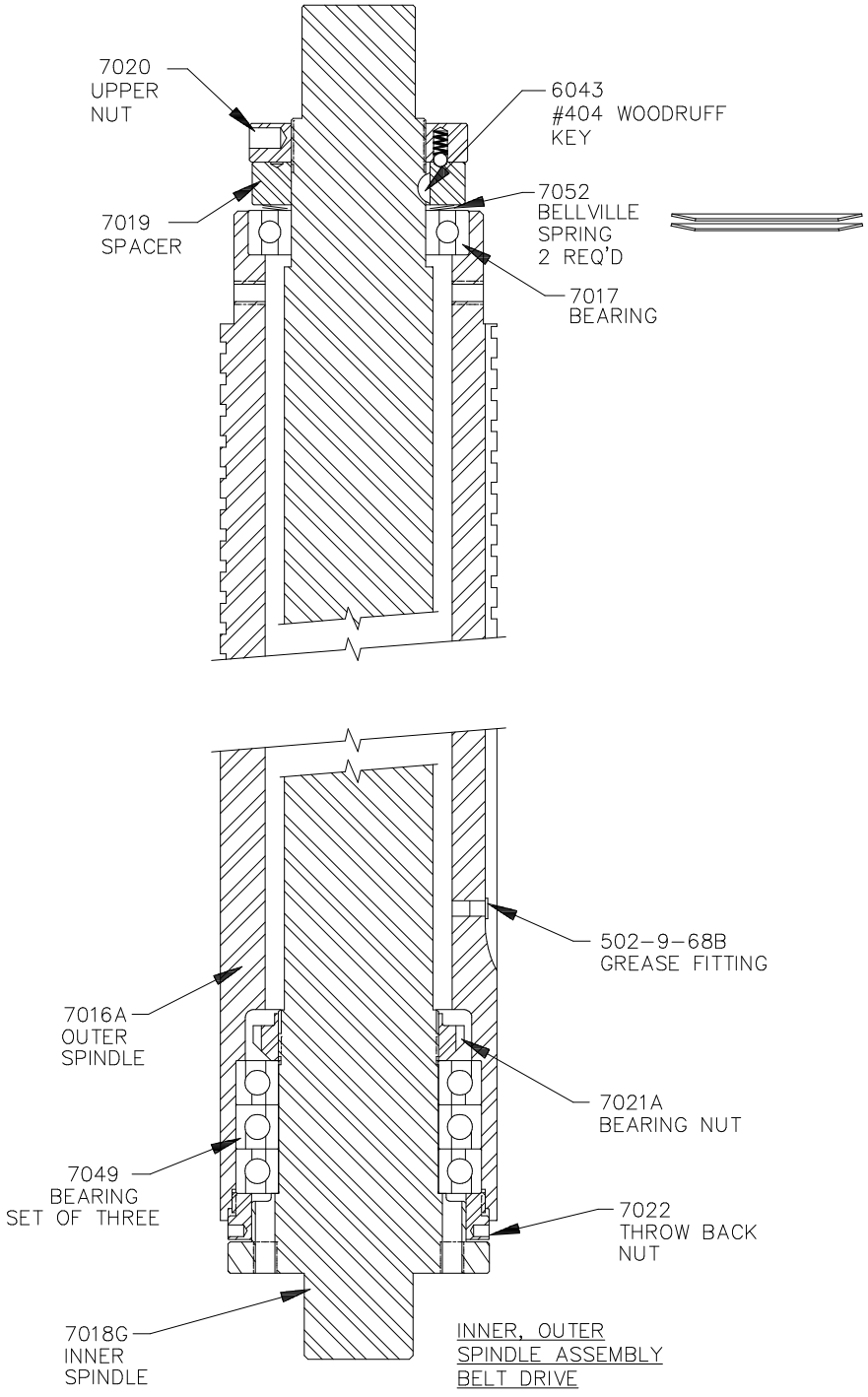


Spindle Base Front Section:

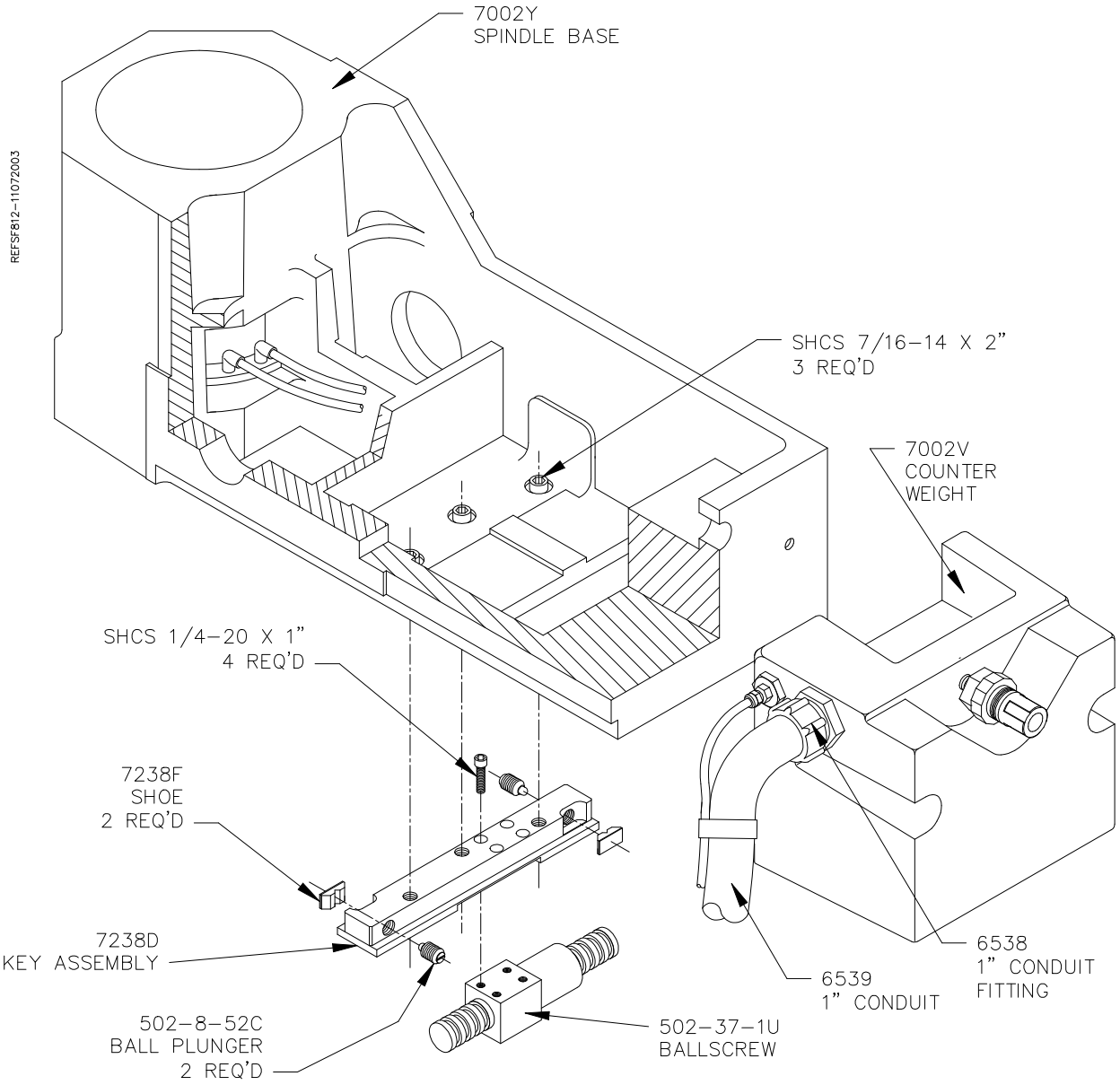


Inner / Outer Spindle Assembly:

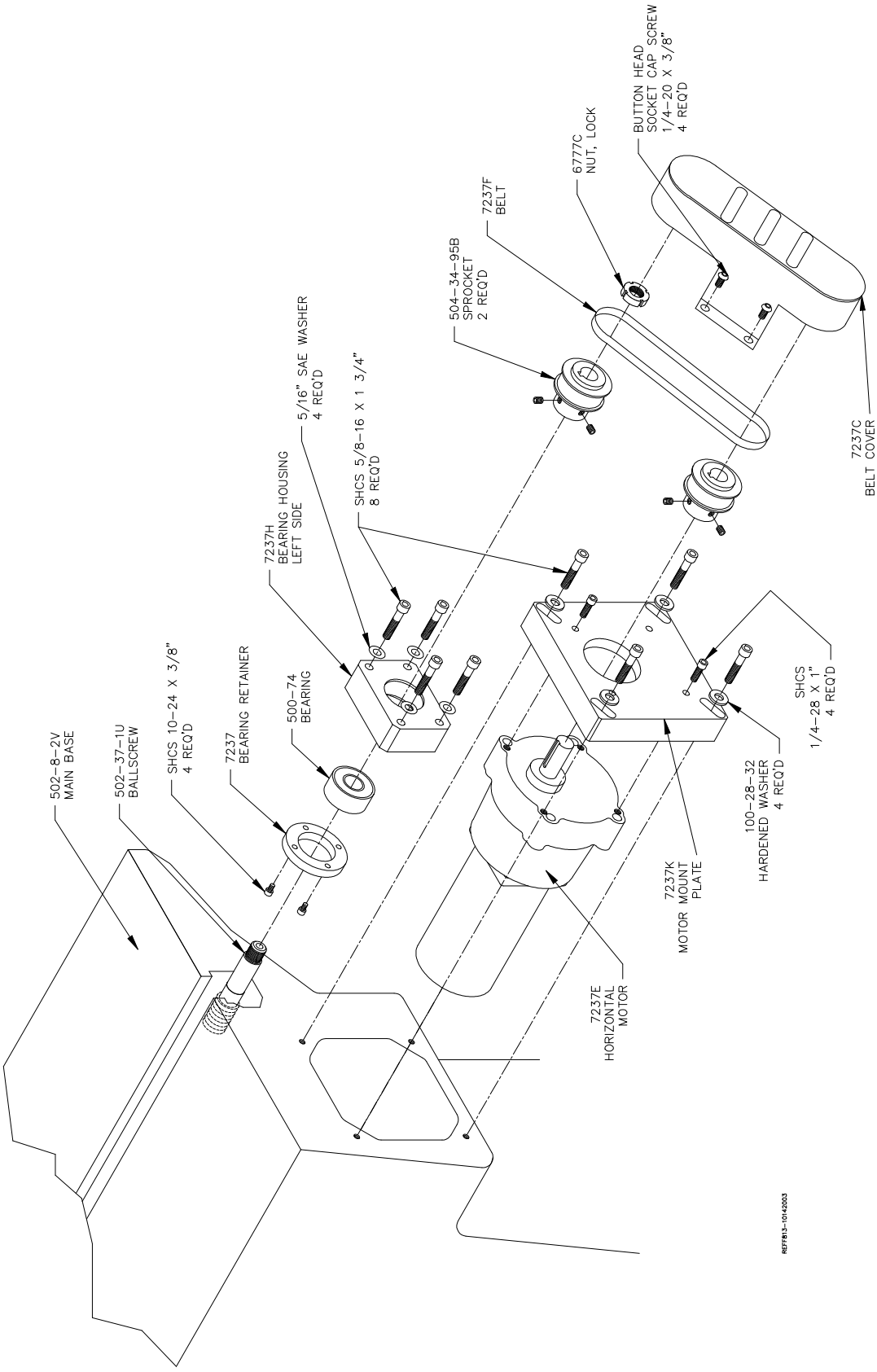
REF'SFOE8-111694



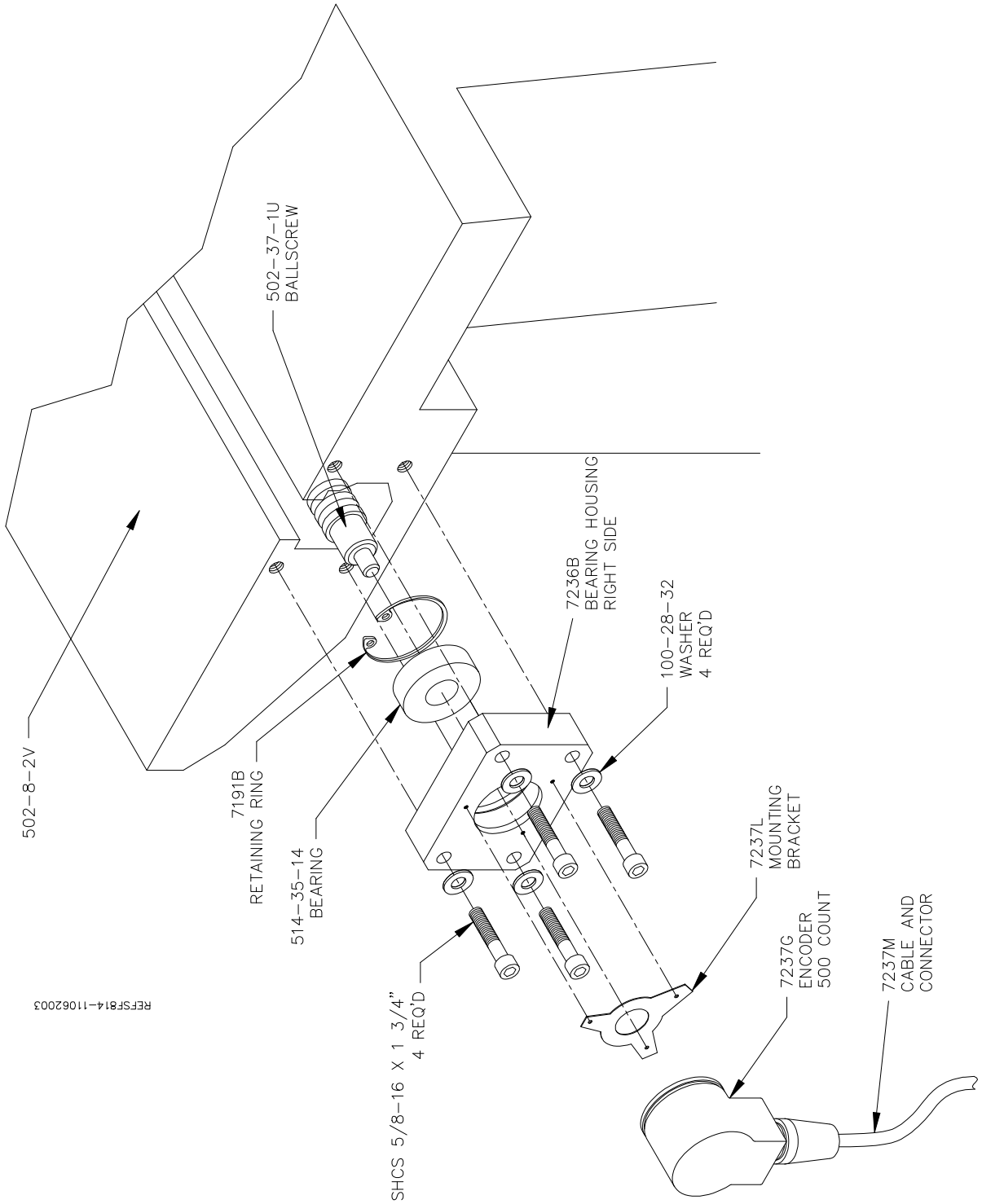
Spindle Base Assembly:



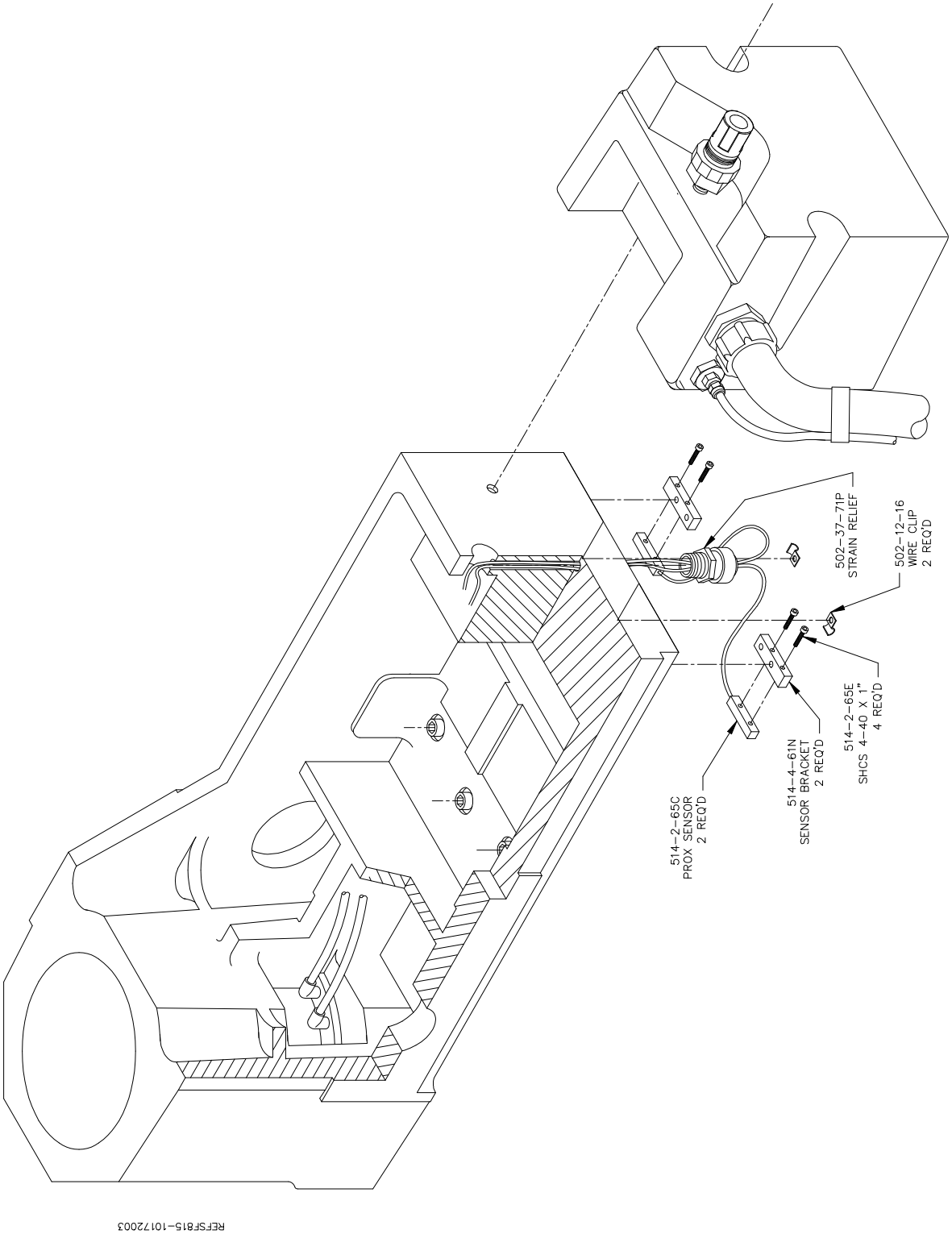
Left Ballscrew Support:



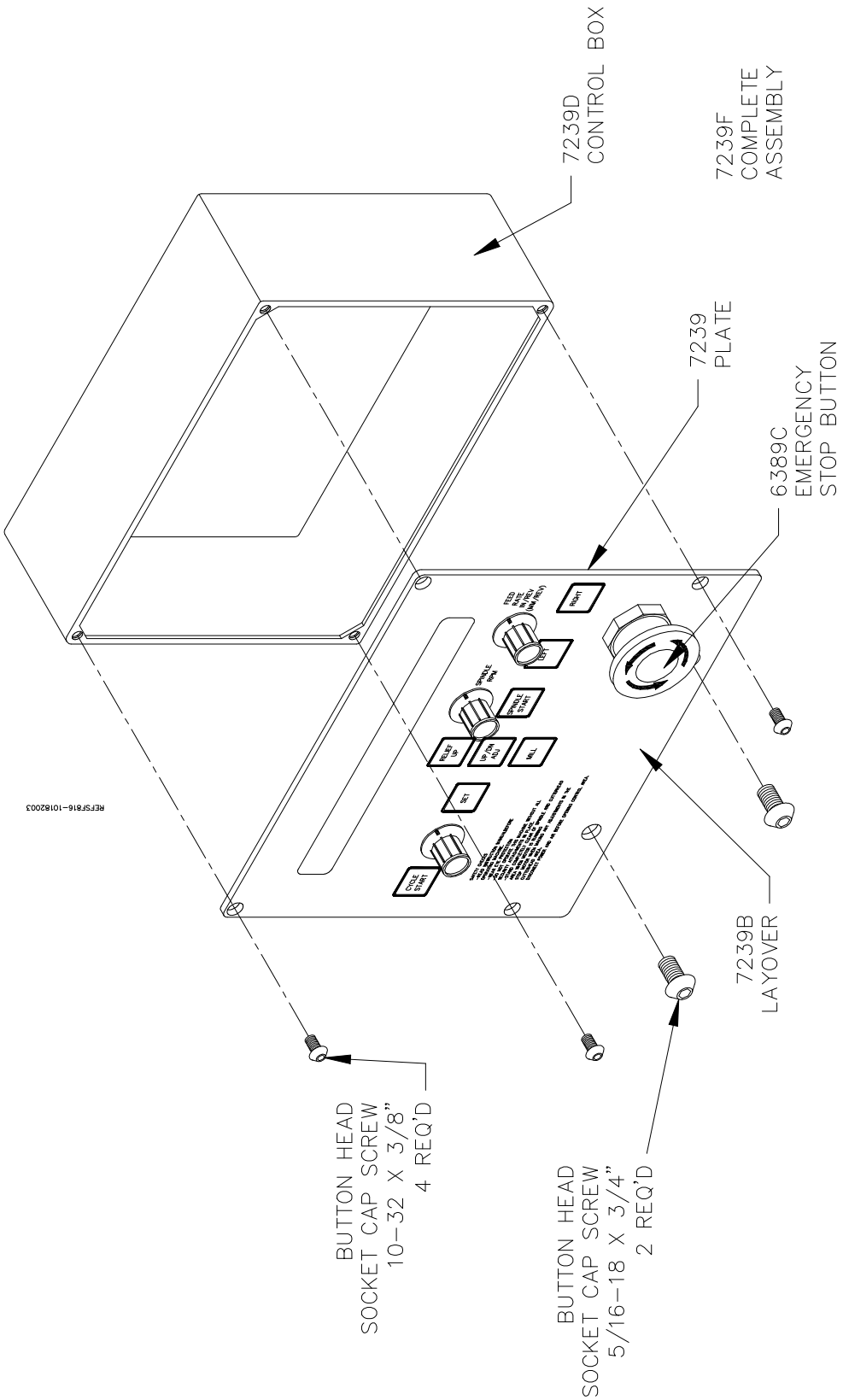
Right Ballscrew Support:



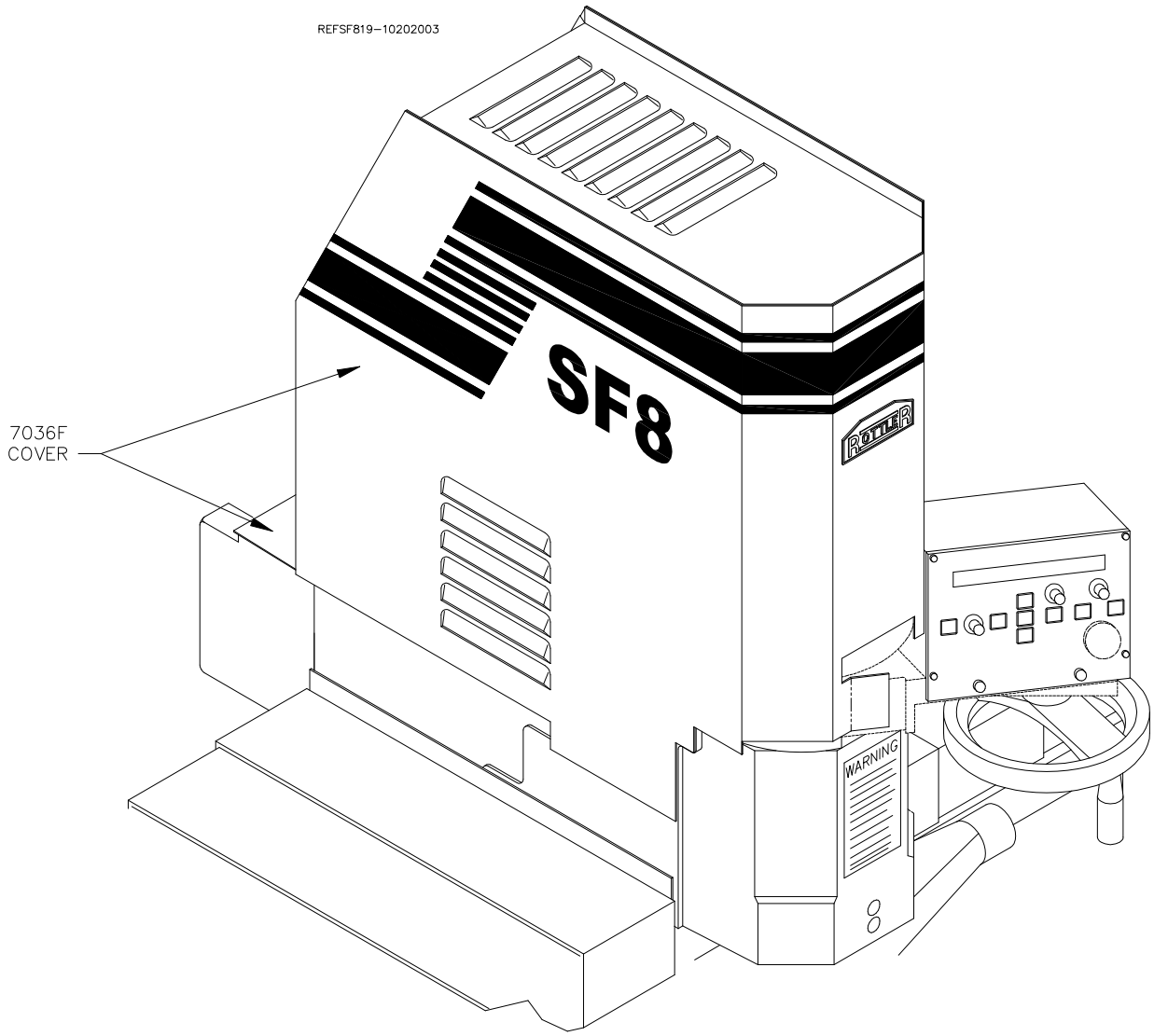
Home and Limit Switches:



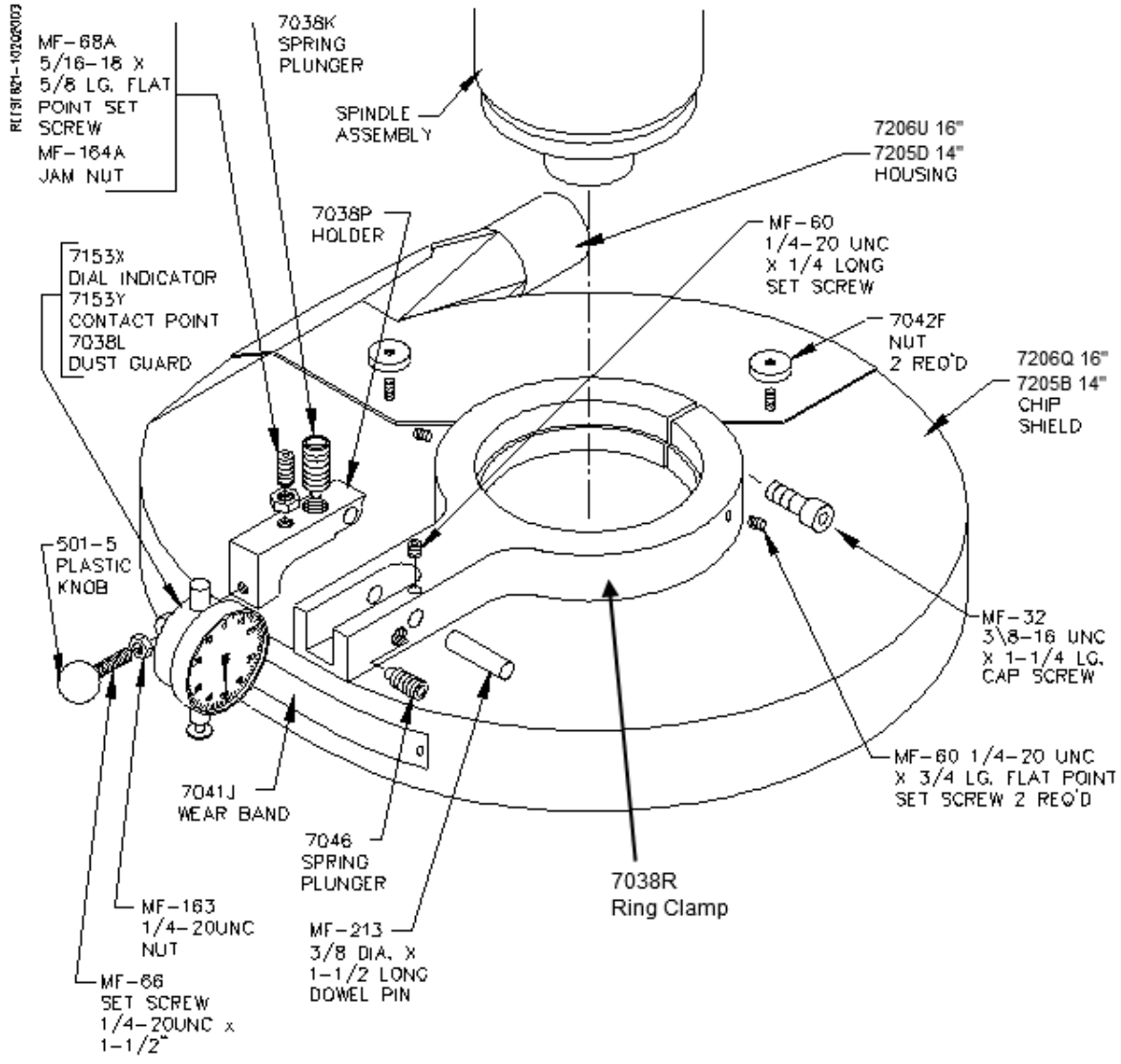
Pendant Assembly:



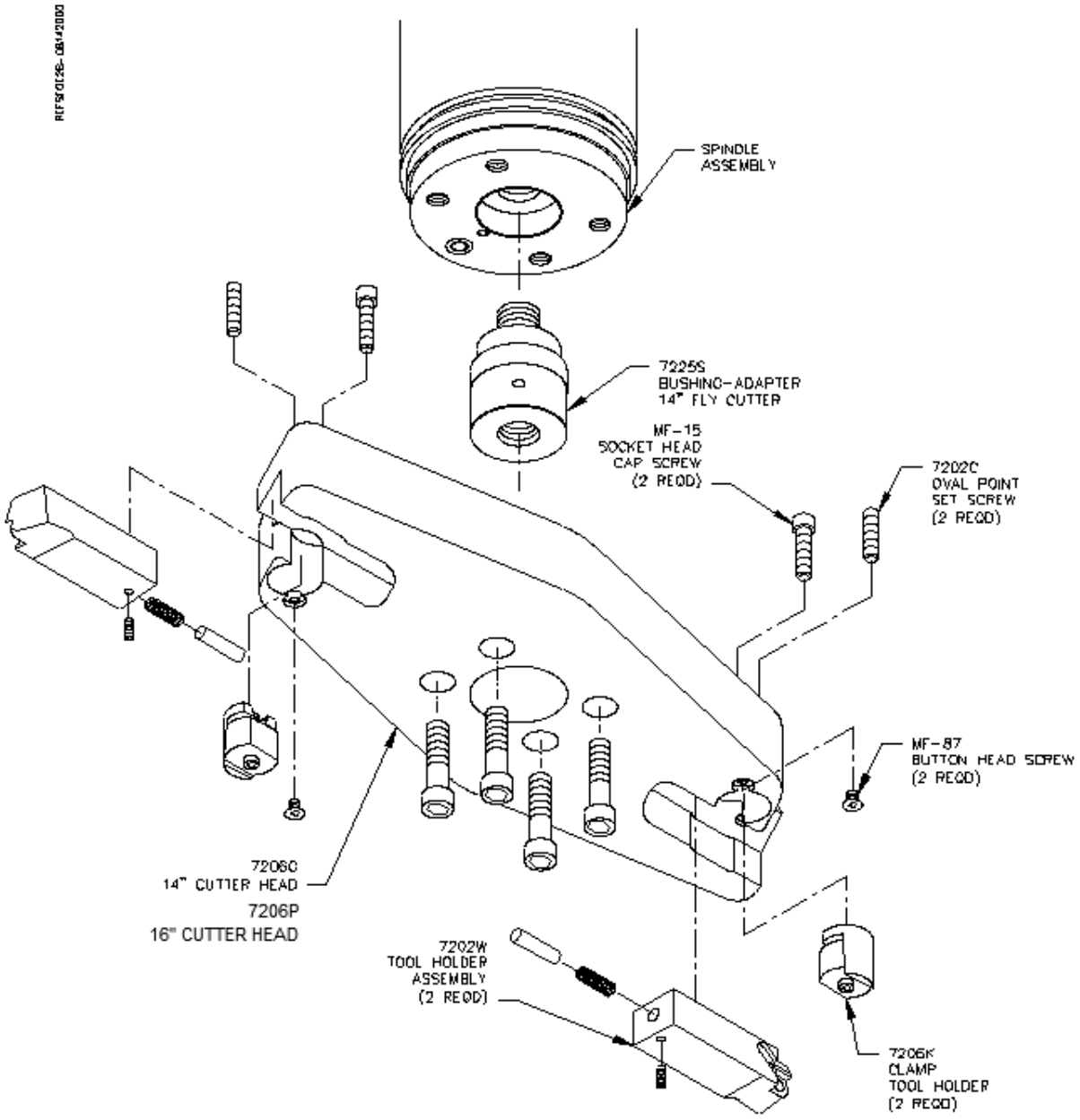
Spindle Base:



Chip Shield:


MF-68A
5/16-18 X
5/8 LG. FLAT
POINT SET
SCREW
MF-164A
JAM NUT
7038K
SPRING
PLUNGER
SPINDLE
ASSEMBLY
7206U 16"
7205D 14"
HOUSING
7038P
HOLDER
MF-60
1/4-20 UNC
X 1/4 LONG
SET SCREW
7153X
DIAL INDICATOR
7153Y
CONTACT POINT
7038L
DUST GUARD
7042F
NUT
2 REQ'D
7206Q 16"
7205B 14"
CHIP
SHIELD
501-5
PLASTIC
KNOB
MF-32
3\8-16 UNC
X 1-1/4 LG.
CAP SCREW
MF-60 1/4-20 UNC
X 3/4 LG. FLAT POINT
SET SCREW 2 REQ'D
7041J
WEAR BAND
7046
SPRING
PLUNGER
7038R
Ring Clamp
MF-163
1/4-20UNC
NUT
MF-213
3/8 DIA. X
1-1/2 LONG
DOWEL PIN
MF-66
SET SCREW
1/4-20UNC x
1-1/2"

14” Fly Cutter:



Riser Set: