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ROTTLER MANUFACTURING

FE24A BORING MACHINE

MACHINE SERIAL NUMBER

OPERATIONS AND MAINTENANCE MANUAL



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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**

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INTRODUCTION

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

It is required that the new user of the FE24A read this manual, in particular the sections concerning safety, before operating the machine.

DESCRIPTION

The model FE24A boring machine is a precision, single point tool, boring unit. It is equipped with tooling and accessories for reboring most American passenger car and truck engines, both inline and, 90 and 60 degree V-types.

FE24A machines may be readily tooled to rebore a wide variety of engines, including European and Asian engines. As well as perform various other boring operations.

This machine is designed for two purposes:

- (1) The alignment of cylinder bores to the pan rails and main bearing locations, as have been done in the original factory boring. This overcomes the many inaccuracies and out-of-alignment problems associated with clamping portable cylinder boring bars to blocks.
- (2) A considerable savings in hole-to-hole time and operator involvement as a result of fast block clamping, inverted centering fingers, push button controls, air operated spindle clamping air floated spindle base, and automatic hole-to-hole positioning.

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 operator pendant. An

auxiliary hand feed travel is located at the base of the feed screw to be used for counterboring and facing sleeves, etc.

Power required is 205-245 volt, single phase. This provides power to the variable speed AC motor controller, the horizontal stepper drive, the operator pendant controller, and various relays and solenoid valves that actuate mechanical controls on the machine to engage feeds and travels as well as clamping and floating of the spindle unit.

LIMITED WARRANTY

Rottler Manufacturing Company model FE24A parts and equipment are 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 instruction in this manual.

Standard air and electric components are warranted by their respective manufacturers

(NOTE: their individual warranty periods may vary significantly from Rottler manufacturing policy).

Tools proven 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 other 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 date of installation or set-up by a qualified service technician or sales rep.

Freight charges after the 60 day period are the customers responsibility.

SAFETY INFORMATION

CAUTION:

This machine is capable of causing severe
bodily injury.

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

As with all machine tools eye protection must be worn at all times by the operator and other personnel within the area of the machine.

In particular, the operator should be very cautious of the cutting tool area.

When boring, the machine is capable of projecting chips over 10 feet from the cutting area. Always use guards.

Operator should be very careful to provide adequate clearances around the set-up area when using the machine in an automatic mode.

The FE24A machine operates under computer control and is susceptible to extraneous electrical impulses internally or externally produced. The machine may make moves out of the control of the operator at any time. The operator should work in and around the machine with caution.

The operator and nearby personnel should be familiar with the location and operation of emergency stop button.

ELECTRICAL POWER - make sure all electrical equipment have the proper electrical overload protection.

MACHINE OPERATOR - Operator of this boring machine should be a skilled machinist craftsman, that is, well versed in the caution, care, and knowledge required to safely operate 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 boring bar.

Rottler Boring 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:

1. **TOOL SHARPENING** - Must be done with care and dexterity to get good bore results, be alert to the light pressure required for sharpening.

CAUTION:

Exposed diamond wheel is a potential hazard to your hands, fingers, and face. Eye protection is a necessity when working in this area.

2. **CUTTING TOOL AREA** - Any operation involving hands in the cutter head area, such as centering, changing centering fingers, tool insertion and removal, cutter head changes, size checking, etc., requires that both the drive motor be turned off and that the spindle clutch (spindle rotation) lever be disengaged, in it's full up position.

NOTE: periodically check that the spindle clutch is disengaged when the lower clutch cylinder is fully extended. The spindle clutch lever should stay in the up position, by its spring plunger, when the air supply to the lower cylinder is disconnected.

3. **BORING** - Eye protection must be worn during this operation and hand must be kept completely away from cutter head. Always position the chip guard for protection before starting spindle.
4. **UPPER HOUSING CONTROLS** - Learn to identify and independently operate these control functions by habit while developing the awareness of keeping your fingers and hands well clear of the rotating feed screw and the knobs, both on top of the feed screw and the spindle.

5. **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 right angle to this channel.

6. **MACHINE MAINTENANCE** - Any machine adjustment, maintenance or parts replacement absolutely requires a complete power disconnect to the machine. **THIS MUST BE AN ABSOLUTE RULE.**

EMERGENCY PROCEDURE

Assuming one of the following has occurred - tool bit is set completely off size, work or boring spindle is not clamped, spindle is not properly centered, these mistakes will become obvious the instant the cut starts.

PRESS THE EMERGENCY STOP BUTTON, LOCATED ON THE PENDANT, IMMEDIATELY.

Find out what the problem is, return the spindle to it's up position, without causing more problems. To start the machine again turn the emergency stop button and pull it out.

Be alert to quickly stop the motor in the event of a serious disruption of the boring process either at the top or bottom of the bore.

"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 to a great extent on it's proper initial installation, particularly the means by which cylinder blocks can be lifted into the machine and flow easily to and from other operations in your shop.

The proper loading arrangement and area location for your FE24A machine is extremely important.

A slow travel (6' to 10'/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 boring 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 would recommend that the open faces be placed at right angles to each other, with the machines approximately three feet apart.

UNPACKING

Use care in removing the crate from the FE24A machine, being careful not to use force on any part of the spindle unit. This is particularly true of the square tube containing the micro switches on the back of the machine.

If equipped with the optional SJ-4 sharpening fixture, remove from the deck and preferably place at a bench close to the machine. It will require 115 volt single phase AC current.

Remove the tool box, parallels, V-fixture, 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. Also, thoroughly clean the cylinder block clamp arm assemblies. Rust inhibitor is applied to the machine at the time of shipment, and any of this inhibitor left on the machine will result in considerable collecting of cast iron dirt and possible slipping of the clamp arms.

SHIPPING HOLD DOWN BOLT

Remove sheet metal cover #502-35-41A on the back side of the spindle unit, by removing it's four round head screws.

Pull out the cotter key through the slotted nut of the roller key assembly and loosen the nut. Turn the machine on, switch the auto/neutral/float switch to neutral. Hand tighten the nut to take out all of the play from the roller key assembly. Loosen the nut approximately 1/12 of a turn. Replace the cotter key in the appropriate slot. Now move the spindle unit from side to side and further clean the rust inhibitor from the table.

Switch the float/neutral/clamp switch to clamp and check for proper operation of the clamp assembly and proper release and movement of the base when switched back to float.

NOTE

Clamp cylinder rods should move a max. 5/8 inch when spindle base is clamped.

Replace sheet metal cover on spindle unit.

LEVELING

Four square-head set screws (502-1-12A), jam nuts (502-1-12F), and chamfered washers (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 chamfered washers below.

Use a precision level and level the upper table within .003" 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 FE24A boring 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.

Check the gauge on the air regulator next to the filter on the lower portion of the enclosure to see if it is set to approximately 90 to 95 psi pressure after the air line is attached.

POWER SUPPLY

This machine requires 205 to 245 VAC single phase, 50 / 60 hz. (measured between L1 and L2). Current requirement is 15 amps. The machine is not sensitive to neutral / hot leg phasing. Two legs of a 205 - 245 VAC 3 phase supply can be used, as long as the voltage from each leg to ground is between 100 - 120 VAC.

If the voltage is outside the 205 - 245 VAC range the machine will not operate correctly and may be damaged. Check building supply voltage at peak usage.

Connect single phase wiring to the 4 pole terminal strip in the middle right side of the electrical enclosure. The power should be isolated from sources of electrical noise and power surges, arc welders for example.

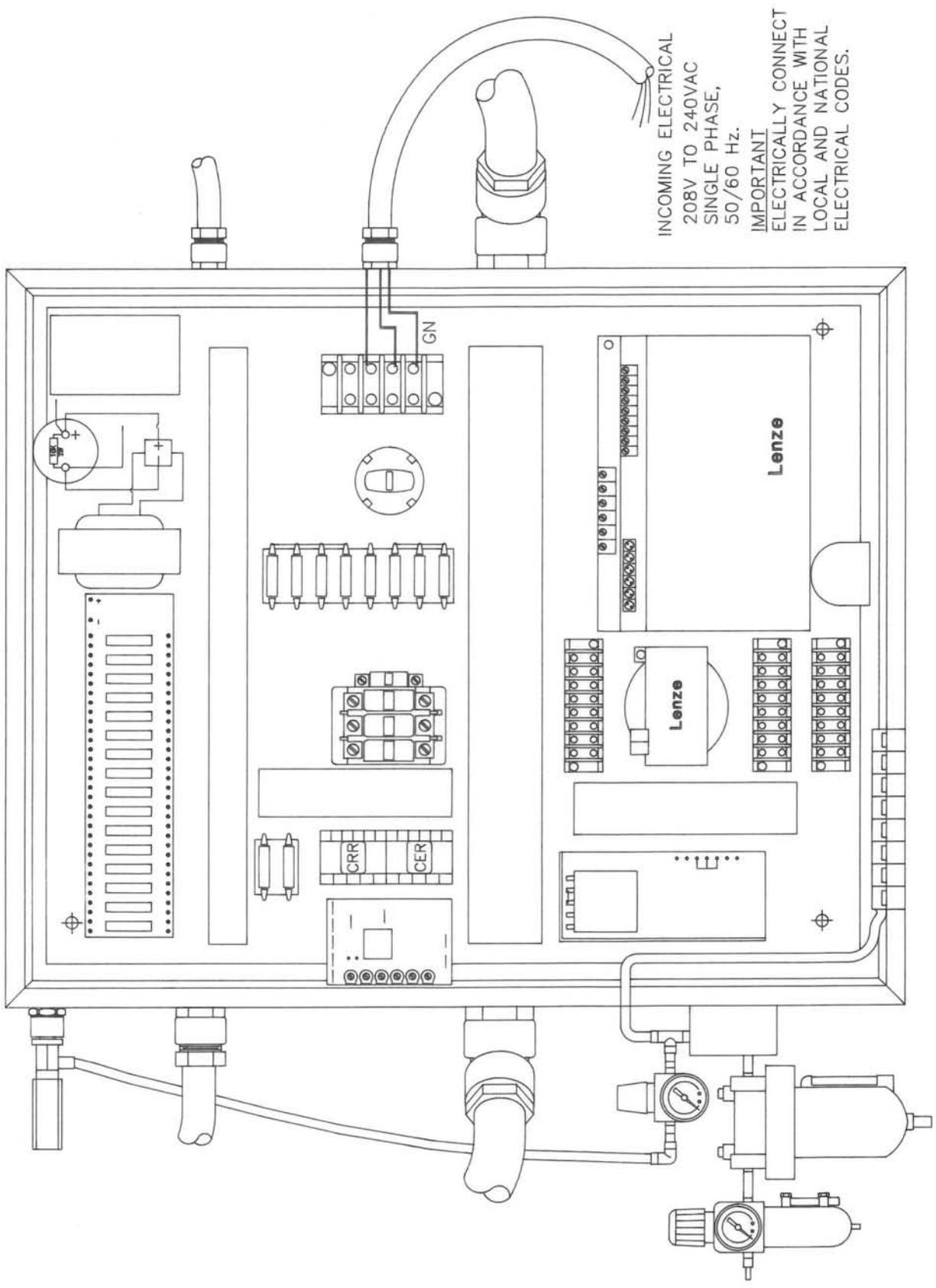
NOTE:

This machine must be connected to a good, isolated earth ground, such as a separate ground rod for this machine only. Connect the earth ground wire to the terminal with the green ground wire, located on the middle right side of the electrical enclosure.

CAUTION:

Do not attempt to attach three phase. The three phase spindle motor receives its power from a three phase variable frequency inverter which is powered by a single phase supply.

FE24A 39



INCOMING ELECTRICAL
208V TO 240VAC
SINGLE PHASE,
50/60 Hz.
IMPORTANT
ELECTRICALLY CONNECT
IN ACCORDANCE WITH
LOCAL AND NATIONAL
ELECTRICAL CODES.

NOTE:

We suggest that before attempting any cylinder boring, the operator should actuate the controls to become familiar with the operation of the machine. (Following the descriptions are related illustrations.)

MAIN POWER - SWITCH

The *Main Power* switch is located on the door of the main electrical enclosure. This switch must be turned off in order to open the door. To reset the machine from an error condition turn the main power switch off, wait 40 seconds, then turn it back on.

POSITION DISPLAY

This display consists of four red LED numbers. Six types of information are obtained from this display:

1. When the machine is first turned on, or when the power is interrupted, the display will show **P--**. This reminds the operator to verify that the desired program number is being used. The program number may change when the power is turned off or the Emergency Stop pressed. Select the desired program before continuing.
2. **Horizontal Position -**
Pressing the *Horizontal Zero* button will switch the display from vertical to horizontal and also zero the position. The letter 'H' will light when the horizontal display is active.

The horizontal display will remain active until a vertical move is made.
3. **Vertical Position -**
Pressing the *Vertical Zero* button will switch the display from horizontal to vertical and also zero the position. The letter 'V' will light when the vertical display is active.

The vertical display will remain active until a horizontal move is made.

4. **Program Stop Positions -**

The *Stop Positions* can be viewed by selecting the desired program number.

Press the *Program Select* button and hold. Turn the *Program/Data Select* knob to the desired program number, and release the *Program Select* button. Now use the *Program/Cycle* selector to view the vertical or horizontal stop positions.

5. **Program Number -**

The program number in use, will be displayed when the *Program Select* button is pushed with the *Program/Cycle* selector in the *Cycle/1* position.

6. **Error -** The display will show an error code to aid in trouble shooting and diagnosing problems. (see maintenance/trouble shooting).

PROGRAM SELECT - BUTTON

When using the *Program Select* button the *Float/Neutral/Clamp* switch must be in the *Clamp* position. Push the *Program Select* button, when the *Program/Cycle* selector is on *Cycle/1*, to select programs. When the program number is displayed the *Program Cycle* selector can be turned to view the actual stop locations.

When the machine is first turned on the position display will show **P--**.

Press the *Program Select* button and hold. Turn the *Program/Data Select* knob to the desired program number, and release the *Program Select* button. Verify the correct program number is being displayed, then push the *Program Select* button again to put it in actual use.

HORIZONTAL ZERO - BUTTON

Following are the uses of the zero button:

Press the *Horizontal Zero* button when programming, to clear any previously set horizontal stops in the current program. (See programming directions for more details).

The button is also used to zero the position display before running an automatic program. After the machine is oriented, to the centering position of the first hole, press the *Horizontal Zero* button.

The maximum distance the machine will travel to the right of zero without pressing the *Horizontal Zero* button is -9.99 inches. When -9.99 is encountered the machine will stop. Press the *Horizontal Zero* button and the position display will zero enabling the machine to be moved to the right until -9.99 is reached again.

VERTICAL ZERO - BUTTON

Following are the uses of the zero button:

Press the *Vertical Zero* button when programming, to clear any previously set vertical stops in the current program. (See programming directions for more details).

The button is also used to zero the position display before running an automatic program. After the machine is oriented, to the centering position of the first hole, press the *Vertical Zero* button.

The maximum distance the machine will travel below zero, is 17.00 inches or the distance of the current programmed down stop. Press the Zero button or increase the down stop distance to travel further.

PROGRAM/CYCLE - SELECTOR

The *Program/Cycle* selector must be set to *Cycle/1* to run a program automatically. (See programming directions for details on using this selector for programming). Once a program has been accessed, use this switch to check the position values for each stop location.

PROGRAM DATA SELECT - KNOB

The *Program/Data Select* knob is used to change the numbers on the display. Rotate it to select the desired program, or stop distances for entry. (See programming/operating directions for more details).

LEFT RAPID TRAVEL - BUTTON

This button has two functions as described below.

1. Push and hold the button to travel the spindle base to the left. Release to stop travel. The spindle base will stop at the current programmed horizontal stop positions.
2. When in programming mode the *Left Rapid Travel* button will blink. It is used to select the left set of digits in the display, for changing with the *Program/Data Select* knob. (See programming directions for more details).

RIGHT RAPID TRAVEL - BUTTON

This button has two functions as described below.

1. Push and hold the button to travel the spindle base to the right. Release to stop travel. The spindle base will stop at the horizontal 00.00 position. When the spindle base is moved right of zero the display will show negative numbers. When the display reaches -9.99 the spindle base will stop. Press the *Horizontal Zero* button and the position display will zero enabling the machine to be moved to the right until -9.99 is reached again.
2. When in programming mode the *Right Rapid Travel* button will blink. It is used to select the right set of digits in the display, for changing with the *Program/Data Select* knob. (See programming directions for more details).

DOWN RAPID TRAVEL - BUTTON

Push and release this button to travel down a short distance. Push and hold this button to travel a longer distance. The spindle will travel down to the 00.00 position (or to the current down stop position if the machine is already below 00.00).

When the spindle is within 00.40" of the 00.00 position it will slow down until 00.00 is reached.

UP RAPID TRAVEL - BUTTON

Push and release this button to travel up a short distance. Push and hold this button to travel a longer distance. The spindle will travel to the current up stop or the *Up Limit Switch*.

CYCLE START/STOP - BUTTON**CAUTION:**

Float/Neutral/Clamp switch must be in *Clamp* position before starting an Automatic Cycle.

The *Cycle Start/Stop* button starts the automatic cycle. At the beginning of a program, the spindle must be in the centering position of the first bore. Press horizontal zero and vertical zero. Press the *Cycle Start/Stop* button to begin.

CAUTION:

The *Cycle Start/Stop* button can only be used to stop the machine when it is traveling horizontally to the left.

To stop the machine during any operation other than horizontal left travel, press the *Emergency stop* button. (Restart as described on page 2.4)

ROTATE FEED - BUTTON

The Rotate feed button is used to bore single holes. When the Rotate Feed button is pressed the spindle motor will start and the feed gear will engage. If the Rotate Feed button is pressed while the machine is feeding it will stop. If the feed is not stopped, the machine will bore until the down stop is reached then retract out of the cylinder.

AUTO RETRACT - BUTTON

Auto Retract is used when not running an automatic cycle (for instance doing single bores) to return the spindle to the upper limit. When the cutter head has reached the bottom of the cut press the *Auto Retract* button and the machine will index the cutting tool to the right side of the bore, offset the spindle to the left, then rapid the spindle up out of the bore.

CENTER - BUTTON

The *Center* button centers the spindle in the bore. The spindle base clamp will turn off, and the spindle base float will turn on. The centering fingers will extend and center the spindle. The spindle base clamp will turn back on, and the centering fingers will retract.

CAUTION:

Centering fingers must be inside of a bore when the *Center* function is used.

If a centering sequence is performed (using the *Center* button) just before *Cycle Start/Stop* is pressed, the spindle will not center again in the first bore. It will center in the following bores of the automatic cycle.

FLOAT/NEUTRAL/CLAMP - SWITCH

This switch controls the clamp system for the spindle base. Following is an explanation of the three switch positions.

1. **CLAMP****CAUTION:**

When boring manually out of an automatic cycle and at all times when running in an automatic cycle this switch must be in the *Clamp* position.

The *Clamp* holds the spindle to the table top when the machine is boring. The switch can be left in the *Clamp* position to make horizontal moves. The controller will automatically turn the *Clamp* on and off as necessary.

2. NEUTRAL

When the switch is in *Neutral* the spindle unit is unclamped and the float turned off. When not running an automatic cycle, *Neutral* is used for centering the spindle in a bore using a dial indicator.

3. FLOAT

When the switch is in *Float* the spindle unit is unclamped and floats on a cushion of air. The *Float* position is used to manually center the spindle in a hole, using the *Manual Centering* knob.

SPINDLE RPM KNOB

The *Spindle RPM* knob regulates the spindle speed from 150 to 700 RPM. The *Spindle RPM* can be changed at any time, including during a bore cut.

EMERGENCY STOP - BUTTON

The *Emergency Stop* button will stop the machine in an emergency situation. Power will be turned off to the motor drives, and to the computer processor located in the large electronic enclosure.

Wait 20 seconds before turning the machine back on. The machine requires this time to reset.

To turn the machine back on again turn the Emergency Stop button clockwise and it will pop back out.

UPPER - LIMIT SWITCH

The *Upper* limit switch is the top switch on the tower. It is the switch the machine normally contacts when the spindle retracts vertically.

UPPER OVER TRAVEL - LIMIT SWITCH

The *Upper Over Travel* limit switch is the middle switch on the tower. If the *Upper* limit switch should fail the *Upper Over Travel* will shut the machine down to prevent mechanical damage. The machine will not move after this switch has been contacted.

To start the machine again actuate the manual hand feed and lower the spindle until the stop rod clears the limit switch. Operate the controls and run the spindle down a couple of inches then run the hand feed back up to it's full up position.

LOWER OVER TRAVEL - LIMIT SWITCH

The *Lower Over Travel* limit switch is the bottom switch on the tower. If the spindle should travel past the programmed lowest stop point the *Lower Over Travel* switch will shut the machine down to prevent mechanical damage. The machine will not move after this switch has been contacted.

To start the machine again; Press the E-stop button. Go around behind the machine and turn off the disconnect switch on the enclosure door. Loosen the set screw for the lower stop rod (note its adjustment position before moving). Slide the stop rod down past the limit switch. Turn power back on and press the up button. Once clear of the limit switch stop the machine and reinstall the stop rod.

STOP ROD

The limit switch *Stop Rods* are set at the factory and should not be changed.

CENTERING KNOB

The *Centering Knob* at the top of the upper spindle housing, operates the centering fingers when turned clockwise. Be careful not to over-extend these fingers when the spindle is not in the a bore or they will come completely out of the pinion drive.

CAUTION:

Main Spindle Drive Motor must be stopped when centering. Spindle rotation engagement could injure the operator's hands or damage cutter head parts.

FEED LEVER

The *Feed Lever* is located on the center of the right side of the upper housing. It is operated automatically and is in feed when the machine is turned on, but can be placed in neutral by manually lifting and holding it in neutral (middle position) or by use of it's

adjusting screw. To turn on machine when the feed lever is in neutral, press the *Cycle Start/Stop* button. Automatic feed will not operate.

MANUAL HAND FEED

The *Manual Hand* feed travel is available for facing sleeves and counterboring, etc.

It is completely separate from the powered spindle travel and should always be returned to the full up position after being used, before the power up travel returns the spindle to the top.

CAUTION:

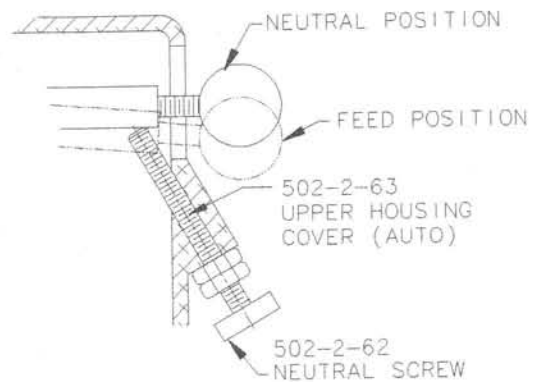
The automatic feed lever must be disengaged when operating this short hand feed.

The standard procedure to operate the hand feed is to Rapid travel close to the cutting point. Turn in Neutral screw placing the feed lever in neutral. Press Rotate/ Feed button. Operate the hand feed to make the cut. Then return the hand feed, and then the power feed to the top.

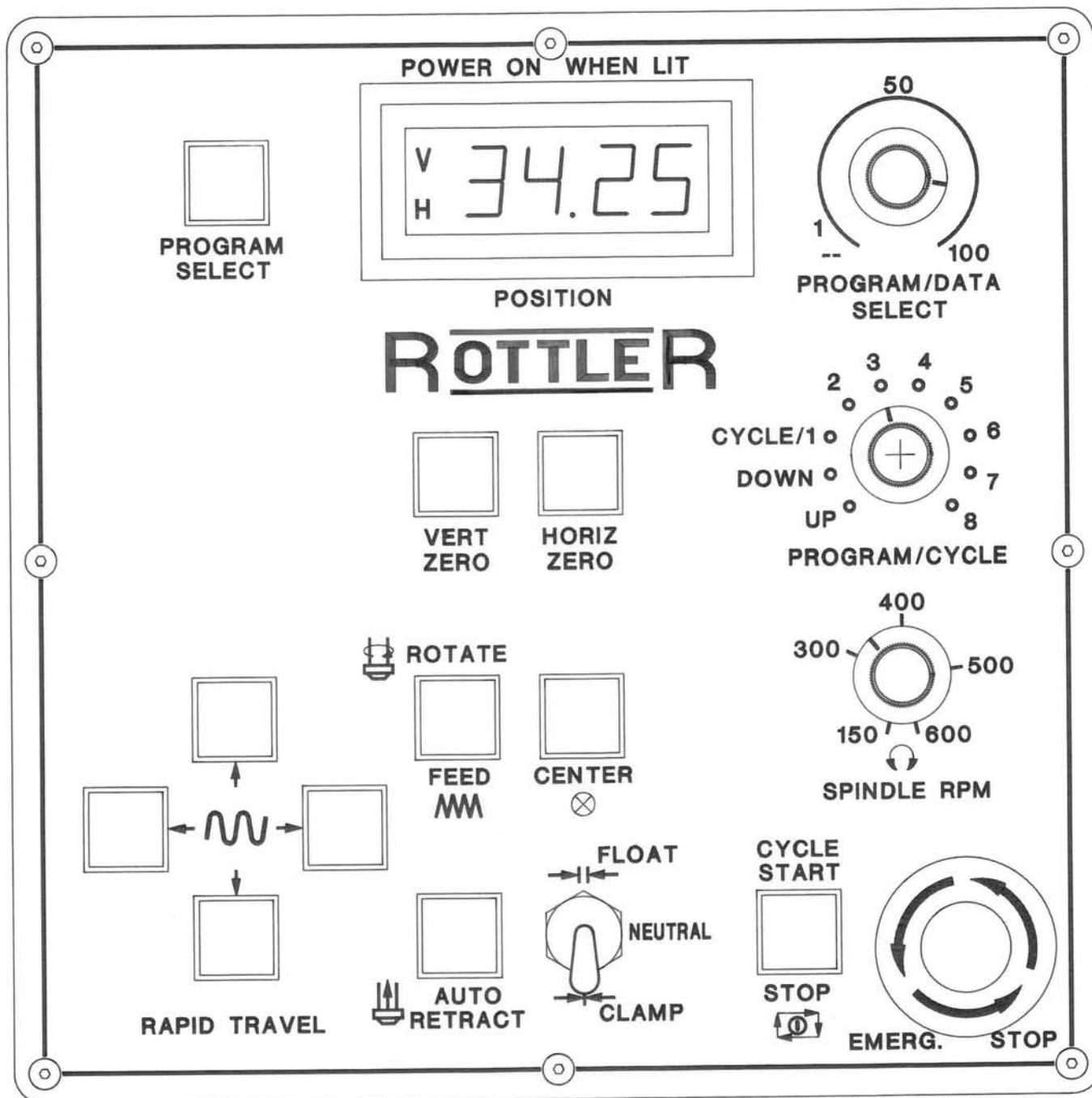
NEUTRAL SCREW

This machine is provided with an adjusting screw which is preset at the factory, to hold the shift lever (500-38-1) in neutral position when using the hand feed. The screw is inserted in the upper housing cover (502-2-63) as shown.

When the machine is held in neutral, all controls will operate as usual, with the exception of the automatic power feed.



Pendant Controls Illustration



Upper Housing Controls Ullustration

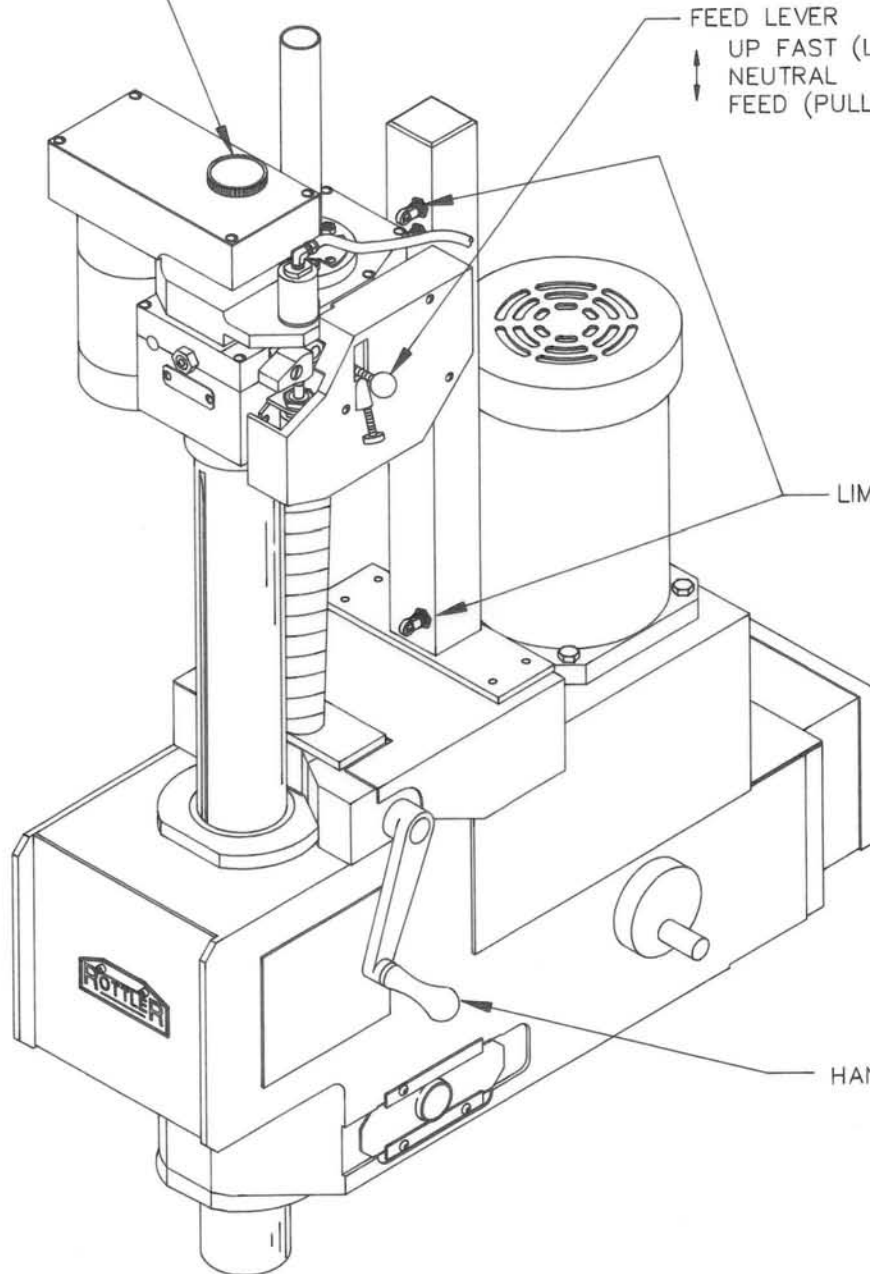
REFFE24A41-082792

CENTERING KNOB
TO EXTEND FINGERS
ROTATE CLOCKWISE

FEED LEVER
UP FAST (LIFT UP)
NEUTRAL
FEED (PULL DOWN)

LIMIT SWITCHES

HAND FEED



POWER-UP & PROGRAMMING INSTRUCTIONS FOR THE FE24A

First measure the cylinder spacing (center to center) on the engine block you are programming.

Remember to always measure from the first cylinder. (For example: Measure the distance from the first cylinder to the second

cylinder, then from the first cylinder to the third cylinder... and so on for all of the cylinders).

These measurements can be taken with a good tape measure and should be made to the closest 1/8 of an inch.

The more accurate the measurement the less the wear and tear on the machine. Enter the measurements in the table below and convert any fractions to decimals.

	Measurement	Decimal Equivalent
1st to 2nd cylinder		
1st to 3rd cylinder		
1st to 4th cylinder		
1st to 5th cylinder		
1st to 6th cylinder		

There are two dimensions that must be obtained to determine the vertical down stop dimension.

Dimension One is the distance from the cutting tool nose to the top of the engine block when the spindle is at the centering position. Always use 1/8 of an inch, or in decimals, .13 inch for this distance.

Dimension Two is the distance from the top of the block to the bottom of the cylinder.

Measure the bore depth from the top of the block to the deepest location of the bore. On some blocks you must increase this dimension and bore deeper than the cylinder to provide clearance for the honing process.

CAUTION:

Some blocks have main bearing casting areas that interfere with the cutterhead when the cutterhead is at the bottom of the bore.

Usually the situation occurs in the second or third bore. It may be necessary to use an offset toolbit on some types of blocks (see optional tooling).

Following is a list of blocks that are known to have interference situations:

Chrysler 173

Add dimensions one and two:

Dimension one .13

Dimension two

Down Stop =

The Up Stop dimension is the distance the spindle must travel up, beyond the centering stop, for the cutterhead to clear the top of the engine block and allow it to travel horizontally to the next hole.

If you are using the standard 2 7/8" diameter production cutterhead and there are no bolts etc., protruding from the top of the engine, -

1.50 inches will work for the Up Stop Dimension. The control comes with this dimension as standard.

Up Stop = -1.50

NOTE:

The Up Stop should always be a negative number. The vertical zero position is the centering position. Positive numbers are down and negative numbers are up.

Now that you have determined the stop dimensions it is time to program the control. The directions assume the power switch is turned off.

BUTTON OR KNOB	DESCRIPTION
Main Power switch	Turn switch clockwise to turn on machine. Display will show P-- .
Float/Neutral/Clamp	Switch to Clamp .
Program/Cycle selector	Turn to Cycle/1 .
Program Select button	Press and Hold . Display will show PXX . (XX stands for a random number).
Program/Data Select knob	While holding the Program Select button turn the Program/Data Select knob to display the program number to be used (00-99).
Program Select button	Release when the desired program number has been displayed. Display will show the selected program number. This step also programs the first cylinder dimension as zero.
Program/Cycle selector	Turn to position 2. This step is for programming the dimension to the number 2 cylinder. The display shows what the previously programmed stop dimension is.
Horizontal Zero button	Push the Horizontal Zero button and the Left and Right Rapid Travel buttons will start to flash. This indicates the control is ready to enter the stop values. The display should read 00.00. (Pressing the Horizontal Zero button zeros the all of the horizontal stops in the selected program.)
Left Rapid Travel button	Press the Left Rapid Travel button, and turn the Program/Data Select knob to enter in the left two digits. (whole numbers).
Right Rapid Travel	Push the Right Rapid Travel button, and turn the Program/Data Select knob to enter in the right two digits. (decimal numbers).

Program/Cycle selector	Turn the <i>Program/Cycle</i> selector to position 3. Program the 3rd and all remaining cylinders in the same way as described previously.
Program/Cycle selector	Turn the <i>Program/Cycle</i> selector to the Down position. Enter the down stop dimension by using the left and right rapid travel buttons described below.
Left Rapid Travel button	Press the <i>Left Rapid Travel</i> button, and turn the <i>Program/Data Select</i> knob to enter in the left two digits. (whole numbers).
Right Rapid Travel	Push the <i>Right Rapid Travel</i> button, and turn the <i>Program/Data Select</i> knob to enter in the right two digits. (decimal numbers).
Program/Cycle selector	Turn the <i>Program/Cycle</i> selector to the Up position. - 1.50 will be displayed automatically. Notice it is a negative number which makes the spindle stop above the vertical zero (centering position).
Program Cycle selector	Turn the <i>Program/Cycle</i> selector to the <i>Cycle/1</i> position. The display will show the program number that is being used. Turn the <i>Program/Cycle</i> selector to all of the positions to check for proper dimensions.
Program Select button	Push the <i>Program Select</i> button and the display will show the current vertical or horizontal position.

The machine is now programmed and ready to run an automatic cycle.

Left, Right, Up, Down	Use the <i>Left, Right, Up, and Down</i> buttons to move the machine to the first cylinder and down to the centering position. The cutting toolnose should be 1/8 inch above the block. Make sure the centering travel of the machine is adequate to center in the cylinder. Adjust the position of the machine horizontally or move the block if necessary.
-----------------------	---

Note:

It is important that the spindle nose be positioned accurately at the 1/8 inch dimension mentioned above. If it is closer than 1/8 the machine will bore deeper. If it is up from the 1/8 dimension the machine will stop short at the bottom of the bore. This may be critical when machining blocks with minimum clearance at the bottom of the bore.

Vertical Zero button	Push the <i>Vertical Zero</i> button to zero the vertical position.
Horizontal Zero button	Push the <i>Horizontal Zero</i> button to zero the Horizontal position.
Check	Check the following for security: Block Clamps (page 3.8)

Tool holder in cutter head (page 3.8)

Eye protection on

Float/Neutral/Clamp switch = Clamp

RPM as desired

Cylinder within centering range

Cycle Start/Stop button

Press the Cycle *Start/Stop* button and the machine will center in the cylinder and start the boring process. The cycle will continue through the entire program unless the operator stops the program. The *Cycle Start/Stop* button can only be used to stop the machine when it is traveling horizontally to the left. Press the *Cycle Start/Stop* button again to restart the machine. The *Emergency stop* button must be used to stop the machine during any other part of the program. (Restart as described on page 2.4.)

At the end of the automatic cycle the spindle base will return to the right side of the machine (Horizontal zero). The display will show P--.

Power-up and Using an Existing Program

CAUTION:

Some blocks have main bearing casting areas that interfere with the cutterhead when the cutterhead is at the bottom of the bore. Usually the situation occurs in the second or third bore. It may be necessary to use an offset toolbit on some types of blocks (see optional tooling).

Following is a list of blocks that are known to have interference situations:

Chrysler 173

The instructions assume the power switch is turned off.

BUTTON OR KNOB	DESCRIPTION
Main Power switch	Turn switch clockwise to turn on machine. Display will show P--
Float/Neutral/Clamp	Switch to <i>Clamp</i> .
Program/Cycle selector	Turn to <i>Cycle/1</i> .
Program Select button	Press and Hold . Display will show PXX. (XX stands for a random number).
Program/Data Select knob	While holding the <i>Program Select</i> button turn the <i>Program/Data Select</i> knob to display the program number to be used (00-99).

Program Select button	Release when the desired program number has been displayed. Display will show the selected program number.
Program/Cycle selector	Turn to stop positions as required to verify the correct program and dimensions have been selected. The display will show the value in each stop position.
Program/Cycle selector	Turn to <i>Cycle/1</i> . Display will show the current program number.
Program Select button	Press the <i>Program Select</i> button and the display will show the current Vertical or Horizontal position.
Left, Right, Up, Down	Use the <i>Left, Right, Up, and Down</i> buttons to move the machine to the first cylinder and down to the centering position. The cutting toolnose should be 1/8 inch above the block. Make sure the centering travel of the machine is adequate to center in the cylinder. Adjust the position of the machine horizontally or move the block if necessary.

Note:

It is important that the spindle nose be positioned accurately at the 1/8 inch dimension mentioned above. If it is closer than 1/8 the machine will bore deeper. If it is up from the 1/8 dimension the machine will stop short at the bottom of the bore. This may be critical when machining blocks with minimum clearance at the bottom of the bore.

Vertical Zero button	Push the <i>Vertical Zero</i> button to zero the vertical position.
Horizontal Zero button	Push the <i>Horizontal Zero</i> button to zero the horizontal position.
Check	<p>Check the following for security:</p> <p>Block Clamps (page 3.8)</p> <p>Tool holder in cutter head (page 3.8)</p> <p>Eye protection on</p> <p>Float/Neutral/Clamp switch = Clamp</p> <p>RPM as desired</p> <p>Cylinder within centering range</p>
Cycle Start/Stop button	Press the <i>Cycle Start/Stop</i> button and the machine will center in the cylinder and start the boring process. The cycle will continue through the entire program unless the operator stops the program. The <i>Cycle Start/Stop</i> button can only be used to stop the machine when it is traveling horizontally to the left. Press the <i>Cycle Start/Stop</i> button again to restart the machine. The <i>Emergency stop</i> button must be used to stop the machine during any other part of the program. (Restart as described on page 2.4.)

At the end of the automatic cycle the spindle base will return to the right side of the machine (Horizontal zero). The display will show P--.

To bore the same block again or bore the other bank of a V-block do the following.

Fixture	Change the V-block from one bank to the other or load another of the same make block into the machine. Position the block so the first cylinder is located below the cutterhead.
Down Rapid Travel button	The display should be showing P--. Push the <i>Down Rapid Travel</i> button and the machine will rapid down to the centering stop. The last program used will be the active program.
Check	Check the following for security: Block Clamps (page 3.8) Tool holder in cutter head (page 3.8) Eye protection on Float/Neutral/Clamp switch = Clamp RPM as desired Cylinder within centering range
Cycle Start/Stop button	Press the <i>Cycle Start/Stop</i> button and the machine will auto-center and repeat the entire program.

MANUAL OPERATION

We recommend, particularly for operators unfamiliar with boring bar, to practice on a junk block in order to become familiar with the controls and procedures of the boring machine.

LOADING IN-LINE CYLINDER BLOCKS

Place an inline block in the machine on top of the 5" parallel fixture. Apply weight to the top of the block at each end to be sure the block is supported evenly and does not rock. Dirt or burrs under the pan rails will result in the block not being clamped properly to all four points of the pan rails. (Please note it is necessary to properly deburr and clean pan rails at support points, as opposed to cleaning the top of the cylinder block for a portable bar.) You will find that some blocks will rock on the parallel fixture and should be shimmed at proper front support to eliminate this problem.

Locate the block on the parallels so that the cylinders are within the 1-1/2" (in-out travel) centering range of the spindle.

CAUTION:

Blocks can be positioned, forcing the spindle base to it's travel limits, causing the spindle not to center. This will cause a mechanical crash.

BLOCK CLAMPS (see illustration)

Position clamp arms so the front of the shoe will contact the block on the ends approximately in the middle.

Tighten clamp arm handles. Lower the shoe onto the block with the cam handle straight up. Tighten clamp leg handles. Lower the cam handle, to clamp the block. If the block is exceptionally long, such as in-line 8 cylinders, operate the two cam handles simultaneously so that locking the first handle does not tend to tilt up the opposite side of the block.

The parallel fixture is designed with an "L" shape. The purpose of this is to extend the back portion of the "L" outward to prevent

cylinder blocks from tilting up when the first clamp is applied.

MICROMETER

Determine the cylinder bore size you wish to cut. Place a tool bit into the tool holder.

Place the tool bit and tool holder into the micrometer. Loosen the tool bit lock screw (DO NOT ALLOW the tool bit to snap against the anvil). Set the micrometer head to the desired bore size. Lightly tighten the tool bit lock screw. Back off micrometer head. Firmly tighten tool bit lock screw. Recheck micrometer reading.

Choose a tool holder that will require minimum tool bit overhang. (We recommend a maximum tool bit overhang of 5/8" outside of tool holder.)

Before setting, make sure the tool bit is properly sharpened. (See tool sharpening instructions).

NOTE:

This micrometer is .050 to a revolution rather than .025 as on a conventional micrometer.

Your boring bar micrometer, as with any other measuring tool, should be used delicately and with care, to be assured of great and continued accuracy.

BORING

Insert the tool holder into the cutter head and push back to the index point. Tighten the tool lock screw with the plastic handled hex driver provided in your tool box.

Use the Left, Right, Up, and Down buttons to position the spindle at the centering position, (centering fingers approximately 1/4" inside the bore).

Move the Float/Neutral/Clamp switch to clamp. Press the Center button. The spindle will center, then the centering fingers will retract.

Use the Up Rapid Travel button to raise the spindle out of the bore (DO NOT move spindle base).

Set the spindle RPM to the desired speed (RPM can be changed at any time even while boring).

Press the Rotate/Feed button. The machine will start boring.

When the machine has finished cutting promptly press the Auto Retract button.

If a cut of .005 or less, on diameter, is to be taken the following centering procedure is required. Move Float/ Neutral/Clamp switch to it's neutral position, then center spindle by using a dial indicator attached to the cutter head. Move Float/Neutral/ Clamp switch to the clamp position.

BORING LARGE TRUCK BLOCK

The FE24A Boring Machine has the capacity to bore truck engines such as the in-line Mack and the in-line GMC series 71. It is necessary when boring these large blocks to remove the wear pads (502-1-21) and place the block directly on the main base (502-1-20). The blocks are then bored according to the instructions.

DEPTHS OF CUT

Cuts under .040" on diameter can be taken using the R4 insert style tool bits. 600 RPM should be used for diameters up to 5". Heavy cuts up to .180" on diameter may be taken using the R8 brazed carbide tool bits. Slower rpms must be used, between 150 and 350 RPM, depending on diameter and depth of cut.

STUB BORING BAR

Heavy cuts up to .150 on the diameter can be made with the stub boring bar using low spindle speed.

CENTERING FINGERS REMOVE AND REPLACE

CAUTION:

Motor must be turned off and spindle clutch lever must be in the up detent position during any centering finger operation.

Centering fingers are removed by rotating the centering knob clockwise until fingers can be pulled out. When they are replaced in the cutter head, they must be placed in the respective numbered slots, with the teeth facing toward the center and the numbers facing up. First rotate centering knob clockwise and then counter-clockwise to insure that fingers enter pinion teeth simultaneously.

CAUTION:

The centering fingers must be installed in the correct slot with the number facing up. If not, the centering pinion will operate in the reverse direction, causing the centering fingers to come out when the machine is boring. This will damage the machine and the block. Be sure that a clock-wise rotation of the centering knob extends the fingers.

CENTERING ACCURACY CHECK

Centering fingers should be kept accurate, to center the new bore within .002" of the center of the worn hole. Centering fingers should be lapped periodically to obtain near perfect centering.

Check the centering fingers by boring a hole and then without moving the spindle unit, extend the fingers against the wall, checking to see that each finger tip will lock a .001" shim. If the fingers will not do this, they should be lapped. Rotate them back and forth in the test bore while pressing the fingers against the wall. If this does not quickly bring contact and pressure to all the fingers, file carefully the high finger or fingers, and repeat the lapping process.

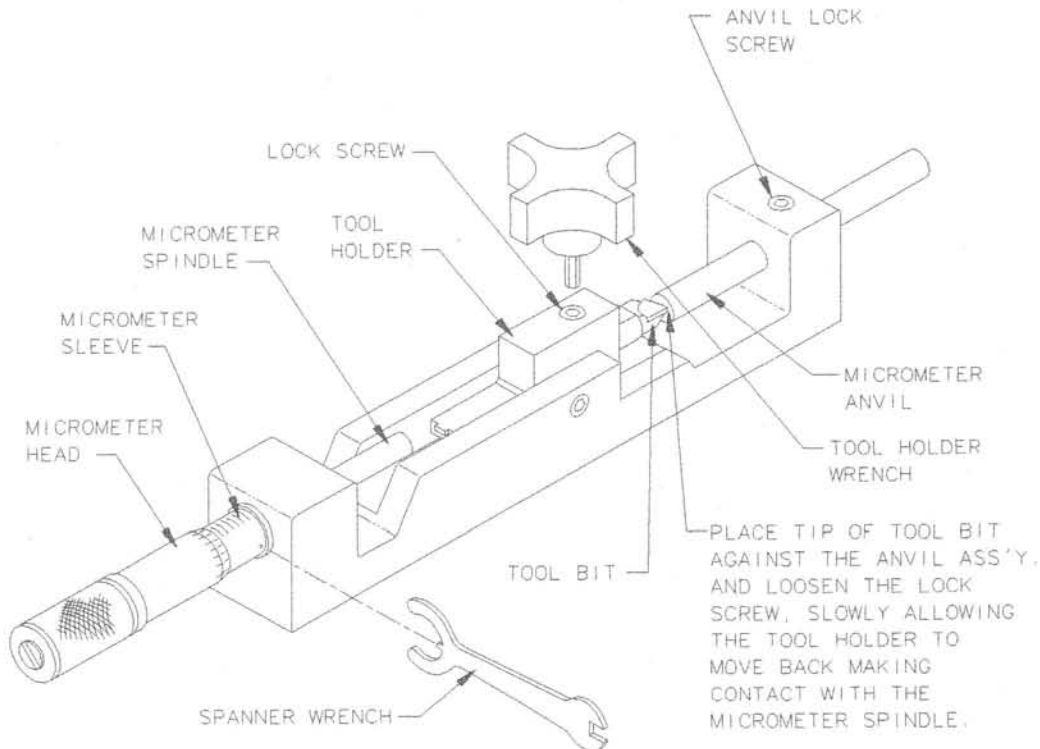
MICROMETER

The boring micrometer should be used delicately to assure continued accuracy.

Inserting the tool into the micrometer is very important. Do not let the tool bit snap against the anvil. This will cause nicks in the anvil and reduce the accuracy of the micrometer.

Lightly tighten the tool bit lock screw, back off the micrometer head, then fully tighten toolbit.

After a period of use the tool bit will force a depression in the micrometer anvil. This will result in inconsistent sizes, particularly after resharping the bit. As necessary turn the anvil slightly so that a flat surface is always exposed to the tip.

**OPTIONAL CAPACITY TO 8" DIAMETER**

For setting FE24A micrometer to high and low scale using micrometer with a 2.90" to 6.00" reading.

CAUTION:

The standard for your FE24A bar is set. Do not change it, except when recalibrating the micrometer, then it should be reset to match the micrometer.

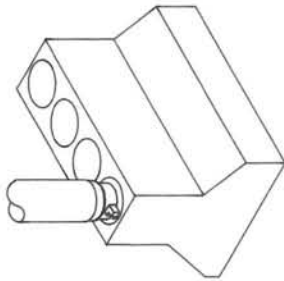
To bore from 2.90 to 6.00, place standard in the micrometer and adjust the anvil so the micrometer reads 6.00".

NOTE: Read directly on the micrometer sleeve.

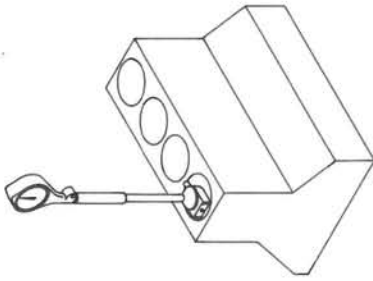
To bore from 4.9" to 8.0" place the standard in the micrometer and adjust the anvil so the micrometer reads 4.0". The micrometer will read 2.9" to 6.0" but will actually set tool from 4.9" to 8.0". When the micrometer is set for larger bores, remember the bar will bore 2" larger than the micrometer reads.

PROCEDURE FOR CALIBRATING MICROMETER

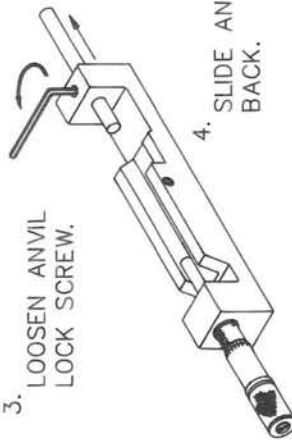
1. USE THE BORING MACHINE TO BORE A HOLE IN A SCRAP BLOCK. WITHOUT CHANGING ANY SIZE SETTING REMOVE TOOL HOLDER.



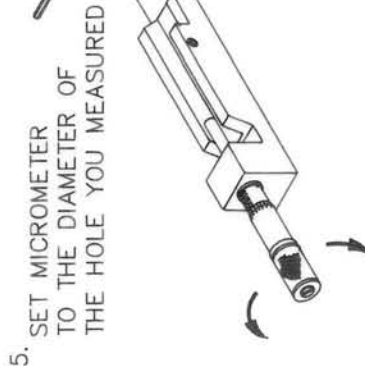
2. MEASURE THE HOLE THAT YOU BORED.



3. LOOSEN ANVIL LOCK SCREW.

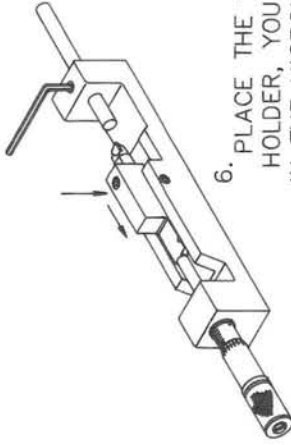


4. SLIDE ANVIL BACK.

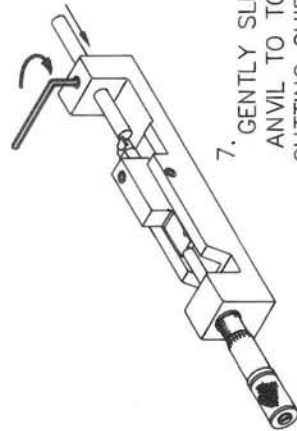


5. SET MICROMETER TO THE DIAMETER OF THE HOLE YOU MEASURED

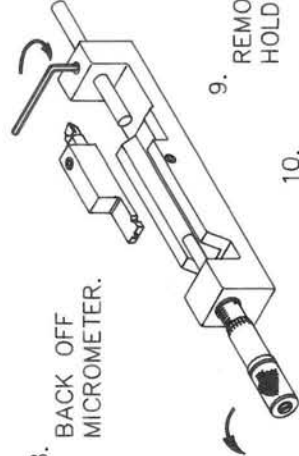
6. PLACE THE TOOL HOLDER, YOU USED, IN THE MICROMETER FRAME.



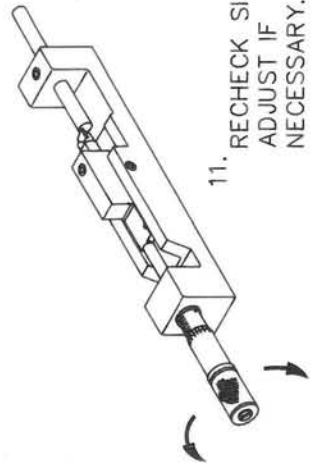
7. GENTLY SLIDE ANVIL TO TOUCH CUTTING CHIP, AND LIGHTLY TIGHTEN LOCK SCREW.



8. BACK OFF MICROMETER.



9. REMOVE TOOL HOLDER. TIGHTEN LOCK SCREW.



11. RECHECK SIZE. ADJUST IF NECESSARY.

AVB-64

Lubrication

Refer to illustrations on pages 4.3 and 4.4.

Below are instructions explaining where and how to add oil to the systems.

Upper Housing

The upper housing is located on top of the outer spindle.

Every 2,000 hours, the Upper Housing should be opened and the old grease removed. Repack with a **mixture of 4 parts grease to 1 part oil**. For grease use **Union Oil-Unoba F1 or F2 lubrication, Mobil Oil-Mobilith A.W. grades 1 or 2, Chevron Duroolith EP1 or EP2**, or any equivalent lithium barium grease. For oil use **Union Oil -315 Klondyke, Union Oil - turbine oil 68, or any SAE 10 (non-detergent) motor oil**.

Spindle Drive Gear Bearing

The Spindle Drive Gear Bearing is behind the small cover on the front of the upper housing.

Every 175 hours, remove the small cover on the upper housing. Add a few drops of **three and one oil, or Union Oil-Union 75, or a very light spindle or sewing machine oil (less than SAE 5)**. Add lubricant to the take up nut area between the clutch teeth.

Motor Gear Housing

The Motor Gear Housing is located at the base of the feed screw. This gear box drives the feed screw.

Every 175 hours, check the oil level of the Motor Gear Housing. Remove the snap plug located on the right side of the spindle base (see illustration). Remove the exposed pipe plug. Fill to the bottom of this hole with **Union SAE 90 Multi purpose gear lube or any equivalent SAE 90 gear lube**.

Do Not Over Fill.

Every 4,000 hours, the gear lube needs to be suctioned out of the fill hole and new gear lube added.

Feed Screw Drive

The Feed Screw Drive fitting is located on the right side of the spindle base.

Every 8 hours, remove the snap plug covering the feed screw grease fitting (see illustration.) Lightly lubricate with **Unoba F1 or F2 lubricant, lubriplate #9930AAA Mobil Oil - Mobilith A.W. grades 1 or 2, Chevron Duroolith EP1 or EP2**, or any equivalent lithium barium grease.

Inner Spindle

The Inner Spindle turns inside the outer spindle.

Every 40 hours, remove the bolt at the top of the spindle. Add two or three drops of **Union Oil 315 Klondyke Oil, or any SAE 10 oil. (non detergent motor oil)**.

Every 175 hours, run the spindle down to expose the grease fitting in the outer spindle keyway. Add 1 shot of **Union Oil-Unoba F1 or F2 lube, Lubriplate #9930AAA, Mobil Oil - Mobilith A.W. grades 1 or 2, Chevron Duroolith EP1 or EP2**, or any equivalent lithium barium grease.

If the inner spindle is removed, clean the lower tapered bearing and repack it with the same grease. A light coating of grease should be applied to the middle bearing at this time also.

IMPORTANT:

DO NOT FILL CAVITY BETWEEN THESE BEARINGS WITH GREASE.

Outer Spindle

The Outer Spindle travels up and down and is supported in 2 outer spindle bushings.

Every 40 hours, the Outer Spindle surface should be cleaned with kerosene. Occasionally a light weight oil should be wiped onto the Outer Spindle.

Hand Feed Assembly

Every 1000 hours, disassemble the hand feed assembly (see page 4.13). Lubricate bronze bushing and bevel gear shaft with **Unoba F1 or F2 lubricant, Lubriplate #9930AAA, Chevron Durolith EP1 or EP2,** or equivalent lithium barium grease.

Ball Screw Nut

The Ballscrew Nut is located on the right side of the spindle base. Under the sliding cover.

Every 175 hours, the Ballscrew Nut should be greased. Use **F2 Multi purpose grease, or Unoba F1 grease,** or equivalent. Grease through the grease fitting if one is provided,

otherwise wipe a small amount of grease directly on the ballscrew.

General Lubrication

There is a grease fitting located on each clamp arm, cam body and one on the pendant swing arm.

Every 175 hours, these grease fittings should be lubricated with **F2 Multi purpose grease, or Unoba F1 grease,** or equivalent

Coalescing Filter

The coalescing filter is the second filter on the incoming air supply. This filter removes the majority of the liquid (oil, water etc...) in the air supply. The filter and incoming air is located on the rear electrical enclosure.

WARNING:

Every 8 hours, this filter must be checked for accumulation of water. If the sight glass reaches 1/4 to 1/2 full the water must be manually emptied. Open valve on the bottom of filter, allow all water to drain, close valve.

Quick Reference Lubrication Chart

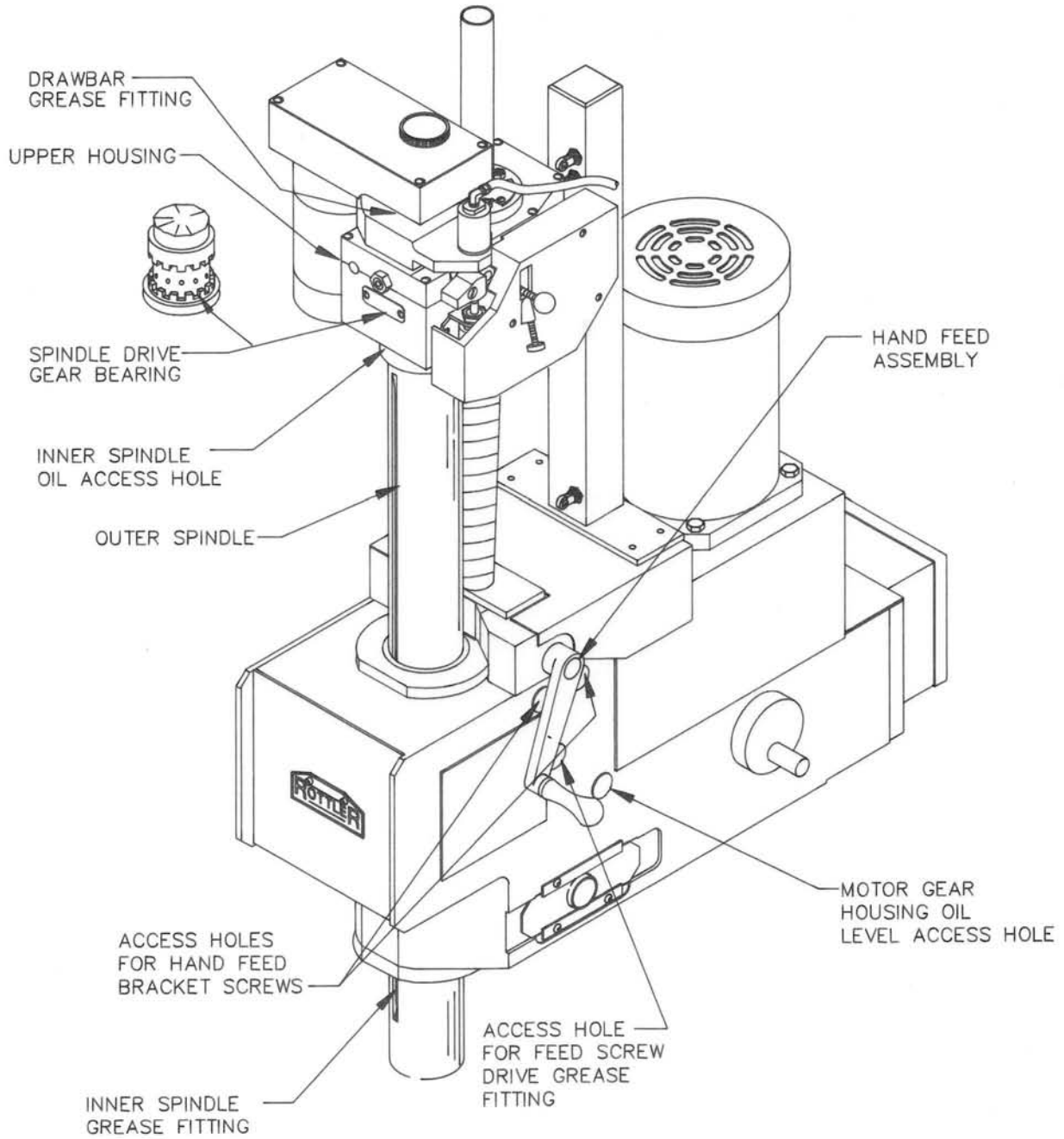
Assembly	Frequency	Lube Operation
Upper Housing	2,000 hrs	Change Grease
Spindle Drive Gear Bearing	175 hrs	A few drops of oil
Motor Gear Housing	175 hrs	Fill with oil
	4,000 hrs	Change oil
Feed Screw Drive	8 hrs	Grease
Inner Spindle	40 hrs	Add oil
	175 hrs	Grease
Outer Spindle	40 hrs	Clean and wipe with oil
Hand Feed Assembly	1000 hrs	Grease
Ball Screw Nut	175 hrs	Grease

IMPORTANT:

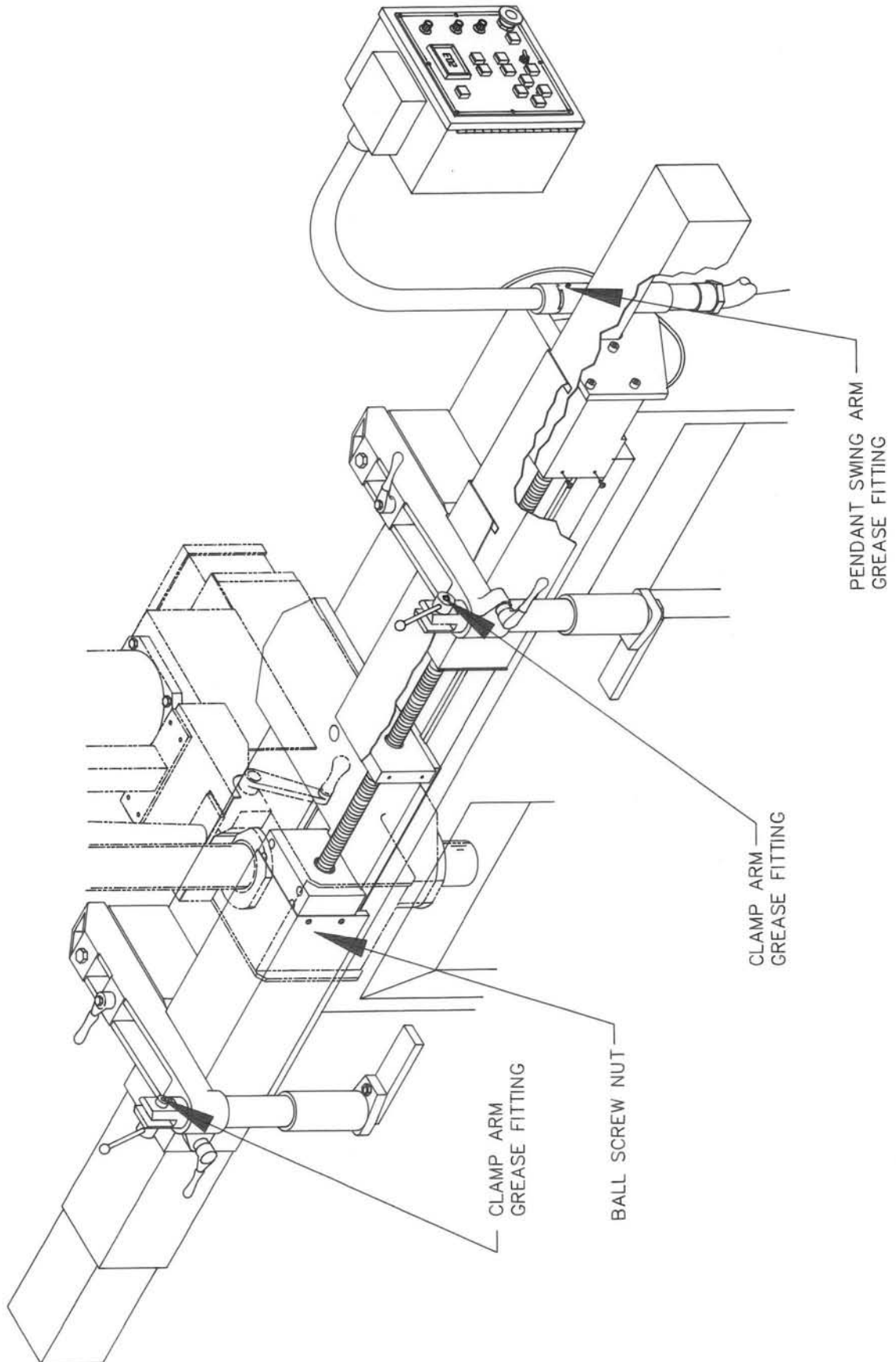
Do not over fill any of the lubrication points
serious electrical damage may result

Spindle Base Lubrication

REFFE24A42-101592



Main Base Lubrication



Adjustment Of Outer Spindle

The main spindle bearings are tapered split cast iron rings, held in a seat by an adjustment nut. The bearings normally require no adjustment for many boring cycles.

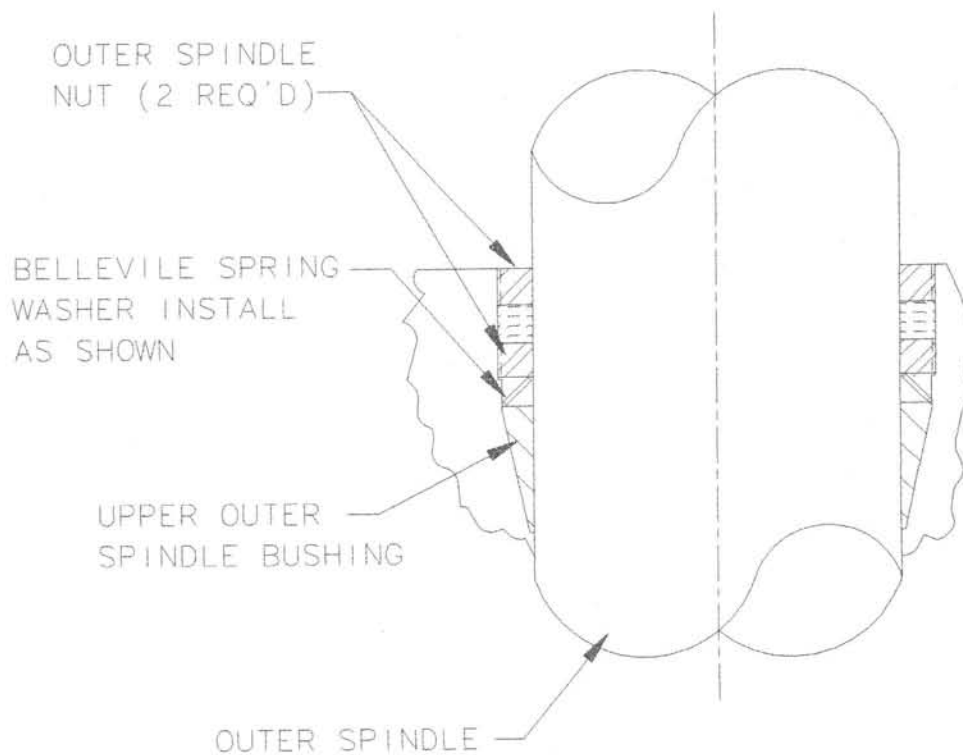
The upper bearing is preloaded in place by a Belleville spring washer, below the adjustment nut. This adjustment should be

checked after the shipment of the machine. Shock to the machine during shipment may result in some setting of the spring.

CAUTION:

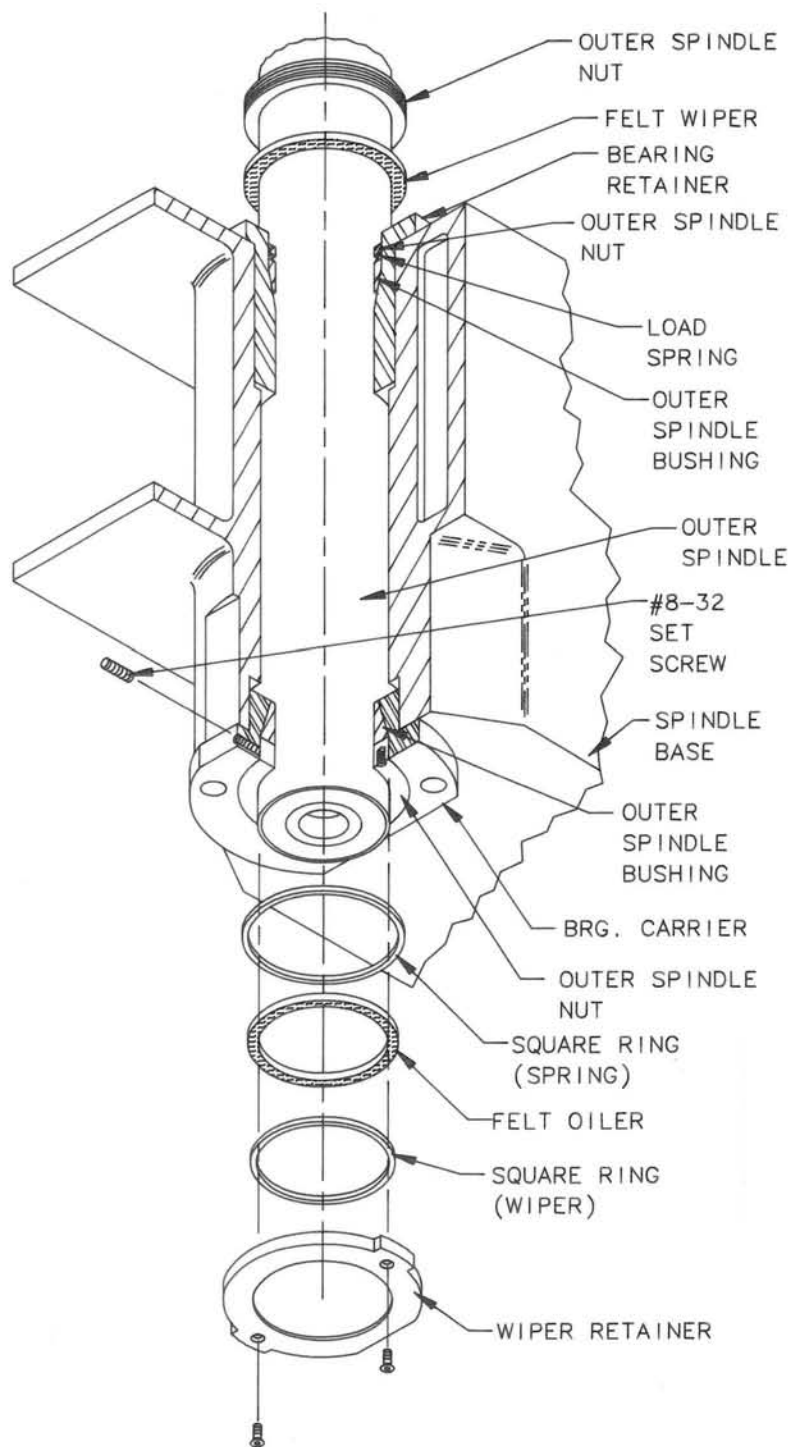
Be careful not to over tighten these bearings. An over tight condition only serves to wear out the machine and make control operation difficult.

If it should be necessary to adjust, see following page.



Outer Spindle Adjustment

1. Run spindle down approx. 4 to 6 inches. Loosen the #8-32 screw & loosen all outer spindle nuts (500-77 & 502-35-27)
2. Tighten the lower bushing (502-35-26) by tightening the lower outer spindle nut, until 10 - 15 lbs. of effort is required to operate the hand feed handle. Lightly tighten #8-32 set screw
3. Repeat this sequence (2) on the upper bushing, by tightening the upper outer spindle nut. The hand feed should operate only slightly tighter. 15 to 20 lbs. of effort required to operate feed handle.
4. Operate the hand feed throughout its travel. The hand feed should work easily at all points of spindle travel. Spindles are ground slightly tapered for maximum rigidity at lower limits of travel.
5. This procedure is also used to check the spindle adjustment. Travel the spindle down approximately 4" from the top. Operate the hand feed 2 turns leaving the handle in the horizontal position pointing to the back of the machine. Using both hands on top of the upper housing, pull down. You will feel the spindle drop and the hand feed handle will swing down. It should require 50-75 lbs. to cause the spindle to drop. In order to recheck using this procedure it is necessary to operate the hand feed 2 turns leaving it in the horizontal position.
6. Avoid too much tension on upper outer spindle nut otherwise tool bit dragback marks will appear in the bore.
7. Over tightening of the outer spindle nuts will put strain on the feed gears and cause spindle to be noisy and not turn freely.



Inner Spindle Adjustment

This machine is equipped with anti-friction bearings at the top and bottom of the inner spindle.

It is very important to properly adjust the preload of these bearings. The wrong adjustment can reduce bearing life or destroy the them.

The bearings are correctly adjusted when a down force of 50 to 100 lbs. on the inner spindle will move the inner spindle .0002 to .0007 out of the outer spindle, see illustration below.

Adjustment

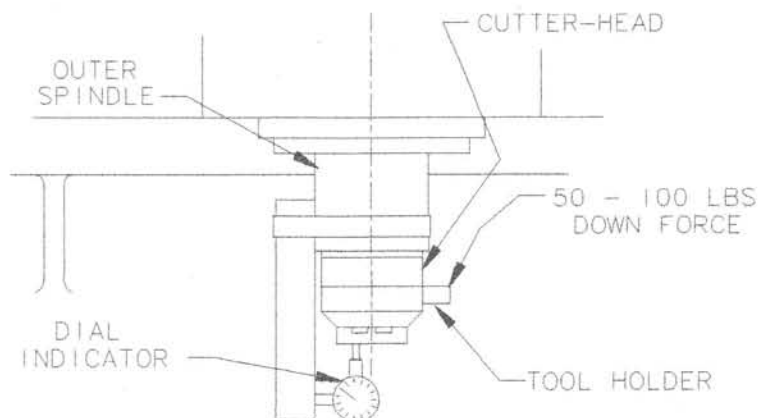
1. Remove two screws and small cover on the front side of the upper housing.
2. Spindle clutch lever must be in the full up position.

3. Insert a pin (diameter .180 or less) in one of the holes provided in the O.D. of the take up nut. (See Inner Spindle Nut). Hold the spindle knob with one hand and turn the take up nut to the left (clockwise). You will note the nut ratchets in notches as you take up. Take up until nut tightens up and back up 3/4 to 1-1/2 notches. Check for the .0002 to .0007 movement as stated before.

CAUTION:

Be sure the detent is in a notch, not midway between the notches.

4. Replace the cover.

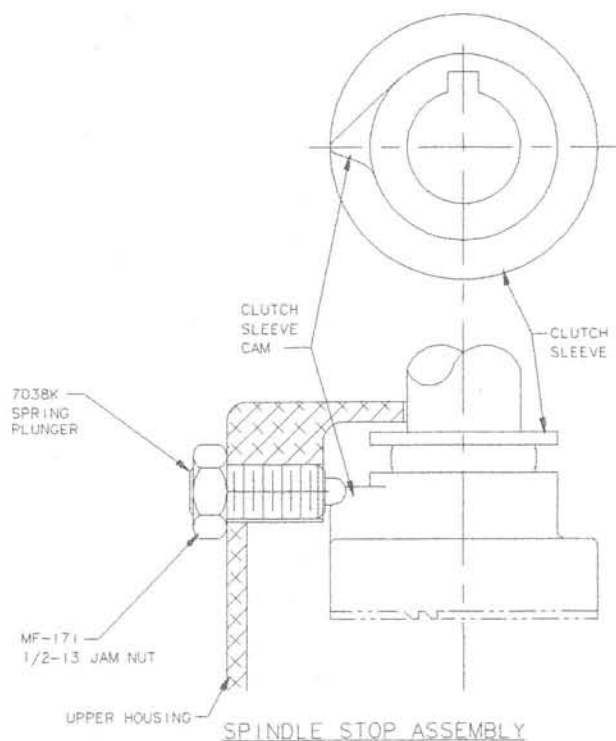


Spindle Stop Adjustment

The purpose of the spindle stop is to stop the spindle with the tool bit facing to the right.

CAUTION:

Disconnect all power to the machine before continuing.



To set plunger in position:

1. Remove spring plunger.
2. Raise clutch lever to upper position.
3. Look through the hole and turn inner spindle so the cam lobe is in line with the hole.
4. Screw in spring plunger until it touches the high spot on the cam lobe. Turn in 2-1/2 turns.
5. Tighten jam nut against gear housing.

Set The Spindle Stop Sensor

Rotate the cutter head clockwise (looking from the top) until the clutch sleeve pin just touches the plunger. Look at the sensor on the back of the centering housing and see if the light is on. If not, the lower knob must be adjusted. First remove the snap plug from the front of the centering housing. Looking

in this hole, turn the cutterhead so you can see how far the index pin is away from the sensor. It should be .02 - .03 away. If necessary adjust the sensor to the proper distance. Rotate the cutterhead so you can see the set screw, located below the index pin. Loosen the set screw. Turn the cutterhead until the clutch sleeve pin just

touches the plunger. Rotate the knob until the pin lines up with the sensor and the light comes on. Turn cutter head until you can reach the setscrew and tighten it. Be careful not to move the knob while tightening.

Upper Housing Backfeed Adjustment

Loosen the three round head screws located on top of the upper housing around the feed screw. Loosen the three adjusting set screw locknuts. Loosen the three adjusting set screws.

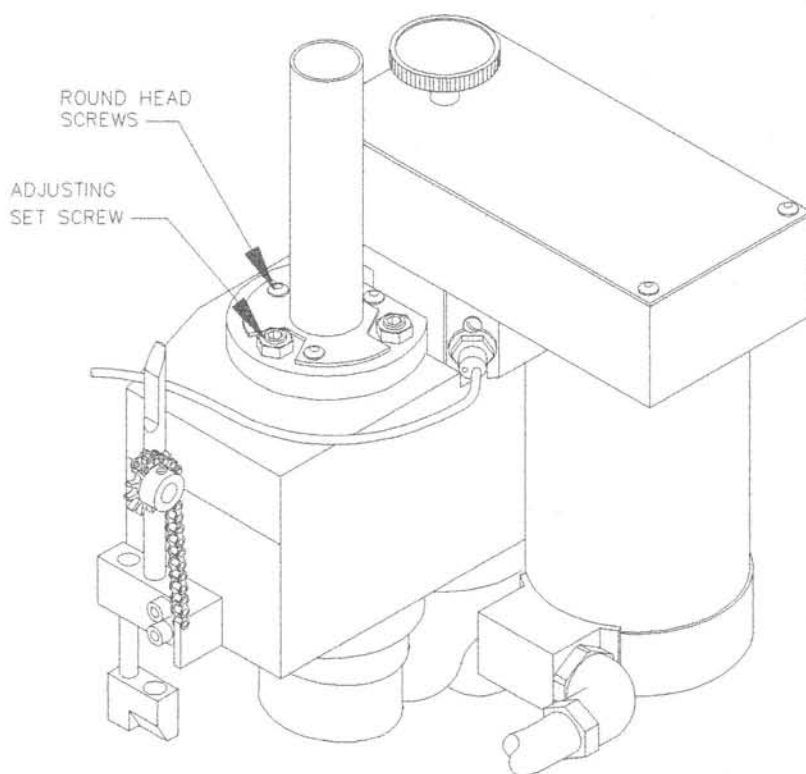
Screw in the three adjusting set screws until they just touch the spring washer inside. Alternating between each screw, turn the screws in, evenly, until you compress the spring washer.

IMPORTANT:

All screws must be turned in the same amount. A light touch is required use no more screw pressure than is required to flatten spring washer.

Turn adjusting screws back approximately 1/4 turn. The hand feed handle should have 1/4 turn of free play when the back feed is adjusted properly. Hold the adjusting screws with an allen wrench and tighten the lock nut.

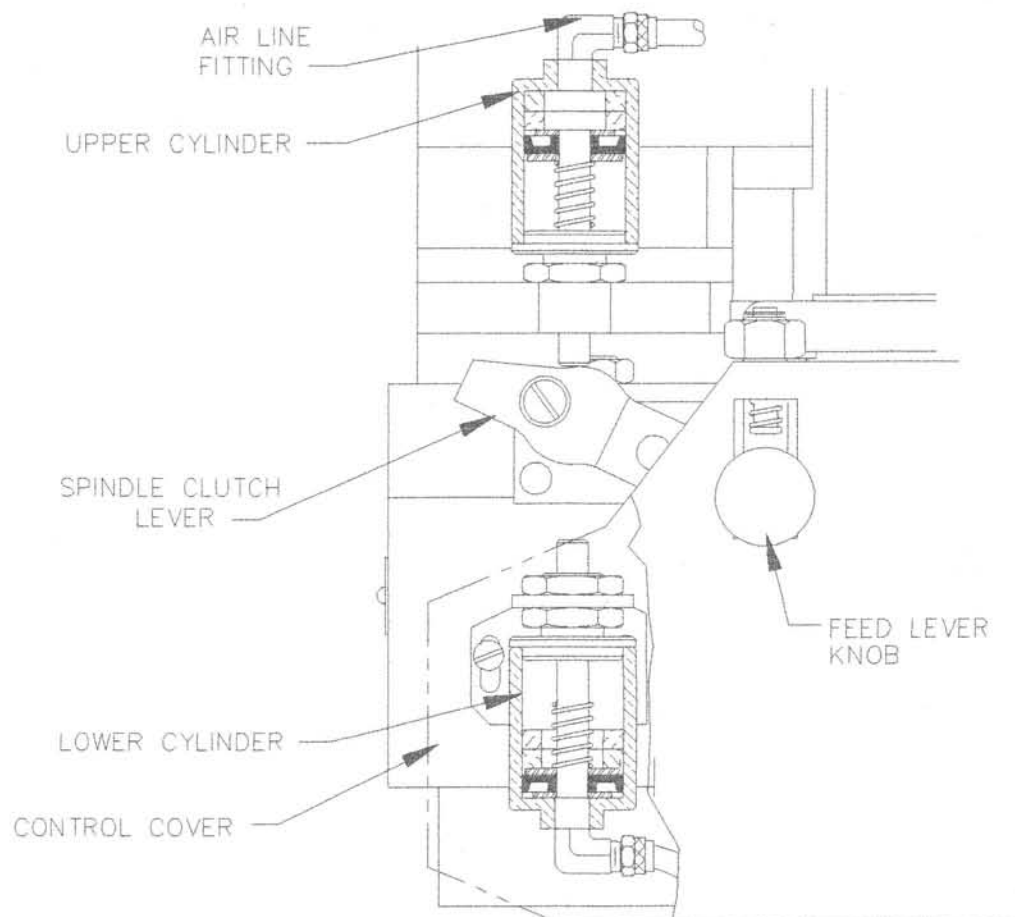
Run the motor with lower gear box engaged, so the feed screw turns, to center the bearing retainer. Turn off motor. Tighten, evenly, the three upper, round head screws.



Spindle Clutch Cylinder Adjustment

Remove feed lever knob & control cover. Loosen the adjusting nuts of the lower cylinder. Pull spindle clutch lever down. Make sure that spindle clutch is fully engaged, by rotating the inner spindle back and forth while pulling down on the lever. Set the lower cylinder so the piston rod is lifting the lever $1/32$ " when cylinder is fully retracted. Lock adjusting nuts.

Remove the air line of the upper cylinder. Loosen adjusting nut of upper cylinder. Unscrew the upper cylinder a few turns. Press the Up Rapid Travel button to extend the lower cylinder. With the lower cylinder fully extended, set the upper cylinder so its piston rod is touching the top of the lever when the lever is resting on the lower piston rod. Then screw upper cylinder in $1/2$ to $3/4$ turn. Tighten the upper cylinder adjusting nut. Replace the air line.

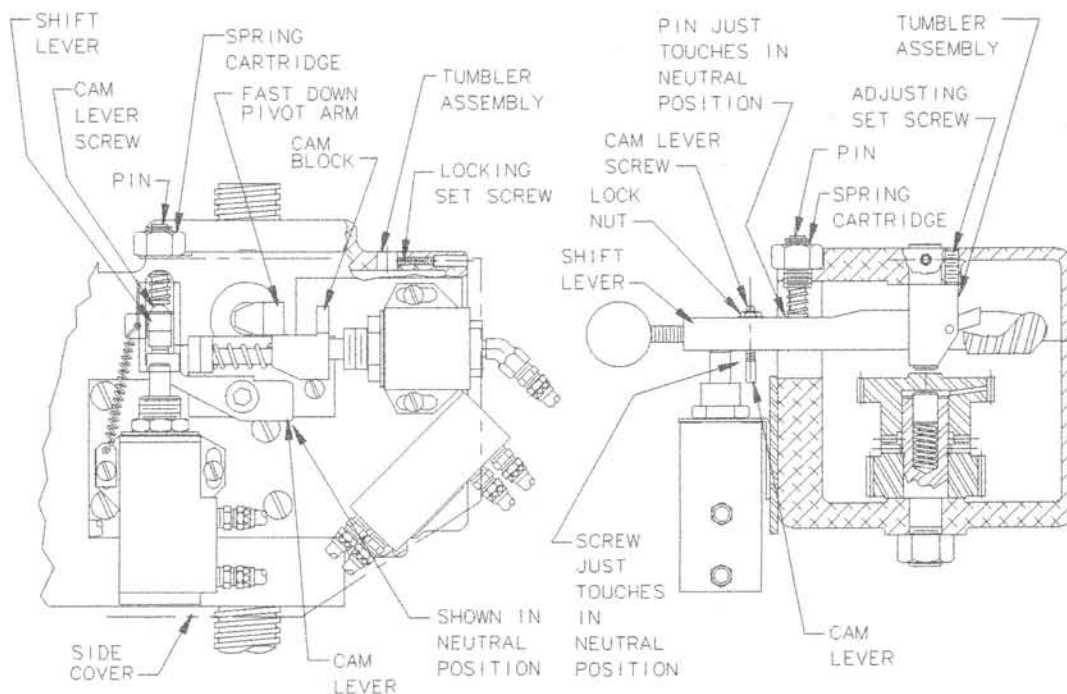


Rapid Return Adjustment

The spindle unit may at some time fail or hesitate to return to the top of its travel, with the up travel engaged. The following procedure is used to adjust the return travel clutches.

1. Remove the side cover on the upper housing.
2. Run boring spindle down 6 inches or more.
3. Loosen the lock nut of cam lever screw in shift lever, back off screw.
4. Find neutral position of shifting lever by rotating feed screw, while holding in cam block. Neutral position must have fast down pivot arm fully engaged with fast down pin and pin at full depth in 500-1 clutch sleeve gear.
5. Pin in spring cartridge assembly should just touch shift lever, when shift lever is in neutral. Adjust by loosening lock nut and turning cartridge.
6. Loosen horizontal locking set screw of tumbler assembly at top and back of upper housing (see illustration).
7. Adjust tumbler shaft so that clutches do not chatter when shift lever is in neutral. Clutches should start to ratchet as the pin in the spring cartridge is raised approximately $1/32$ ", when lifting the shift lever. If clutches ratchet after the pin is raised more than $1/32$ ", reset tumbler lower, by turning vertical set screw inward, which will result in a deeper engagement of clutches.

If clutches ratchet in neutral or before pin is raised $1/32$ ", reset tumbler higher, by first backing off the vertical set screw in the top of the gear housing, then force the tumbler up with shift lever. Use the adjusting set screw to reset tumbler.



8. Tighten locking set screw to relock shaft. Check to see that adjustment has not been changed by the locking set screw.
9. Readjust cam lever screw in shift lever so it just touches the cam lever when shift is in neutral, lock with it's lock nut.

Drive Belt Removal

CAUTION:

Disconnect all power before proceeding.

Remove the sheet metal cover from the rear of the spindle unit. Loosen the four motor mount bolts and slide the motor forward. Reach in through the rear of the spindle unit and remove the belt.

Drive Belt Installation

Installation of belt is the opposite of removal.

Adjust belt tension for 1/8" to 3/8" play in best when the belt is pushed between the two pulleys.

Centering Belt Removal

CAUTION:

Disconnect all power before proceeding.

Locate the set screw in the centering knob. Loosen the set screw to remove the knob.

Remove the four screws securing the sheet metal cover on top of the centering housing. Loosen (Do Not Remove) the four motor mount screws. Slide the motor forward and slip the belt off.

Centering Belt Installation

Installation of the belt is the reverse of removal.

CAUTION:

Overtightening of centering belt will cause bearing wear and may cause the centering fingers to extend during the boring cycle.

Adjust the belt tension for approximately 1/4 inch deflection, measured midway between pulleys, with a force of 1 ounce.

Excessive Loads

CAUTION:

Disconnect all electrical and air power to boring machine before attempting any repairs

Thrust overload

If a vertical thrust load of approximately 3,000 pounds is imposed on your FE24A machine spindle, the threads of the 500-41 bronze thrust nut will shear. This happens when the spindle is stopped by an external force, for example traveling down into the top of the block. It makes no difference if the spindle is turning or not.

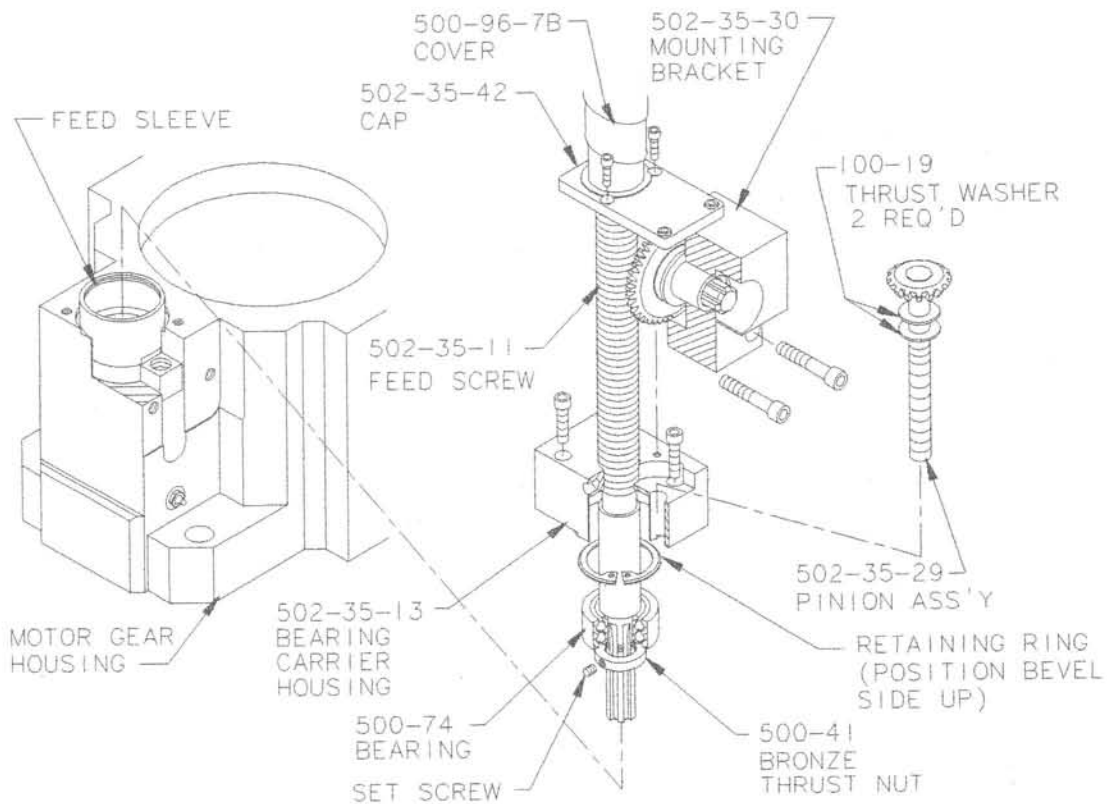
The motor will continue to run, with no feed or down travel. If the machine continues to run in down travel, the drive spline will be pulled out of mesh and the feed screw will not turn. A spare nut, 500-41, is provided in the tool box, in the event this happens.

Disassembly For Replacement Of Thrust Nut

1. Remove the six round head screws and three rubber grommets that attach the shroud (502-35-67). Disconnect the chain from the stop rod bracket. Move the shroud to the side. Remove the two cap plugs, in the spindle base, that cover the hand feed bracket screws. Remove the two socket head cap screws to the hand feed bracket (502-35-30). Remove the two socket head cap screws to the hand feed bracket (502-35-30). Remove the two socket head cap screws in the cap (500-96-7B). Lift the hand feed bracket and the attached cap, out of the way. Turn out (counter clockwise) the bevel pinion (502-35-29). Be careful not

to lose the two thrust washers (100-19). Remove the four screws and the bearing carrier housing (502-35-13), raise the assembly.

2. Hold cam block (500-43) to the left while hand rotating the feed screw counter clockwise. This will raise the lower assembly out of the spline. Remove the retaining ring (506-10), and press feed sleeve assembly (502-35-12), off bearing (500-74). Back out set screw from bronze thrust nut (500-41) and screw off nut. On reassembly, be sure to replace the retaining ring with the bevel side up, and make sure you bolt the hand feed bracket back in place with out binding the gear action.



Mechanical Failure Due To Overload

Rotary deceleration loads which stall the motor will cause the Lenze drive to trip, or the driven pulley key to shear.

To reset the Lenze drive, power down the entire machine, wait for the trip light to go out, and power back up.

Replacing the shear key. Remove the six round head screws and the three rubber grommets that attach the shroud. Disconnect the chain from the stop rod bracket. Move the shroud to the side. Remove the belt as described on page 4.12. Remove the collar, loosen the two nylon capscrews, then remove the driven pulley. Lightly tighten the two nylon capscrews on reassembly.

Removal of Motor Assembly

CAUTION:

Disconnect all electrical and air power before continuing.

Remove the drive belt as described on page 4.12. Remove the four bolts securing the motor, lift the motor straight up. Disconnect conduit connection and electrical wiring. Be sure to mark wires so you can reconnect the wiring correctly.

Assembly is the reverse. Install and adjust the belt as described on page 4.12.

Removal of Motor Gear Housing

NOTE:

Motor and motor gear housing may be removed without disassembly of upper housing and feed screw.

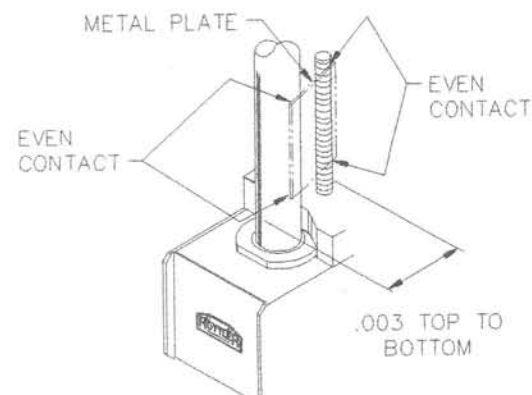
Remove and disassemble hand feed assembly as described on page 4.13

There are six screws holding the motor gear housing on to the spindle base. After the screws have been removed lift off the motor gear housing.

Replacing Motor Gear Housing

Set the motor gear housing in place. Put the mounting bolts in but do not tighten them. Reassemble the hand feed. See page 4.13.

Alignment of the motor gear housing is crucial. Measure from the outside of the outer spindle to the outside of the feed screw, at the top and at the bottom. They should be parallel within .003. Check for parallel at the side also. Use a flat metal plate. Lay the plate against the outer spindle and the feed screw. The plate should contact both surfaces evenly over a six inch distance. Tighten the motor gear housing mounting bolts.



Disassembly of Motor Gear Housing

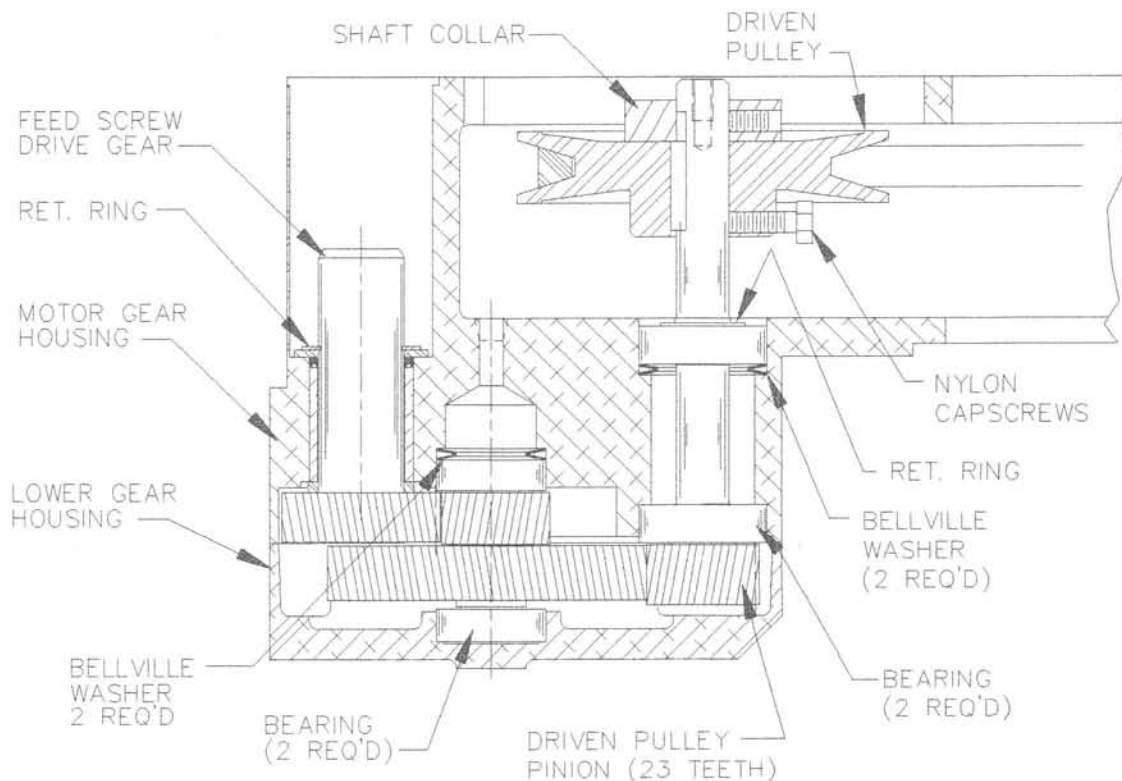
Remove shaft collar, loosen the two nylon capscrews and then remove the driven pulley. Take out the plug in the side of the motor gear housing and drain the oil. Remove the retaining ring from the driven pulley pinion. Remove the retaining ring and thrust washer from the feed screw drive gear. Remove the eight socket head cap screw located in the bottom of the lower gear housing.

Inside the motor gear housing, near the driven pulley pinion, there is a set screw plug. Remove this plug. Use a long blunt punch and tap the gears and lower gear housing off.

Be careful when removing the bearings inside the motor gear housing. The spring washers located behind the bearings must be reinstalled in the correct direction.

Failure Due To Low Airline Pressure

A pressure switch PS/2 (located on the bottom of the electrical control panel (see page 5.2) has normally open contacts that close when the airline pressure reaches 80 to 85 psi. As long as the line pressure is above this, the machine will operate. If the line pressure falls below this value, the switch contacts open, shutting off power to the entire control circuit and thereby stopping the machine.



This is a protective device to prevent the machine from operating when there is insufficient air pressure available to operate the air clamp and air controls.

Centering Rod and Draw Bar Removal

Remove the cutter head as described in the Optional Equipment manual. Loosen the set screw securing the centering knob and remove the knob. Remove the four screws holding the centering housing cover. Loosen the four screws holding the centering motor. Slide the centering motor forward and remove the belt. The draw bar/centering rod assembly will now lift straight up.

To replace the draw bar/centering rod assembly, reverse the previous procedure. See page 4.12 for centering belt adjustment.

Disassembly of Upper Housing and Spindle Removal

Move the spindle all the way to the top of its travel. Move the spindle base all the way to the left of its travel. Tighten the upper spindle adjusting nut snug to keep the spindle from dropping.

CAUTION:

Disconnect all air and electrical power to the machine before attempting any repairs.

Remove the draw bar assembly as described above. Disconnect the air line on the upper spindle clutch cylinder. Remove four screws securing the centering motor housing. Lay the housing and motor aside. The lower knob must be removed by loosening its locking set screw. Remove the control cover from the side of the upper housing. Raise the spindle clutch lever to its full up position which will expose the countersunk screw. Remove this and the other mounting screw.

Pull the lever assembly out (see page 5.20) Remove spring (502-2-48) (see page 5.18) and bracket (502-2-47). Remove control base plate (500-47). Remove any air lines that are in the way.

Remove the six screws holding the upper housing cover and lift it off. Remove the shift lever (500-38-1B) (see page 5.17), also remove the upper fast return gear (500-25), plunger and spring. Remove the spindle clutch (500-3D) (see page 5.15), and key 500-3-1. Remove bearing (500-18) and spring (500-14) from the feed screw. Be sure to reassemble the spring washer in the proper direction. Lift the clutch sleeve gear straight up off the feed screw. Unscrew the feed nut (500-2) to remove it. Remove from the feed screw, the thrust washer and feed gear (500-8-1).

Place something under the end of the inner spindle to keep it from falling out. Unscrew the spindle adjusting nut (500-5A). Loosen the nut through the access hole in the upper housing, remove the rest of the way by hand from inside the gear housing. The drive gear assembly can be worked off along with the flanged spacer (500-4G). Remove the inner spacer and the high pro key. The inner spindle may now be lowered out of the machine.

NOTE:

Some lubrication will run out when spindle is removed.

Replacing The Inner Spindle and Reassembling The Upper Housing

When reassembling the inner spindle and upper housing be careful to install gears and bearings and spring washers in the correct thrust directions as shown in the illustrations. After assembly be sure to go back to the

beginning of the maintenance section and follow all of the adjustment procedures to readjust the machine. Relubricate as directed in lubrication section.

Removal of Upper Gear Housing

Disassemble upper gear housing as described above. Remove the two hex head screws at the top of the outer spindle. Apply heat with a torch to the upper housing at the collar area where the bolts were. Lift the upper housing while tapping with a soft faced hammer. Remove nut on the fast return gear shaft (500-29) (see page 5.17). Press the shaft and the gear off. Long gear (500-7) may be removed. Be careful of the oil seals at the bottom of the housing do not damage them.

Reassembly of the Upper Housing

Before slipping the long gear back into the oil seal open the seal to prevent the garter spring from snapping out. When placing the thrust bearing in be sure the race with the small ID is placed 'up'. To put upper housing back on outer spindle, apply Loctite to the top area of the outer spindle. Heat the housing as was done in disassembly. Place the housing on the outer spindle and turn to the correct position quickly.

CAUTION:

After placing upper housing on the outer spindle, before it cools you must set the parallelism between the outer spindle and the feed screw. (refer to page 4.14).

Centering Function

The following information describes the sequence of control functions of the Auto Centering System. **NOTE:** acceleration speeds and current limit values must be set properly for smooth operation. Functions are the same in both Automatic or Manual mode.

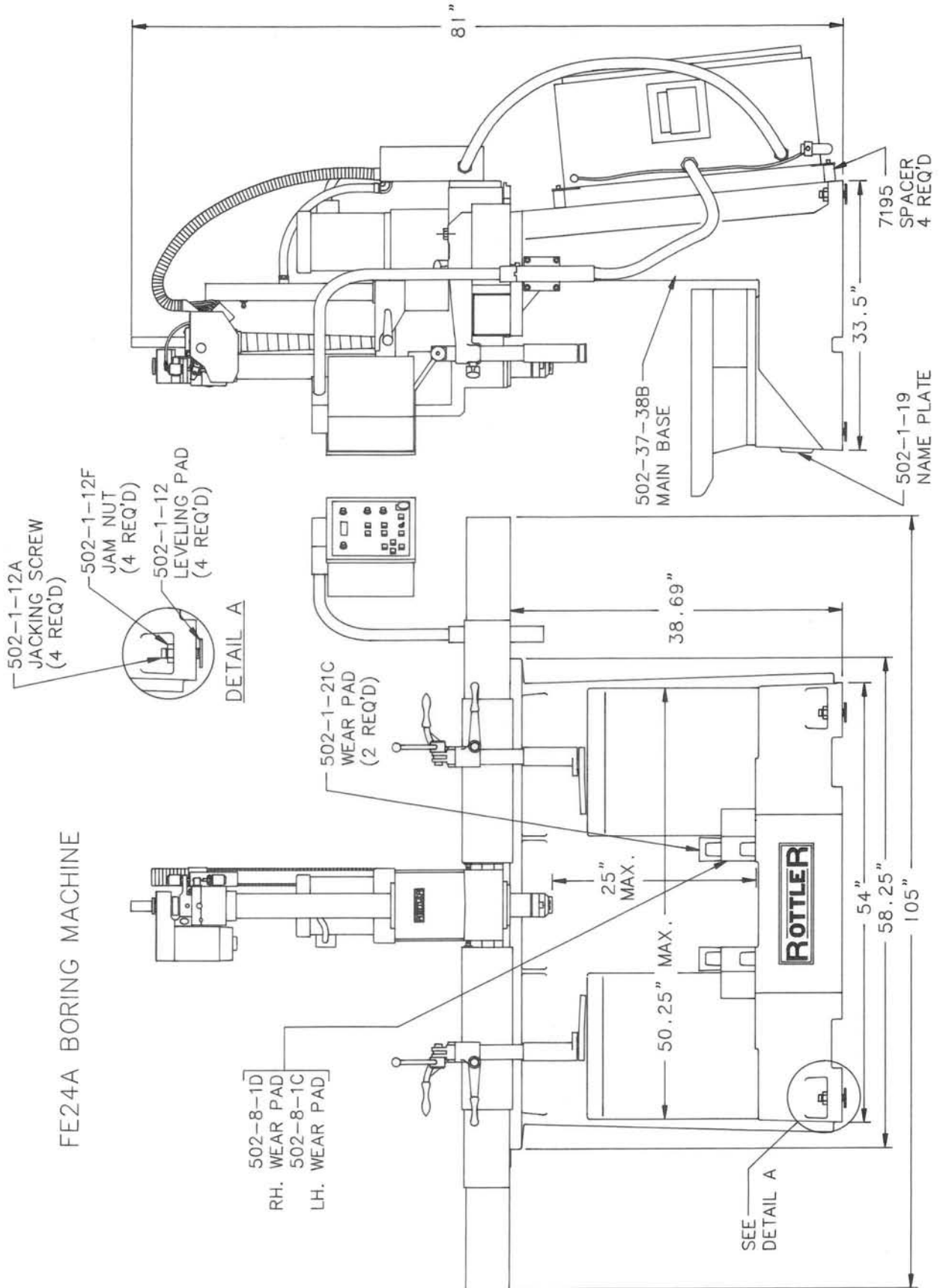
1. Spindle Base goes to the neutral unclamp condition.
2. Spindle clutch is engaged so that centering drive does not turn spindle when centering motor is turning.
3. Centering drive is actuated for a total of 3.2 seconds. Rotation of centering shaft (knob) is clockwise looking from the top. Acceleration rate is set at 5 seconds. Current limit is set at .9 to 1 amp, current limit should provide 60 to 80 ounce inches of torque.
4. 1.2 seconds after the drive starts, the spindle base goes to a float condition, and the drive goes to a current limit and holds the force.
5. 2.2 seconds after the drive starts the spindle base is clamped
6. 3.2 seconds after the drive starts the centering drive motor reverses, turning the centering shaft counter clockwise. This retracts the centering fingers. Then it goes to current limit and turns off.
7. The centering drive motor circuit is provided with a resistor which induces a load on the centering motor to keep the centering fingers retracted.

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 the areas the way material 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.

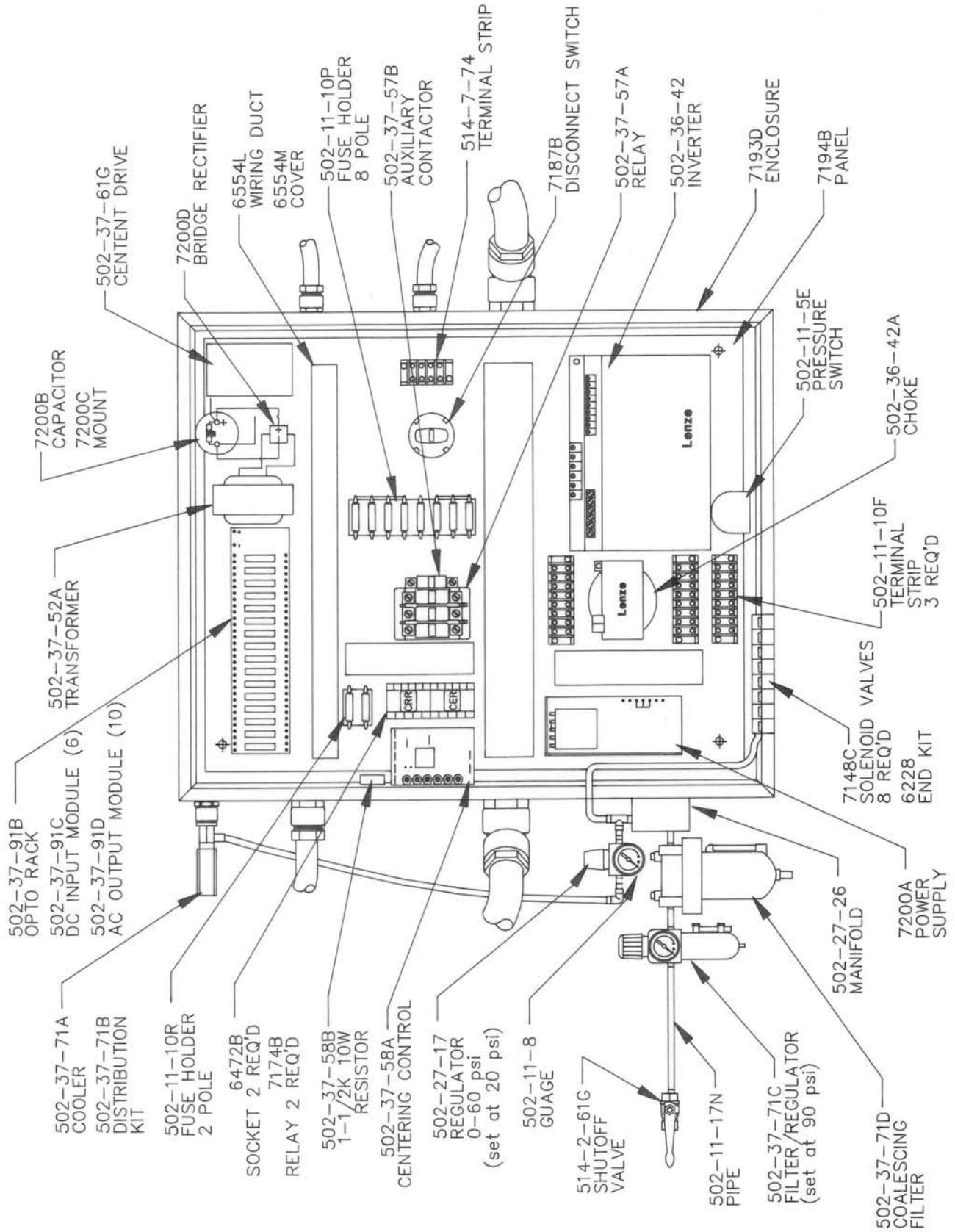
Front / Right Side View

REFFE24A1-092094



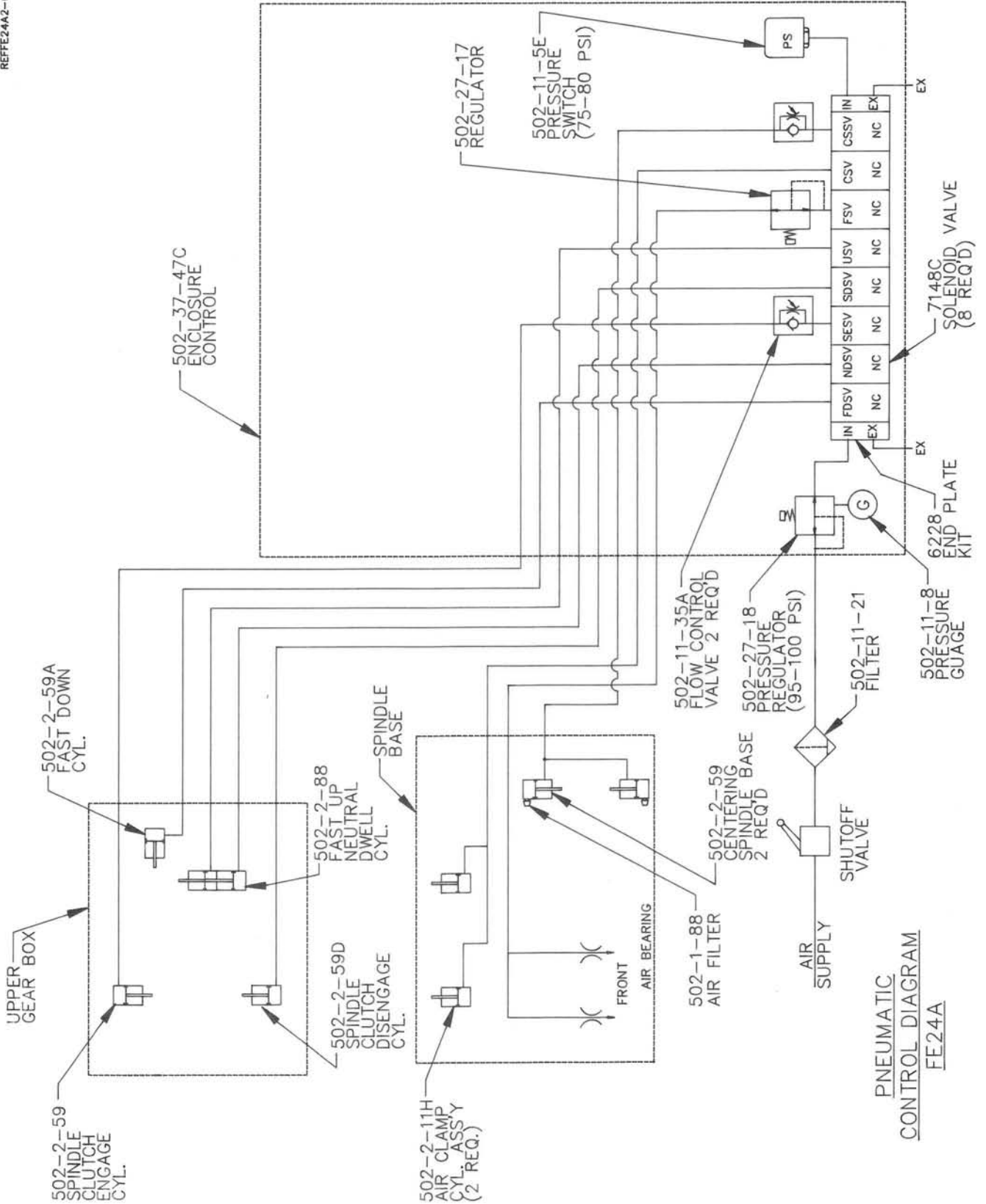
Electrical Components

REFFE24A23-092094



Pneumatic Control

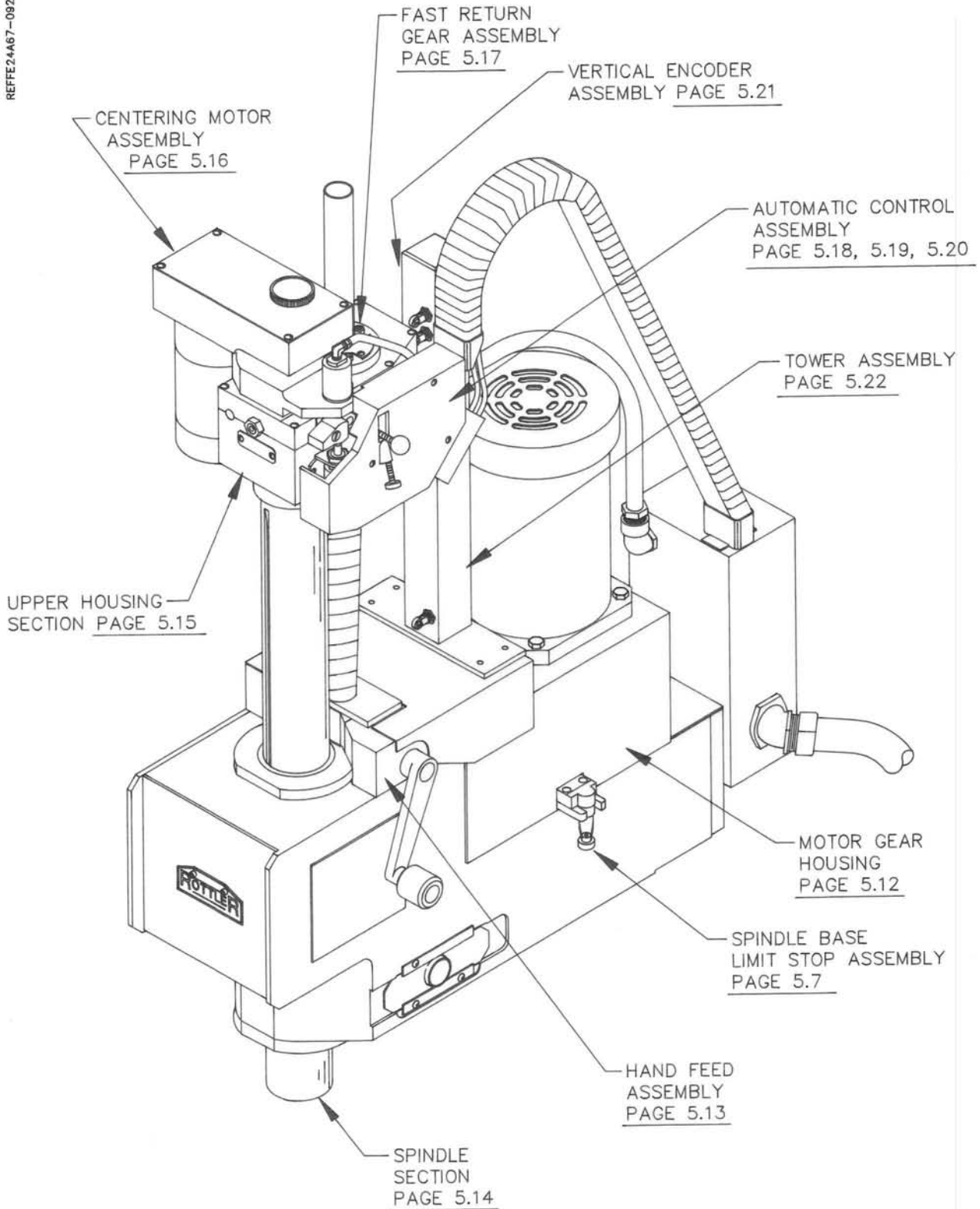
REFFE24A2-080993



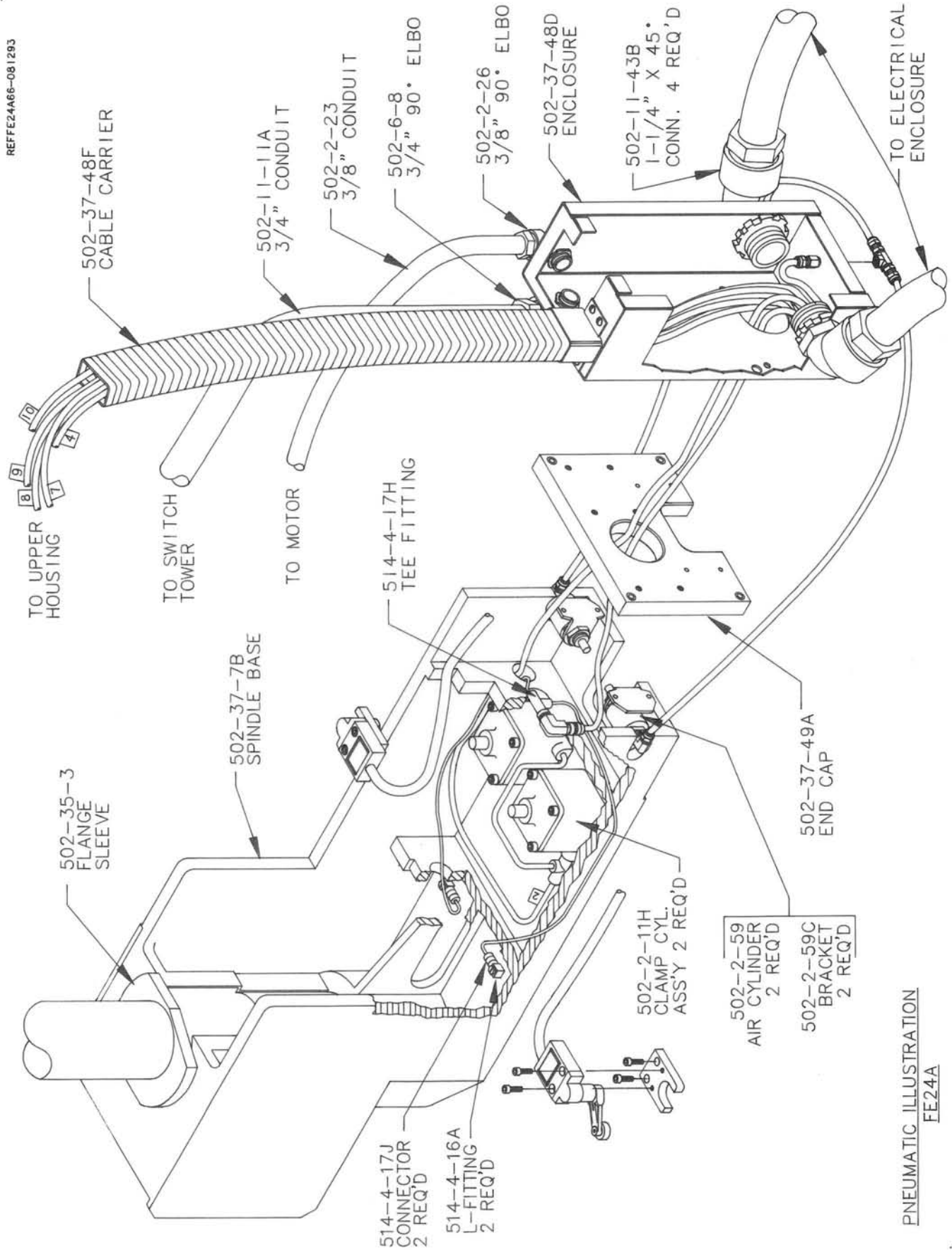
PNEUMATIC CONTROL DIAGRAM
FE24A

Spindle Base Assembly Illustration

REFFE24467-092194

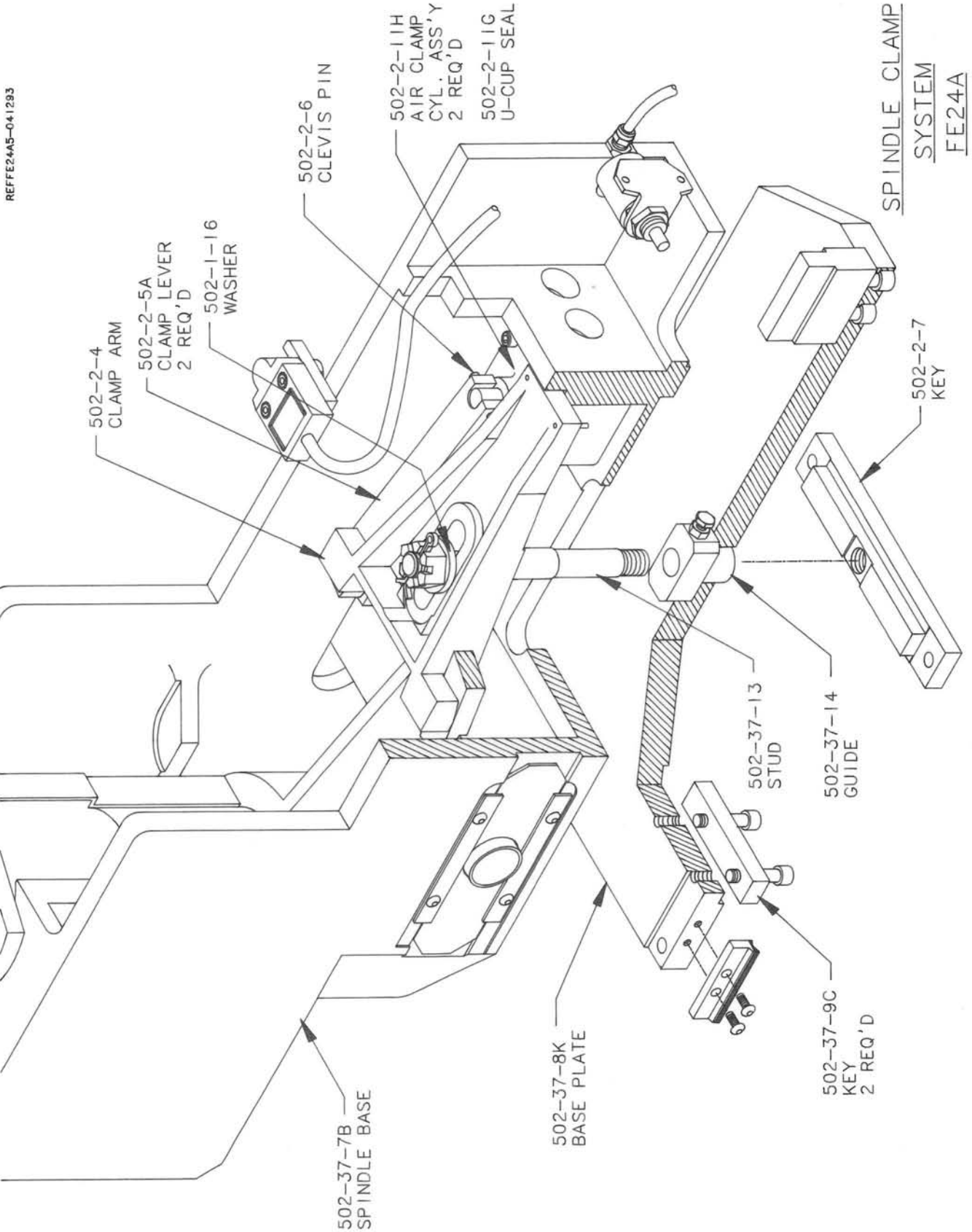


Pneumatic Illustration



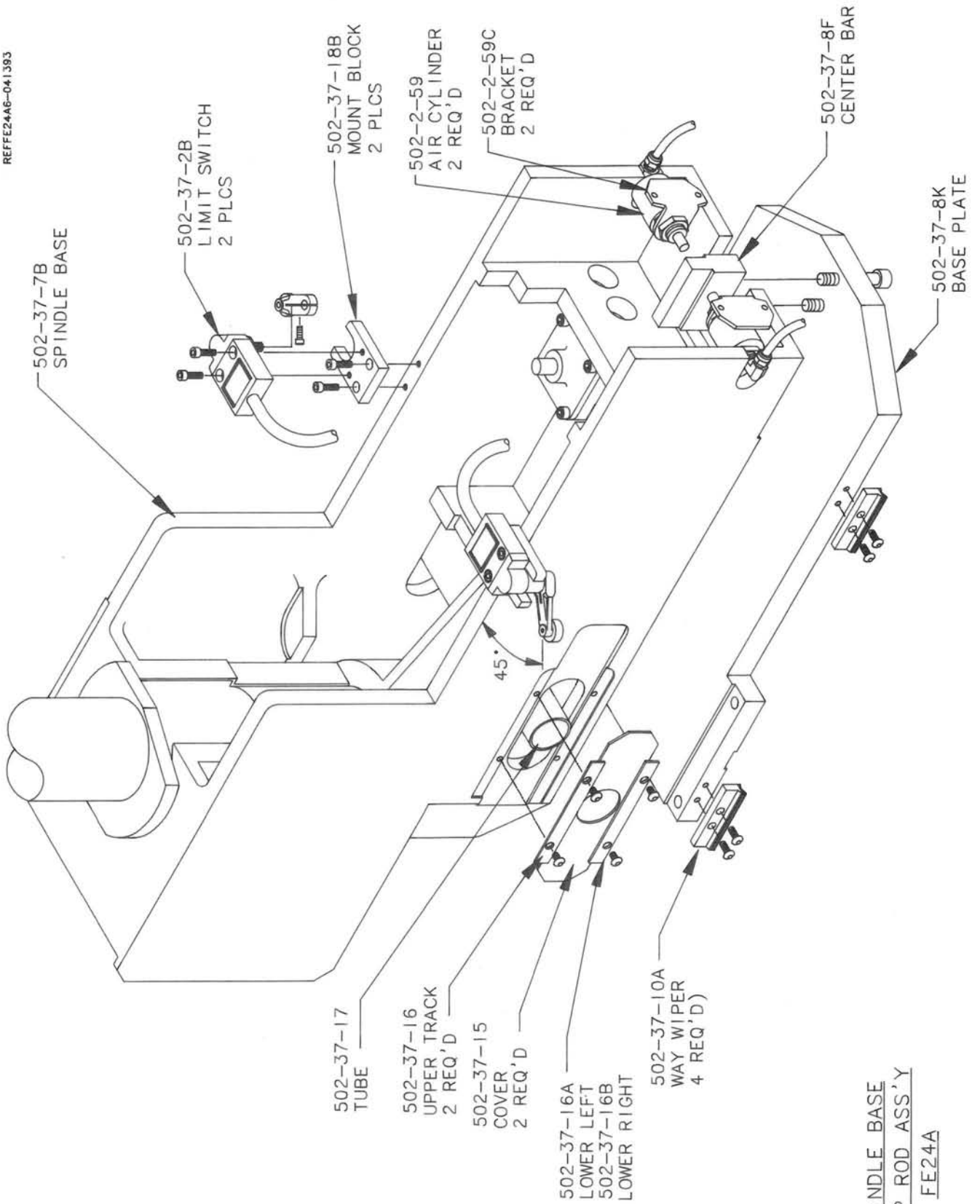
PNEUMATIC ILLUSTRATION
FE24A

Spindle Clamp System



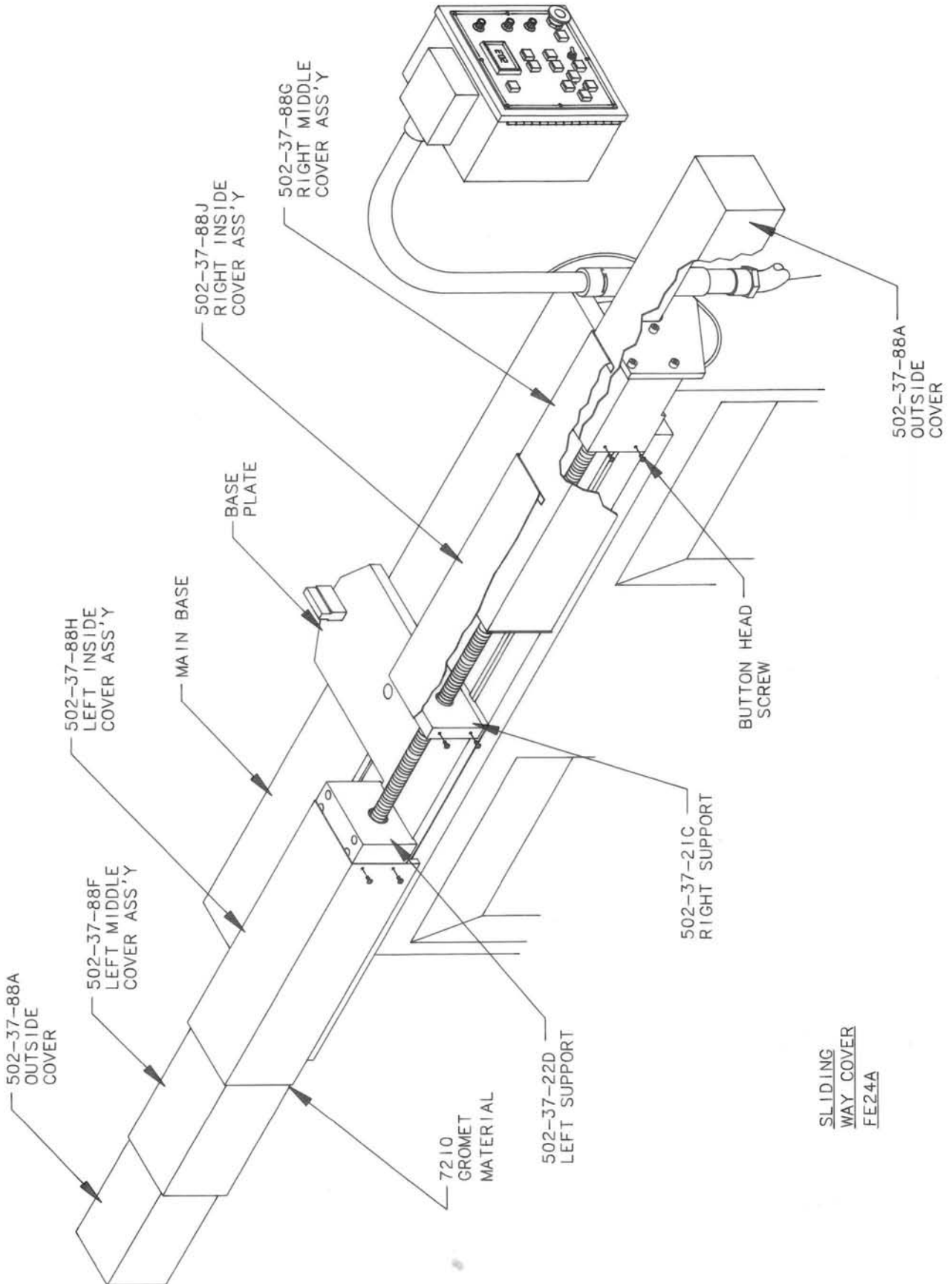
Spindle Base Stop Limit Assembly

REFFE24A6-041393



SPINDLE BASE
STOP ROD ASS'Y
FE24A

Sliding Way Cover

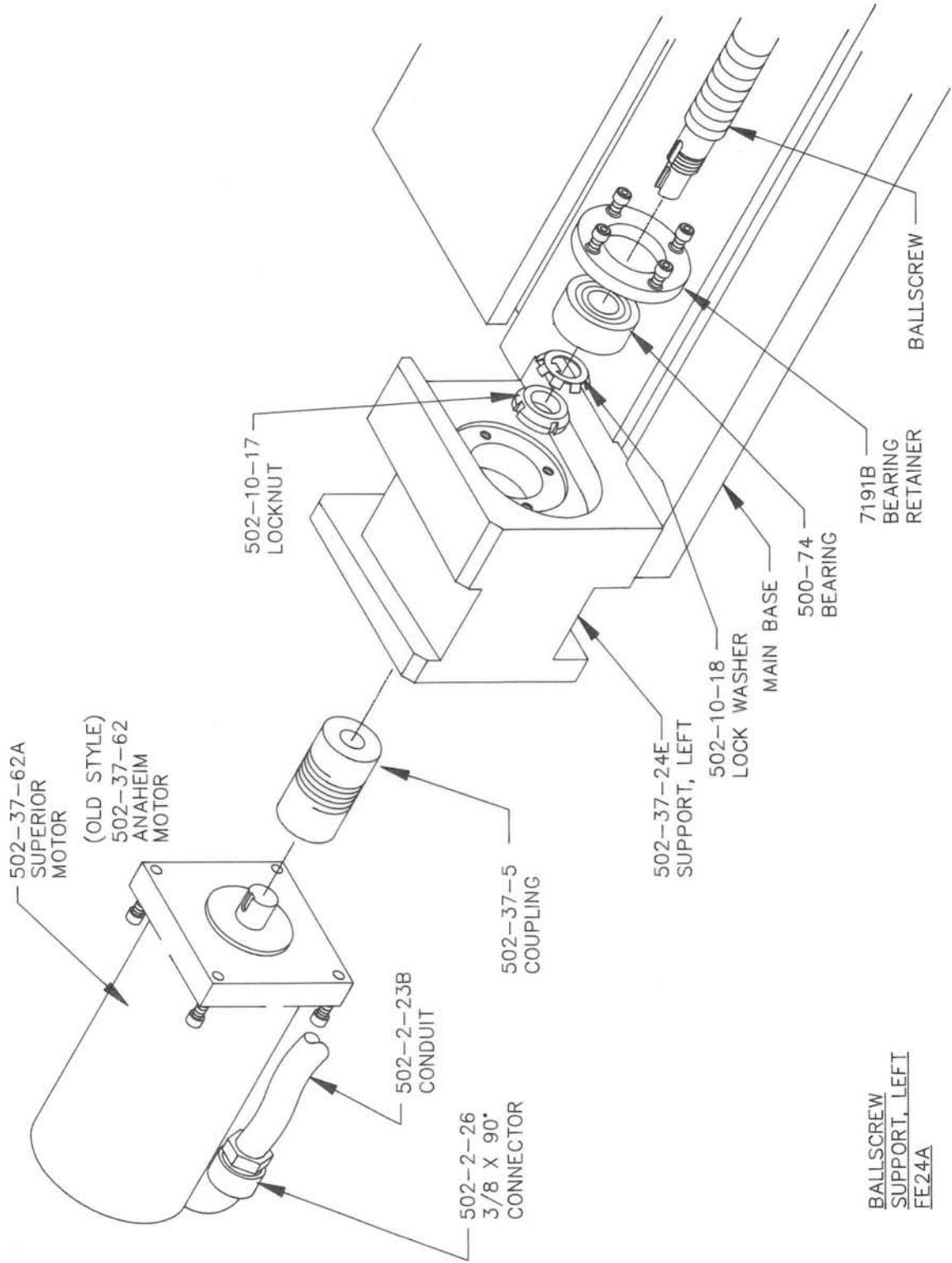


SLIDING
WAY COVER
FE24A

FE24A8

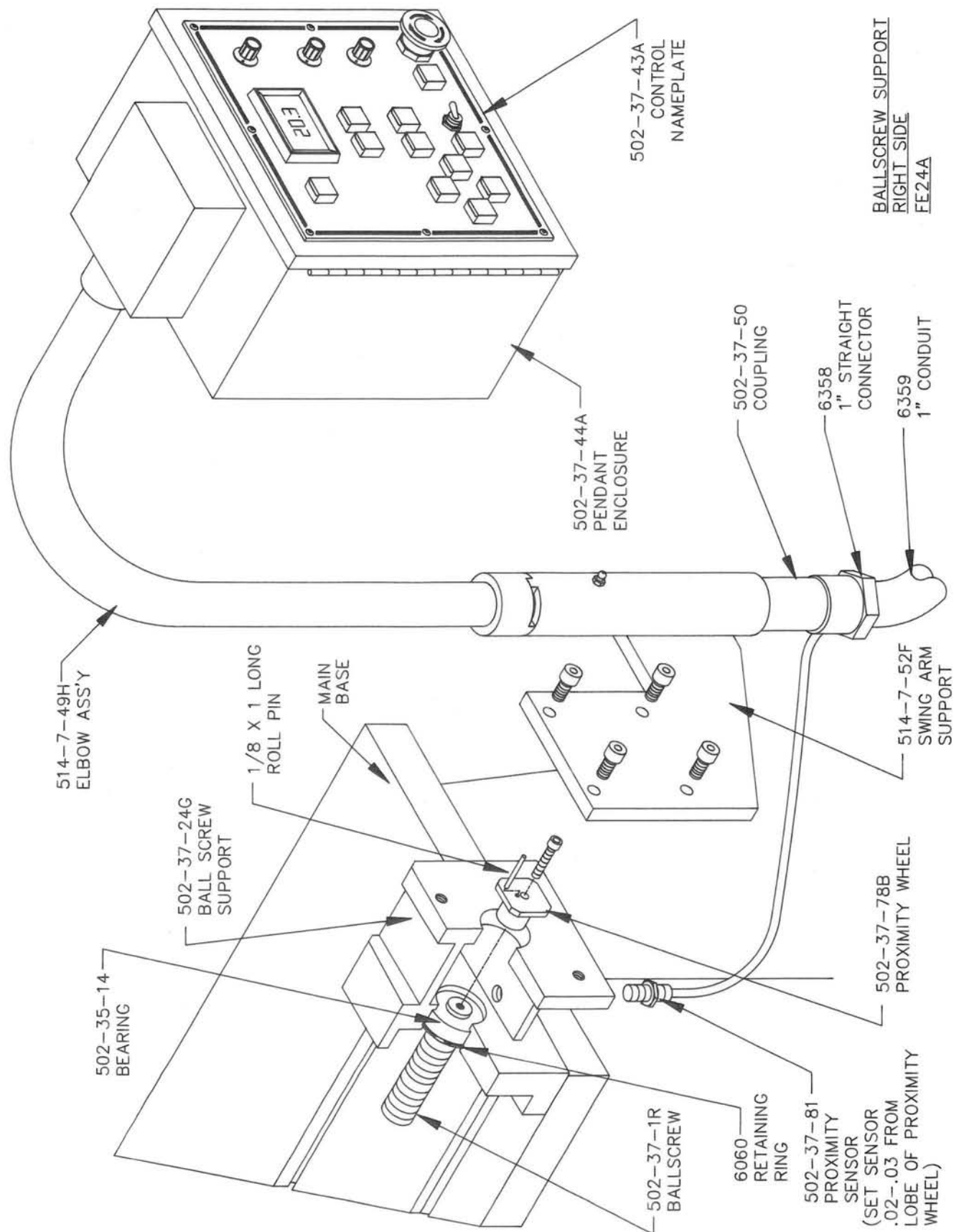
Ballscrew Support Left

REFFE24A8-002094



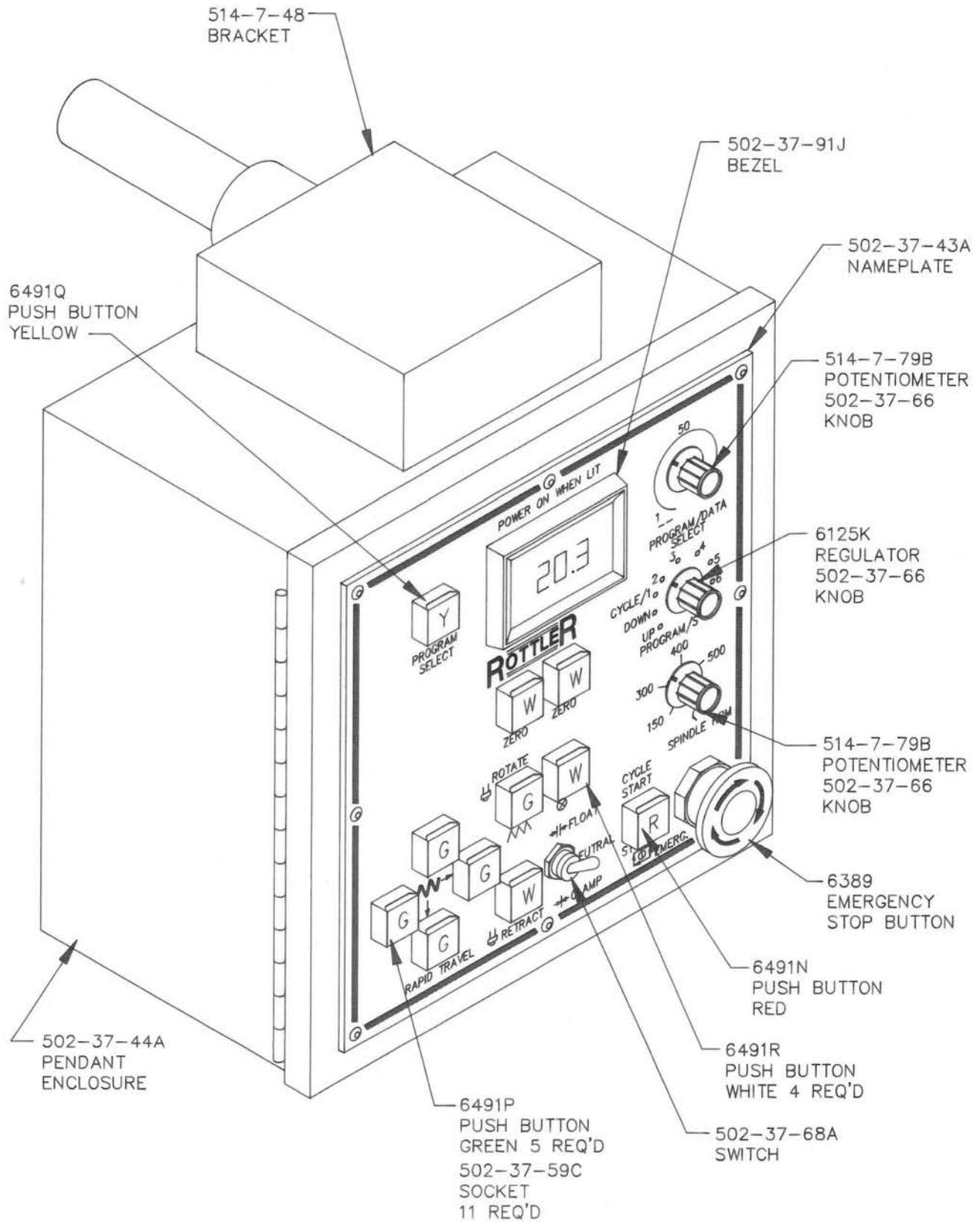
BALLSCREW SUPPORT, LEFT
FE24A

Ballscrew Support Right



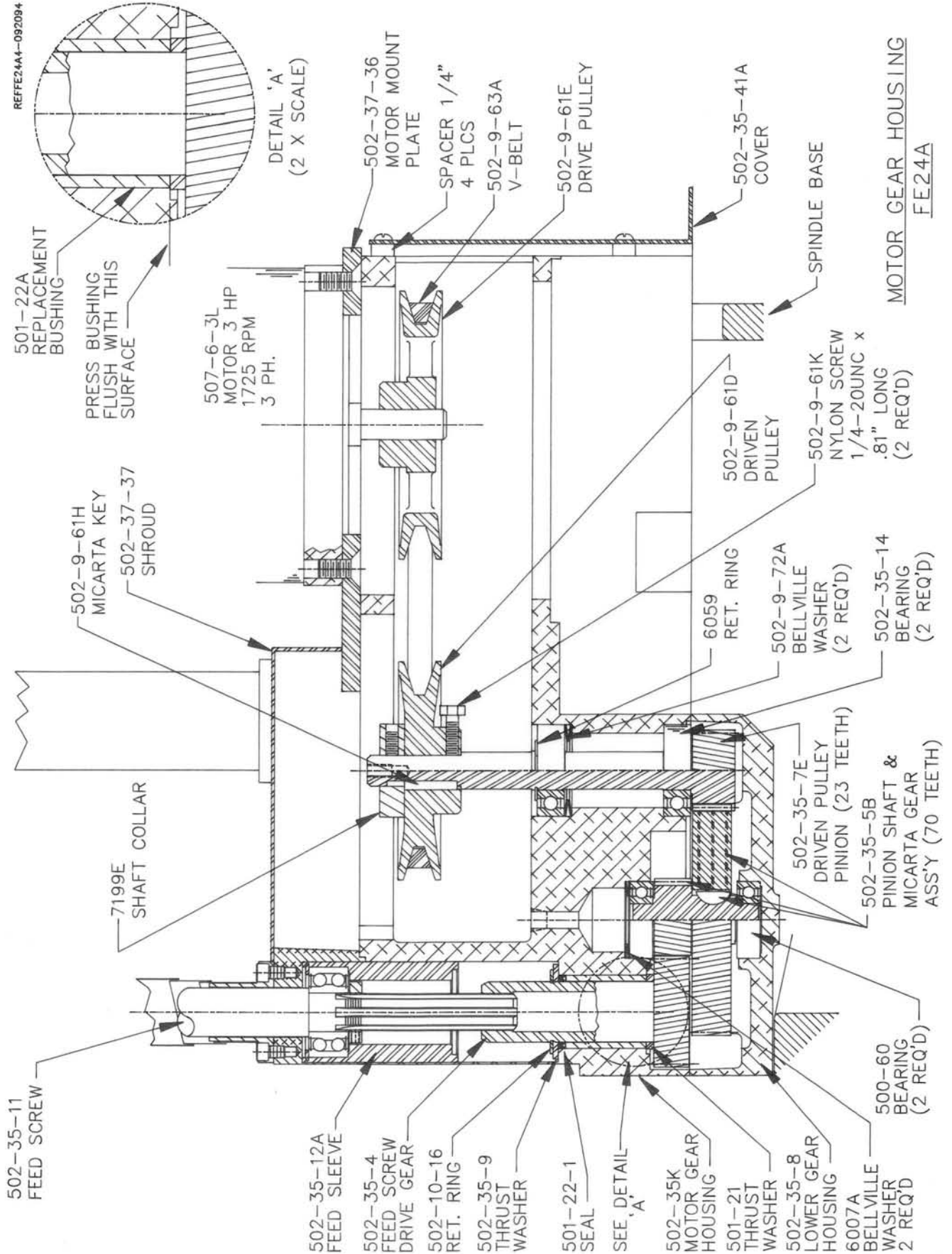
FE24A 10

Pendant Components



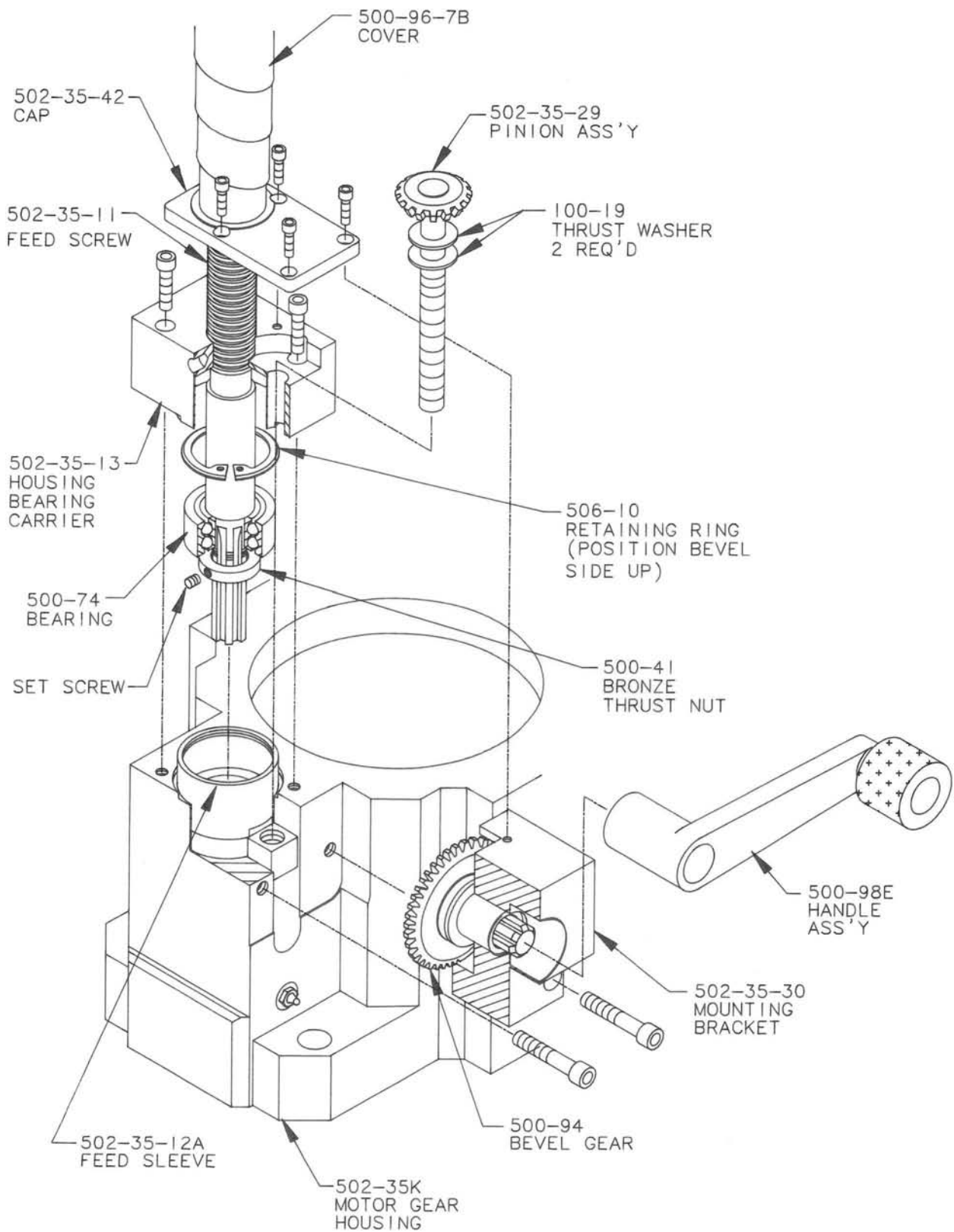
FE24A7

Motor Gear Housing Section

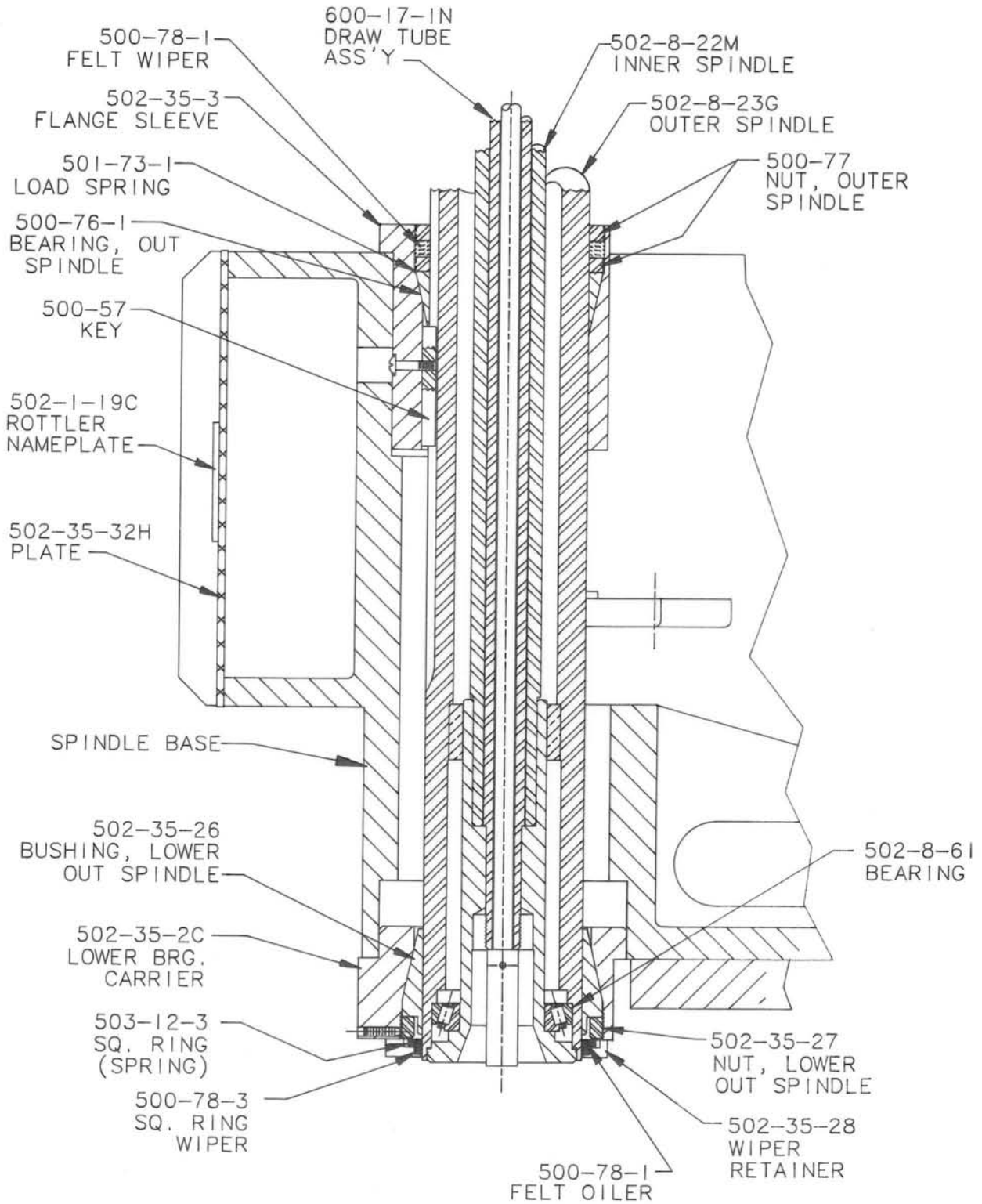


Hand Feed Assembly

REFFE24A11-092094



Spindle Section

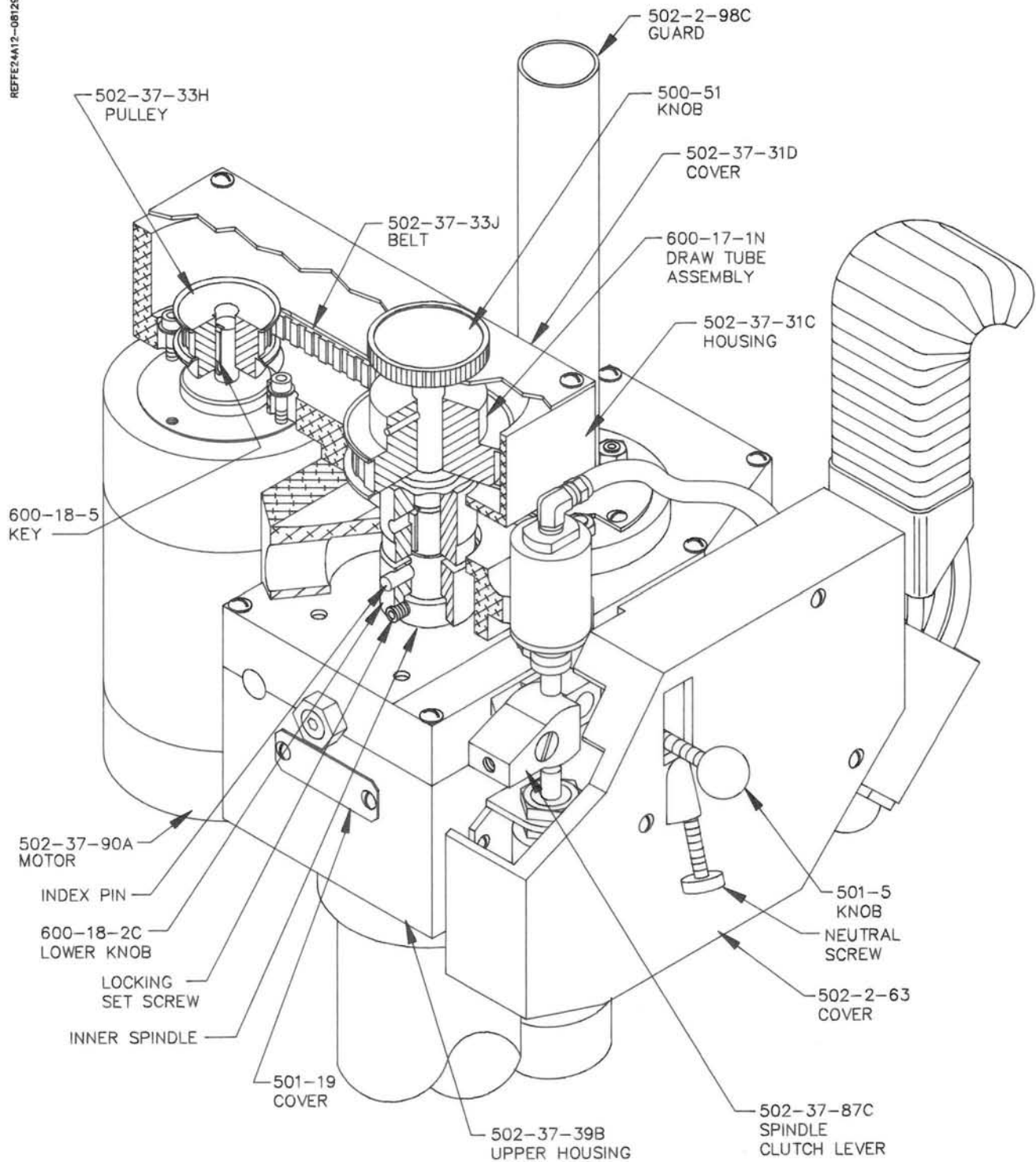


SECTION THRU
SPINDLE
FE24A

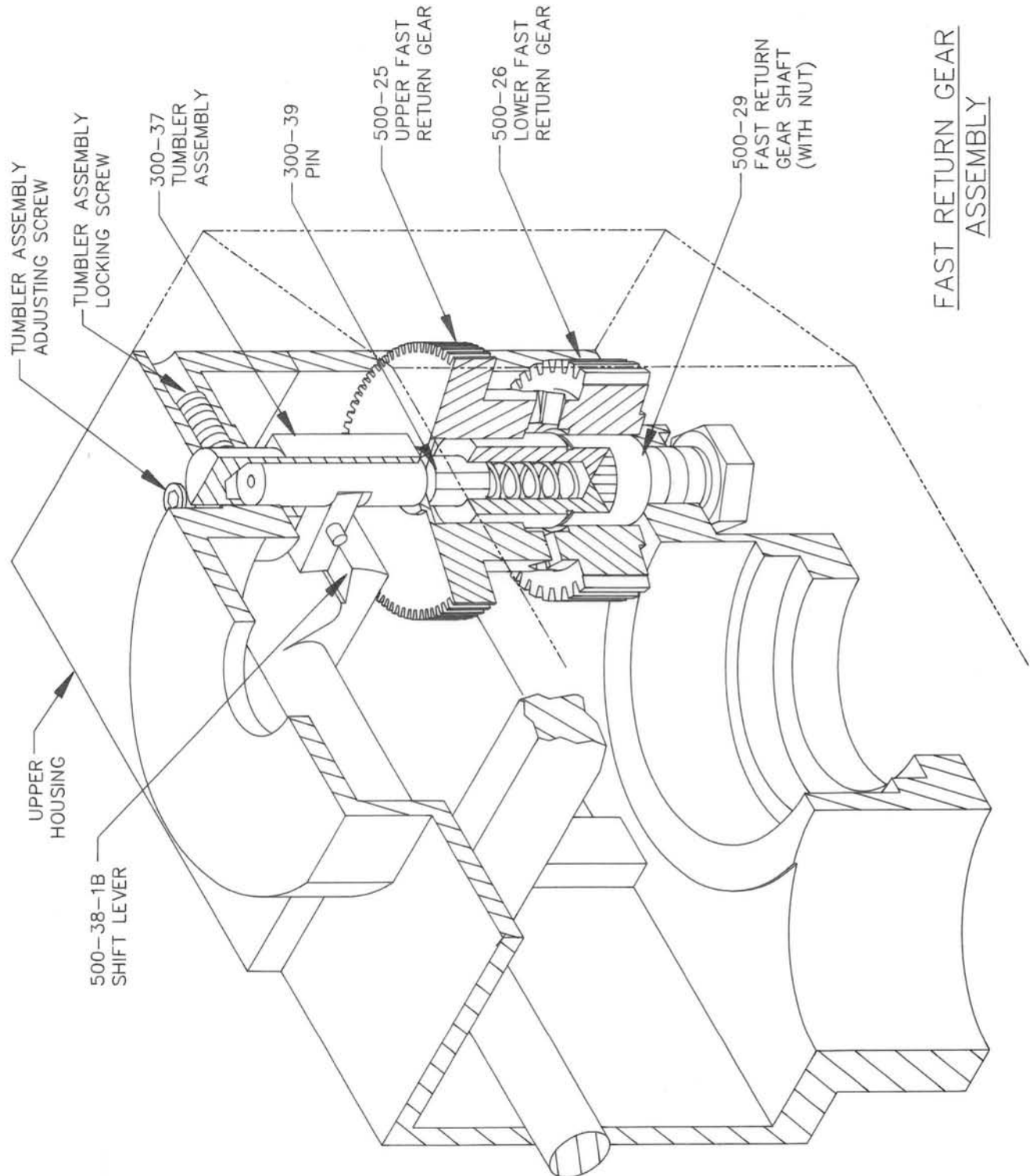
FE24A3

Centering Motor Assembly

REFFE24A12-081293



Fast Return Assembly

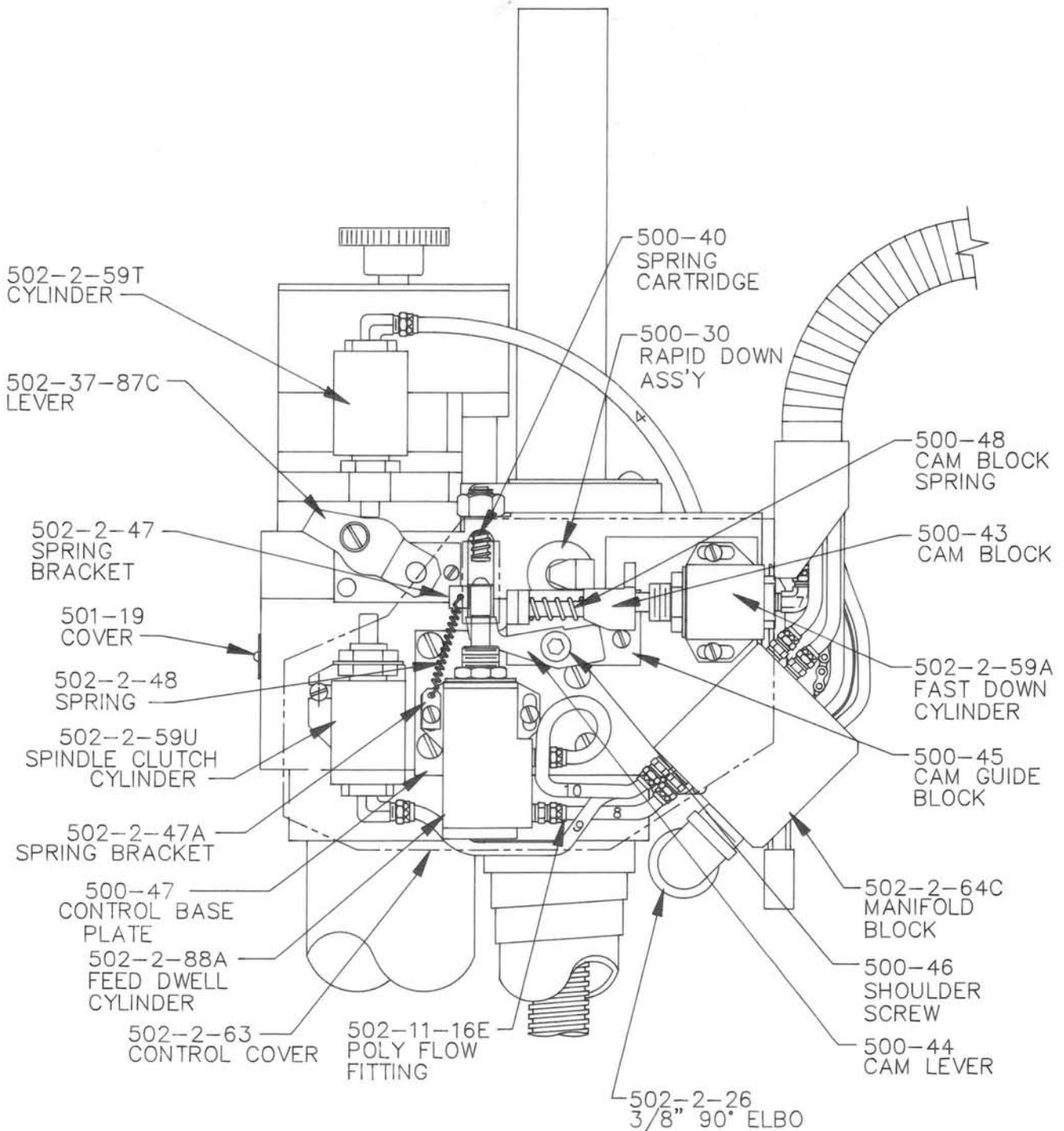


FAST RETURN GEAR ASSEMBLY

FE24A1B

Automatic Control Assembly

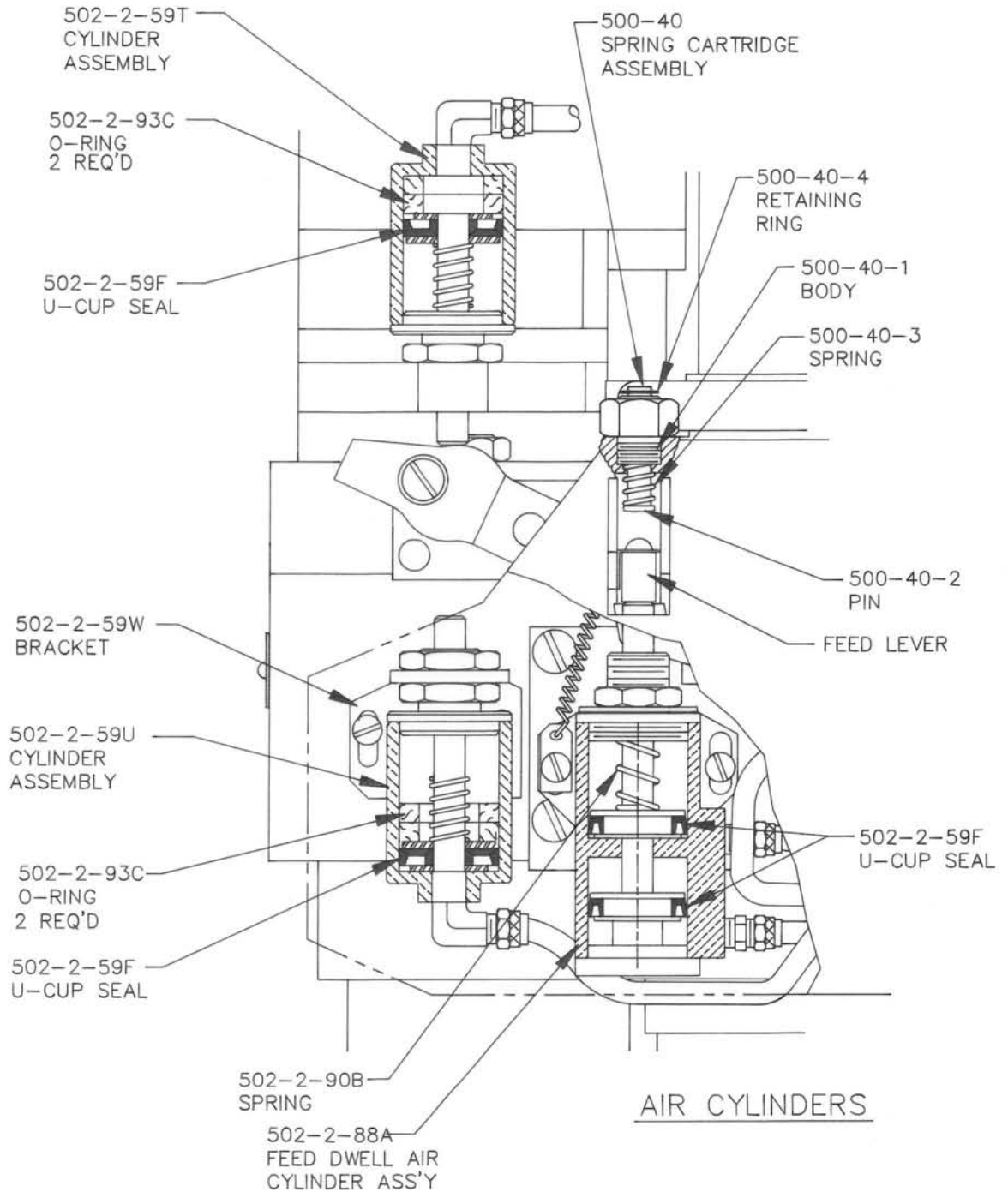
REFFE24A15-092094



Spindle Clutch Air Cylinders

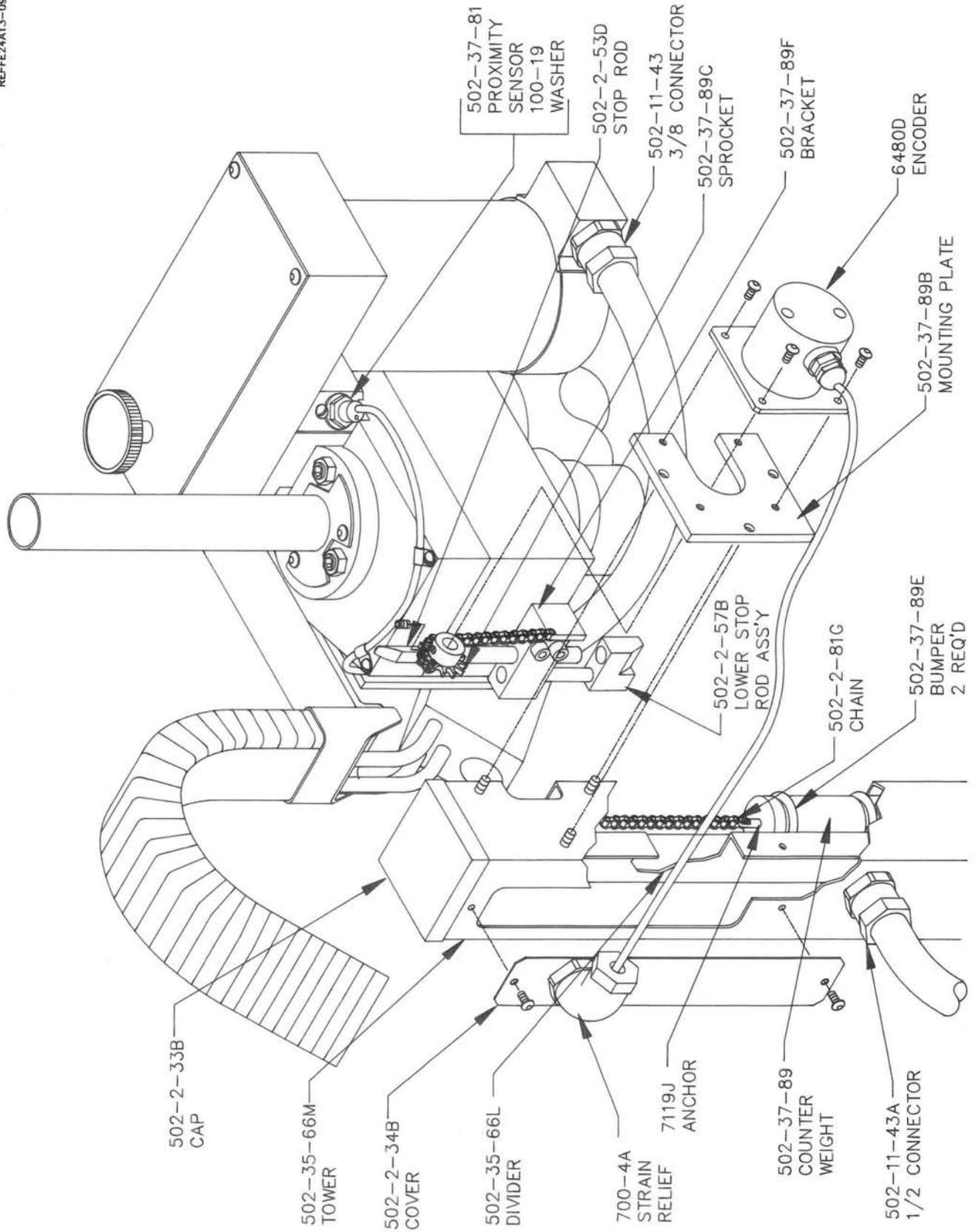
(See also: Old Style Parts Assemblies at the end of this manual)

REFFE24A61-092094



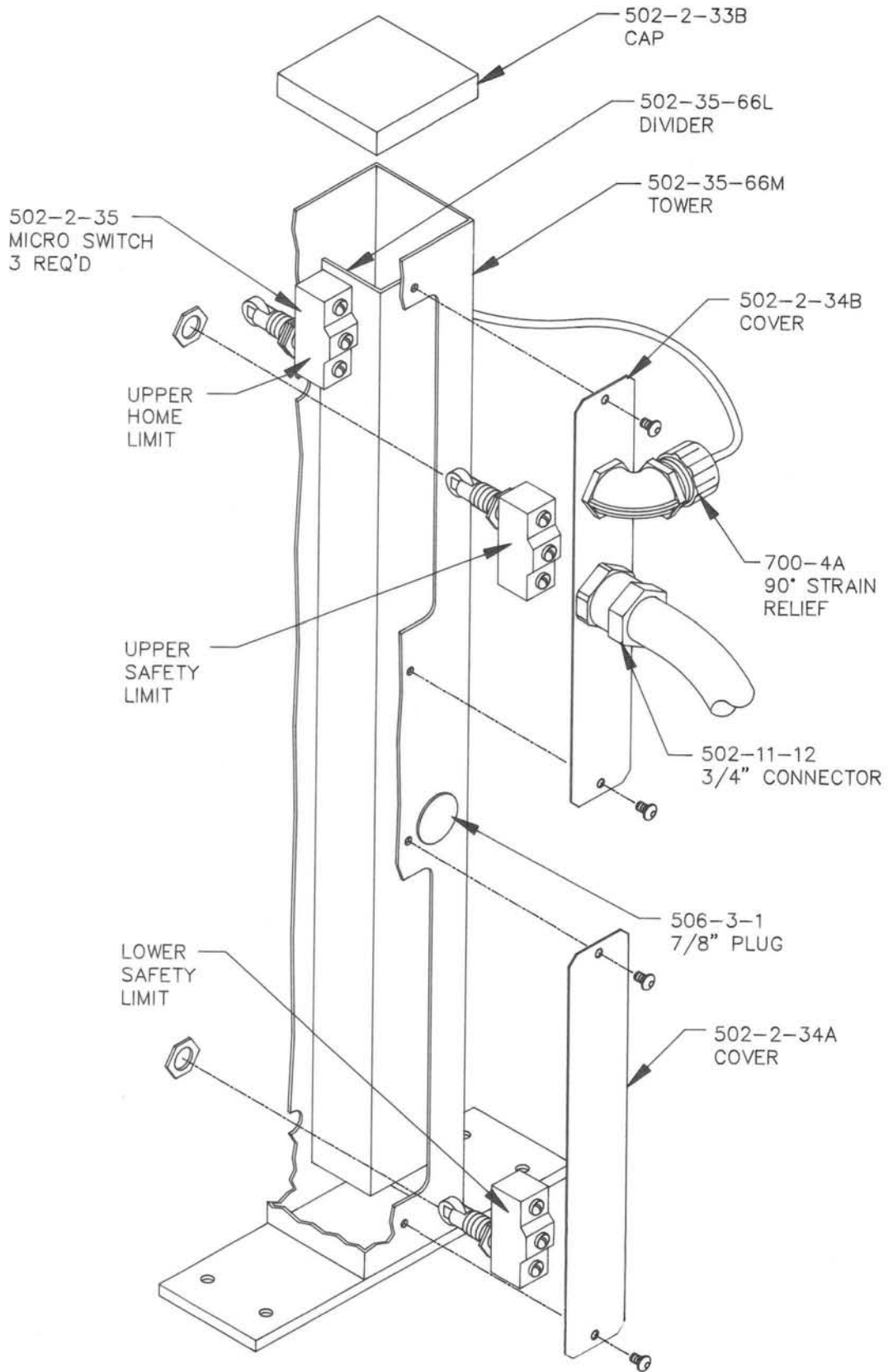
Vertical Encoder Assembly

REFFE24A13-091693

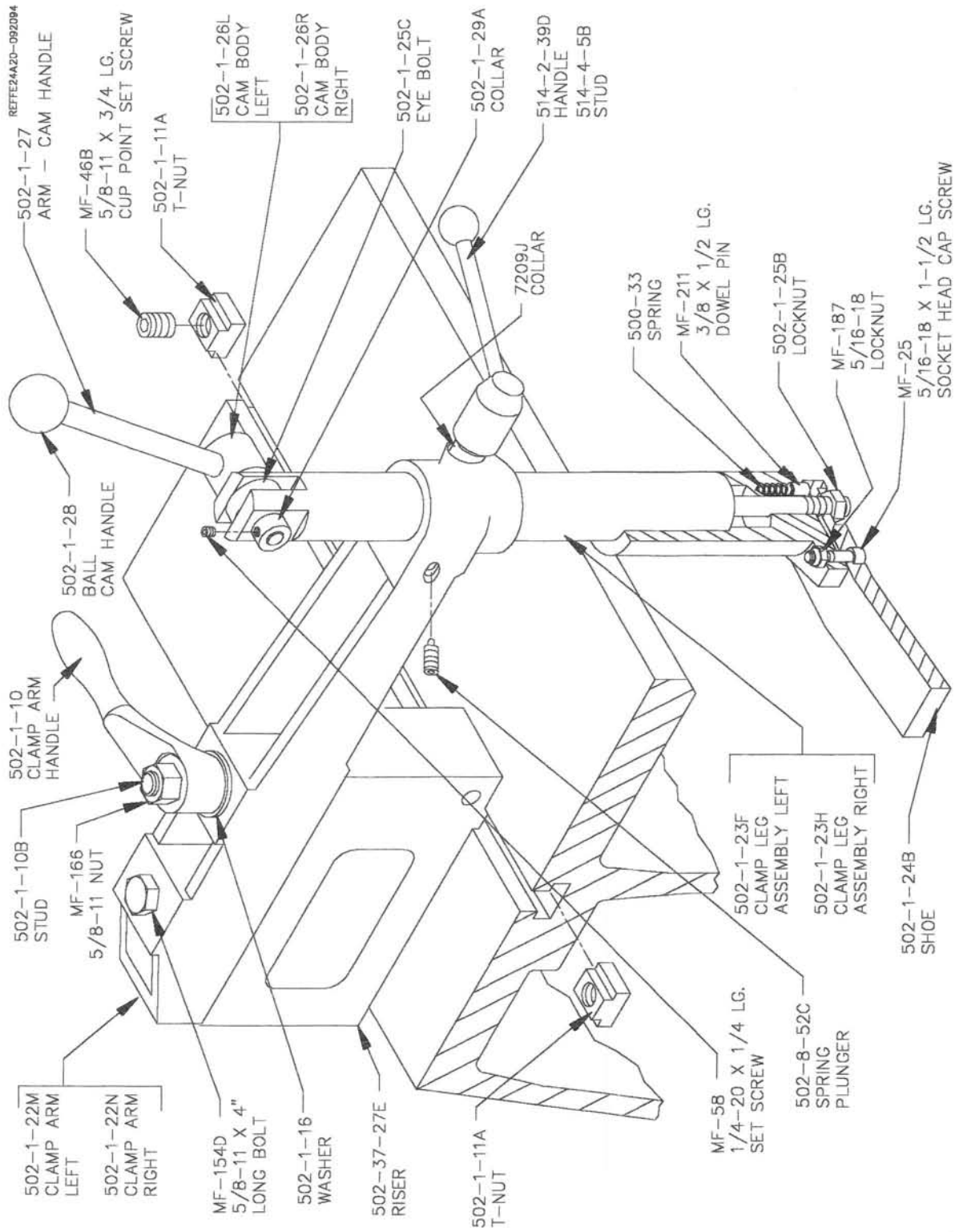


Tower Assembly

REFFE24A14-092094



Clamp Arm Assembly



Tool Box Assembly



500-98E
HAND FEED
HANDLE ASS'Y



502-12-2
SPANNER
WRENCH
(2 REQUIRED)



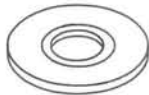
100-24
TOOL
PULLER



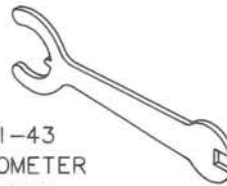
PART No.	FUSE No.	QTY.
502-37-53A	MDA 20	2
502-37-55	MDL 2	2
502-37-72B	MDL 4	2
6456L	MDA 1	4



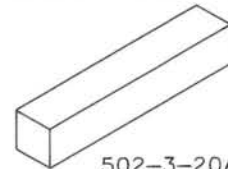
502-1-12
LEVELING
PAD
(4 REQUIRED)



500-41
LOCK NUT
FEED SCREW

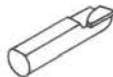


501-43
MICROMETER
WRENCH

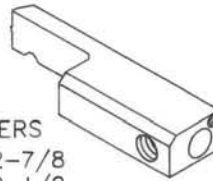


502-3-20A
DIAMOND
DRESSING
STICK

502-1-12A
JACKING SCREW
(4 REQUIRED)



501-31-1
TOOL BIT
R 8 (1")



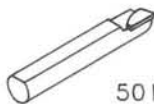
TOOLHOLDERS
502-25A 2-7/8
502-25B 2-1/2
502-25C 2-1/4
502-25D 3-5/16



100-23
TOOL HOLDER
WRENCH



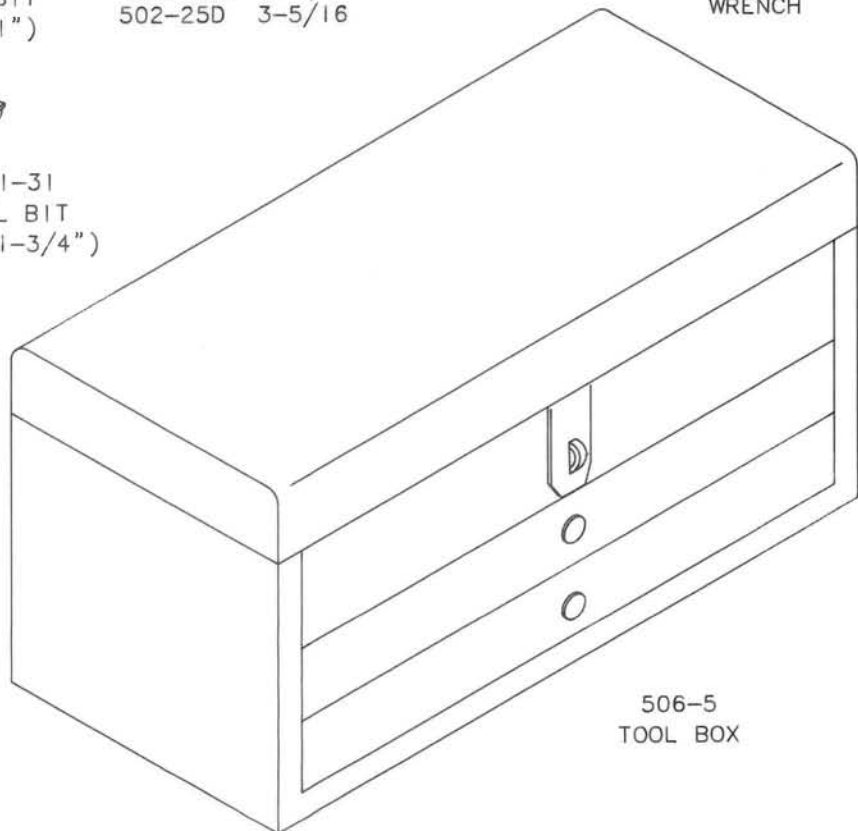
502-1-12F
JAM NUT
(4 REQUIRED)



501-31
TOOL BIT
R 8 (1-3/4")

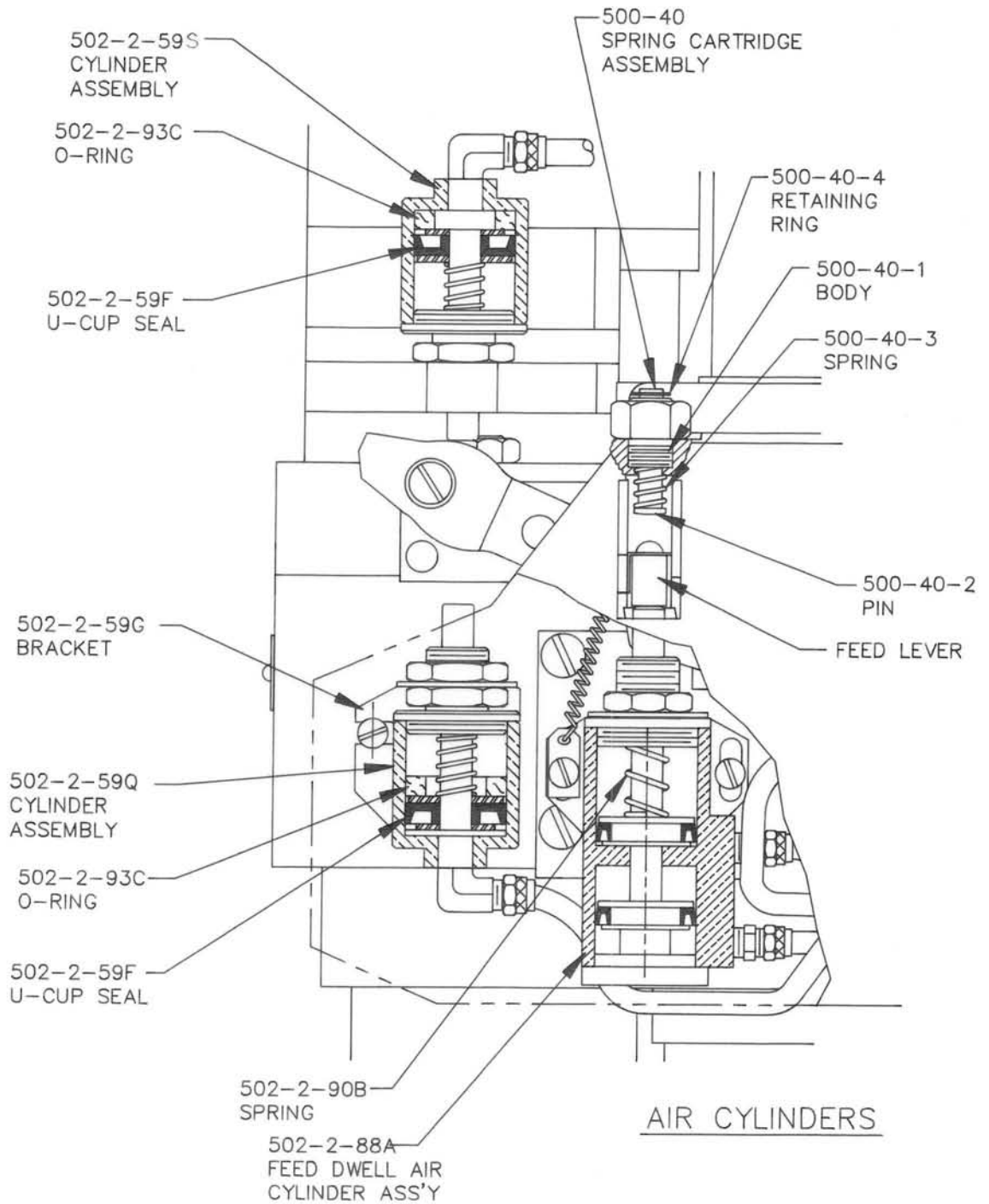


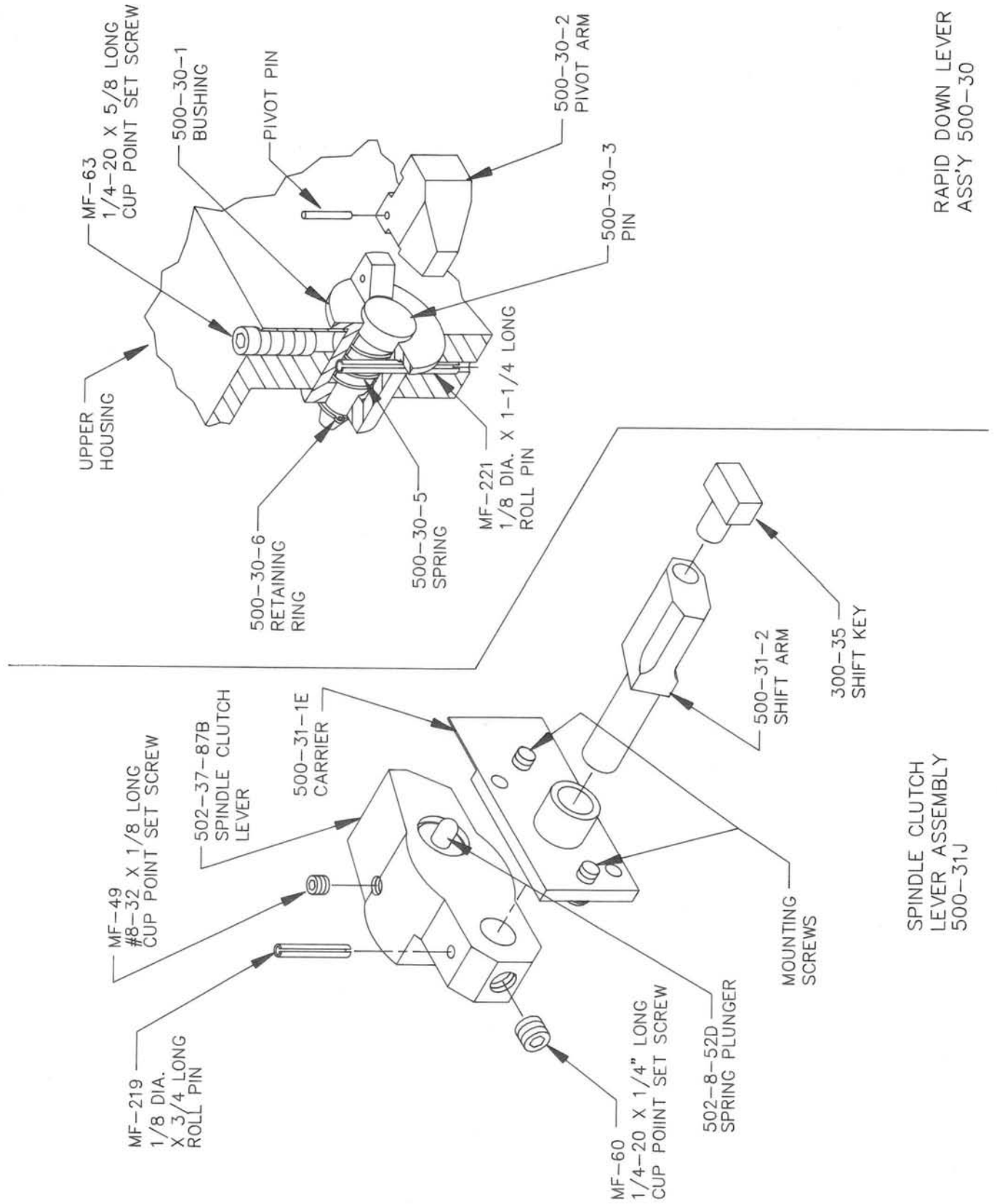
501-72
7/32" HEX
DRIVER
(OPTIONAL
501-72A
(5/32) HEX
DRIVER



506-5
TOOL BOX

FE24A16





SPINDLE CLUTCH LEVER ASSEMBLY 500-31J

RAPID DOWN LEVER ASS'Y 500-30

FE24A19

Production Cutter Head

With Tooling 600-8-10D

Without Tooling 600-8-10E

The production cutterhead has a standard bore capacity of 2.875" to 6".

The production cutterhead used in the FE24A machine simplifies and speeds up the boring operation. It eliminates the need to remove the tool every time you center the spindle in a new bore.

CAUTION:

Be sure that this head does not interfere with lower extremities of the block, such as bosses and hubs.

The cutter head is designed to clear most all obstructions in U.S. passenger car and truck engines.

REFFE24A24-121892

