12/22/93

ROTTLER

MANUFACTURING

FA-2AVB

BORING MACHINE

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

DESCRIPTION

The model FA-2AVB 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, 90 and 60 degree V-types. FA-B machines may be readily tooled to rebore a wide variety of engines including European and Asian engines as well as perform a wider variety of 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 is realized as a result of fast block clamping, inverted centering fingers, push button controls, air operated spindle clamping and air floated spindle base.

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

Power is furnished by a 230-460 volt 3 phase, totally enclosed motor with an outboard fan. An air actuated variable pulley provides variable speed. An enclosure at the rear of the machine contains relays and 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 FA-2AVB 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.

IMPORTANT

OPERATING SAFETY AND EMERGENCY PROCEDURES

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. NOTE - Eye protection is a necessity when working in this area.

2. CUTTING TOOL AREA - Any operation involving hand 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 this lever to make sure that the upper lever position will lock out the spindle clutch when the detent is engaged . Check to see if the upper indent will firmly hold the spindle clutch out of engagement.

3. BORING - Eye protection must be worn during this operation and hand must be kept completely away from cutter head

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.

E M E R G E N C Y P R O C E D U R E

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. TURN OFF MOTOR IMMEDIATELY.

NOTE: You can keep your finger on the stop button, if you wish to insure instant shut down.

After finding out what the problem is, methodically organize the controls to return the spindle to it's up position, without causing more problems.

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 FA-2AVB 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 satisfactorily. 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 anticipate, 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 FA-2AVB 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.

Remove the SJ4 sharpening fixture from the deck and preferably place at a bench close to the machine. This fixture will require 115 volt single phase AC current. If it is necessary to mount this fixture on the FA-2AVB base with an angle plate, mount it so that the sharpening wheel is below the top face of the machine base, and the sharpening grit will not be thrown on top of the base.

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, clean thoroughly the cylinder block clamp arm assembly. 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.

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.

MACHINE SETUP

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 bolt assembly and loosen the nut. Adjust the nut now, so that the washer is loose and the spindle unit may be slid it's full travel in and out without tending to drag and bind the 5/8" bolt assembly. Loosen the nut only far enough to do this and no further, and reinsert the cotter key in the appropriate slot. Now slide the spindle unit from side to side and further clean the rust inhibiter from the table.

Attach an air source to the appropriate intake at the air filter on the side of the rear control enclosure.

NOTE: AIR SUPPLY IN "F" SERIES MACHINES
It is very important your air source for "F" series boring machines 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.

CAUTION: Before attaching electrical power to the boring bar, check your electrical current and the electrical current rating on the motor nameplate on the side of the motor. If compatible, check to see if wiring on the inside of the motor wire connection box on the side of the motor is correct for the voltage you are going to use, as per connecting instructions on the motor nameplate, or in the wire connecting box cover. Also, check to see that the correct "H" type heaters are in the motor starter that go with the amp reading on the motor nameplate.

Check to see if safety toggle switch at rear of the spindle unit is turned off.

CAUTION: This machine must be grounded at grounding screw in motor starter enclosure.

Machine Set-up con't

Connect 230-volt,3 phase wiring to the L-1, L-2, and L-3 terminals, as noted on right hand upper portion of the motor starter, located in upper right portion of the rear enclosure.

If the 460-volt current is used, reconnect the terminals on the transformer (502-11-2) as shown. Also change the coil in the solenoid valve in the back of the spindle base see page (89).

Check the gauge on the air regulator in 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.

Turn on safety toggle switch at the rear of the spindle unit and turn the clamp selector switch to the left (float) position, slide the spindle unit from side to side and in and out to make sure it slides freely. The necessary effort to slide this will decrease when the shipping oil is entirely removed from the machine base. (There is an adjustment noted - Clamp Selector Switch, Page 62, to adjust effort required to slide the spindle unit).

Turn the clamp selector to the right (clamp) and check proper operation of the clamp assembly and proper release and movement of the base when turned back to float.

Replace sheet metal cover on the spindle unit.

Plug the motor by pushing the feed button, along with the stop button. The feed screw should turn counter-clockwise,looking from the top of the machine. If it turns in the wrong direction, or tends to ratchet and not drive at all, switch the wires on L-1 or L-2 terminals.

CONTROLS

We suggest that before attempting any cylinder boring, the operator should actuate the controls to become familiar with the operation of the machine.

1 - CLAMP (FLOAT) SWITCH
Turn the clamp switch to the right to energize the spindle hold down clamp. When this is turned to the left, air is exhausted from the bottom of the spindle unit, providing easy movement of the spindle.

> CAUTION: Motor must be stopped when positioning bar, inadvertent spindle rotation could injure the operator's hands or damage the cutterhead parts.

It is important to note the clamp switch may be left in the neutral straight up position so that the spindle unit is neither floated nor clamped. You will find it often useful to use this position on your machine for dial indicating purposes in bores and to make slight adjustments in order - either to correct or to introduce a desired total indicator run-out reading.

2 - FAST DOWN BUTTON
Press fast down button and you will notice that the machine travels rapidly down until the button is released. To become familiar with the rapid down travel, we suggest that you place a tool in the holder slot and practice running this tool holder down rapidly (in the fast spindle speed) to an exact point, and returning it to the upper position. This can be done rapidly and very accurately with a little practice.

3 - FEED BUTTON
Press the feed button and the machine will remain in slow down feed until either the stop button, lower microswitch, or the up button is pressed.

4 - UP BUTTON
The up button may be pressed any time.

The up button will continue the travel upward on the machine until either the stop button is pressed or the machine contacts the upper microswitch and stops at the top of the travel.

You will often find it convenient to stop the up travel of the machine as soon as the spindle is clear of the cylinder bore, then slide to the next bore location. This is particularly useful when the cylinder is located well down from the upper limit of the travel.

Controls con't

5 - STOP BUTTON
Stop button may be pressed anytime, BUT only in emergency cases, when boring.

6 - SPINDLE CLUTCH CONTROL
The spindle clutch control, located at the upper right of the upper gear housing, is actuated by pulling down. This may be done on high speed when jogging or starting the unit, or when the machine is idle.

It may be necessary if the machine is idle, to turn the centering knob counter-clockwise slowly to determine if the clutch is engaged. A light down pressure on the spindle clutch at the time you start the feed will assure that it is fully engaged for boring.

Lift the clutch knob anytime, EXCEPT WHEN BORING, to disengage clutch.
When boring, first raise and hold feed shift lever into neutral position then disengage the clutch.

SPINDLE STOP
This machine is equipped with a spindle stop that engages as the spindle clutch is disengaged. (This is a spring loaded stop and can be over-ridden). It is positioned to stop the spindle with the tool directly facing the operator.

7 - VARIABLE SPEED DRIVE
Change spindle speed by pressing one of the two push buttons located on the left side of the control panel, upper (faster), lower (slower). Read RPM's on the tachometer located on the top left hand corner of the control panel.

An optimum boring speed for rapid stock removal and good tool life is 380 surface feet per minute on normal oversize cuts. A guideline to secure this surface speed is the following list of spindle RPM's of different bore diameters:

3"BORE	-	470 RPM
4"BORE	-	360 RPM
6"BORE	-	240 RPM

NOTE: Refer to the chart in the back of the manual for speed recommendations.

Controls con't

8 - CENTERING KNOB
The centering knob (upper knob) at the top of the upper spindle housing, operated the centering fingers when turned clockwise. Be careful not to over-extend these fingers when the spindle is not in the cylinder or they will come completely out of the pinion drive.

CAUTION: Motor must be stopped when centering. inadvertent spindle rotation engagement could injure the operator's hands or damage cutter head parts.

9 - STOP ROD
The upper and lower limit switches located on the square tube, control the upper and lower limits of travel of the bar. The lower limit switch is actuated by an adjustable stop rod. This stop rod is locked in place by the plastic knob on the back of the upper housing. The upper limit switch stop rod is set at the factory and should not be changed.

10 - FEED LEVER
The feed lever is the knob in the center on 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 or middle position or by use of it's adjusting screw. To turn on machine when the feed lever is in neutral, press the feed button. Automatic feed will not operate.

11 - MANUAL HAND FEED
The manual hand feed travel is available for facing sleeves and counterboring, etc.

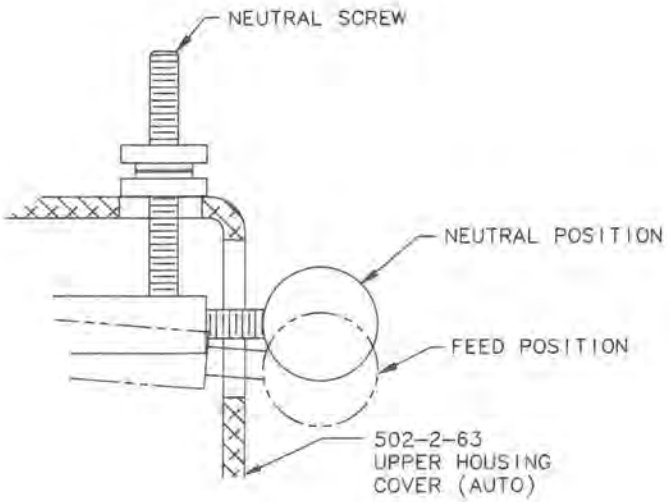
It is completely separate from the powered spindle travel and should ALWAYS BE RETURNED TO THE FULL UP POSITION AFTER BEING USED, BEFORE THE POWER UP TRAVEL RETURNS THE SPINDLE TO THE TOP.

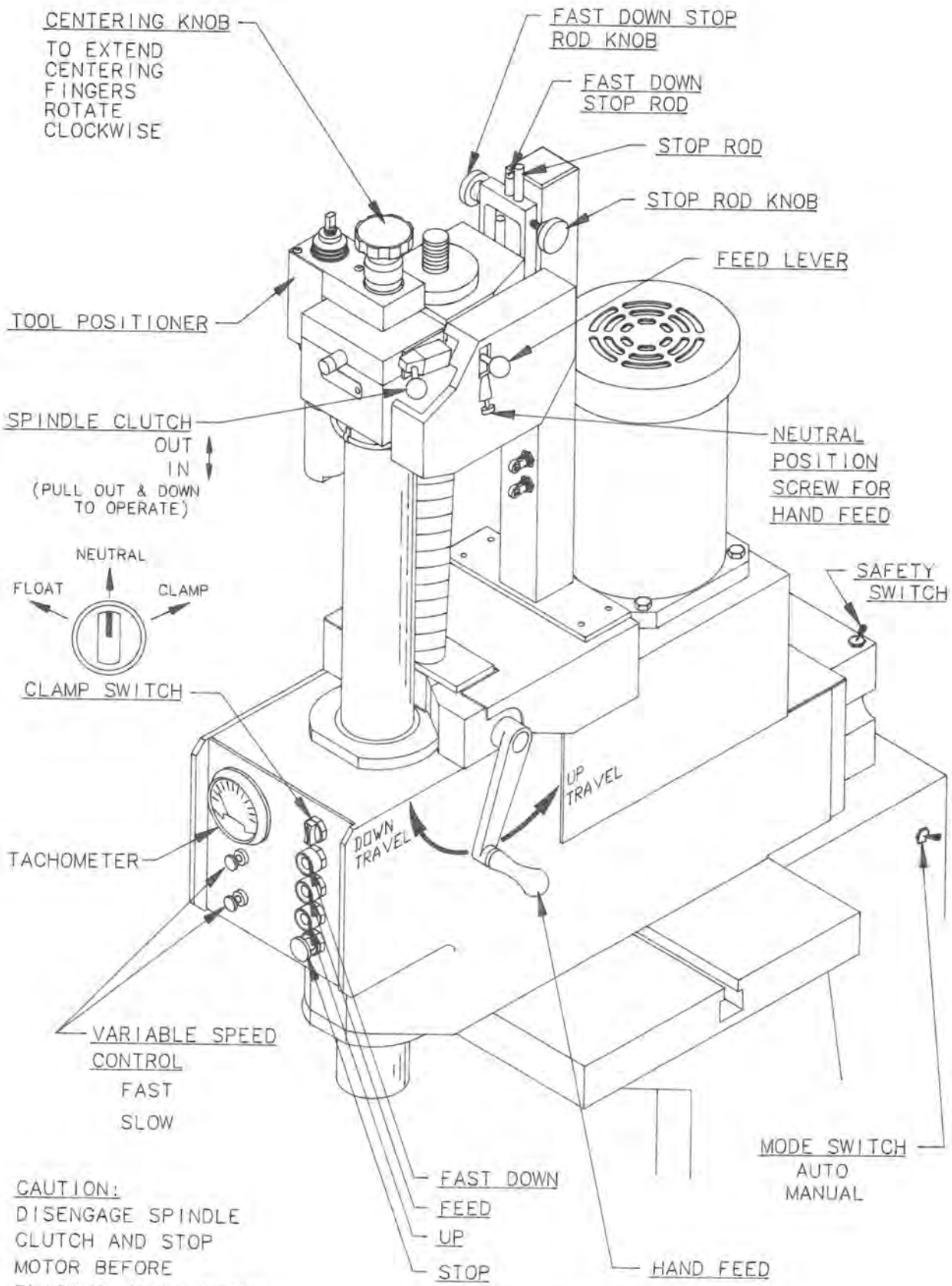
CAUTION: The automatic feed lever must be disengaged when operating this short hand feed. To disengage feed lever, raise knob and hold in the middle or neutral position or use adjusting screw to hold it in neutral position. All controls, excepting the automatic feed will operate with the neutral screw engaged (feed button turns on machine).

The standard procedure to operate the hand feed is to power travel close to the feeding point, press feed button, engage spindle clutch, operate the hand feed, (holding the feed lever where required), and then return first the hand feed, and then the power feed to the top.

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.




CENTERING KNOB
TO EXTEND CENTERING FINGERS ROTATE CLOCKWISE
FAST DOWN STOP ROD KNOB
FAST DOWN STOP ROD
STOP ROD
STOP ROD KNOB
FEED LEVER
TOOL POSITIONER
SPINDLE CLUTCH
OUT
IN
(PULL OUT & DOWN TO OPERATE)
NEUTRAL POSITION SCREW FOR HAND FEED
NEUTRAL
FLOAT
CLAMP
SAFETY SWITCH
CLAMP SWITCH
UP TRAVEL
DOWN TRAVEL
TACHOMETER
VARIABLE SPEED CONTROL
FAST
SLOW
MODE SWITCH
AUTO
MANUAL
FAST DOWN
FEED
UP
STOP
HAND FEED
CAUTION:
DISENGAGE SPINDLE CLUTCH AND STOP MOTOR BEFORE PLACING HANDS NEAR THE CUTTER HEAD.

CONTROLS

AUTOMATIC FAST DOWN STOP

The purpose of the stop is to allow the operator to rapid travel the spindle down, without requiring strict attention to accurately stop the travel at the proper height for centering.

The stop consists of an added limit switch (FDLS) and mating adjustable stop rod. The rod is the middle stop rod (502-2-56) on the back of the upper housing and is adjusted to stop the spindle automatically when the middle limit switch is contacted.

The spindle down travel is started by depressing the FAST DOWN button and stopped by either releasing the button or allowing the automatic stop to actuate. To rapid down travel past the automatic stop, it is necessary to depress the feed button and "feed" the stop rod past the switch.

AUTOMATIC SPINDLE RAPID RETURN

The purpose of this device is to completely eliminate the operator attention required to disengage the spindle clutch and return the spindle to the top of it's travel.

A toggle switch on the side of the control panel selects automatic or manual operation. The automatic return consists of a double pole, double throw lower limit switch (502-2-36); and an air cylinder (502-2-59D) to disengage the spindle clutch; and air operated cylinder and cam mechanism to rotate the spindle to the return position (tool bit facing the operator); two time delay switches, in the control panel, control and time the air operation.

The automatic spindle rapid return is operated with the toggle switch in the "auto" position. When the stop rod contacts the limit switch (502-2-36), the spindle clutch is first disengaged, then the spindle is rotated to the return position, and the spindle is returned to the top of it's travel. With the toggle switch in the manual position the machine shuts off when the limit switch is contacted and is returned to the top of it's travel by depressing the up button.

NOTE: Machines are equipped with a lower safety limit switch to protect the machine spindle from damage in the event of failure of air or electrical components in the panel or on the machine.

-B TYPE CUTTER HEADS

ALTERNATE CUTTER HEAD ARRANGEMENTS

CAUTION: Turn off machine before changing cutter head.

Your FA-2AVB is equipped with a single draw bolt through the inner spindle so that a number of different styles of cutterheads, tools, and indicators, may be rapidly interchanged. A spanner wrench is provided for locking and unlocking the cutter head, it is used on the lower knob on top of the spindle, engage spindle clutch to hold spindle from turning. When inserting alternate tools, make sure the socket is absolutely clean and while threading in place, make sure the spline is easily engaged without burring. Disengage spindle clutch.

PRODUCTION CUTTER HEAD 600-8-4H or G
The production cutter head with a standard bore capacity of 2.875" to 6" may be quickly attached to the FA-2AVB machine by use of the draw bolt.

It is used in the FA-2AVB machine to simplify and speed up the operation, eliminating the necessity of removing the tool everytime you center the spindle in a new bore.

CAUTION: Care must be taken to determine that the lower body of this head does not interfere with lower extremities of the block such as bosses and hubs of main bearing bores.

The cutter head body is designed to clear most all obstructions in U.S. passenger car and truck engines.
NOTE: Some V-6 blocks (GM 60 degree) have a bad interference problem at the bottom of the bore, which will require the use of a special offset tool bit #100-29-7. This bit has to be used with a 6" micrometer #900-2-5 and an offset micrometer anvil #501-34-7.

A dampener weight is also provided in the cutter head to improve performance of the boring spindle. This requires little or no maintenance as long as liquids or contamination do not enter the weight cavity. Should this occur, the operator will experience chatter problems with this head and it will have to be disassembled and cleaned. It is simply done by removal of the three flat head screws. Carefully disassemble, clean and reassemble.

BLIND HOLE CUTTER HEAD (OPTIONAL) 600-8-5

This cutter head is attached and operates in the same manner as a production cutter head except the centering fingers are located above the cutter tool, requiring tool removal to center each bore. An offset tool bit is provided so that extreme blind bores may be processed. A dampener weight is also provided in the which requires the same maintenance as a production cutter head.

1.5" (38mm) STUB BORING BAR (OPTIONAL) 600-2

This stub boring head with a capacity of 1.5" to 4.1" (38mm to 104mm) diameter x 6.5" (165mm) depth, may be quickly attached to the FA-2AVB boring machine. At all times the work should be located in the machine so the end of the stub boring head is no further than 1" from the beginning of the work when the spindle is in the upper limit of travel.

Unlike the production cutter head, centering fingers are located above the cutting tool, requiring tool removal to center each bore.

Two sets of centering fingers are provided, the smaller has a 1.5" to 2.625" bore diameter range and the larger a 2.625" to 4.1" diameter bore range.

If centering fingers require dressing after a period of use, apply the same lapping procedure noted on page 36. The micrometer may also be periodically calibrated as noted on page 39.

An offset tool bit is also provided in order to bore to the extreme bottom of blind holes.

IMPORTANT GENERAL INFORMATION

FOR THE BEST USE OF

THE MODEL 1.5 STUB BORING TOOLING

CAUTION: Inner Spindle Adjustment (see page 46) must be correct for precision use of stub boring heads.

Since the extended Stub Boring Head design has considerable over hang with a small shaft diameter, the cutting tool "B" land must be kept very narrow, (.005" to .015") (.127mm to .3810mm) wide. This will ensure best results with no chatter at the bottom of the bore.

The small head will also be inclined to deflect with increasingly heavy cuts. You may expect, with properly sharpened tools, that after a .040" (1.016mm) (on diameter) cut, a second pass of the tool will remove close to .001" (.0254mm) material on the diameter. A second pass following a lesser first cut will remove less metal.

The .040" (1.016mm) cut will also leave a light drag back mark in the cylinder that can in turn be eliminated by the second pass.

The drag back mark is generally eliminated in any event by the finish honing. It may also be eliminated by repositioning the boring spindle away from the tool position on the return stroke.

You can use the second pass performance (second pass must be made without re-centering) to provide a most precise bore.

In general size variations in a typical cycle bore will approximate.0007" (.01778mm). A second pass will reduce these variations to generally less than half and provide a fine finish. This finish will require very little stock removal with a hone in order to cross hatch for an excellent ring seating condition.

The boring head assembly as noted in stub bar illustration, is equipped with a dampening weight, part #600-8-2. This requires little or no maintenance as long as liquids or contamination do not enter the weight cavity. Should this occur, the operator will experience chatter problems with this head and it will have to be disassembled and cleaned.

Performance of the stub boring bar is also closely related to the proper lubrication and adjustment of the machine inner spindle bearing. Check the inner spindle adjustment two to three times a year to make sure clearance is correct.

CAUTION: It is very important that after inserting tool holder into the stub boring cutter head and pushing it firmly back to it's indexing point, that you remove all finger pressure from the tool holder and the tool bit, before locking it with it's locking set screw. This is especially important when using the offset blind hole tool bit. Failure to follow the above instruction will result in size variation.

1.5 (SHORT) STUB BORING BAR (OPTIONAL) 600-8-8A

This Stub Boring Head, with a capacity of 1.5" to 4.1" diameter (38 to 104mm) x 3" depth (76mm), attaches and operates the same as the 600-2 cutter head. It is designed especially to be used with the production full width single cut VW head facing tool. It can also be used for general purpose boring where a rigid stub boring head is required.

If you already have a 600-2 stub cutter head, you may use it's tooling for this head.

NOTE: When this cutter head is used for VW head facing, cutter head will require centering bushings and wide facing cutting tools, which are sold separately. See page 94 for sizes.

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OPERATING INSTRUCTIONS

We recommend, particularly for operators unfamiliar with boring bar, to practice on a junk block in order to become acquainted with all controls and details connected with the use of the machine.

BORING AUTOMOBILE AND SMALL TRUCK BLOCKS

LOADING IN-LINE CYLINDER BLOCKS

Place a Chevrolet, Ford, or Plymouth 6 cylinder block in the machine on top of the 5" parallel fixture, and apply weight to the top of the block at each end to determine there is no burr or dirt under the pan rails that will result in the block not being clamped properly to all four points of the pan rails. (You will 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 parallel fixture and should be shimmed at proper front support to eliminate rock.

Place the block into the machine, so that the holes are in a position to approximately locate boring spindle in the middle of it's 1-3/4" in and out travel, when centered.

You will note that it is possible to put engines in this machine in such a way that the spindle unit may be forced to the limits of either it's in or out travel and not enable it to be centering properly.

Swing clamp arms out so that the toe of the shoe will contact the center of the ends of the cylinder block.

Lock clamp handles firmly and lower the toe firmly on the block with the cam handle straight up. Lock ball handles firmly and lower cam handle to clamp block. If the block is exceptionally long, such as straight 8's, operate the two cam handles simultaneously so that locking the first handle does not tend to rock the opposite side of the block up.

You will note that the parallel fixture is designed with an "L" shape. The purpose of this is to extend the back portion of the "L" outboard to prevent cylinder blocks from rocking when first clamp is applied.

CAUTION: The standard production-type cutter head with centering fingers below the tool bit must be checked for interference with main bearing bosses or other protrusions on engines other than typical American passenger car and truck engines. FA-2AVB machines may have other cutter heads substituted to avoid this difficulty.

Operating Instructions Con't

MICROMETER

Determine the cylinder bore size you wish to cut and place a tool bit into the tool holder and use the micrometer to set to size. Choose a tool holder that will allow minimum tool bit overhang, for the size you wish to bore. We recommend a maximum tool bit overhang of 3/4" 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. Particular attention should be paid to inserting the holder in the micrometer without allowing the spring loaded tool bit to snap against the micrometer anvil. Caution should be used to lightly lock the tool bit. Then turn the micrometer spindle away from reading and firmly lock the tool bit. Then re-check the micrometer reading.

BORING

Insert the tool holder into the boring bar spindle and push firmly back to the index point. Lightly lock the tool lock screw with the plastic handled hex driver provided in your tool box.

Make sure spindle clutch is out (lever in up position) and the spindle is placed near the center of the hole but slightly to the rear. Press fast-down to travel down to within 1/8" of the cut. If you should travel the cutter into the bore, place fingers on "up" and "stop" buttons and press the "up" button, immediately pressing "stop" button when the cutter is out of the bore.

CENTERING WITH CENTERING FINGERS

Turn clamp selector to left (floating position). Turn centering knob clockwise to extend centering fingers. Make sure they will extend and contact the cylinder wall. Continue to hold a firm rotary pressure on the centering knob and turn clamp selector to the right (clamp position). When rotating clamp selector switch, a slight pause is required in the straight up or neutral position, to assure good centering. This pause will allow the float air to dissipate and the spindle to settle evenly before the clamp cylinders engage.

NOTE: DO NOT PULL KNOB TOWARD YOU DURING CENTERING. THIS IS THE MOST COMMON CAUSE OF CENTERING ERROR.

Turn centering knob counter clockwise to return fingers to "in" position. Apply light down pressure on the spindle clutch lever while pressing feed button to begin boring.

Operating Instructions Con't

If you wish to check the bore size, allow the machine to bore a sufficient depth above the ring travel. Raise and hold the feed shift lever into neutral position, disengage spindle clutch, push "up" button. Allow machine to return to it's full up position. Check bore diameter, adjust if necessary and re-insert tool, rapid travel down to job again; engage spindle clutch and press feed button. do not unclamp during this checking operation.

When cutter has completed boring operation, set down stop rod on the back of the upper gear housing to stop feed.The stop should be set promptly after machine finishes cutting as the inverted style of the cutter head does not have a large amount of end clearance above main bearing bosses on some engine models.

After feed has stopped, lift spindle clutch lever, turn lower knob, (600-18-2) clockwise until detent is contacted, press the "up" button to return the spindle to the top.

NOTE: If a cut of .005 or less, on diameter, is to be taken the following centering procedure is required - turn float clamp switch to it's neutral position, then center spindle by using a dial indicator attached to the cutter head. Then turn clamp selector to the right (clamp position).

CAUTION: Handle block and fixture with substantial care and guidance. A block hoist is required. Mishandling of a heavy engine block and fixture could result in the dropping of a heavy piece and possible personal injury. BE CAREFUL!

The Model 502-1-72B V6/V8 combination air fixture is a fast, simple and universal system to properly and accurately hold most 60 degree and 90 degree V-type engine blocks for cylinder boring.

NOTE: The block must have the main bearing caps in place and torqued.

Care must be taken to assure the side contact edge of the locator bar is above the cap split surface. A pair of 3/8", 1/2" and 1-3/16" spacers are provided for blocks with large main bearing bores, locate above the main bearing split line.

V BLOCKS
(Blocks with main bearing center lines no more than 1/2" higher than the pan rail plane) are mounted with the 502-3-8B V block frame in place. Select the 90 degree option placement of frame to suit block length, or main bearing caps will interfere with frame. Rotate frame 90 degrees by moving its shoulder screws to alternate set of holes.

Y BLOCKS
(Blocks with main bearing 2-3/8" to 3-1/2" higher than the pan rail plane) are mounted directly on the fixture. Some Y-blocks (GM 60 degree) have too narrow pan rails and some have too low main bearing location which will require the use of the 502-1-15C precision 1-1/4 x 3 parallel set to raise and or support the block. Use the shoulder screws from the V-block frame and hook the parallels over the back of the V-fixture.

This fixture may be easily repositioned on the fixture support assembly (without a block in place) to shift from the 60 degree support surface to the 90 degree support surface or vice versa. Trip lower toggle switch on control tower to switch float capability from 60 degree to 90 degree surfaces.

F4 main base only: 2-1/2" (502-1-21C) wear pads must be bolted on top of the 4" wear pads when using this fixture at elevated position. Remove only for largest blocks. (see page 25).

The 502-1-21C wear pads are used for most automotive blocks. These wear pads must be removed to accommodate large blocks including the Ford Super Duty Truck Series, the Caterpillar 3208 and the International V 401, 446, 549, and 550 series.
On F2 main bases the fixture will rest on the 4" wear pads.

CAUTION: Extreme care must be taken by operator whenever handling large blocks. Large blocks may cause fixture to tip when floated too far outward. We recommend leaving hoist attached when moving these blocks. Large blocks should be lifted

from the block band surface. DO NOT use the 502-1-95 block handler assembly on these blocks.

NORMAL OPERATION PROCEDURE:

The normal operation procedure on smaller V blocks is to first attach the block handler assembly on to the block making sure the cam lifters are COMPLETELY engaged and that the lift hook is approximately centered in block lengthwise. Place the 502-1-82M locator bar assembly thru the main bearings and hoist the block into the fixture. Pulling the block towards you, with the locator against the positioners, will prevent jamming in the slot of the guides during the loading and unloading operation. After locator bar is engaged in the positioners, pivot block outwards as you lower it.

Make sure the block is firmly seated in place and not resting on pan-rail burrs or other interferences. Accurate seating can also be a problem with extremely warped, distorted blocks. Another cause of problems is failure to remove main bearing inserts. The locator bar has a relief for blocks with a small main bearing or seal.

Activate locator bar clamp by switching the upper toggle on the control tower.

Warped or distorted blocks may require leveling of the deck surface in the long direction. This is possible with the hand-screw assembly in the left-hand bar positioner. Disengage the locator bar clamp and slide the locator bar to the far right position. Reactivate the locator bar clamp. Raise or lower the handscrew as required. For the non-adjustable position slide locator bar to the far left. (see illustration next page).

Depress the valve button in the control tower and push fixture back into bore position. There is a guide block (502-1-105) attached to the bottom of the fixture to aid in guiding the fixture along the support ways. Lack of air float support will indicate you are moving off the center of the support ways. Operate the block clamp arms, bore, and pull fixture back to the load position while depressing the valve button. Lift the block with the block handler, turn the block 180 degrees and reload to duplicate the operation on the other bank. Use upper switch on control tower to release locator bar clamp fingers.

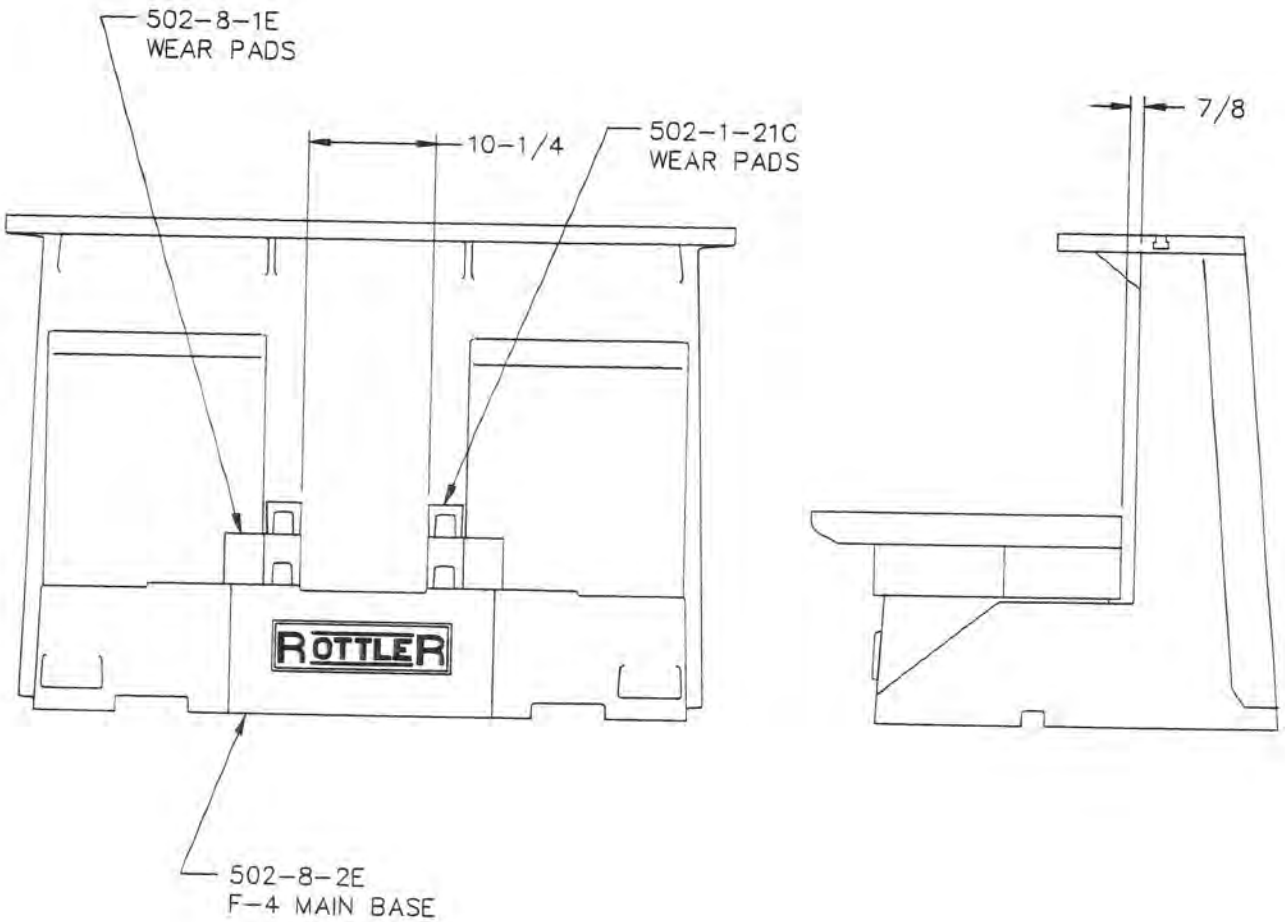
For safety, the air float will cease when the fixture is at it's outer limit of travel, using the 502-1-21C wear pads.

Use lift hook 502-1-103 to lift V6/V8 fixture from main base.

BORING LARGE TRUCK BLOCK

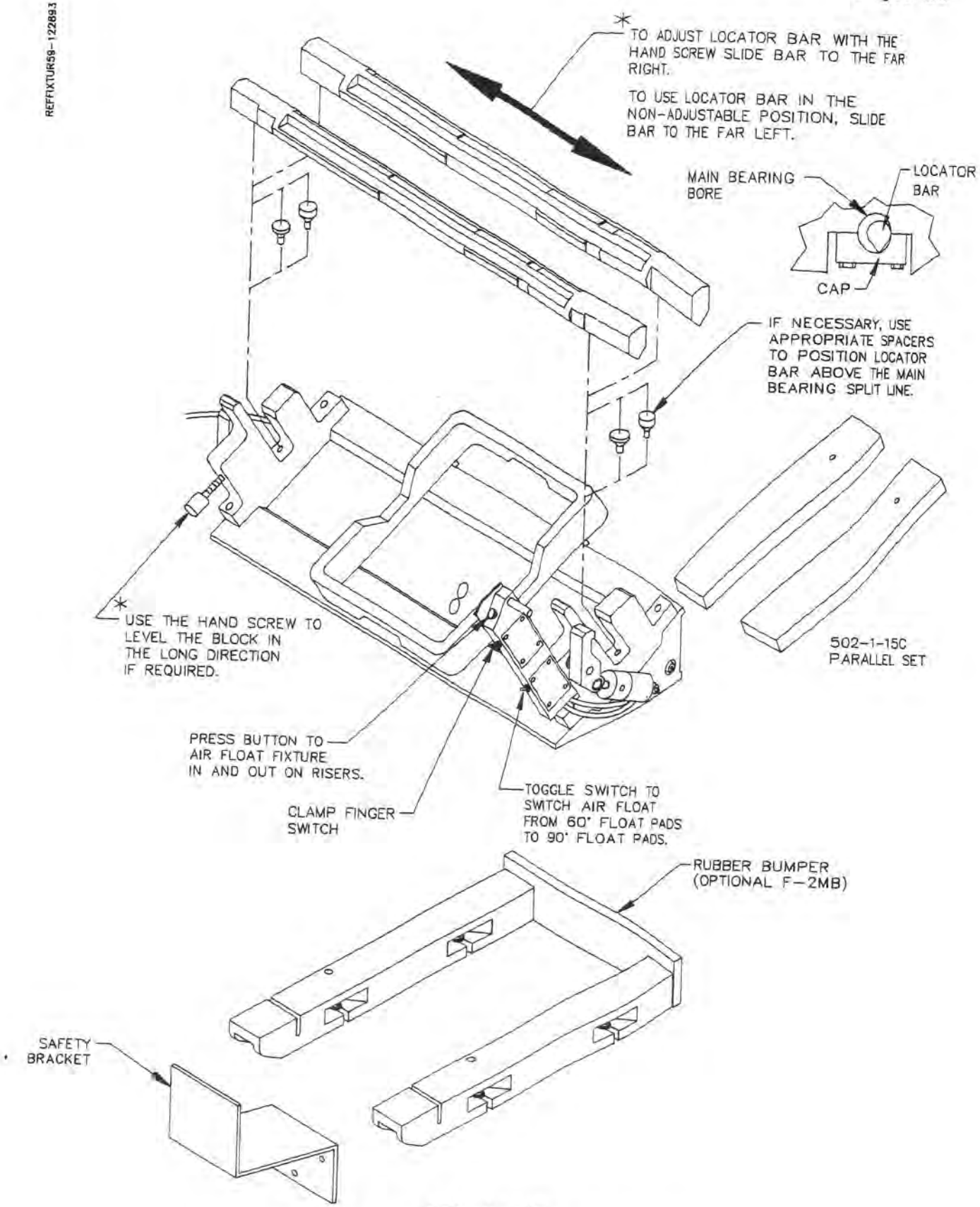
The F-2VB Boring Machine has the capacity to bore truck engines such as the in-line Mack and the in-line GMC series 71. It is necessary when boring these large blocks to remove the wear pads (502-1-21) and place the block directly on the main base (502-1-20). The blocks are then bored per instructions.

REFBUL30-100192



WEAR PAD
MOUNTING DIMENSIONS
F-4 & F-24 MACHINES ONLY

REFFIXTUR59-122893



502-1-72B
V6/V8 FIXTURE ASSEMBLY WITH AIR FLOAT
BORING MACHINE APPLICATION

PROCEDURES FOR BORING FORD 2800 cc V-6 AND GM V-6 CITATION CYLINDER BLOCKS

Cutter heads that clear main bearing bosses of these blocks are:

600-2	Stub bar 6-1/2" long
600-8-8A	Stub bar 3" long
600-8-6	Blind hole cutter head
502-13D	Short production stub bar

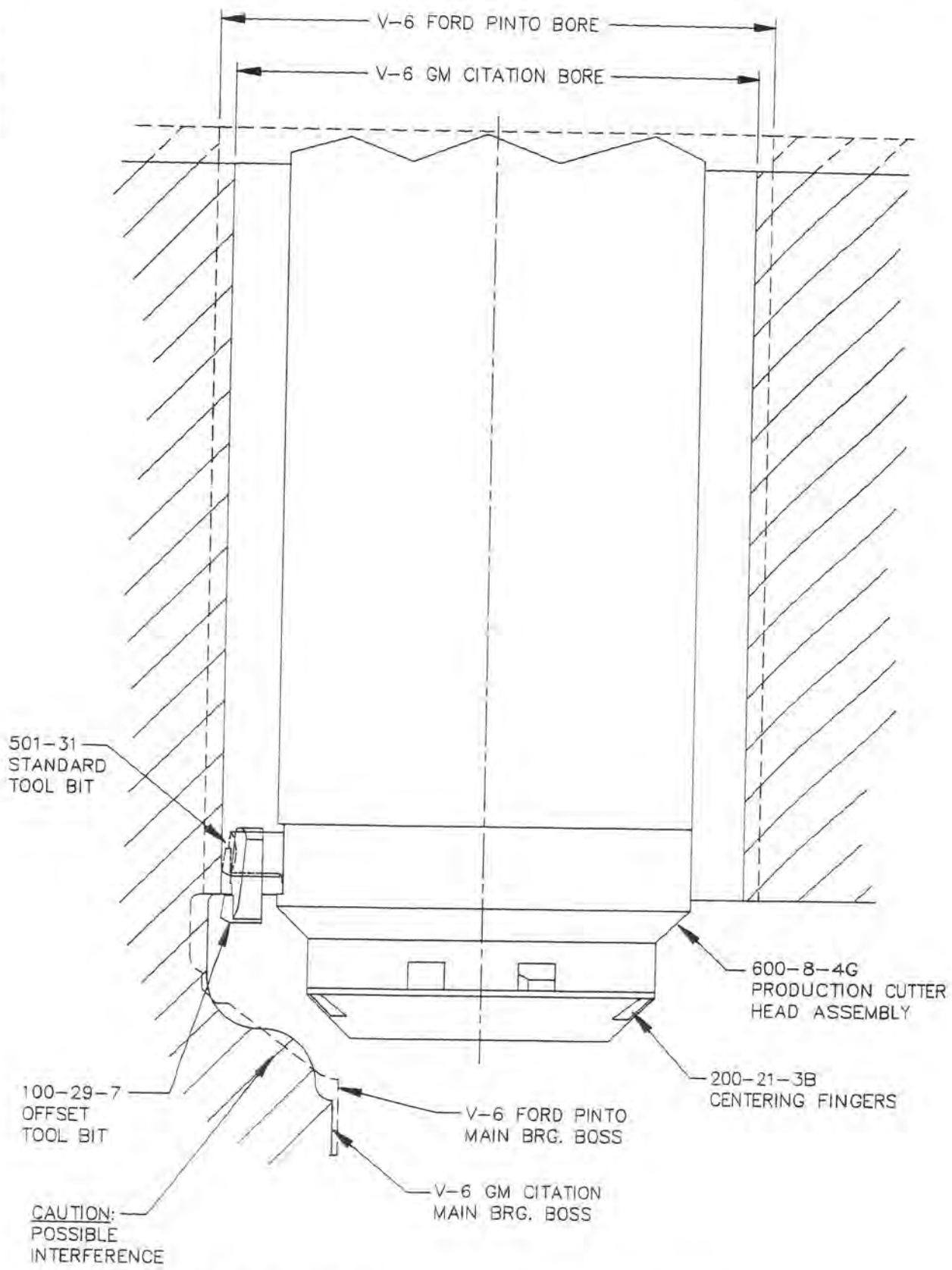
NOTE: Production cutter head, part #600 -8-4, will not clear main bosses of these blocks. New production cutter head, part #600-8-4G, will clear main bosses with offset tool #100-29-7 (see next page).

6-1/2" Stub bar cannot be used on F2 main base. 6-1/2" Stub bar can be used on the F4 main base, provided: The 2-1/2" wear pads are removed, and the left 4" wear pad is turned 180 degrees.

CAUTION: After turning wear pad, drill and tap new holes in the main base to secure the wear pad in this position.

If 3" long stub bar, blind hole cutter head, or #502-13D production stub bar is used, place fixture on 2-1/2" wear pads.

REFBUL19-100192

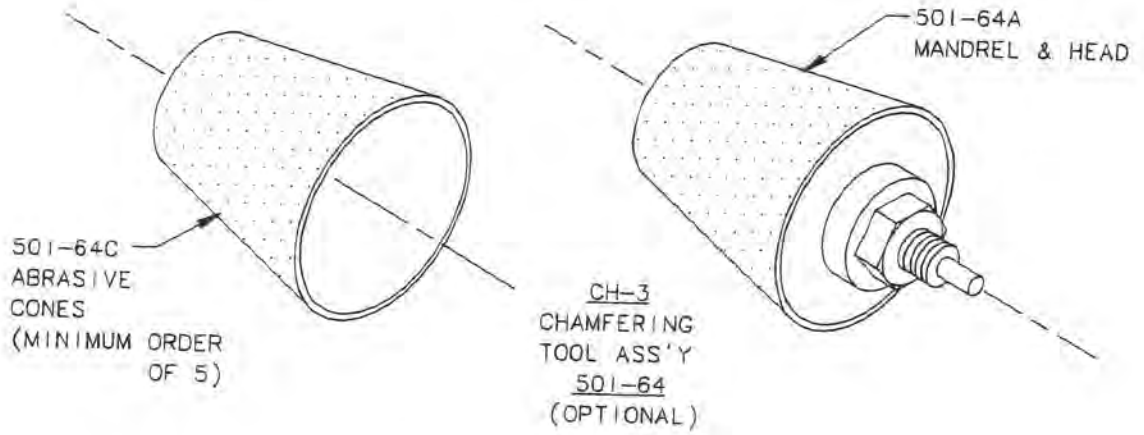


FORD & GM CITATION V-6 BLOCK MAIN BEARING
BOSS INTERFERENCE ILLUSTRATION

CHAMFERING

A special tool is available for chamfering. Tool may be set by either inserting in the head and approximately setting or placing in a micrometer and set approximately .100 over the bore size. Chamfering can be done either by using slow feed and releasing when adequate chamfer has been developed or by use of the hand feed.

Chamfering may also be simply done most effectively when an optional model CH-3 abrasive tool driven by a drill motor. This method will not require boring bar and develops a smooth burr free entry for rings.



COUNTERBORING

Counterboring will often be required in re-sleeving large engine blocks, and frequently a close tolerance must be maintained in order to properly secure the sleeve installation.

NOTE: Use hand feed.

UPPER AND LOWER DECK REPAIR OF DIESEL CYLINDER BLOCKS

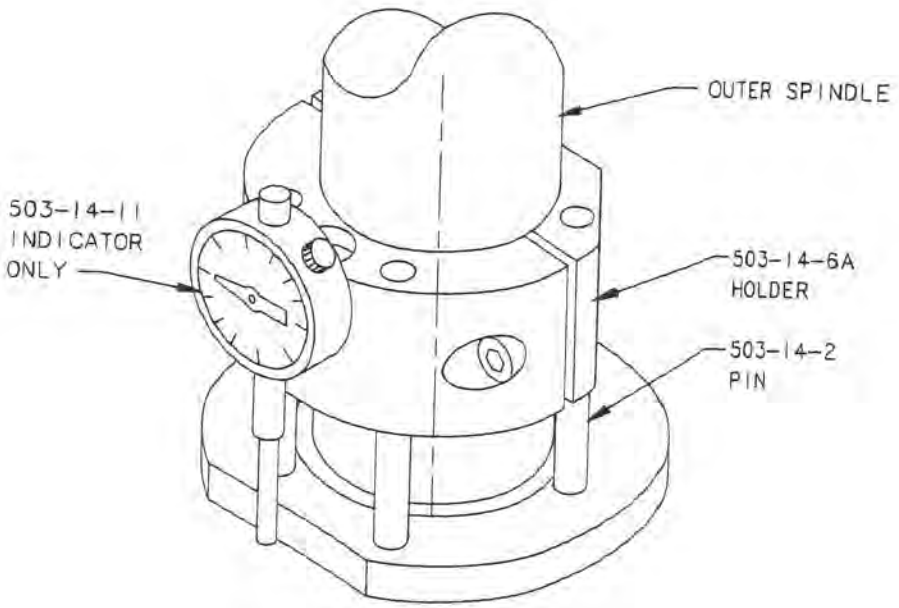
Most diesel blocks use the cylinder head to clamp the lip of the wet sleeve against the counterbore and at the same time, location of the sleeve is determined by the upper and lower fit.

This requires a good deal of caution to determine that:

1. Counterbore is parallel to the top deck.

2. Counter bore is exactly square with the concentric upper and lower deck bore fit diameters.

Counterboring may be best accomplished by the use of an optional 1" travel dial indicator assembly, 503-14F



503-14F
DEPTH DIAL INDICATOR
(OPTIONAL)

Counterboring con't

To counterbore to a close tolerance depth, carefully hand feed the RF type cutter bit down until the cutter is slightly touching the block surface. Adjust the dial reading to "zero" and hand feed cut down to within .003" to .007" of desired depth. Check the exact depth of counterbore at this point with your depth micrometer and hand feed the remaining depth required by reading the proper number of graduations on the indicator.

The dial depth indicator clamp is manufactured with spring pins so it will compensate for the weight of the spindle and allow very accurate depth control. It may be clamped into any position within the machine's spindle travel.

NOTE: 1/4 turn of the right hand clamp screw is sufficient tightening force. This will allow the collar to slip on the column, (after pins retract into collar),if the collar is inadvertently left in wrong position during normal cycle boring operation.

Instructions for Use of Optional Mechanical Dial Run-out Indicator con't

Turn the spindle, and the indicator now will read the total run-out. This will be exactly double the distance is out of center.

To clean up a bore, it will be necessary to set the tool about the amount of this run-out in addition to the basic bore size measure. If you bump the spindle unit lightly with your hand you will find you can easily reduce the reading to near "zero" for minimum stock removal.

Similarly if the bore is substantially out of round or has scored wear grooves, you may move the spindle so that you get two maximum equal dial readings at the opposed large portion of the out of round.

Achieving this you will find the bore will clean up on a slightly larger diameter than you measure at the maximum out of round area.

Turn switch to clamp when you have the proper dial reading, remove the indicator, proceed with the boring as usual.

If you wish to check the squareness of the bore face, reset the dial indicator lever for the proper travel direction and adjust the spindle and indicator to contact the surface above the bore. Rotate the spindle to check out of square.

Remember, if you wish to correct out of square with shims under the work piece, you will have to use a shim proportionately larger (as the support points are to the indicator travel extreme) than the out of square reading.

DEPTHS OF CUT

Proper cutting speeds are arranged so that the high speed range will rapidly take cuts up to .040" on diameter - up to 4" diameters.

Cuts that are taken over this size should be run on low spindle speed to prevent excessive tool wear. Heavier cuts up to .200" on diameter may be taken on low speed.

STUB BORING BAR

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

TOOL BIT SHARPENING

CAUTION: EYE PROTECTION MUST BE WORN WHEN SHARPENING TOOL BITS!

The performance of your boring bar and quality of work it will do, is almost entirely dependent on the care of the cutting tool. It is the most frequent cause of size and finish problems in boring.

To sharpen the carbide bit, insert the tool holder in the sharpening jig slot. Place the jig over the pin provided on the SJ4 and sharpen bits on small diamond wheel provided on the motor shaft. Always make sure you sharpen the tool on the side of the diamond wheel that is running toward the top face of the bit. Sharpening the wrong side can readily chip the point. When sharpening, use very light pressure, moving the tool back and forth across the diamond wheel,to improve cutting and prevent grooving of the diamond wheel. After sharpening a number of times, dress excess steel away from the carbide with a grinding wheel.

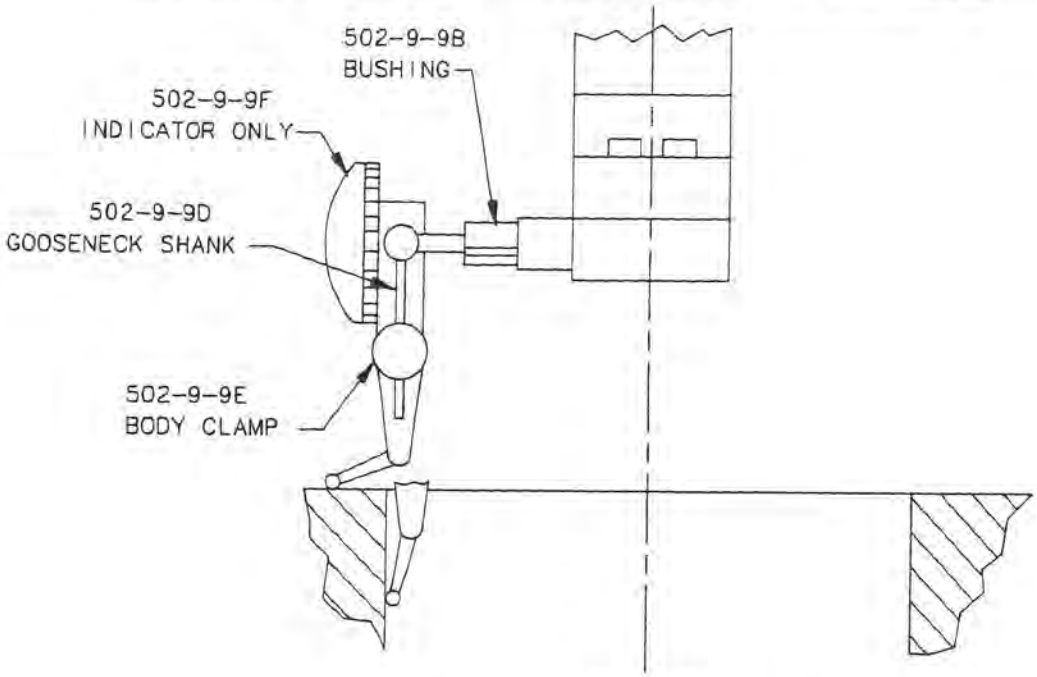
Dress steel away from the carbide and grind away unused portions of the carbide lands to allow faster diamond wheel touch up. This will also be convenient in the event a small fracture occurs in the carbide, and will reduce wear on the diamond wheel. The top surface will crater .010 to .015 back of the tip with considerable boring, so the tip should be occasionally dressed back .020 to .025.

CAUTION: See sheet for tool sharpening requirement.

Diamond wheel is designed for carbide only and is not intended for rapid stock removal. steel tends to load it. A tool bit used for aluminum boring should never alternately be used for cast iron or steel. Iron weld on top of the bit will cause a rough finish on aluminum work.

CAUTION: Do not attempt to dress or sharpen the top of the tool bit. Grind or dress the front and sides only.

INSTRUCTIONS FOR USE OF OPTIONAL MECHANICAL DIAL RUN-OUT INDICATOR (#502-9-9A)



502-9-9A
DIAL RUNOUT INDICATOR ASS'Y

The #502-9-9A mechanical dial run-out indicator may be used for checking and if necessary for correcting the centering or bore concentricity. It may also be used for checking face squareness of the work piece to the boring spindle.

The principle use in checking centering will be for engines requiring an absolute minimum oversize, particularly when irregular wear and score areas can be found.

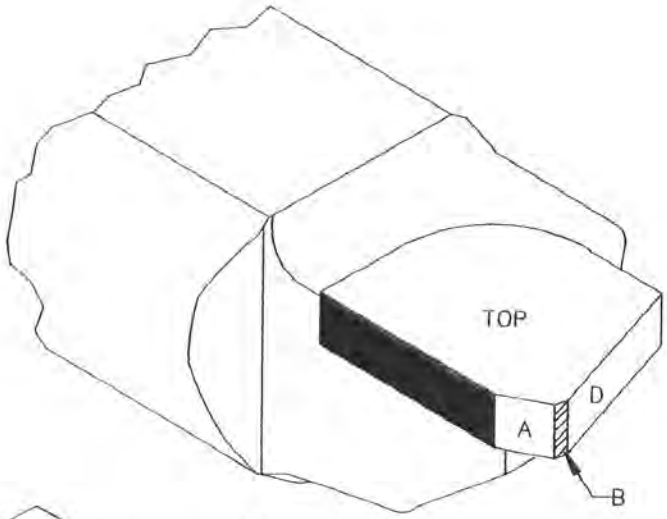
To use the indicator, simply place the gooseneck shank in the split bushing provided and insert the appropriate size tool holder. The indicator may be used on any style of cutter head.

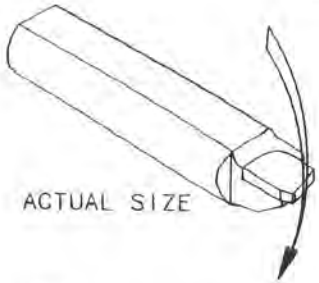
Center the spindle by normal use of the centering fingers.

Turn float clamp switch to neutral or straight up position.

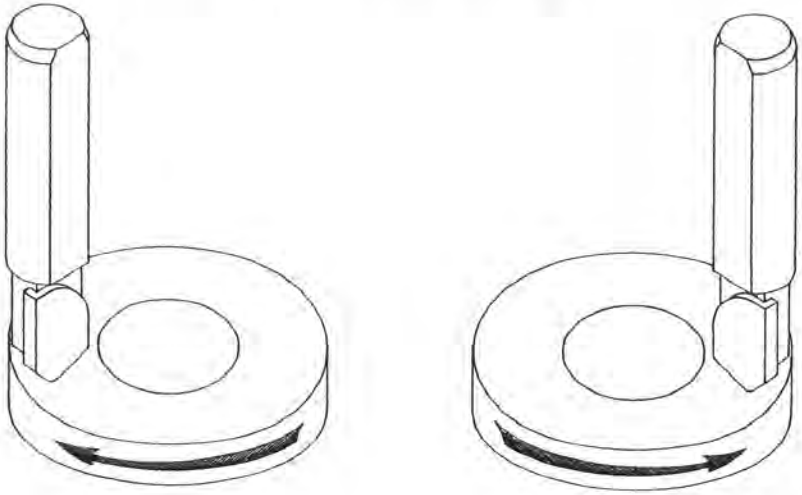
Now raise the spindle out of the bore and insert the indicator. Make sure the indicator lever is set properly so the dial will travel in the right direction.

Lower the spindle and adjust the indicator mount with either gooseneck, or tool holder lock screw so the probe makes contact.





THE TOOL MUST BE SHARPENED ON CORRECT SIDE OF DIAMOND WHEEL SO THAT THE WHEEL IS TURNING INTO TOP FACE OF TOOL.



The performance of your boring bar and the quality of work it will do is almost entirely dependent on the care of the cutting tool.

In the accompanying illustration; letters A, B, D, correspond to the letters indicated on your sharpening jig, in other words, when your jig is set in the "A" position, it will sharpen the "A" land as shown in the illustration.

The most critical point of this sharpening is the width of the "B" land (as indicated by the diagonal line shading). This width should be maintained at about .015 to .025. This width is held by cutting back the "D" land as required. The "B" land must be reduced to .005 to .015 on all stub boring heads and long bore operations. See page 32 for exact "B" land requirements.

In the event your bar chatters or bores a rough finish at the bottom of the cylinder, it is very probable the "B" land is too wide.

The "A" is not critical to width but should be maintained in good condition to obtain free cutting, particularly on heavy cuts.

The top surface of the bit is finely finished at the factory and requires no further resurfacing. This also means no honing or in any way attempting to break off the chip that somtimes seems to be apparent. The practice of doing these things will inevitably result in poor surface finish and impair the accuracy of the machine.

The frequency of sharpening the bit will vary depending on the type of iron being bored.

To produce the best result at the extreme length capacity, use an rf facing tool, 501-29A, and do not sharpen an 'A' land, This tool bit is particularly useful for heavy stock removal on long bores.

TOOL SHARPENING REQUIREMENTS

CARE OF DIAMOND WHEEL

If the diamond wheel is handled with care it will provide many years of service.

A abrasive stone is furnished with your diamond wheel for use in honing the face of the wheel. You should use this stone frequently to remove the particles that tend to load this wheel, otherwise you will not produce the keen edge on the tool that allows the machine to bore accurate holes with a fine surface finish.

TOOL LIFE

With tools sharpened to a precision edge, it should be possible to bore approximately 20 oversize cylinders on high speed.

This applies to most American passenger bores under 4" provided no hard spots or foreign materials are in the cylinders. The same number of sleeving cuts can be made on low speed, without further sharpening. Provided the tool has an original keen edge.

Two grades of carbide tool bits are available:

R8 tool bit: A tough grade of carbide for heavy and interrupted cuts and general boring.

R1 tool bit: A harder carbide with better wear characteristics, to be used for normal boring with improved tool life. Suggested for production re-boring.

CENTERING FINGERS

CHANGING OR INSTALLATION OF CENTERING FINGERS

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

Centering fingers can be taken out by simply rotating the centering knob clockwise until fingers can be removed. When they are replaced or reset in the cutter head,they should be replaced in the respective numbered slots and the centering knob first rotated clockwise and then counter clockwise to insure that fingers enter pinion teeth simultaneously.

CENTER ACCURACY CHECK

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

Centering Fingers con't
Center Accuracy Check

Periodically check the centering fingers by boring a hole and then without unclamping 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 by rotating them back and forth in this test bore while holding the fingers against the wall. If this does not quickly bring contact and pressure to all the fingers, it will be necessary to dress carefully the high finger or fingers with a file and repeat the lapping process.

I M P O R T A N T

M A I N T E N A N C E

LUBRICATION

F STYLE

The F style Upper Housing Unit should be repacked with a mixture of 4 parts grease to 1 part oil. For grease use Union Oil - UNOBA F1 or F2 lube, Mobil oil - Mobilith A.W. Grades 1 or 2, Chevron Durolith 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. Repack approximately every 25,000 boring cycles. When this grease is changed, the Upper Housing Lid should be removed and the original lubricant entirely removed.

The Upper Housing Spindle Drive Gear Bearing should be lubricated MONTHLY, by adding a few drops of three and one oil, or Union Oil - Union 75, or a very light spindle or sewing machine oil (less than S.A.E. 5) to the bearing. Add by removing the small cover on the front of the Upper Housing and add lubricant to take up nut area between the clutching teeth.

The lower gear box oil level should be checked MONTHLY. Check by removing 7/8" diameter snap plug and pipe plug on the right side of the spindle base, oil level should be just up to the bottom of this hole (see illustration).

CAUTION: When adding oil for refilling, DO NOT OVER FILL.

Change this gear lubricant every 40,000 boring cycles. Use Union SAE 90 Multipurpose gear lubricant or any equivalent SAE 90 gear lubricant.

If your F style machine is operated on a continuous basis, grease fittings at the top of the Spindle Unit and at the bottom of Feed Screw Drive, should be lightly lubricated daily, or less often if the machine is not used continuously. Lubricate with UNOBA F1 or F2 lubricant, Lubriplate #9930AAA, Mobil oil - Mobilith A.W. Grades 1 or 2, Chevron Durolith EP1 or EP2, or any equivalent Lithium Barium Grease.

Lubrication, F Style con't

Inner spindle - GREASE LUBRICATED, These spindles have a throw back ring, between the inner and outer spindle on the lower end. See page (76).
MAINTENENCE - Add two or three drops of, Union oil 315 Klondyke oil, or any SAE #10 oil (nondetergent motor oil) WEEKLY, and one shot of, Union oil - unoba F1 or F2 lube, Lubriplate #930AAA, Mobil oil - Mobilith A.W. grades 1 or 2, Chevron Durolith EP1 or EP2, or any equivilant lithium barium grease monthly, to the hole in the spindle keyway. 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. (Do not fill cavity between these bearings with grease).

Inner spindle - OIL LUBRICATED, These spindles will have an oil seal between the inner and outer spindle on the lower end, See page (78).
MAINTENENCE - Add two or three drops of, Union oil 315 turbine oil, or Union oil Klondyke oil, or any SAE #10 oil (nondetergent motor oil) WEEKLY, to the hole in the keyway in the outer spindle, or if there is no hole in the outer spindle, remove one of the upper gear box spindle mounting bolts and add there. If all oil is removed from the spindle, add approximately 1 pint of the same SEA #10 oil through the hole.

Main Spindle surface should be cleaned with with Kerosene weekly and occasionally a light weight oil applied to prevent excessive dryness.

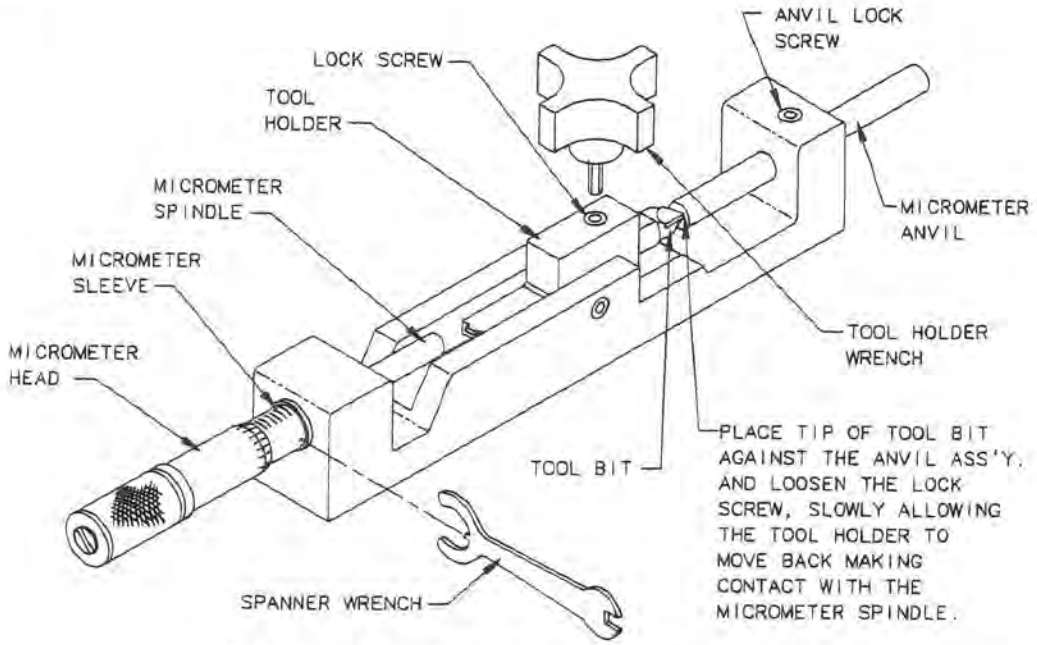
Grease fitting located on the clamp arm cam body should be lubricated monthly.

Disassemble hand feed assembly and lubricate bronze bushing and bevel gear shaft with UNOBA F1 or F2 lubricant, Lubriplate #930 AAA, Mobil Oil - Mobilith A.W. Grades 1 or 2, Chevron Durolith EP1 or EP2, or any equivalent Lithium Barium Grease. This should be done once every 6 months.

MICROMETER

Your boring micrometer, as with any other measuring tool, should be delicately and with care to be assured of the greatest accuracy. Particular attention should be paid to inserting the tool in the micrometer without allowing tool bit to snap into micrometer anvil. Care should be used in the method of lightly locking the tool bit before tightening.

After a period of use you will note that the tool bit will force a depression in the mic. anvil. This, of course, will result in the inconsistent sizes, particularly after resharpening the bit. Periodically we would recommend turning the anvil slightly and finally end for end so that a flat surface is exposed to the tool bit tip.



SPECIAL MICROMETER INSTRUCTIONS

(For optional capacity to 8" diameter)
For setting FA-2AVB micrometer to high and low reading using micrometer with a 2.90" to 6.00" reading.

CAUTION: The standard for your FA-2AVB bar is set. Do not change it, except when it is necessary to recalibrate the micrometer, then the standard should be reset to match the micrometer.

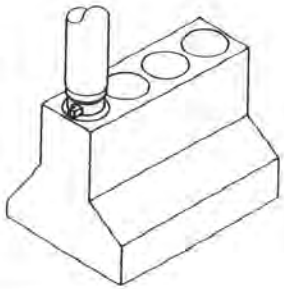
To bore from 2.90 to 6.00, place standard in the micrometer and adjust the mic. anvil so that the mic. reads 6.00".

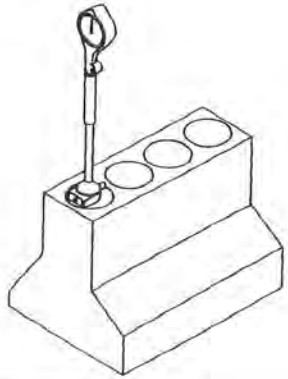
NOTE: Read directly as shown on the micrometer sleeve.

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

PROCEDURE FOR CALIBRATING MICROMETER

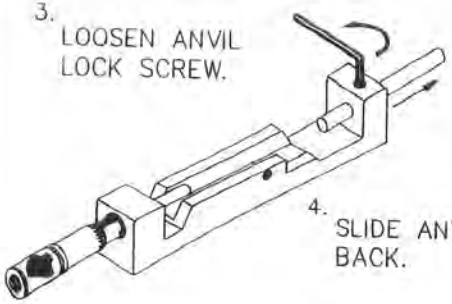
1. USE THE BORING MACHINE TO BORE A HOLE IN A SCRAP BLOCK. WITHOUT CHANGING ANY SIZE SETTING REMOVE TOOL HOLDER.





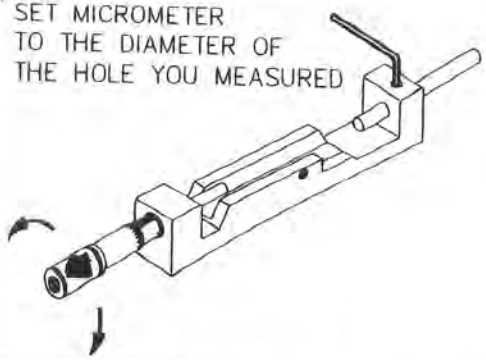
2. MEASURE THE HOLE THAT YOU BORED.

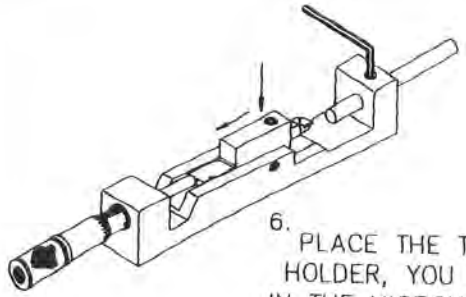
3. LOOSEN ANVIL LOCK SCREW.



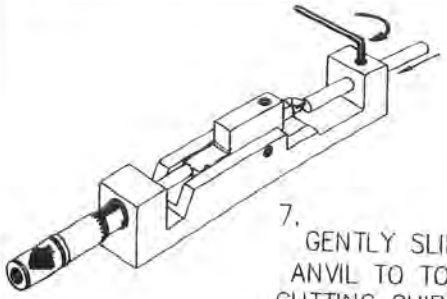
4. SLIDE ANVIL BACK.

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



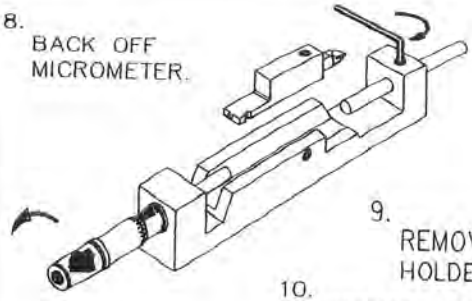


6. PLACE THE TOOL HOLDER, YOU USED, IN THE MICROMETER FRAME.



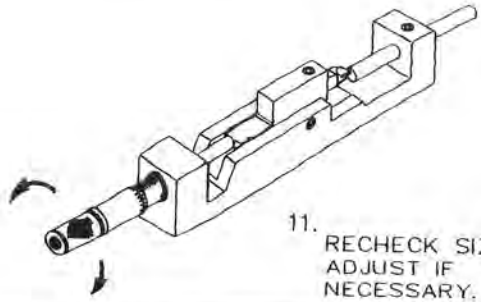
7. GENTLY SLIDE ANVIL TO TOUCH CUTTING CHIP. AND LIGHTLY TIGHTEN LOCK SCREW.

8. BACK OFF MICROMETER.

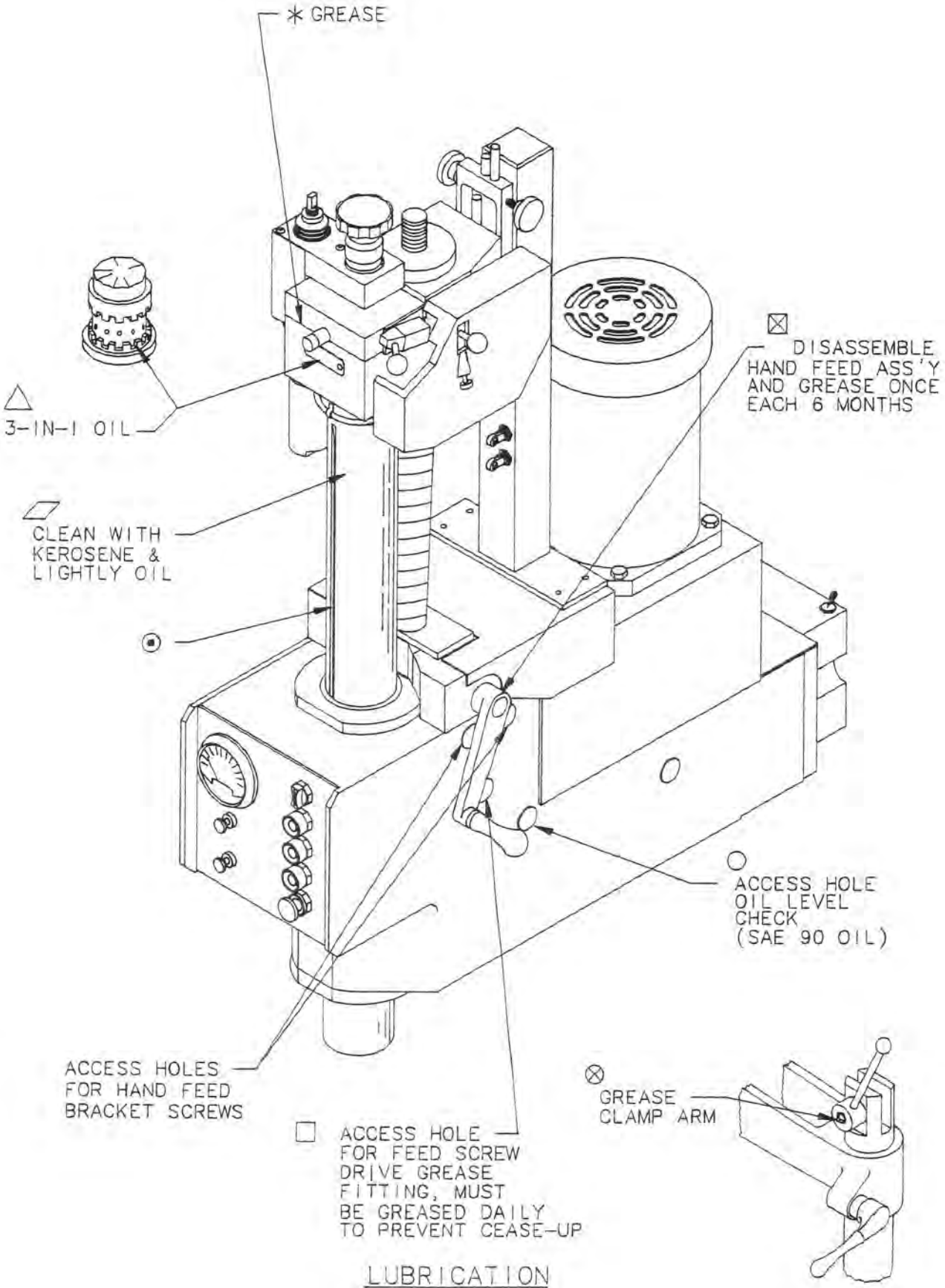


9. REMOVE TOOL HOLDER.

10. TIGHTEN LOCK SCREW.

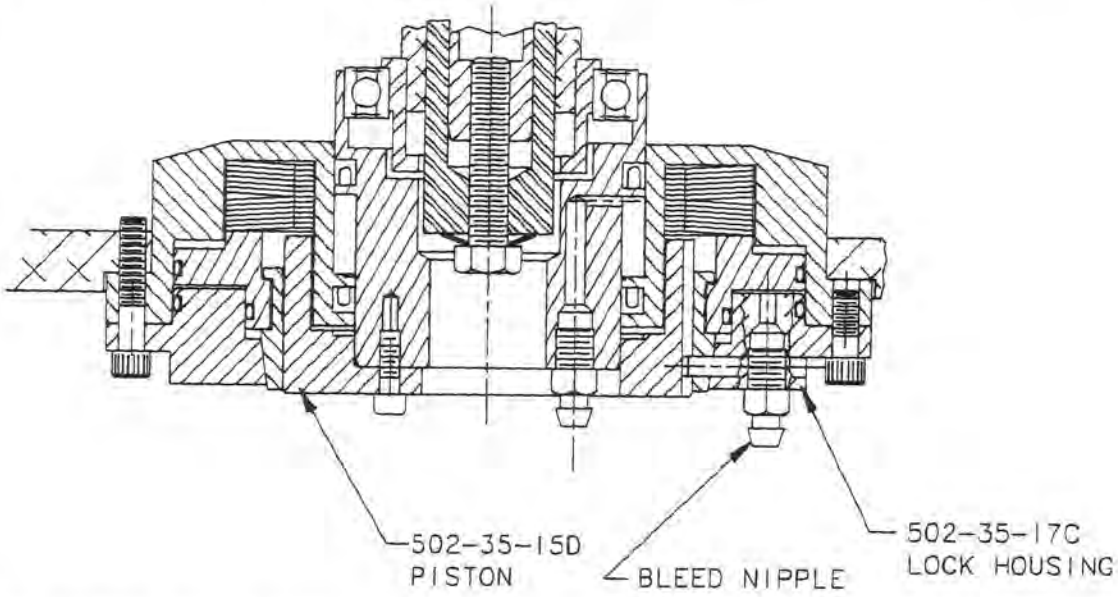


11. RECHECK SIZE. ADJUST IF NECESSARY.



LUBRICATION

WATER DRAIN USED ON MACHINES MANUFACTURED AFTER SEPTEMBER 1,1987.



BLEEDING WATER OUT OF VARIABLE SPEED ACTUATING CYLINDER.

NOTE: If air supply is high in moisture, water can accumulate in the variable speed actuating cylinder. This water can cause malfunction of the variable speed system.

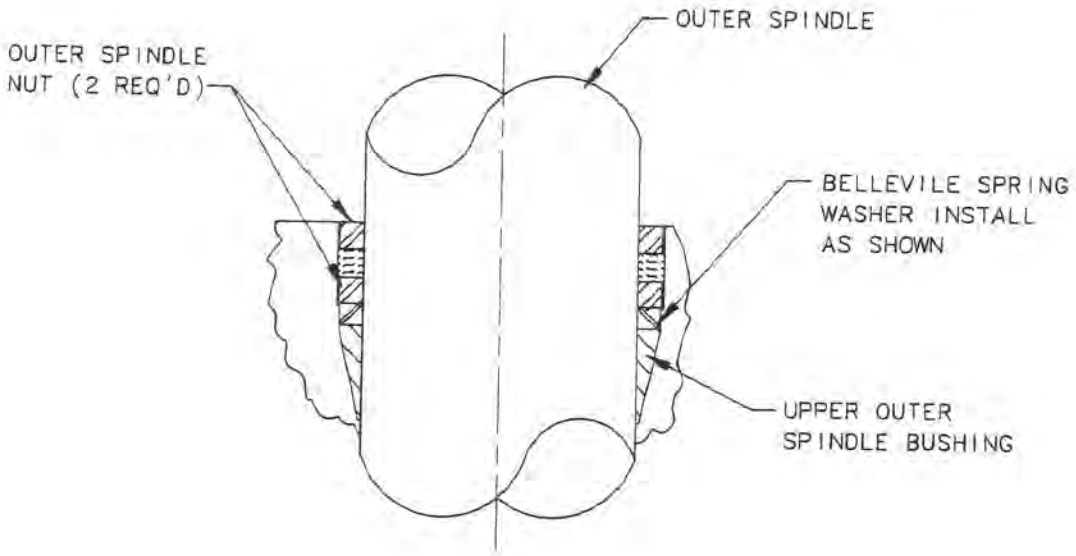
Water can be removed by attaching hoses to the three bleed nipples under the cylinder. Turn off the air supply, loosen the bleed nipple, then turn on the air supply and actuate the cylinder. Close the bleed nipple after the water is removed.

ADJUSTMENT OF OUTER SPINDLE

Main spindle bearings are tapered split cast iron rings held in seat by the adjustment nut. Tension on the bearings is normally adequate requiring 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, since shock to the machine during shipment may result in some setting of the spring.

CAUTION: Caution should be used in adjusting these bearings in order to avoid a too tight spindle which only serves to wear out the machine and make control operation difficult. If it should be necessary to adjust, see next page.



VITAL OUTER SPINDLE ADJUSTMENT

1. Run spindle down approx. 4" to 6" loosen the #8-32 screw & loosen all outer spindle nuts (500-77 & 502-35-27)

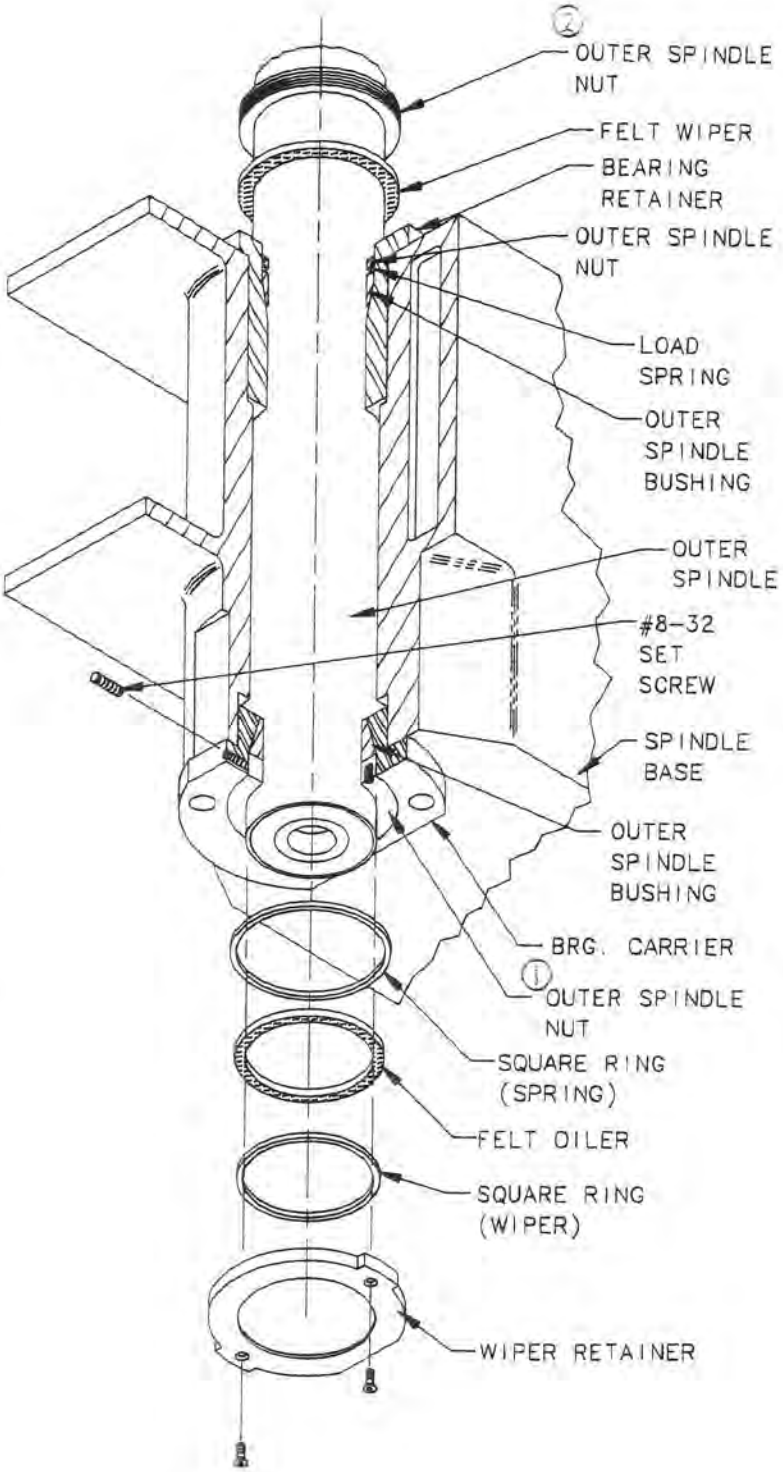
2. Tighten the lower bushing (502-35-26) by tightening the outer spindle nut marked 1 , until 10 to 15 lbs. of effort is required to operate the hand feed handle. Lightly tighten #8-32 set screw.

3. Repeat this sequence (2) on the upper bushing, by tightening the outer spindle nut marked 2 , take care that the hand feed operates only slightly tighter or 15 to 20 lbs. of effort is required to operate feed handle.

4. Traverse the bar at all points of travel and make sure the hand feed works easily. Spindles are ground slightly tapered to secure max. rigidity at lower limits of travel.

5. Spindle adjustment may also be checked by hand feeding the spindle down and pulling the slack out of feed mechanism by pulling down the upper gear housing. Pressure required at tightest point is indicated in chart below.

STYLE MACH.	PRESSURE REQUIRED
FA-2AVB	50 - 75 LBS



Vital Outer Spindle Adjustment con't

In order to recheck the friction on the spindle it is necessary to crank down again to create backlash.

6. Avoid excessive tension on upper outer spindle nut 2 otherwise tool bit dragback marks will appear in bore.

7. Excessive tightening of the outer spindle nuts will cause strain on feed gears and cause spindle to have an audible, excess resistance.

ADJUSTMENT OF INNER SPINDLE

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 bearings.

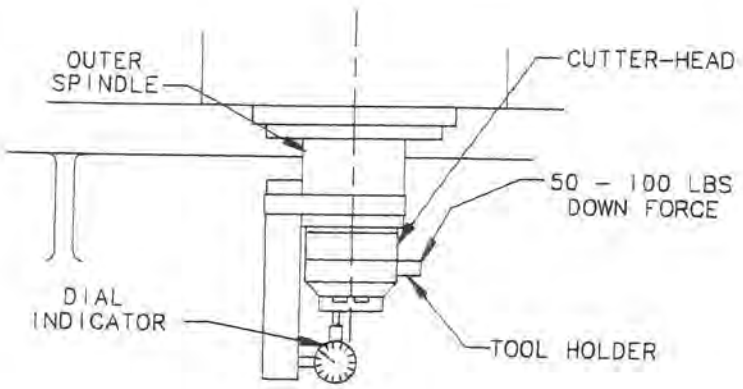
The bearings are correctly adjusted when a down force of 50 to 100 lbs. on the inner spindle will move the inner spindle .0002 to .0007 out of the outer spindle, SEE ILLUSTRATION BELOW.

ADJUSTMENT

1. Remove two screws and small cover on the front side of the upper housing.
2. Remove the stop screw restricting the up travel of the spindle clutch lever and move the lever to full up position (See detail J). Rotate the spindle approximately 1/2 turn away from the detent spring. Position the tool holder slot to the rear.
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.

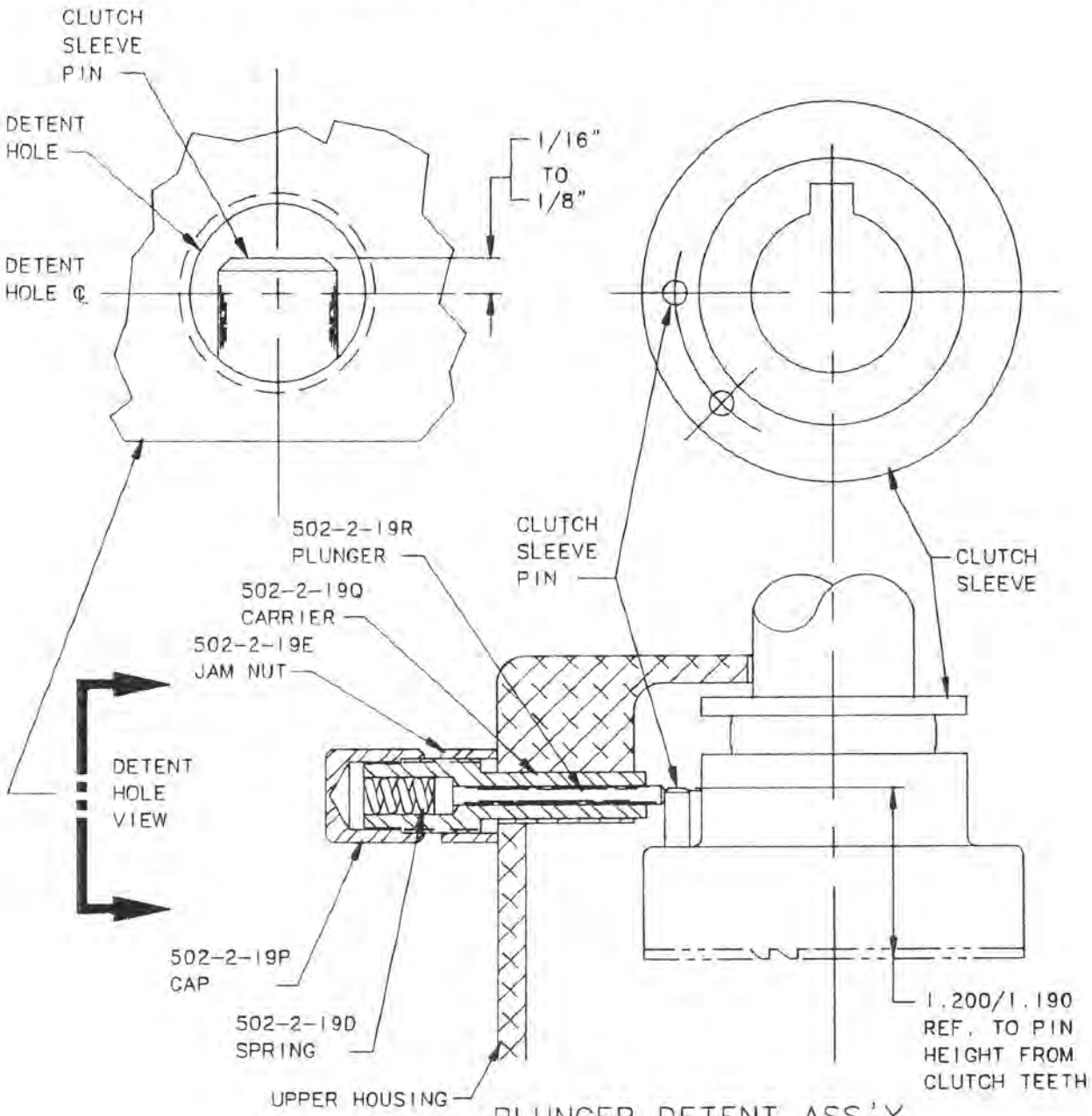
CAUTION: Be sure the detent is in a notch, not midway between the notches.

4. Replace the cover. Readjust the spindle clutch control stop screw.



SPINDLE STOP DETENT ADJUSTMENT

THE PURPOSE OF THE DETENT IS TO STOP THE SPINDLE FROM TURNING WITH THE TOOL BIT FACING THE MACHINE OPERATOR.



PLUNGER DETENT ASS'Y
502-2-19A

TO SET PLUNGER DETENT IN POSTION

(1) REMOVE PLUNGER DETENT
(2) RAISE CLUTCH LEVER TO UPPER DETENT POSITION.
(3) INSPECT CLUTCH PIN THRU DETENT HOLE TO BE SURE TOP OF PIN IS ABOVE CENTER OF HOLE (SEE ABOVE VIEW). REPLACE PIN IF IT IS BELOW ℄
(4) SCREW IN PLUNGER DETENT UNTIL IT TOUCHES PIN.
(5) TURN PLUNGER 3/4 TO 1 TURN BEYOND TOUCH POSITION.
(6) TIGHTEN JAM NUT AGAINST GEARBOX.

UPPER HOUSING BACK FEED ADJUSTMENT

TO ADJUST THE FEED SCREW PLAY IN THE UPPER HOUSING

First loosen and back off approximately 1/16" the three round head screws around the feed screw, in the upper housing. Then loosen the three adjusting screw lock nuts, then adjusting screws.

Alternating between each screw, turn the adjusting screws, evenly in, until you have compressed the spring washer, (all screws must be turned in the same amount).

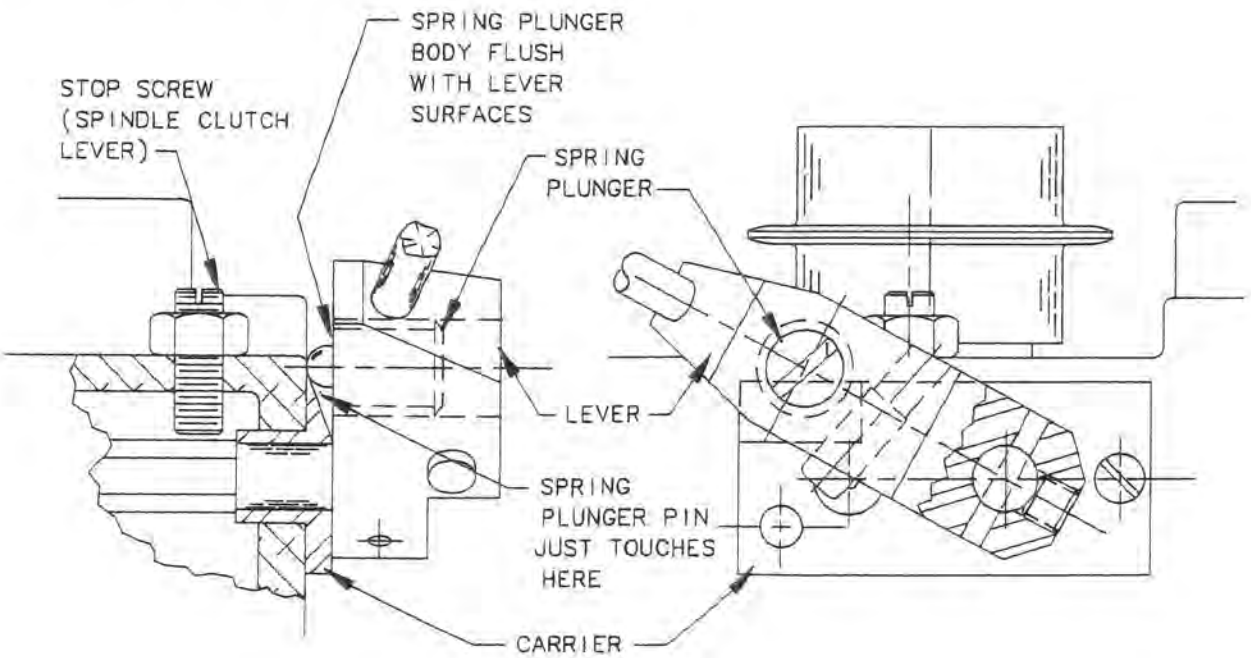
NOTE: A light touch is required in adjusting this bearing clearance. Spring should be flat, but no more pressure than is required to flatten spring should be used.

Turn adjusting screw back 1/4 turn to allow for running clearance. Hold adjusting screw with an allen wrench and lock them with lock nut.

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

SPINDLE CLUTCH CONTROL LEVER ADJUSTMENT

Check spring plunger body to see if it is flush with lever (see illustration below). Loosen the stop screw lock nut then the stop screw. Raise the control lever till the pin in the spring plunger is is just touching the edge of the carrier as shown in the illustration. Set stop screw so that the lever will not go any higher. Lock with lock nut.



RAPID RETURN ADJUSTMENT

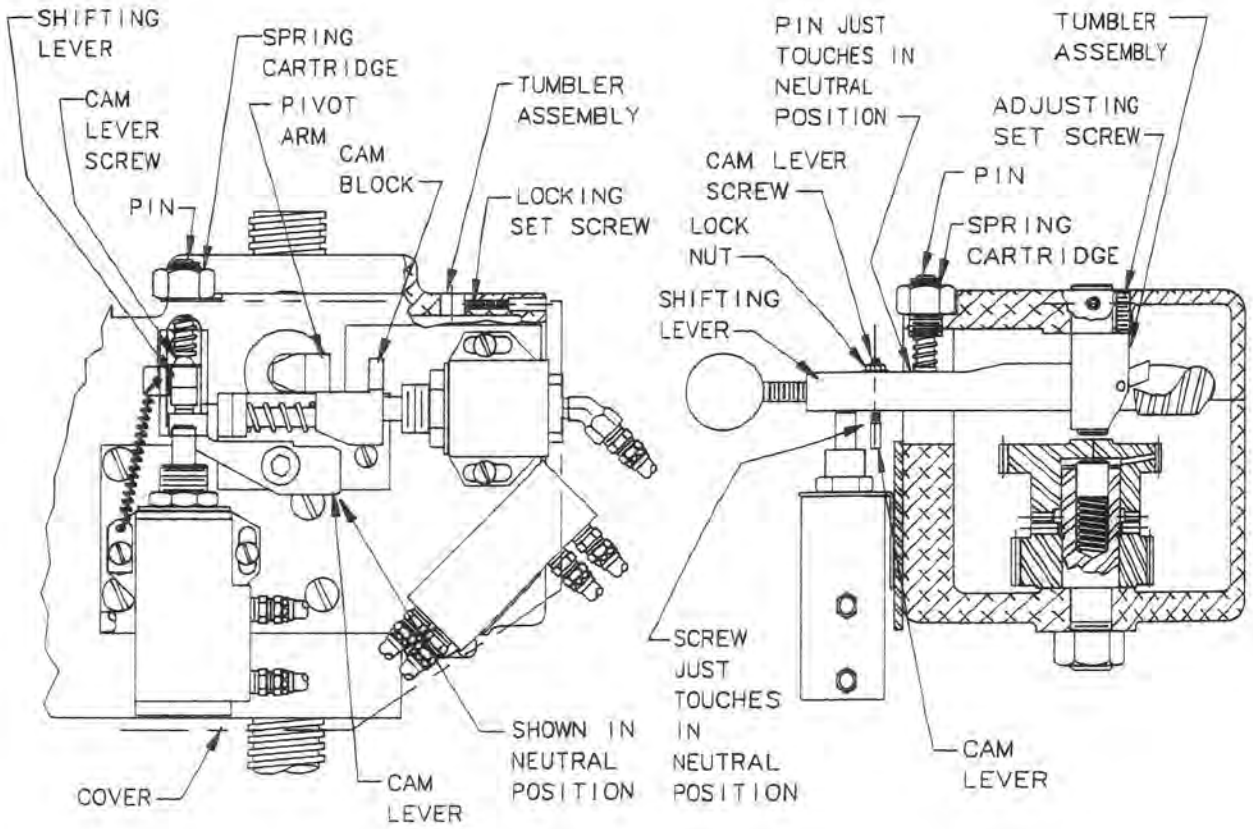
IF THE SPINDLE UNIT SHOULD EVER FAIL OR HESITATE TO RETURN TO THE TOP OF IT'S TRAVEL WITH THE UP TRAVEL ENGAGED, THE FOLLOWING PROCEDURE MAY BE USED TO ADJUST THE RETURN TRAVEL CLUTCHES.

1. REMOVE SIDE COVER ON UPPER GEAR BOX.

2. RUN BORING SPINDLE DOWN APPROXIMATELY 6 INCHES OR MORE.

3. LOOSEN 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 CAM BLOCK 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 SHOLD 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).



Rapid Return Adjustment con't

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 spring cartridge is raised approximately 1/32, when lifting the shift lever. If clutches ratchet after the pin is raised more than a 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.

BELT REPLACEMENT AND ADJUSTMENT

BELT REMOVAL

Run spindle RPM up to it's highest speed.

CAUTION: Disconnect all power before proceeding.

Remove the shroud by removing the six round head screws and three rubber gromets. Remove the four hex head cap screws in the motor mounting plate.

Carefully lift the motor straight up. Care must be taken when removing the motor because the upper half of the pulley must slide out of the lower half at this time and can bind.

Remove the RPM sender and it's mounting bracket from the housing bearing carrier by removing it's two round head machine screws.

Slip the belt over the lower half of the drive pulley. (Before removing the driven pulley, note the height of the lower half of this pulley, so it can be replaced in the same place. Loosen the drawbolt located on top of the proximity wheel and tap lightly on the bolt to loosen it's collet. Fold the belt around the pulley.

Remove the driven pulley assembly and belt, from the motor gear housing. Place a wooden wedge between the pulley faces to keep them open, Then remove the belt.

BELT INSTALLATION

CAUTION: Disconnect all power before proceeding.

Use a wooden wedge to open the pulley assembly (care must be taken not to damage the pulley faces). Fold the belt around the driven pulley. Slide the driven pulley, and belt, onto the pinion shaft and set to old height. Tighten collet bolt to 112 inch lbs. (10 ft. lbs.) or flatten the belleville washer, which indicates when the proper torque is applied.

NOTE: Leave a min. 1/16 gap between hub of the driven pulley and the top of the driven pinion shaft flange.

Slip the belt over the lower half of the drive pulley. Carefully lower the motor and upper half of the drive pulley into the lower half of drive pulley, extra care must be taken to line-up the key in the lower half. Secure the motor mounting plate to the motor gear housing with the four hex head screws.

CHECK BELT ALIGNMENT

Rotate the pulleys and see if the belt runs parallel (within 1/32) to the top surface of the motor gear housing, or main base upper deck. Adjust the driven pulley if not correct.

NOTE: If case vibrates severely or if belt does not run all the way out on pulleys in high and low RPM or if the full speed range (100-600 rpm) is not being achieved, check belt alignment.

MOTOR PULLEY HALF REMOVAL
Reduce spindle RPM to its lowest.

CAUTION: Disconnect all power before proceeding.

Remove the four hex head cap screws in the motor mounting plate. Carefully lift the motor straight up. Care must be taken when removing the motor because the upper half of the pulley must slide out of the lower half at this time an can bind.

Remove the upper half of the drive pulley from the motor shaft, by loosening the drawbolt located on the bottom of the drive pulley, tap lightly on the bolt to loosen it's collet.

MOTOR PULLEY HALF INSTALLATION
Slide the spacer and pulley half onto the motor shaft until the spacer touches the step in the shaft. Tighten the collet bolt to 112 inch lbs. (10 ft.lbs.) or flatten the belleville washer, Which indicates when the proper torque is applied.

Carefully lower the motor and upper half of the drive pulley into the lower half of drive pulley, extra care must be taken to line-up the key in the lower half. Secure the motor mounting plate to the motor gear housing with the four hex head screws.

VARIABLE SPEED DRIVE ADJUSTMENT
CYLINDER WITH 2 AIR LINES

If the spindle speed increases before it slows down, when the slow speed button is pressed, the following adjustment procedure may be used to correct this action.

NOTE: If the slow speed button is pressed rapidly, this will always cause an increase in speed.

First remove the rear cover from the back of the spindle base by removing its four screws.

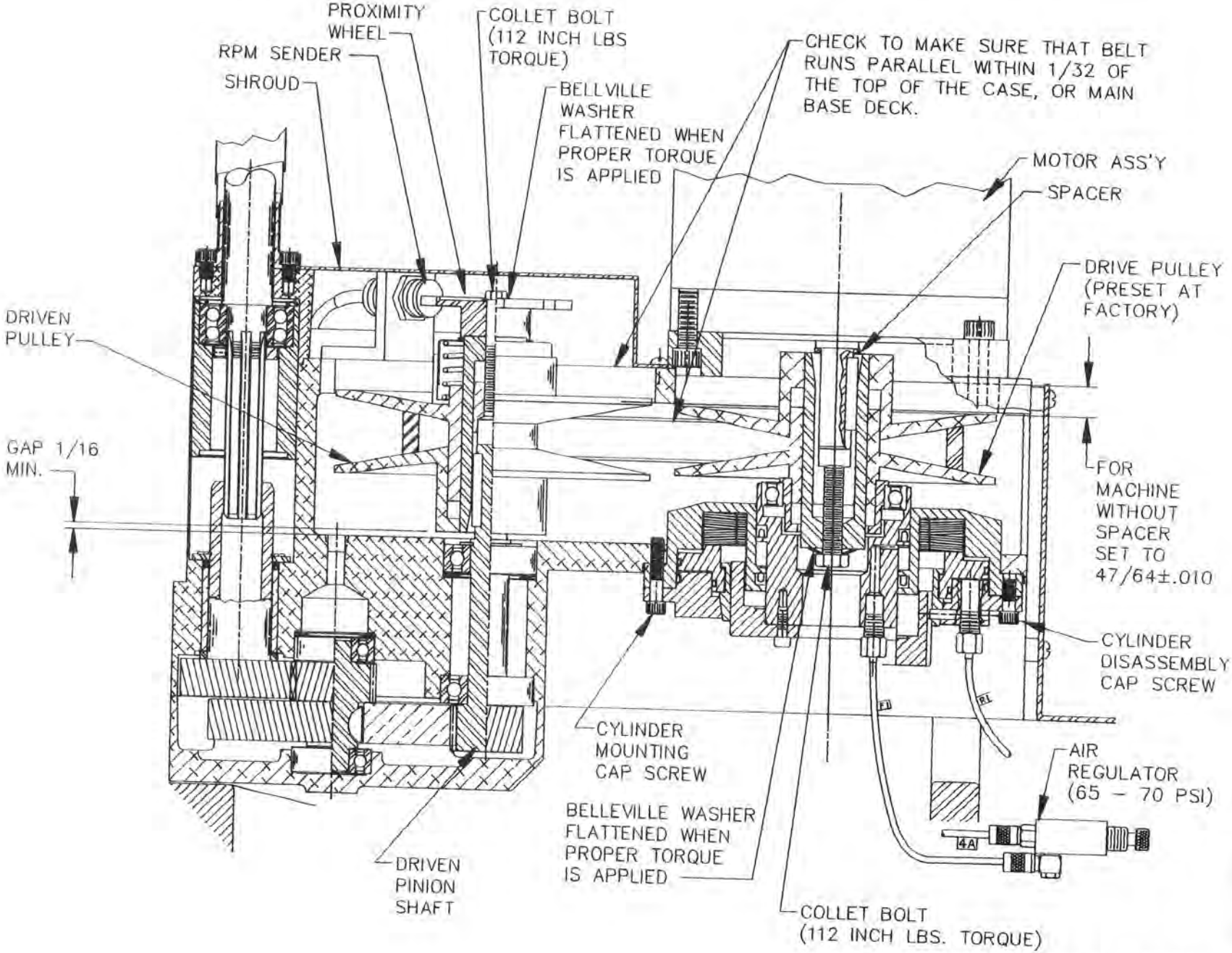
Locate the regulator inside the back of the spindle base, the valve with the knurled knob. Turn this knob all the way out, then turn it in until you have 65-70 lbs. of air pressure or until the time for an increase in speed, from 100 RPM to 600 RPM is approximately 17 seconds.

VARIABLE SPEED DRIVE ADJUSTMENT
OLD STYLE CYLINDER WITH 3 AIR LINES

If spindle speed decreases when spindle is rotating, the following adjustment procedure may be used to correct this action.

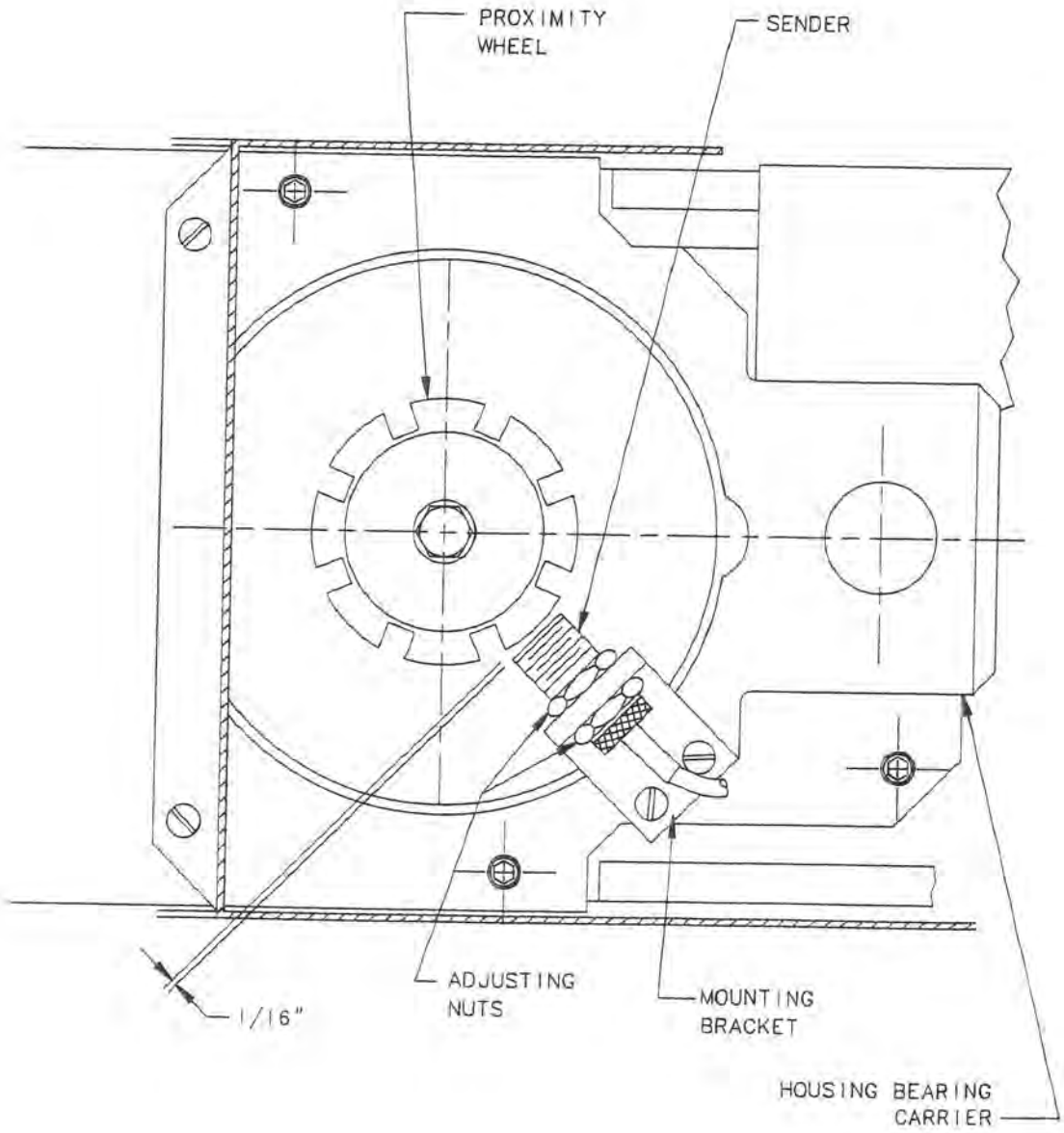
First remove the rear cover from the back of the spindle base, by removing its four screws.

Locate the regulator inside the back of the spindle base, the valve with the knurled knob. Set to 30 to 35 PSI, or slightly higher than previously set.


PROXIMITY WHEEL
RPM SENDER
SHROUD
COLLET BOLT (112 INCH LBS TORQUE)
BELLVILLE WASHER FLATTENED WHEN PROPER TORQUE IS APPLIED
CHECK TO MAKE SURE THAT BELT RUNS PARALLEL WITHIN 1/32 OF THE TOP OF THE CASE, OR MAIN BASE DECK.
MOTOR ASS'Y
SPACER
DRIVE PULLEY (PRESET AT FACTORY)
DRIVEN PULLEY
GAP 1/16 MIN.
FOR MACHINE WITHOUT SPACER SET TO 47/64±.010
CYLINDER DISASSEMBLY CAP SCREW
CYLINDER MOUNTING CAP SCREW
AIR REGULATOR (65 – 70 PSI)
BELLEVILLE WASHER FLATTENED WHEN PROPER TORQUE IS APPLIED
DRIVEN PINION SHAFT
COLLET BOLT (112 INCH LBS. TORQUE)
VARIABLE SPEED DRIVE ADJUSTMENT

R.P.M. SENDER ADJUSTMENT

REMOVE SHROUD FROM MOTOR GEAR HOUSING. CHECK CLEARANCE BETWEEN PROXIMITY WHEEL AND SENDER. CLEARANCE SHOULD BE 1/16". IF NOT ADJUST THE CLEARANCE BY MOVING THE NUTS OF THE SENDER ON THE MOUNTING BRACKET.



PULLEY ACTUATOR CYLINDER - REMOVAL AND DISASSEMBLY

REMOVAL

Remove the motor assembly as described in belt removal. Lift the belt over the lower half of the drive pulley and move to the side. Remove the rear cover by removing the four round head cap screws.

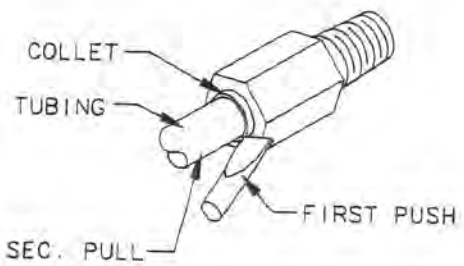
Remove the four bolts holding end cap mounting plate to spindle base, lower plate out of the way. Remove flow control valve on left rear side of spindle base by loosening it's set screw.

Disconnect air line F1, R1, and C1 at cylinder. (see illustration below on how to disconnect lines from this type of fitting.) Remove the (3) cylinder mounting socket head screws. The "A" screw in the center front position of the motor gear housing and the 2 120 degrees away from it. Lower the pulley actuator cylinder out of the bottom of the motor gear housing and remove from the rear. CAUTION: Cylinder is heavy and will drop when screws are removed.

CYLINDER DISASSEMBLY

Remove three flat head socket screws in the bottom of the lock drum. Lift the lower half of drive pulley and piston out of the top of the cylinder. Remove the three socket head cap screws in the cylinder. Disassemble the cylinder, lock piston, and lock drum from the lock housing. Remove pulley and bearing by pressing bearing out of piston.

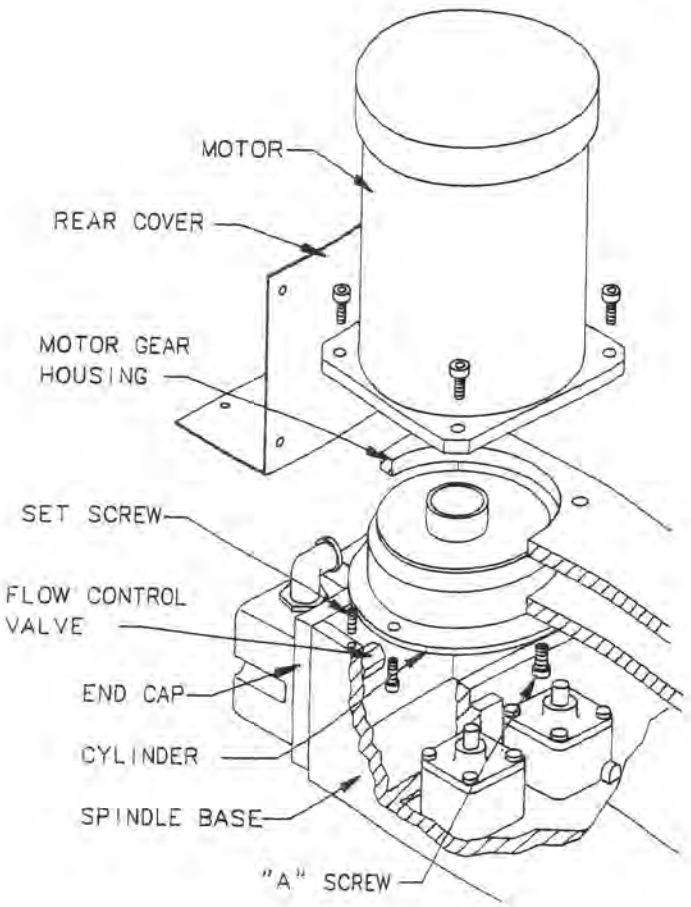
NOTE: Care must be taken not to damage any of the "O" rings when reassembling.



LEGRIS TUBE FITTINGS

TO DISCONNECT
TUBING FROM LEGRIS FITTING - PUSH COLLET WITH A SCREWDRIVER THEN PULL TUBING.

TO CONNECT TUBING TO LEGRIS FITTINGS JUST PUSH TUBING INTO FITTING.
NOTE - TUBING MUST BE ALL THE WAY IN TO SEAL TUBING. FIRST PASSED A GRIPPING RIDGE THEN THRU AN O-RING.



EXCESSIVE LOADS

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

NOTE: If excessive loads are imposed on your boring machine the following occurs.

THRUST OVERLOAD

If an excessive thrust load of approximately 3,000 pounds is imposed on your FA-2AVB machine spindle the threads of the nut (500-41, Section A-A, HAND FEED) will shear. This load could typically occur by either rapid traveling or feeding the spindle into the top of the block. This accident could happen with the spindle either rotating or stationary.

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

DISASSEMBLY NECESSARY FOR REPLACEMENT IS:

1. Remove the shroud (502-35-67), by removing it's six round head screws and tree rubber gromets. Remove the two snap plugs, in the spindle base, covering the access holes to 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 in the cap (502-35-42), which are closest to the cover (500-96-7). Lift the hand feed bracket, along with the cap attached, 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), beneath the bevel pinion. Remove the four countersunk screws and the housing bearing carrier (502-35-13).

2. Raise the assembly, hold cam block (500-43) to 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 without binding the gear action.

MECHANICAL FAILURE DUE TO OVERLOAD

Rotary deceleration loads which stall the motor will cause the motor overload protection to drop out and can be corrected simply by pressing the reset button in the rear of the machine.

REMOVAL OF MOTOR ASSEMBLY

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

Remove the four hex head bolts from the motor mounting plate, and carefully lift motor straight up. Care must be taken when removing the motor because the upper half of the pulley must slide out of the lower half at the same time and can bind.

Loosen collet bolt, located on the bottom of the upper half of pulley, and tap lightly to loosen collet, and remove pulley. Remove the four socket head cap screws from the bottom of the motor mounting plate and remove plate.

NOTE: To reassemble reverse the above description and read carefully the section on belt installation and adjustment.

DISASSEMBLY OF MOTOR GEAR HOUSING

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

1. REMOVAL OF HAND FEED HOUSING (Section A-A)
   Remove the shroud(502-35-67), by removing it's six round head screws and three rubber gromets.

   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 (502-35-42), which are closest to the cover (500-96-7). Lift the hand feed bracket, along with the cap attached, 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), beneath the bevel pinion.

Remove the four countersunk screws and the housing bearing carrier (502-35-13). Lift out feed screw, or if upper housing is still intact, hold cam block (500-43) to left and rotate feed screw (502-35-13) counter clockwise until feed screw is clear of motor gear housing.

Disassembly of Motor Gear Housing, con't

2. REMOVAL OF FEED SLEEVE AND BEARING (Section A-A)
   Remove snap ring (506-10), and press sleeve assembly (502-35-12) off bearing. Back out socket set screw from bronze thrust nut and screw off nut. Bearing may now be removed.

3. REMOVAL OF MOTOR GEAR HOUSING
   To remove the motor gear housing, remove the six socket head cap screws attaching the motor gear housing to the spindle base (three screws located on left and three on the right side of motor gear housing).

   NOTE: In reassembly, motor gear housing alignment must be checked after screw sleeve is in place before the motor gear housing screws are permanently locked. Use surface plate over feed screw and spindle to establish side to side alignment. In-out alignment must be within .003" and can only be done by measuring.

4. REMOVAL OF DRIVEN PULLEY(Section B-B, Motor Gear Housing)
   Assuming motor is already removed, Fold the belt around the driven pulley. Loosen the collet bolt located on top of the proximity wheel (503-41-35) and lightly tap on the bolt to loosen it's collet. Remove the driven pulley assembly and the belt.

5. REMOVAL OF AIR ACTUATING CYLINDER
   See page 56 for pulley actuator cylinder removal and disassembly. See pages 85,86,& 87 for illustration.

6. MOTOR GEAR HOUSING DISASSEMBLY (Section B-B, Motor Gear Housing)
   To disassemble the motor gear housing, remove eight socket head cap screws, and the screw plug located in the middle, bottom of the lower gear box (502-35-8). Remove the retaining ring (6059) from the driven pulley pinion (502-35-7A). Remove the retaining ring (502-10-16) and thrust washer (502-35-9) from the feed screw drive gear (502-35-4). Tap both gear and pinion lightly with mallet and the lower gear box will separate from the motor gear housing.

   NOTE: If it should become necessary to remove the upper bearings (500-60 or 502-35-14) from the motor gear housing. Be careful not to lose the preload springs located under them, and reassemble with the preload springs stacked in the same manner.

FAILURE DUE TO LOW AIRLINE PRESSURE

A pressure switch PS2 (located in the left top of the control panel) 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 the line pressure should fall below this value the switch contacts open, de-energizing 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 & DRAW BAR & ROD ASSEMBLY REMOVAL

Automatic type machines require the removal of the tool positioner drive chain in order to remove the sprocket knob. Remove the chain guard and then the connecting link of the chain.

Reassembly of the chain requires the correct timing of the stop indent to the tool positioner cam (see pages 66 & 67).

Loosen the set screw in sprocket 600-18-3, remove cutter head, force sprocket up to remove draw bar and or centering rod.

DISCONNECTING MACHINE SPINDLE UNIT FROM CONTROL PANEL

CAUTION: Disconnect all power before proceeding.

Disconnect the thirteen out-going wires on the right hand side of the twelve pole terminal strip. Disconnect the three power wires from the starter, ground wire and the seven air lines.

NOTE: Before disconnecting any electrical wires or air lines, make certain they are properly coded for easy replacement.

Disconnect umbilical cord from control panel, feeding all disconnected wiring and air lines out of control panel. The machine spindle may now be separated from the control panel.

DISASSEMBLY OF UPPER HOUSING AND SPINDLE REMOVAL

Remove cutter head. Remove cover 502-2-63. Remove the tool positioner - chain guard, connecting link of chain, chain, and tool positioner housing. For reassembly, see pages 66 & 67.

Disassembly of Upper Housing and Spindle Removal con't

Remove 600-18-2 knob, 500-17 knob,600-18-3 sprocket by releasing socket set screw. You may then remove the draw tube and/or centering rod.
Unscrew the spindle clutch lever stop pin, raise lever to extreme top, which will allow removal of the countersunk screw, then the lever assembly may be removed.

Remove 502-2-48 spring, 502-2-47 bracket, 500-47 base plate, 502-2-51 or 502-2-52 stop bracket. Remove six screws holding upper housing sections together and lift off the 500-22f upper lid.

Remove 500-38-1 shifting lever along with 500-25 upper fast return gear with plunger and spring, 500-3 spindle clutch and key, 500-14 ball bearing and take up spring, (be sure spring is reassembled properly), 500-1 sleeve gear, 500-2 feed nut, and 500-8 or 500-8-1 feed gear with it's thrust washer.

If bar is in a vertical spindle position, we suggest you place something under the spindle nose to prevent the inner spindle from falling out, then remove 500-5 spindle nut. Nut can be started off through adjusting access hole and then hand turned.

500-6-1 drive gear may be worked off along with 500-4 spacer woodruff key.

Inner spindle may be removed now.

CAUTION: Lubrication will run out when spindle is removed.

If upper housing is to be removed from spindle, the hex cap screws in upper housing should be removed and housing driven off spindle.

Heat on housing will simplify removal of this press fit.

Nut should be removed from the 500-29 shaft and shaft may be pressed out with gear.

500-7 long gear with radial and thrust bearings may be removed along with oil seals. Extreme care should be taken when removing long gear out of seal and seal out of housing. Seal is fragile and garter spring will come out easily. When reassembling, open seal as long gear is pushed in to prevent spring from snapping out.

NOTE: On reassembly, thrust bearing has one race with a small I.D. which is mounted "up" in gear housing.

CONTROL FUNCTION

To provide a most convenient guide in the event of a control failure to your FA-2AVB, the following information describes the sequence of control actions.

The Air Electric Control is described in capital type, and the resulting mechanical function in lower case, so a difficulty may be easily isolated.

TOGGLE SWITCH

THE TOGGLE SWITCH, 502-2-25, (SECTION B-B) OPENS AND CLOSES THE 110 VOLT CONTROL CIRCUIT. WHEN OPENED, THIS SWITCH DEACTIVATES THE ENTIRE UNIT EXCEPT THE CURRENT TRANSFORMER.

CLAMP SELECTOR SWITCH

THE CLAMP SELECTOR SWITCH TURNED TO LEFT CLOSES THE CIRCUIT TO FSV (FLOAT SOLENOID VALVE) (PANEL LOCATION, VALVE NUMBER 2 FROM TOP). THIS NORMALLY CLOSED VALVE IS OPENED, ALLOWING AIR TO FLOW THROUGH THE ATTACHED REGULATOR, 502-27-17, AND THEN OUT THE ORIFICE ON BOTTOM OF SPINDLE UNIT. (REGULATOR MAY BE ADJUSTED UP OR DOWN TO FURNISH PROPER LIFT FOR EASY MOVEMENT OF SPINDLE UNIT). THE REAR ORIFICE ALSO HAS A FLOW CONTROL VALVE FOR PRECISE ADJUSTMENT.

THE CLAMP SELECTOR SWITCH, TURNED TO RIGHT, CLOSES THE CIRCUIT TO CSV (CLAMP SOLENOID VALVE) (PANEL LOCATION, TOP VALVE). THIS NORMALLY CLOSED VALVE IS OPENED, ALLOWING AIR TO FLOW DIRECTLY TO THE TWO CLAMP CYLINDERS.

The cylinders lift two lever arms, 502-2-5, (section B-B), pivoting on the casting rib to lift the arm, 502-2-4, which exerts effort through washers and nut to the stud, 502-2-10.

FAST DOWN PUSH-BUTTON

THE FAST DOWN BUTTON WHEN DEPRESSED CLOSES THE CIRCUIT TO THE FDSV (FAST DOWN SOLENOID VALVE) (PANEL LOCATION, VALVE NUMBER 3 FROM TOP). THIS NORMALLY CLOSED VALVE OPENS, ALLOWING AIR TO FLOW TO THE HORIZONTALLY MOUNTED CYLINDER, 502-2-59A, (VIEW E-E) ON UPPER HOUSING.

The cylinder moves the cam,500-43, forward allowing the lever, 500-44, to lift the shift lever, 500-38-1, upward to neutral position. The spring cartridge, 500-40 is adjusted slightly above the neutral position, so the lever will not easily raise further into up travel. Further forward movement of the cam, 500-43, hinges the pivot, 500-30-2, forcing the pin, 500-30-3, into the slot of the sleeve gear, braking the feed nut so the machine will rapid travel down.

THE ABOVE MECHANICAL ACTION TAKES PLACE AS AIR PRESSURE BUILDS IN THE AIR CIRCUIT, AND UPON REACHING 75 psi CLOSES PRESSURE SWITCH #1 (PANEL LOCATION, SECOND PRESSURE SWITCH FROM TOP.), WHICH

ENERGIZES (MS) MOTOR STARTER. FAST DOWN BUTTON MUST BE HELD TO MAINTAIN CONTACT AND WHEN RELEASED WILL DROP OUT CIRCUIT.

FEED PUSH-BUTTON

DEPRESSING THE FEED BUTTON CLOSES THE CIRCUIT TO THE (FR) FEED RELAY WHICH SEALS IN THE FEED CIRCUIT AND ALSO LOCKS OUT THE FAST DOWN CIRCUIT. THE FEED RELAY ENERGIZES THE (MS) MOTOR STARTER.

Mechanically, the FA-2AVB is normally in the in-feed position. The lever, 500-38-1, is spring loaded in the down position, with the key, 500-35, holding the sleeve gear, 500-1, down into the clutch, causing the differential rotation to turn the nut, 502-2, on the screw. If necessary, the shift lever, 500-38-1, can be manually lifted to raise the sleeve gear out of feed position into the neutral or fast return.

WHEN IN-FEED, THE STOP BUTTON OR THE (LLS) LOWER LIMIT SWITCH WILL OPEN THE CIRCUIT, AND ENGAGE THE UP TRAVEL CIRCUIT.

UP PUSH-BUTTON

DEPRESSING THE UP BUTTON OR ACTUATING THE (LLS) LOWER LIMIT SWITCH CLOSES THE CIRCUIT TO THE UP RELAY, THE MOTOR STARTER, AND THE NEUTRAL DWELL SOLENOID VALVE. THIS NORMALLY CLOSED VALVE OPENS TO ALLOW AIR TO FLOW TO THE LOWER PORT OF THE NEUTRAL DWELL CYLINDER, 502-2-88, THE CENTER VERTICAL CYLINDER ON THE UPPER HOUSING, CAUSING IT TO MOVE TO NEUTRAL DWELL POSITION, STOPPING FEED. THE UP RELAY ALSO ACTIVATES (TD1) TIME DELAY ONE, WHICH AFTER APPROXIMATELY 2 SECONDS OPENS THE CIRCUIT TO THE MOTOR STARTER (which stops spindle rotation).IT ALSO ACTIVATES (TD2) TIME DELAY TWO, WHICH AFTER 2.5 SECONDS CLOSES THE CIRCUIT TO THE SPINDLE CLUTCH SOLENOID VALVE. THIS VALVE ALLOWS AIR TO FLOW TO THE SPINDLE CLUTCH DISENGAGEMENT CYLINDER.(This cylinder disengages the spindle clutch). THE CYLINDER IS PORTED AT THE TOP, SO THAT AFTER COMPLETION OF IT'S STROKE IT ALLOWS AIR TO FLOW TO THE TOOL POSITIONER CYLINDER, (SEE PAGE 84). (The cam of the positioner cylinder rotates the cutting tool to the front).THE SOLENOID VALVE ALSO SUPPLIES AIR TO (PS3) PRESSURE SWITCH THREE, WHICH CLOSES THE CIRCUIT TO THE MOTOR STARTER, AFTER IT REACHES 75 TO 80 psi.

(TD2) TIME DELAY TWO ALSO ACTIVATES (TD3) TIME DELAY THREE, WHICH AFTER 3 SECONDS, CLOSES THE CIRCUIT TO THE UP SOLENOID VALVE. THIS VALVE ALLOWS AIR TO FLOW TO THE UPPER PORT OF THE NEUTRAL DWELL CYLINDER (causing it to lift the shift lever to the extreme up position.) ALL TIME SETTINGS CAN BE +1/2 SECOND BUT REQUIRE A MINIMUM OF 1/2 SECOND BETWEEN EACH.

THIS MACHINE INCORPORATES A LOWER SAFETY LIMIT SWITCH (SLS) THAT WILL OPEN MACHINE CIRCUIT AT BOTTOM OF TRAVEL SHOULD AN INITIAL ELECTRICAL OR AIR COMPONENT FAIL.

The cylinder raises the shift lever, 500-38-1, (section D-D) to neutral dwell first then to extreme up, depressing the spring cartridge, 500-40. The lever, 500-38-1, through the key, 300-35, lifts the sleeve gear, 500-1, out of the clutched feed position, and the lug on the extreme right of the shift lever, 500-38-1, (section D-D & F-F) raises the arm of the tumbler assembly,

300-37, engaging it with the gear, 500-26, to turn the feed nut and retract the spindle. The spindle can be manually retracted by starting the motor in-feed and manually lifting the lever, 500-38-1, although care must be exercised to avoid bypassing the upper limit switch. If it fails to completely engage or tends to ratchet, a simple clutch adjustment can be made. (See Rapid Return Adjustment).

THE UP CIRCUIT IS OPENED BY EITHER THE STOP PUSH BUTTON OR THE OPENING OF THE NORMALLY CLOSED (ULS) UPPER LIMIT SWITCH.

STOP PUSH BUTTON

THE STOP BUTTON OPENS ANY MOTOR OPERATED CIRCUIT OF THE MACHINE.

COMMON CAUSES OF TROUBLE

(Poor finish, inaccurate holes, excessive tool bit heat, excessive tool drag back lines, etc.).

The great majority of these problems are a result of tool bit sharpening. Check to make sure tool bit "B" land is of proper width, with keen sharp faces and top of bit is free from flaws, with original rake angle and smooth finish. Frequently, a minute flaw, not visible to the naked eye, will prevent a fine finish.

It is possible dirt or lubricant used to clean outer spindle may enter lower cutter, and the assembly containing a chatter dampening device, (detail K, 502-2-43). The result of this would be to encounter spindle chatter at the bottom of the bore, particularly long bores.

Clean the inside of this assembly extremely cautiously and thoroughly, leaving completely dry. Tolerances on these parts are extremely close and much care should be used.

Holes with inconsistent patterns and excessive chipping of tool bits in interrupted cuts at bottom of bore are an indication of a loose inner spindle bearing.

A loose outer spindle bearing will not generally result in taper or inaccurate bores, but can allow spindle to drop slack in feed nut, resulting in a mark in the cylinder.

CUTTING TOOL DRAG BACK LINES

Standard "F" & "D" series Rottler cylinder reboring equipment is designed to minimize tool return drag back lines by bringing the tool bit to the front of the machine so that the offset return thrust of the feed screw can slightly deflect the spindle away from the cylinder wall.

It is common for machines to make a faint withdrawl mark particularly at the bottom of the cylinder. Very light honing (.0005") should remove all traces of the mark.

Tool marks can, of course, be completely eliminated by off setting the spindle away from tool bit while returning the spindle.

Here are the maintenance steps you can take to minimize tool drag back:

1. Check tool bit for sharp free cutting ability. A too wide "B" land and negative rakes will cause drag back particularly on stub boring heads.

2. Check inner spindle bearing adjustment in accordance with this manual.

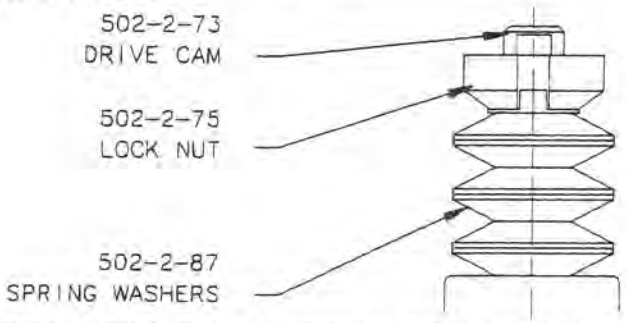
3. Check outer spindle bearing adjustment in accordance with this manual. A slightly heavier drag on lower outer spindle bearing and freer upper adjustment will improve tool drag marks. It may be necessary, if problems persist, to rotate the upper sleeve bearing approximately 90 degrees in order to reseat the bearing for better up stroke relief.

TORQUE LIMITER, AUTOMATIC SPINDLE RAPID RETURN

A torque limiting device is provided in the spindle rotation mechanism drive sprocket. So that, in the event an operator engages the spindle clutch just as the spindle returns to the top and is still rotating with the cam still engaged, or if for any reason the spindle clutch was engaged with the cam engaged, the torque limiter will release. (Release force approximately 20 foot pounds).

To reset the torque limiter after it has released; grasp the cutter head to keep it from rotating, and with a wrench applied to the flats on the end of the drive cam (502-2-73), rotate the drive cam until the torque limiter "clicks" into it's operating position.

If, for any reason, the torque limiter is disassembled, make certain the sprockets are marked so the exact timing can be maintained when reassembling (see adjustment of the spindle positioner cam if they have to be reset). When reassembling the torque limiter, make sure the spring washers (6) are assembled on the shaft as shown below.



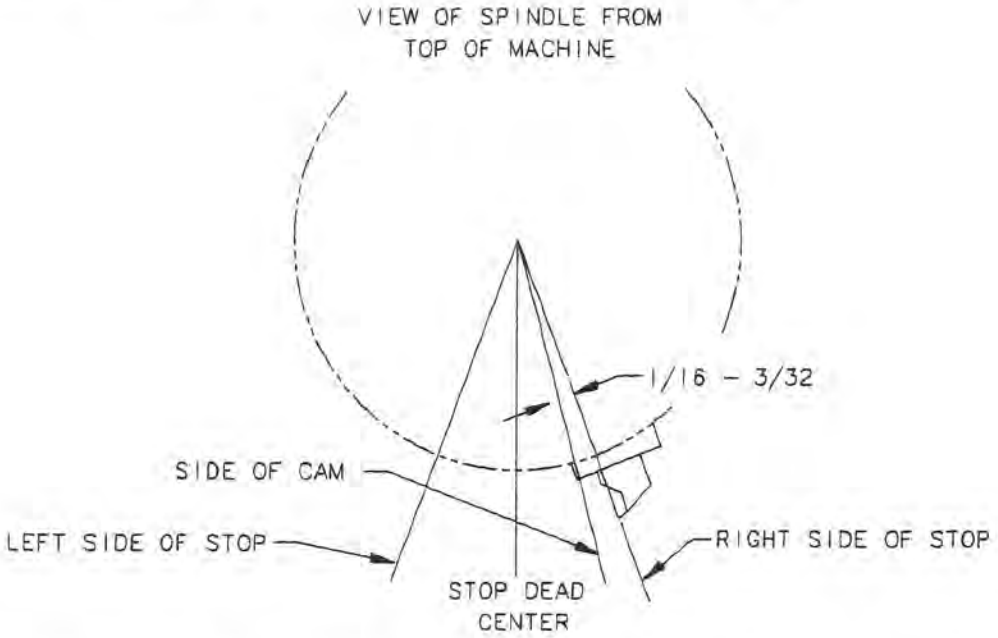
Tighten the lock nut (502-2-75) until the slack is taken out of springs and then tighten an additional 1 to 1-1/4 turns.
To check the release force of the torque limiter - hold cutter head and with a wrench on the flat of the drive cam apply approximately 20 foot lbs. of force to wrench, limiter should click out. If adjustment is required tighten or loosen lock nut.

ADJUSTMENT OF THE SPINDLE POSITIONER CAM

The spindle positioner cam (502-2-73) has to be set in relation to the spindle stop. The spindle stop is engaged as the spindle clutch is disengaged and it positions the tool as shown in the diagram, on the following page.

When the spindle positioner cylinder is energized, the rod (502-2-68) is extended, causing the drive pin in the rod to drive the cam (502-2-73) and rotate the spindle clockwise to the return position. To check the relationship of the cam and spindle stop, travel the spindle down close to the lower limit and then depress the Up button. As the spindle returns, grasp the cutter and rotate it counter clockwise.

Adjustment of the Spindle Positioner Cam con't

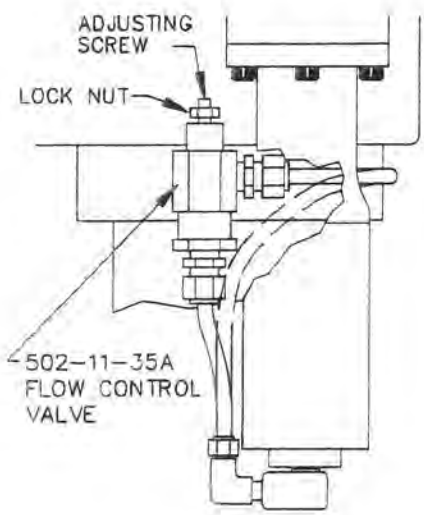


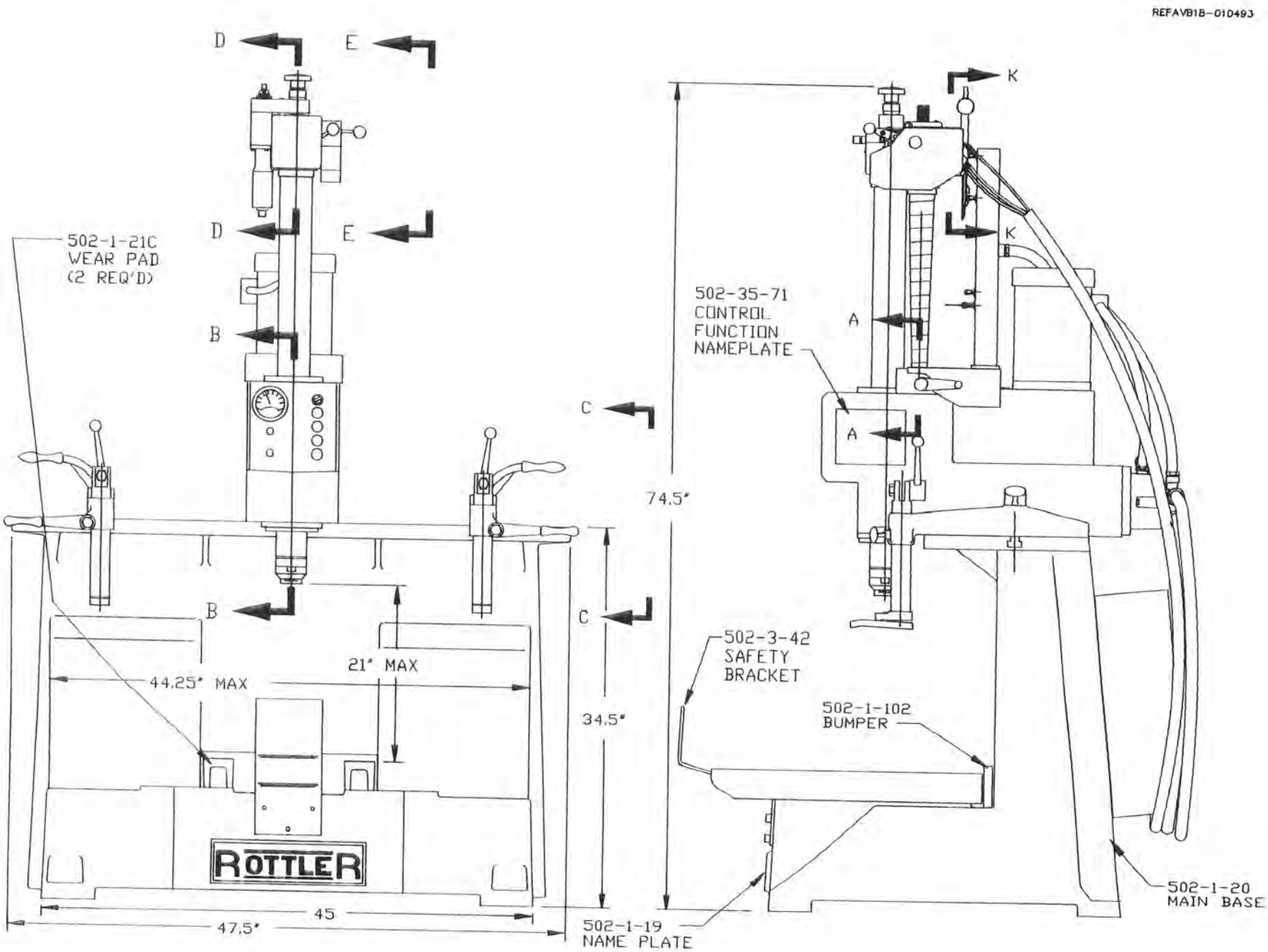
far enough to clear the stop. Now rotate it clockwise, first contacting the right side of the stop and riding up on the stop, then contacting the side of the cam. The amount of travel from the point that the right side of the stop is contacted to the cam should be approximately 1/16" to 3/32" on the periphery of the cutter head. The cutter head should never rotate past dead center on the stop before contacting the cam.

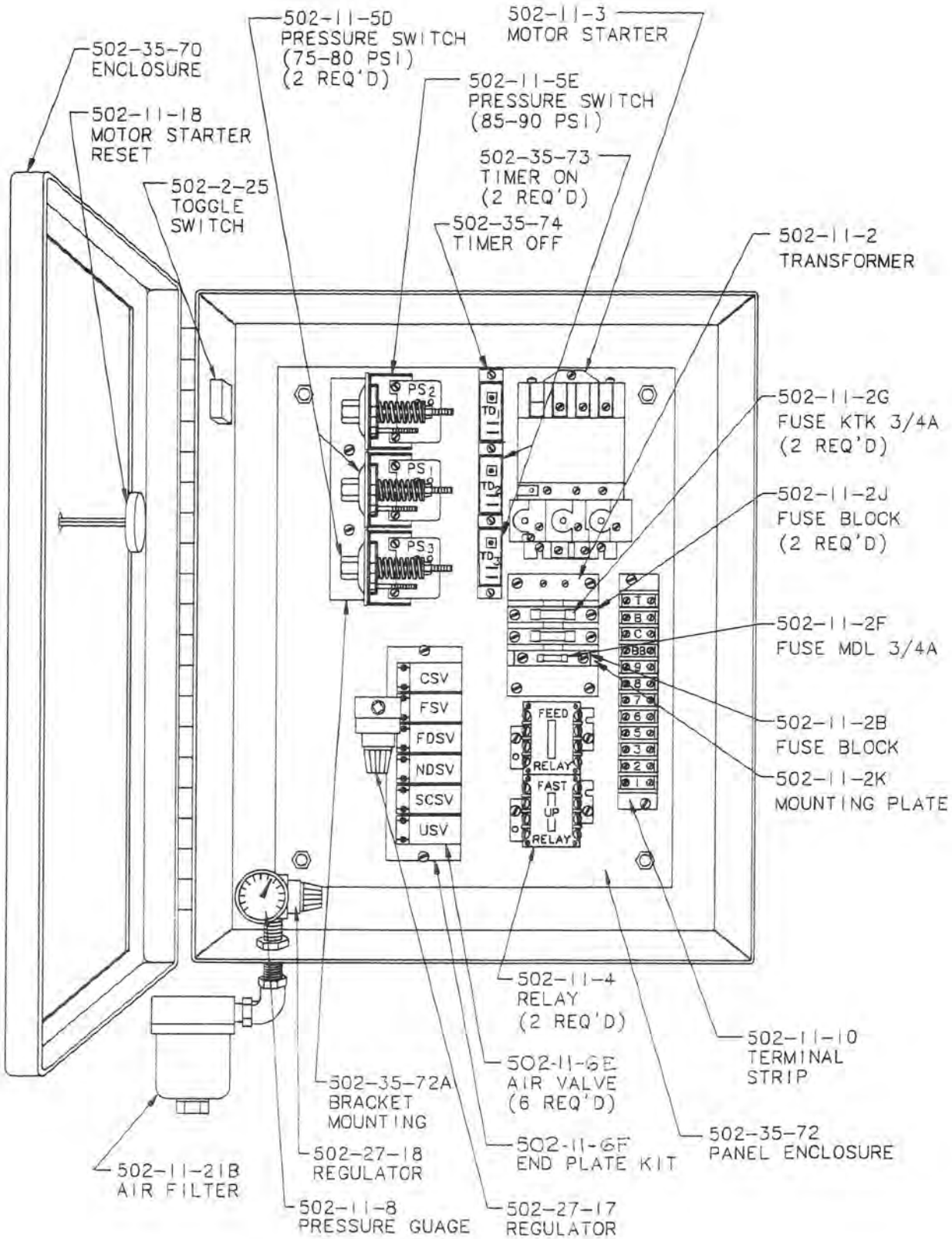
To make this adjustment, loosen the (3) Allen head cap screws on the air cylinder rod end (502-2-66). This allows the air cylinder to be rotated several degrees; rotating the cylinder clockwise (viewed from the top) will increase the distance from the right side of the stop to the cam, and rotating it counter clockwise will decrease it. The drive pin in the rod (502-2-68), and the cam (502-2-73) can be inspected by removing the round snap-out cover on the front of the housing (502-2-65).

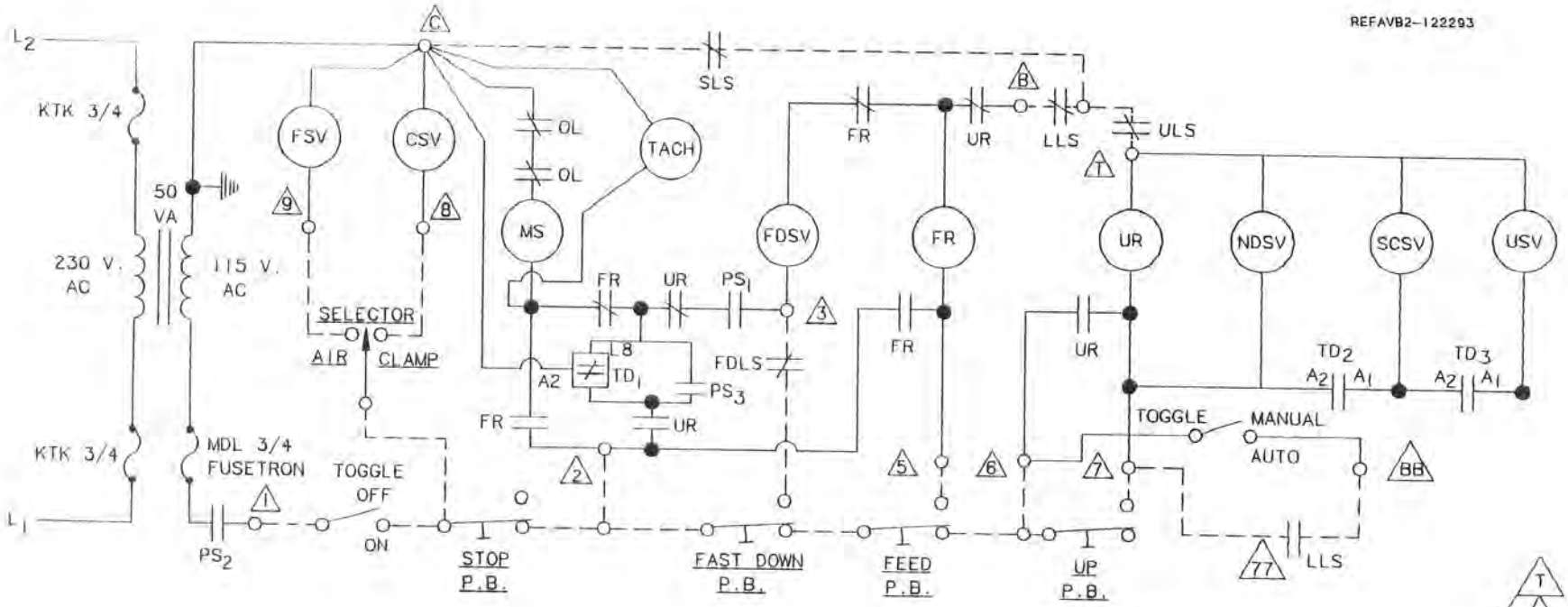
Setting Valve

Loosen lock nut on valve adjusting screw. Turn Adjusting Screw all the way out. Check speed of cutter head when tool positioner is engaged. Set the valve so that the tool positioner operates at half this speed, or until positioner is smooth and cutter does not override plunger detent or drive cam. Tighten lock nut on adjusting screw.




REFAVB1B-010493
D
E
D
E
B
B
C
C
K
K
A
A
502-1-21C
WEAR PAD
(2 REQ'D)
502-35-71
CONTROL
FUNCTION
NAMEPLATE
74.5"
21" MAX
44.25" MAX
34.5"
502-3-42
SAFETY
BRACKET
502-1-102
BUMPER
ROTTLER
45
47.5"
502-1-19
NAME PLATE
502-1-20
MAIN BASE

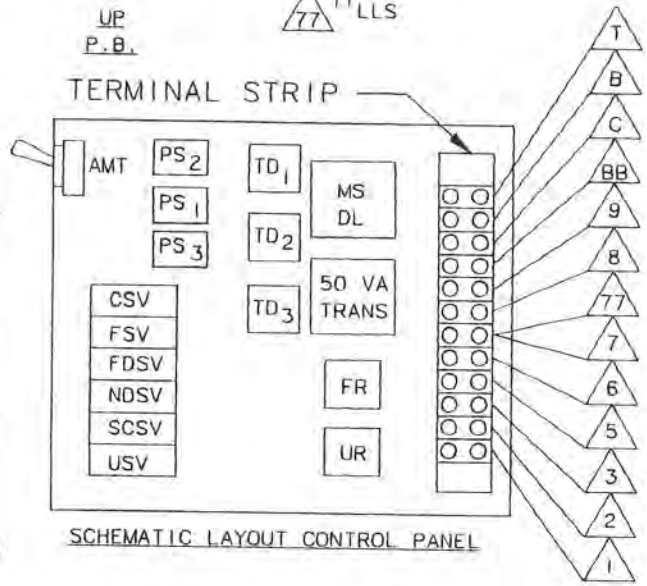

502-11-5D
PRESSURE SWITCH
(75-80 PSI)
(2 REQ'D)
502-11-3
MOTOR STARTER
502-35-70
ENCLOSURE
502-11-5E
PRESSURE SWITCH
(85-90 PSI)
502-11-18
MOTOR STARTER
RESET
502-35-73
TIMER ON
(2 REQ'D)
502-2-25
TOGGLE
SWITCH
502-35-74
TIMER OFF
502-11-2
TRANSFORMER
502-11-2G
FUSE KTK 3/4A
(2 REQ'D)
502-11-2J
FUSE BLOCK
(2 REQ'D)
502-11-2F
FUSE MDL 3/4A
502-11-2B
FUSE BLOCK
502-11-2K
MOUNTING PLATE
PS2
PS1
PS3
CSV
FSV
FDSV
NDSV
SCSV
USV
FEED
RELAY
FAST
UP
RELAY
502-11-4
RELAY
(2 REQ'D)
502-11-10
TERMINAL
STRIP
502-11-6E
AIR VALVE
(6 REQ'D)
502-35-72A
BRACKET
MOUNTING
502-11-6F
END PLATE KIT
502-35-72
PANEL ENCLOSURE
502-11-21B
AIR FILTER
502-27-18
REGULATOR
502-11-8
PRESSURE GUAGE
502-27-17
REGULATOR



LEGEND

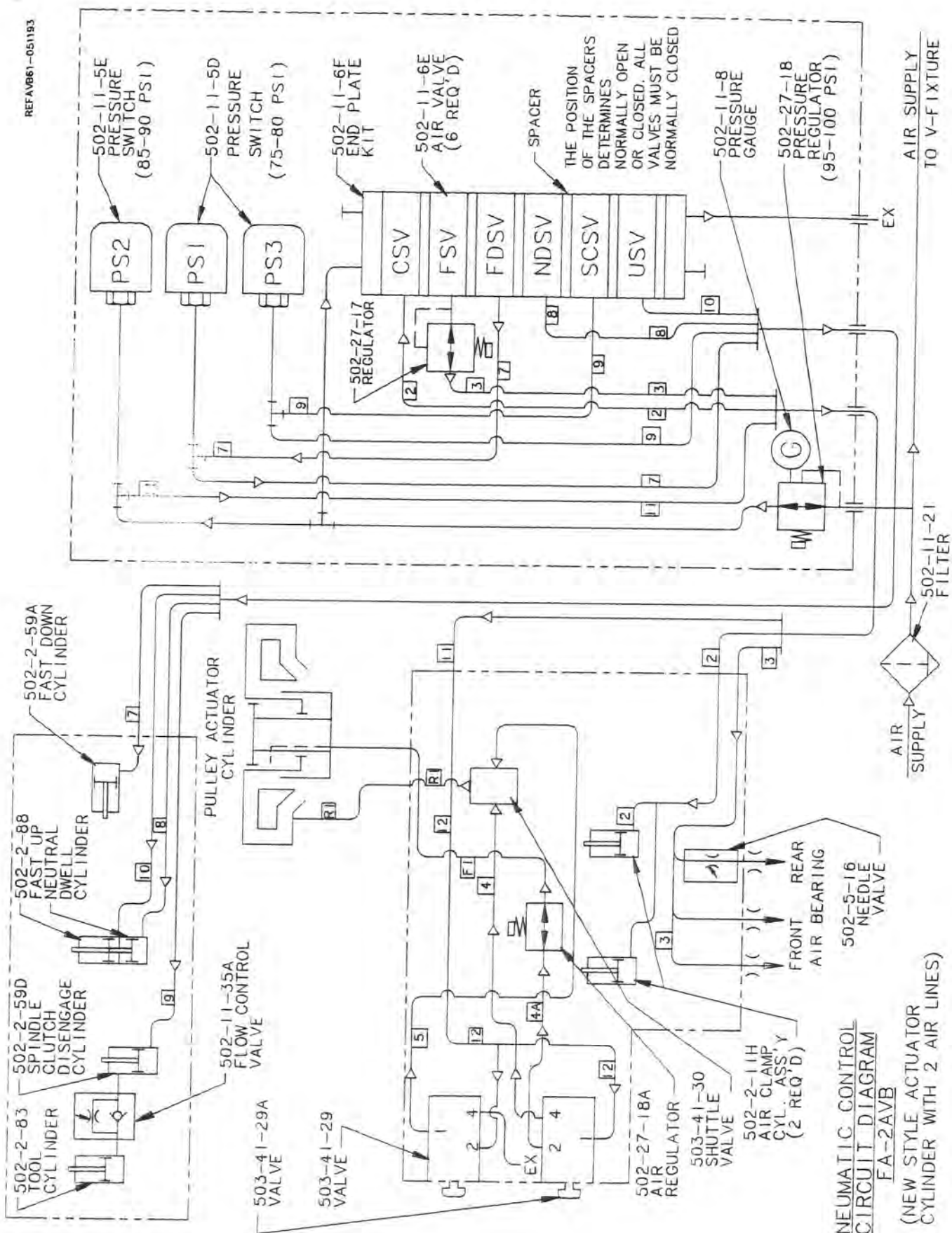
CSV – CLAMP SOLENOID VALVE
SCSV – SPINDLE CLUTCH SOLENOID VALVE
FDSV – FAST DOWN SOLENOID VALVE
NDSV – NUETRAL DWELL SOLENOID VALVE
FSV – FLOAT SOLENOID VALVE
USV – UP SOLENOID VALVE
FR – FEED RELAY
MS – MOTOR STARTER
OL – OVER LOAD, MOTOR STARTER
LLS – LOWER LIMIT MICRO SWITCH
ULS – UPPER LIMIT MICRO SWITCH
FDLS – FAST DOWN LIMIT SWITCH
AMT – AUTO-MANUAL TOGGLE SWITCH
UR – UP RELAY
SLS – SAFETY LIMIT SWITCH-ADDED TO TYPE A CONTROL ONLY AT SER. 2188 NOV – 66

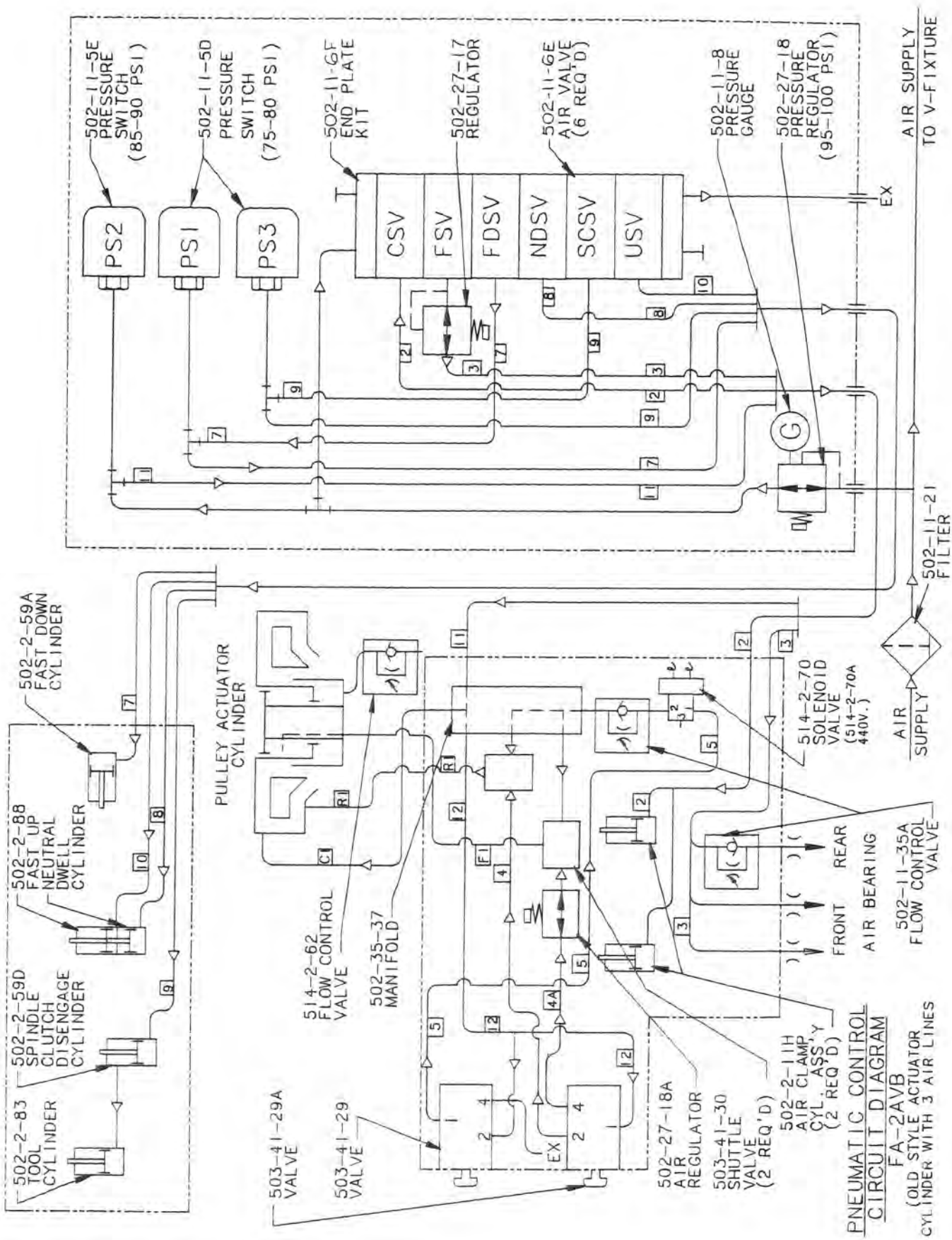
PS_1 – PRESSURE SWITCH N.O. CONTACTS CLOSED BY AIR PRESS. WHEN FDSV IS ENERGIZED
PS_2 – PRESSURE SWITCH N.O. CONTACTS CLOSED BY SUPPLY AIR PRESS.
PS_3 – PRESSURE SWITCH N.O. CONTACTS CLOSED BY SPINDLE CLUTCH SOLENOID VALVE
TD_1 – TIME DELAY MOTOR OFF
TD_2 – TIME DELAY SPINDLE CLUTCH SOLENOID ON
TD_3 – TIME DELAY FAST UP SOLENOID ON
△ – WIRES & TERMINAL INDICATORS

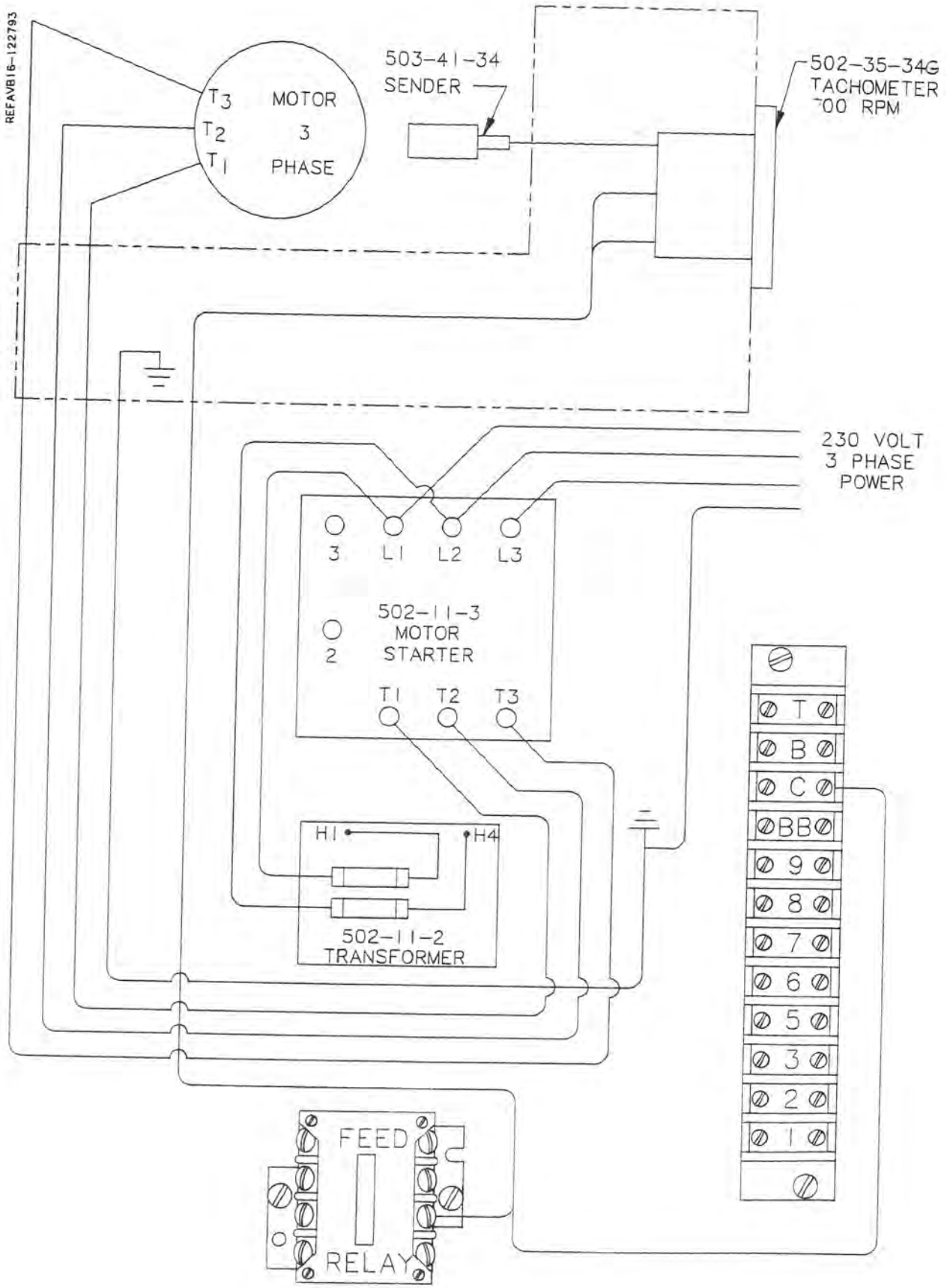


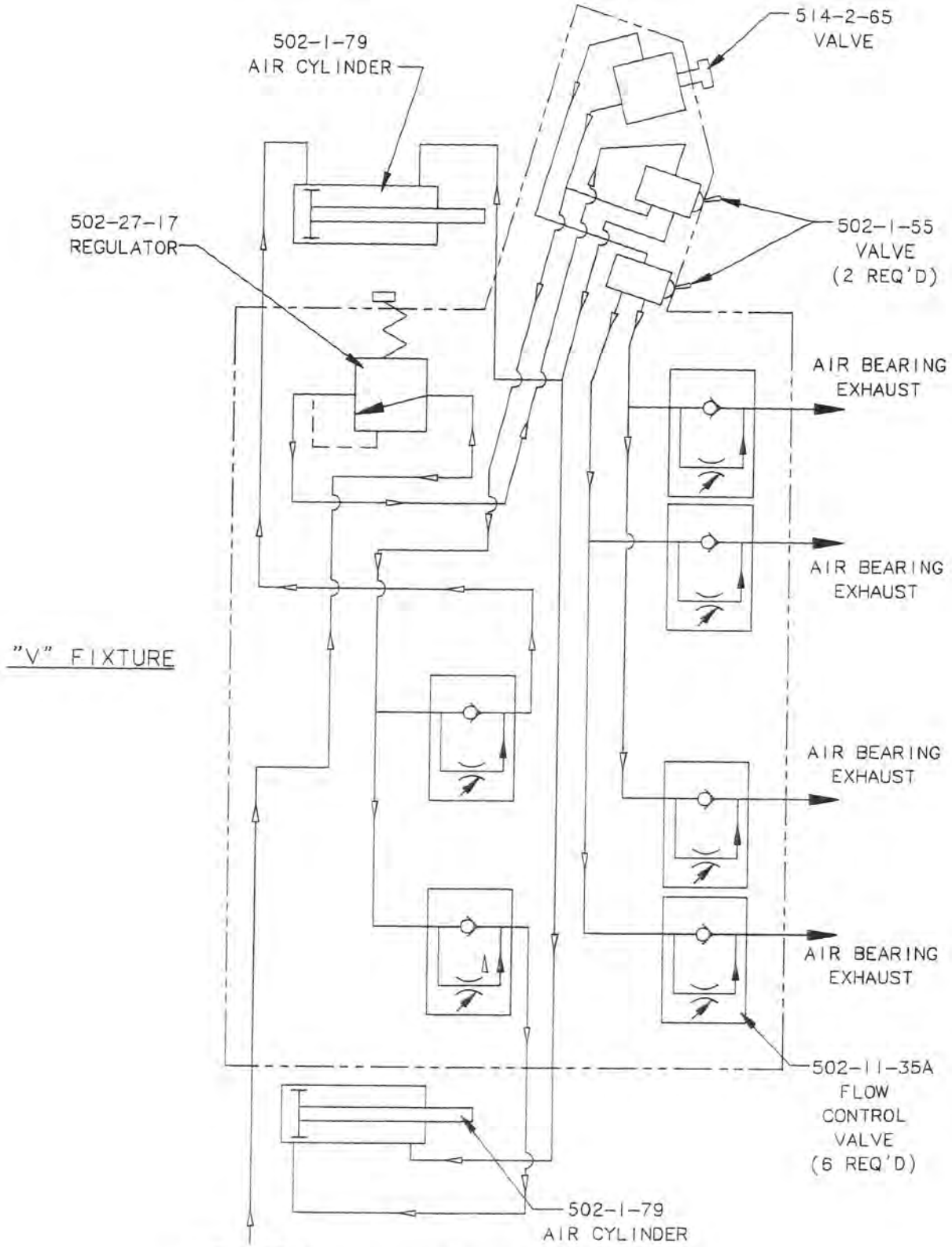
SCHEMATIC LAYOUT CONTROL PANEL

FA-2AVB AUTOMATIC BORING MACHINE CONTROL CIRCUIT DIAGRAM

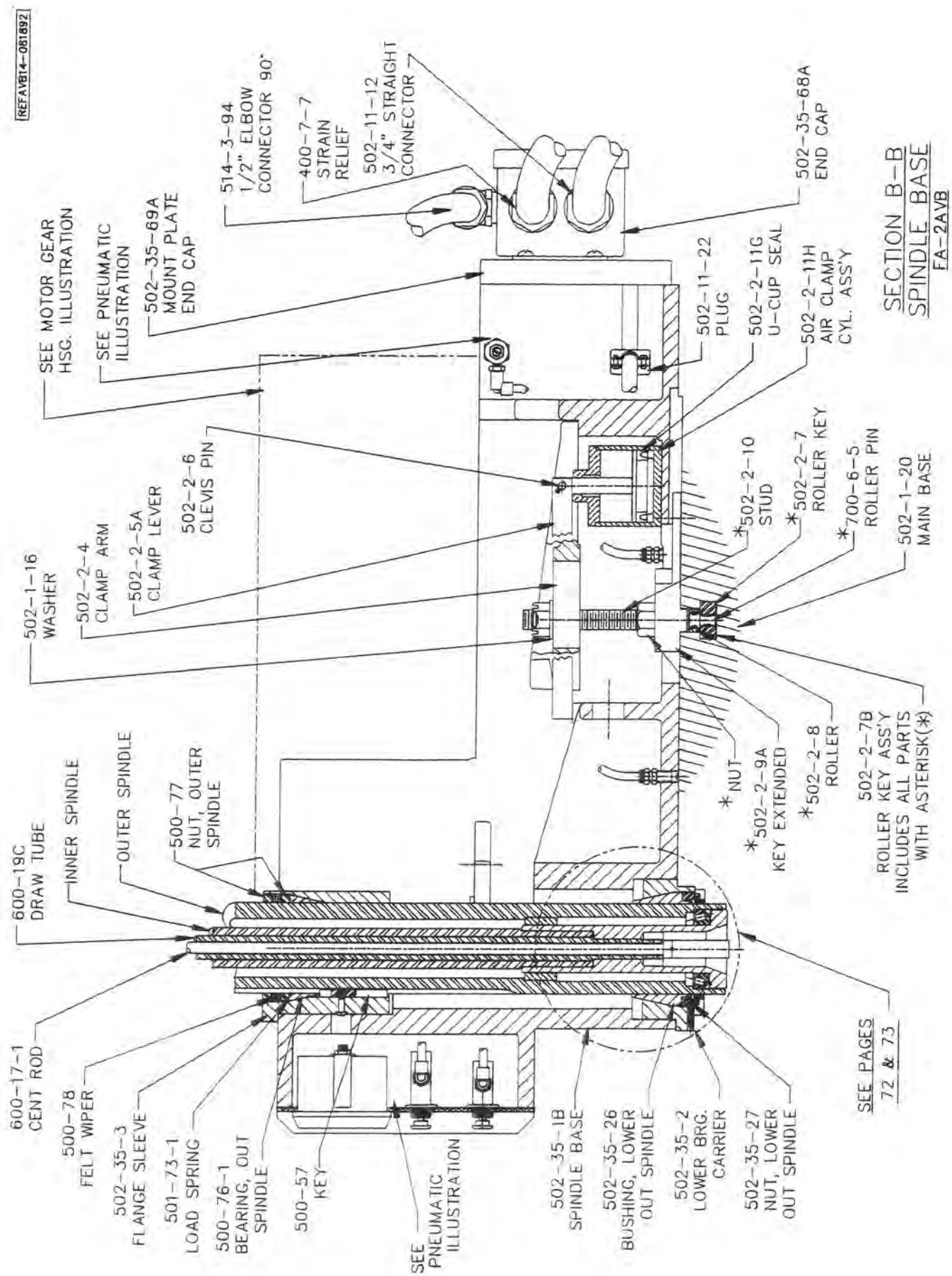

REFAVB61-051193
502-11-5E PRESSURE SWITCH (85-90 PSI)
502-11-5D PRESSURE SWITCH (75-80 PSI)
502-11-6F END PLATE KIT
502-11-6E AIR VALVE (6 REQ'D)
SPACER
THE POSITION OF THE SPACERS DETERMINES NORMALLY OPEN OR CLOSED. ALL VALVES MUST BE NORMALLY CLOSED
502-11-8 PRESSURE GAUGE
502-27-18 PRESSURE REGULATOR (95-100 PSI)
AIR SUPPLY TO V-FIXTURE
PS2
PS1
PS3
CSV
FSV
FDSV
NDSV
SCSV
USV
EX
502-27-17 REGULATOR
502-2-59A FAST DOWN CYLINDER
502-2-88 FAST UP NEUTRAL DWELL CYLINDER
502-2-59D SPINDLE CLUTCH DISENGAGE CYLINDER
502-2-83 TOOL CYLINDER
502-11-35A FLOW CONTROL VALVE
PULLEY ACTUATOR CYLINDER
503-41-29A VALVE
503-41-29 VALVE
502-27-18A AIR REGULATOR
503-41-30 SHUTTLE VALVE
502-2-11H AIR CLAMP CYL. ASS'Y (2 REQ'D)
502-5-16 NEEDLE VALVE
FRONT REAR AIR BEARING
502-11-21 FILTER
AIR SUPPLY
PNEUMATIC CONTROL CIRCUIT DIAGRAM FA-2AVB
(NEW STYLE ACTUATOR CYLINDER WITH 2 AIR LINES)


502-11-5E PRESSURE SWITCH (85-90 PSI)
502-11-5D PRESSURE SWITCH (75-80 PSI)
502-11-6F END PLATE KIT
502-27-17 REGULATOR
502-11-6E AIR VALVE (6 REQ'D)
502-11-8 PRESSURE GAUGE
502-27-18 PRESSURE REGULATOR (95-100 PSI)
PS2
PS1
PS3
CSV
FSV
FDSV
NDSV
SCSV
USV
EX
AIR SUPPLY TO V-FIXTURE
502-11-21 FILTER
AIR SUPPLY
502-2-59A FAST DOWN CYLINDER
502-2-88 FAST UP NEUTRAL DWELL CYLINDER
502-2-59D SPINDLE CLUTCH DISENGAGE CYLINDER
502-2-83 TOOL CYLINDER
PULLEY ACTUATOR CYLINDER
514-2-62 FLOW CONTROL VALVE
502-35-37 MANIFOLD
514-2-70 SOLENOID VALVE (514-2-70A 440V.)
502-11-35A FLOW CONTROL VALVE
FRONT REAR AIR BEARING
503-41-29A VALVE
503-41-29 VALVE
502-27-18A AIR REGULATOR
503-41-30 SHUTTLE VALVE (2 REQ'D)
502-2-11H AIR CLAMP CYL. ASS'Y (2 REQ'D)
PNEUMATIC CONTROL CIRCUIT DIAGRAM
FA-2AVB
(OLD STYLE ACTUATOR CYLINDER WITH 3 AIR LINES

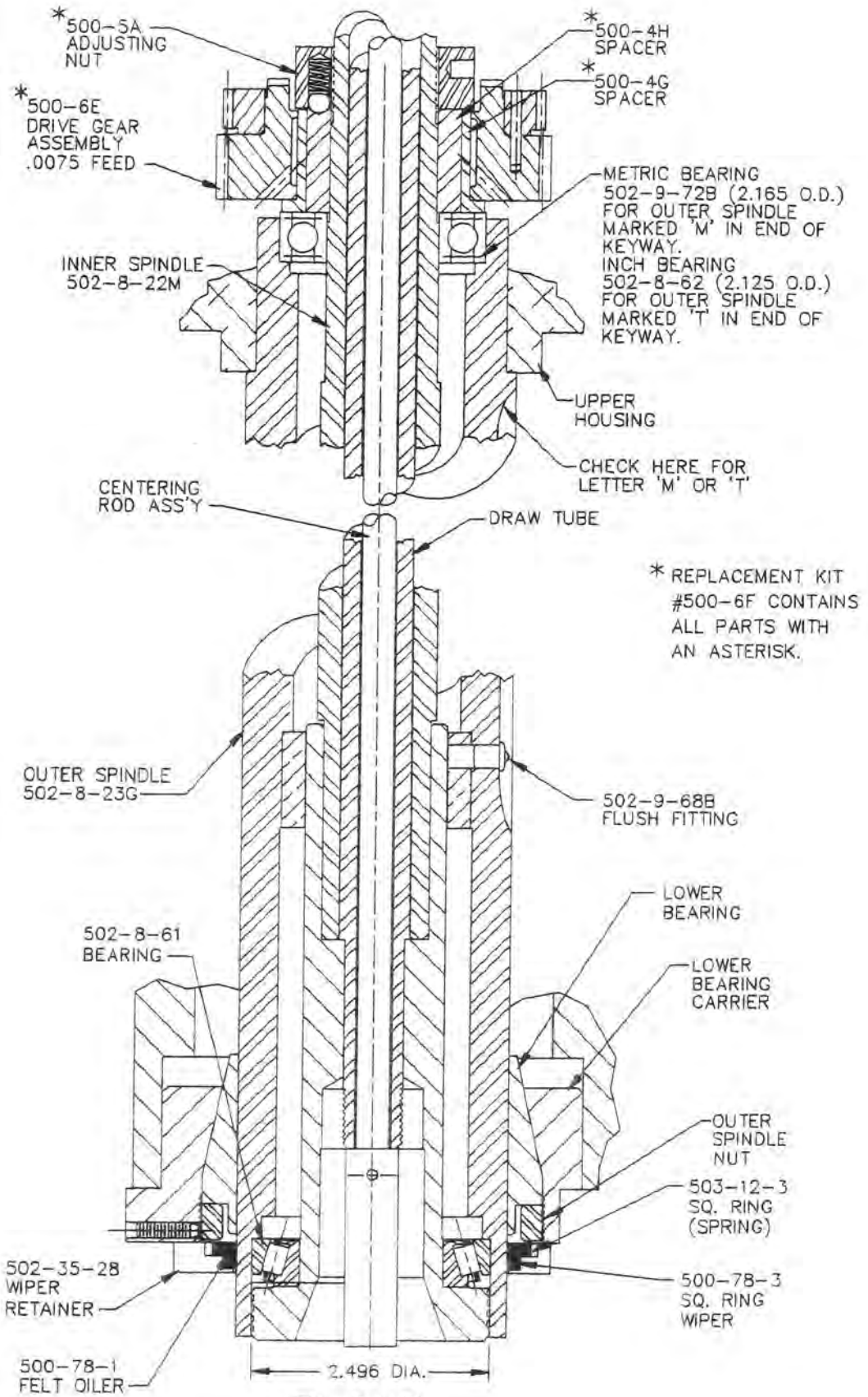

REFAVB16-122793
T3
T2
T1
MOTOR
3
PHASE
503-41-34
SENDER
502-35-34G
TACHOMETER
00 RPM
230 VOLT
3 PHASE
POWER
3
L1
L2
L3
502-11-3
MOTOR
STARTER
2
T1
T2
T3
H1
H4
502-11-2
TRANSFORMER
T
B
C
BB
9
8
7
6
5
3
2
1
FEED
RELAY



"V" FIXTURE
PNEUMATIC CONTROL
CIRCUIT DIAGRAM


REFAVB14-081892
SEE MOTOR GEAR HSG. ILLUSTRATION
SEE PNEUMATIC ILLUSTRATION
502-35-69A MOUNT PLATE END CAP
514-3-94 1/2" ELBOW CONNECTOR 90°
400-7-7 STRAIN RELIEF
502-11-12 3/4" STRAIGHT CONNECTOR
502-35-68A END CAP
502-11-22 PLUG
502-2-11G U-CUP SEAL
502-2-11H AIR CLAMP CYL. ASS'Y
502-2-6 CLEVIS PIN
502-2-5A CLAMP LEVER
502-2-4 CLAMP ARM
502-1-16 WASHER
*502-2-10 STUD
*502-2-7 ROLLER KEY
*700-6-5 ROLLER PIN
502-1-20 MAIN BASE
600-19C DRAW TUBE
INNER SPINDLE
OUTER SPINDLE
500-77 NUT, OUTER SPINDLE
*NUT
*502-2-9A KEY EXTENDED
*502-2-8 ROLLER
502-2-7B ROLLER KEY ASS'Y INCLUDES ALL PARTS WITH ASTERISK(*)
600-17-1 CENT ROD
500-78 FELT WIPER
502-35-3 FLANGE SLEEVE
501-73-1 LOAD SPRING
500-76-1 BEARING, OUT SPINDLE
500-57 KEY
SEE PNEUMATIC ILLUSTRATION
502-35-1B SPINDLE BASE
502-35-26 BUSHING, LOWER OUT SPINDLE
502-35-2 LOWER BRG. CARRIER
502-35-27 NUT, LOWER OUT SPINDLE
SEE PAGES 72 & 73
SECTION B-B
SPINDLE BASE
FA-2AVB

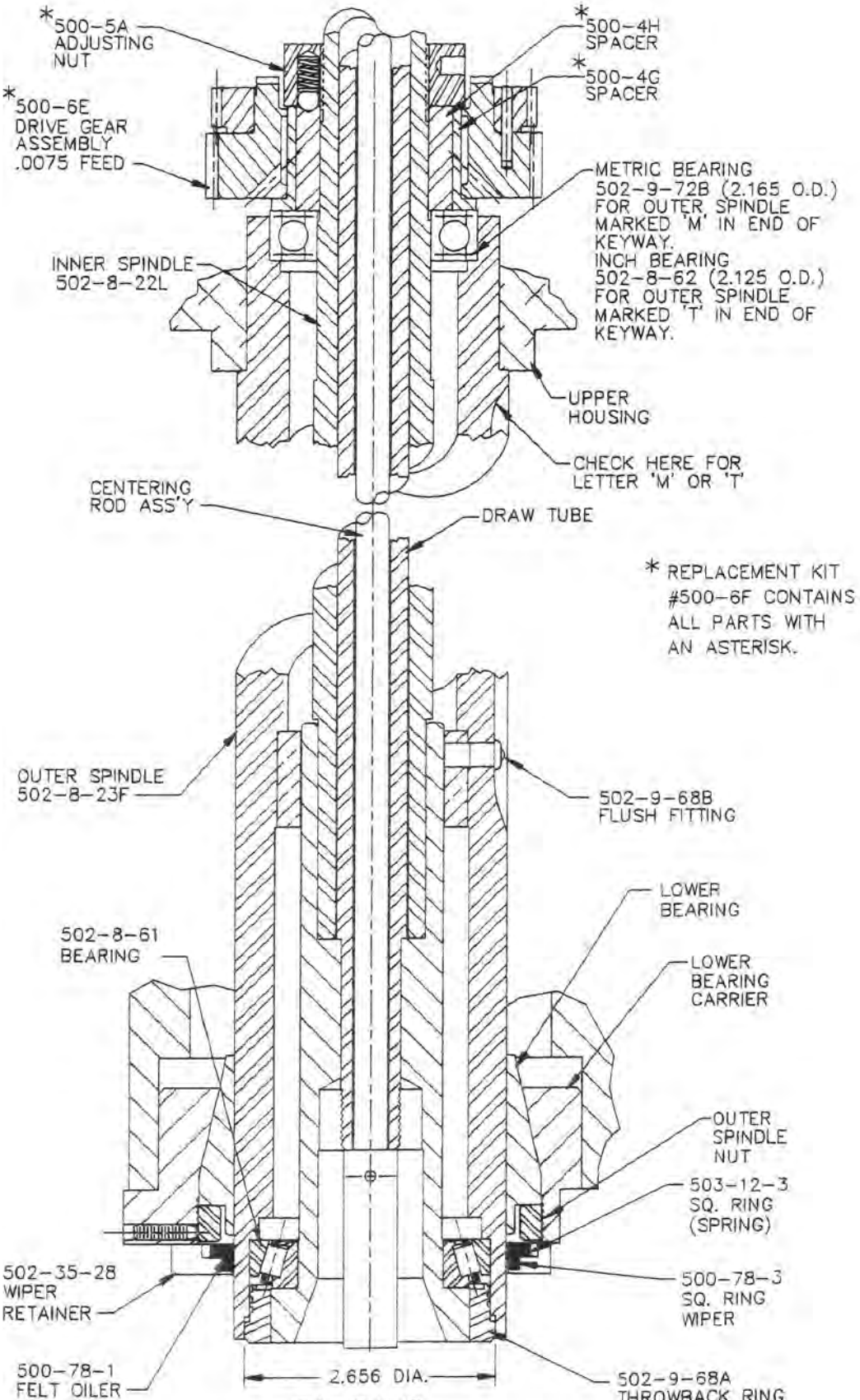
REFAVB73-081892



FA-2AVB

SPINDLE
WITH SOLID THROW BACK RING
GREASE LUBRICATED

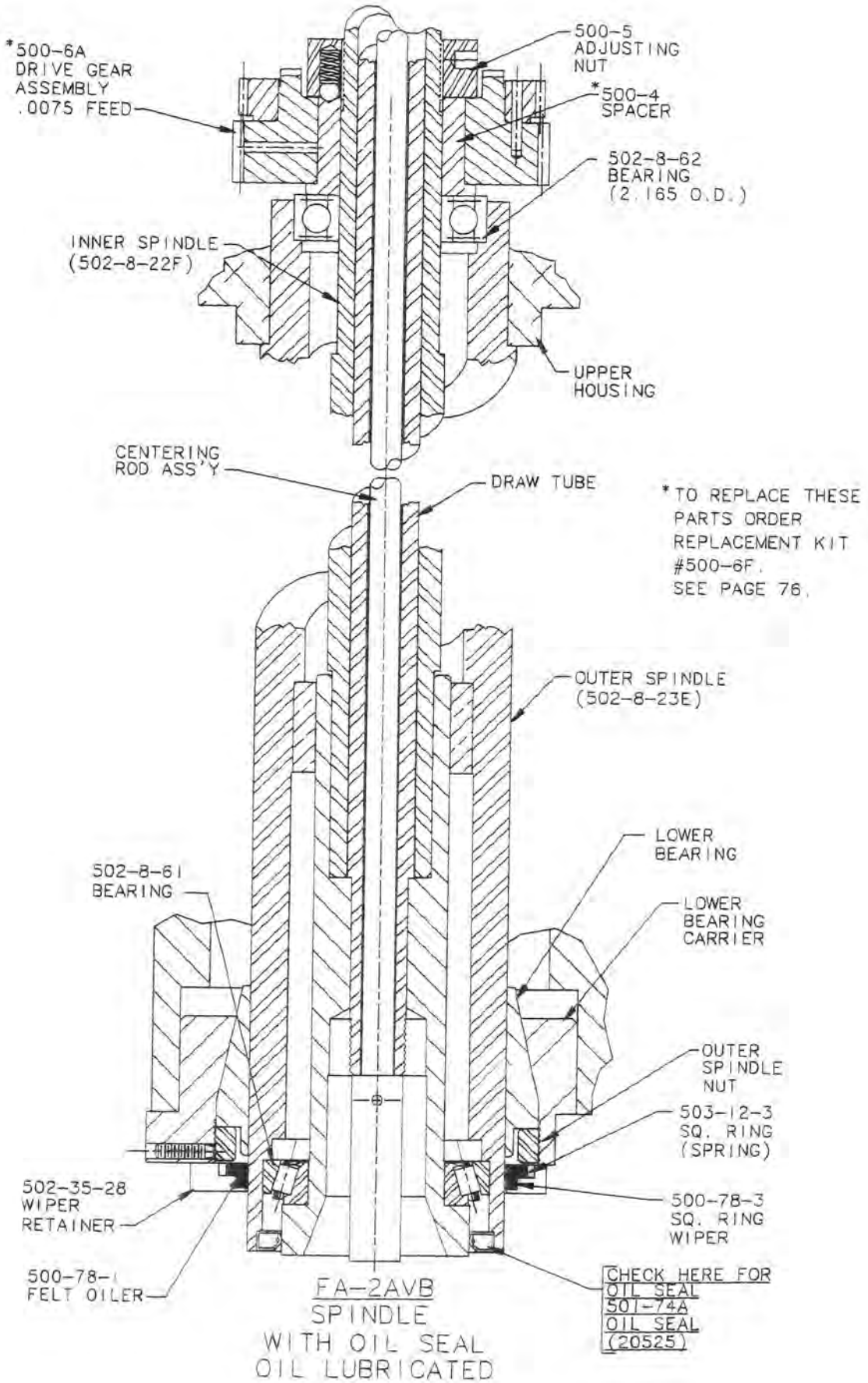
REFAVB64-081692



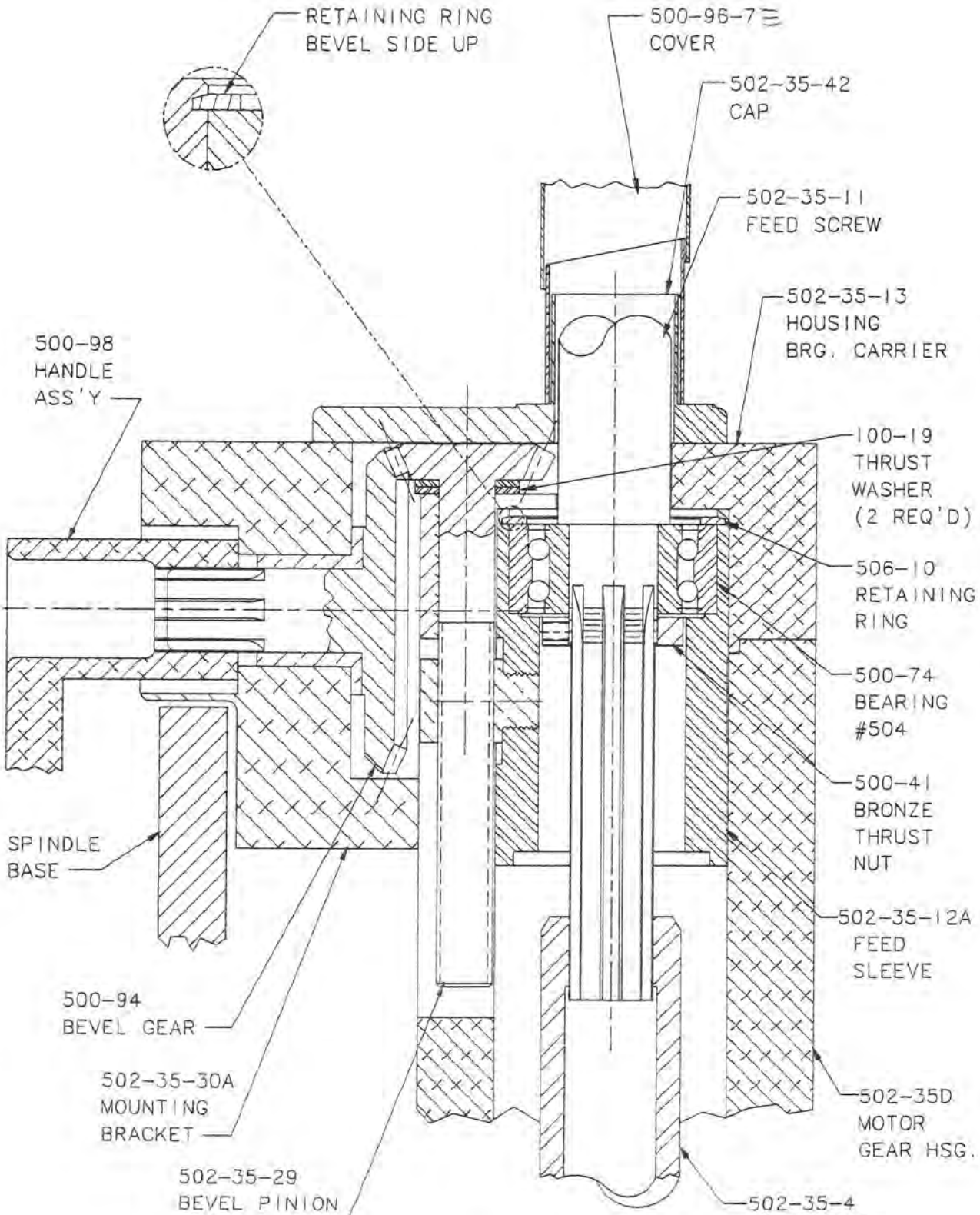
FA-2AVB

SPINDLE
WITH PRESSED ON THROW BACK RING
GREASE LUBRICATED

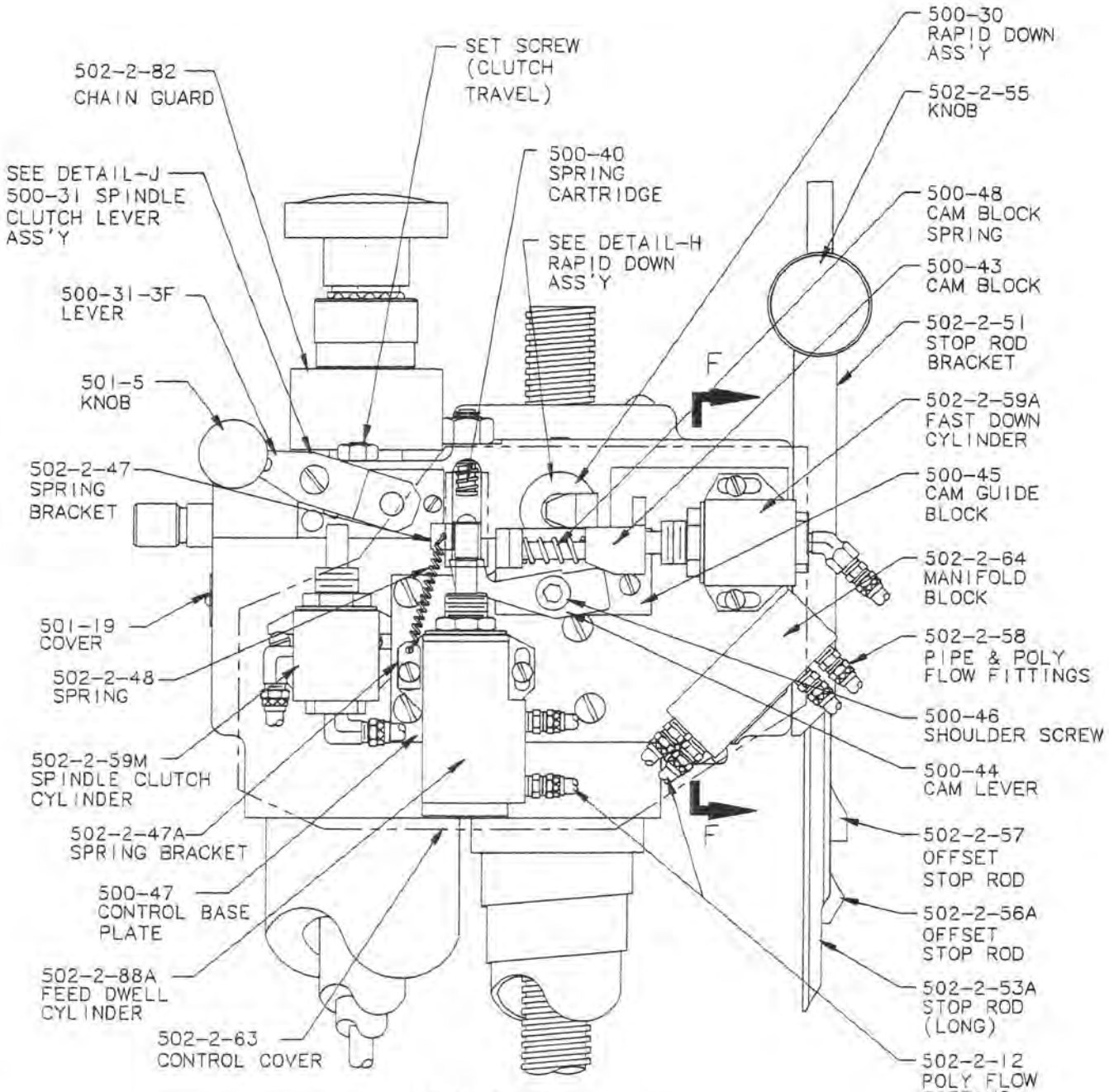
REFAVBI-051393



FA-2AVB
SPINDLE
WITH OIL SEAL
OIL LUBRICATED



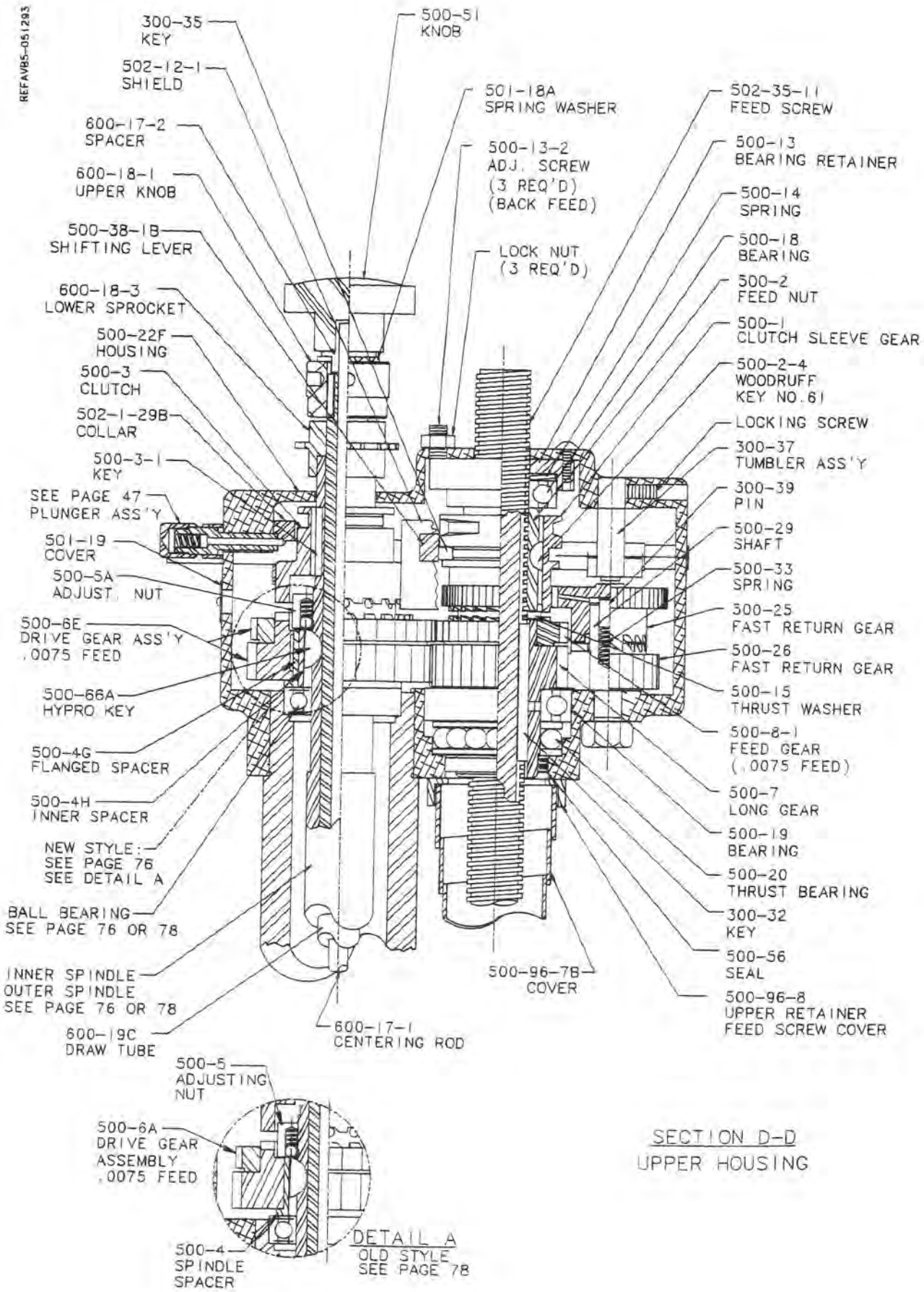
SECTION A-A
HAND FEED
FA-2AVB

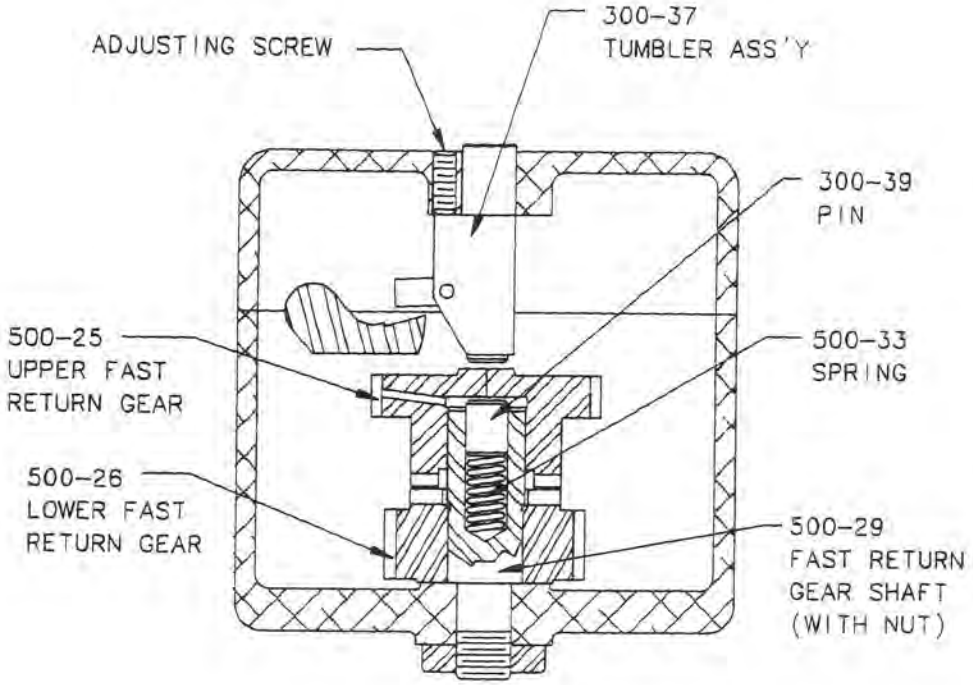


VIEW E-E

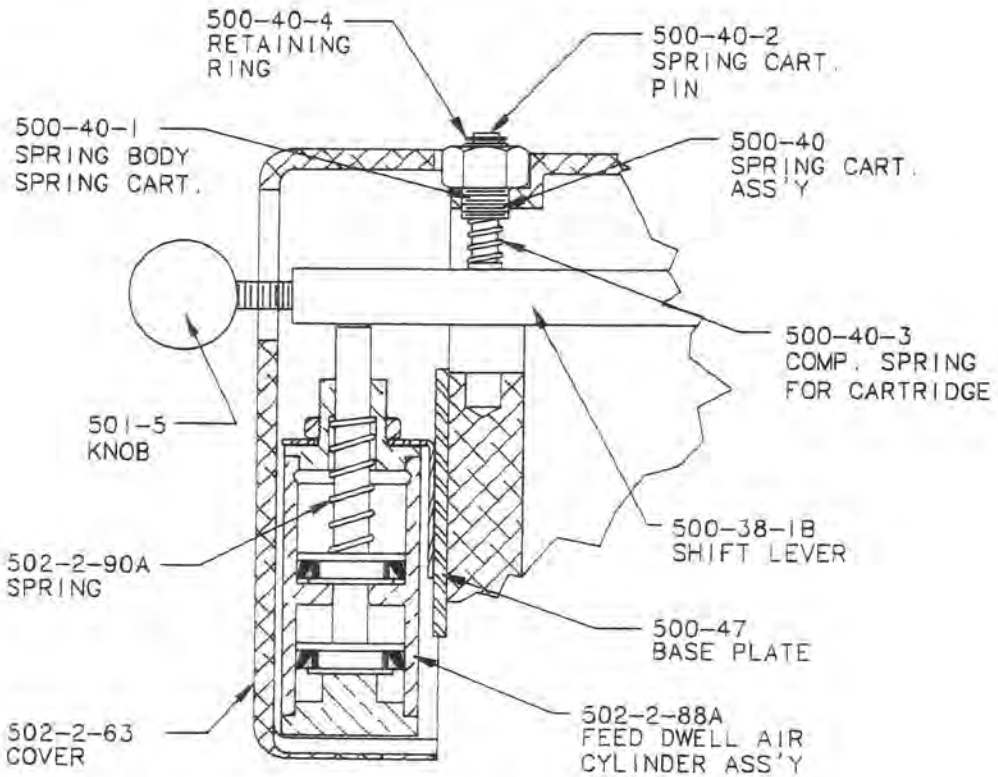
UPPER HOUSING CONTROLS

FA-2AVB

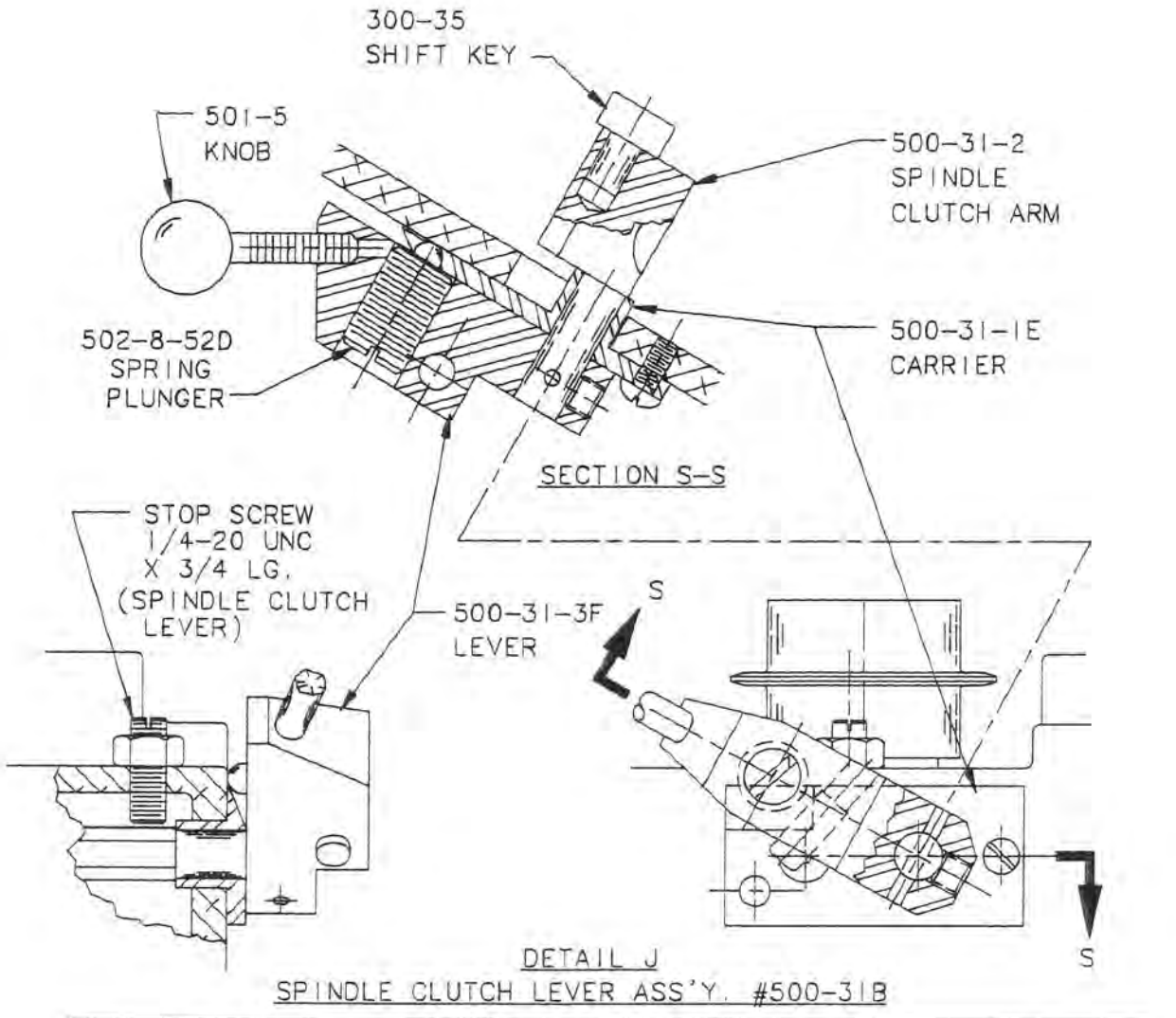

REFAVB5-051293
300-35 KEY
502-12-1 SHIELD
600-17-2 SPACER
600-18-1 UPPER KNOB
500-38-1B SHIFTING LEVER
600-18-3 LOWER SPROCKET
500-22F HOUSING
500-3 CLUTCH
502-1-29B COLLAR
500-3-1 KEY
SEE PAGE 47 PLUNGER ASS'Y
501-19 COVER
500-5A ADJUST. NUT
500-6E DRIVE GEAR ASS'Y .0075 FEED
500-66A HYPRO KEY
500-4G FLANGED SPACER
500-4H INNER SPACER
NEW STYLE: SEE PAGE 76 SEE DETAIL A
BALL BEARING SEE PAGE 76 OR 78
INNER SPINDLE OUTER SPINDLE SEE PAGE 76 OR 78
600-19C DRAW TUBE
500-51 KNOB
501-18A SPRING WASHER
500-13-2 ADJ. SCREW (3 REQ'D) (BACK FEED)
LOCK NUT (3 REQ'D)
600-17-1 CENTERING ROD
500-96-7B COVER
502-35-11 FEED SCREW
500-13 BEARING RETAINER
500-14 SPRING
500-18 BEARING
500-2 FEED NUT
500-1 CLUTCH SLEEVE GEAR
500-2-4 WOODRUFF KEY NO.61
LOCKING SCREW
300-37 TUMBLER ASS'Y
300-39 PIN
500-29 SHAFT
500-33 SPRING
300-25 FAST RETURN GEAR
500-26 FAST RETURN GEAR
500-15 THRUST WASHER
500-8-1 FEED GEAR (.0075 FEED)
500-7 LONG GEAR
500-19 BEARING
500-20 THRUST BEARING
300-32 KEY
500-56 SEAL
500-96-8 UPPER RETAINER FEED SCREW COVER
500-5 ADJUSTING NUT
500-6A DRIVE GEAR ASSEMBLY .0075 FEED
500-4 SPINDLE SPACER
DETAIL A
OLD STYLE
SEE PAGE 78
SECTION D-D
UPPER HOUSING



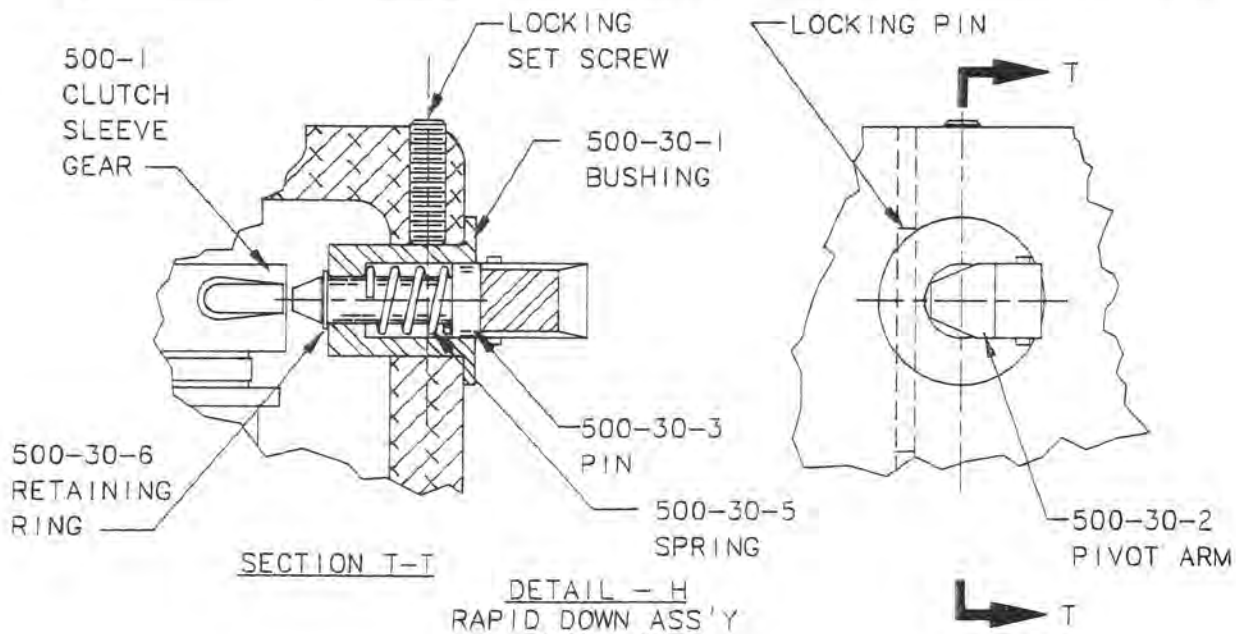
SECTION K-K



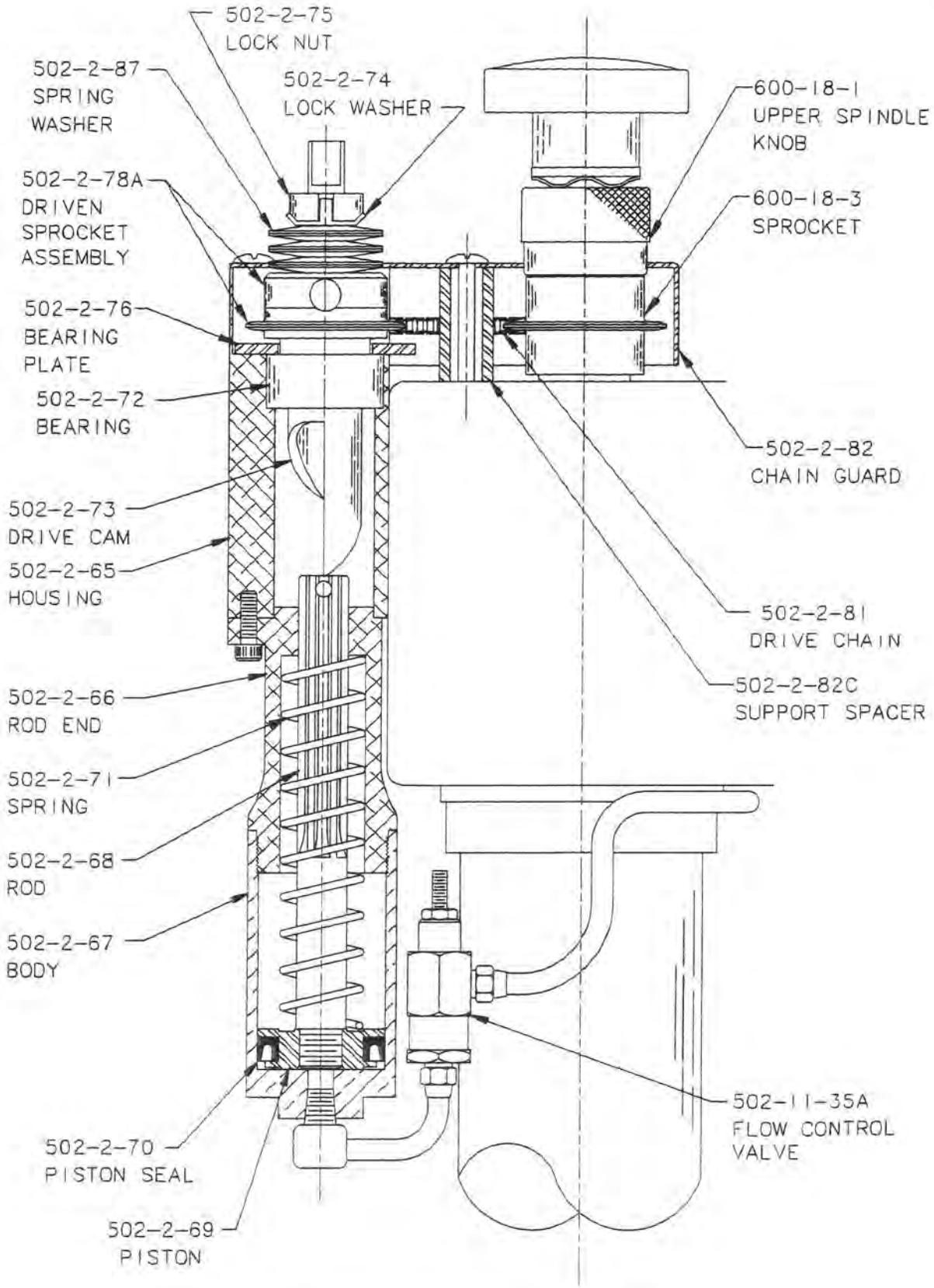
DETAIL F
(FEED LEVER)



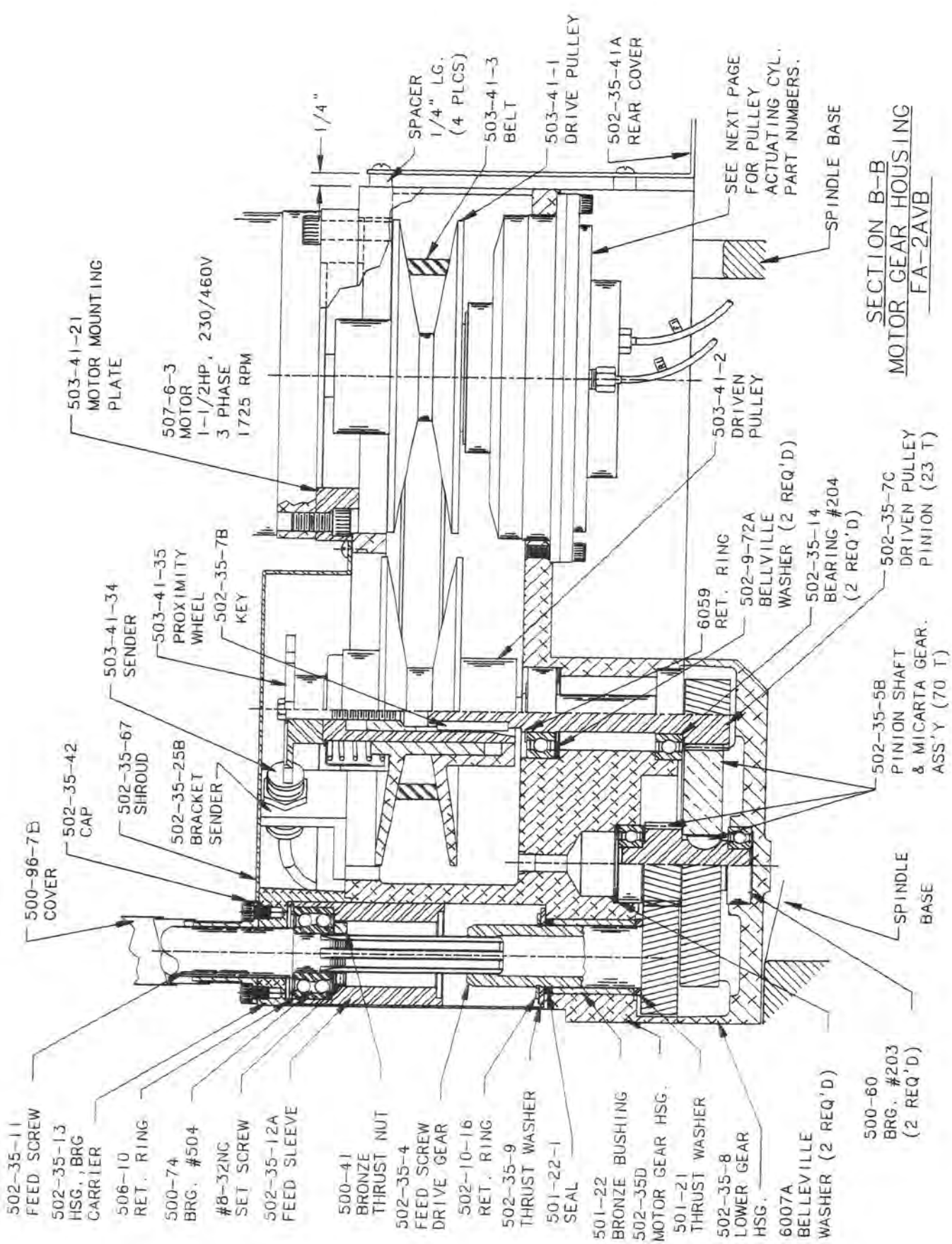
DETAIL J
SPINDLE CLUTCH LEVER ASS'Y. #500-31B



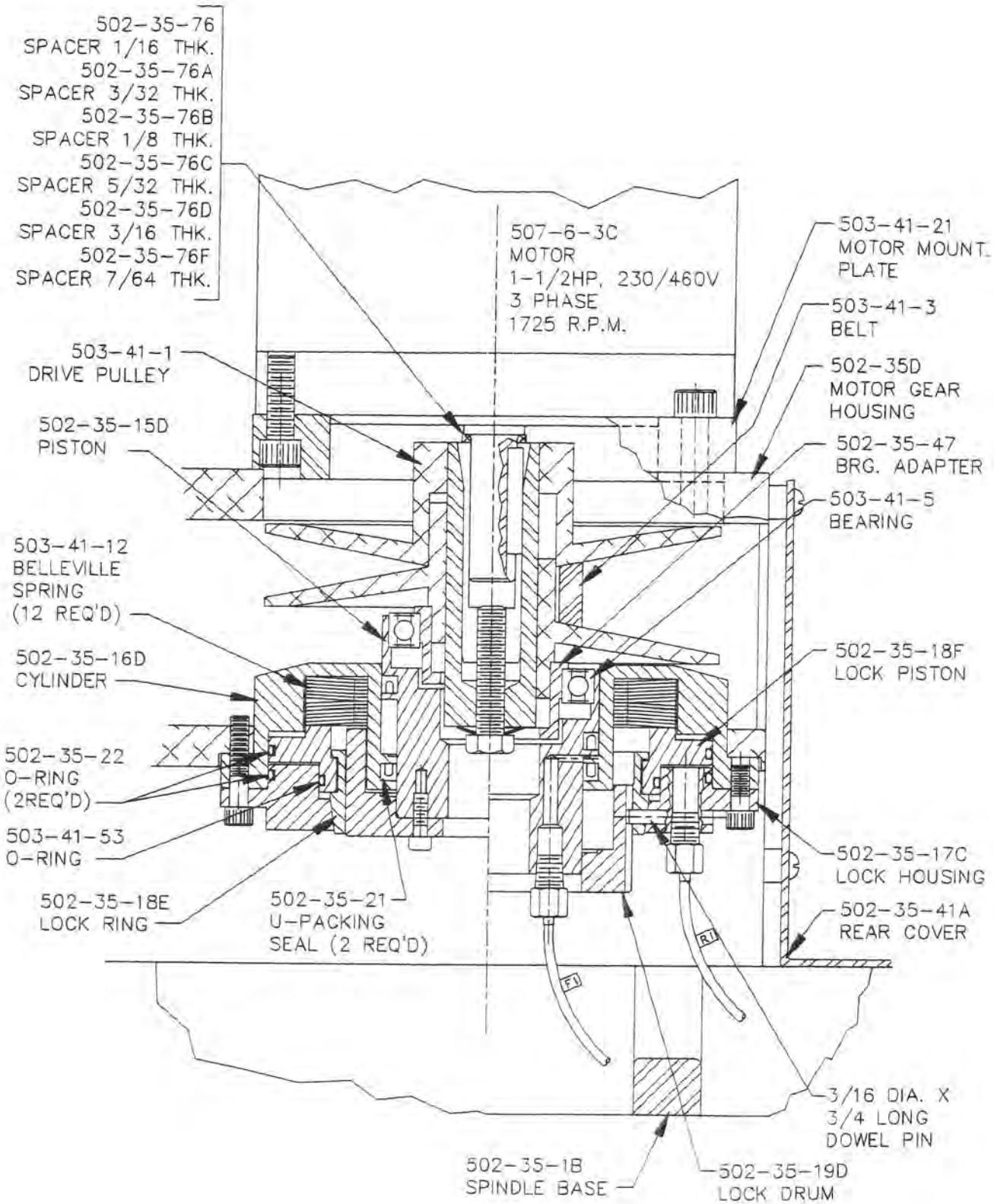
DETAIL - H
RAPID DOWN ASS'Y
500-30



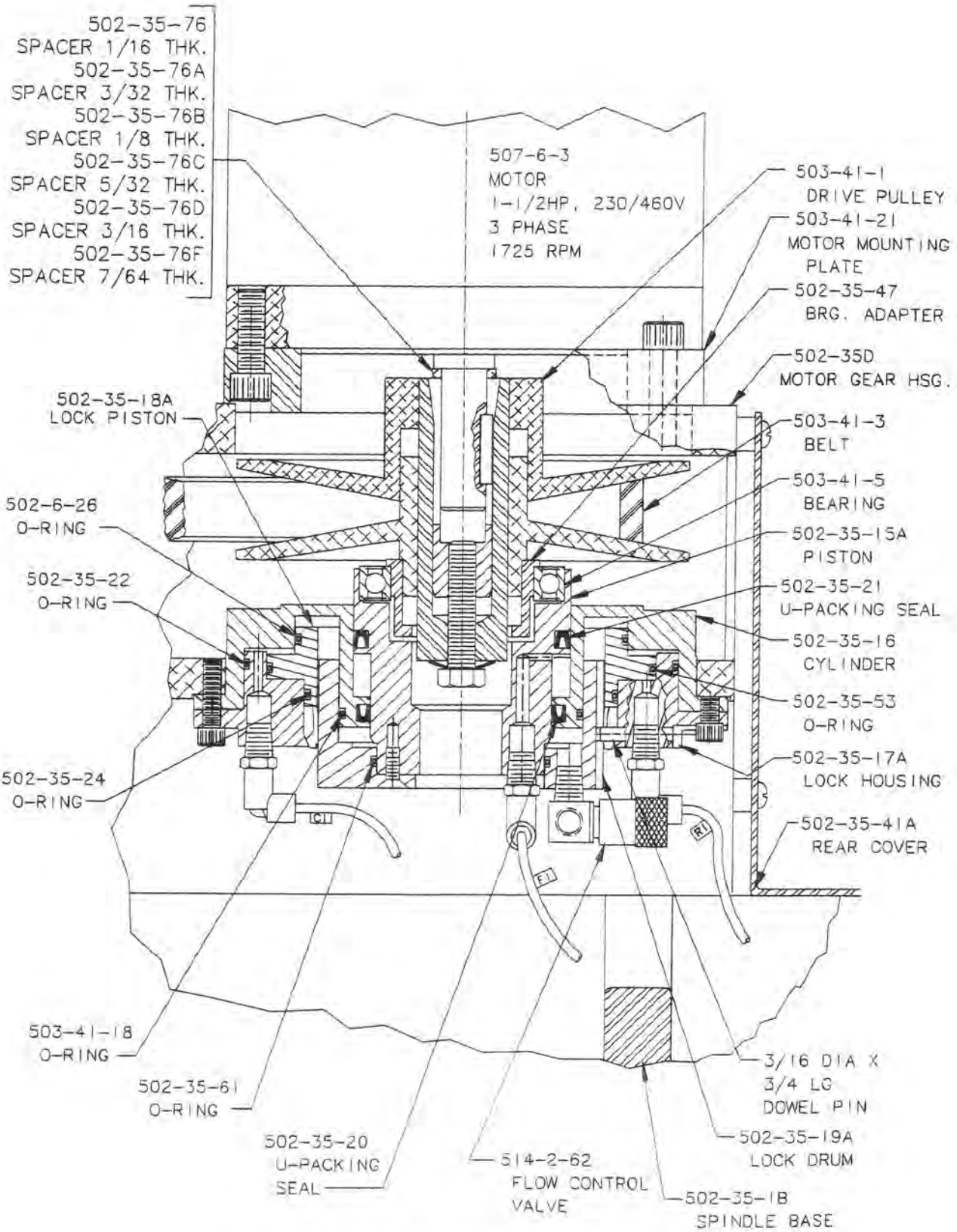
FRONT VIEW UPPER HOUSING
AUTOMATIC TOOL POSITION ASS'Y



SECTION B-B
MOTOR GEAR HOUSING
FA-2AVB



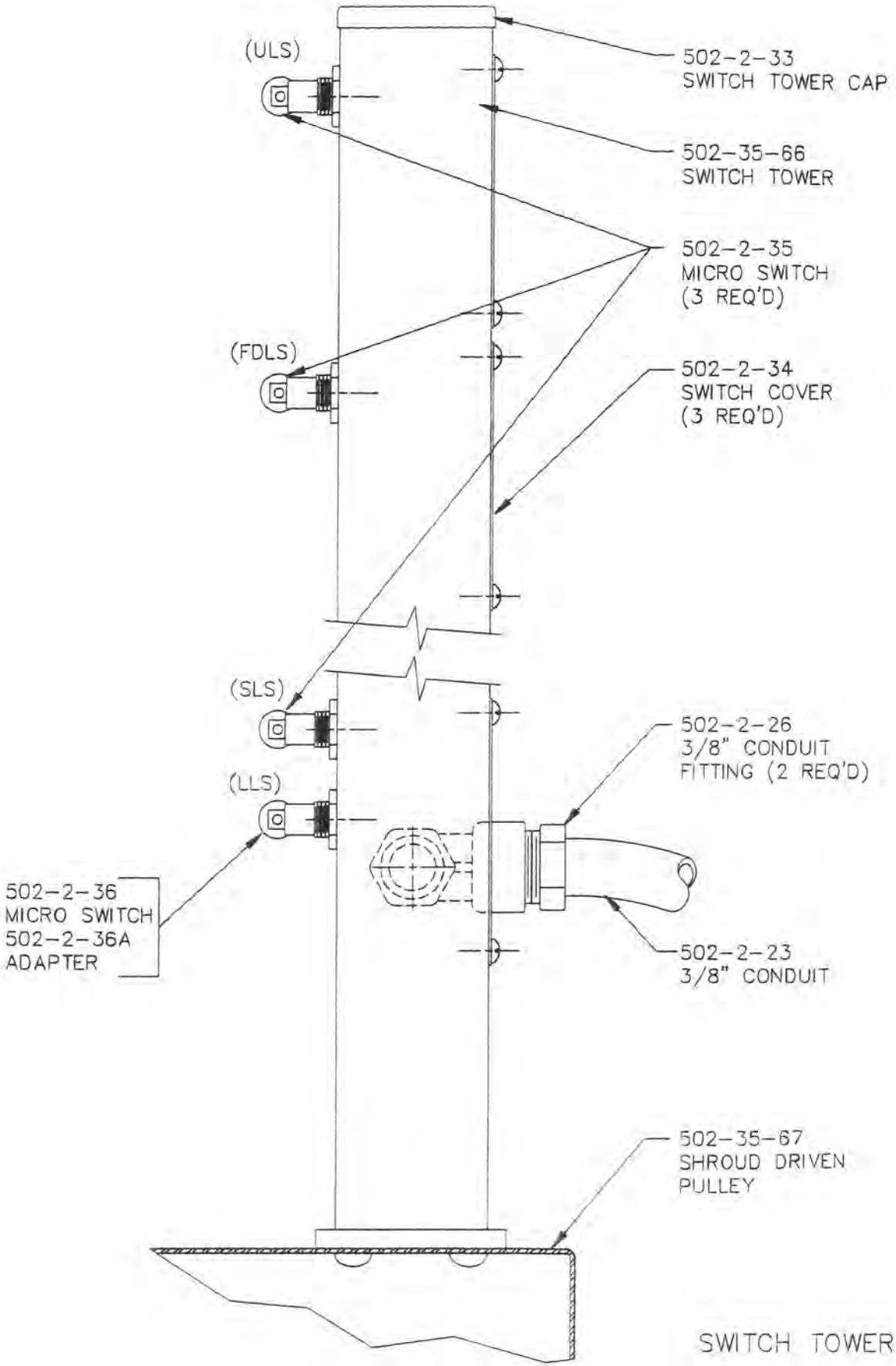
FA-2AVB VARIABLE SPEED PULLEY
ACTUATING CYLINDER
(NEW STYLE WITH 2 AIR LINES)



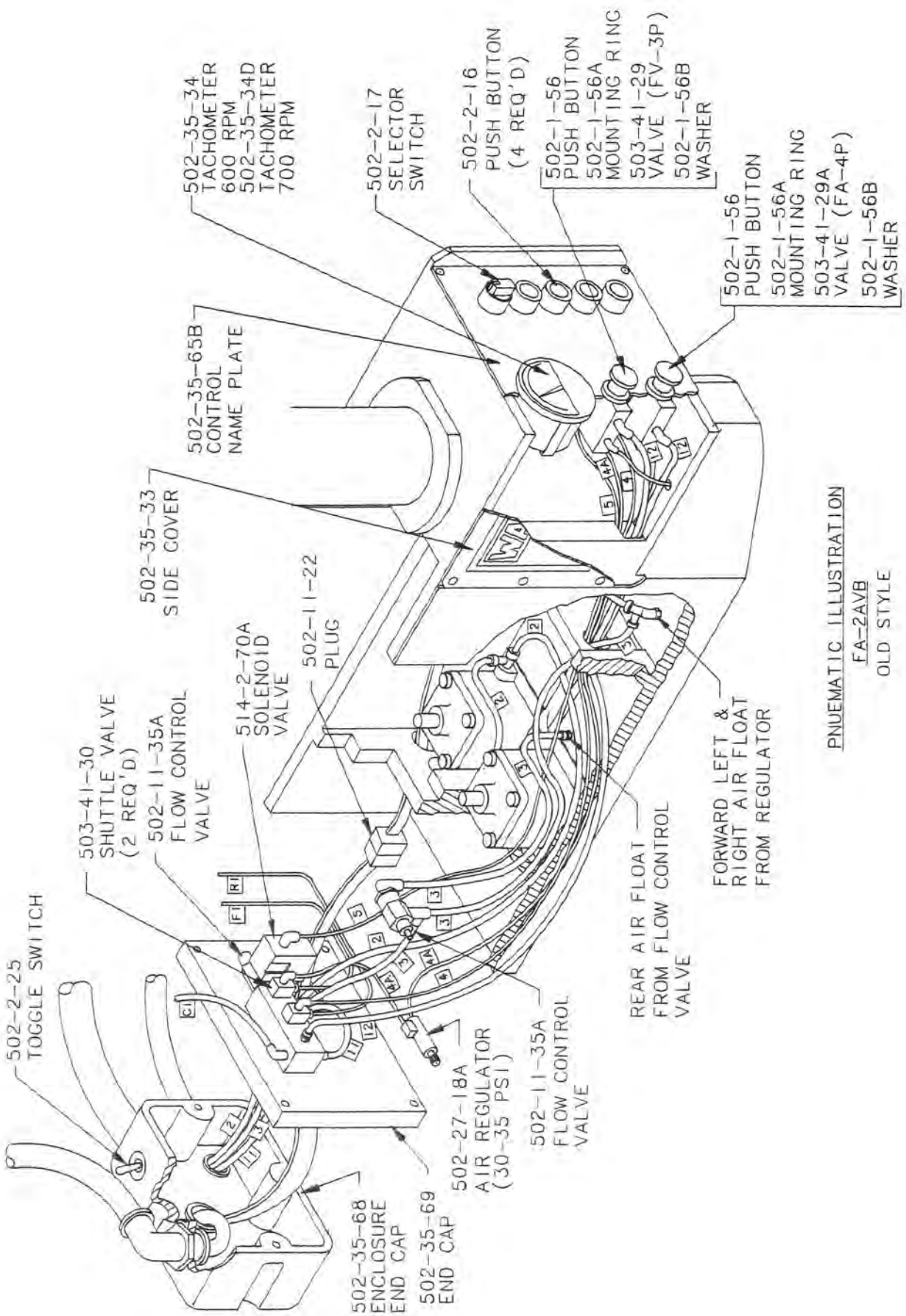
FA-2AVB VARIABLE SPEED PULLEY

ACTUATING CYLINDER

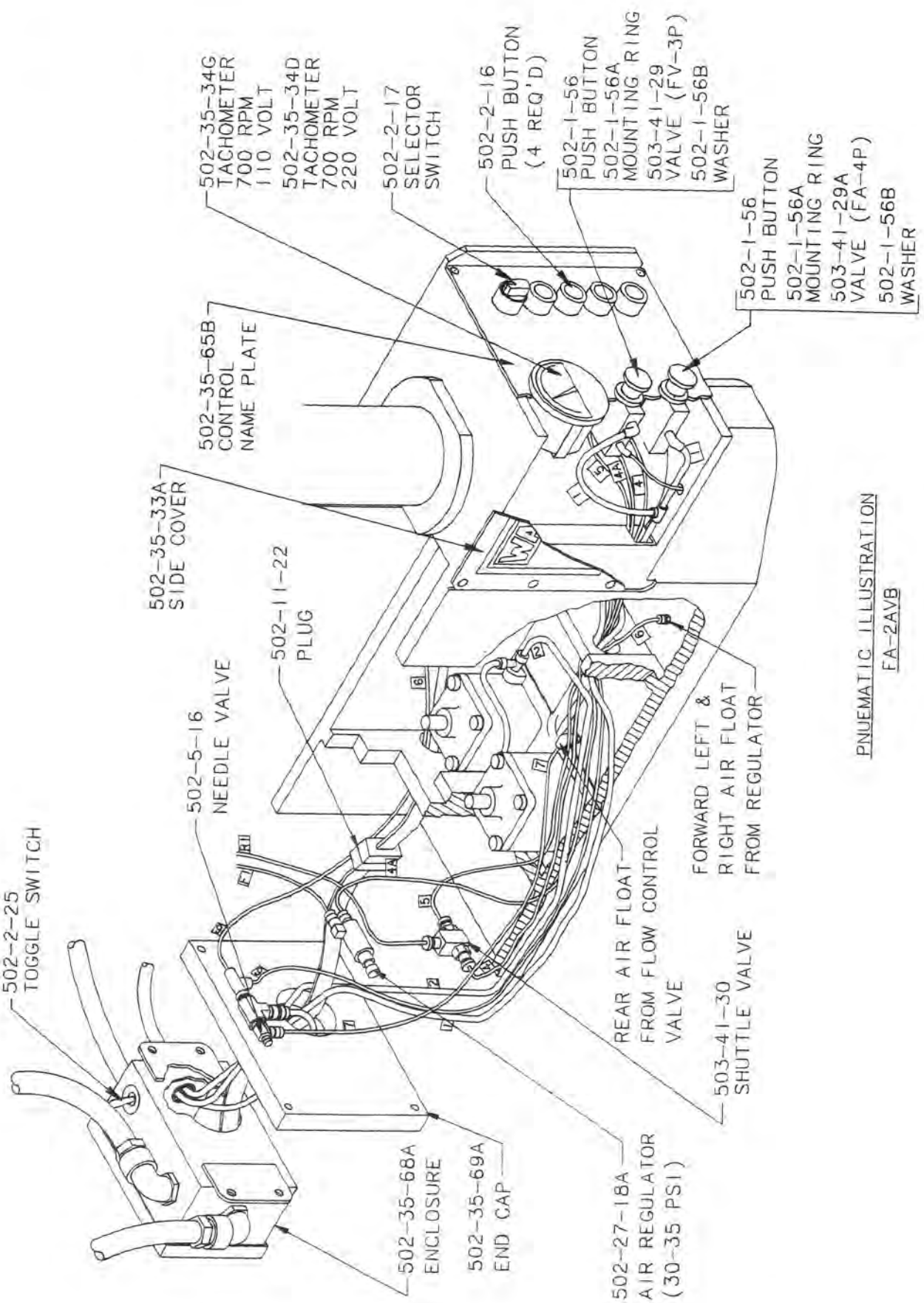
(OLD STYLE WITH 3 AIR LINES)



SWITCH TOWER


502-2-25
TOGGLE SWITCH
503-41-30
SHUTTLE VALVE
(2 REQ'D)
502-11-35A
FLOW CONTROL
VALVE
514-2-70A
SOLENOID
VALVE
502-11-22
PLUG
502-35-33
SIDE COVER
502-35-65B
CONTROL
NAME PLATE
502-35-34
TACHOMETER
600 RPM
502-35-34D
TACHOMETER
700 RPM
502-2-17
SELECTOR
SWITCH
502-2-16
PUSH BUTTON
(4 REQ'D)
502-1-56
PUSH BUTTON
502-1-56A
MOUNTING RING
503-41-29
VALVE (FV-3P)
502-1-56B
WASHER
502-1-56
PUSH BUTTON
502-1-56A
MOUNTING RING
503-41-29A
VALVE (FA-4P)
502-1-56B
WASHER
502-35-68
ENCLOSURE
END CAP
502-35-69
END CAP
502-27-18A
AIR REGULATOR
(30-35 PSI)
502-11-35A
FLOW CONTROL
VALVE
REAR AIR FLOAT
FROM FLOW CONTROL
VALVE
FORWARD LEFT &
RIGHT AIR FLOAT
FROM REGULATOR
PNUEMATIC ILLUSTRATION
FA-2AVB
OLD STYLE

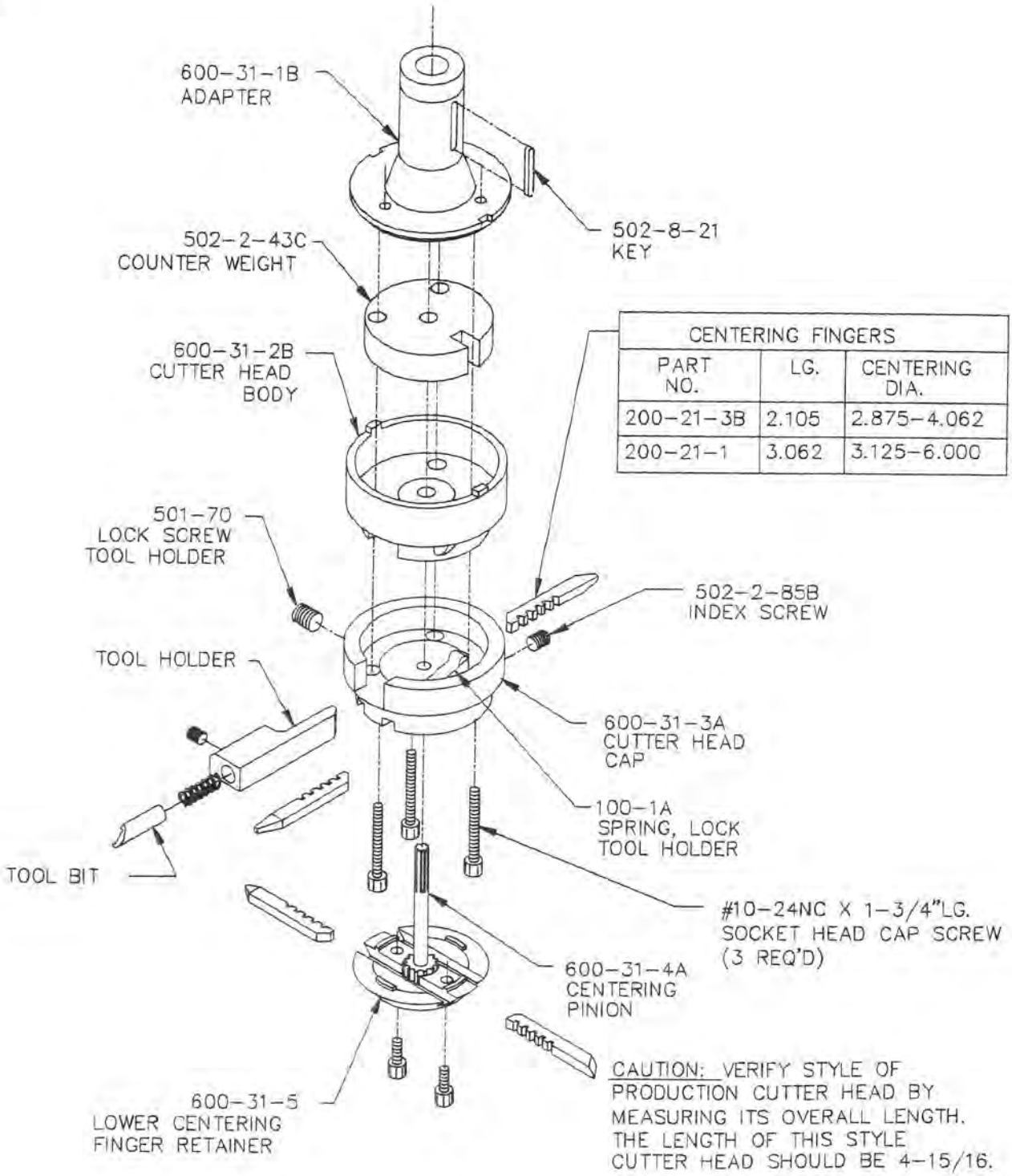
REFAVB67-122793



PNUEMATIC ILLUSTRATION

FA-2AVB

REF2VB51-122093



CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-21-3B	2.105	2.875-4.062
200-21-1	3.062	3.125-6.000

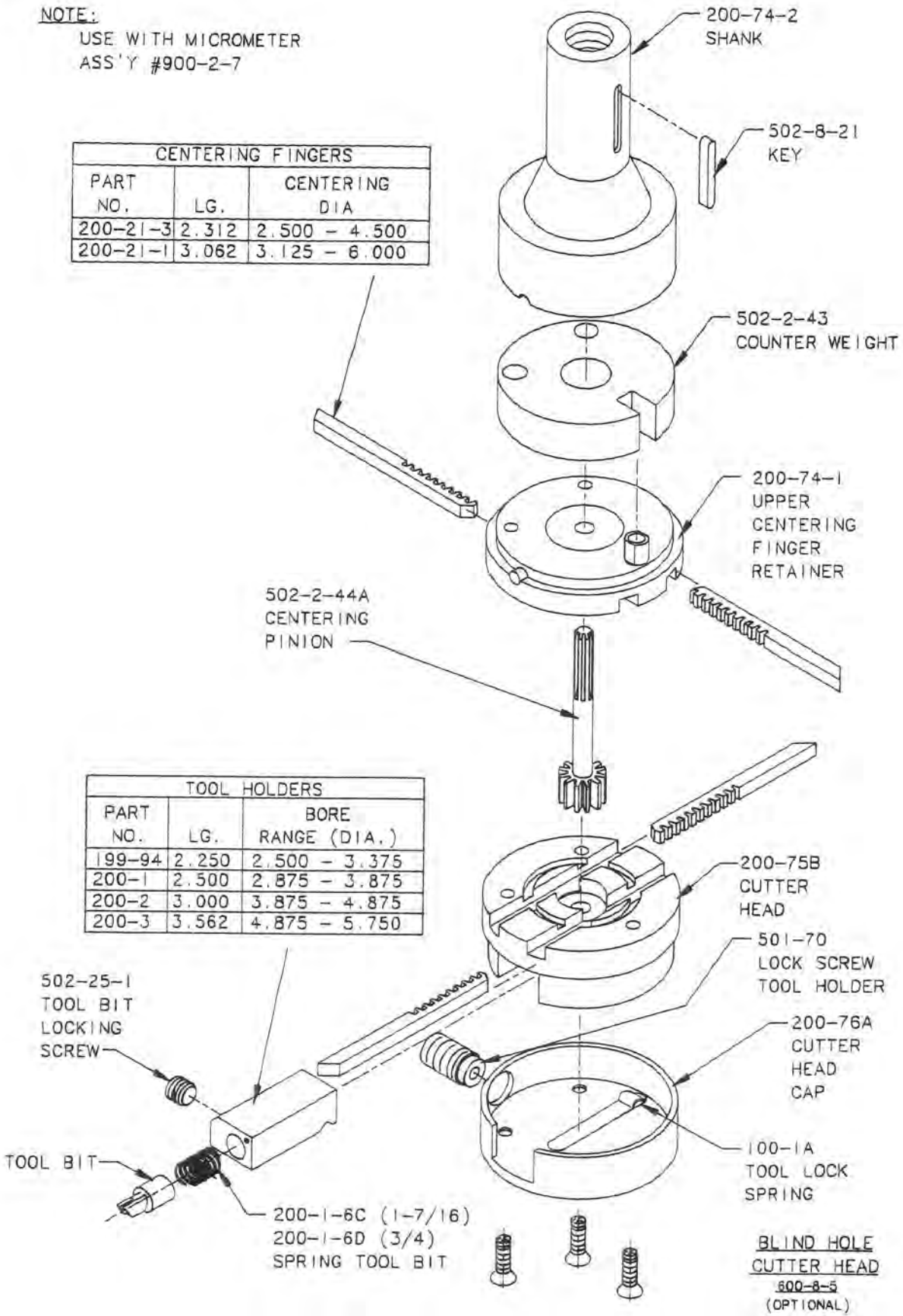
CAUTION: VERIFY STYLE OF PRODUCTION CUTTER HEAD BY MEASURING ITS OVERALL LENGTH. THE LENGTH OF THIS STYLE CUTTER HEAD SHOULD BE 4-15/16.

PRODUCTION CUTTER HEAD #2 ASS'Y
600-8-4J W/TOOLING
600-8-4K W/OUT TOOLING

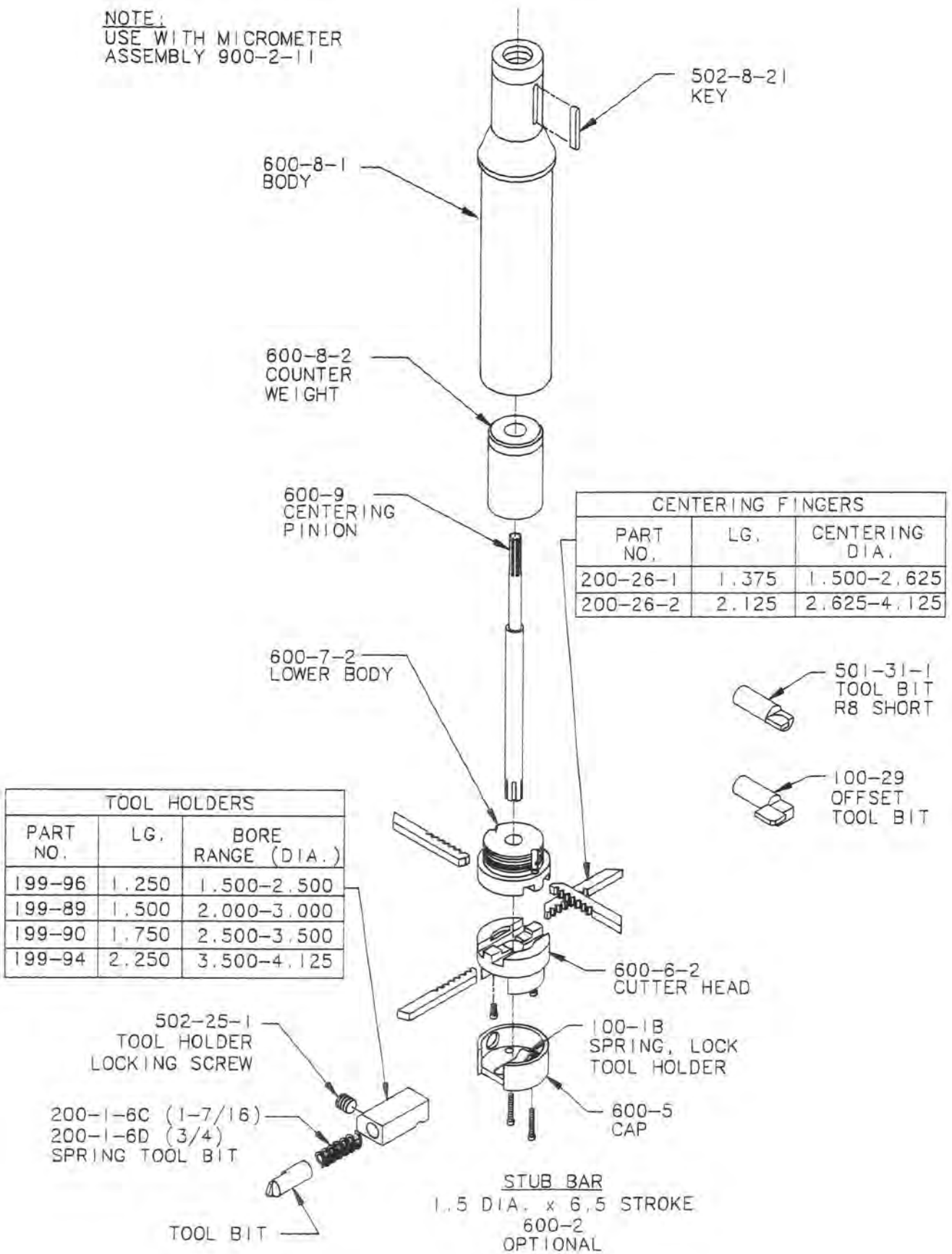
NOTE:
USE WITH MICROMETER
ASS'Y #900-2-7

CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA
200-21-3	2.312	2.500 - 4.500
200-21-1	3.062	3.125 - 6.000

TOOL HOLDERS		
PART NO.	LG.	BORE RANGE (DIA.)
199-94	2.250	2.500 - 3.375
200-1	2.500	2.875 - 3.875
200-2	3.000	3.875 - 4.875
200-3	3.562	4.875 - 5.750



BLIND HOLE
CUTTER HEAD
600-8-5
(OPTIONAL)

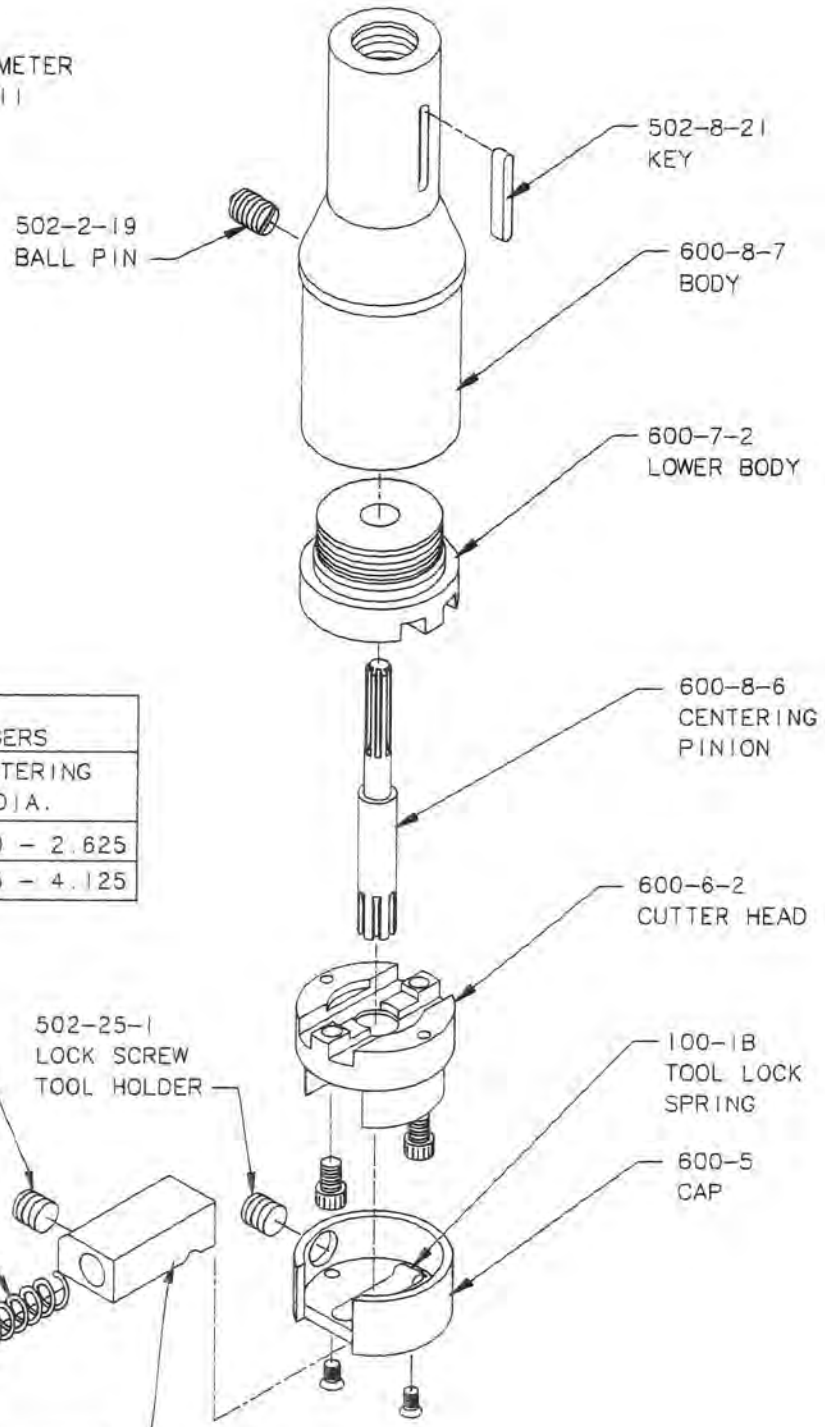


CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-26-1	1.375	1.500-2.625
200-26-2	2.125	2.625-4.125

TOOL HOLDERS		
PART NO.	LG.	BORE RANGE (DIA.)
199-96	1.250	1.500-2.500
199-89	1.500	2.000-3.000
199-90	1.750	2.500-3.500
199-94	2.250	3.500-4.125

NOTE
USE WITH MICROMETER
ASS'Y # 900-2-11

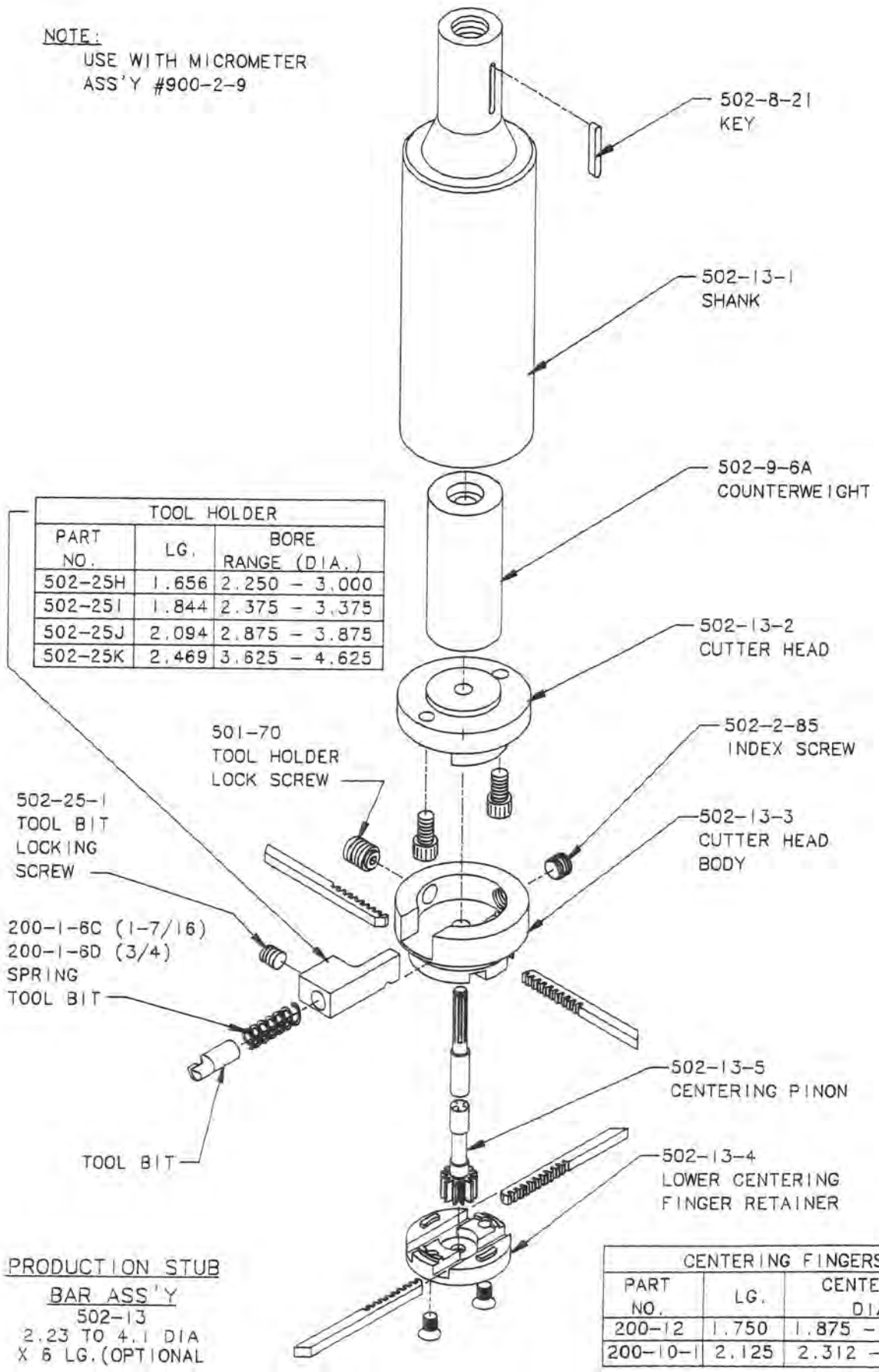
REF2VB23-122093



(OPTIONAL) CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-26-1	1.375	1.500 - 2.625
200-26-2	2.125	2.625 - 4.125

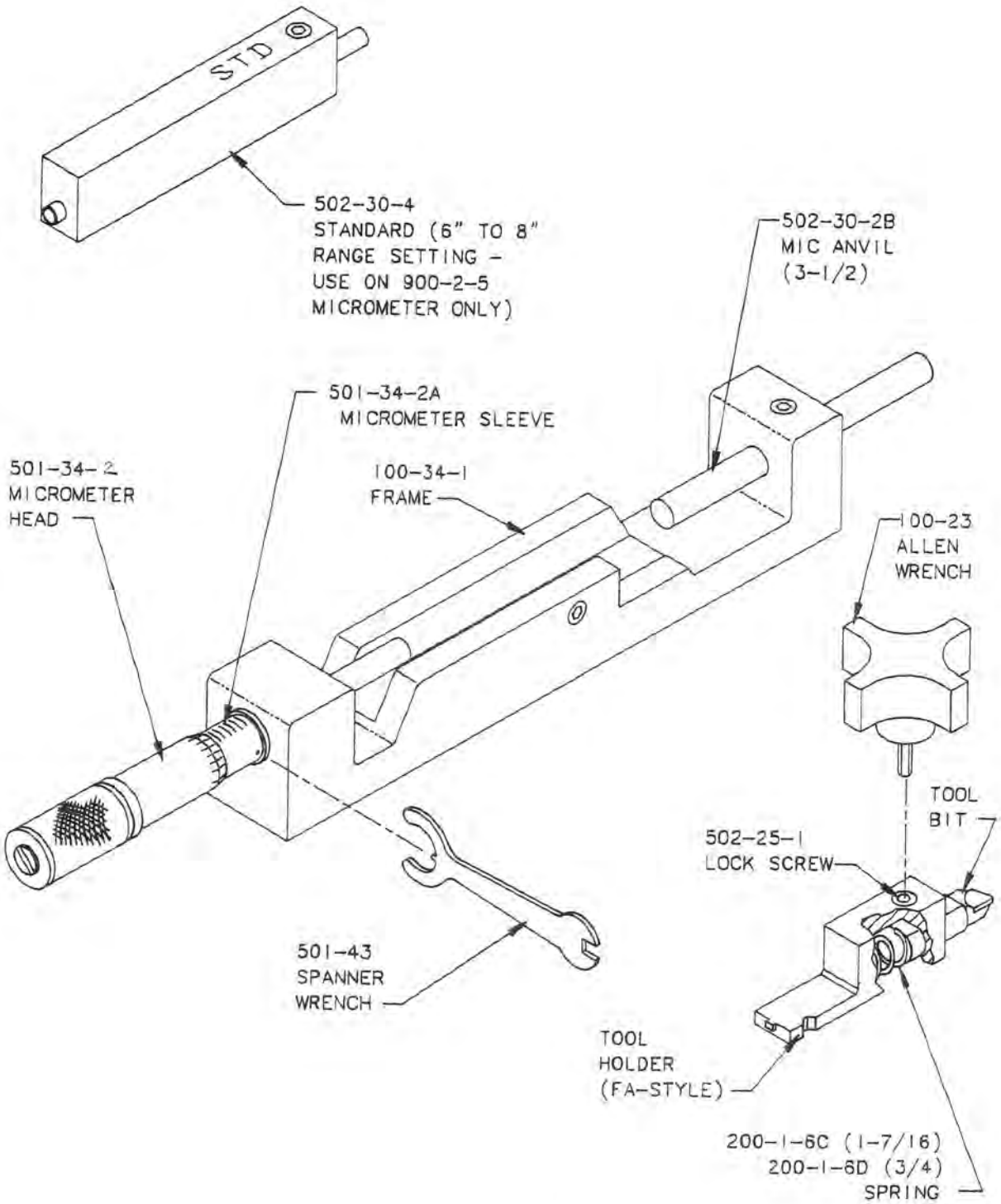
TOOL HOLDERS		
PART NO.	LG.	BORE RANGE (DIA.)
199-96	1.250	1.500-2.500
199-89	1.500	2.000-3.000
199-90	1.750	2.500-3.500
199-94	2.250	3.500-4.125

STUB BAR
1.5 TO 4.1 DIA.
X 3" STROKE
600-8-8A
(OPTIONAL)



TOOL HOLDER		
PART NO.	LG.	BORE RANGE (DIA.)
502-25H	1.656	2.250 - 3.000
502-25I	1.844	2.375 - 3.375
502-25J	2.094	2.875 - 3.875
502-25K	2.469	3.625 - 4.625

CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-12	1.750	1.875 - 3.500
200-10-1	2.125	2.312 - 4.125



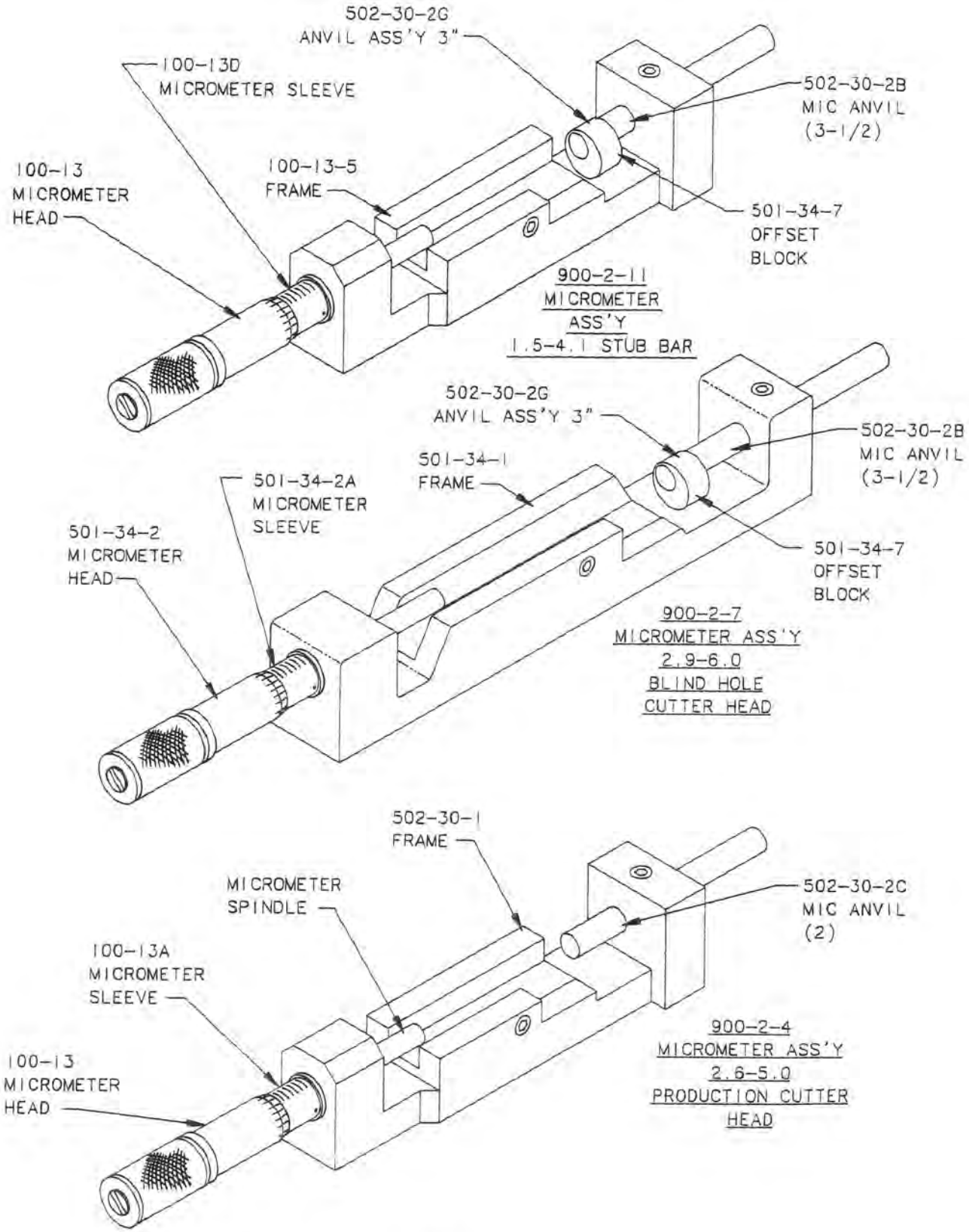
MICROMETER ASS'Y

900-2-5

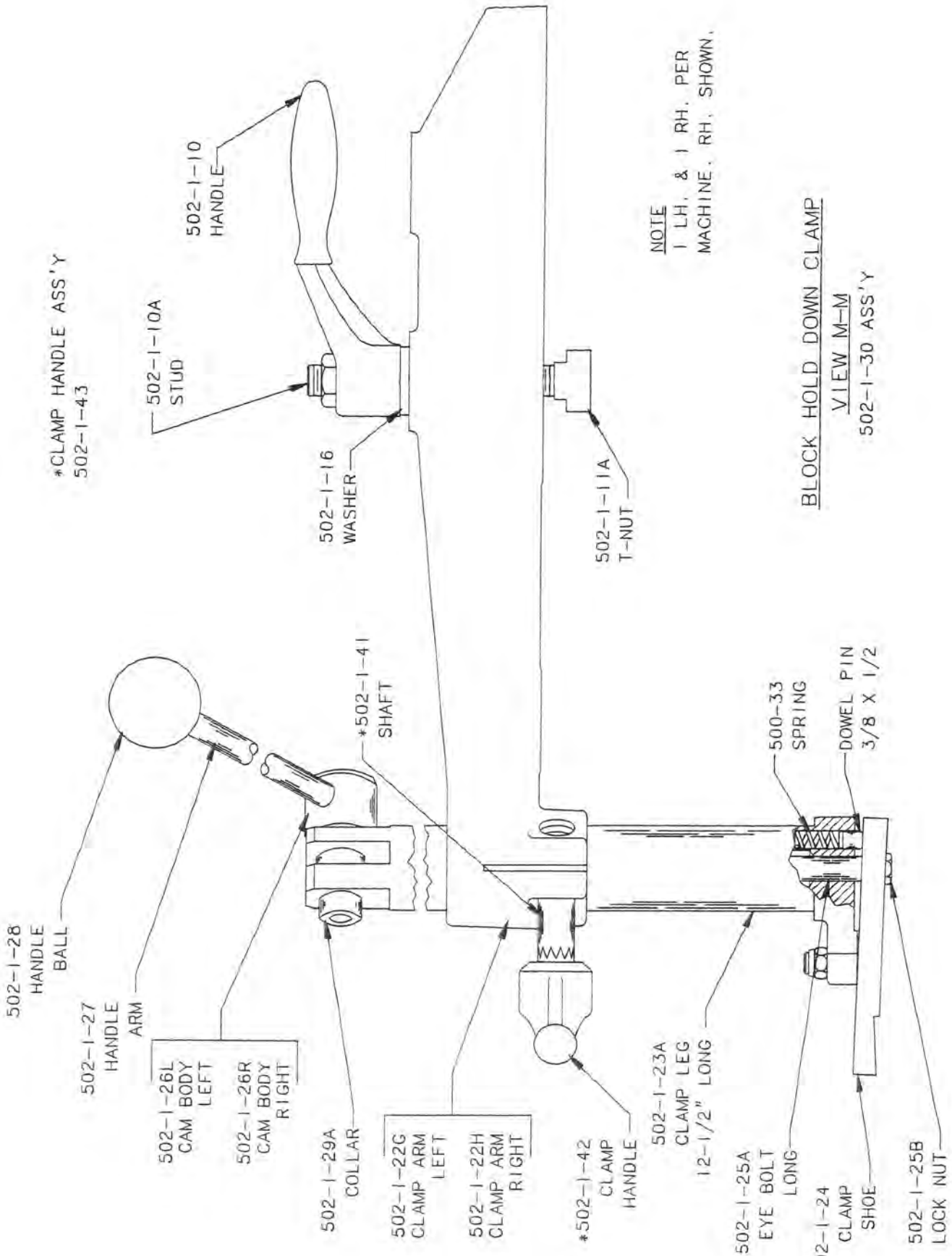
2.9 - 6.0

PRODUCTION CUTTER HEAD

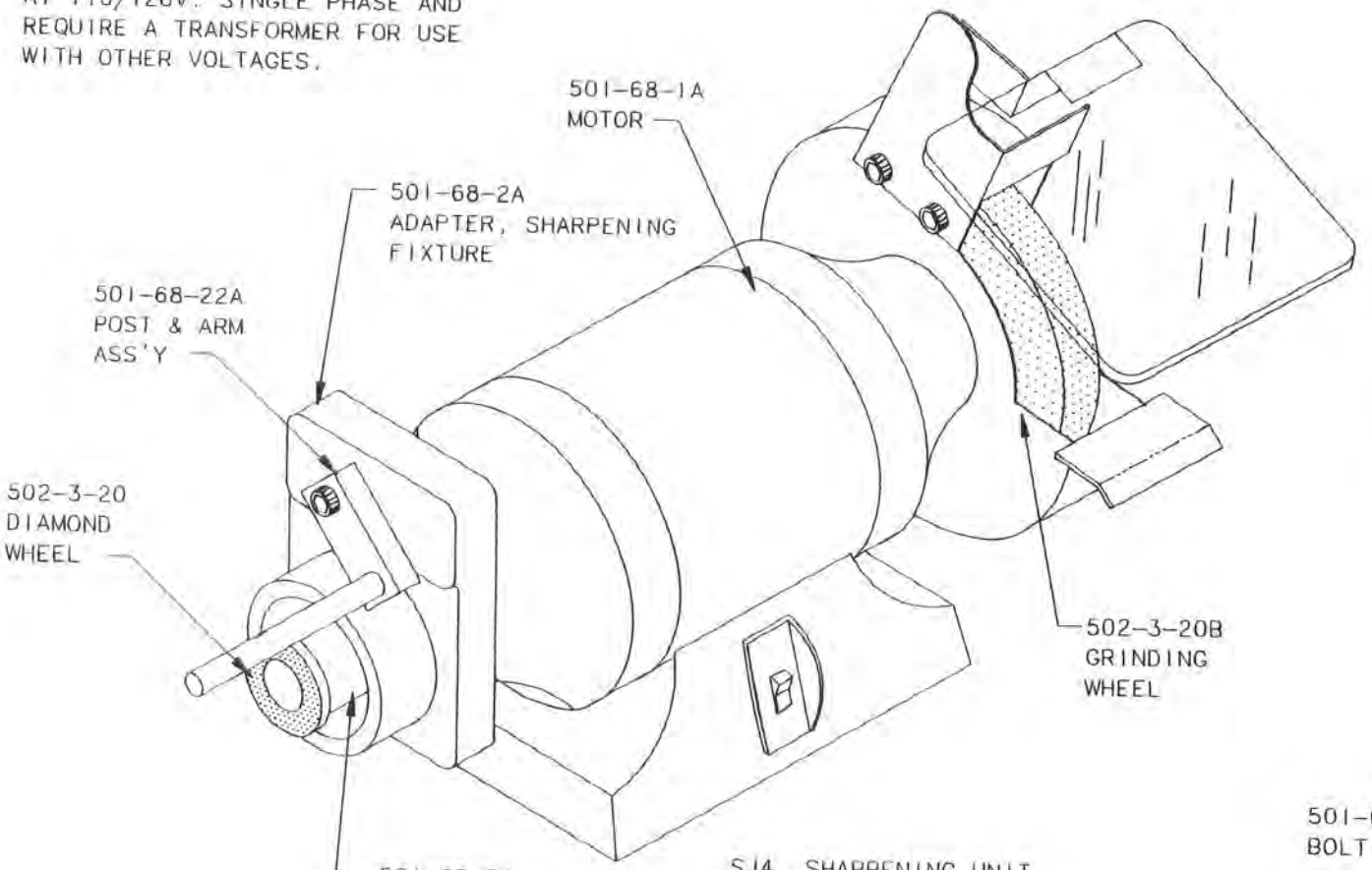
FA-2B, FA-2AB & FA-2AVB

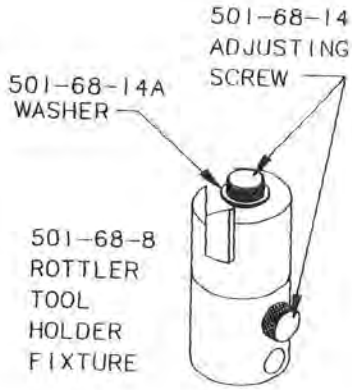


OPTIONAL
MICROMETERS


*CLAMP HANDLE ASS'Y
502-1-43
502-1-10
HANDLE
502-1-10A
STUD
502-1-16
WASHER
502-1-11A
T-NUT
NOTE
1 LH. & 1 RH. PER
MACHINE. RH. SHOWN.
BLOCK HOLD DOWN CLAMP
VIEW M-M
502-1-30 ASS'Y
502-1-28
HANDLE
BALL
502-1-27
HANDLE
ARM
502-1-26L
CAM BODY
LEFT
502-1-26R
CAM BODY
RIGHT
*502-1-41
SHAFT
502-1-29A
COLLAR
502-1-22G
CLAMP ARM
LEFT
502-1-22H
CLAMP ARM
RIGHT
*502-1-42
CLAMP
HANDLE
502-1-23A
CLAMP LEG
12-1/2" LONG
500-33
SPRING
DOWEL PIN
3/8 X 1/2
502-1-25A
EYE BOLT
LONG
502-1-24
CLAMP
SHOE
502-1-25B
LOCK NUT

THESE TOOL SHARPENERS ARE RATED AT 110/120V. SINGLE PHASE AND REQUIRE A TRANSFORMER FOR USE WITH OTHER VOLTAGES.





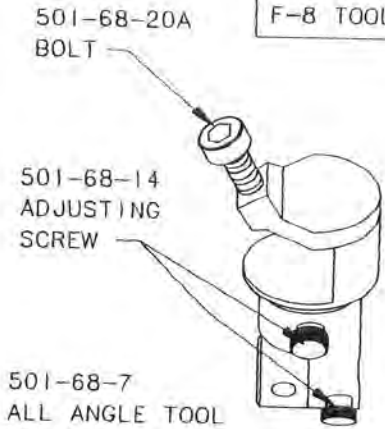
5418A
OPT. ROTTLER
TOOL HOLDER
FIXTURE FOR
F-8 TOOLING

502-3-20A
DRESSING
STICK

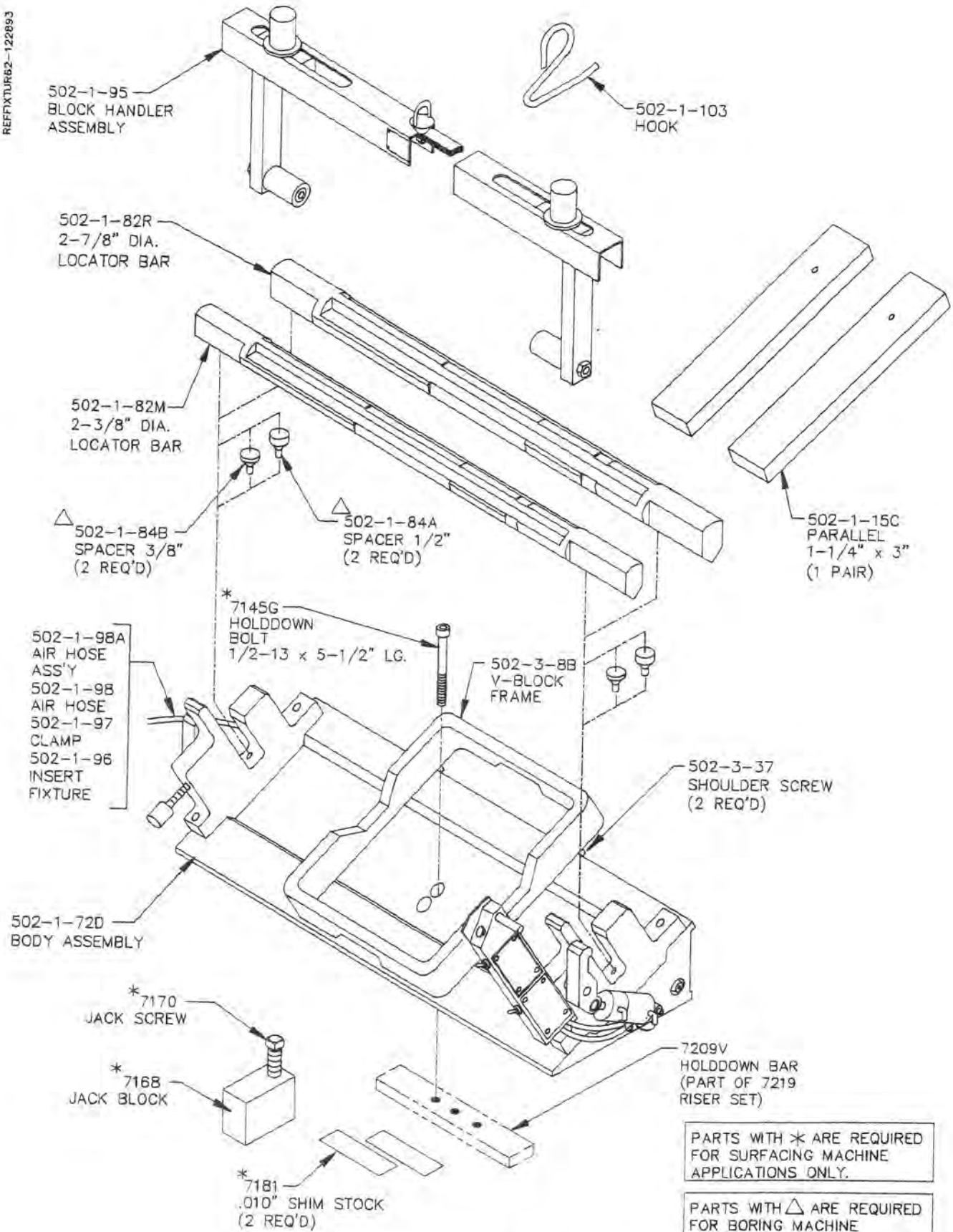
SJ4 SHARPENING UNIT
501-66E (WITHOUT
TOOL FIXTURE)

SJ4B SHARPENING UNIT
501-66B WITH ROTTLER
TOOL HOLDER FIXTURE
501-68-8

SJ4A SHARPENING UNIT
501-66D WITH ALL ANGLE
TOOL HOLDER FIXTURE
501-68-7



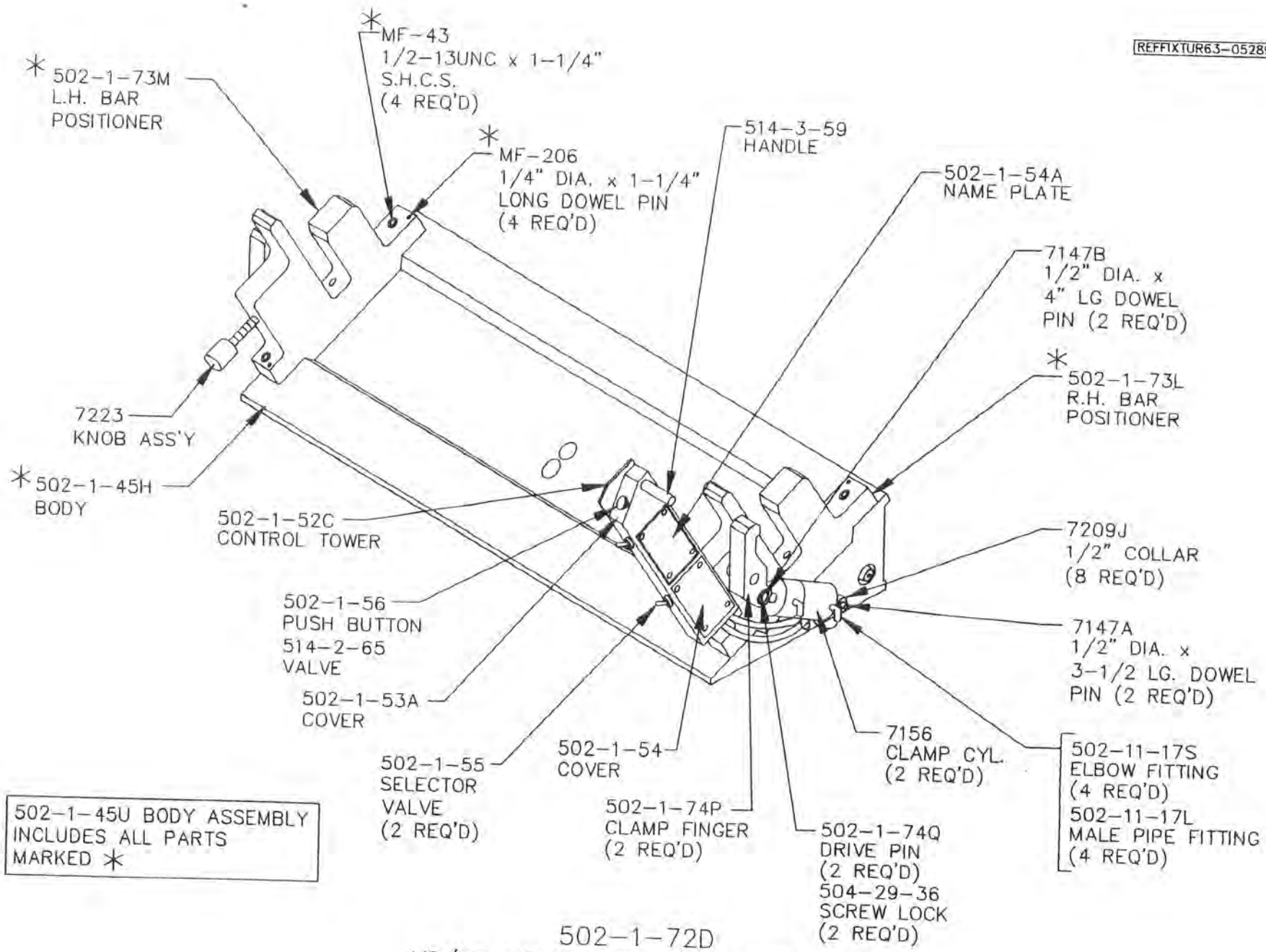
REFFIXTUR62-122893



PARTS WITH * ARE REQUIRED FOR SURFACING MACHINE APPLICATIONS ONLY.

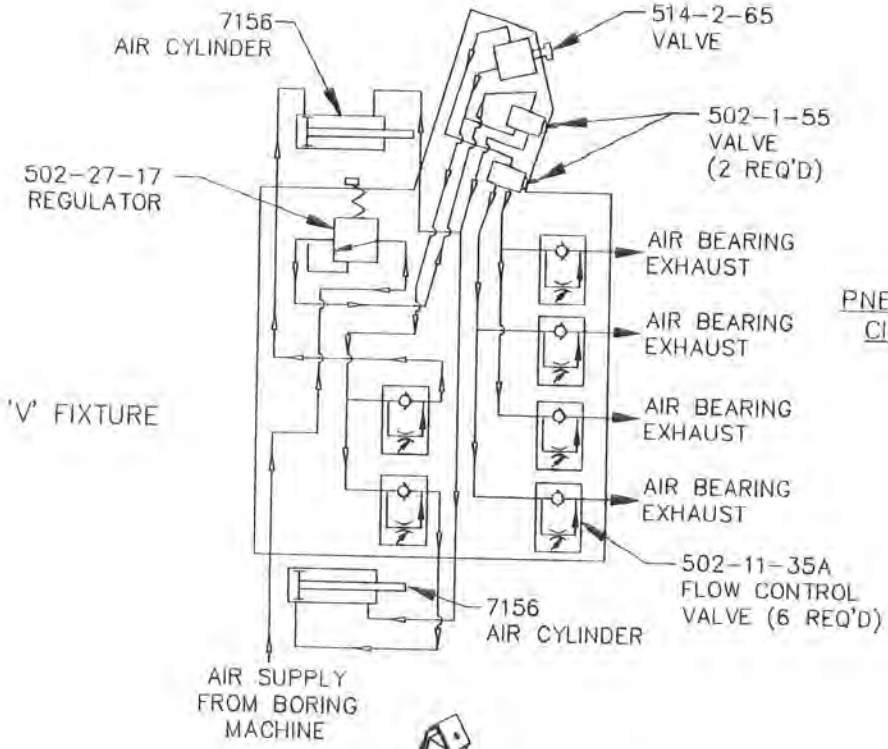
PARTS WITH △ ARE REQUIRED FOR BORING MACHINE APPLICATIONS ONLY.

502-1-72B
V6/V8 FIXTURE ASSEMBLY WITH AIR FLOAT



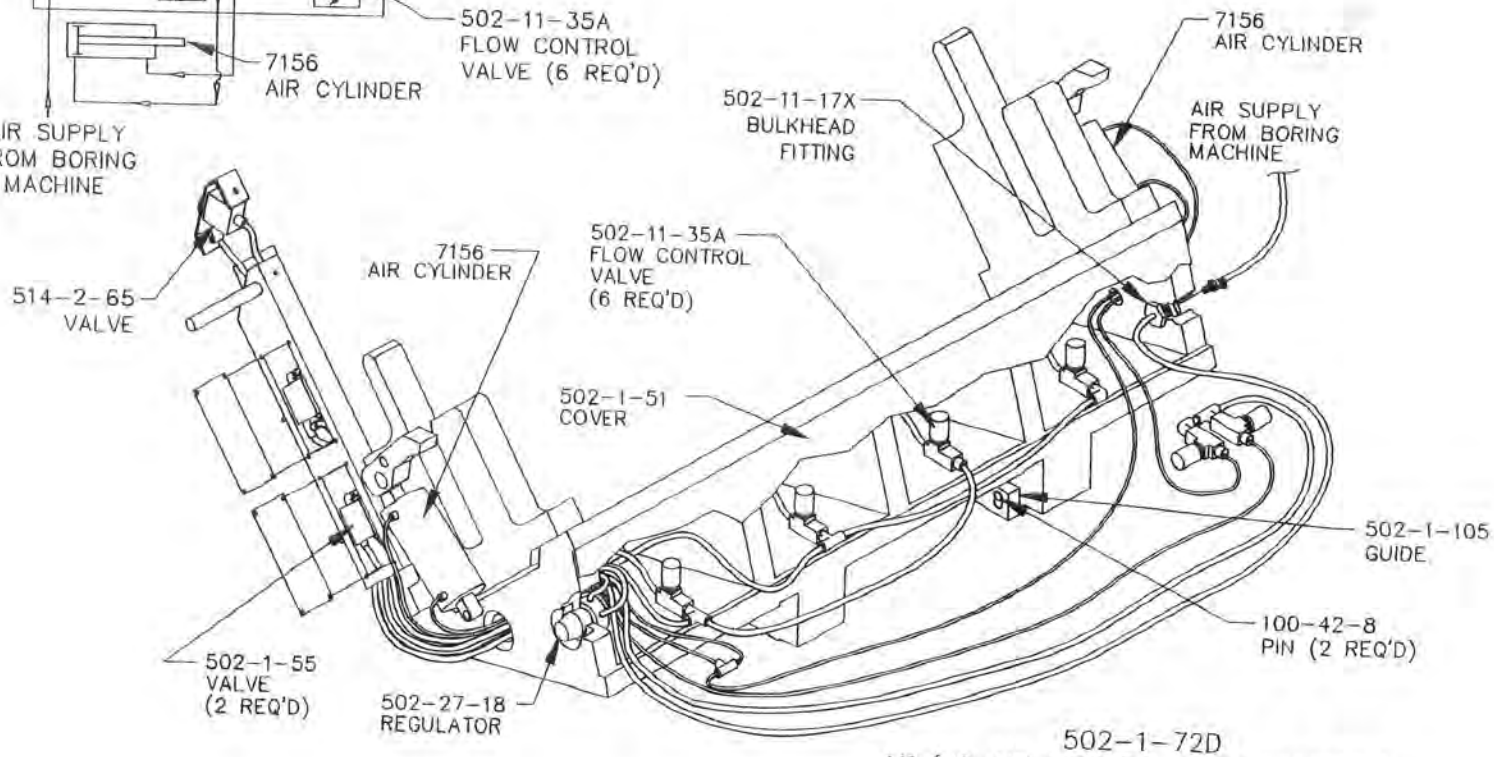
502-1-72D
V6/V8 AIR FIXTURE BODY ASSEMBLY

REFFIXTUR64-122093

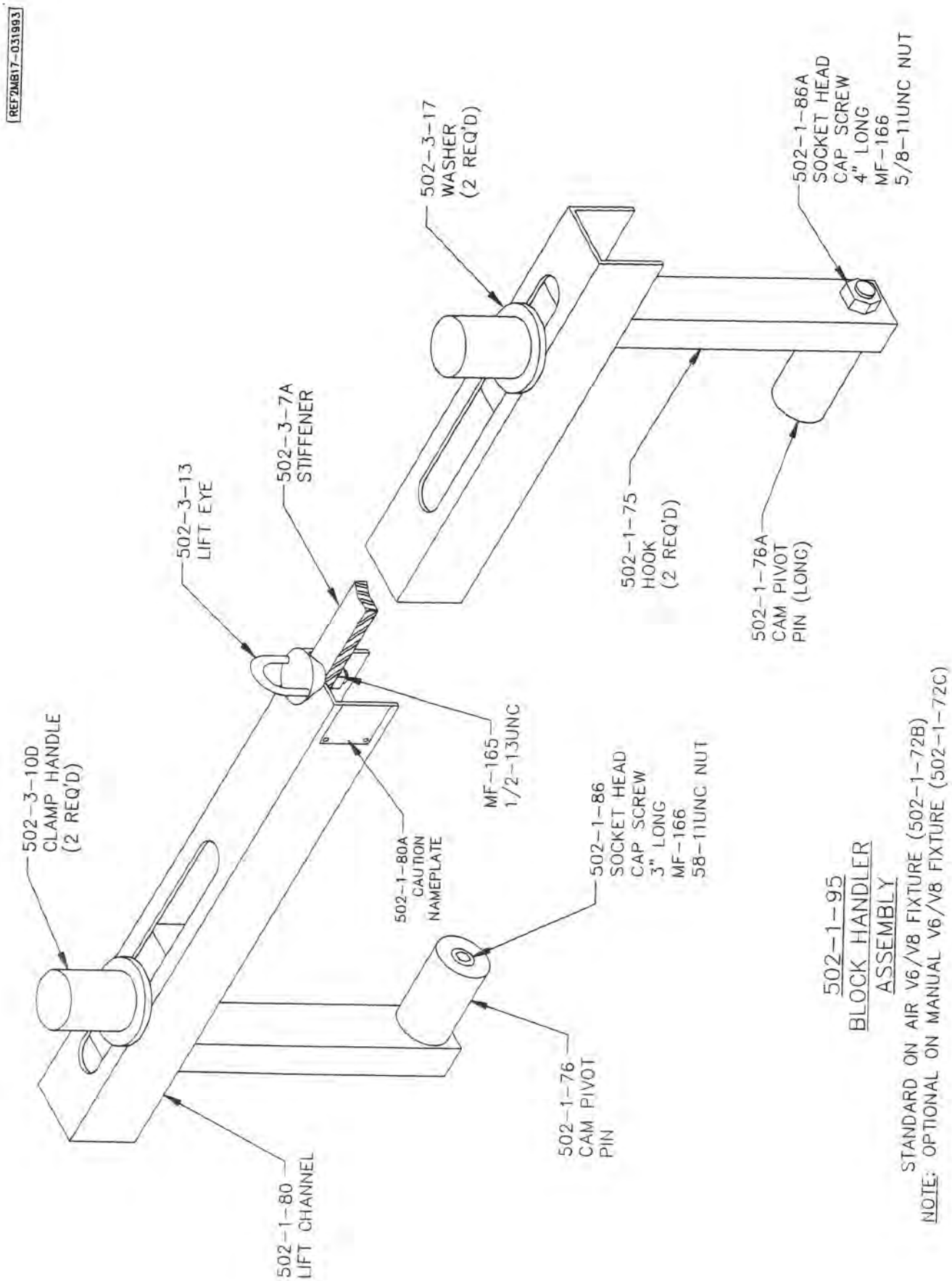


'V' FIXTURE

PNEUMATIC CONTROL
CIRCUIT DIAGRAM

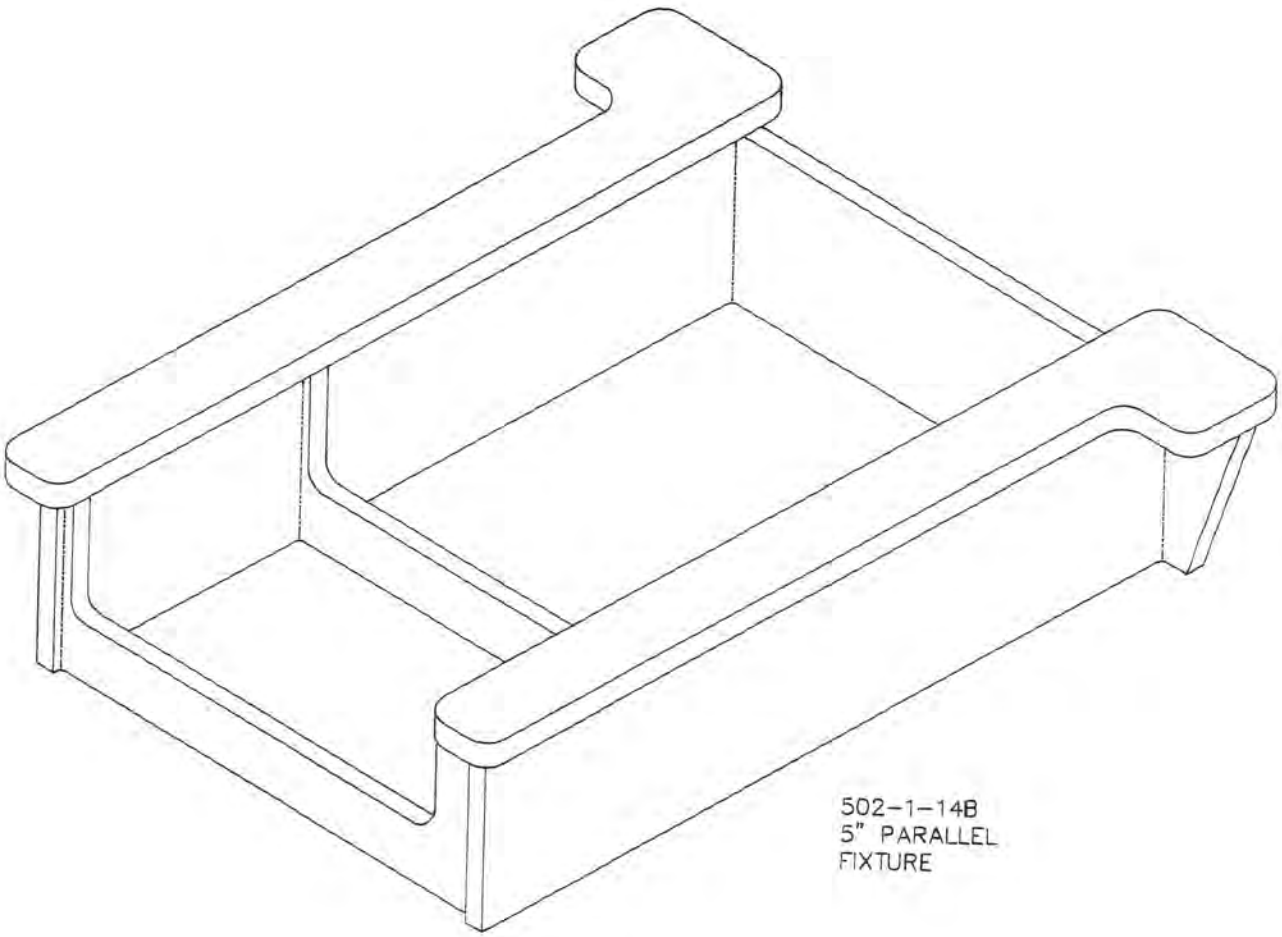


502-1-72D
V6/V8 AIR FIXTURE BODY ASSEMBLY
BACK VIEW



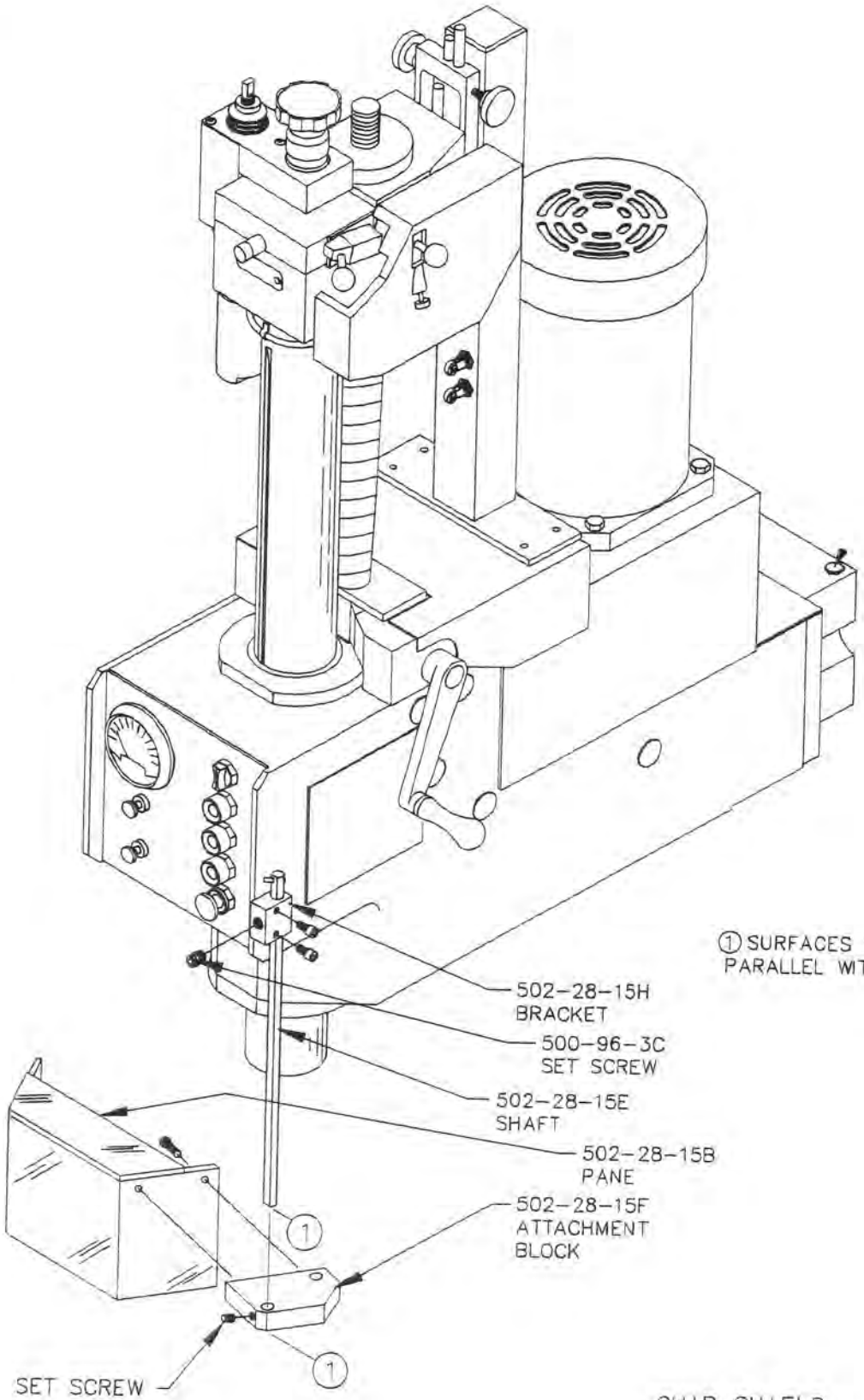
502-1-95
BLOCK HANDLER
ASSEMBLY

STANDARD ON AIR V6/V8 FIXTURE (502-1-72B)
NOTE: OPTIONAL ON MANUAL V6/V8 FIXTURE (502-1-72C)



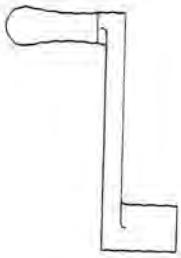
502-1-14B
5" PARALLEL
FIXTURE

REFAVB68-122793



CHIP SHIELD
ASSEMBLY #502-28-15C

REFAVB52-051293



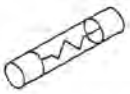
500-98
HAND FEED
HANDLE ASS'Y

502-12-2
SPANNER
WRENCH

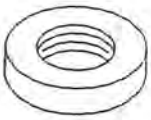
100-24
TOOL
PULLER

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

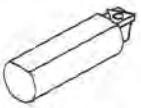
502-1-12A
JACKING SCREW
(4 REQUIRED)



502-11-2F
FUSETRON
MDL 3/4

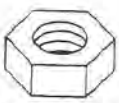


500-41
LOCK NUT
FEED SCREW



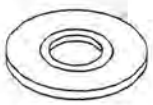
501-29-5H
TOOL BIT
(1.02")

501-29-5E
R 8 INSERT
(2 REQUIRED)

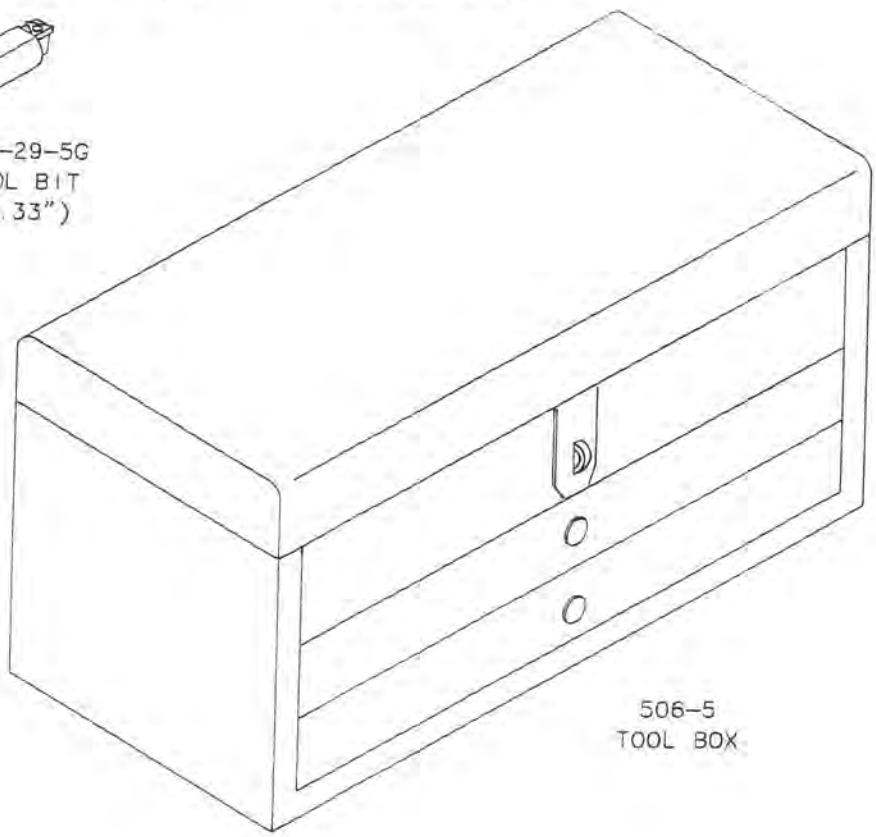


502-1-12F
JAM NUT
(4 REQUIRED)

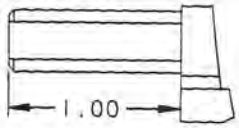
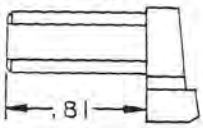
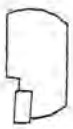
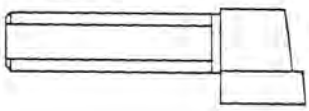
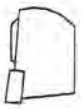
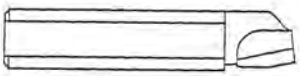
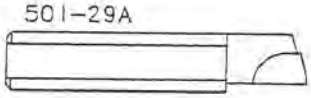
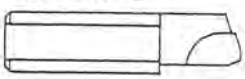
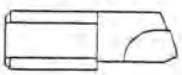
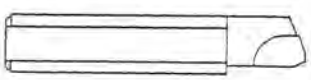
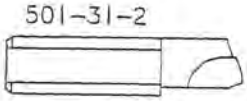
501-29-5G
TOOL BIT
(1.33")

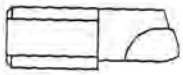
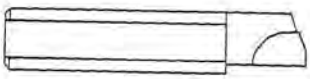
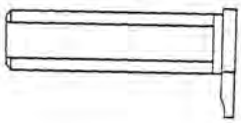
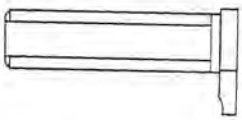
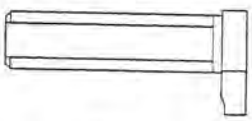
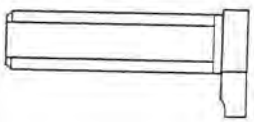
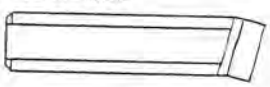
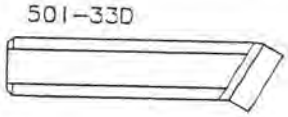
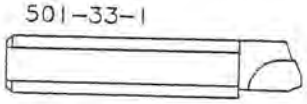
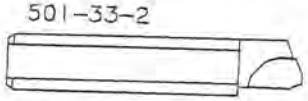


502-1-12
LEVELING
PAD
(4 REQUIRED)

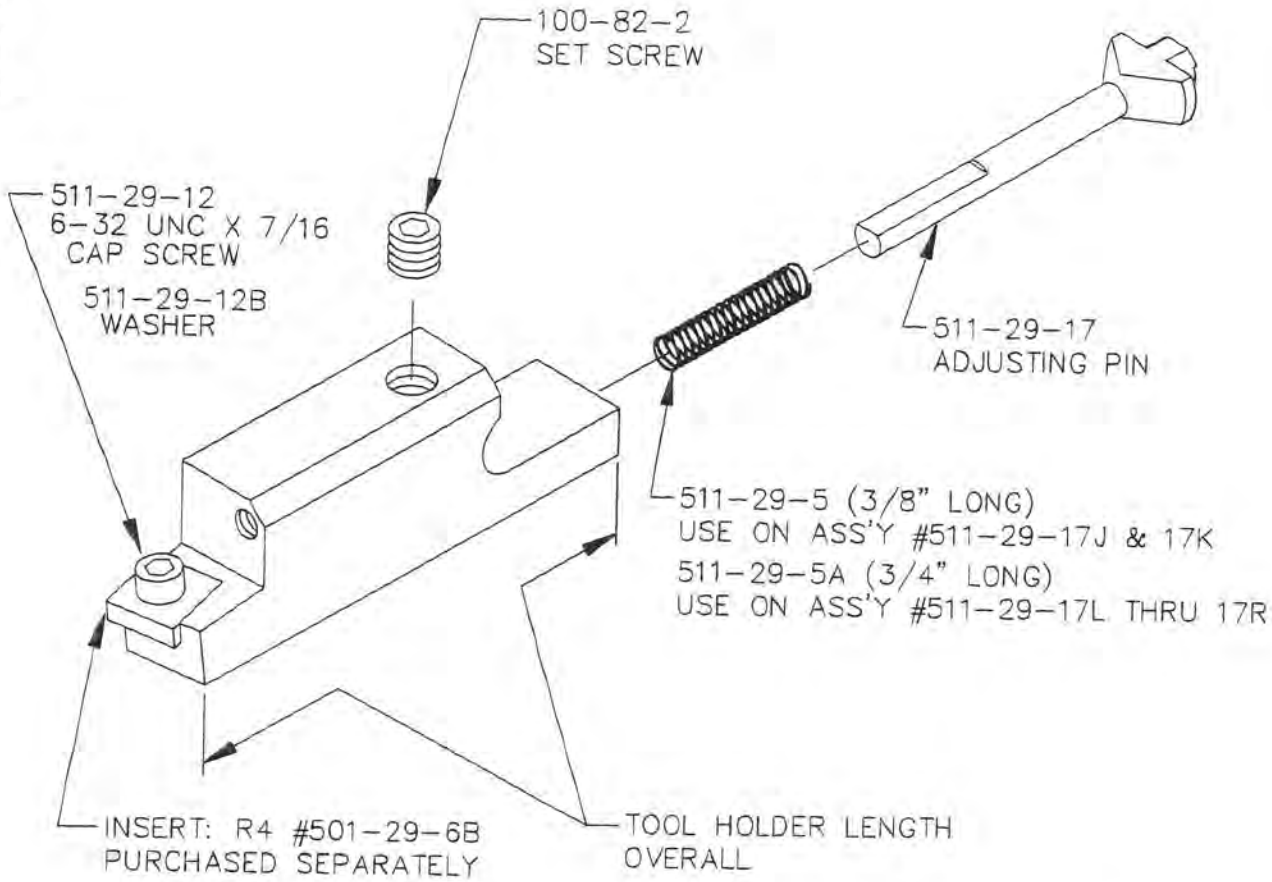


506-5
TOOL BOX

PART NUMBERS		DESCRIPTION
100-29 		OFFSET TOOL BIT (for boring blind cylinder holes)
100-29-7 		OFFSET TOOL BIT (for boring GM 60° V6)
100-76 		OFFSET TOOL BIT (for boring blind cylinder holes)
501-28 		C.C. Steel Cutting Tool Bit w/chip curler to break up chips while boring
501-29A 		RF Facing & Counterboring Tool Bit for facing and counterboring of cylinder block, for cutting off sleeve.
501-30 		RI Carbide Tool Bit, long 1-3/4" (for high speed finishing) (recommended for non-interupted cuts)
501-30-2 		RI Carbide Tool Bit, medium, 1-3/8"
501-30-1 		RI Carbide Tool Bit, short 1"
501-31 		R8 Carbide Tool Bit, long 1-3/4" (for general purpose & heavy cuts, cast iron) (recommended for interupted cuts)
501-31-2 		R8 Carbide Tool Bit, medium 1-3/8"

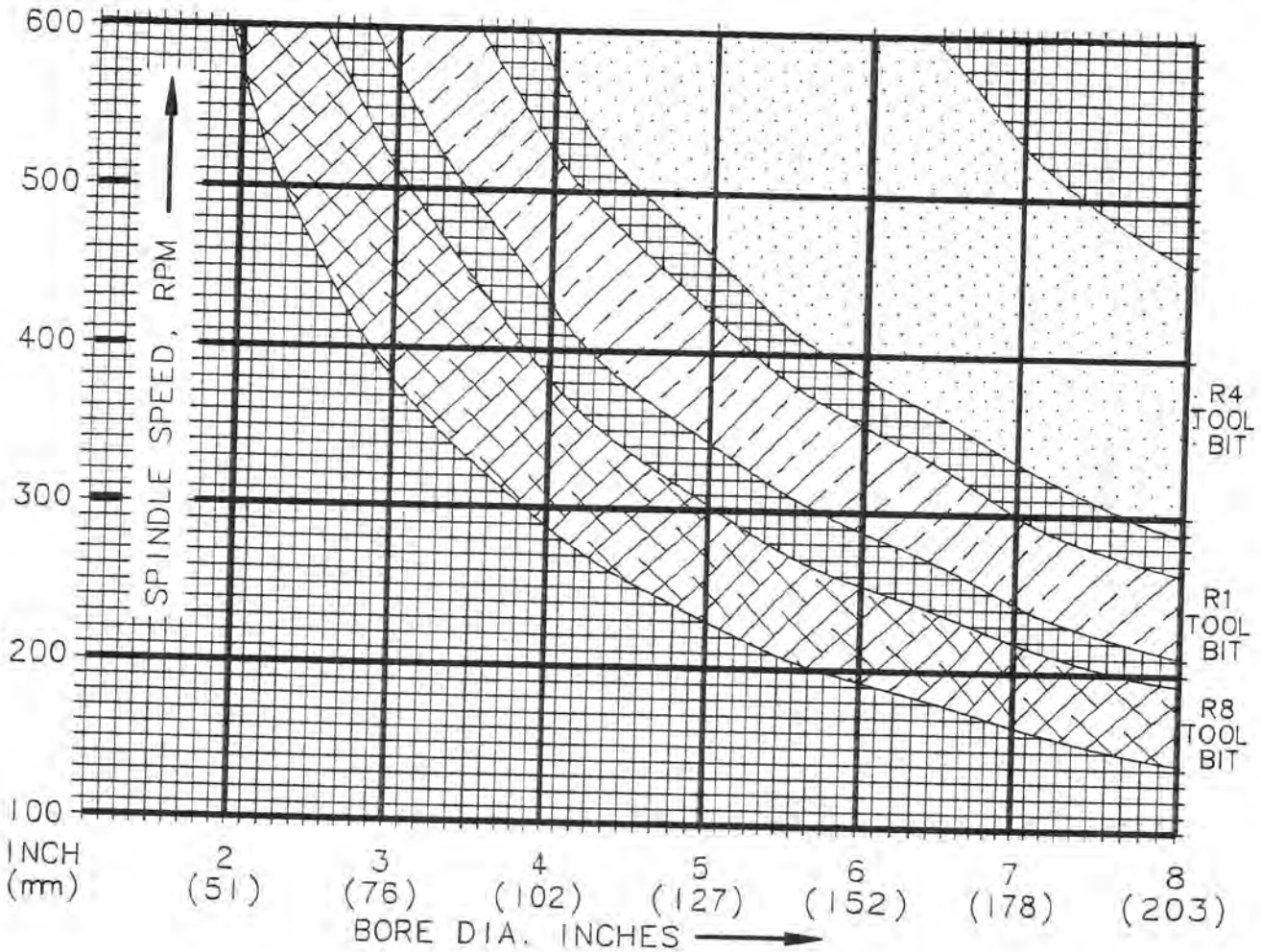
PART NUMBERS		DESCRIPTION
501-31-1 		R8 Carbide Tool Bit, short 1"
501-31A 		C.C.B. Cummins Counter Boring Tool Bit, for counterboring of cummins diesel cylinder block.
501-32-3 		.037 Grooving Tool Bit
501-32-1 		.048 Grooving Tool Bit
501-32-2 		.072 Grooving Tool Bit
501-32-4 		.152 Grooving Tool Bit
501-33B 		15° Cummins Chamfer Tool Bit (chamfering cummins blocks)
501-33D 		30° Chamfer Tool Bit (for general purpose chamfering cast iron)
501-33-1 		R8 (12° Rake) Long Roughing Cut
501-33-2 		R1-Vega (12° Rake)

REF2MB27-122293



TOOL HOLDER ASS'Y PART No.	TOOL HOLDER PART No.	TOOL HOLDER LENGTH	BORE RANGE
511-29-17J	511-29-17A	1.95"	2.65 - 3.05
511-29-17K	511-29-17B	2.15	3.05 - 3.45
511-29-17L	511-29-17C	2.35	3.45 - 3.85
511-29-17M	511-29-17D	2.55	3.85 - 4.25
511-29-17N	511-29-17E	2.75	4.25 - 4.65
511-29-17P	511-29-17F	2.95	4.65 - 5.05
511-29-17Q	511-29-17G	3.15	5.05 - 5.45
511-29-17R	511-29-17H	3.98	6.70 - 7.10

OPTIONAL TOOL HOLDER
SQUARE CARTRIDGE
NEGATIVE RAKE



SPINDLE SPEED VS. BORE

NOTE:

SPINDLE SPEEDS SHOWN WILL YIELD BEST RESULTS FOR NORMAL CUTS ON CAST IRON (APPROX. 110 TO 220 BHN).

USE 2/3 SPEED FOR HEAVY CUTS.
USE 1/4 SPEED FOR HARD MATERIAL (Rc 35–50, BHN 327–475).
BORE SIZE MAY VARY DUE TO HEAT BUILD UP.