

JAN. 1989

ROTTLER  
MANUFACTURING

## DA-O, DA-OB

BORING MACHINE

MACHINE SERIAL NUMBER

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OPERATIONS AND MAINTENANCE  
MANUAL



MANUFACTURED BY:

ROTTLER MANUFACTURING COMPANY

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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**

## D E S C R I P T I O N

THE MODEL DA-0 BAR IS A PORTABLE PRECISION BORING UNIT. THE AUTOMOTIVE MODEL IS COMPLETE WITH SINGLE POINT TOOLING AND ACCESSORIES FOR STANDARD ENGINE REBORING WORK. THE AUTOMOTIVE AND INDUSTRIAL MODEL DA-0B INCORPORATES A HOLLOW INNER SPINDLE DESIGN WITH A QUICK CHANGE SOCKET TYPE SPINDLE NOSE SUITED TO THE USE OF A NUMBER OF OPTIONAL CUTTER HEADS. A DRAW TUBE, WITH SPANNER HOLES, AT THE TOP OF THE UPPER HOUSING HOLDS CUTTER HEADS IN PLACE AND INCLUDES A SPLINE ENGAGED INNER ROD TO ACTUATE CENTERING FINGERS. ALTERNATE USE OF CUTTER HEADS PROVIDES A CONSIDERABLY EXPANDED SIZE RANGE AND VERSATILITY TO THE DA-0B BAR. ALL FEEDS AND TRAVERSES ARE POWER OPERATED AND CONTROLLED FROM THE UPPER GEAR HOUSING UNIT. AN AUXILLIARY HAND TRAVEL IS LOCATED AT THE BASE OF THE FEED SCREW. POWER IS FURNISHED BY END MOUNTED AC SINGLE PHASE 110-220 VOLT GENERAL ELECTRIC MOTOR OF 3/4 H.P. THREE PHASE MOTOR IS ALSO AVAILABLE. A QUICK CHANGE LEVER SELECTS TWO SPINDLE SPEEDS.

GEAR HOUSINGS ARE ALUMINUM ALLOY IN ORDER TO INCORPORATE THE LIGHTEST POSSIBLE WEIGHT WITHOUT SACRIFICING RIGIDITY.

NOTE:

WHEN BAR IS SHIPPED FROM FACTORY THE MACHINED SURFACES ARE PROTECTED WITH RUST VETO. AFTER UNCRATING, USE CLEAN CLOTH DAMPENED WITH KERSOENE OR SOLVENT AND REMOVE THE PROTECTIVE OIL.

CARE SHOULD BE TAKEN TO AVOID FLUID ENTRY INTO THE CUTTER HEAD COUNTERWEIGHT AREA.

W A R N I N G

The model DA series boring machines are not standard equipped with motor overload or low electrical power protection.

This protection is not built into the machine because the electrical code requirements vary, and it is more economical for the purchaser to buy these devices directly from an electrical equipment supplier, to suit local code.

Overload protection is most important, and it is a necessity to pass electrical code requirement. Make sure you install this equipment with motor protection in accordance with the electrical requirements noted on the motor name plate.

CAUTION horizontal or inverted

To ensure adequate lubrication for spindle bearing, the Boring Bar should be run in the vertical position (with feed controls up) for at least 5 minutes after each 8 hours of horizontal or inverted boring, at light or medium loads.

At heavy loads the time intervals should be reduced.

G U A R A N T E E

LIMITED

Rottler Manufacturing Company model DA parts and equipment are guaranteed as to workmanship and material. This limited guarantee remains in effect for one year from date of delivery, provided the machine is owned and operated by the original purchaser, and is operated and maintained as per instructions in this manual.

Standard electric components are warranted by their respective manufacturers.

Tools proven defective within the time limit will be remedied at the factory's option, either by replacement of parts and/or service by the factory.

We accept no responsibility for defects caused by external damage, wear, abuse, or misuse. Neither do we accept any obligation to provide compensation for other direct or indirect costs in connection with cases covered by the warranty.

Guarantee does not cover shipping or freight charges.

I M P O R T A N T

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 metal cutting tools.

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 machine.

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. Light pressure is all that is required for sharpening.

CAUTION:

Tool sharpening 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 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 pin is engaged.

3. BORING - Eye protection must be worn during this operation and hands 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 knobs on top of the upper gear box, and cutter head area.

OPERATING SAFETY AND EMERGENCY PROCEDURES, Cont'd

5. BAR LOADING & UNLOADING - Carefully develop handling methods of loading and unloading boring machine, so that no injury can result if hoist equipment or lift connection should fail. Before moving boring machine check shoulder screw of lifting eye to make sure it is tight. (Lift eye should turn freely.)
6. MACHINE MAINTENANCE - Any machine adjustment, maintenance or part 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

Turn motor off immediately in the event of the following.

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.

NOTE: You can keep your fingers on the stop switch, if you wish to insure instant shut down, when it is required.

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.

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

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

## C O N T R O L S

We suggest that before attempting any cylinder boring, that the operator clamp the machine over an open area and actuate the controls to become familiar with the operation of the machine. Note all controls are illustrated on the spindle boring unit page and on the control plate attached to the front of the boring unit, itself.

### 1. FEED LEVER

Feed lever is the latching lever on the side of the bar. Press down until the lever latches to engage the cutting feed. To disengage, press the feed release arm which will unlatch the lever and allow it to return to the neutral position. Lift the feed lever until it latches to engage the RAPID RETURN TRAVEL. Do not manually hold this mechanism up when near top of travel. The bar will automatically return to neutral upon reaching the top of the travel. If you wish to return the bar to neutral while it is in rapid travel, again press feed release arm which will unlatch the lever and allow it to return to neutral position. As a safety precaution, we recommend that the motor be stopped when centering or positioning the bar. Inadvertant spindle rotation engagement could injure the operator's other hand or damage the cutter head parts. You will note the stop rod, that is held in the hand feed cap by set screw, has a round shaped end which will release cutting feed when it contacts latching lever. This is most conveniently raised up and locked by a set screw in the proper position on the completion of the first bore cuts. This rod should not be used to hold close tolerance cut depths.

### 2. FAST DOWN LEVER

The fast down travel lever is located to the right or rear of the feed lever. Check feed lever to see that it is in neutral position before actuating. LEVER SHOULD BE PULLED DOWN QUICKLY AND FIRMLY AND NOT ALLOWED TO RATCHET. Control is spring loaded and will release when you release the pressure. Excess ratcheting may cause premature component replacement.

To become familiar with the rapid down travel, we suggest that you place a tool holder into the holder slot and practice running this tool holder down rapidly (in the fast spindle speed) to the desired point, and returning it to the upper position. This can be done rapidly and very accurately with a little practice.

### 3. SPINDLE CLUTCH CONTROL

Spindle clutch control is located to left side or front of the feed lever. A pull-release rapid down movement will engage spindle rotation and a reverse action will disengage. In that this is a jaw clutch we recommend stopping the motor or jogging the motor to engage clutch on the high spindle RPM. Standard procedure is to throw out clutch upon completion of bore. Turn cutter head around to indexing detent to position tool to front, then reverse the travel. The lower knob on the spindle of the upper housing may be used for manually turning the spindle when necessary.

## CONTROLS Cont'd

### 4. MANUAL HAND FEED

A 2 3/16" manual travel is actuated by a rotating handle attached to spline at top of the spindle base.

CAUTION: This travel should always be left in full up position after using, before spindle is returned to full up position.

Normal procedure is to rapid travel or feed bar to point requiring manual travel. If back feeding is necessary, run hand travel down first and then rapid travel down to where tool can be inserted.

This manual hand feed travel is available for facing sleeves and counterboring, etc. It is completely separate from the power 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.

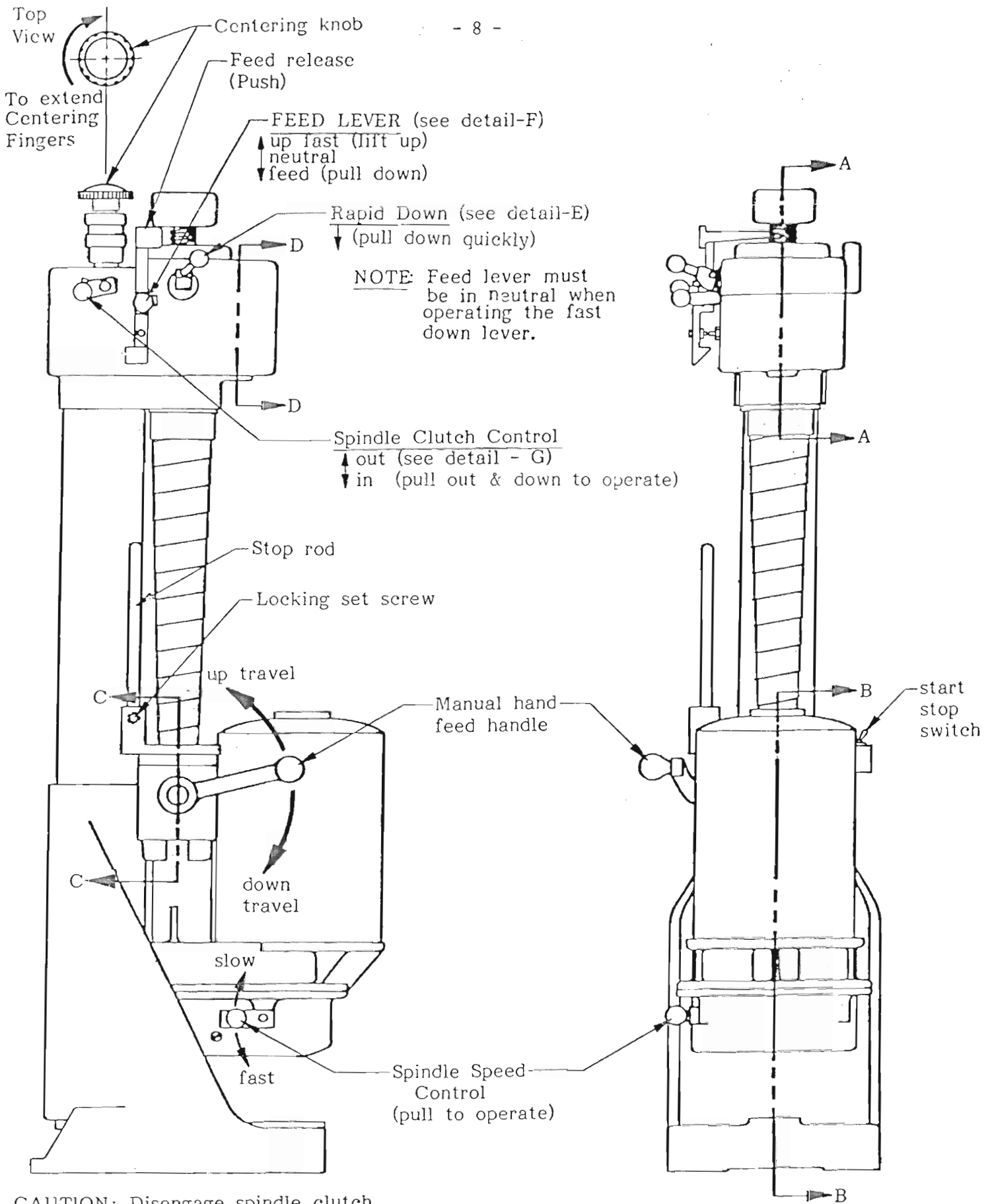
### 5. SPEED CONTROL

The speed control is changed by pulling out and raising or lowering the plastic knob at the lower right of the spindle unit. This may be operated when the machine is running or being jogged, and will not suffer any damage, but do not shift when boring. High speed is in the bottom position and low speed is in the upper position.

### 6. CENTERING KNOB

The centering knob (upper knob) at the top of the upper spindle housing operates the centering fingers when turned clockwise. Be careful not to over-extend these fingers when the spindle is not in the cylinder or they will come completely out of the pinion drive. Retract fingers when centering has been accomplished.





**CAUTION:** Disengage spindle clutch and stop motor before placing hands near the cutter head.

SPINDLE BORING UNIT

B TYPE CUTTER HEADS

ALTERNATE CUTTER HEAD ARRANGEMENTS

Your DA-O B is equipped with a single draw bolt through the inner spindle assembly so that a number of different styles of cutter heads, tools, and indicators, may be rapidly interchanged. Two spanner wrenches are provided for locking and unlocking the cutter head, they are used on the two lower knobs on top of the spindle. 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. Never change heads with motor running.

OPTIONAL

2.5 PRODUCTION CUTTER HEAD (600-8-9)

Size capacity 2.5 to 5.7 (63MM - 145MM) diameter

The production cutter head may be quickly attached to the DA-O B machine by use of the draw bolt.

It is used in the DA-O B machine to simplify and speed up the operation, eliminating the necessity of removing the tool every time 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 obstructions in the U.S. passenger car and truck engines.

A dampener weight is 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 two flat head screws in the lower centering finger retainer. Then remove the three socket head cap screws in the bottom of the cutter head cap. Carefully disassemble, clean and reassemble.

OPTIONAL

BLIND HOLE CUTTER HEAD

600-8-5

Size capacity 2.5 to 5.7 (63MM - 145MM) diameter

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, requires 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 cutter head which requires the same maintenance as production cutter head.

OPTIONAL

1.5 STUB BORING BAR

600-8-3

This stub boring head with a capacity of 1.5" to 4.1" diameter x 5.25" depth (38MM TO 104MM X 133MM DEPTH) may be quickly attached to the DA-O B .

Unlike the production cutter head, centering fingers are located above the cutting tool requiring tool removal to center each bore. Counter-weight maintenance same as production cutter head.

For operation of 1.5 stub boring bar see page 18 .

## O P E R A T I N G I N S T R U C T I O N S - A U T O M O T I V E

WE RECOMMEND, PARTICULARLY FOR OPERATORS UNFAMILIAR WITH THE 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.

CAREFULLY CLEAN AND FILE OFF HIGH SPOTS, THREAD BURRS, ETC. ON TOP OF CYLINDER BLOCKS. WHEN USING THE VACUUM CHIP REMOVER, (DA-VO ONLY) TAKE CARE TO REMOVE OIL AND GREASE FILM FROM CYLINDERS IN ORDER TO PREVENT EVENTUAL LOADING OF AIR PASSAGES AND VACUUM FILTER.

MEASURE EACH CYLINDER. DETERMINE THE AMOUNT OF METAL TO BE REMOVED FROM THE MEASUREMENT OF CYLINDER WHICH SHOWS THE MOST WEAR.

### CLAMPING

THE MODEL 501-37 HOLD DOWN ASSEMBLY, UTILIZES THE MAIN BEARINGS AS A SURFACE TO PULL PORTABLE BORING BAR EQUIPMENT SECURELY DOWN TO THE TOP OF THE BLOCK. THIS ORGANIZES THE THRUST, THROUGH THE BLOCK AND PREVENTS DISTORTION OF THE CYLINDERS THEMSELVES, AS WELL AS GOOD SECURITY FOR THE BORING BAR DURING SUBSTANTIAL CUTS. IT CAN BE USED REGARDLESS OF WHETHER BEARING CAPS ARE IN PLACE OR NOT. IT OBVIOUSLY CANNOT BE USED IF THE CRANKSHAFT REMAINS IN THE CYLINDER BLOCK.

TO MOST EFFECTIVELY USE THIS ASSEMBLY, LEAVE THE WASHER AND HOLD DOWN BOLT ASSEMBLY OUT OF THE 501-37-2 ADJUSTING TUBE, THEN SELECT THE PROPER LENGTH STUD REQUIRED, INSERT IT INTO THE EYE NUT AND ADJUSTING TUBE. YOU CAN VISUALLY NOTE WHICH ONE WILL PROPERLY SPACE THE SUPPORT PLATE AWAY FROM THE MAIN BEARING BAR, 509-15. IN GENERAL, THE SHORT 5-3/4" STUD WILL ACCOMMODATE A MAIN BEARING TO THE TOP OF THE BLOCK, HEIGHT OF 6-1/2" TO 11-1/2". THESE STUDS INCREASE IN LENGTH BY 3" INCREMENTS.

LAY THE SUPPORT PLATE 501-37-3, OVER THE TOP OF THE BLOCK SO THAT THE ADJUSTING TUBE AND EYE NUT WILL HANG OVER THE END OF THE BLOCK TO THE MAIN BEARING LOCATION. WITH THE TUBE HANGING OVER THE END OF THE BLOCK YOU CAN READILY ROTATE THE ADJUSTING TUBE UNTIL THE EYE APPROXIMATELY LINES UP WITH THE MAIN BEARINGS. PLACE THE MAIN BEARING BAR, 509-15, THROUGH THE EYE TO MAKE SURE THE ADJUSTMENT IS CLOSE.

CLAMPING CONT'D

LOWER THE ASSEMBLY INTO THE HOLE NEXT TO THE ONE YOU WISH TO BORE AND ADJUST THE ADJUSTABLE STOP 501-37-7, SO THAT THE PINS ON THE OTHER SIDE OF THE PLATE ARE NEAR THE OPPOSITE WALL. THIS PREVENTS THE PLATE FROM DROPPING INTO THE CYLINDER. PLAN THE HOLD DOWN LOCATION SO THAT AFTER BORING THE FIRST HOLE THE BORING BAR MAY BE ROTATED OR SWUNG COUNTER-CLOCKWISE TO BORE THE NEXT CYLINDER.

MAKE SURE THE EYE NUT IS TURNED PROPERLY AND PLACE THE MAIN BEARING BAR, 509-15, THROUGH THE MAIN BEARING LINE AND EYE NUT. INSERT SUFFICIENTLY SO THE BAR RESTS ON THE MAIN BEARING ON THE FAR SIDE OF THE EYE NUT.

ROTATE THE ADJUSTING TUBE FINGER-TIGHT, THEN PULL THE BORING BAR OVER THE ASSEMBLY. NOW START THE BOLT AND WASHER INTO THE SUPPORT TUBE. THEN PLACE THE C-WASHER, 501-37-8, IN PLACE AND SLIDE THE MACHINE FURTHER UNTIL THE SPINDLE IS APPROXIMATELY CENTERED OVER THE HOLE TO BE BORED. MAKE SURE THE SPINDLE CLUTCH IS OUT (LEVER IN UP POSITION) OPERATE FAST DOWN TO TRAVEL THE CUTTER HEAD DOWN INTO THE BORE (TURN OFF MOTOR) TURN CENTERING KNOB CLOCK WISE TO EXTEND CENTERING FINGERS. WE SUGGEST YOU SHIFT THE BAR SLIGHTLY WHILE EXERTING PRESSURE ON THE CENTERING FINGERS TO INSURE THAT CENTERING FINGERS ARE MAKING GOOD CONTACT. TIGHTEN THE BOLTS WITH THE RATCHET WRENCH WHILE YOU ARE STILL HOLDING PRESSURE ON THE CENTERING FINGERS. TURN CENTERING KNOB COUNTER-CLOCKWISE TO RETURN FINGERS TO IN POSITION.

B O R I N G - AUTOMOTIVE ONLY

DETERMINE THE CYLINDER BORE SIZE YOU WISH TO BORE. SELECT A TOOL HOLDER THAT WILL ALLOW MINIMUM TOOL BIT OVERHANG. WE RECOMMEND A MAXIMUM TOOL BIT OVERHANG OF 5/8" OUTSIDE OF TOOL HOLDER. PLACE TOOL BIT INTO THE TOOL HOLDER.

NOTE: BEFORE SETTING, MAKE SURE TOOL BIT IS PROPERLY SHARPENED, (SEE TOOL SHARPENING REQUIREMENTS).

PLACE TOOL BIT AND HOLDER IN MICROMETER. HOLD TOOL BIT LIGHTLY AGAINST MIKE ANVIL AND LOOSEN ALLEN SCREW WITH WRENCH. GENTLY LET TOOL HOLDER SLIDE BACK TO MAKE CONTACT WITH MICROMETER SPINDLE. THIS PROCEDURE WILL PREVENT CHIPPING CARBIDE. THIS MICROMETER IS .050 TO A REVOLUTION RATHER THAN .025 AS ON A CONVENTIONAL MIKE.

BORING - AUTOMOTIVE ONLY CONT'D

SET MIKE TO SIZE YOU WISH TO BORE AND TIGHTEN SET SCREW LIGHTLY. BACK OFF MIKE AND TIGHTEN SET SCREW. HERE AGAIN EXCESSIVE TIGHTENING ONLY TENDS TO NICK MIKE ANVIL AND MAKE FUTURE SETTING DIFFICULT. AFTER TIGHTENING, RECHECK SIZE.

MAKE SURE TOOL HOLDER AND TOOL HOLDER SLOT IN HEAD ARE FREE FROM DIRT. INSERT TOOL IN SLOT MAKING SURE IT IS COMPLETELY BACK AND LATCHED. LIGHTLY LOCK SET SCREW WITH SOCKET TYPE SCREW DRIVER PROVIDED WITH TOOLS.

B O R I N G

ENGAGE SPINDLE CLUTCH AND LATCH FEED LEVER IN DOWN POSITION. WHEN BAR HAS COMPLETED BORING, SET STOP ROD SO LEVER WILL BE THROWN INTO NEUTRAL POSITION. STOP ROD WILL THEN BE SET FOR THE OTHER HOLES ON THE SAME CYLINDER BLOCK.

DISENGAGE SPINDLE CLUTCH. TURN CUTTER HEAD TO FRONT POSITION AND LATCH FEED LEVER TO RAPID RETURN POSITION. ALLOW SPINDLE TO RETURN TO ITS FULL UP POSITION. TURN OFF MOTOR. REMOVE VACUUM HOOD, IF SO EQUIPPED AND TOOL HOLDER WITH TOOL PULLER. (ALWAYS REMOVE TOOL HOLDER AFTER BORING.) LOOSEN ANCHOR BOLT AND PROCEED TO NEXT CYLINDER. IF BORE IS TO BE CHAMFERED WITH BAR THIS SHOULD BE DONE BEFORE LOOSENING ANCHOR BOLT.

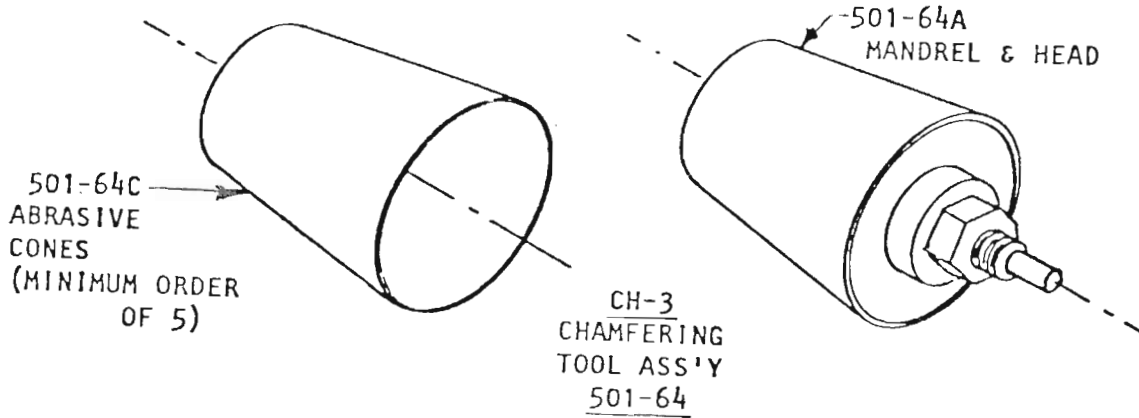
REMEMBER THEN, IN ORDER TO ROTATE A 180° TO THE OTHER BORE ALWAYS TURN THE MACHINE COUNTERCLOCKWISE, VIEWING THE MACHINE FROM THE TOP. IF YOU WOULD TURN IT THE OTHER WAY, IT IS POSSIBLE YOU MAY LOCK THE ADJUSTING TUBE MORE THAN FINGER-TIGHT. PIN HOLES ARE PROVIDED IN THE TOP FLANGE OF THE TUBE IN ORDER TO LOOSEN IT, SHOULD THIS DIFFICULTY OCCUR.

IF VACUUM (DAV-0 ONLY) IS USED, A CYLINDER BLOCK CAN GENERALLY BE BORED BEFORE EMPTYING DUST BAG. KEEP BAG AND FILTER CLEAN. AN OIL SATURATED BAG OR FILTER WILL RESTRICT THE FLOW OF AIR.

C H A M F E R I N G

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

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

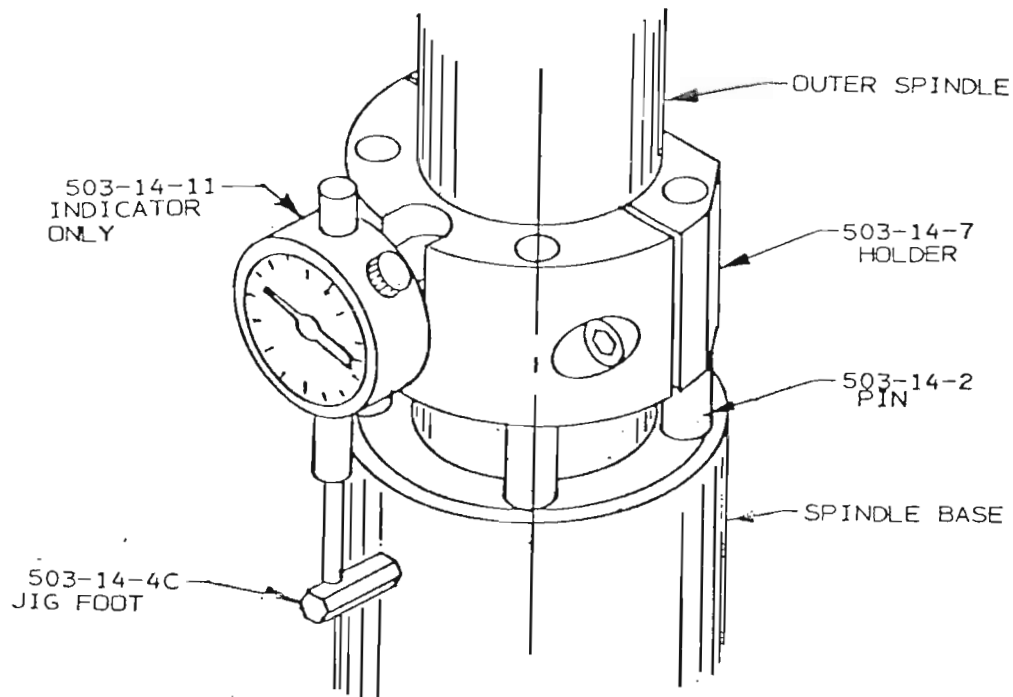


### COUNTERBORING

The slow travel manual feed is provided for use in counterboring, facing sleeves flush etc.

CAUTION: The manual hand feed should always be returned to the full up position before returning the power travel to the top.

An optional 1" travel dial indicator assembly (503-14-C) is available for accurate control of counter bore depths.

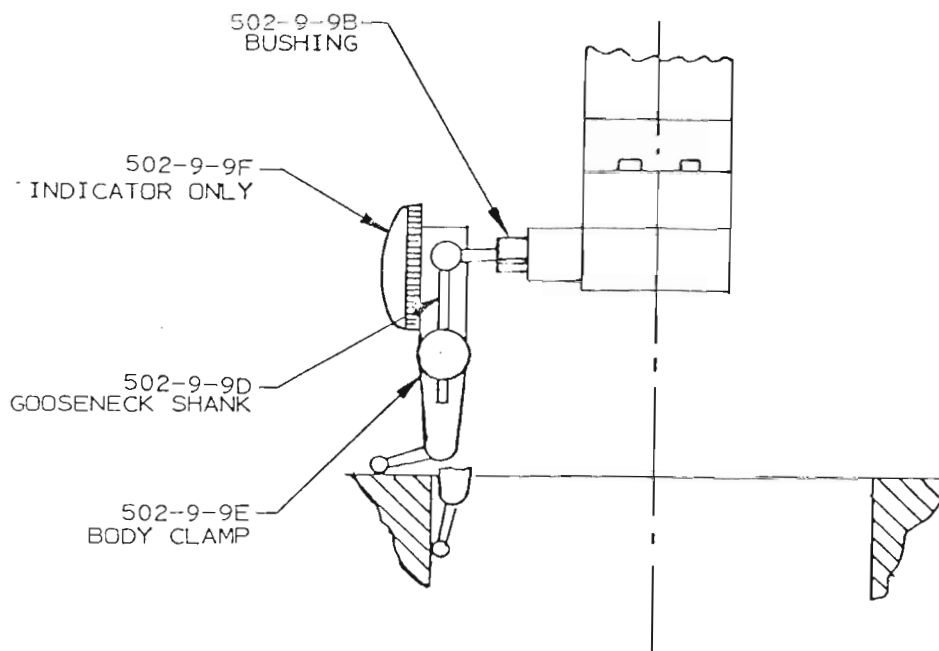


503-14C  
DEPTH DIAL INDICATOR  
ASS'Y

To counterbore to a close tolerance depth, carefully hand feed the RF type cutter bit down until the cutter is lightly touching the block surface. Adjust the dial reading to 0 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 number of graduations on the indicator.



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



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

The #502-9-9A Mechanical Dial Runout Indicator may be used for checking and if necessary correcting the centering or bore concentricity. It may also be used for checking face squareness of the work piece to the boring spindle.

The principal 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 in 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, and clamp spindle.

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.

INSTRUCTIONS FOR USE OF OPTIONAL MECHANICAL DIAL  
RUNOUT INDICATOR, Con'd

Turn the spindle, and the indicator now will read the total runout. This will be exactly double the distance the spindle is out of a round hole center.

To clean up a bore, it will be necessary to set the tool about the amount of this runout in addition to the basic bore size you measure. If you bump the spindle unity lightly with your hand you will find you can easily reduce the reading to near 0 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 and two minimum equal readings for each turn of the spindle.

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.

Clamp spindle when you have the proper dial reading, check the runout again then remove the indicator, and 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 then to check out of square.

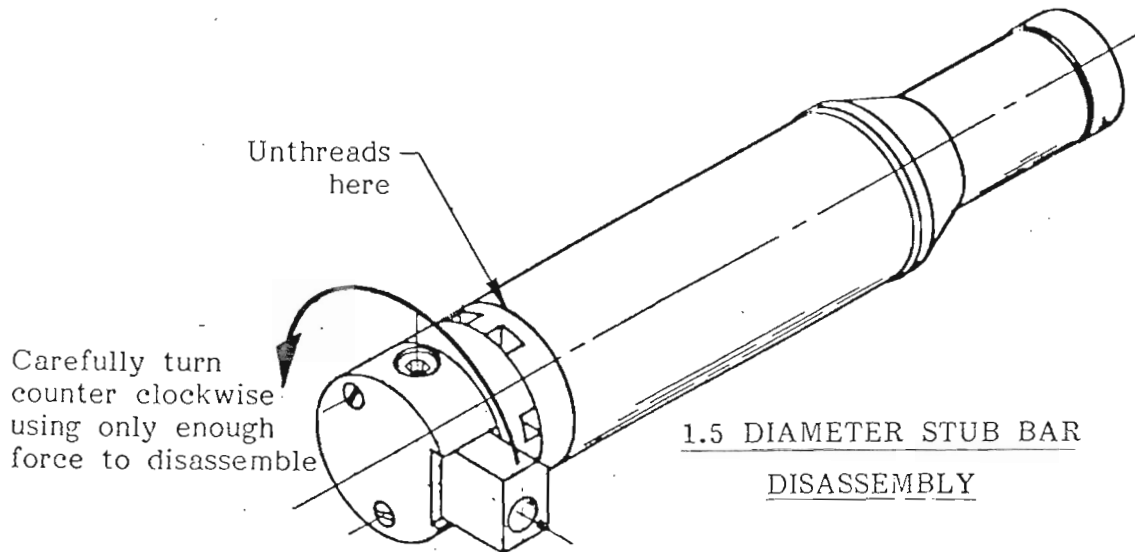
Remember, if you wish to correct out of square with shims on top the work piece, you will have to use a shim proportionately larger (as the support points are to the indicator travel extreme) than the out of square reading.

1.5 DIAMETER STUB BORING BAR ASSEMBLY  
OPERATING INSTRUCTIONS

The stub boring head, part number 600-8-3, has a capacity of 1.5 to 4.1" diameter (38MM to 104MM) with a maximum length capacity of 5.25" (133MM) up to the machine spindle diameter of 2.5" (64MM). Beyond 2.5" diameter the stub bar can bore deeper holes. It may be quickly attached to B machines by the single draw bolt through the inner spindle assembly. Two spanner wrenches are provided for locking and unlocking of cutter head at the top of the spindle. NOTE: Make sure the tool shank and receptacle are absolutely clean when changing tools.

Unlike the production cutter head, centering fingers are located above the cutting tool requiring tool removal to center each bore. Two centering finger sets are provided. The smaller including a 1.5" to 2 5/8" bore diameter range and the larger a 2 5/8" to 4.1" diameter bore range.

A dampening weight (600-8-2) is housed within the stub bar. This weight requires little or no maintenance as long as liquids or contamination do not enter the weight cavity. Should this occur, the operator will experience bore chatter problems with this head and it will have to be disassembled and cleaned.



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

If centering fingers require dressing after a period of use, apply the same lapping procedure noted on page (24). The micrometer may also be periodically calibrated as noted on page (25).

IMPORTANT GENERAL INFORMATION  
FOR THE BEST USE OF  
THE 1.5 DIAMETER STUB BORING BAR ASSEMBLY

CAUTION: Inner spindle adjustment (see page 30) must be correct for precision use of stub boring heads.

Since extended stub boring head design has considerable overhang with a small shaft diameter, the cutting tool "B" land must be kept very narrow (.005" to .015") (.13MM to .38MM wide). This will insure accurate 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" cut (1.02MM) (on diameter), a second pass of the tool will remove close to .001" (.025MM) material on the diameter. A second pass following a lesser first cut will remove less metal.

The .040" (1.02MM) 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 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 (second pass must be made without re-centering) to provide a most precise bore.

In general, size variations in typical cycle bore will approximate .0007" (.018MM). 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.

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 per 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 its indexing point, that you remove finger pressure from the tool holder and tool bit, before locking it with its 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.

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 SKETCH, 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 SKETCH.

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 LONG BORE OPERATIONS AND STUB BORING HEADS. SEE PAGE 22 FOR EXACT 'B' LAND REQUIREMENTS.

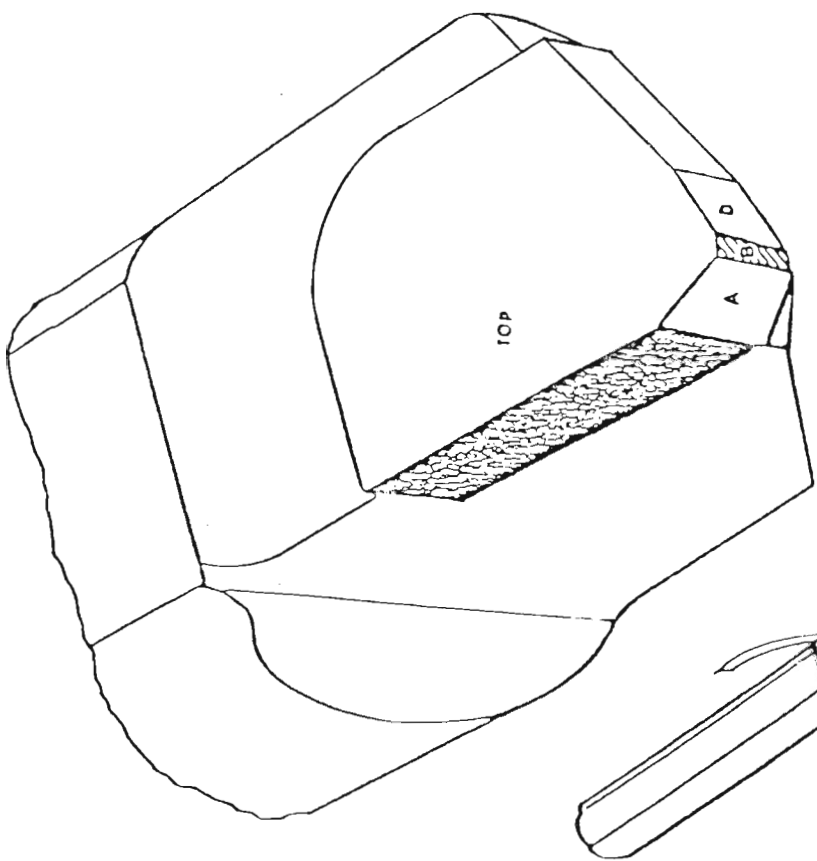
IN THE EVENT YOUR BAR CHATTERS OR BORES A ROUGH FINISH AT THE BOTTOM OF THE CYLINDER, IT IS VERY PROBABLE THE 'B' LAND IS TOO WIDE.

THE 'A' CUTTING LAND 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 SOMETIMES SEEMS TO BE APPARENT. THE PRACTICE OF DOING THESE THINGS WILL INEVITABLY RESULT IN POOR SURFACE FINISH AND IMPAIR THE ACCURACY OF THE MACHINE.

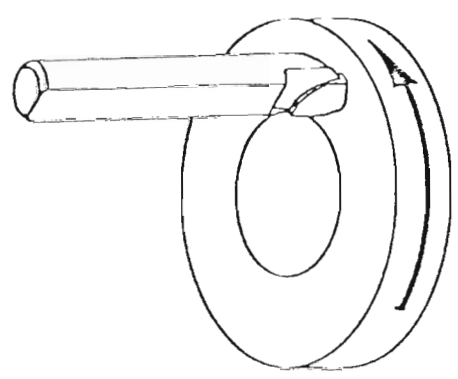
THE FREQUENCY OF SHARPENING THE BIT WILL VARY DEPENDING UPON THE TYPE OF IRON BEING BORED.

TOOL SHARPENING REQUIREMENTS



ACTUAL SIZE

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



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 of 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 tool holder in the sharpening jig slot. Place the jig over the pin provided on the top of the motor housing and sharpen bits on the 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 which will 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. CAUTION: See sheets for tool sharpening requirements.

NOTE: 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. A silicon carbide (green) grit grinding wheel will remove the carbide material quickly, which will reduce wear on diamond wheel.

CAUTION: The diamond wheel is not suitable for rapid stock removal and is designed for carbide only. 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 TOP OF THE TOOL BIT. GRIND OR DRESS FRONT AND SIDES ONLY.

CUTTING SPEEDS AND CUTTING DEPTH RECOMMENDATIONS

PRODUCTION CUTTER HEAD AND BLIND HOLE CUTTER HEAD

ROUGHING CUTS FOR SLEEVING

-Maximum cut .100 on a diameter. Use low spindle speed only.

FINISH CUT: TO 8" TRAVEL DEPTH

-Maximum cut .040 on a diameter. Use a .015 to .025 "B" land.

TO MAXIMUM TRAVEL DEPTH

-Maximum cut .025 on a diameter. Use a .008 to .015 "B" land.

SPINDLE SPEED

-Bore diameter to 3 3/4" use high spindle speed.

-Bore diameter to above 3 3/4" use low spindle speed.

-Boring 4" bores in high speed will cause size variation from tool heat expansion.

NOTE: To produce best results at extreme travel or heavy stock removal use an RF facing tool

Part # 501-29-A

(Do not sharpen "A" land on this tool)

STUB BORING BAR

ROUGHING CUTS FOR SLEEVING

-Maximum cut .100 on a diameter. Use low spindle speed only.

FINISH CUT: TO 4" TRAVEL DEPTH

-Maximum cut .040 on a diameter. Use .010 to .020 "B" land.

TO 8" TRAVEL DEPTH

-Maximum cut .025 on a diameter. Use .008 to .015 "B" land.

SPINDLE SPEED

-Bore diameters to 3 3/4" use high spindle speed.

-Bore diameters above 3 3/4" use low spindle speed.

-Boring 4" bores in high speed will cause size variation from tool heat expansion.

### MAINTENANCE OF DIAMOND WHEEL

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

An 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 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 tool sharpening to precision edge, it should be possible to bore approximately twenty oversize cylinders, provided the correct spindle speed is used. This applies to most passenger car 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 keen edge.



### CENTERING FINGERS

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

### CHANGING OR INSTALLATION OF CENTERING FINGERS

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.

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 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.

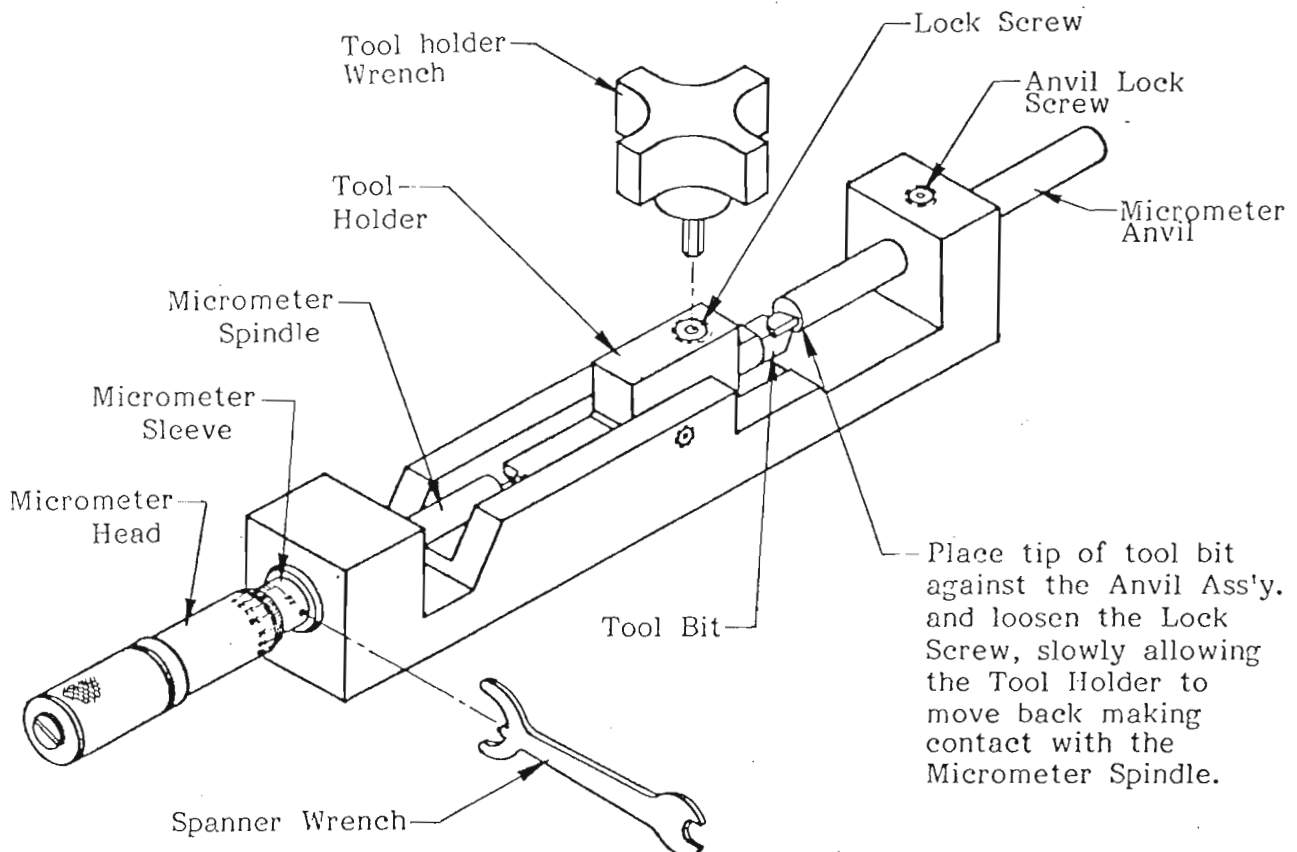
### TOOL SETTING MICROMETER

Your boring micrometer, as with any measuring tool, should be used 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, move the micrometer spindle away from the tool holder, before tightening.

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

### CALIBRATING TOOL SETTING MICROMETER

1. Bore a hole.
2. Remove tool holder and bit and place in micrometer.
3. Adjust micrometer so that it reads the same size as the hole you have bored. Small variations may be made by turning the micrometer sleeve with spanner wrench provided. Larger changes should be made by moving the anvil.



I M P O R T A N T  
M A I N T E N A N C E

LUBRICATION

DA STYLE

\* The DA style upper housing unit should be packed with UNION OIL UNOBA F1 or F2, or lubriplate #930 AAA, Mobil oil - Mobilith A.W. Grades 1 or 2, Chevron Durolith EP1 or EP2, or any equivalent LITHUIM BARIUM grease, approximately every 25,000 boring cycles. When this grease is changed, the upper housing lid should be removed and the original lubricant entirely removed. Grease should flow around gears when running, if necessary add oil to achieve grease movement.

△ 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 very light spindle or sewing machine oil (less than SAE5) to the bearing. Add by removing the small cover on the front of the upper housing and add lubricant to the take up nut area between the clutching teeth.

○ The lower motor housing units oil level should be checked MONTHLY. Check by removing the pipe plug on the left side of the lower gear housing, oil level should be just up to the bottom of this hole.

CAUTION: When adding oil or 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 DA style machine is operated on a continuous basis, the grease fittings at 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 or lubriplate #930 AAA, Mobil oil - Mobilith A.W. Grades 1 or 2, Chevron Durolith EP1 or EP2, or any equivalent LITHUIM BARIUM grease.

⊙ Two or three drops of UNION oil - 315 turbine oil, or UNION oil 315 KLONDYKE oil, or any SAE 20 oil (nondetergent motor oil) can be added weekly to the breather at the top of the key way in the main spindle to insure fluidity of main spindle bearing lubricant.

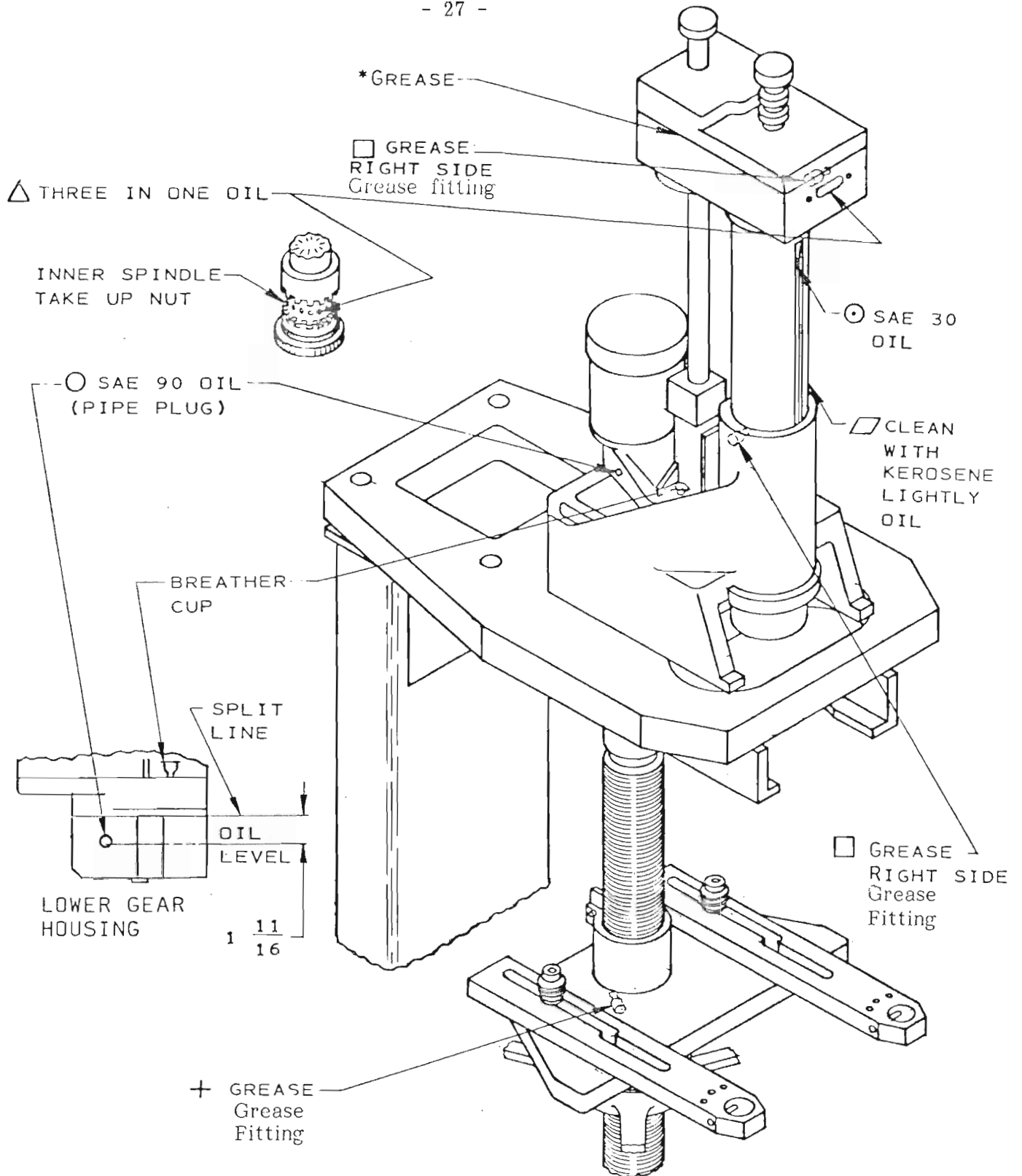
▱ Main spindle surface should be cleaned with kerosene weekly and occasionally a light weight oil applied to prevent excessive dryness.

⊕ Grease fitting on the stands. Clamp bracket plate should be greased lightly when needed.

CAUTION horizontal or inverted

To ensure adequate lubrication for spindle bearing, the Boring Bar should be run in the vertical position (with feed controls up) for at least 5 minutes after each 8 hours of horizontal or inverted boring, at light or medium loads.

At heavy loads the time intervals should be reduced.



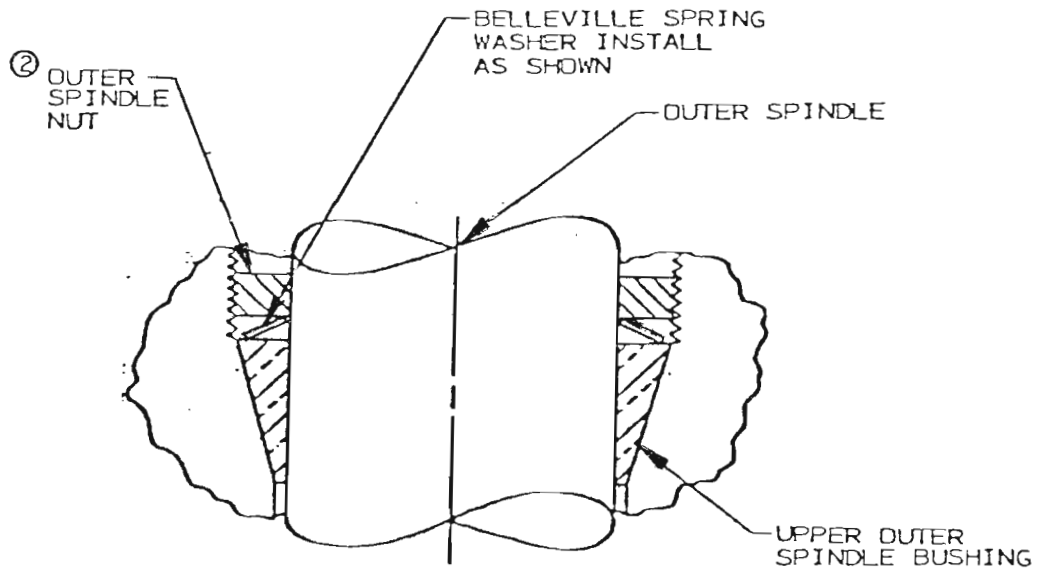
LUBRICATION

### 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 set 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 page (29).

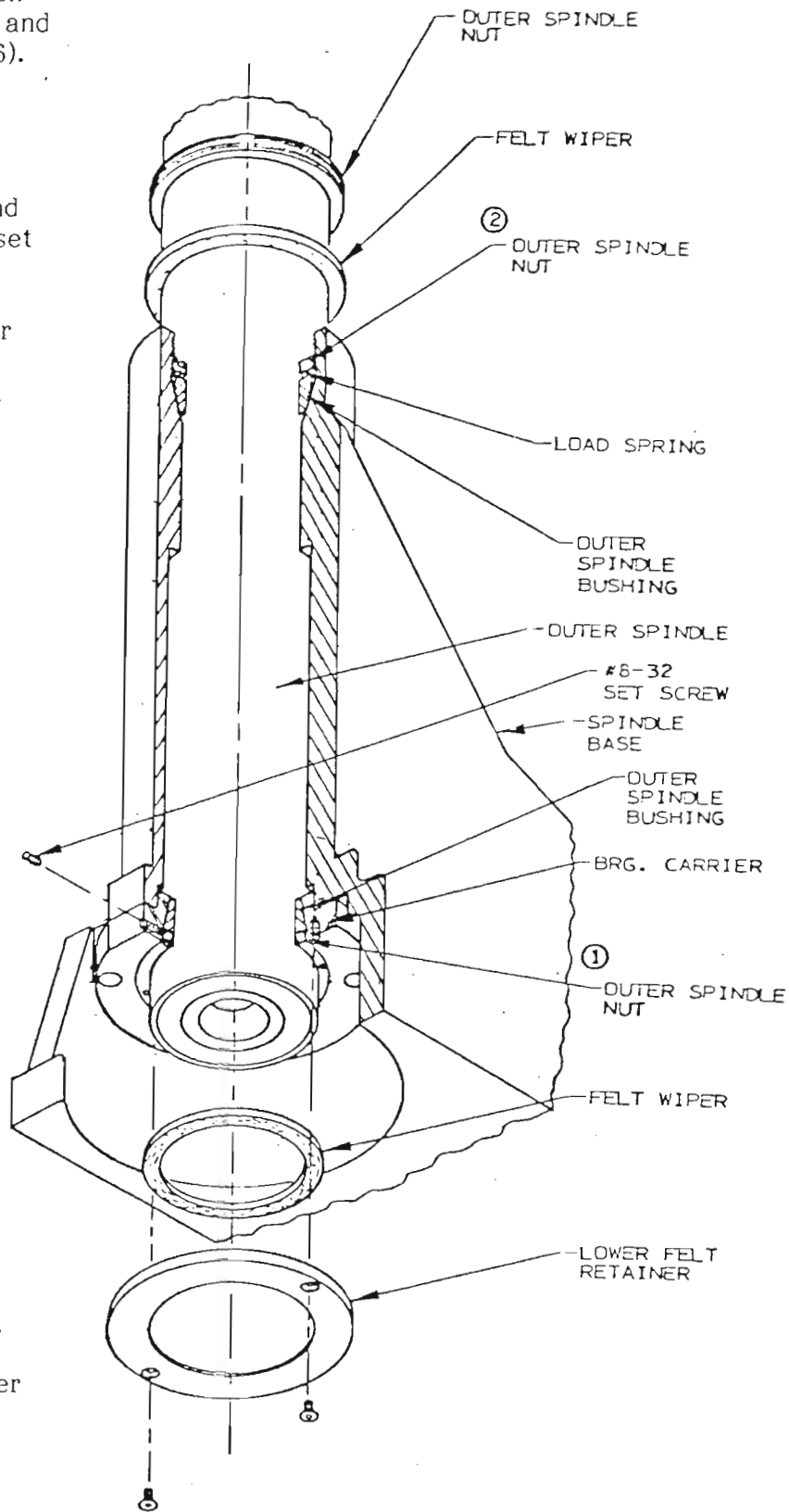


1. Run spindle down approximately 4" to 6", loosen the #8-32 set screw and loosen the lower outer spindle nut (500-77) and both upper outer spindle nuts (700-26).
2. Tighten the lower bushing (200-15-6), by tightening the outer spindle nut marked ①, until 10 to 15 lbs. of effort is required to operate 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 mark ②, take care that the hand feed operates only slightly tighter or 15 to 20 lbs. of effort is required to operate the hand 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
DA-O, -OB, & -OC & -OCB4	30 - 50 lbs
FA & F-2B	50 - 75 lbs
FA-4VB, IDA-4 DA-5 & 6IDA-6B	60 - 80 lbs

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 outer spindle nuts will cause strain on feed gears and cause spindle to "have audible excess resistance."



### ADJUSTMENT OF INNER SPINDLE

1. Remove two screws and small cover on front of upper housing.
2. Remove stop set screw restricting up travel of spindle clutch lever and move lever to full up position. See **page 32** for illustration. Rotate spindle approximately 1/2 turn away from the detent spring (which will position tool holder slot to rear).
3. Inset pin (diameter .180 or less) in one of the holes provided in the outer diameter of the take up nut. (See inner spindle nut.) Hold spindle knob with one hand and turn take up nut to left (clockwise). You will note the nut ratchets in notches as you take up. Take up until the spindle is tight and back off 3/4 to 1 1/2 notches. Run bar on high speed making sure there is only slight heating at the bottom of the spindle. If heat is excessive, back off one notch further.

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

4. Replace cover and reset spindle clutch stop screw to allow clutch lever to stop in its upper detent.

### C O R R E C T I O N

#### O F

### T O O L C H A T T E R

#### AT LOWER EXTREMITIES OF BORES

Chatter at lower end of bores likely has nothing to do with spindle adjustments.

It is primarily caused by tool sharpening that inadequately narrows the tool "B" land. (See tool sharpening requirements).

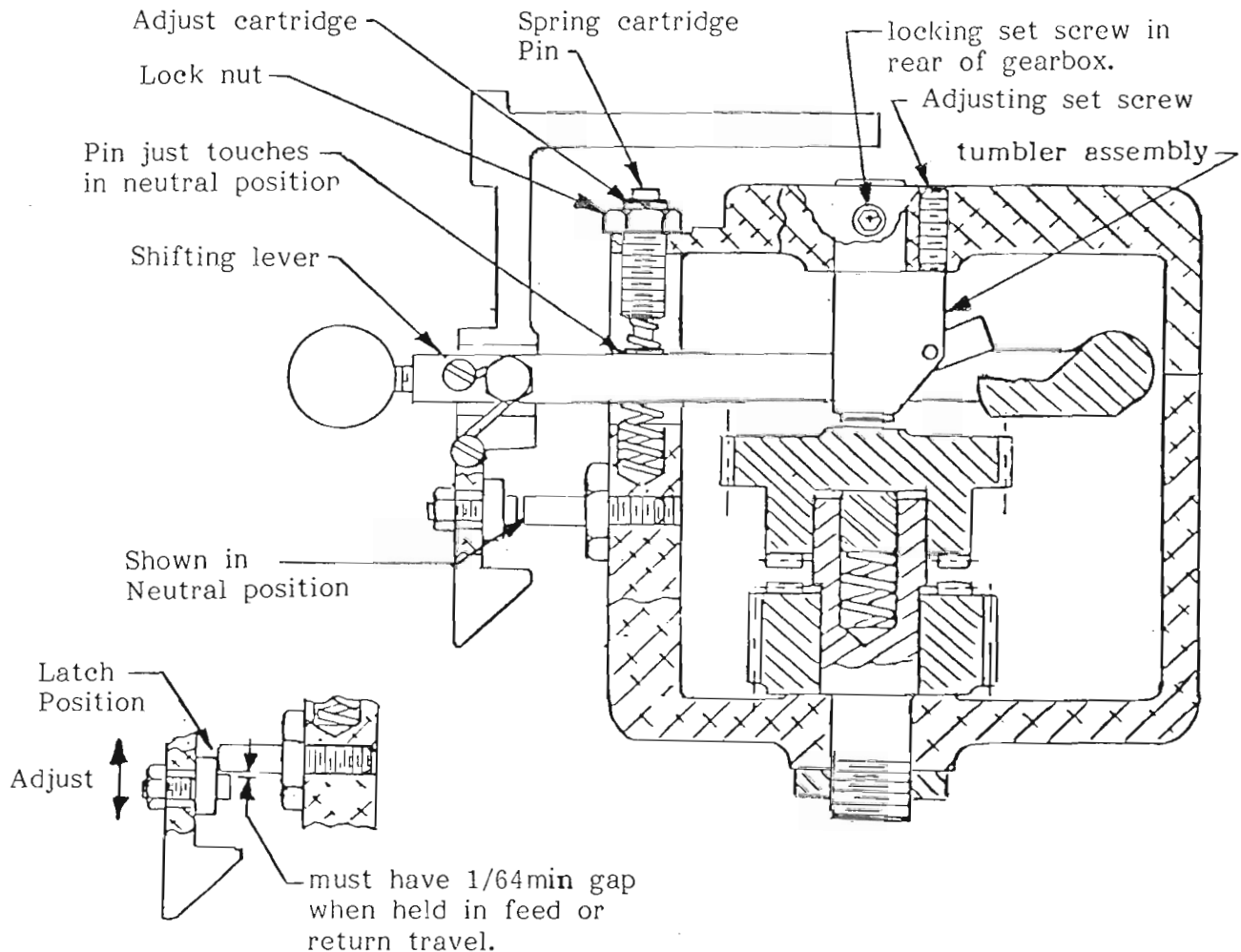
All DA-O cutter heads are equipped with heavy metal dampener weights. These precisely machined weights help prevent chatter at bore extremities. They must however, occasionally be cleaned and reassembled to operate properly.



R A P I D R E T U R N A D J U S T M E N T

If the boring machine should ever fail or hesitate to return to the top of travel when shift lever is lifted and latched, the following procedure may be used to adjust return traverse clutches.

1. Run boring spindle down approximately 6 inches or more.
2. Loosen horizontal locking set screw at top and back of upper housing. (See below)
3. Find neutral position of shifting lever by rotating feed screw, while engaging fast down lever. Neutral position must have fast down lever fully engaged with fast down pin at full depth in 500-1 clutch sleeve gear.
4. Pin in spring cartridge assembly should just touch shift lever, when shift lever is in neutral. Adjust by loosening lock nut and turning cartridge.
5. 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 shifting lever. If clutches ratchet after the pin is raised more than  $1/32''$ , reset tumbler lower, by turning vertical set screw inward, which will result in a deeper engagement of clutches. If clutches ratchet in neutral or before pin is raised  $1/32''$  reset tumbler higher, by first backing off the vertical set screw in the top of the housing, then force the tumbler up with the shift lever.
6. Tighten locking set screw to relock shaft. Check to see that adjustment has not been changed by the locking set screw.



### 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 (3) 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 pressure above that which is required to flatten spring, should be used.

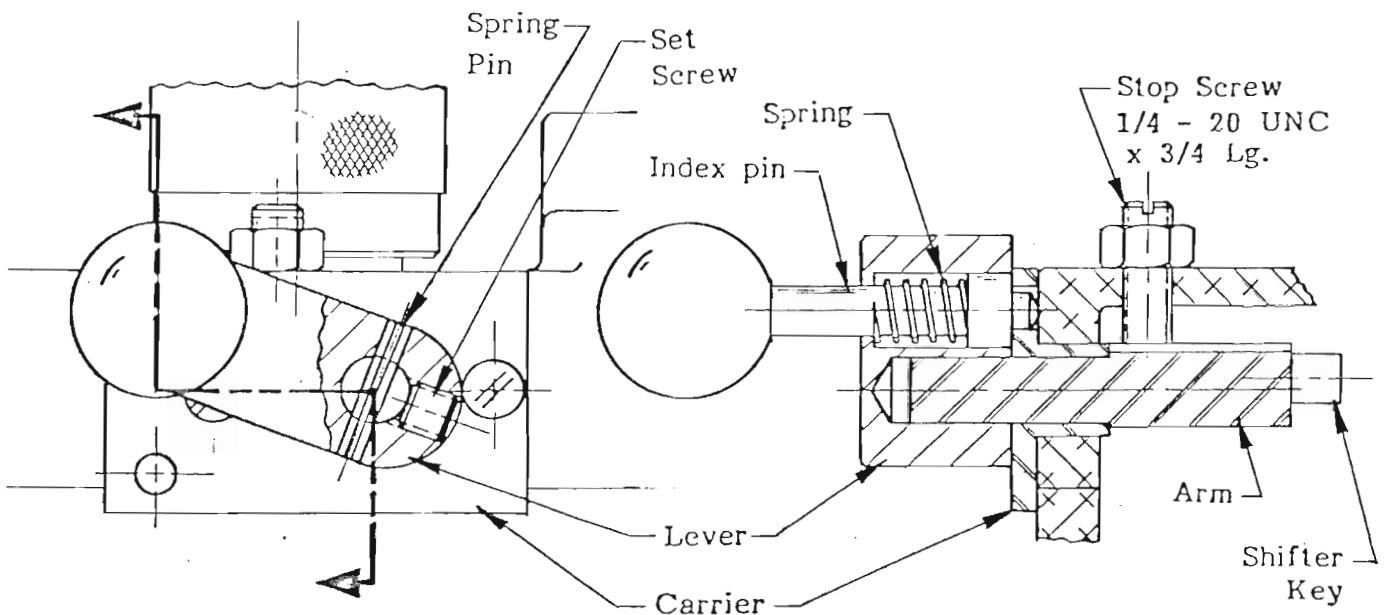
Turn adjusting screw back 1/3 turn to allow for running clearance. Hold adjusting screw with and allen wrench and lock them with lock nut.

Run motor with lower gear box engaged, so that the feed screw is turning, to center bearing retainer. Turn off motor, tighten evenly the (3) upper round head screws.

### SPINDLE CONTROL LEVER ADJUSTMENT

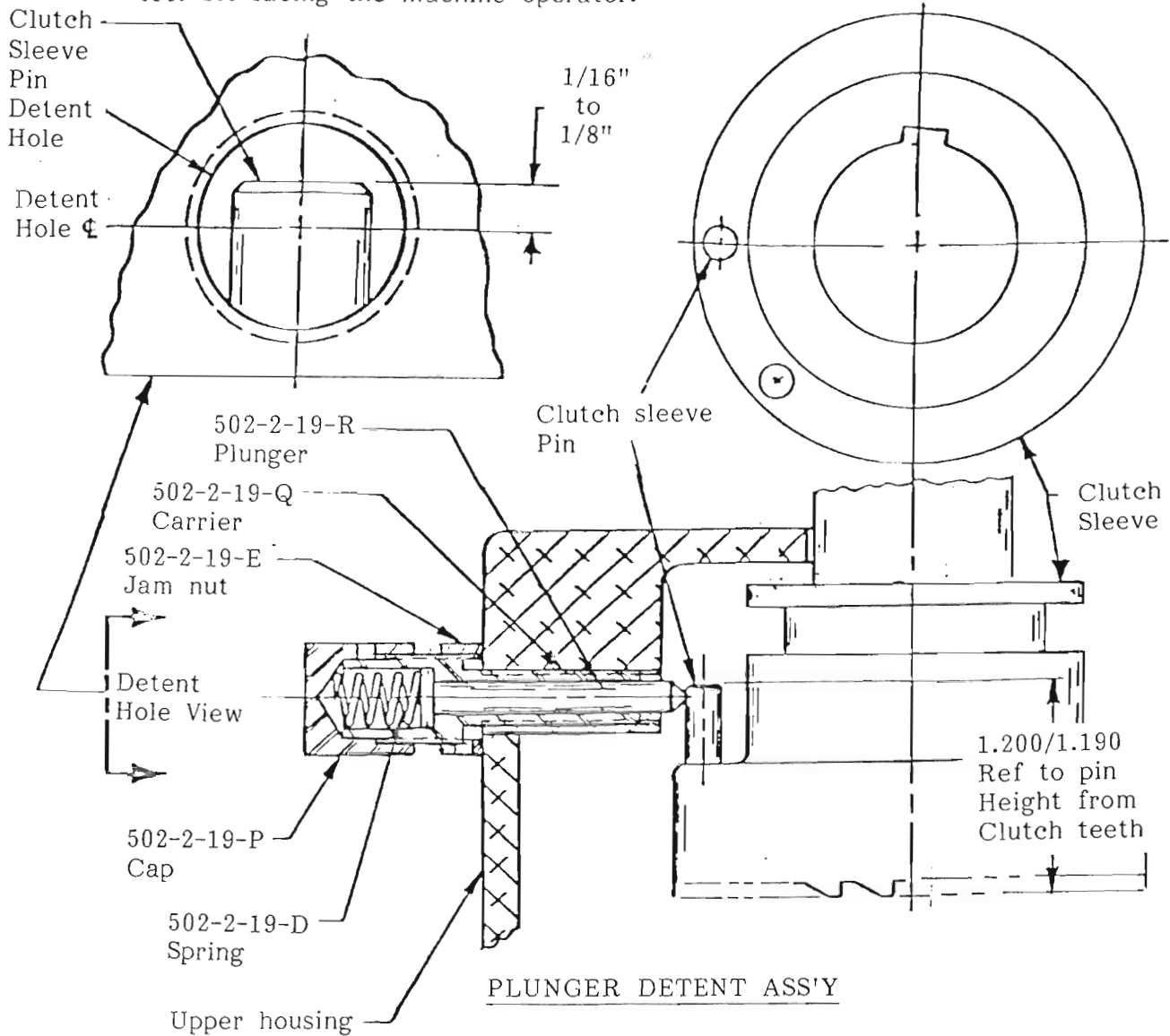
To re-adjust the spindle control lever, first loosen the stop screw lock nut, then the stop screw.

Raise the control lever to its neutral (up) position (detent pin engaged) adjust the stop screw so that the lever will not go any higher, lock with the lock nut.



SPINDLE STOP DETENT ADJUSTMENT

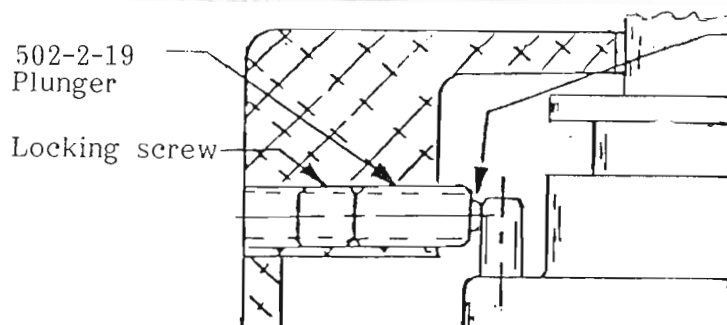
The purpose of the detent is to stop the spindle from turning with the tool bit facing the machine operator.



TO SET PLUNGER DETENT

- (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 turns beyond touch position.
- (6) Tighten jam nut against gearbox.

OLD STYLE PLUNGER DENTENT 502-2-19



DO NOT EXCEED 1/2 TURN OF DETENT FROM POINT OF CONTACT WITH CLUTCH PIN. IF EXCEEDED, THE BALL MAY DISLodge AND DAMAGE THE INTERNAL COMPONENTS.

## EXCESSIVE LOADS

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

### 1. THRUST LOADS

If the machine is fed or rapid traveled into an object that imposes an excessive thrust load on the spindle, the brass thrust nut, part number 500-41, will probably be sheared and require replacing. This accident could happen with spindle either rotating or stationary.

The effect of this will be for the machine to continue to run but with no feed or down travel working. If the machine is left in feed or down travel, drive spline will be pulled completely out of mesh, at which point the motor will continue to run but feed screw will not turn at all. For replacement of brass thrust nut, 500-41, see removal of feed sleeve and bearing.

### 2. RADIAL LOADS

If the machine has a tool in the cutter head that turns into an object, an excessive radial shock will be imposed on the spindle and will probably shear motor drive key, 500-62. This would likely happen only when spindle drive clutch is in.

The immediate effect of this will be for the motor only to run without turning any visible parts of the boring bar. A movement of the speed change lever will indicate the lower gear box is entirely inoperative. For replacement of the motor drive key, 500-62, see removal of motor field assembly.

CAUTION: DISCONNECT ALL ELECTRICAL POWER TO BORING MACHINE BEFORE MAKING ANY REPAIRS.

## REMOVAL OF MOTOR FIELD ASSEMBLY

NOTE: This is the only disassembly required to replace micarta motor drive key in cases of excessive radial load on the machine spindle.

### SECTION B-B

Remove fan shroud cover and shroud. Hold fan and unscrew diamond mounting adaptor. Remove fan, remove (4) long motor screws and lift off the motor field assembly. Be careful not to lose spring washer on top bearing, and replace properly in reassembly.

Lay blocks or shims on bottom end bell (flat surface of gear box) and pry up to remove rotor.

O F

M O T O R H O U S I N G

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

1. REMOVAL OF HAND FEED HOUSING

SECTION C-C

Remove 2 hex socket screws on bottom 500-97-2 hand feed bracket and 2 screws holding 500-96-9 plate to 500-70-1 housing. Turn out (counter-clockwise) bevel gear.

Remove 4 socket head cap screws in 500-70-1 housing. Lift out feed screw, or if upper housing is still intact, hold in rapid down lever (502-27-11), and rotate feed screw counter-clockwise until feed screw is clear of motor unit. On reassembly it may be necessary to rotate motor and feed screw. Use care in aligning spline in feed gear, to match feed-screw spline. Make sure hand-feed pinion threaded-shaft and threaded boss of feed sleeve do not jam in entering slot of motor housing.

2. REMOVAL OF FEED SLEEVE AND BEARING

NOTE: For removal of brass nut only. (This disassembly is not necessary to remove motor housing).

Remove snap ring 506-10, and press sleeve assembly, 500-73 off bearing. Back out socket set screw from brass thrust nut and screw off nut. Bearing may now be removed from shaft.

NOTE: Snap ring must be reassembled with chamfer side up.

SECTION C-C

3. REMOVAL OF MOTOR HOUSING

To remove motor housing, remove 2 side screws in the spindle base, then take out 4 bolts in housing flange.

NOTE: In reassembling, motor alignment must be checked after feed screw bearing housing is in place before flange bolts are permanently locked. Use surface plate over feed screw and spindle, when spindle and feed screw are parallel the plate will not rock.

4. MOTOR HOUSING DISASSEMBLY

To disassemble motor housing, remove speed shifter lever by removing its roll pin and set screws, then remove 2 pins and 6 screws and bottom screw in the middle of bottom gear box.

Tap lightly with mallet on motor pinion, 500-64 or 500-64-2, and feed screw drive gear, 501-20, and housing will come apart. Pinion shaft, 501-6 with clutch and gears may be tapped out with small punch through center hole in bottom of the gear box.

D I S A S S E M B L Y  
O F

UPPER HOUSING AND SPINDLE REMOVAL

DA-O ONLY

Loosen set screws in lower spindle knob, 500-17, and lift centering rod and knob assembly out of spindle.

DA-OB ONLY

Remove cutter head, loosen set screw in lower spindle knob 600-18-2, lift centering rod, draw tube, and knob assembly out of spindle.

DA

Remove 502-27-22 knob by releasing its socket set screw. Unscrew spindle clutch lever stop screw 500-30-4. Raise lever to extreme top, which will allow removal of counter-sunk screw and lever assembly. Remove cap screw to disassemble trip lever, 500-35. (CAUTION: DO NOT LOSE TRIP SPRING). Remove (6) screws holding upper housing sections together, and lift off upper lid, 500-22.

Now shifting lever, 500-38-A, may be removed along with 500-25 upper fast return gear with plunger and spring, spindle clutch (and key) 500-3. Remove ball bearing (with take up spring) 500-18, (BE SURE SPRING IS REASSEMBLED PROPERLY), sleeve gear 500-1, feed nut 500-2, thrust washer 500-15, and feed gear 500-8.

If the bar is in a vertical spindle position, we suggest you place something under the spindle nose to prevent inner spindle from falling out and then remove 500-5, spindle nut. Nut can be started off through adjusting access hole and then hand turned. Now drive gear assembly 500-6, may be worked off along with 500-4 spacer, and woodruff key. Inner spindle may now be removed.

CAUTION: Lubrication will run out when spindle is removed.

Two hex cap screws in upper housing should be removed and housing may be driven off spindle. Heat on housing will simplify removal of this sweat fit.

Lift upper housing off of feed screw.

Nut should be removed from 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 seal.

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

Extreme care should be taken when removing long gear out of seal or 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 garter spring from snapping out.

### COMMON CAUSES OF TROUBLE

(Poor finish, inaccurate holes, excessive tool bit heat, excessive tool-drag 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 that 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, (502-2-43). The result of this would be to encounter spindle chatter at bottom of bore, particularly on long bores.

Clean the inside of this assembly 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. Chipping may happen if R1 tool bits are used on interrupted cuts.

A loose outer spindle bearing can result in taper or inaccurate bores, and can allow spindle to drop slack in feed nut, resulting in marks in the cylinder.

### CUTTING TOOL DRAG-BACK LINES

Standard 'F' and '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.

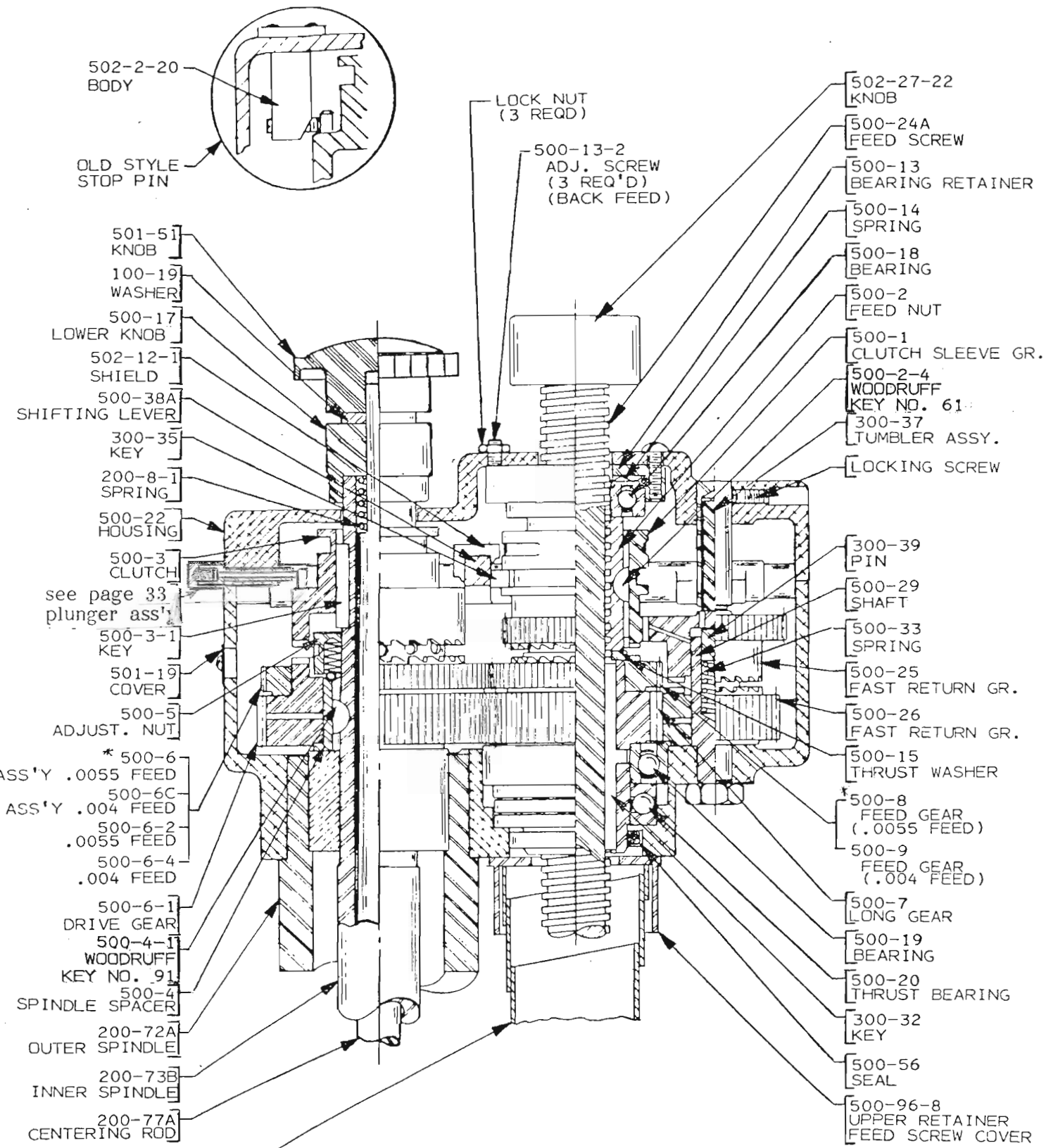
It is common for machines to make a faint withdrawal mark particularly at the bottom of the cylinder. Very light honing (.0005") should remove all traces of the mark.

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 rake will cause drag-back particularly on stub boring heads.
2. Check inner spindle bearing adjustment in accordance with manual.
3. Check outer spindle bearing adjustment in accordance with manual. A slightly heavier drag on the 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 reseal the bearing for better up-stroke relief.





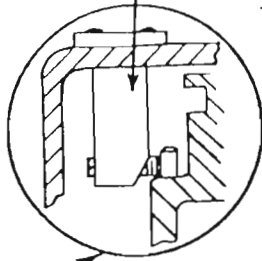
SECTION A - A

UPPER HOUSING

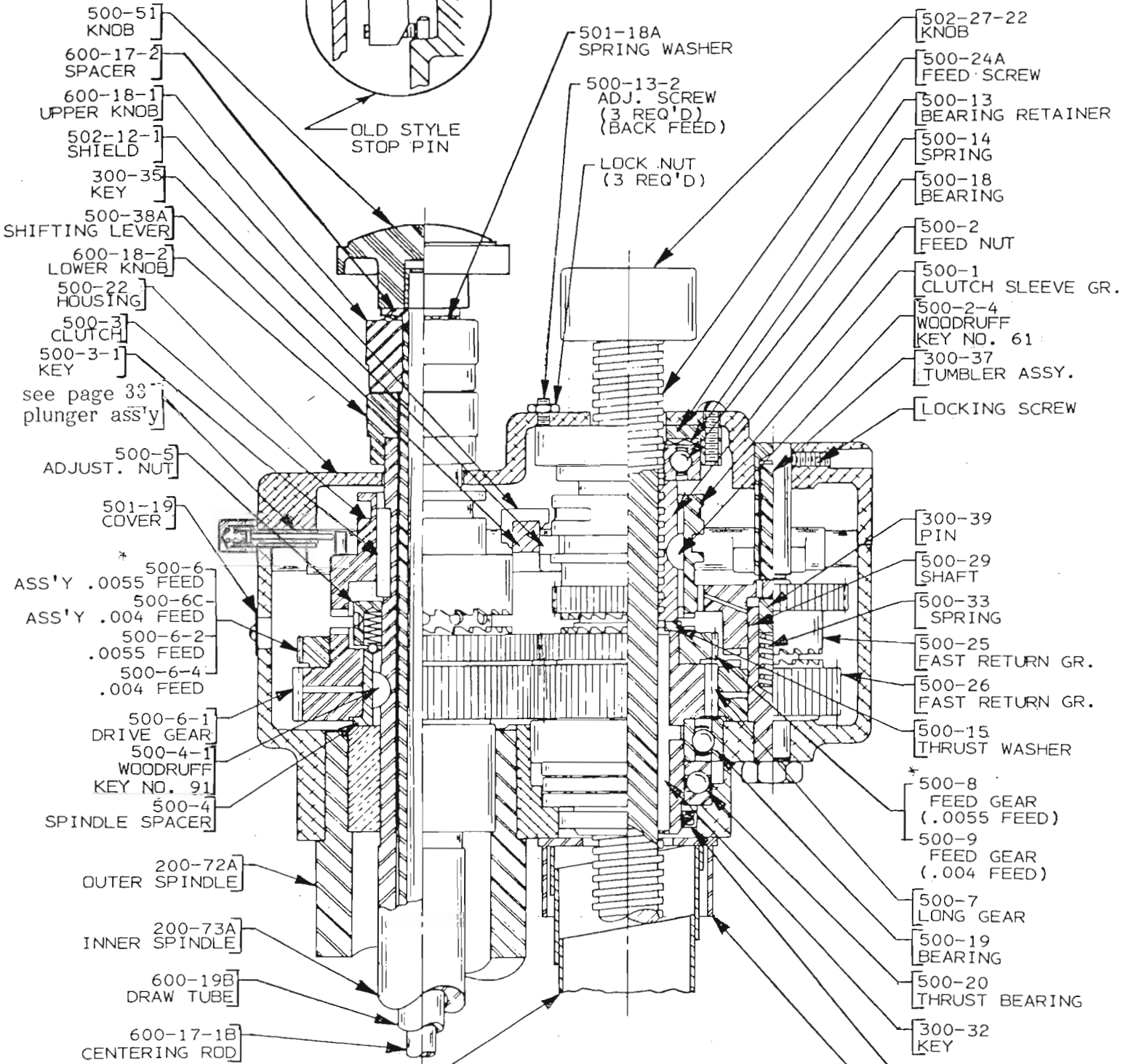
\*Standard feed gears  
.0055 optional feed  
gears .004

DA-O  
only

502-2-20  
BODY



OLD STYLE  
STOP PIN



- 500-51 KNOB
- 600-17-2 SPACER
- 600-18-1 UPPER KNOB
- 502-12-1 SHIELD
- 300-35 KEY
- 500-38A SHIFTING LEVER
- 600-18-2 LOWER KNOB
- 500-22 HOUSING
- 500-3 CLUTCH
- 500-3-1 KEY
- see page 33  
plunger ass'y
- 500-5 ADJUST. NUT
- 501-19 COVER
- \* 500-6 ASS'Y .0055 FEED
- 500-6C ASS'Y .004 FEED
- 500-6-2 .0055 FEED
- 500-6-4 .004 FEED
- 500-6-1 DRIVE GEAR
- 500-4-1 WOODRUFF KEY NO. 91
- 500-4 SPINDLE SPACER
- 200-72A OUTER SPINDLE
- 200-73A INNER SPINDLE
- 600-19B DRAW TUBE
- 600-17-1B CENTERING ROD

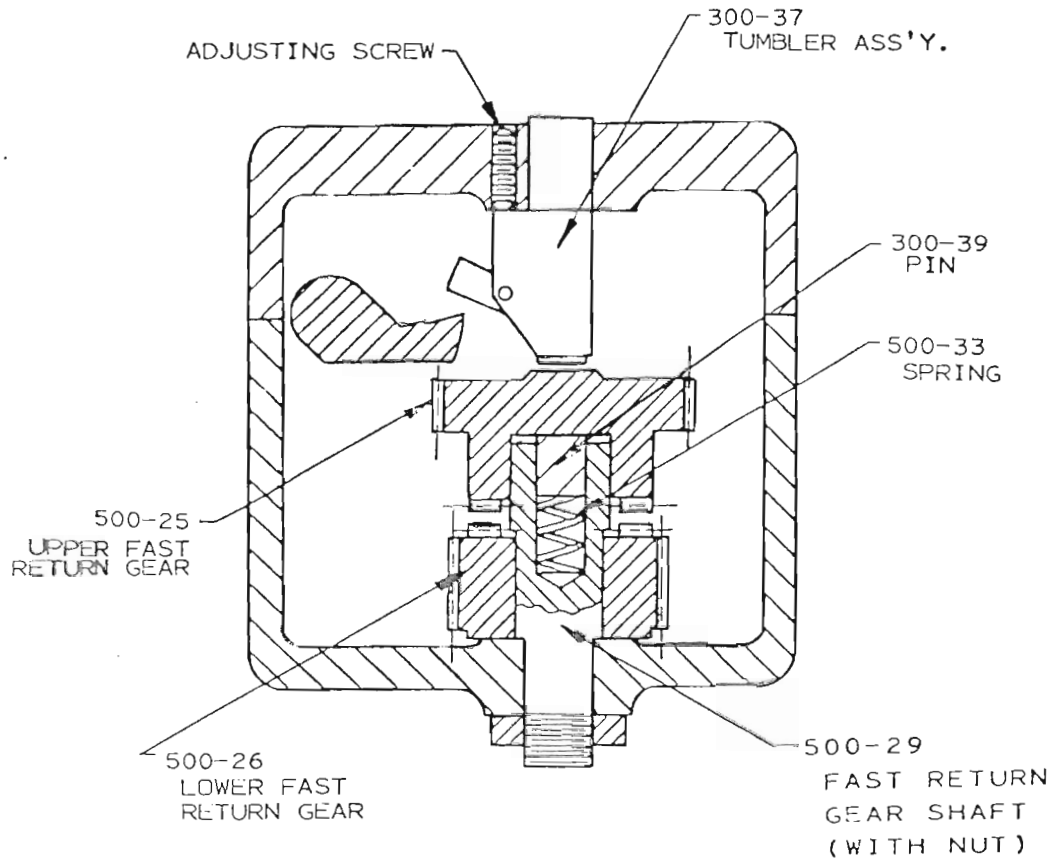
- 501-18A SPRING WASHER
- 500-13-2 ADJ. SCREW (3 REQ'D) (BACK FEED)
- LOCK NUT (3 REQ'D)
- 502-27-22 KNOB
- 500-24A FEED SCREW
- 500-13 BEARING RETAINER
- 500-14 SPRING
- 500-18 BEARING
- 500-2 FEED NUT
- 500-1 CLUTCH SLEEVE GR.
- 500-2-4 WOODRUFF KEY NO. 61
- 300-37 TUMBLER ASSY.
- LOCKING SCREW
- 300-39 PIN
- 500-29 SHAFT
- 500-33 SPRING
- 500-25 FAST RETURN GR.
- 500-26 FAST RETURN GR.
- 500-15 THRUST WASHER
- \* 500-8 FEED GEAR (.0055 FEED)
- 500-9 FEED GEAR (.004 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

SECTION A - A

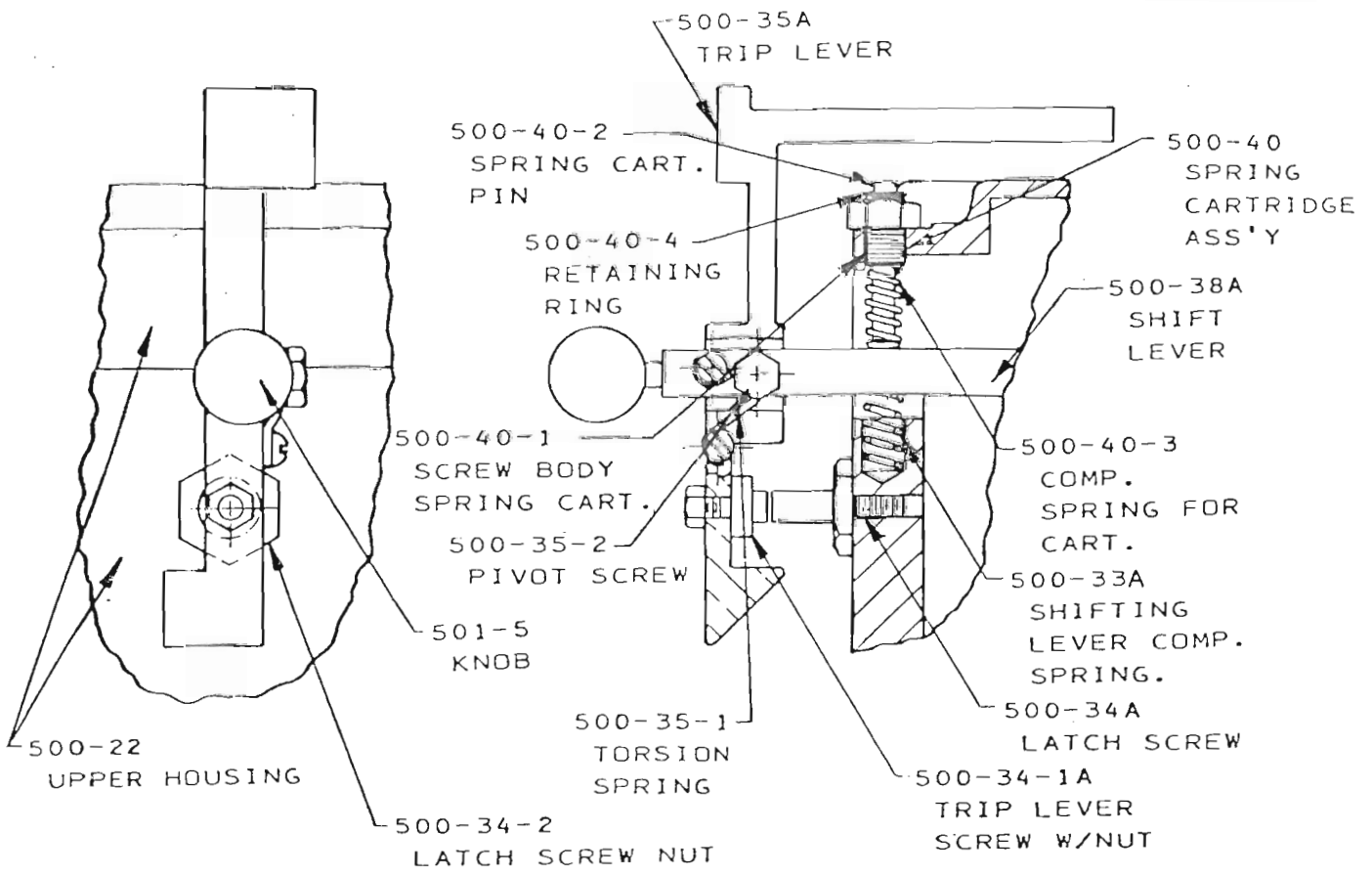
UPPER HOUSING

\*Standard feed gears  
.0055 optional feed  
gears .004

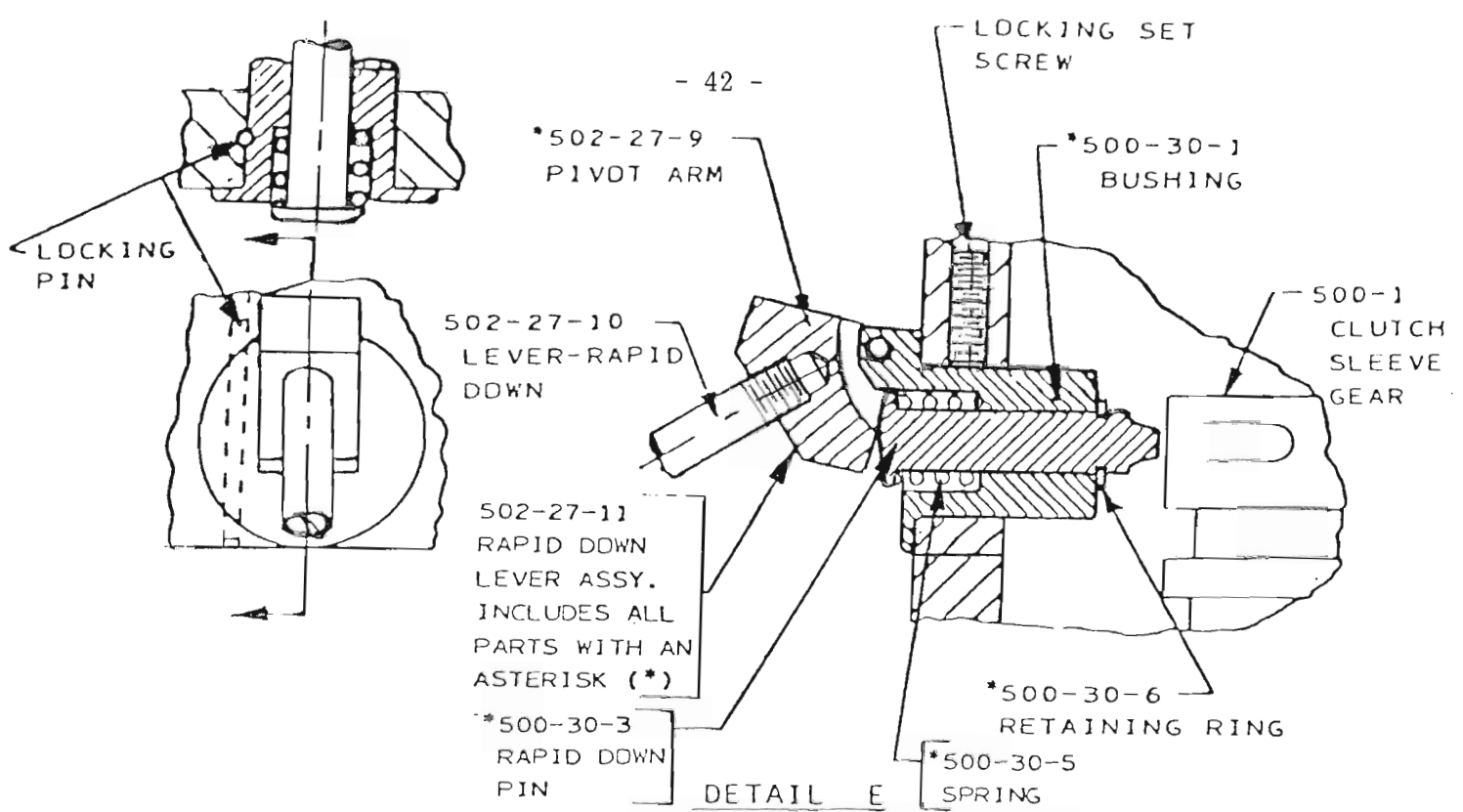
DA-OB  
only



SECTION D-D

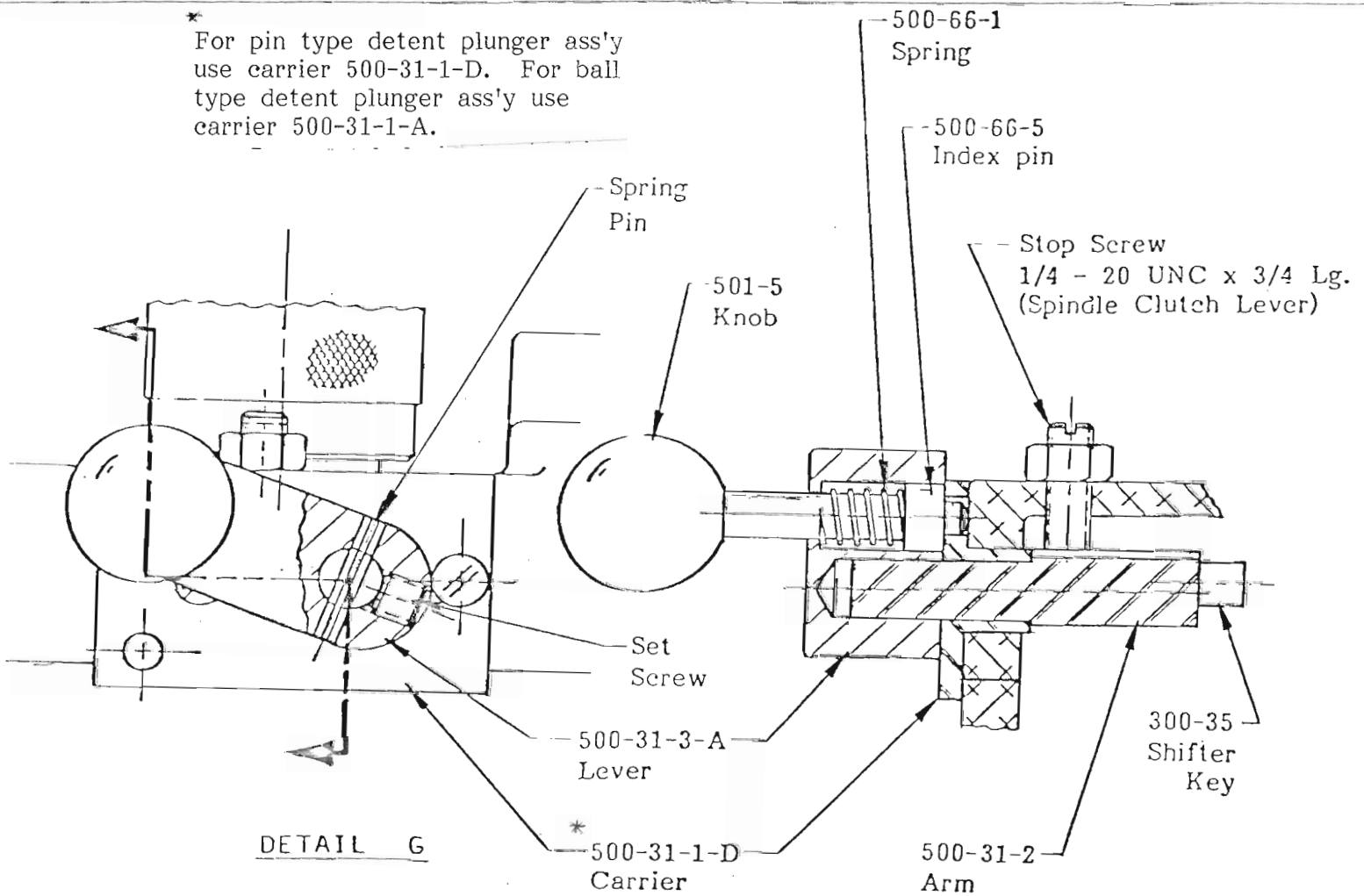


DETAIL F  
(FEED LEVER)

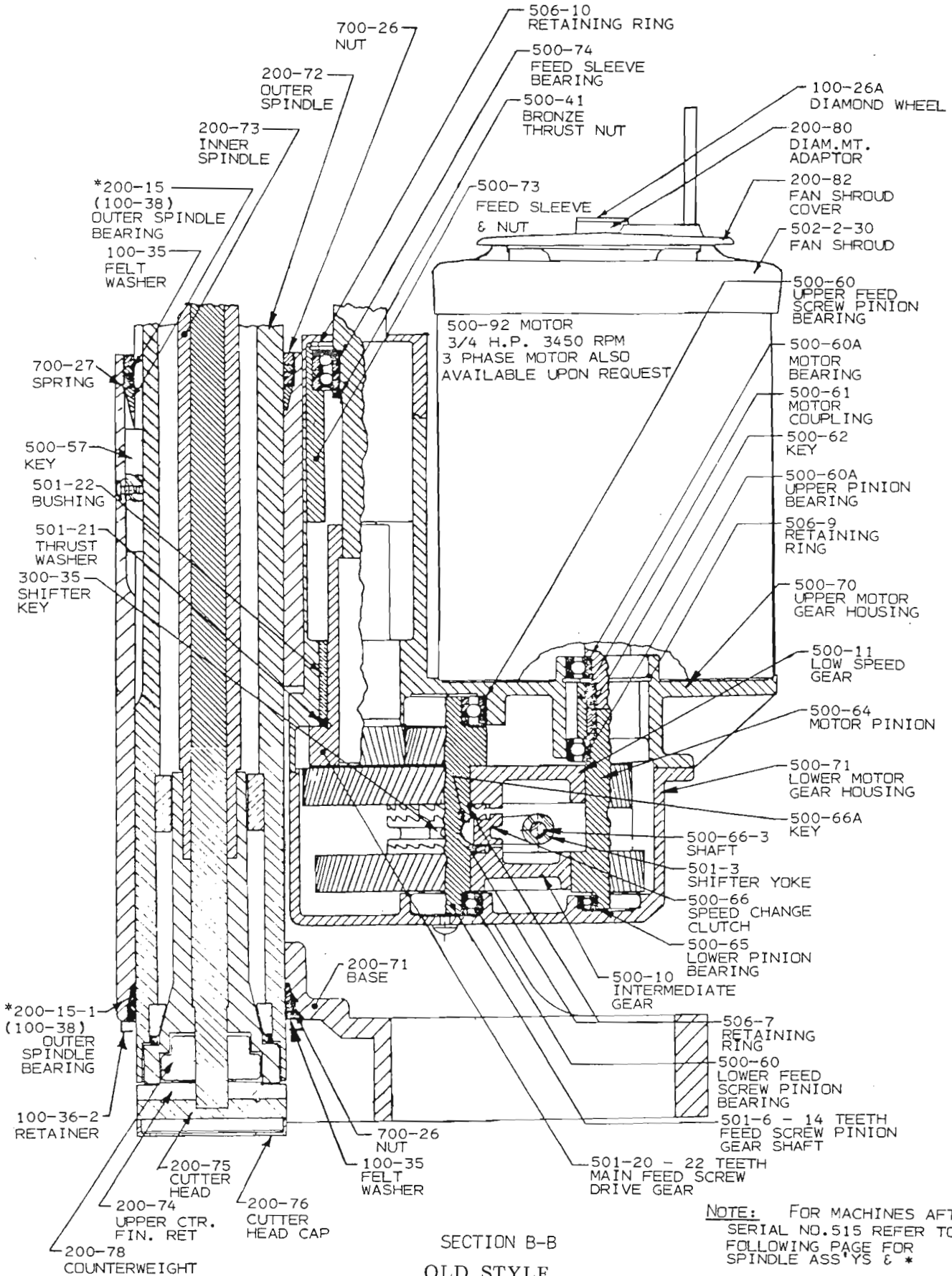


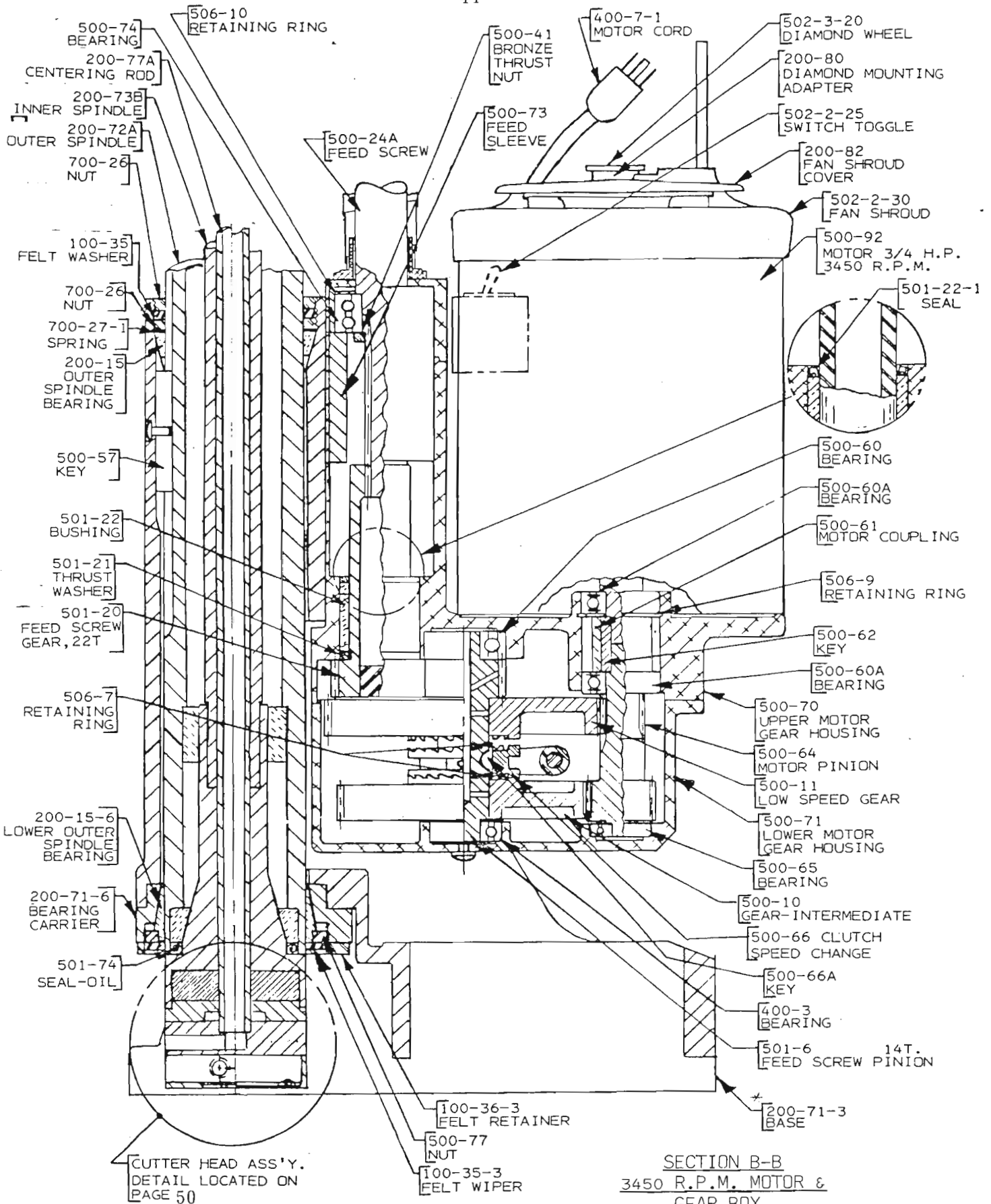
FAST DOWN LEVER

\* For pin type detent plunger ass'y use carrier 500-31-1-D. For ball type detent plunger ass'y use carrier 500-31-1-A.

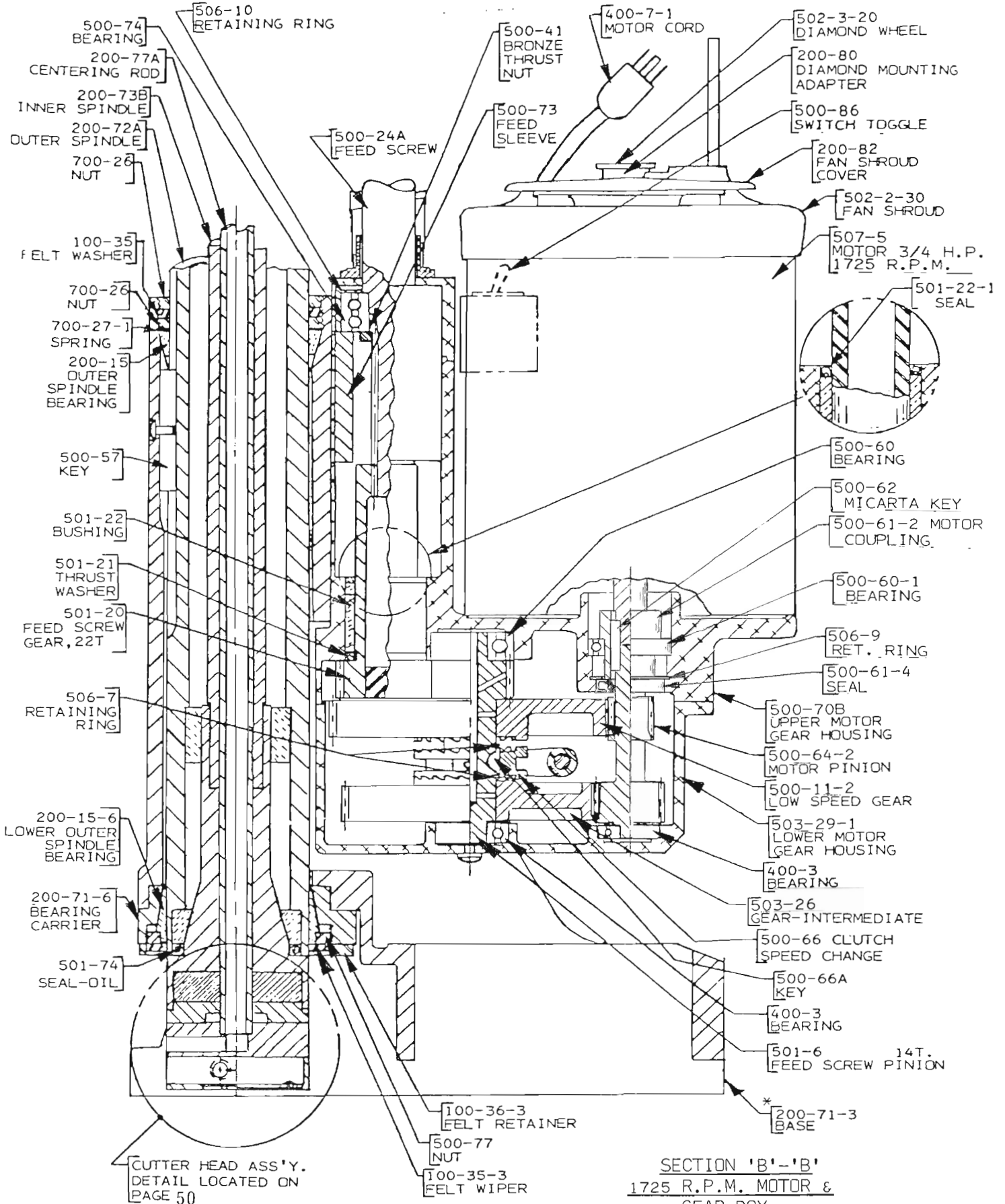


SPINDLE CLUTCH CONTROL





\* NOTE-  
THIS TYPE SPINDLE BASE  
USE ON BARS #923 & UP

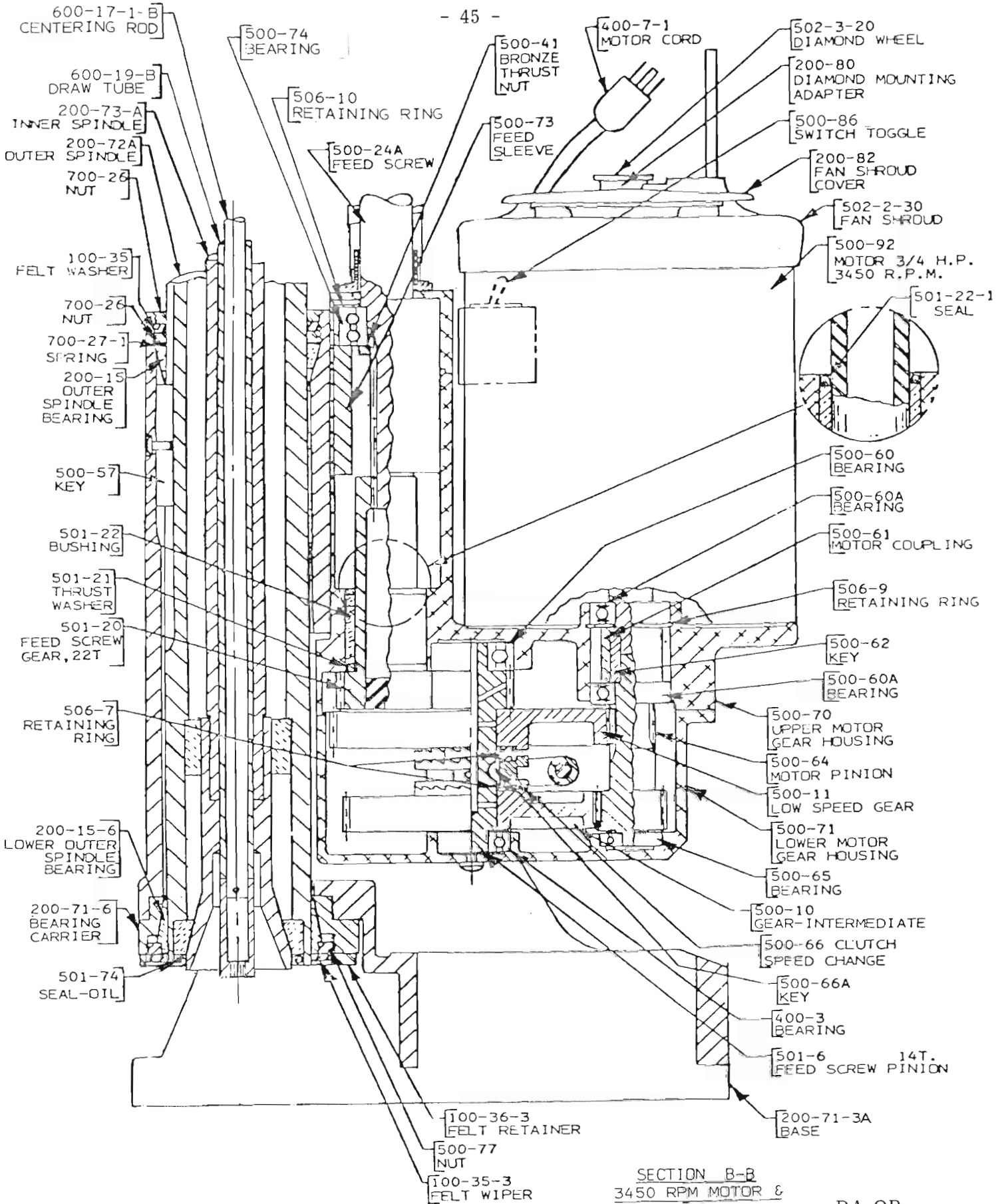


SECTION 'B'-'B'  
1725 R.P.M. MOTOR &  
GEAR BOX

VARY WITH MOTOR  
NAMEPLATE.

DA-0 SHOWN (FOR DA-0B STYLE SEE PAGE 45A).

\* NOTE-  
THIS TYPE SPINDLE BASE  
USE ON BARS #923 & UP

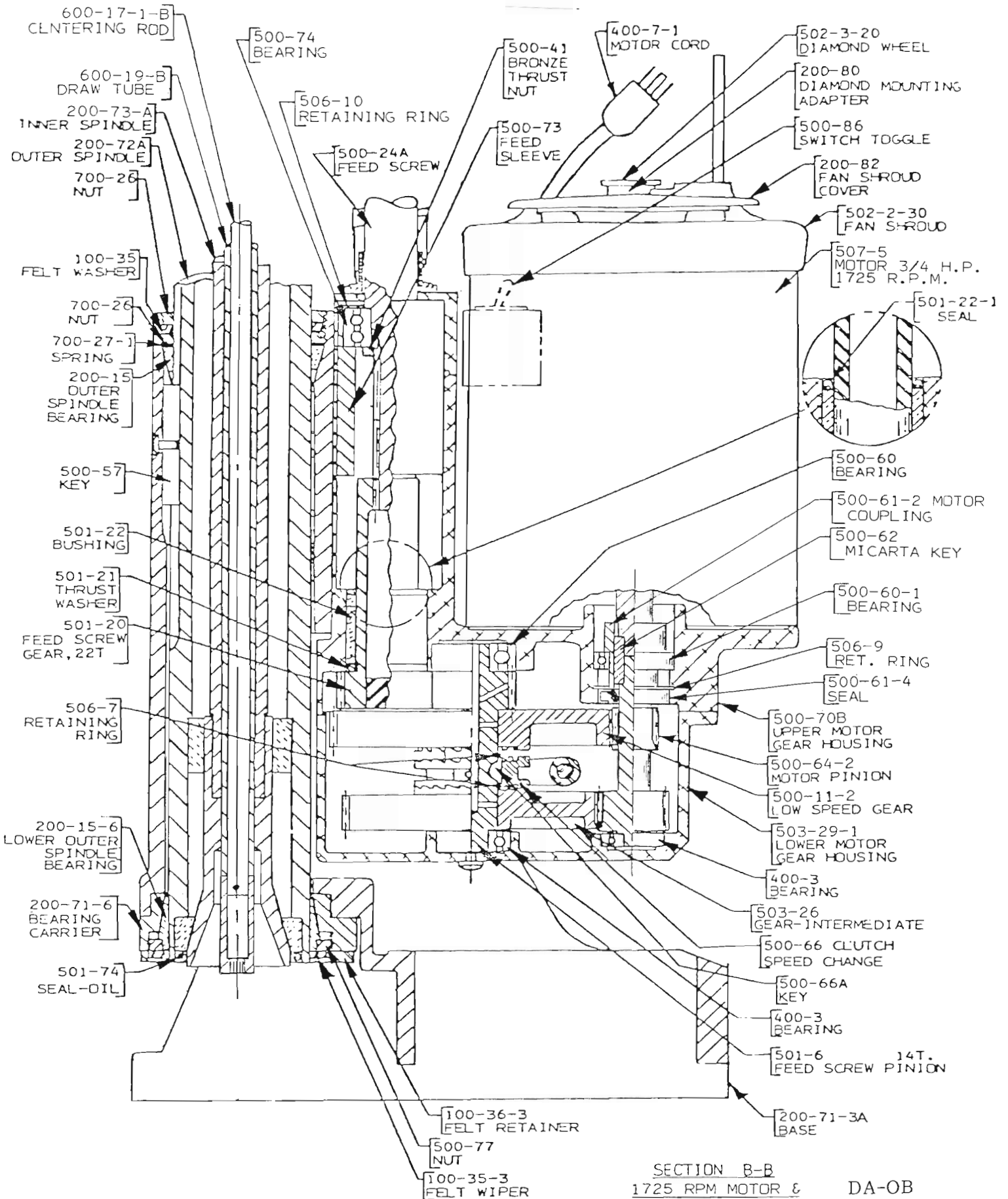


SECTION B-B  
 3450 RPM MOTOR &  
 GEAR BOX

DA-OB  
 only

VERIFY WITH  
 MOTOR NAMEPLATE.

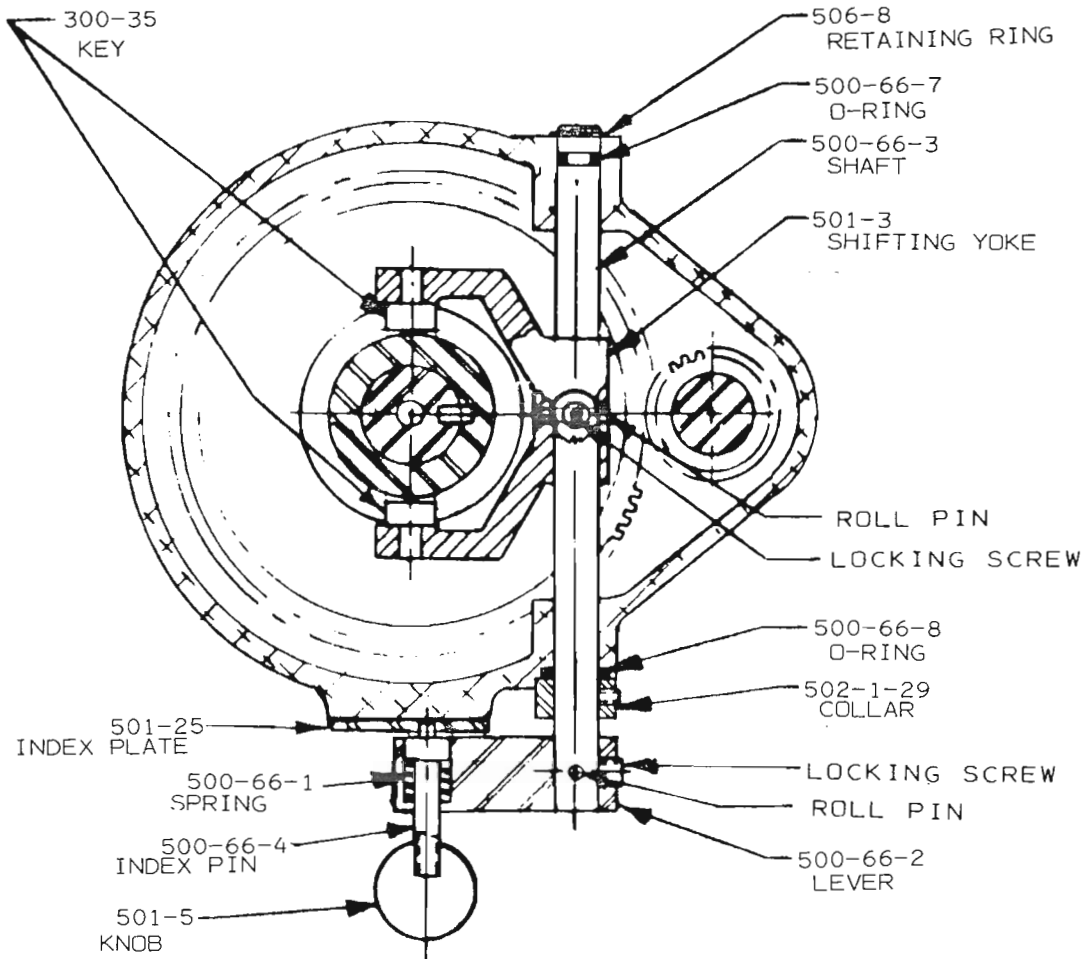




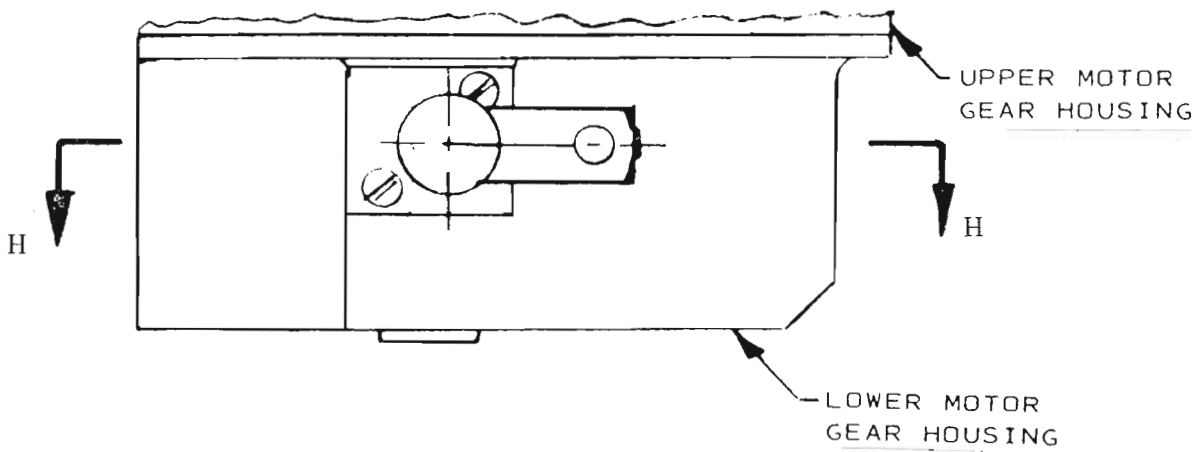
SECTION B-B  
 1725 RPM MOTOR &  
 GEAR BOX

DA-OB  
 only

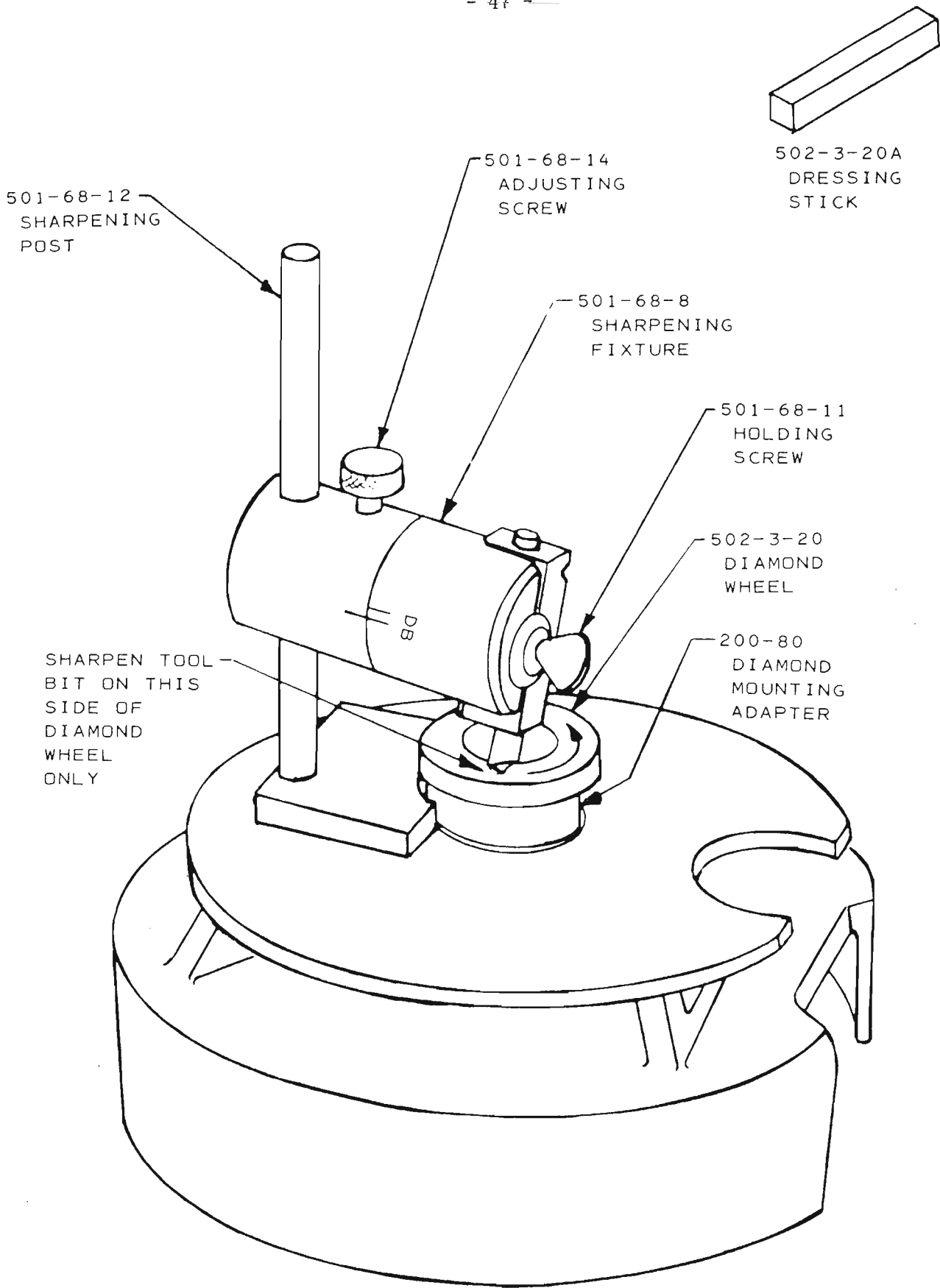
VERIFY WITH  
 MOTOR NAMEPLATE.



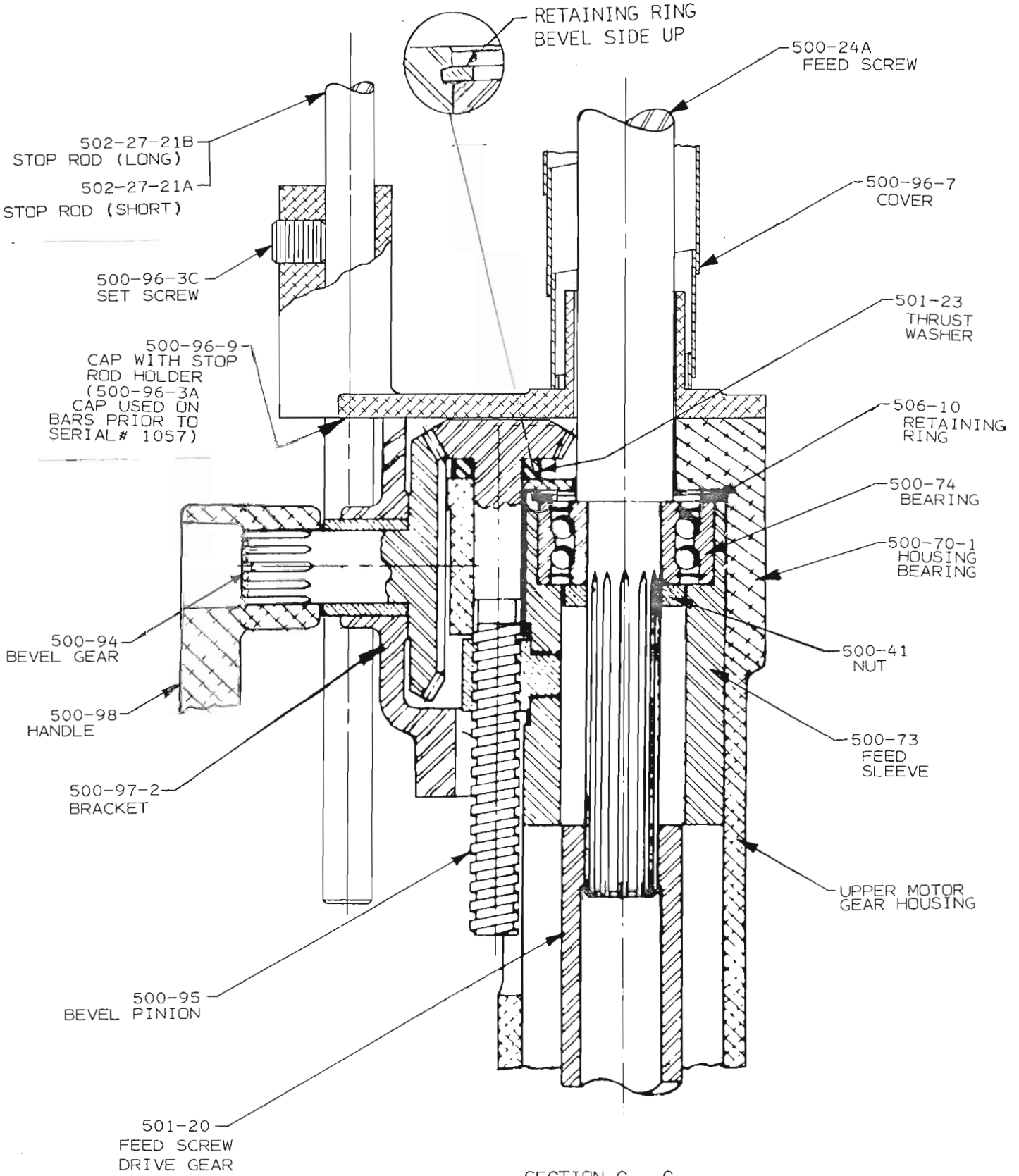
SECTION H-H



SPEED CONTROL  
LOWER MOTOR HOUSING



TOOL BIT SHARPENING

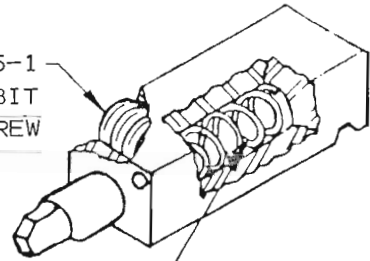


SECTION C - C

HAND FEED

NOTE: USE WITH  
MICROMETER ASS'Y  
900-2-1

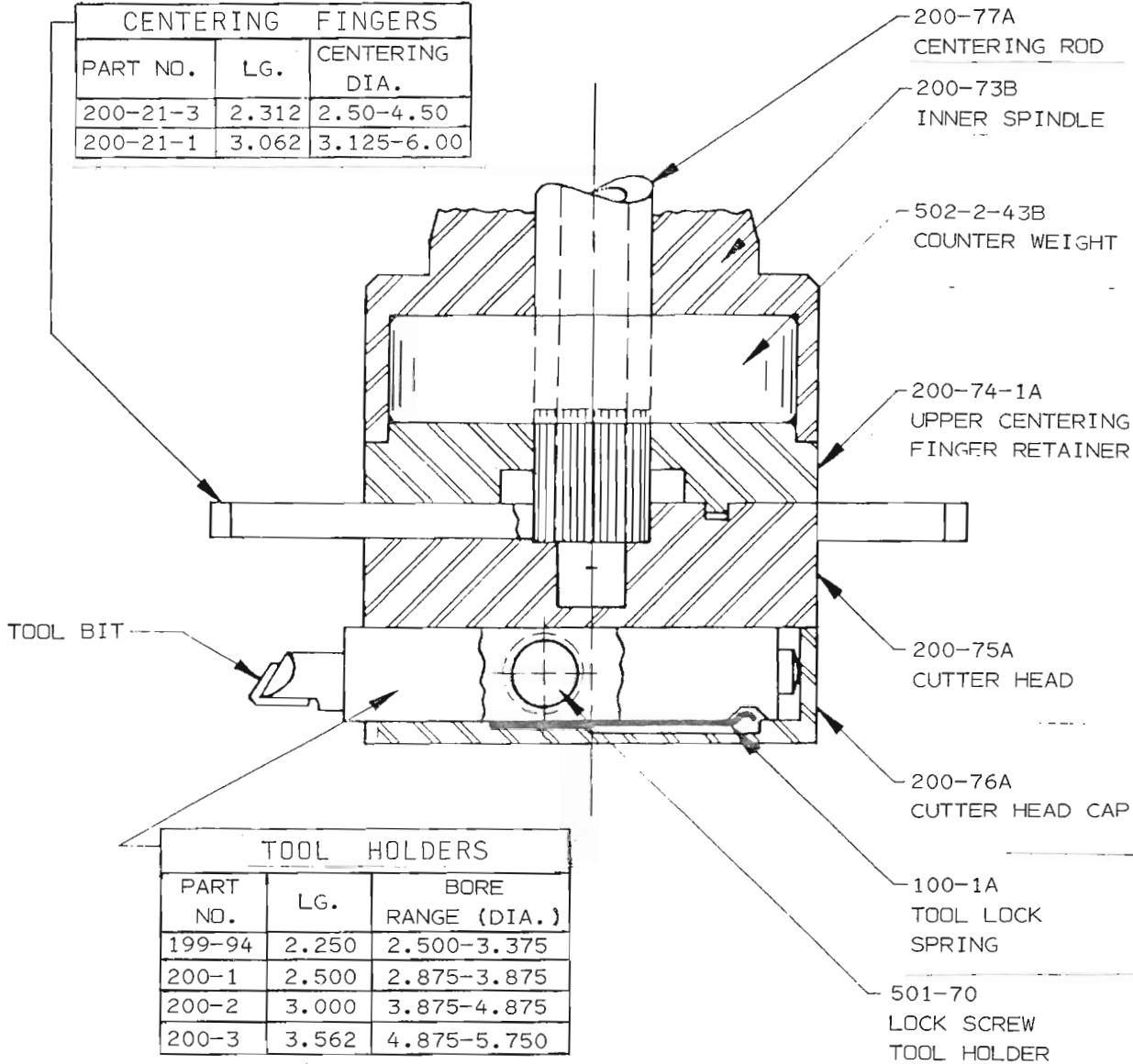
502-25-1  
TOOL BIT  
LOCKING SCREW



200-1-6C (1 7/16)  
200-1-6D (3/4)  
SPRING TOOL BIT

TOOL HOLDER  
(DA STYLE)

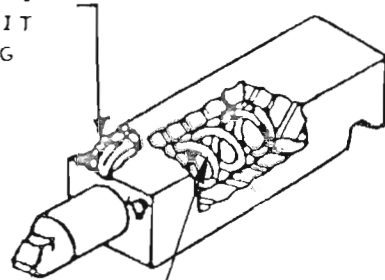
CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-21-3	2.312	2.50-4.50
200-21-1	3.062	3.125-6.00



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

NOTE: USE WITH  
MICROMETER ASS'Y  
900-2-1

502-25-1  
TOOL BIT  
LOCKING  
SCREW



200-1-6C (1-7/16)  
200-1-6D (3/4)  
SPRING  
TOOL BIT

TOOL HOLDER  
(DA STYLE)

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

502-8-21  
KEY

502-2-44A  
CENTERING PINION

200-74-2  
SHANK

502-2-43  
COUNTER  
WEIGHT

200-74-1  
UPPER  
CENTERING  
FINGER  
RETAINER

200-75B  
CUTTER  
HEAD

200-76A  
CUTTER  
HEAD  
CAP

100-1A  
TOOL  
LOCK  
SPRING

501-70  
LOCK SCREW  
TOOL HOLDER

TOOL  
BIT

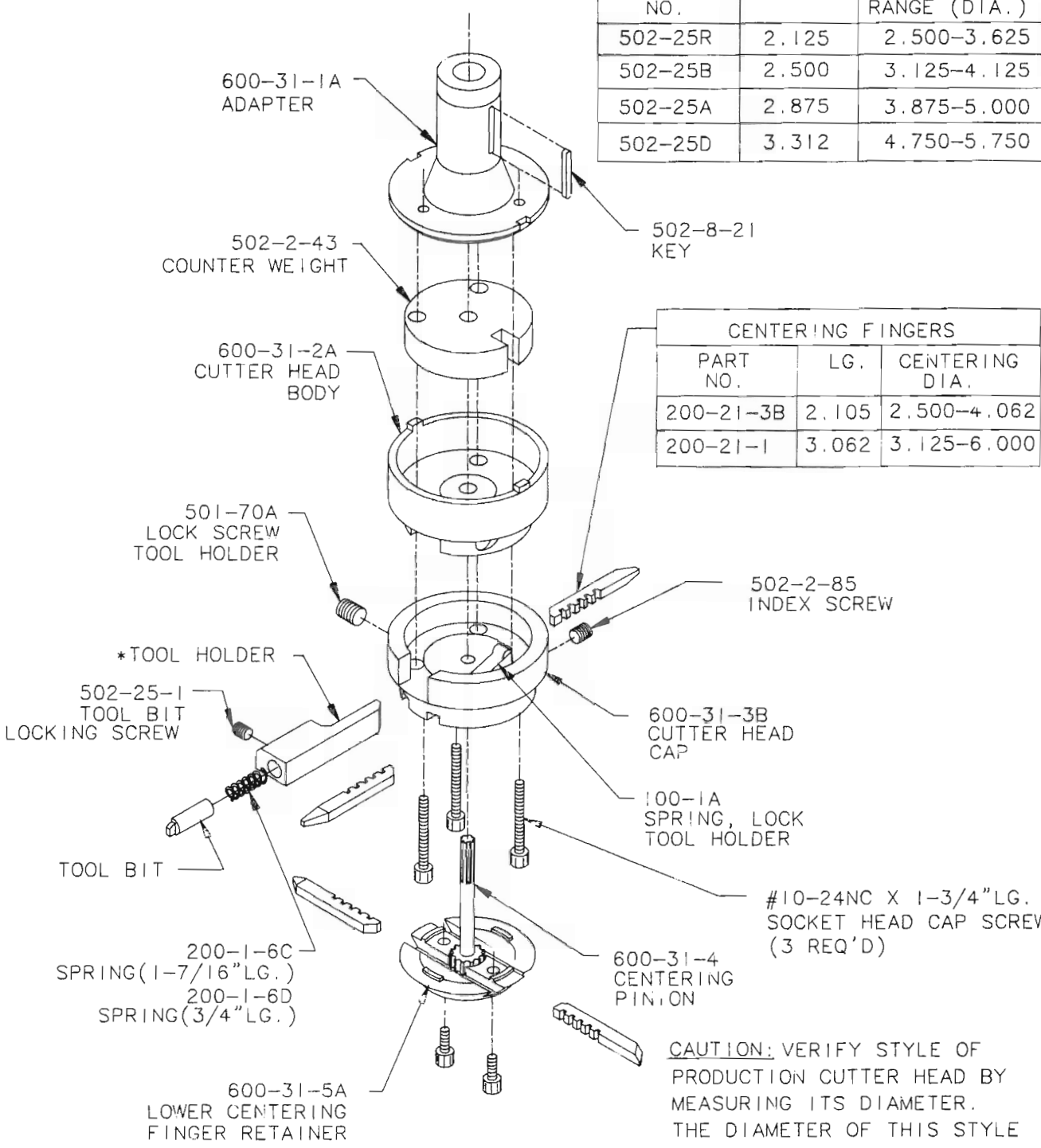
TOOL HOLDERS		
PART NO.	LG.	BORE RANGE (DIA.)
199-94	2.250	2.500 - 3.375
200-1	2.500	2.875 - 3.875
200-2	3.000	3.875 - 4.875
200-3	3.562	4.875 - 5.750

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

DA-OB  
ONLY

NOTE: USE WITH MICROMETER  
ASS'Y 900-2-16

*TOOL HOLDERS		
PART NO.	LG.	BORE RANGE (DIA.)
502-25R	2.125	2.500-3.625
502-25B	2.500	3.125-4.125
502-25A	2.875	3.875-5.000
502-25D	3.312	4.750-5.750



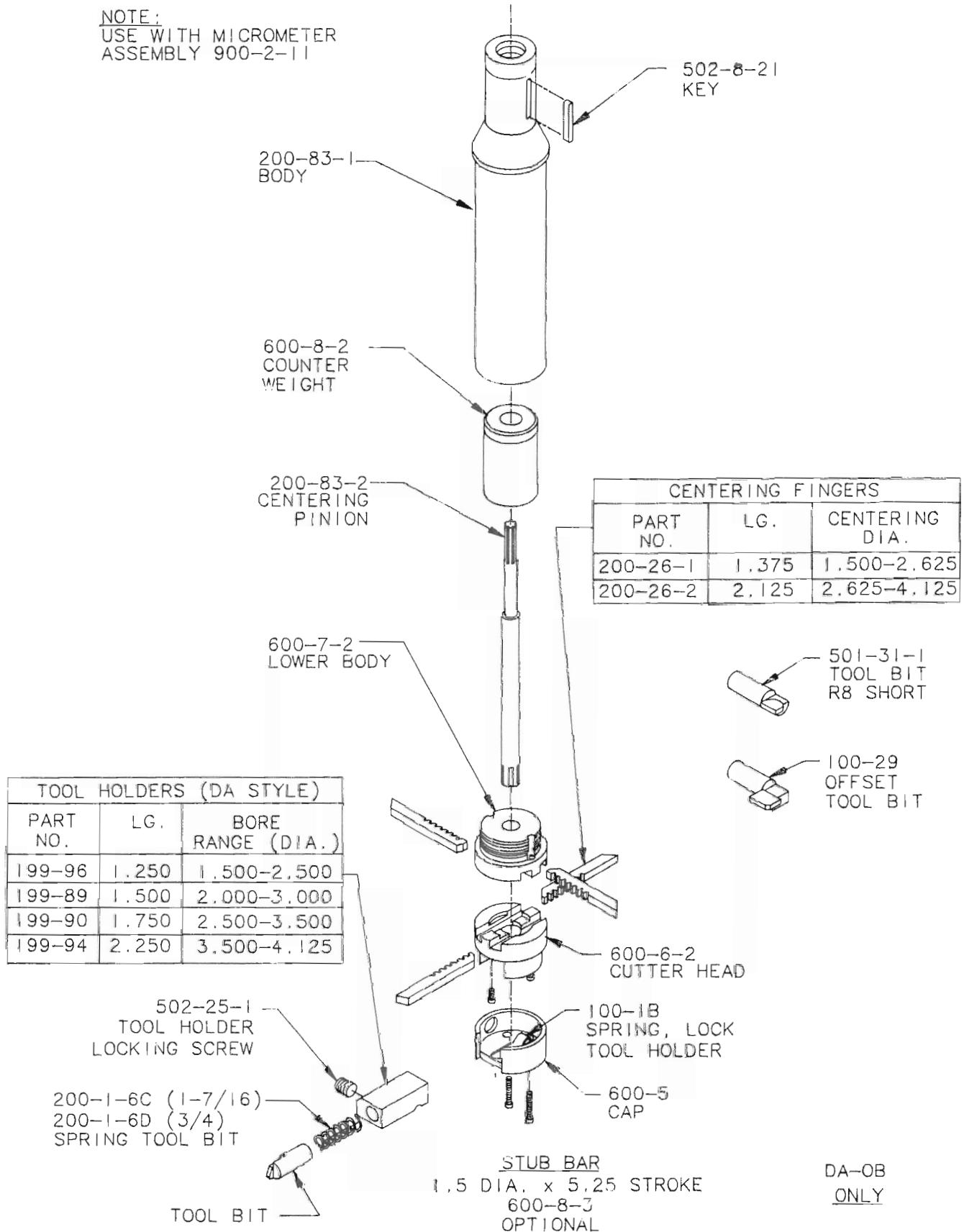
CENTERING FINGERS		
PART NO.	LG.	CENTERING DIA.
200-21-3B	2.105	2.500-4.062
200-21-1	3.062	3.125-6.000

CAUTION: VERIFY STYLE OF PRODUCTION CUTTER HEAD BY MEASURING ITS DIAMETER. THE DIAMETER OF THIS STYLE CUTTER HEAD SHOULD BE 2.5 DIA.

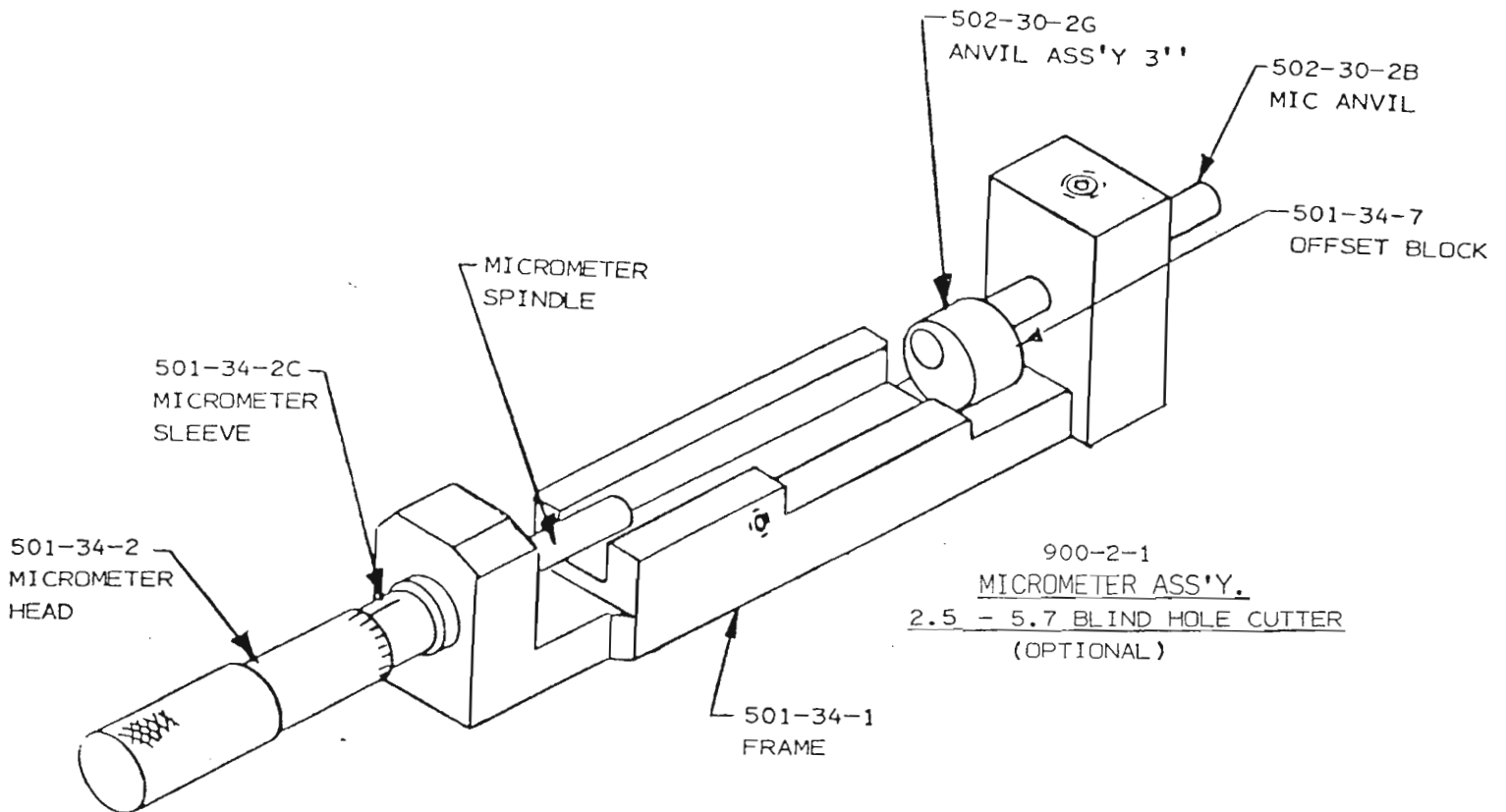
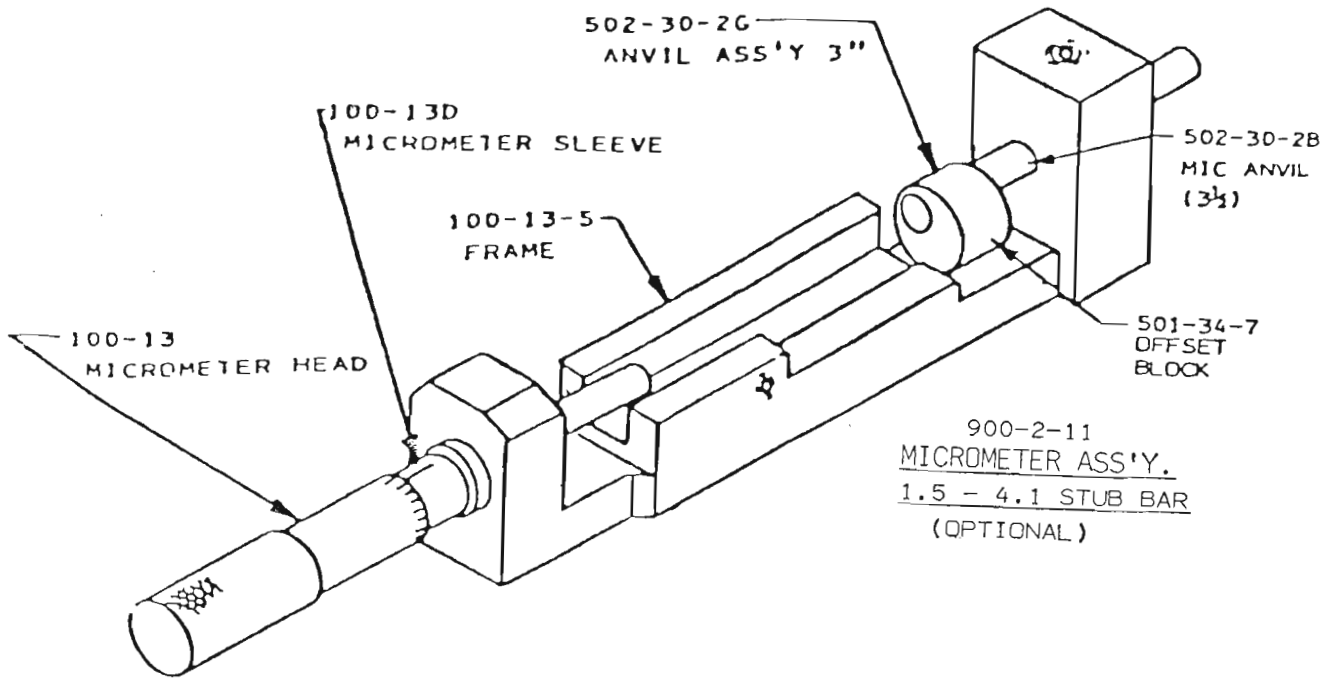
2.5 PRODUCTION CUTTER HEAD  
600-8-9  
OPTIONAL

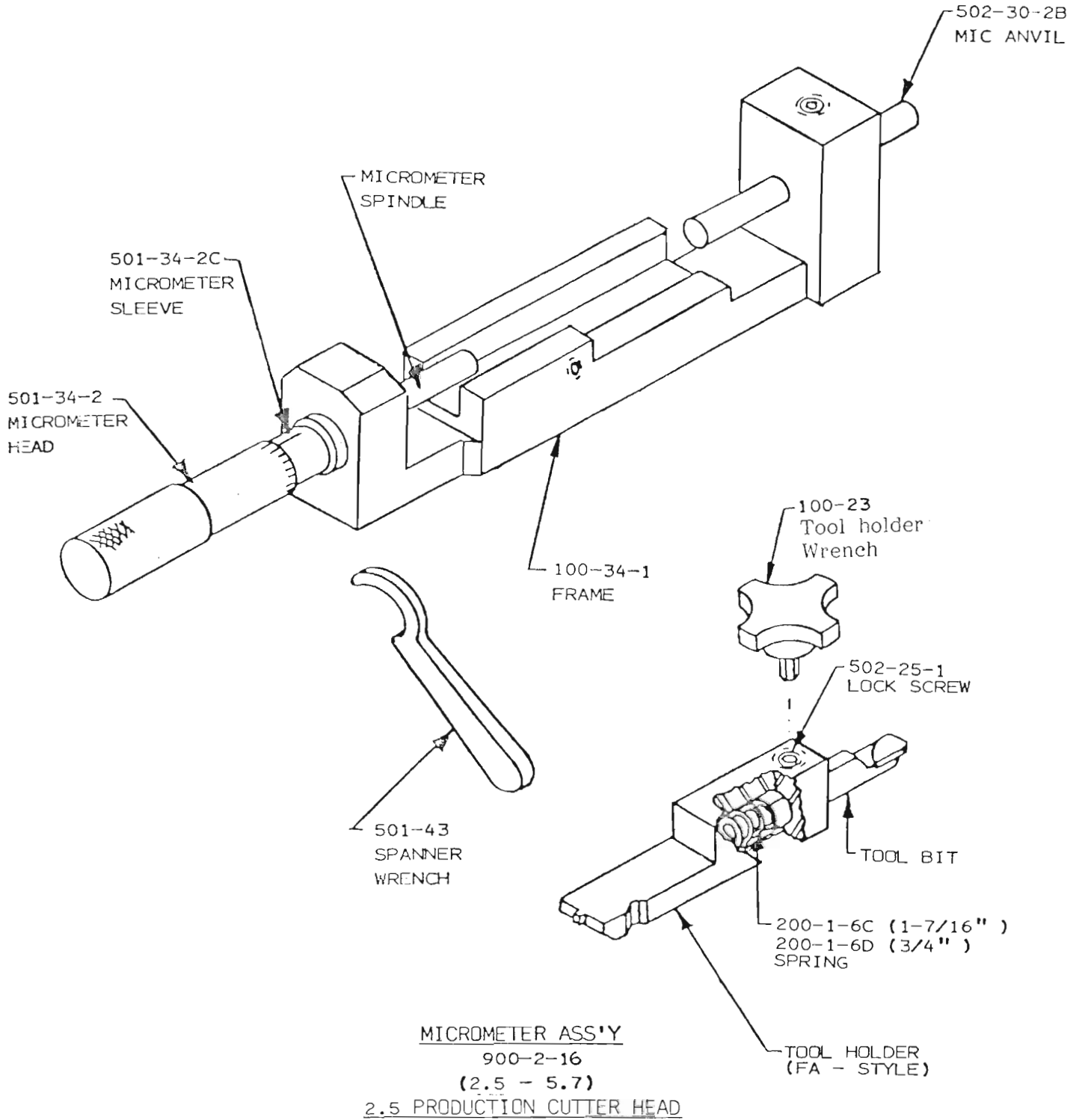
DA-OB  
ONLY

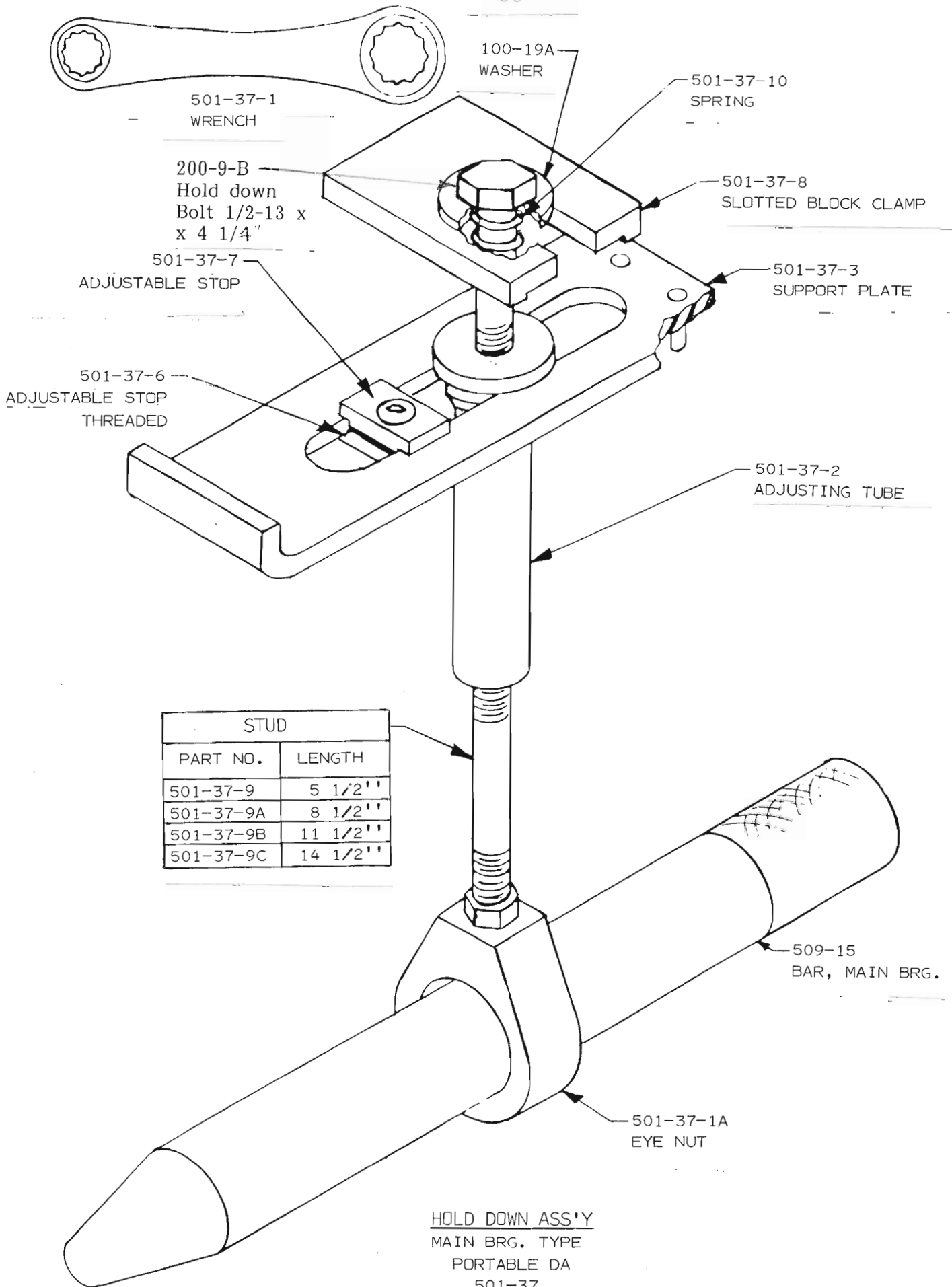
NOTE:  
USE WITH MICROMETER  
ASSEMBLY 900-2-11











HOLD DOWN ASS'Y  
 MAIN BRG. TYPE  
 PORTABLE DA  
 501-37

Optional

HOLD DOWN ASSEMBLY CYLINDER TYPE

OPTIONAL

Insert the proper size wing in the hold down clamp for the diameter of cylinder and adjust hold down length so that the anchoring screw will have at least 3/8" length of thread holding. Before placing bar on block, reach through cylinder and make sure there is an adequate square surface where you intend to set hold down. Beware of fillets and chamfers around clamping area. In blocks which have relief for connecting rod clearance the hold down lug will most often straddle the relief with adequate holding surface on each corner. It is convenient to insert one of the bolts in the hold down to hold it while expanding the wing with the T wrench. Excessive tightening will result in distortion of bore and marks in finished cylinders. In many blocks it is possible to utilize the stud holes to anchor the bar.

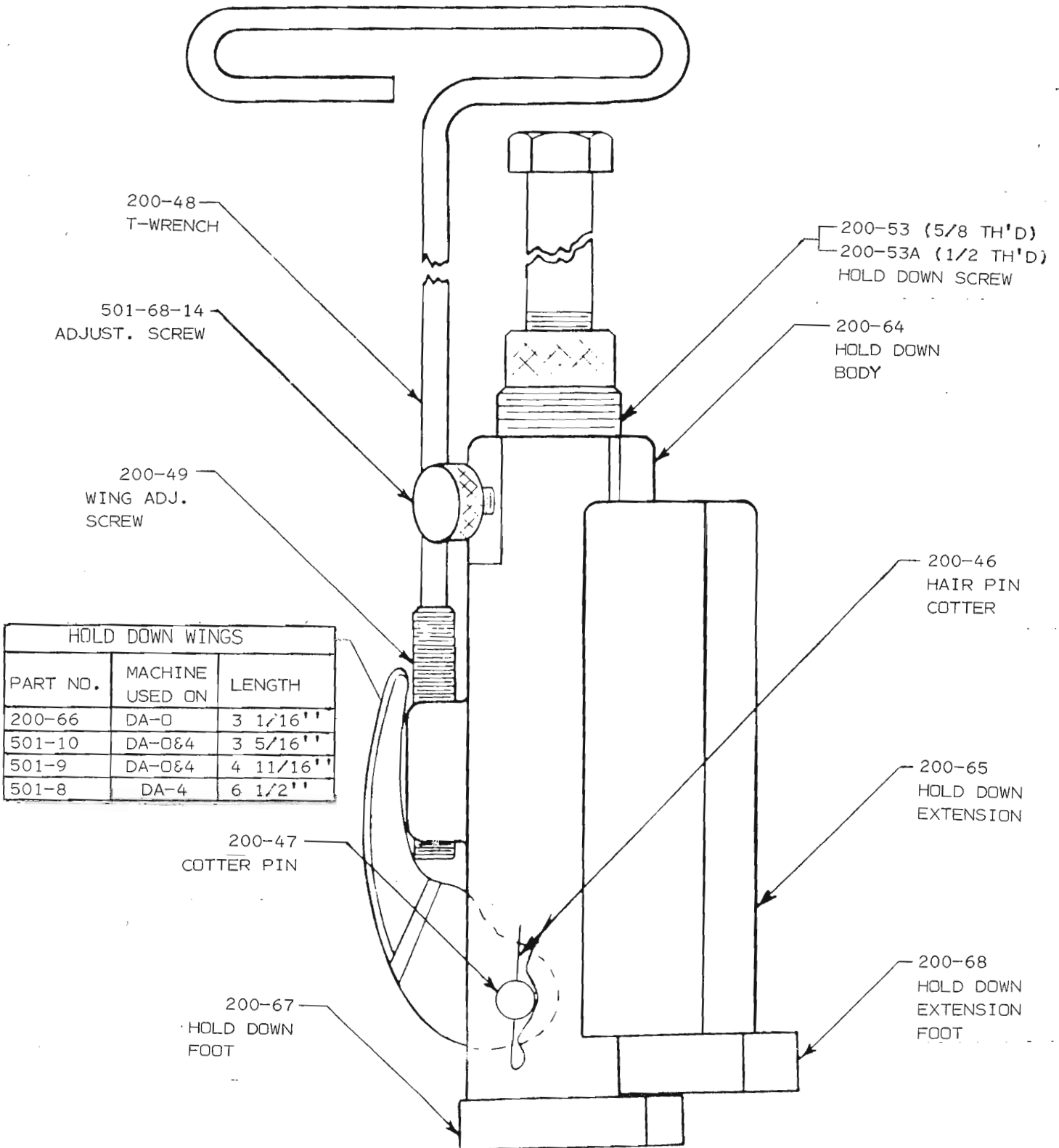
In any event, attempt to set the hold down device so the boring bar can be pivoted to bore adjacent cylinders on either side and with the hold down bolt in as close to spindle as practical.

Check also to make sure there is good contact on boring bar base and block on all sides of hold down. If this is questionable, particularly on long industrial jobs, it is advisable to use additional clamps after centering bar such as milling machine type clamps on the steps of the base.

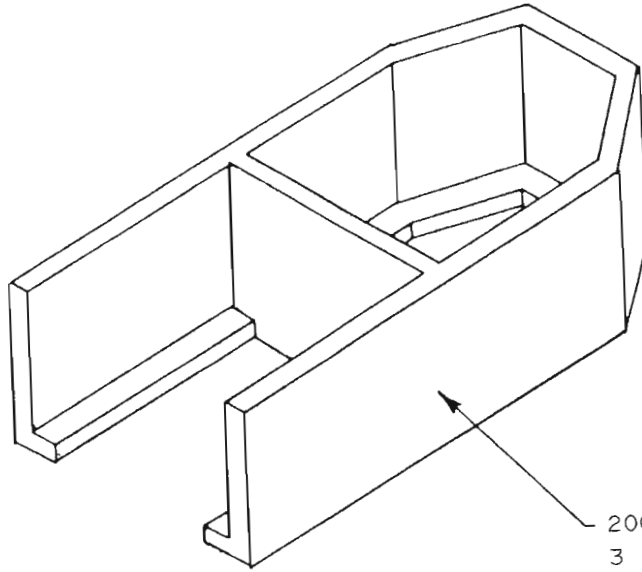
Place the bar with spindle over the hole to be bored and insert the bolt in the hold down without tightening. Check to make sure tool holder is not in bar and centering fingers are not extended.

Start motor and rapin travel bar into cylinder for centering. As a safety precaution always stop motor so it is impossible to inadvertently engage spindle rotation. It is usually desirable to locate fingers just under the ring wear ridge. Bear in mind that no. 2 and 4 centering fingers are slightly higher than others and must be under the ridge. The best method of centering when little stock is left for clean up is to rotate spindle with top knob so that 2 fingers straddle the greatest wear under the ridge. These wear pockets generally occur in line with the block.

After locating fingers properly, extend them by turning top centering knob and exert tension on the knob while tightening hold down bolt. Do not over tighten. Approximately 25 lbs. tension on 3" wrench is adequate for light to medium cuts. Before tightening hold down bolt it is advisable to rock bar slightly to make sure fingers are making positive contact with cylinder wall. Retract fingers into head, start motor, and return bar to up position by latching feed lever in up position.



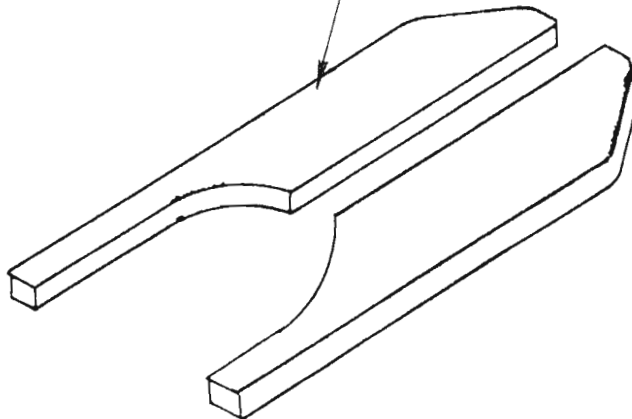
DA-0 HOLDDOWN ASSEMBLY  
CYLINDER TYPE  
OPTIONAL

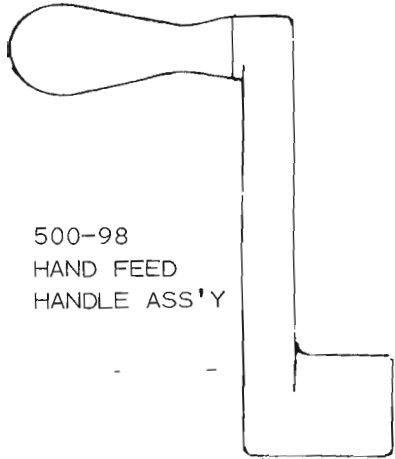


200-88  
3 1/2 STUB  
BAR RISER

Optional

200-87  
R & L WEAR PADS  
USED ON MACHINE PRIOR  
TO SERIES #923

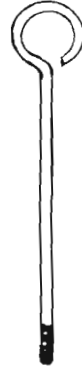




500-98  
HAND FEED  
HANDLE ASS'Y



502-12-2  
SPANNER WRENCH  
(2 REQ'D ON  
DA-OB ONLY)



100-24  
TOOL PULLER



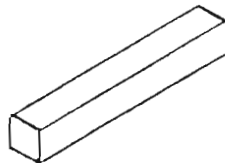
501-72 (7/32)  
501-72A (5/32)  
HEX DRIVER



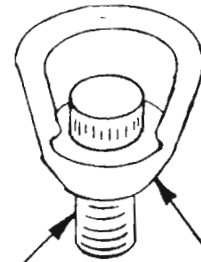
500-41  
LOCK NUT  
FEED SCREW



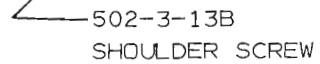
500-62  
KEY, MICARTA



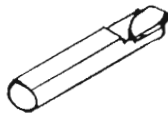
502-3-20A  
DRESSING STICK



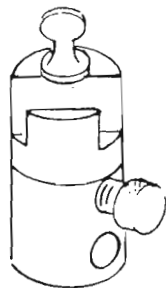
502-3-13A  
LIFTING EYE NUT



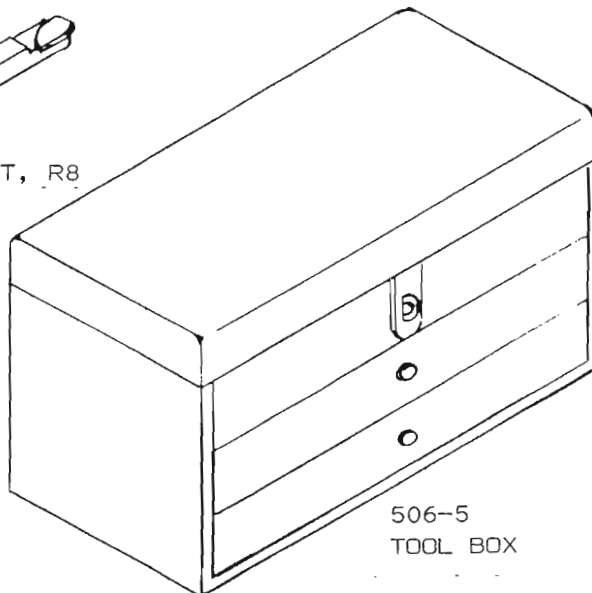
502-3-13B  
SHOULDER SCREW



501-31  
TOOL BIT, R8



501-68-8  
SHARPENING  
FIXTURE



506-5  
TOOL BOX

T O O L B I T S

D A -

PART NUMBER	DESCRIPTION
100-29	<u>Offset Tool Bit</u> (for boring blind cylinder holes)
501-29A	<u>R.F. Facing &amp; Counterboring Tool Bit</u> for facing & counterboring of cylinder blocks, for cutting off sleeve
501-31	<u>R8 Carbide Tool Bit 1-3/4" long</u> (for general purpose & heavy cuts, cast iron) (Recommended for interrupted cuts)
501-31-1	<u>R8 Carbide Tool Bit, 1" short</u>
501-31-1A	<u>R8 Carbide Tool Bit, 11/16" extra short</u>
501-31-2	<u>R8 Carbide Tool Bit, Medium 1-3/8"</u>
501-33D	<u>30° Chamfer Tool Bit</u> for general purpose chamfering, cast iron



INSTRUCTIONS FOR INSTALLATION AND OPERATION

OF THE 100-28A FIXTURE

PLACE THE 100-28A UNIVERSAL BORING STAND ON THE FLOOR WITH ITS FOUR WASHERS UNDER THE JACKING SCREWS.

PLACE THE BORING BAR UNIT IN POSITION ON THE TOP PLATE, SECURE THE BORING UNIT TO THE TOP PLATE WITH ITS HOLD DOWN BOLT AND CLAMP BLOCK. CAREFULLY LEVEL THE MACHINES TOP PLATE, LOCK THE LOWER JACKING SCREWS AFTER TOP PLATE IS LEVEL. (THE BASE MUST BE EQUALLY SUPPORTED AT FOUR POINTS ON THE FLOOR).

BLOCK CLAMPING

CAREFULLY CLEAN AND FILE OFF HIGH SPOTS, THREAD BURRS, ETC., ON TOP OF CYLINDER BLOCK.

PLACE BLOCK ON SUPPORT ARMS, SPREAD ARMS TO GIVE ADEQUATE SUPPORT FOR BLOCK, STEADY THE BLOCK AS YOU ROTATE THE SCREW JACK UP, UNTIL IT IS ALMOST CONTACTING THE TOP PLATE. CHECK FOR ANY DOWEL PIN ETC., THAT MIGHT INTERFERE WITH THE TOP PLATE. ALSO CHECK TO MAKE SURE THAT THE BORE IS CENTERED IN THE TOP PLATE HOLE. STEADY BLOCK AS YOU ROTATE THE SCREW JACK INTO THE LOCK POSITION. USE CARE TO MAKE SURE THE BLOCK TOP IS PERFECTLY FLAT AGAINST THE TOP PLATE. NOTE: EXCESSIVE CLAMP PRESSURE WILL TEND TO EXPOSE A SLIGHT GAP AT FRONT; CHECK THIS CAREFULLY.

SMALL CYLINDERS AND ODD SHAPE BLOCK CLAMPING

ATTACH CLAMP ARM ASSEMBLY 100-27-5D, TO CLAMP BRACKET PLATE. THESE CLAMP ARMS ARE SUITED TO HOLD V4 MARINE CYLINDERS AND A WIDE VARIETY OF SINGLE AND TWIN CYLINDER SMALL ENGINES. VERY LITTLE CLAMP PRESSURE IS REQUIRED. YOU MAY CHECK BLOCK TIGHTNESS FOR BORING, BY BUMPING BLOCK WITH YOUR HAND TO DETERMINE IF IT IS SECURE. THIS IS ADEQUATE CLAMPING PRESSURE UNLESS YOU ANTICIPATE HEAVY SLEEVING CUTS.

THE ARMS CAN BE PLACED WITHIN INTEGRAL CRANKCASES BLOCK FOR HOLDING.

AGAIN YOU MUST CHECK TO SEE THAT THE SURFACE AGAINST THE TOP PLATE HAS NO GAP.

NOTE: AN IRREGULARLY SHAPED BLOCK OCCASIONALLY REQUIRES AN ADDED 'C' CLAMP, ESPECIALLY FOR HEAVY SLEEVE CUTS.

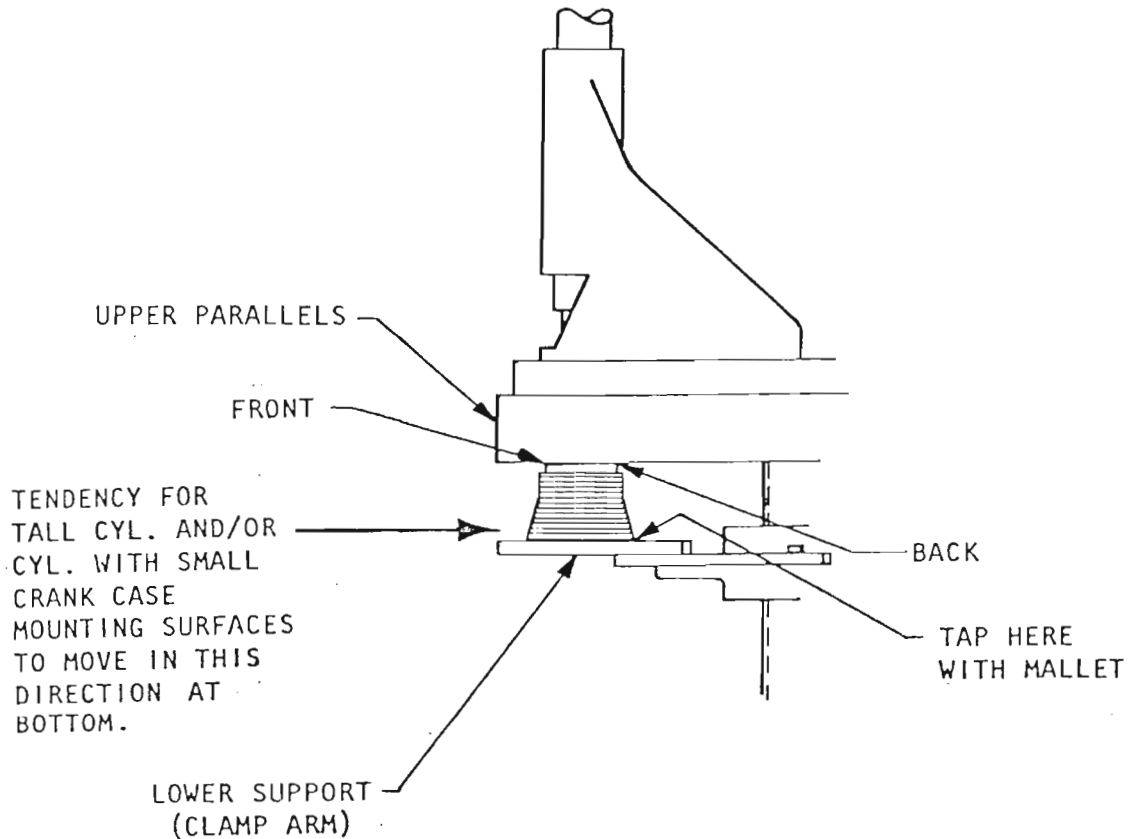
IF THE CYLINDER HAS A SKIRT ABOVE THE CLAMP SURFACE, MAKING IT IMPOSSIBLE TO INSERT THE TOOL HOLDER, A PARALLEL SPACER IS PROVIDED TO LOWER THE CYLINDER.

CLAMPING

THERE IS A TENDENCY FOR SOME CYLINDERS THAT ARE TALL OR THOSE WHICH HAVE SMALL CRANKCASE MOUNTING SURFACES TO ROCK (SHIFT) WHEN CLAMPED IN THE DA-DC2 OR 100-28A STAND.

THESE CYLINDERS MAY MOVE IN THE DIRECTION SHOWN IN THE SKETCH AND LOSE THEIR FULL CONTACT WITH THE CRANKCASE MOUNTING SURFACE AGAINST THE UPPER PARALLELS.

THIS SHIFTING MAY BE COMPENSATED BY LIGHTLY TAPPING THE LOWER PORTION OF THE CYLINDER WITH A MALLET FROM THE BACK SIDE AFTER THE BLOCK IS CLAMPED.



100-28A CENTERING

MOTORCYCLE AND SMALL CYLINDERS

MINIMUM STOCK REMOVAL

IMPORTANT CENTERING INFORMATION FOR MOTORCYCLE CYLINDERS AND OTHER REPAIR REQUIRING MINIMUM STOCK REMOVAL.

BEFORE SHIPMENT FROM THE FACTORY, THE MODEL DA-0B BORING MACHINES ARE REPETITIVELY TESTED ON A ROUND HOLE FOR A MAXIMUM CENTERING ERROR OF .002 TOTAL INDICATOR READING. THIS MEANS THAT IF ALL BORES WEAR PERFECTLY SQUARE, TO THE MOUNTING SURFACE, .003 ON A DIAMETER MATERIAL REMOVAL WOULD CLEAN OR COMPLETELY FINISH THE CYLINDER SURFACE.

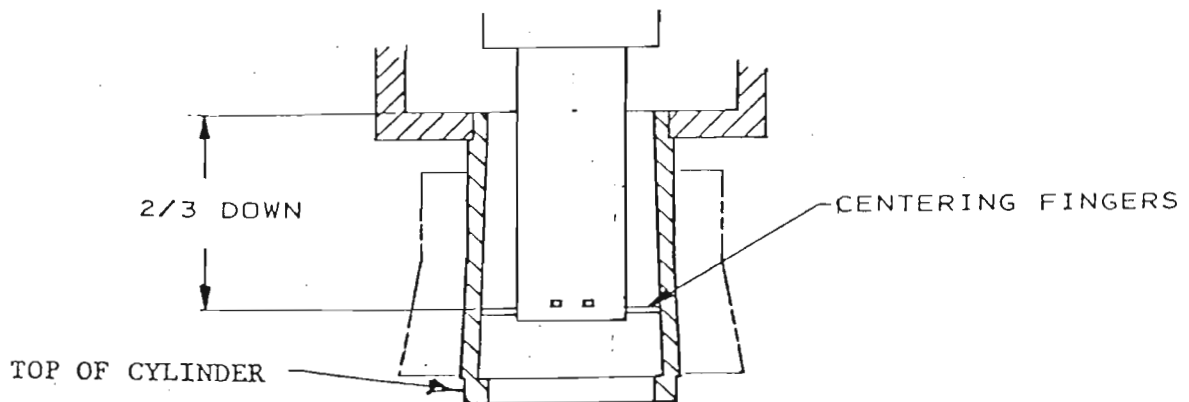
PRACTICALLY SPEAKING IT WILL BE NECESSARY TO BORE CYLINDERS .005" OR .12MMS LARGER THAN THE MAXIMUM WEAR DIAMETER IN THE CYLINDER TO BE SURE OF CLEAN UP.

REMEMBER TOO, THE INNER SPINDLE MUST BE PROPERLY ADJUSTED FOR CORRECT CENTERING. (SEE PAGE 30 OF THE MANUAL)

A SLIGHT OUT OF SQUARE CONDITION OF THE EXISTING CYLINDER BORE AND CRANKCASE MOUNT SURFACE WILL ALSO PREVENT CLEAN UP.

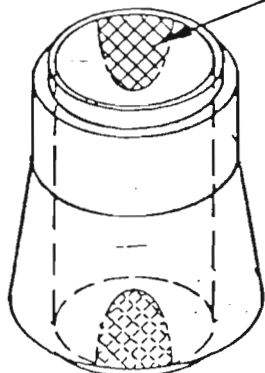
CRANKCASE MOUNTING SURFACES MUST BE FREE OF DAMAGE AND CLEAN TO PREVENT TILTING THE CYLINDER WHEN CLAMPING. (SEE INSTRUCTION ON CLAMPING)

BEST CLEAN UP RELIABILITY WILL RESULT FROM CENTERING APPROXIMATELY 2/3 DOWN THE CYLINDER LENGTH AS SHOWN BELOW.

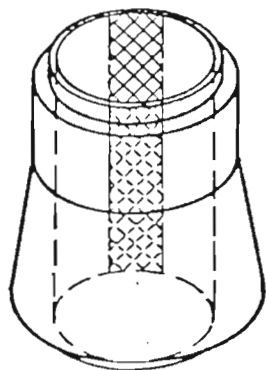


NOTE THE FOLLOWING EXAMPLES OF BORES WHICH DID NOT FINISH COMPLETELY. (CLEANED UP)

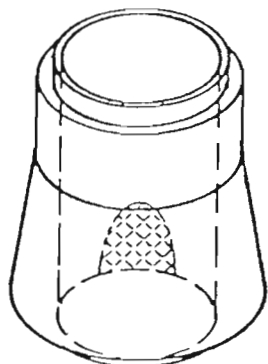
REPRESENTS UNFINISHED OR NOT CLEANED UP



NON CLEANED UP AREAS BOTTOM AND TOP OPPOSITE, INDICATES ORIGINAL BORE OUT OF SQUARE WITH MOUNT SURFACE OR CYLINDER WAS TILTED WHEN BORED.

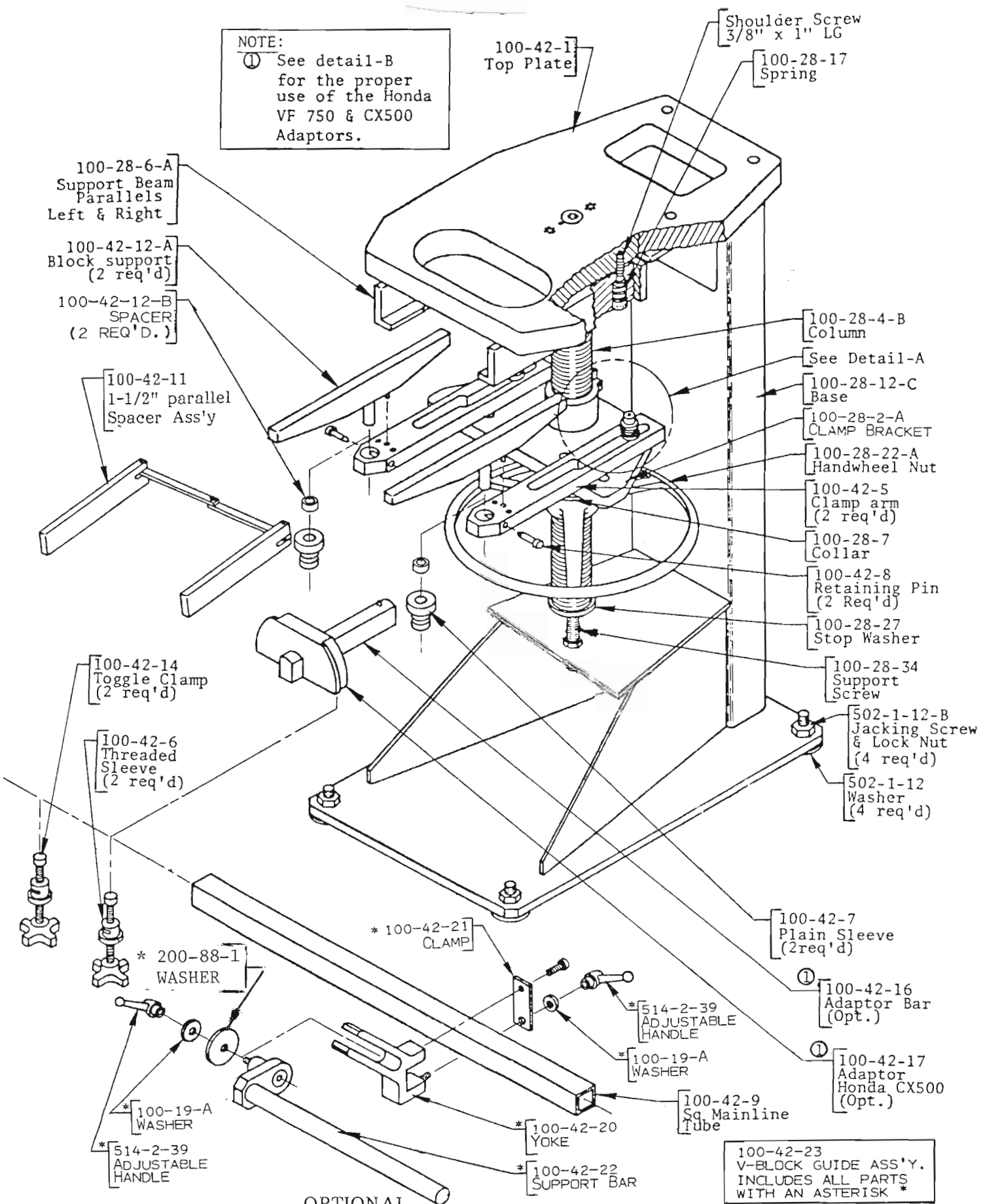


NON CLEANED SURFACE TOP TO BOTTOM RESULTS FROM MACHINE NOT BEING EXACTLY CENTERED.



NON CLEANED SURFACE ONE SIDE AT BOTTOM RESULTS FROM CORRECT CENTER AT TOP BUT OUT OF SQUARE CONDITION AGAIN. CENTERING IN MIDDLE OF CYLINDER OR 2/3 DOWN WILL MINIMIZE THIS CONDITION.

NOTE:  
 ① See detail-B for the proper use of the Honda VF 750 & CX500 Adaptors.



100-28-6-A  
 Support Beam  
 Parallels  
 Left & Right

100-42-12-A  
 Block support  
 (2 req'd)

100-42-12-B  
 SPACER  
 (2 REQ'D.)

100-42-11  
 1-1/2" parallel  
 Spacer Ass'y

100-42-14  
 Toggle Clamp  
 (2 req'd)

100-42-6  
 Threaded  
 Sleeve  
 (2 req'd)

\* 200-88-1  
 WASHER

\* 100-19-A  
 WASHER  
 \* 514-2-39  
 ADJUSTABLE  
 HANDLE

100-42-1  
 Top Plate

Shoulder Screw  
 3/8" x 1" LG

100-28-17  
 Spring

100-28-4-B  
 Column

See Detail-A

100-28-12-C  
 Base

100-28-2-A  
 CLAMP BRACKET

100-28-22-A  
 Handwheel Nut

100-42-5  
 Clamp arm  
 (2 req'd)

100-28-7  
 Collar

100-42-8  
 Retaining Pin  
 (2 Req'd)

100-28-27  
 Stop Washer

100-28-34  
 Support  
 Screw

502-1-12-B  
 Jacking Screw  
 & Lock Nut  
 (4 req'd)

502-1-12  
 Washer  
 (4 req'd)

\* 100-42-21  
 CLAMP

100-42-7  
 Plain Sleeve  
 (2req'd)

① 100-42-16  
 Adaptor Bar  
 (Opt.)

① 100-42-17  
 Adaptor  
 Honda CX500  
 (Opt.)

\* 514-2-39  
 ADJUSTABLE  
 HANDLE

\* 100-19-A  
 WASHER

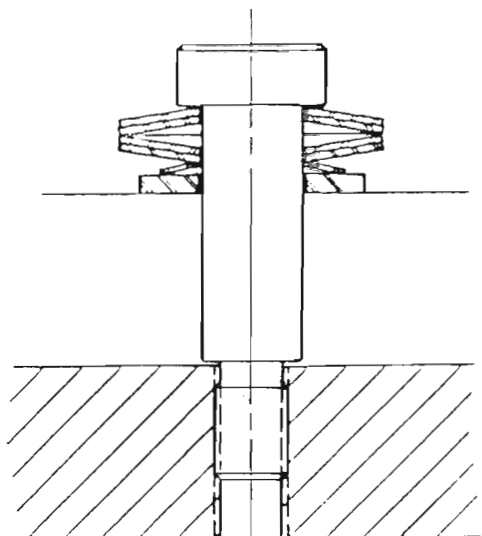
100-42-9  
 Sq. Mainline  
 Tube

\* 100-42-20  
 YOKE

\* 100-42-22  
 SUPPORT BAR

100-42-23  
 V-BLOCK GUIDE ASS'Y.  
 INCLUDES ALL PARTS  
 WITH AN ASTERISK \*

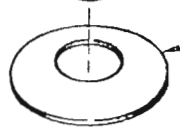
OPTIONAL  
 SMALL ENGINE STAND WITH V-BLOCK CAPABILITY  
 100-42



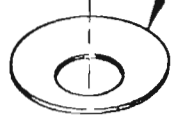
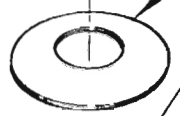
Section view of washer arrangement



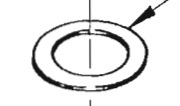
Shoulder screw  
1/2" x 1-1/4" lg.  
(2 req'd)



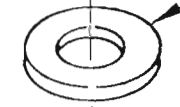
502-2-87A  
Belleville  
washer  
.049 thk.  
(8 req'd)



100-42-13  
Belleville  
washer  
.016 thk.  
(2 req'd)

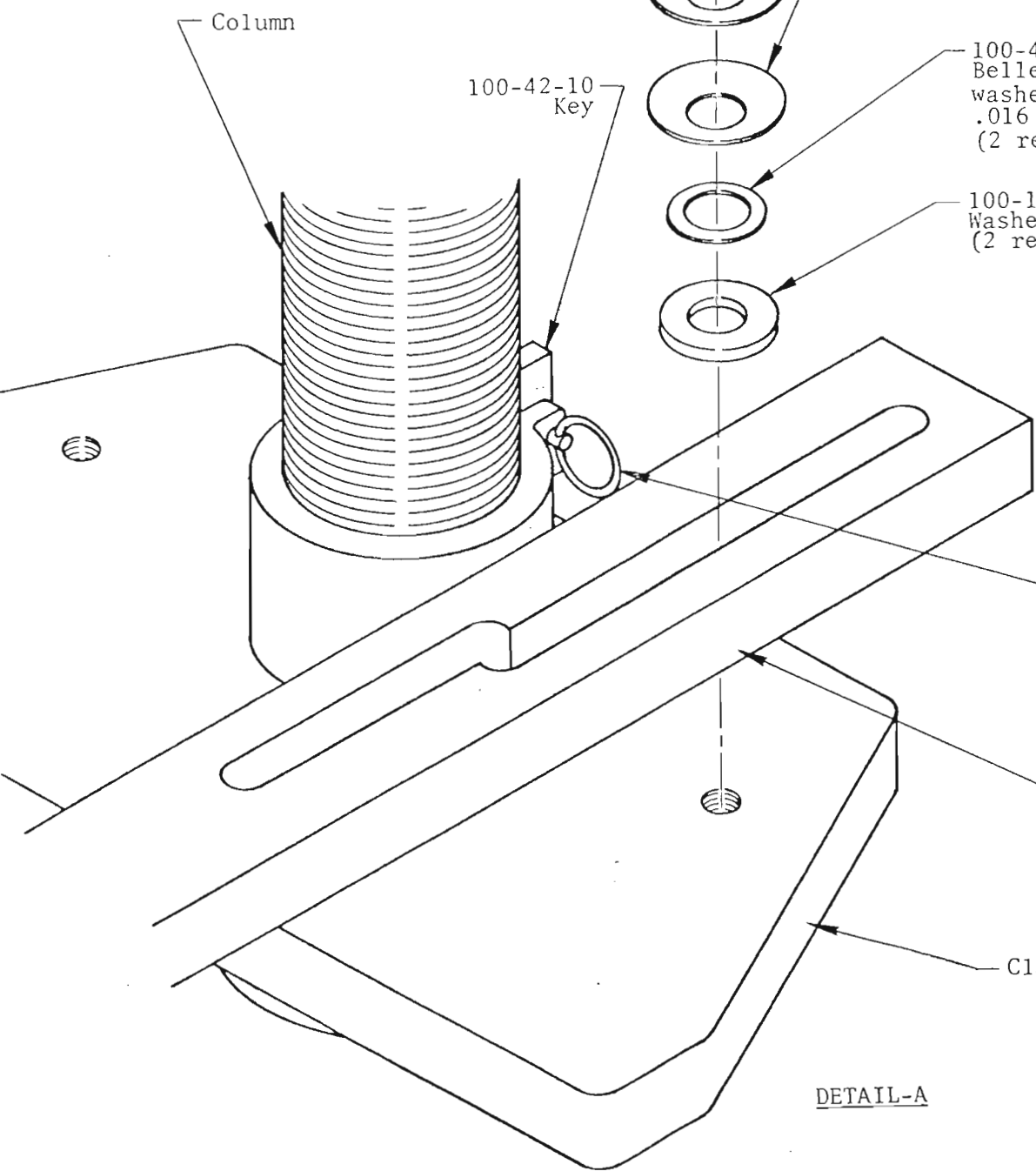


100-19-B  
Washer  
(2 req'd)



Column

100-42-10  
Key



100-42-19  
Pin

100-42-5  
Clamp arm  
(2 req'd)

Clamp bracket

DETAIL-A

OPERATING INSTRUCTIONS  
SMALL ENGINE STAND WITH V-BLOCK CAPABILITY

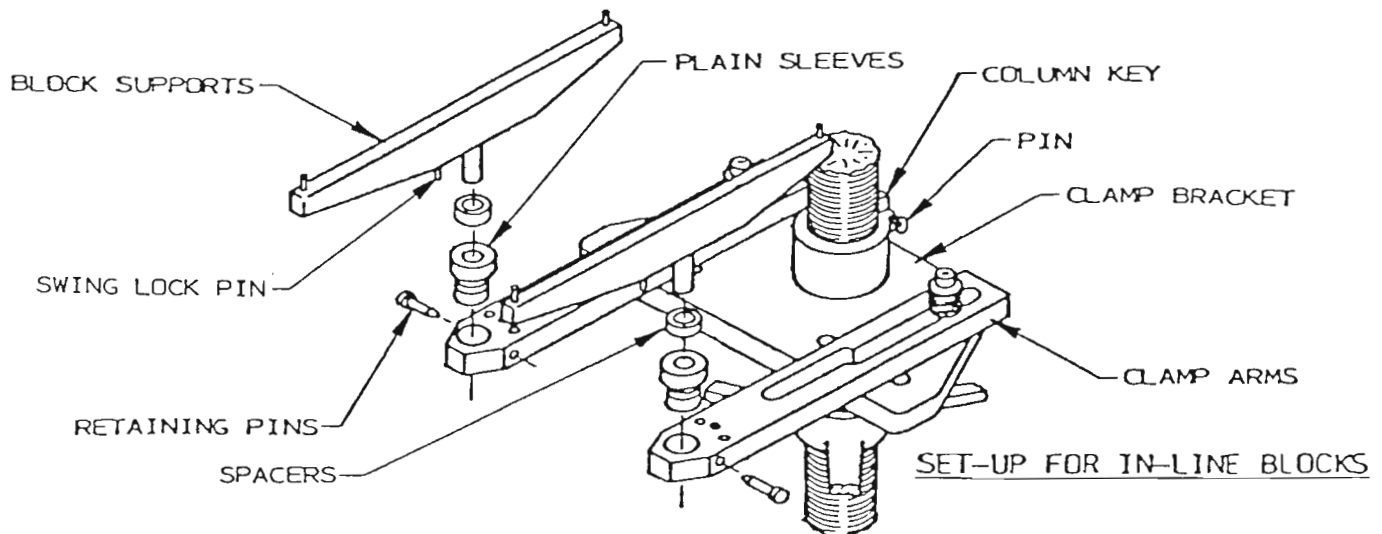
# 100-42

BLOCK CLAMPING

NOTE: The following instructions and illustrations of various block and cylinder clamping procedures, are only examples of one method in which to clamp these blocks and cylinders. They are intended to illustrate the various clamping set-ups, and to give you understanding of safety precautions.

IN-LINE BLOCKS

1. Carefully clean and file off high spots, thread burrs, gaskets, etc., on top of cylinder block.
2. Measure each cylinder. Determine the amount of metal to be removed from the measurement of cylinder which shows the most wear.
3. Install the plain sleeves and retaining pins in the clamp arms. If bearing caps are on, place spacers between block supports and plain sleeves. Place block support pins into the plain sleeves with swing lock pins to the front. Install the column key (100-42-10) and pin (100-42-19) in the rear of the clamp bracket, this will prevent the clamp bracket from turning. Swing support beam parallels back.



4. Slide clamp arms all the way out. Place block on supports, so the center of the cylinders are in line with the pivoting points of the block supports. Push block and block supports back under the top plate, center two end bores in top plate hole. Now position the block supports to give adequate support during boring, but make sure block supports are not obstructing the bore or bores you are machining, and that clamp arms can be swung to second set of bores without lifting block out of stand. When moving to second set of bores, pull block out for head surface cleaning.

BLOCK CLAMPING cont'd

NOTE: If dowel pins are present on the head surface, the 1 1/2" parallel spacer assembly must be used between the head surface and the bottom of the top plate. At least one parallel must remain in contact with the top plate at all times during loading and positioning, and both parallels in contact during clamping.

5. Steady the block as you rotate the screw jack into locking position. Use care to make sure the block head surface is perfectly flat against the bottom of the top plate.

NOTE: When clamping blocks resting on the block supports, it may be necessary to lift up on the front, or back of block, while rotating the screw jack, in order to clamp block properly.

CAUTION: Maximum weight capacity of boring stand is 150 lbs.

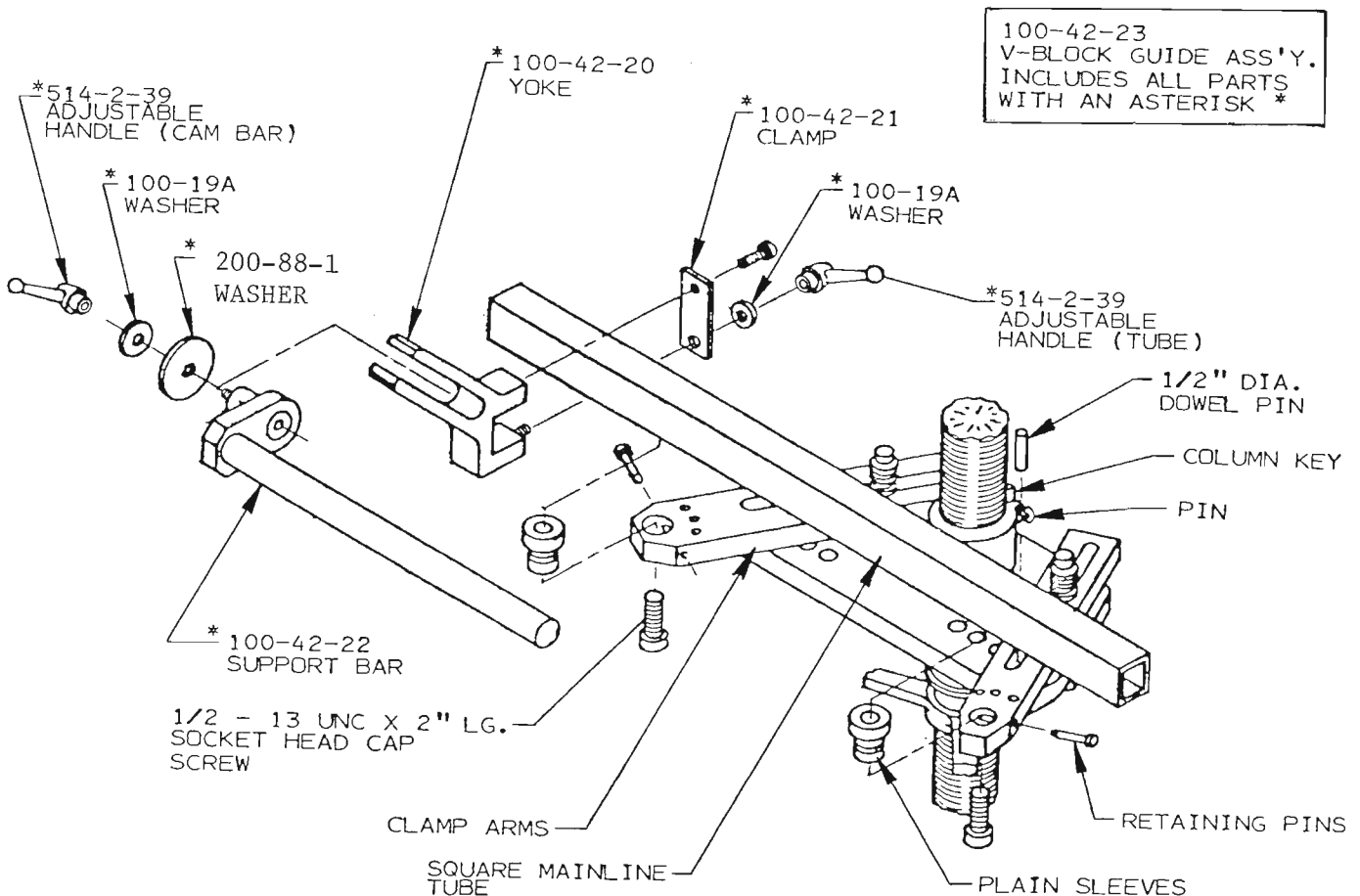
The V-block guide assembly (100-42-23), illustrated on page 71, can also be used in clamping the in-line block with caps off, if desired, when the square mainline tube is used.



BLOCKING CLAMPING Cont'd

V BLOCKS with uniform main bearing diameters

1. Carefully clean and file off high spots, thread burrs etc., on top of cylinder block.
2. Measure each cylinder. Determine the amount of metal to be removed from the measurement of cylinder which shows the most wear.
3. Install plain sleeves and retaining pins in the clamp arms. Insert, from the bottom of the plain sleeves, 1/2 - 13 UNC x 2" long socket head cap screws and thread them into the square mainline tube. The square mainline tube may also be used with the threaded sleeves and toggle clamps installed in the clamp arms for irregular applications. Position the square mainline tube in the center of the top plate hole. Install the V-Block guide assembly (100-42-23) onto the left end of the square mainline tube. Using the tube adjustable handle, clamp the V-Block guide assembly securely to the square mainline tube. Install a 1/2" diameter dowel pin in the off-set slot of one of the clamp arms to prevent side movement of clamp arms during the loading of the block. Install column key and pin to prevent the clamp bracket from turning. Swing support beam parallels back to rear of stand.



SET-UP FOR V BLOCKS  
WITH UNIFORM MAIN BEARING DIAMETER

## BLOCK CLAMPING Cont'd

4. Check block head surface for dowel pins, etc., that might interfere with the clamping of the head surface. Measure the distance from the head surface of block to the main bearing diameter. Add 1/4" to that measurement, 1 3/4" if dowel pins are present on the head surface. The distance from the bottom of top plate, to the top of square mainline tube, should be set to this dimension.

Measure the distance from the center of the cam shaft bore to the closest edge of the main bearing diameter and note the angle of the cam shaft bore in relation to the main bearing diameter. Using these dimensions position the support bar (100-42-22) of the V-block guide assembly, so it will pass through the cam shaft bore when the block is in the desired boring position and the main bearing diameter is resting on the square mainline tube. Using the cam bar adjustable handle, clamp it securely in place. Cam bar is a safety device, not a locator for alignment.

5. Lift the block by cylinder bank you plan to bore, near the center of gravity of the block. Position the block so that the top of the block is facing you, and to the right side of the boring stand. Lower mains onto the square mainline tube, and slide block under top plate until block is held safely by boring stand, while making sure the support bar passes through the cam shaft bore. If it does not, reposition the support bar so it will and clamp it firmly in place. Slide the block under top plate so that it is supported by the V-block guide assembly, should you accidentally rotate the screw jack the wrong way. Rotate screw jack up, until only 1/16" gap is left between top plate and head surface of block.

NOTE: If dowel pins are present on head surface the 1 1/2" parallel spacer assembly must be used between head surface and the bottom of top plate. At least one parallel must remain in contact with the top plate at all times during loading and positioning, and both parallels in contact during clamping.

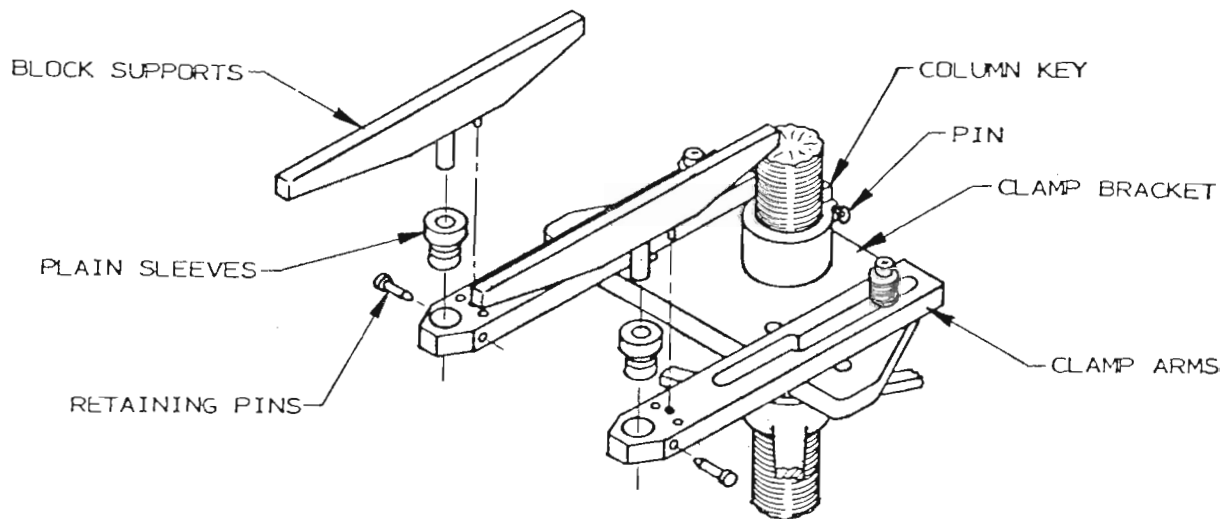
6. Disconnect lifting device and slide block further under boring stand, centering two bores in the top plate hole. Steady the block as you rotate the screw jack into locking position. Use care to make sure the head surface is perfectly flat against the bottom of the top plate. After boring the first set of holes, you may move the block and the square mainline tube to the front for cleaning of the head surface of block.

CAUTION: Be sure cam bar will hold block before moving block to front.

BLOCK CLAMPING Cont'd

SINGLE CYLINDERS

1. Install the plain sleeves and retaining pins in clamp arms. Position clamp arms so the clamp arm shoulder screws are hitting the desired stops of the offset clamp arms. Install the column key and pin.
2. Place cylinder on block supports, so center of cylinder is in line with the pivoting points of the block supports. Position the block supports so they give adequate support to the cylinder, without interfering with the bore.
3. Position the support beam parallels. Rotate the screw jack into clamping position. Use care to make sure the crankcase mounting surface is perfectly flat against the support beam parallels.



SUGGESTED SET-UP FOR SINGLE CYLINDERS

## BLOCK CLAMPING Cont'd

### SMALL CYLINDER AND ODD SHAPE BLOCK CLAMPING

1. Install the toggle clamps with threaded sleeves in the clamp arms.  
(See page 65)

These toggle clamps are suited to hold a wide variety of single and twin cylinder small engines. Combined with the adaptor bar (100-42-16) and horseshoe adaptor (100-42-17) they will handle the V-2 Honda CX500, V-4 Honda VF750, and marine cylinder such as the V-4 Evinrude and the V-6 Mercury. Very little clamp pressure is required. You may check block tightness for boring, by bumping the block with your hand to determine if it is secure. This is adequate clamping pressure unless you anticipate heavy sleeving cuts.

The arms can be placed within integral crankcase blocks for holding.

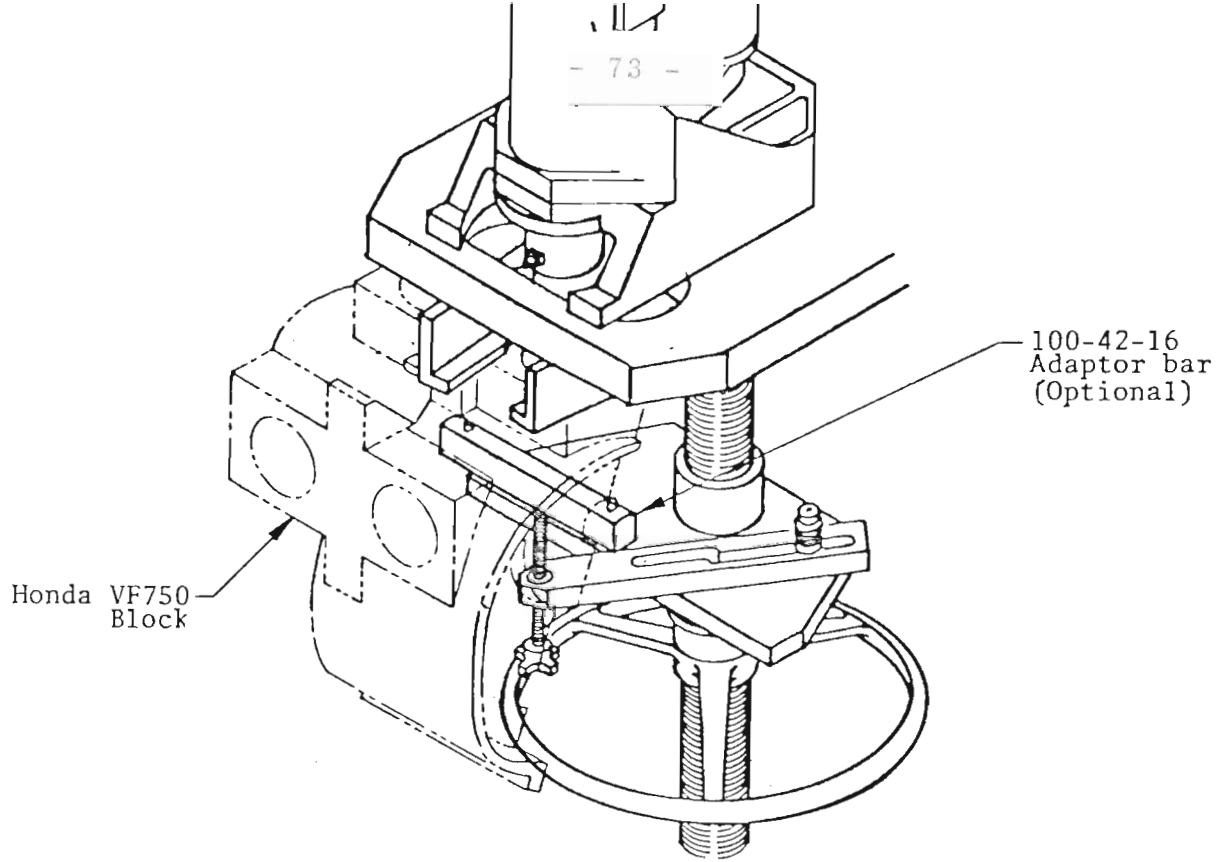
Again you must check to see that the head surfaces against the support beam parallels have no gaps.

### HONDA CX500 (See illustration on page 73)

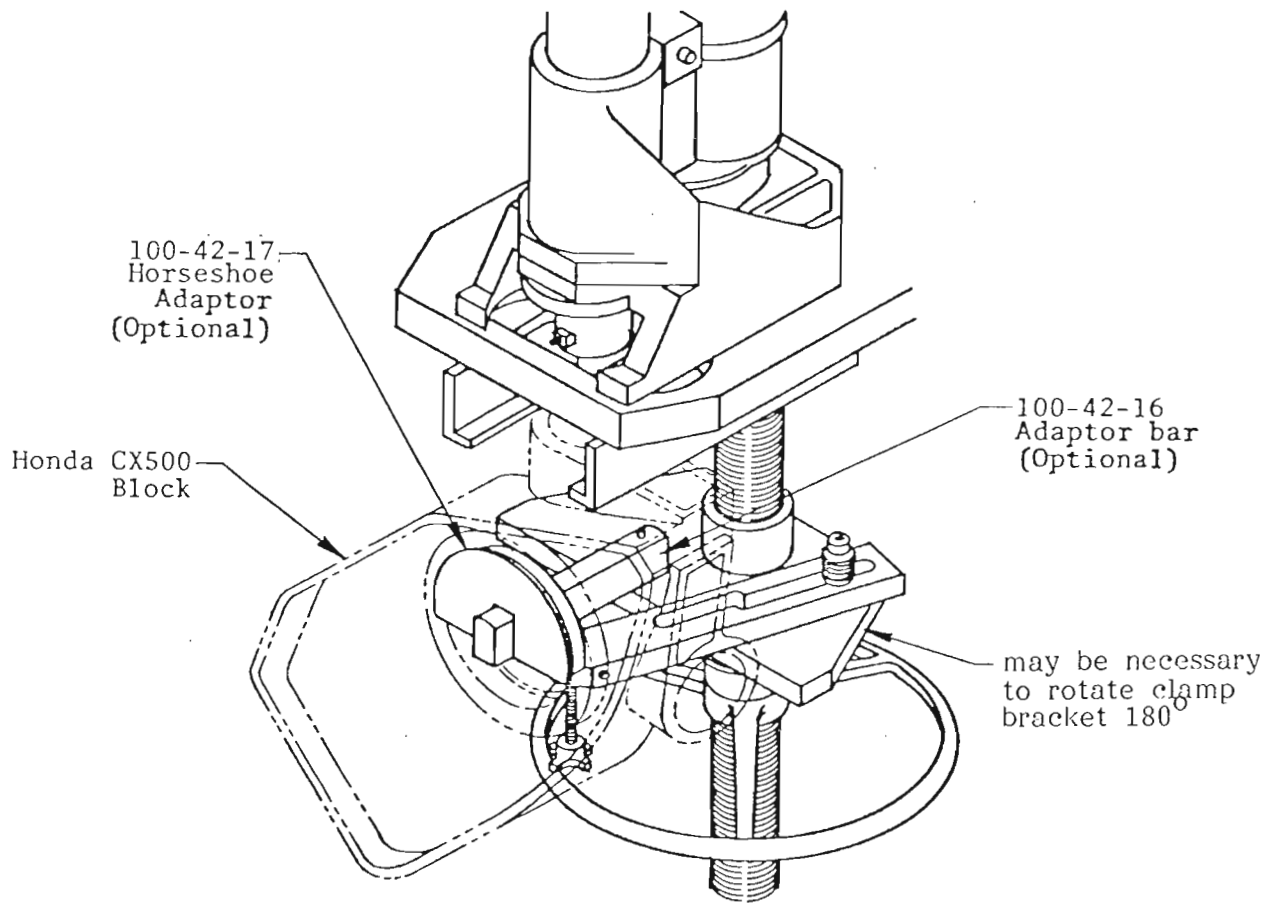
1. Install the toggle clamp with threaded sleeve in one of the clamp arms. Pivot support beam parallels to the sides, so they won't interfere during loading.
2. Assemble the horseshoe adaptor with the adaptor bar. Place in main bore with protruding dowel pin on outside of small main bore. Lift block placing the clamp arm with the toggle clamp inside the crankcase. Place the button shoe of the toggle clamp into the counterbore in the bottom of the adaptor bar.
3. Pivot the support beam parallels so that they just clear the diameter of the bore. Rotate screw jack into clamp position. To bore the opposite cylinder, lower screw jack, pivot support beam parallels to side, rotate block, pivot support beam parallels back into clamping position, center cylinder under top plate hole and clamp.

### HONDA VF750 (See illustration on page 73)

1. Install the toggle clamp with threaded sleeve in one of the clamp arms. Place adaptor bar on toggle clamp.
2. Load block with the main bore resting on the adaptor bar. Pivot support beam parallel into clamping position. Center cylinder to be bored in top plate hole. Rotate screw jack into locking position.



(Honda VF750 set-up shown)  
(varied positions of clamps are possible)



(Honda CX500 set-up shown)

BLOCK CLAMPING, Cont'd

V-6 MERCURY AND V-4 EVINRUDE OUTBOARD BLOCKS

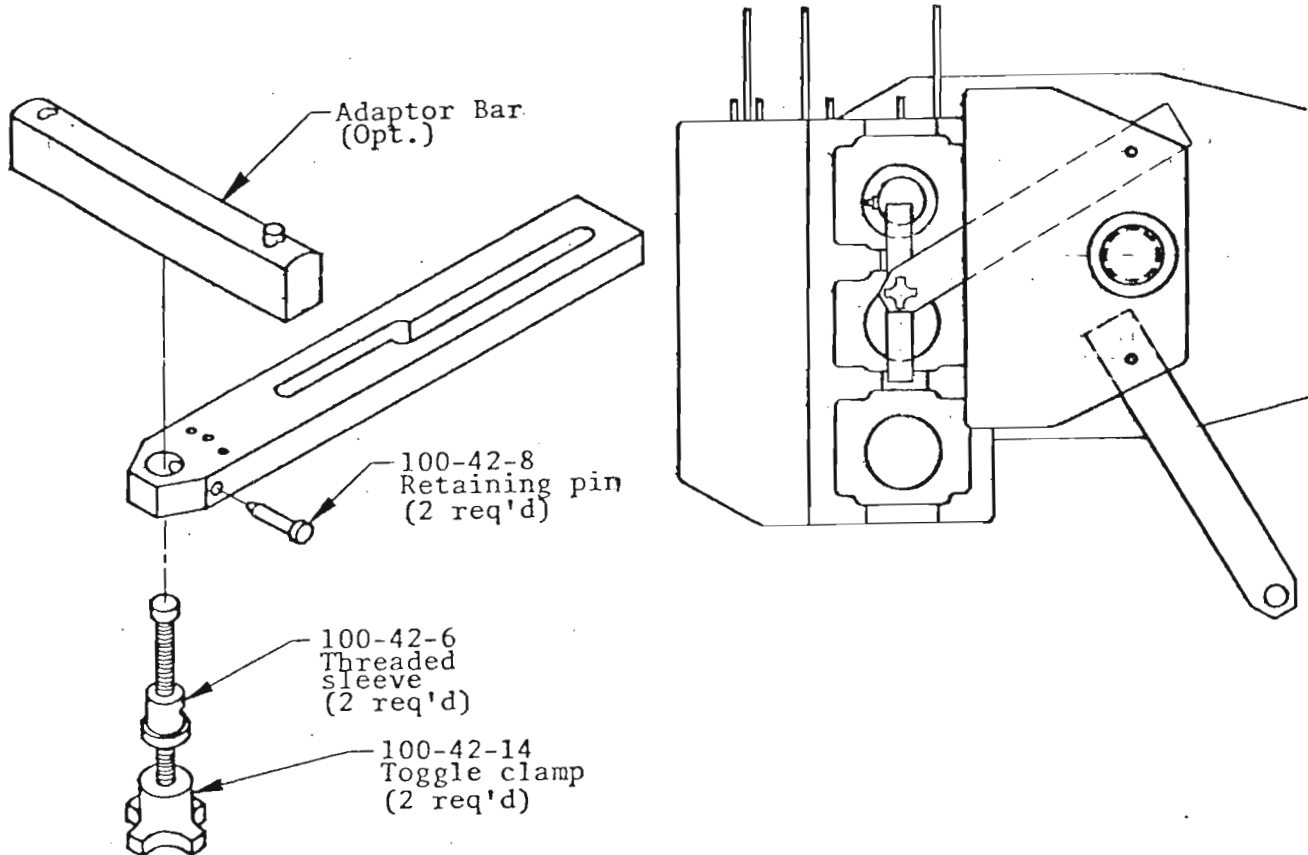
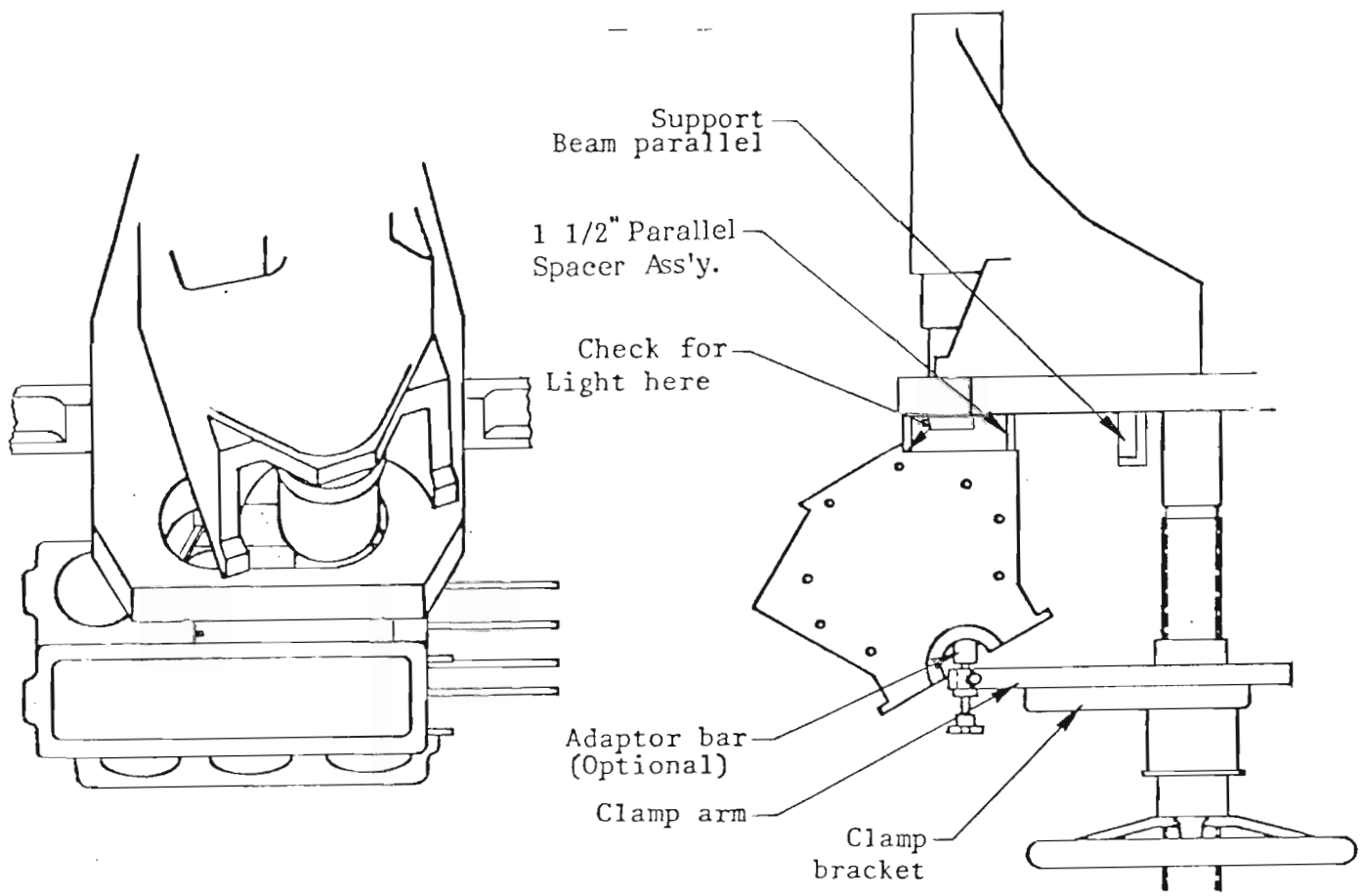
(see illustration on page 77)

1. Install the toggle clamp with threaded sleeve in one of the clamp arms. Place adaptor bar on toggle clamp. Install column key and pin.

On the V-6 Mercury outboard block this adaptor bar will support the two center main bearing bores. The 1 1/2" parallel spacer assembly is necessary to use between the cylinder deck and the bottom of top plate, for them to clear the top of the block.

2. Pivot the support beam parallels out to clear the block. Carefully load block into boring stand, placing the two center main bearing bores on the adaptor bar, with the toggle clamp screw between the mains, as shown on illustration. Place the 1 1/2" parallel spacer assembly between the bottom of top plate and the cylinder deck as shown on illustration. Turn handwheel up until block is clamped against 1 1/2" parallel spacer assembly. Check to make sure cylinder deck is perfectly flat against 1 1/2" parallels, check by seeing if both 1 1/2" parallels are tight. Usually the block will be clamped at the back and not at the front. If you tap the block at the bottom back side with a mallet, it will force the bottom forward to correct this. (Alternate top front impact to correct alignment.)

On the V-4 Evinrude the adaptor bar will support only at the center main bearing bore, so the toggle clamp screw must be positioned directly under the center main bearing bore. Follow the same procedure as the V-6 Mercury, with only the exception, that the 1 1/2" parallel spacer assembly is not necessary.



MERCURY V-6 BLOCK  
 (Shown in position to bore outer cyl.)