

ROTTLER MANUFACTURING

FA-4B

BORING MACHINE

MACHINE SERIAL NUMBER

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

DESCRIPTION

THE MODEL FA-4B BORING MACHINE IS A PRECISION, SINGLE POINT TOOL, BORING UNIT. IT IS EQUIPPED WITH TOOLING AND ACCESSORIES FOR REBORING ALMOST ALL AMERICAN PASSENGER CAR ENGINES, MANY HEAVY DUTY DIESEL ENGINES AND TRANSMISSION CASES. STUB BORING HEADS MAY BE ADDED FOR SMALL ENGINE CYLINDERS AND UNIVERSAL BORING APPLICATIONS.

INSOFAR AS CYLINDER REBORING IS CONCERNED, THIS MACHINE IS DESIGNED FOR TWO PURPOSES:

- (1) THE LOCATING OF CYLINDER BORES RELATIVE TO THE PAN RAILS AND MAIN BEARING LOCATION, AS HAS BEEN DONE IN THE ORIGINAL FACTORY BORING. THIS OVERCOMES THE MANY INACCURACIES AND OUT-OF-ALIGNMENT PROBLEMS ASSOCIATED WITH CLAMPING PORTABLE CYLINDER BORING BARS TO BLOCKS.
- (2) A CONSIDERABLE SAVINGS IN HOLE-TO-HOLE TIME IS REALIZED AS A RESULT OF FAST BLOCK CLAMPING, INVERTED CENTERING FINGERS, PUSH BUTTON CONTROLS, AND AIR OPERATED CLAMPING AND LIFTING DEVICES.

CHANGEOVER OR RESETTING TIME REQUIRED TO SET UP V-TYPE OR IN-LINE ENGINES IS A MINIMUM, MAKING THIS MACHINE HIGHLY SUITED TO THE JOBBER SHOP WHERE ENGINES CANNOT BE RUN THROUGH IN MODEL LOTS.

THE ADDED FEATURE THAT THE BLOCK CAN BE BORED WITH BEARING CAPS ON OR OFF ALSO INCREASES THE VERSATILITY AND SPEED OF SET UP.

ALL FEEDS AND RAPID TRAVELS ARE POWER OPERATED AND CONTROLLED FROM THE CONVENIENTLY LOCATED PUSH BUTTON STATION. AN AUXILIARY HAND FEED TRAVEL IS LOCATED AT THE BASE OF THE FEED SCREW TO BE USED FOR COUNTERBORING AND FACING SLEEVES, ETC.

DESCRIPTION, CON'T

POWER IS FURNISHED BY A 220-440 VOLT, 3 PHASE, TOTALLY ENCLOSED MOTOR WITH AN OUTBOARD FAN. A QUICK CHANGE SHIFT LEVER SELECTS TWO GEAR DRIVEN RANGES TO PROVIDE GOOD TORQUE AT LOW SPEED. THE SMALL KNOB PROTRUDING FROM THE UPPER HOUSING PROVIDES FAST AND SLOW BORING FEED RATES. AN ENCLOSURE AT THE REAR OF THE MACHINE CONTAINS RELAYS AND VALVES THAT ACTUATE MECHANICAL CONTROLS ON THE MACHINE TO ENGAGE FEEDS AND TRAVELS AS WELL AS CLAMPING AND FLOATING OF THE SPINDLE UNIT.

G U A R A N T E E

L I M I T E D

ROTTLER BORING BAR COMPANY MODEL FA-4B PARTS AND EQUIPMENT ARE QUARANTEED AS TO WORKMANSHIP AND MATERIAL. THIS LIMITED GUARANTEE REMAINS IN EFFECT FOR ONE YEAR FROM THE DATE OF DELIVERY, PROVIDED THE MACHINE IS OWNED AND OPERATED BY THE ORIGINAL PURCHASER AND IS OPERATED AND MAINTAINED AS PER INSTRUCTION IN THIS MANUAL.

STANDARD AIR AND ELECTRIC COMPONENTS ARE WARRENTEED 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.

AIR SUPPLY IN "F" SERIES MACHINESCAUTION:

IT IS VERY IMPORTANT YOUR AIR SOURCE FOR "F" SERIES BORING MACHINES BE MOISTURE FREE.

WATER AND OIL IN THE LINE WILL RESULT IN EARLY VALVE FAILURE.

OUR RECOMMENDATION IS THE INSTALLATION OF A WATER TRAP AT THE MACHINE.

I M P O R T A N TOPERATING SAFETY AND EMERGENCY PROCEDURES

ELECTRICAL POWER - MAKE SURE ALL ELECTRICAL EQUIPMENT HAVE THE PROPER ELECTRICAL OVERLOAD PROTECTION.

MACHINE OPERATOR - OPERATOR OF THIS BORING MACHINE SHOULD BE A SKILLED MACHINIST CRAFTSMAN, THAT IS, WELL VERSED IN THE CAUTION, CARE, AND KNOWLEDGE REQUIRED TO SAFELY OPERATE A METAL CUTTING TOOL.

IF THE OPERATOR IS NOT A SKILLED MACHINIST, THE OPERATOR MUST PAY STRICT ATTENTION TO THE OPERATING PROCEDURE OUTLINED IN THIS MANUAL, AND MUST GET INSTRUCTION FROM A QUALIFIED MACHINIST IN BOTH THE PRODUCTIVE AND SAFE OPERATION OF THIS BORING BAR.

ROTTLER BORING EQUIPMENT HAS THE FOLLOWING AREAS OF EXPOSED MOVING PARTS, THAT YOU MUST TRAIN YOURSELF TO RESPECT AND STAY AWAY FROM WHEN THEY ARE IN MOTION:

1. TOOL SHARPENING - MUST BE DONE WITH CARE AND DEXTERITY TO GET GOOD BORE RESULTS, BE ALERT TO THE LIGHT PRESSURE REQUIRED FOR SHARPENING.

CAUTION: EXPOSED DIAMOND WHEEL IS A POTENTIAL HAZARD TO YOUR HANDS, FINGERS, AND FACE.
NOTE - EYE PROTECTION IS A NECESSITY WHEN WORKING IN THIS AREA.

2. CUTTING TOOL AREA - ANY OPERATION INVOLVING HAND IN THE CUTTER HEAD AREA, SUCH AS CENTERING, CHANGING CENTERING FINGERS, TOOL INSERTION AND REMOVAL, CUTTER HEAD CHANGES, SIZE CHECKING, ETC., REQUIRES THAT BOTH THE DRIVE MOTOR BE TURNED OFF AND THAT THE SPINDLE CLUTCH (SPINDLE ROTATION) LEVER BE DISENGAGED, IN IT'S FULL UP POSITION.

OPERATING SAFETY & EMERGENCY PROCEDURES, CON'T

NOTE: PERIODCALLY CHECK THIS LEVER TO MAKE SURE THAT THE UPPER LEVER POSITION WILL LOCK OUT THE SPINDLE CLUTCH WHEN THE DETENT PIN IS ENGAGED. ON FA MACHINE, CHECK TO SEE IF THE UPPER INDENT WILL FIRMLY HOLD THE SPINDLE CLUTCH OUT OF ENGAGEMENT.

3. BORING - EYE PROTECTION MUST BE WORN DURING THIS OPERATION AND HAND MUST BE KEPT COMPLETELY AWAY FROM CUTTER HEAD.

4. UPPER HOUSING CONTROLS - LEARN TO IDENTIFY AND INDEPENDENTLY OPERATE THESE CONTROL FUNCTIONS BY HABIT WHILE DEVELOPING THE AWARENESS OF KEEPING YOUR FINGERS AND HANDS WELL CLEAR OF THE ROTATING FEED SCREW AND THE KNOBS, BOTH ON TOP OF THE FEED SCREW AND THE SPINDLE.

5. WORK LOADING & UNLOADING - CAREFULLY DEVELOP HANDLING METHODS OF LOADING AND UNLOADING WORK PIECES, SO THAT NO INJURY CAN RESULT IF HOIST EQUIPMENT OR LIFT CONNECTION SHOULD FAIL.

PERIODICALLY CHECK LIFT COMPONENTS FOR DAMAGE THAT MAY CAUSE FAILURE OF V-8 FIXTURE. LIFTING EYE CAN EVENTUALLY FAIL IF THE EYE IS RESET IN LINE WITH THE 502-3-7 HOLD DOWN BAR. EYE MUST BE AT RIGHT ANGLE TO THIS BAR.

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.

OPERATING SAFETY & EMERGENCY PROCEDURES, CON'TEMERGENCY PROCEDURE

ASSUMING ONE OF THE FOLLOWING HAS OCCURRED - TOOL BIT IS SET COMPLETELY OFF SIZE, WORK OR BORING SPINDLE IS NOT CLAMPED, SPINDLE IS NOT PROPERLY CENTERED, THESE MISTAKES WILL BECOME OBVIOUS THE INSTANT THE CUT STARTS. TURN OFF MOTOR IMMEDIATELY.

NOTE: YOU CAN KEEP YOUR FINGERS ON THE STOP BUTTON, IF YOU WISH TO INSURE INSTANT SHUT DOWN, WHEN IT IS REQUIRED.

AFTER FINDING OUT WHAT THE PROBLEM IS, METHODICALLY ORGANIZE THE CONTROLS TO RETURN THE SPINDLE TO ITS UP POSITION, WITHOUT CAUSING MORE PROBLEMS.

BE ALERT TO QUICKLY STOP THE MOTOR IN THE EVENT OF A SERIOUS DISRUPTION OF THE BORING PROCESS EITHER AT THE TOP OR BOTTOM OF THE BORE.

"REMEMBER" METAL CUTTING TOOLS HAVE THE SPEED AND TORQUE TO SEVERLY INJURE ANY PART OF THE HUMAN BODY EXPOSED TO THEM.

MACHINE INSTALLATION LOCATION

THE PRODUCTIVITY OF THIS MACHINE WILL DEPEND TO A GREAT EXTENT ON ITS PROPER INITIAL INSTALLATION, PARTICULARLY THE MEANS BY WHICH CYLINDER BLOCKS CAN BE LIFTED INTO THE MACHINE AND FLOW EVENLY TO AND FROM OTHER OPERATIONS IN YOUR SHOP.

THE PROPER LOADING ARRANGEMENT AND AREA LOCATION FOR YOUR FA-4B MACHINE IS EXTREMELY IMPORTANT. A SLOW TRAVEL (6' TO 10' MINIMUM) POWER HOIST, OPERATED FROM EITHER A BRIDGE CRANE OR JIB CRANE ARRANGEMENT WORKS VERY SATISFACTORILY. A 1,500 LB. HOIST IS GENERALLY ADEQUATE FOR LIFTING THE ENGINE BLOCK AND V-8 FIXTURE COMBINATION. AN AIR HOIST WITH SPEED CONTROL MAKES AN IDEAL METHOD FOR FAST, CONVENIENT LOADING.

IF SOME PRODUCTION BORING WITH THIS MACHINE IS ANTICIPATED AND THE CYLINDER BLOCKS ARE NOT DIRECTLY LOADED AND UNLOADED FROM A CONVEYOR, WE WOULD RECOMMEND CONSIDERABLE ATTENTION TO BE GIVEN TO THE CRANE SO THAT IT COVERS AN ADEQUATE AREA TO ALLOW THE OPERATOR TO BACK UP AND REMOVE CYLINDER BLOCKS WITHOUT CLUTTERING UP HIS OWN AREA. IF TWO MACHINES ARE TO BE OPERATED BY ONE OPERATOR, WE WOULD RECOMMEND THAT THE OPEN FACES BE PLACED AT RIGHT ANGLES TO EACH OTHER, WITH THE MACHINES APPROXIMATELY THREE FEET APART.

UNPACKING

USE CARE IN REMOVING THE CRATE FROM THE FA-4B MACHINE, BEING CAREFUL NOT TO USE FORCE ON ANY OF THE SPINDLE UNIT. THIS IS PARTICULARLY TRUE OF THE SQUARE TUBE CONTAINING THE MICRO-SWITCHES ON THE SPINDLE UNIT.

UNPACKING, CON'T

REMOVE THE SJ3 SHARPENING FIXTURE FROM THE DECK AND PREFERABLY PLACE AT A BENCH AREA CLOSE TO THE MACHINE. THIS FIXTURE WILL REQUIRE 110 OR 220 VOLT, SINGLE PHASE, AC CURRENT. IF IT IS NECESSARY TO MOUNT THIS FIXTURE, ON THE BASE WITH AN ANGLE PLATE, MOUNT IT SO THAT THE SHARPENING WHEEL IS BELOW THE TOP FACE OF THE MACHINE BASE, AND THE SHARPENING GRIT WILL NOT BE THROWN ON TOP OF THE BASE.

REMOVE THE TOOL BOX, PARALLELS, V-6 TRUCK FIXTURE, AND THE ENTIRE V-8 FIXTURE ASSEMBLY, LOCATED AT THE LOWER PORTION OF THE MACHINE AND COMPLETELY CLEAN THESE ARTICLES, AS WELL AS THE MACHINE BASE PADS AND UPPER TABLE, WITH SOLVENT. ALSO, CLEAN THOROUGHLY THE CYLINDER BLOCK CLAMP ARM ASSEMBLY. RUST INHIBITOR IS APPLIED TO THE MACHINE AT THE TIME OF SHIPMENT, AND ANY OF THE INHIBITOR LEFT ON THE MACHINE WILL RESULT IN CONSIDERABLE COLLECTING OF CAST IRON DIRT AND POSSIBLE SLIPPING OF CLAMP ARMS.

LEVELING

FOUR SQUARE HEAD SET SCREWS, JAM NUTS, AND CHAMFERED WASHERS, ARE PROVIDED WITH THE MACHINE FOR LEVELING. INSERT THE SCREW AND NUT AT THE BASE SUPPORT POINTS, BEING CAREFUL THAT THE SCREW POINT SEATS IN THE CHAMFERED WASHERS BELOW.

USE A PRECISION LEVEL AND LEVEL THE UPPER TABLE WITHIN .003" PER FOOT IN BOTH DIRECTIONS AND MAKE SURE THAT THE MACHINE WEIGHT IS EQUALLY SUPPORTED AT THE FOUR SUPPORT POINTS OF THE BASE.

M A C H I N E S E T U P

REMOVE COVER, #502-12-6 OR #502-9-35,
ON THE LOWER PORTION OF THE SPINDLE UNIT.

PULL OUT THE COTTER KEY THROUGH THE SLOTTED NUT OF THE BOLT ASSEMBLY AND LOOSEN THE NUT. ADJUST THE NUT NOW, SO THAT THE WASHER IS LOOSE AND THE SPINDLE UNIT MAY BE SLID ITS FULL TRAVEL IN AND OUT WITHOUT TENDING TO DRAG AND BIND THE 5/8" BOLT ASSEMBLY. LOOSEN THE BOLT ONLY FAR ENOUGH TO DO THIS AND NO FURTHER, AND REINSERT THE COTTER KEY IN THE APPROPRIATE SLOT. NOW SLIDE THE SPINDLE UNIT FROM SIDE TO SIDE AND FURTHER CLEAN THE RUST INHIBITOR FROM THE TABLE.

ATTACH AN AIR SOURCE TO THE APPROPRIATE INTAKE AT THE AIR FILTER ON THE SIDE OF THE REAR OF THE CONTROL ENCLOSURE.

CAUTION: BEFORE ATTACHING ELECTRICAL POWER TO THE BORING BAR, CHECK YOUR ELECTRICAL CURRENT AND THE ELECTRICAL CURRENT RATING ON THE MOTOR NAMEPLATE ON THE SIDE OF THE MOTOR. IF COMPATABLE, CHECK TO SEE IF WIRING ON THE INSIDE OF THE MOTOR WIRE CONNECTION BOX ON THE SIDE OF THE MOTOR IS CORRECT FOR THE VOLTAGE YOU ARE GOING TO USE, AS PER CONNECTING INSTRUCTION ON THE MOTOR WIRE CONNECTION BOX COVER. ALSO, CHECK TO SEE THAT THE CORRECT "H" TYPE HEATERS ARE IN THE MOTOR STARTER THAT GO WITH THE AMP READING ON THE MOTOR NAMEPLATE.

CHECK TO SEE IF SAFETY TOGGLE SWITCH AT REAR OF THE SPINDLE UNIT IS TURNED OFF.

MACHINE SETUP, CON'T

CONNECT 220-VOLT, 3 PHASE WIRING TO THE L-1, L-2, AND L-3 TERMINALS, AS NOTED ON THE RIGHT HAND UPPER PORTION OF THE MOTOR STARTER, LOCATED IN THE UPPER RIGHT PORTION OF THE REAR ENCLOSURE.

IF THE 440-VOLT CURRENT IS USED, RECONNECT THE TERMINALS ON THE TRANSFORMER (502-11-2) AS SHOWN.

MAKE SURE THE AIR REGULATOR WITH THE GAUGE IS SET TO APPROXIMATELY 90 TO 95 PSI PRESSURE AFTER THE AIR LINE IS ATTACHED.

TURN ON SAFETY TOGGLE SWITCH AT THE REAR OF THE SPINDLE UNIT AND TURN THE CLAMP SELECTOR SWITCH TO THE LEFT (OFF) POSITION, SLIDE THE SPINDLE UNIT FROM SIDE TO SIDE AND IN AND OUT TO MAKE SURE IT SLIDES FREELY. THE NECESSARY EFFORT TO SLIDE THIS WILL DECREASE WHEN THE SHIPPING OIL IS ENTIRELY REMOVED FROM THE MACHINE BASE. (THERE IS AN ADJUSTMENT NOTED - CONTROL FUNCTION, PAGE 62 - TO ADJUST EFFORT REQUIRED TO SLIDE THE SPINDLE UNIT).

TURN THE CLAMP SELECTOR TO THE RIGHT (CLAMP) AND CHECK PROPER OPERATION OF THE CLAMP ASSEMBLY AND PROPER RELEASE AND MOVEMENT OF THE BASE WHEN TURNED BACK TO UNCLAMP.

REPLACE COVER ON THE SPINDLE UNIT.

SHIFT SPINDLE SPEED SELECTOR INTO LOW RANGE, LIGHTLY HOLD IN LOW RANGE WITH SELECTOR KNOB PULLED OUT. PLUG THE MOTOR BY PUSHING THE FEED BUTTON, ALONG WITH THE STOP BUTTON. THE FEED SCREW SHOULD TURN COUNTER-CLOCKWISE, LOOKING FROM THE TOP OF THE MACHINE. IF IT TURNS IN THE WRONG DIRECTION, OR TENDS TO RATCHET AND NOT DRIVE AT ALL, SWITCH THE WIRES ON L-1 OR L-2 TERMINALS. SHIFT THE SPINDLE SPEED LEVER BACK INTO THE SLOW SPEED (UP POSITION).

C O N T R O L S

WE SUGGEST THAT BEFORE ATTEMPTING ANY CYLINDER BORING, THE OPERATOR SHOULD ACTUATE THE CONTROLS TO BECOME FAMILIAR WITH THE OPERATION OF THE MACHINE.

1 - CLAMP (FLOAT) SWITCH

TURN THE CLAMP SWITCH TO THE RIGHT TO ENERGIZE THE SPINDLE HOLD DOWN CLAMP. WHEN THIS IS TURNED TO THE LEFT, AIR IS EXHAUSTED FROM THE BOTTOM OF THE SPINDLE UNIT, PROVIDING EASY MOVEMENT OF THE SPINDLE.

CAUTION: MOTOR MUST BE STOPPED WHEN POSITIONING BAR, INADVERTANT SPINDLE ROTATION COULD INJURE THE OPERATOR'S HANDS OR DAMAGE THE CUTTER HEAD PARTS.

IT IS IMPORTANT TO NOTE THAT CLAMP SWITCH MAY BE LEFT IN THE NEUTRAL STRAIGHT UP POSITION SO THAT THE SPINDLE UNIT IS NEITHER FLOATED NOR CLAMPED. YOU WILL FIND IT OFTEN USEFUL TO USE THIS POSITION ON YOU MACHINE FOR DIAL INDICATING PURPOSES IN BORES AND TO MAKE SLIGHT ADJUSTMENT IN ORDER- EITHER TO CORRECT OR TO INTRODUCE A DESIRED TOTAL INDICATOR RUNOUT READING.

2 - FAST DOWN BUTTON

PRESS FAST DOWN BUTTON AND YOU WILL NOTICE THAT THE MACHINE TRAVELS RAPIDLY DOWN UNTIL THE BUTTON IS RELEASED. TO BECOME FAMILIAR WITH THE RAPID DOWN TRAVEL, WE SUGGEST THAT YOU PLACE A TOOL INTO THE HOLDER SLOT AND PRACTICE RUNNING THIS TOOL HOLDER DOWN RAPIDLY (IN A FAST SPINDLE SPEED) TO AN EXACT POINT, AND RETURNING IT TO THE UPPER POSITION. THIS CAN BE DONE RAPIDLY AND VERY ACCURATELY WITH A LITTLE PRACTICE.

CONTROLS, CON'T3 - FEED BUTTON

PRESS THE FEED BUTTON AND THE MACHINE WILL REMAIN IN SLOW DOWN FEED UNTIL EITHER THE STOP BUTTON, LOWER STOP MICROSWITCH, OR UP BUTTON, IS PRESSED.

NOTE: DO NOT PRESS THE STOP BUTTON OR UP BUTTON, WHEN BORING. SEE THE PROCEDURE FOR THIS OPERATION.

4 - UP BUTTON

THE UP BUTTON MAY BE PRESSED ANY TIME EXCEPT WHEN BORING, THEN THE FOLLOWING PROCEDURE MUST BE NOTED: FIRST RAISE AND HOLD THE FEED SHIFT LEVER INTO NEUTRAL POSITION, DECLUTCH THE INNER SPINDLE, AND THEN PUSH THE UP BUTTON.

THIS WILL ALLOW THE CUTTER TO CLEAR ITSELF IN THE BORE BEFORE RETRACTION OF THE SPINDLE, THEREBY ELIMINATING THE POSSIBILITY OF CHIPPING THE TOOL BIT.

THE UP BUTTON WILL CONTINUE THE TRAVEL UPWARD ON THE MACHINE UNTIL EITHER THE STOP BUTTON IS PRESSED OR THE MACHINE CONTACTS THE UPPER MICROSWITCH AND STOPS AT THE TOP OF THE TRAVEL.

YOU WILL OFTEN FIND IT CONVENIENT TO STOP THE UP TRAVEL OF THE MACHINE AS SOON AS THE SPINDLE IS CLEAR OF THE CYLINDER BORE, THEN SLIDE TO THE NEXT BORE LOCATION. THIS IS PARTICULARLY USEFUL WHEN THE CYLINDER IS LOCATED WELL DOWN FROM THE UPPER LIMIT OF THE TRAVEL.

5 - STOP BUTTON

STOP BUTTON MAY BE PRESSED ANYTIME, BUT ONLY IN EMERGENCY CASES, WHEN BORING.

CONTROLS, CON'T6 - SPINDLE CLUTCH CONTROL

THE SPINDLE CLUTCH CONTROL, LOCATED AT THE UPPER RIGHT OF THE UPPER GEAR HOUSING, IS ACTUATED BY PULLING DOWN. THIS MAY BE DONE ON HIGH SPEED THEN JOGGING OR STARTING THE UNIT, OR WHEN THE MACHINE IS IDLE.

IT MAY BE NECESSARY IF THE MACHINE IS IDLE, TO TURN THE CENTERING KNOB COUNTERCLOCKWISE SLOWLY TO DETERMINE IF THE CLUTCH IS ENGAGED. A LIGHT DOWN PRESSURE ON THE SPINDLE CLUTCH AT THE TIME YOU START THE FEED WILL ASSURE THAT IT IS FULLY ENGAGED FOR BORING.

LIFT THE CLUTCH KNOB AT ANY TIME, EXCEPT WHEN BORING, TO DISENGAGE CLUTCH.

WHEN BORING, FIRST RAISE AND HOLD FEED SHIFT LEVER INTO NEUTRAL POSITION THEN DISENGAGE THE CLUTCH.

SPINDLE STOP

THIS MACHINE IS EQUIPPED WITH A SPINDLE STOP THAT ENGAGES AS THE SPINDLE CLUTCH IS DISENGAGED. (THIS IS A SPRING LOCATED STOP AND CAN BE OVER-RIDDEN). IT IS POSITIONED TO STOP THE SPINDLE WITH THE TOOL DIRECTLY FACING THE OPERATOR.

7 - SPINDLE SPEED CONTROL (HIGH-LOW)

THE HIGH, LOW GEARED SPINDLE SPEED CONTROL IS CHANGED BY PULLING OUT AND RAISING OR LOWERING THE PLASTIC KNOB AT THE LOWER RIGHT OF THE SPINDLE UNIT. THIS CONTROL MAY BE OPERATED WHEN THE MACHINE IS RUNNING, BUT JOB MOTOR OR HAND TURN DRIVE TO SHIFT UP TO 200 SPINDLE RPM OR HIGHER. DO NOT SHIFT WHEN BORING. THIS CONTROL IS OFTEN USED IN POSITIONING THE SPINDLE TO SECURE INSTANT HIGHER OR LOWER RAPID TRAVEL.

CONTROLS, CON'T8 - TWO SPEED FEED CONTROL

THE TWO FEEDS PROVIDED ON YOUR MACHINE ARE CONTROLLED BY A SLIDING KEY ARRANGEMENT, OPERATED BY A SMALL KNOB ON THE TOP OF THE UPPER HOUSING. THIS KNOB IS RAISED TO ENGAGE A LOW SPEED FEED RATE AND LOWERED TO SECURE A HIGHER FEED RATE. TO OPERATE THIS CONTROL, FIRST LIFT THE FEED SHIFT LEVER TO ITS NEUTRAL POSITION, THEN WITH THE MOTOR RUNNING, SHIFT THE TWO SPEED FEED LEVER, THEN ALLOW THE FEED SHIFT LEVER TO RETURN TO THE FEED POSITION. IT WILL TAKE A MOMENT FOR THE SLIDING KEY TO DROP INTO THE DRIVE POSITION. THIS CONTROL MAY BE OPERATED WHILE THE MACHINE IS ACTUALLY IN A BORING OPERATION, ALTHOUGH THE DWELL OF THE TOOL MAY LEAVE A WITNESS MARK IN THE BORE.

9 - CENTERING KNOB

THE CENTERING KNOB ON THE LEFT SIDE OF THE UPPER HOUSING OPERATES THE CENTERING FINGERS WHEN TURNED CLOCKWISE. BE CAREFUL NOT TO OVER-EXTEND THESE FINGERS WHEN THE SPINDLE IS NOT IN A CYLINDER OR FINGERS WILL COME COMPLETELY OUT OF THE PINION DRIVE.

CAUTION: MOTOR MUST BE STOPPED WHEN CENTERING. INADVERTANT SPINDLE ROTATION ENGAGEMENT COULD INJURE THE OPERATOR'S HANDS OR DAMAGE CUTTER HEAD PARTS.

10 - STOP ROD

THE UPPER AND LOWER LIMIT SWITCHES LOCATED ON THE SQUARE TUBE CONTROL THE UPPER AND LOWER LIMITS OF TRAVEL OF THE BAR. THE LOWER LIMIT SWITCH IS ACTUATED BY AN ADJUSTABLE STOP ROD. THIS STOP ROD IS LOCKED IN PLACE BY THE PLASTIC KNOB ON THE BACK OF THE UPPER HOUSING. THE UPPER LIMIT SWITCH STOP ROD IS SET AT THE FACTORY AND SHOULD NOT BE CHANGED.

CONTROLS, CON'T11 - FEED LEVER

THE FEED LEVER IS THE KNOB IN THE CENTER ON THE RIGHT SIDE OF THE UPPER HOUSING. IT IS OPERATED AUTOMATICALLY AND IS IN FEED WHEN THE MACHINE IS TURNED ON, BUT CAN BE PLACED IN NEUTRAL BY MANUALLY LIFTING AND HOLDING IT IN NEUTRAL OR MIDDLE POSITION OR BY USE OF ITS ADJUSTING SCREW. TO TURN ON MACHINE WHEN THE FEED LEVER IS IN NEUTRAL, PRESS THE FEED BUTTON. AUTOMATIC FEED WILL NOT OPERATE.

12 - MANUAL HAND FEED

THE MANUAL HAND FEED TRAVEL IS AVAILABLE FOR FACING SLEEVES AND COUNTERBORING, ETC.

IT IS COMPLETELY SEPARATE FROM THE POWERED SPINDLE TRAVEL AND SHOULD ALWAYS BE RETURNED TO THE FULL UP POSITION AFTER BEING USED, BEFORE THE POWER UP TRAVEL RETURNS THE SPINDLE TO THE TOP.

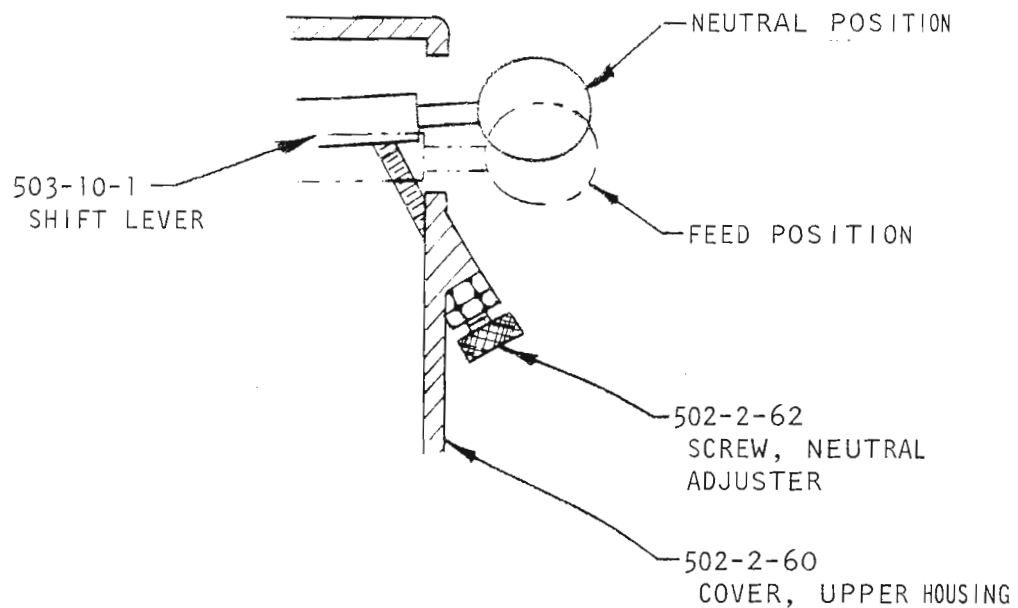
CAUTION: THE AUTOMATIC FEED LEVER MUST BE DISENGAGED WHEN OPERATING THIS SHORT HAND FEED. TO DISENGAGE FEED LEVER, RAISE KNOB AND HOLD IN THE MIDDLE OR NEUTRAL POSITION OR USE ADJUSTING SCREW TO HOLD IT IN NEUTRAL POSITION. ALL CONTROLS, EXCEPTING THE AUTOMATIC FEED WILL OPERATE WITH THE NEUTRAL SCREW ENGAGED (FEED BUTTON TURN ON MACHINE).

THE STANDARD PROCEDURE TO OPERATE THE HAND FEED IS TO POWER TRAVEL CLOSE TO THE FEEDING POINT, PRESS FEED BUTTON, ENGAGE SPINDLE CLUTCH, OPERATE THE HAND FEED, (HOLDING THE FEED LEVER WHERE REQUIRED), AND THEN RETURN FIRST THE HAND FEED, AND THEN THE POWER FEED TO THE TOP.

CONTROLS, CON'TNEUTRAL POSITION FOR HAND FEED

THIS MACHINE IS PROVIDED WITH AN ADJUSTING SCREW WHICH IS PRESET AT THE FACTORY, TO HOLD THE SHIFT LEVER (503-10-1) IN NEUTRAL POSITION WHEN USING THE HAND FEED. THE SCREW IS INSERTED IN THE UPPER HOUSING COVER (502-2-60) AS SHOWN.

WHEN THE MACHINE IS HELD IN NEUTRAL, ALL CONTROLS WILL OPERATE AS USUAL, WITH THE EXCEPTION OF THE AUTOMATIC POWER FEED.

NEUTRAL POSITION FOR HAND FEED

CONTROLS, CON'T13A - VARIABLE SPEED DRIVEOPERATION OF VARIABLE SPEED DRIVE

THE HAND WHEEL SPEED CONTROL MUST BE ADJUSTED WHILE THE MACHINE IS RUNNING AND CAN ACTUALLY BE ADJUSTED UNDER MODERATE LOADS WHEN THE MACHINE IS BORING. THIS SPEED IS ADJUSTED TO SECURE YOUR OPTIMUM BORING SPEED. AN OPTIMUM BORING SPEED FOR RAPID STOCK REMOVAL AND GOOD TOOL LIFE IS 380 SURFACE FEET PER MINUTE ON NORMAL OVERSIZE CUTS. A GUIDE LINE TO SECURE THIS SURFACE SPEED IS THE FOLLOWING LIST OF SPINDLE RPM'S AT DIFFERENT BORE DIAMETERS:

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

NOTE: REFER TO THE CHART IN BACK OF THE MANUAL FOR SPEED RECOMMENDATION.

CAUTION: DO NOT RAPIDLY CHANGE SPEED ABOVE #3 ON VARIABLE DRIVE UNIT. RAPID CHANGING OF SPEED ABOVE #3 CAN CAUSE DAMAGE TO VARIABLE CONTROL DRIVE GEARS.

| VARIABLE DRIVE UNIT NUMBER | SPINDLE R.P.M. | |
|-------------------------------|-------------------|-------------|
| | <u>LOW</u> | <u>HIGH</u> |
| 1 | 25 | 90 |
| 3 | 55 | 190 |
| 5 | 100 | 390 |
| 6 | 134 | 490 |

CONTROLS, CON'T13B - 6 SPEED BELT DRIVEOPERATION OF 3 SPEED BELT CASE

TO CHANGE SPEED IN 3 SPEED BELT CASE:

CAUTION: FIRST DISCONNECT POWER FROM THE BORING BAR

THEN LOOSEN THE KNOBS ON THE SIDE COVERS. PIVOT THE COVERS TO GAIN ACCESS TO V-BELT. NOW LOOSEN THE CLAMP HANDLE ON THE SIDE OF THE MOTOR AND PIVOT THE MOTOR FORWARD. NOW YOU CAN MOVE THE BELT TO A NEW GROOVE LOCATION. THE TOP GROOVE POSITION IS FOR LOW RPM, BOTTOM POSITION IS FOR HIGH SPINDLE RPM. AFTER SELECTING THE SPEED YOU REQUIRE, PIVOT MOTOR BACK TO TIGHTEN THE V-BELT. (DO NOT OVER-TIGHTEN BELT). THEN TIGHTEN THE CLAMP HANDLE.

AN OPTIMUM BORING SPEED FOR RAPID STOCK REMOVAL AND GOOD TOOL LIFE IS 380 SURFACE FEET PER MINUTE ON NORMAL OVERSIZE CUTS.

| | | |
|---------|---|-----|
| 4" BORE | - | 380 |
| 6" BORE | - | 200 |
| 8" BORE | - | 100 |

| <u>V-BELT LOCATION</u> | <u>SPINDLE RPM</u> | |
|------------------------|--------------------|-------------|
| | <u>LOW</u> | <u>HIGH</u> |
| TOP | 20 | 80 |
| MEDIUM | 50 | 200 |
| BOTTOM | 100 | 380 |

-B TYPE CUTTER HEADSALTERNATE CUTTER HEAD ARRANGEMENTS

YOUR FA-4B 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.

PRODUCTION CUTTER HEAD 600-8-4

THE PRODUCTION CUTTER HEAD WITH A STANDARD BORE CAPACITY OF 3.25" TO 8" MAY BE QUICKLY ATTACHED TO THE FA-4B MACHINE BY USE OF THE DRAW BOLT.

IT IS USED IN THE FA-4B 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 ALL OBSTRUCTIONS IN THE U.S. PASSENGER CAR AND TRUCK ENGINES.

NOTE: CUTTER HEAD BODY WILL NOT CLEAR U.S. OR GERMAN FORD V-6 2600 AND 2800CC ENGINE BLOCKS.

-B TYPE CUTTER HEAD, CON'T

A DAMPENER WEIGHT IS ALSO PROVIDED IN THE CUTTER HEAD TO IMPROVE PERFORMANCE OF THE BORING SPINDLE. THIS REQUIRES LITTLE OR NO MAINTENANCE AS LONG AS LIQUIDS OR CONTAMINATION DO NOT ENTER THE WEIGHT CAVITY. SHOULD THIS OCCURE, THE OPERATOR WILL EXPERIENCE CHATTER PROBLEMS WITH THIS HEAD AND IT WILL HAVE TO BE DIS-ASSEMBLED AND CLEANED. IT IS SIMPLY DONE BY REMOVAL OF THE THREE FLAT HEAD SCREWS. CAREFULLY DISASSEMBLE, CLEAN, AND REASSEMBLE.

BLIND HOLE CUTTER HEAD (OPTIONAL) 600-20

THIS CUTTER HEAD IS ATTACHED AND OPERATES IN THE SAME MANNER AS A PRODUCTION CUTTER HEAD EXCEPT THE CENTERING FINGERS ARE LOCATED ABOVE THE CUTTER TOOL, REQUIRING TOOL REMOVAL TO CENTER EACH BORE. AN OFFSET TOOL BIT IS PROVIDED SO THAT EXTREME BLIND BORES MAY BE PROCESSED. A DAMPENER WEIGHT IS ALSO PROVIDED IN THE CUTTER HEAD.

STUB BORING BAR (OPTIONAL) 1.875 (48MM) 502-9

THIS STUB BORING HEAD WITH A CAPACITY OF 1.875" TO 4.1" (48MM TO 104MM) DIAMETER X 8" (203MM) DEPTH, MAY BE QUICKLY ATTACHED TO THE FA-4B BORING MACHINE. AT ALL TIMES THE WORK SHOULD BE LOCATED IN THE MACHINE SO THE END OF THE STUB BORING HEAD IS NO FURTHER THAN 1" FROM THE BEGINNING OF THE WORK WHEN THE SPINDLE IS IN THE UPPER LIMIT OF TRAVEL.

UNLIKE THE PRODUCTION CUTTER HEAD, CENTERING FINGERS ARE LOCATED ABOVE THE CUTTING TOOL, REQUIRING TOOL REMOVAL TO CENTER EACH BORE.

TWO SETS OF CENTERING FINGERS ARE PROVIDED, THE SMALLER HAS A 1.875" TO 3.5" BORE DIAMETER RANGE AND THE LARGER A 2.312" TO 4.1" DIAMETER BORE RANGE.

-B TYPE CUTTER HEAD, CON'T

IF CENTERING FINGERS REQUIRE DRESSING AFTER A PERIOD OF USE, APPLY THE SAME LAPPING PROCEDURE NOTED ON PAGE 43 THE MICROMETER MAY ALSO BE PERIODICALLY CALIBRATED AS NOTED ON PAGE 43 AND 44

AN OFF-SET TOOL BIT IS ALSO PROVIDED IN ORDER TO BORE TO THE EXTREME BOTTOM OF BLIND HOLES.

IMPORTANT GENERAL INFORMATION
FOR THE BEST USE OF
THE MODEL 1.875 STUB BORING TOOLING

CAUTION: INNER SPINDLE ADJUSTMENT (SEE PAGE 50) MUST
BE CORRECT FOR PRECISION USE OF STUB BORING HEADS.

SINCE THE EXTENDED STUB BORING HEAD DESIGN HAS CONSIDERABLE
OVERHANG WITH A SMALL SHAFT DIAMETER, THE CUTTING TOOL
"B" LAMP MUST BE KEPT VERY NARROW, (.005" TO .015")
(.127MM TO .3810MM) WIDE. THIS WILL INSURE BEST RESULTS
WITH NO CHATTER AT THE BOTTOM OF THE BORE.

THE SMALL HEAD WILL ALSO BE INCLINED TO DEFLECT WITH
INCREASEINGLY HEAVY CUTS. YOU MAY EXPECT, WITH PROPERLY
SHARPENED TOOLS, THAT AFTER .040" (1.016MM) (ON DIAMETER)
CUT A SECOND PASS OF THE TOOL WILL REMOVE CLOSE TO
.001" (.0254MM) MATERIAL ON THE DIAMETER. A SECOND PASS
FOLLOWING A LESSER FIRST CUT WILL REMOVE LESS METAL.

THE .040" (1.016MM) CUT WILL ALSO LEAVE A LIGHT DRAG
BACK MARK IN THE CYLINDER THAT CAN IN TURN BE ELIMINATED
BY THE SECOND PASS.

THE DRAG BACK MARK IS GENERALLY ELIMINATED IN ANY EVENT
BY FINISH HONING. IT MAY ALSO BE ELIMINATED BY
REPOSITIONING THE BORING SPINDLE AWAY FROM THE TOOL
POSITION ON THE RETURN STROKE.

YOU CAN USE THE SECOND PASS PERFORMANCE (SECOND PASS
MUST BE MADE WITHOUT RE-CENTERING) TO PROVIDE A MOST
PRECISE BORE.

GENERAL INFO. FOR STUB BORING TOOLING, CON'T

IN GENERAL SIZE VARIATIONS IN A TYPICAL CYCLE BORE WILL APPROXIMATE .0007" (.01778MM). A SECOND PASS WILL REDUCE THESE VARIATIONS TO GENERALLY LESS THAN HALF AND PROVIDE A FINE FINISH. THIS FINISH WILL REQUIRE VERY LITTLE STOCK REMOVAL WITH A HONE IN ORDER TO CROSS HATCH FOR AN EXCELLENT RING SEATING CONDITION.

THE BORING HEAD ASSEMBLY AS NOTED IN STUB BAR ILLUSTRATION, IS EQUIPPED WITH A DAMPENING WEIGHT, PART 502-9-6A. THIS REQUIRES LITTLE OR NO MAINTENANCE AS LONG AS LIQUIDS OR CONTAMINATION DO NOT ENTER THE WEIGHT CAVITY. SHOULD THIS OCCUR, THE OPERATOR WILL EXPERIENCE CHATTER PROBLEMS WITH THIS HEAD AND IT WILL HAVE TO BE DISASSEMBLED AND CLEANED.

PERFORMANCE OF THE STUB BORING BAR IS ALSO CLOSELY RELATED TO THE PROPER LUBRICATION AND ADJUSTMENT OF THE MACHINE INNER SPINDLE BEARING. CHECK THE INNER SPINDLE ADJUSTMENT TWO TO THREE TIMES PER YEAR TO MAKE SURE CLEARANCE IS CORRECT.

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

THIS STUB BORING HEAD, WITH A CAPACITY OF 1.5 TO 4.1" DIAMETER (38 TO 104MM) X 3" DEPTH (76MM), ATTACHES AND OPERATES THE SAME AS THE 502-9 CUTTER HEAD. IT IS DESIGNED ESPECIALLY TO BE USED WITH THE PRODUCTION FULL WITH SINGLE CUT V.W. HEAD FACING TOOL. IT CAN ALSO BE USED FOR GENERAL PURPOSE BORING WHERE A RIGID STUB BORING HEAD IS REQUIRED.

NOTE: WHEN THIS CUTTER HEAD IS USED FOR V.W. HEAD FACING, CUTTER HEAD WILL REQUIRE CENTERING BUSHINGS AND WIDE FACING CUTTING TOOLS, WHICH ARE SOLD SEPARATELY. SEE PAGE 96 FOR SIZES.

V.W. HEAD FACING INSTURCTION

INSTALL 600-8-8A STUB BORING HEAD. SELECT THE SIZE CENTERING BUSHING YOU REQUIRE FOR THE SIZE HEAD YOU ARE FINISHING. PLACE IT OVER THE STUB BAR, RAISING IT UP UNTIL IT ENGAGES THE BALL DETENT TO HOLD IT IN ITS PARK POSITION. SET A FACING TOOL THAT IS IN THE RANGE YOU REQUIRE. SET BY LOOSENING ADJUSTING PIN SET SCREW, WHICH WILL ALLOW ADJUSTING PIN TO SLIDE BACK AGAINST MICROMETER ANVIL.

INSERT FACING TOOL INTO CUTTER HEAD AND LOCK WITH TOOL HOLDER LOCK SCREW.

PLACE CYLINDER HEAD ON PARALLELS AS SHOWN IN SKETCH. MAKE SURE MOUNTING SURFACE IS REASONABLY FLAT. SHIM TO SUPPORT PROPERLY IF SURFACE IS EXCEPTIONALLY OUT OF FAT.

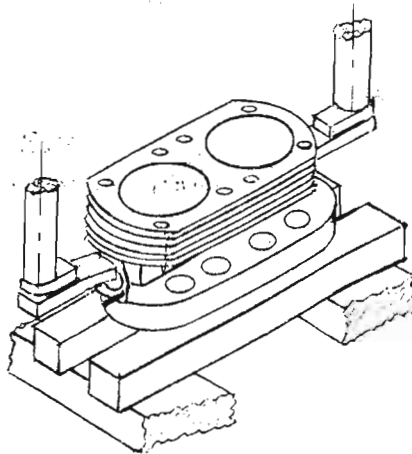
V.W. HEAD FACING INSTRUCTION, CON'T

CLAMP HEAD WITH SUFFICIENT FORCE TO ENSURE HOLDING IN POSITION WHEN CUTTING.

NOTE: EXCESSIVE CLAMP FORCE MAY WARP OR DEFLECT HEAD.

SHIFT SPINDLE SPEED TO LOW--"ALL OPERATING TO BE IN LOW SPEED". RAPID TRAVEL HEAD DOWN UNTIL FACING TOOL IS JUST ABOVE CYLINDER HEAD. TURN OFF BORING BAR. MOVE CENTERING BUSHING DOWN FROM ITS PARK POSITION. TURN BORING BAR CLAMP SWITCH TO FLOAT. CENTER SPINDLE WITH BUSHING, TURN SWITCH BACK TO CLAMP. RAISE BUSHING BACK TO ITS PARK POSITION.

NOW USING THE HAND FEED AND DIAL DEPTH INDICATOR ASSEMBLY, 503-14A, FACE HEAD TO THE DESIRED DEPTH. SET DIAL INDICATOR SO THAT YOU CAN FINISH TO THE SAME DEPTH IN THE NEXT BORE. DO NOT ALLOW TOOL TO DWELL FOR MORE THAN A FEW REVOLUTIONS AT THE FINISH DEPTH OR A WAVY FINISH WILL RESULT.



OPERATING INSTRUCTIONS

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.

BORING AUTOMOBILE AND SMALL TRUCK BLOCKSLOADING IN-LINE CYLINDER BLOCKS

PLACE A CHEVROLET, FORD, OR PLYMOUTH 6 CYLINDER BLOCK IN THE MACHINE ON TOP OF THE 5" PARALLELS, AND APPLY WEIGHT TO THE TOP OF THE BLOCK AT EACH END TO DETERMINE THAT THERE IS NO BURR OR DIRT UNDER THE PAN RAILS THAT WILL RESULT IN THE BLOCK NOT BEING CLAMPED PROPERLY TO ALL FOUR POINTS OF THE PAN RAILS. (YOU WILL NOTE IT IS NECESSARY TO PROPERLY DEBURR AND CLEAN PAN RAILS AT SUPPORT POINTS, AS APPOSED TO CLEANING THE TOP OF THE CYLINDER BLOCK FOR A PORTABLE BAR.) YOU WILL FIND THAT SOME BLOCKS WILL ROCK ON PARALLELS AND SHOULD BE SHIMMED AT THE PROPER FRONT SUPPORT TO ELIMINATE ROCK.

PLACE THE BLOCK INTO THE MACHINE, SO THAT THE HOLES ARE IN A POSITION TO APPROXIMATELY LOCATE BORING SPINDLE IN THE MIDDLE OF ITS 1-3/4" IN AND OUT TRAVEL, WHEN CENTERED.

YOU WILL NOTE THAT IT IS POSSIBLE TO PUT ENGINES IN THIS MACHINE IN SUCH A WAY THAT THE SPINDLE UNIT MAY BE FORCED TO THE LIMITS OF EITHER ITS IN OR OUT TRAVEL AND NOT ENABLE IT TO BE CENTERING PROPERLY.

NOW IN ORDER TO CLAMP BLOCK SECURELY, SWING CLAMP ARMS OUT SO THAT THE TOE OF THE SHOE WILL CONTACT THE CENTER OF THE ENDS OF THE CYLINDER BLOCK.

OPERATING INSTRUCTIONS, CON'T
BORING AUTOMOBILE AND SMALL TRUCK BLOCKS
LOADING IN-LINE CYLINDER BLOCKS

LOCK CLAMP HANDLES FIRMLY AND LOWER THE TOE FIRMLY ON THE BLOCK WITH THE CAM HANDLE STRAIGHT UP. LOCK BALL HANDLES FIRMLY AND LOWER CAM HANDLE TO CLAMP BLOCK. IF THE BLOCK IS EXCEPTIONALLY LONG, SUCH AS STRAIGHT 8'S, OPERATE THE TWO CAM HANDLES SIMULTANEOUSLY SO THAT LOCKING THE FIRST HANDLE DOES NOT TEND TO ROCK THE OPPOSITE SIDE OF BLOCK UP.

YOU WILL NOTE THAT THE LARGE PARALLELS ARE DESIGNED WITH AN "L" SHAPE. THE PURPOSE OF THIS IS TO EXTEND THE BACK PORTION OF THE "L" OUTBOARD TO PREVENT CYLINDER BLOCKS FROM ROCKING WHEN FIRST CLAMP IS APPLIED.

CAUTION: THE STANDARD PRODUCTION-TYPE CUTTER HEAD WITH CENTERING FINGERS BELOW THE TOOL BIT MUST BE CHECKED FOR INTERFERENCE WITH MAIN BEARING BOSSES OR OTHER PROTUBERANCES ON ENGINES OTHER THAN TYPICAL AMERICAN PASSENGER CAR AND TRUCK ENGINES. FA-4B MACHINES MAY HAVE OTHER CUTTER HEADS SUBSTITUTED TO AVOID THIS DIFFICULTY.

MICROMETER

DETERMINE THE CYLINDER BORE SIZE YOU WISH TO CUT AND PLACE A TOOL BIT INTO THE TOOL HOLDER AND USE THE MICROMETER TO SET TO SIZE. CHOOSE A TOOL HOLDER THAT WILL ALLOW MINIMUM TOOL BIT OVERHANG, FOR THE SIZE YOU WISH TO BORE. WE RECOMMEND A MAXIMUM TOOL BIT OVERHANG OF 5/8" OUTSIDE OF TOOL HOLDER. BEFORE SETTING, MAKE SURE THE TOOL BIT IS PROPERLY SHARPENED. (SEE TOOL SHARPENING INSTRUCTIONS.)

NOTE: THIS MICROMETER IS .050 TO A REVOLUTION RATHER THAN .025 AS ON A CONVENTIONAL MICROMETER.

OPERATING INSTRUCTIONS, CON'TMICROMETER

YOUR BORING BAR MICROMETER, AS WITH ANY OTHER MEASURING TOOL, SHOULD BE USED DELICATELY AND WITH CARE, TO BE ASSURED OF GREAT AND CONTINUED ACCURACY. PARTICULAR ATTENTION SHOULD BE PAID TO INSERTING THE HOLDER IN THE MICROMETER WITHOUT ALLOWING THE SPRING LOADED TOOL BIT TO SNAP AGAINST THE MICROMETER ANVIL. CAUTION SHOULD BE USED TO LIGHTLY LOCK THE TOOL BIT. THEN TURN THE MICROMETER SPINDLE AWAY FROM READING AND FIRMLY LOCK THE TOOL BIT. THEN RE-CHECK THE MICROMETER READING.

BORING

INSERT THE TOOL HOLDER INTO THE BORING BAR SPINDLE AND PUSH FIRMLY BACK TO THE INDEX POINT. LIGHTLY LOCK THE TOOL LOCK SCREW WITH PLASTIC HANDLED HEX DRIVER PROVIDED IN YOUR TOOL BOX.

MAKE SURE SPINDLE CLUTCH IS OUT (LEVER IN UP POSITION) AND THE SPINDLE IS PLACED NEAR THE CENTER OF THE HOLE BUT SLIGHTLY TO THE REAR. TURN CLAMP SELECTOR TO RIGHT (CLAMP POSITION). PRESS FAST-DOWN BUTTON TO TRAVEL THE CUTTER DOWN TO WITHIN $1/8$ " OF THE CUT. IF YOU SHOULD TRAVEL THE CUTTER INTO THE BORE, PLACE FINGERS ON UP AND STOP BUTTONS, AND PRESS THE UP BUTTON, IMMEDIATELY PRESSING STOP BUTTON WHEN THE CUTTER IS OUT OF THE BORE.

CENTERING WITH CENTERING FINGERS

TURN CLAMP SELECTOR TO LEFT (FLOAT POSITION). TURN CENTERING KNOB CLOCK-WISE TO EXTEND CENTERING FINGERS. MAKE SURE THEY WILL EXTEND AND CONTACT THE CYLINDER WALL. CONTINUE TO HOLD A FIRM ROTARY PRESSURE ON THE CENTERING KNOB AND TURN CLAMP SELECTOR TO THE RIGHT (CLAMP POSITION.) WHEN ROTATING CLAMP SELECTOR SWITCH, A SLIGHT PAUSE IS REQUIRED IN THE STRAIGHT UP OR NEUTRAL POSITION, TO ASSURE GOOD CENTERING. THIS PAUSE WILL ALLOW THE FLOAT AIR TO DISSIPATE AND THE SPINDLE TO SETTLE EVENLY BEFORE THE CLAMP CYLINDERS ENGAGE.

OPERATING INST., CON'TCENTERING WITH CENTERING FINGERS

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

TURN CENTERING KNOB COUNTER-CLOCKWISE TO RETURN FINGERS TO "IN" POSITION. APPLY LIGHT DOWN PRESSURE ON THE SPINDLE CLUTCH LEVER WHILE PRESSING FEED BUTTON TO BEGIN BORING. IF YOU WISH TO CHECK THE BORE SIZE, ALLOW THE MACHINE TO BORE A SUFFICIENT DEPTH ABOVE THE RING TRAVEL. RAISE AND HOLD THE FEED SHIFT LEVER INTO NEUTRAL POSITION, DISENGAGE SPINDLE CLUTCH, PUSH UP BUTTON. ALLOW THE MACHINE TO RETURN TO ITS FULL UP POSITION.

CHECK BORE DIAMETER, ADJUST IF NECESSARY AND RE-INSERT TOOL RAPID TRAVEL DOWN TO JOB AGAIN; ENGAGE SPINDLE CLUTCH AND PRESS FEED BUTTON. Do NOT UNCLAMP DURING THIS CHECKING OPERATION.

WHEN CUTTER HAS COMPLETED BORING OPERATION, SET DOWN STOP ROD ON THE BACK OF THE UPPER GEAR HOUSING TO STOP FEED. THE STOP SHOULD BE SET PROMPTLY AFTER MACHINE FINISHES CUTTING AS THE INVERTED STYLE OF THE CUTTER HEAD DOES NOT HAVE A LARGE AMOUNT OF END CLEARANCE ABOVE MAIN BEARING BOSSES ON SOME ENGINE MODELS.

AFTER FEED HAS STOPPED, LIFT SPINDLE CLUTCH LEVER, TURN LOWER SPINDLE KNOB, (600-18-2) CLOCK-WISE UNTIL DETENT IS CONTACTED, PRESS THE UP BUTTON TO RETURN THE SPINDLE TO THE TOP.

NOTE: IF A CUT OF .005 OR LESS, ON DIAMETER IS TO BE TAKEN, THE FOLLOWING CENTERING PROCEDURE IS REQUIRED - TURN FLOAT CLAMP SWITCH TO ITS NEUTRAL POSITION, THEN CENTER SPINDLE BY USING A DIAL INDICATOR ATTACHED TO THE CUTTER HEAD. THEN TURN CLAMP SELECTOR TO THE RIGHT (CLAMP POSITION.)

BORING V-8 BLOCKS

THE STANDARD V-8 FIXTURE WITH THE FA-4B MACHINE IS DESIGNED TO BORE MOST 90-DEGREE V-8 TYPE AMERICAN PASSENGER CARS AND LIGHT TRUCKS. THE V-8 TYPE BLOCKS ARE INDEXED BY BEING SUPPORTED ON THE PARALLEL FRAME (502-3-8) SO AS TO MATCH THE MAIN BEARING LOCATION WITH THE INDEX BAR. MOST CURRENT Y BLOCKS ARE BORED BY SETTING THE ENGINE DIRECTLY ON THE FIXTURE.

TO UTILIZE THIS FIXTURE, IT IS PLACED IN THE WOODEN CRADLE AND THE CYLINDER BLOCK IS LOWERED ONTO THE FIXTURE. CARE MUST BE TAKEN TO HAVE THE PAN RAILS CLEAN SO THAT THE BLOCK RESTS FIRMLY ON THE FIXTURE WITH NO ROCK. IF THE CAPS ARE IN PLACE, YOU MUST ALSO CHECK CAREFULLY THE END MAIN BEARING CAPS IN PARTICULAR TO ASSURE THAT THEY ARE TIGHT AND ALSO CHECK TO DETERMINE THAT THERE ARE NO INSERTS OR SEALS IN THE MAIN BEARINGS THAT COULD INTERFERE WITH THE INDEX BAR.

LATE MODEL, SMALL V-6 90° Y BLOCKS WILL REQUIRE SMALL PARALLELS UNDER THEM SO THAT THEY ARE RAISED FOR THE INDEX BAR TO PASS THROUGH THE CENTER OF THE MAIN BEARINGS.

THERE ARE A FEW V-TYPE BLOCKS THAT HAVE A LARGER DIAMETER END MAIN BEARING. IN THIS CASE, MAKE SURE ALL CAPS ARE OFF OR THE CAP NEXT TO THE LARGE MAIN IS TORQUED IN PLACE AS WELL AS ONE AT THE OPPOSITE END.

CAUTION: LOOSE CAPS HELD BY ONE SCREW ONLY CAN FALL AROUND IN THE FIXTURE AND PREVENT ENGINE BLOCK FROM LYING PROPERLY AGAINST THE INDEX BAR.

NOW INSERT THE INDEX BAR FROM THE SIDE OF THE FIXTURE WITH THE OFFSET CAP, AND PUSH BAR THROUGH THE MAINS UNTIL IT INDEXES INTO THE OPPOSITE SIDE OF THE FIXTURE.

BORING V-8 BLOCKS, CON'T

V-8 FIXTURE HAS TWO INDEX BAR LOCATIONS. THE TOP LOCATION IS USED FOR THE INTERNATIONAL 401 SERIES AND FORD SUPER DUTY TRUCK BLOCKS ONLY.

IF THE BLOCK DOES NOT HAVE THE BEARING CAPS ON, YOU MAY LEAVE INDEX BAR IN PLACE, BUT BE SURE AND CHECK FOR INSERTS OR SEALS IN MAIN BEARINGS.

PLACE THE ALUMINUM HOLD DOWN BAR OVER THE BLOCK AND TIGHTEN THE HANDLES (502-3-10) TO CLAMP THE BLOCK TO THE FIXTURE. MAKE CERTAIN THE BAR CLAMPS THE BLOCK AT BOTH ENDS.

ATTACH YOUR HOIST HOOK TO THE EYE IN THE ALUMINUM HOLD DOWN BAR AND LIFT.

WHEN PARTICULARLY LARGE V-8'S ARE BEING BORED, SUCH AS THE CHEVROLET 348 BLOCK, OR THE MERCURY LINCOLN ANGLE TOP BLOCK, IT IS MOST CONVENIENT TO SLIDE BOTH THE CLAMP AND THE BORING SPINDLE COMPLETELY TO THE SIDE TO KEEP THE BORING SPINDLE WELL OUT OF THE WAY WHILE LOADING. LOWER THE FIXTURE AND BLOCK ASSEMBLY DOWN ON THE WEAR PADS, PULLING THE TOP OF THE BLOCK DOWN ON THE PROPER FACE.

THE FA-4B WEAR PADS ARE RELIEVED OUTBOARD OF THE LOWER SUPPORT PADS IN ORDER TO CLEAR THE FLANGE ON THE Y-BLOCKS. CHECK TO MAKE SURE NO PART OF THE FLANGE ON THE Y-BLOCK IS HANGING UP ON THE BASE SECTION.

NOW SLIDE THE BLOCK BACK INTO THE BORING POSITION.

NOTE: A 1-1/2" WIDE BOARD IN BACK OF THE V-8 FIXTURE WILL SPACE MOST ENGINES OUT SO THAT HOLES ARE IN PROPER POSITION FOR BORING AND NO ATTENTION IS REQUIRED FOR POSITIONING.

BORING V-8 BLOCKS, CON'T

RELEASE THE HOLD DOWN BAR (502-3-7) AND ALLOW THE ENGINE TO SLIDE DOWN FIRMLY SO THAT THE LOCATOR BAR CONTACTS THE MAIN BEARINGS, AND RETIGHTEN HOLD DOWN BAR.

SET THE BLOCK HOLD DOWN CLAMPS TO BEST APPLY DOWN PRESSURE AT THE CENTER OF THE V-8 FIXTURE. NOW THIS BANK IS READY TO BORE, MUCH THE SAME AS AN IN-LINE BLOCK.

WHEN THIS BANK IS BORED, REMOVE THE CLAMPS AND SLIDE THE ASSEMBLY OUTWARD SO THAT THE ASSEMBLY WIPES THE CUTTING CHIPS CLEAR OF THE WEAR PADS. LIFT THE ENGINE AGAIN WITH THE HOLD DOWN BAR AND SWING 180° TO REINSERT AS BEFORE. BE SURE TO LOOSEN THE HOLD DOWN BAR AND ALLOW BLOCK TO DROP DOWN, AND INDEX ON OPPOSITE SIDE OF THE MAIN BEARINGS.

NOTE: USE CAUTION WHEN BORING DODGE OR PLYMOUTH V-8'S AS THERE IS A LIMITED AMOUNT OF TRAVEL AVAILABLE AFTER THE CUTTER IS THROUGH THE BORE DUE TO INVERTED STYLE CUTTER HEAD.

ANGLE TOP BLOCKS

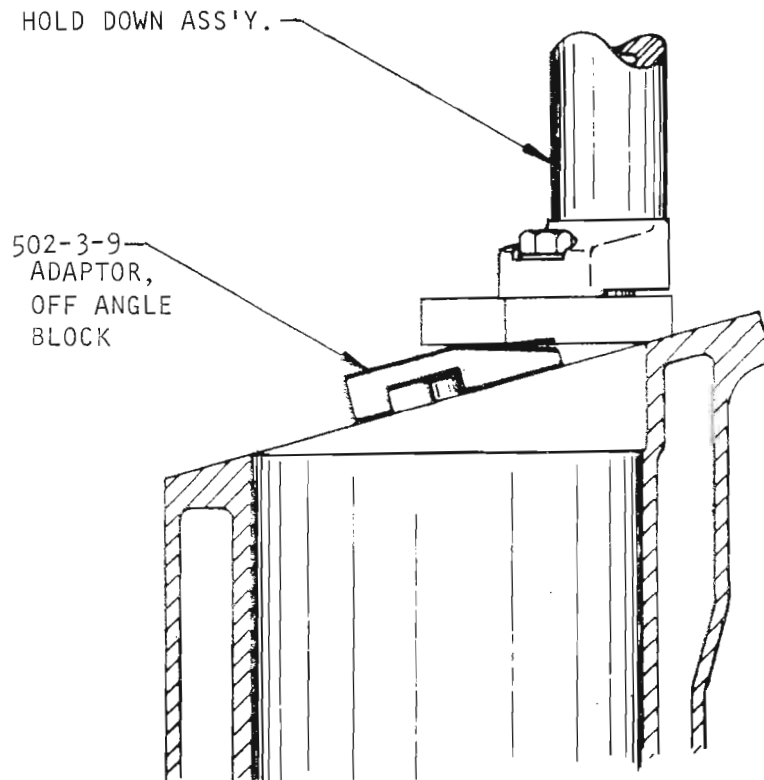
THE SMALL WEDGE SHAPED ALUMINUM BLOCKS (502-3-9) ARE PROVIDED IN YOUR TOOL KIT TO HOLD DOWN ANGLE TOP BLOCKS. PLACE THESE OVER DOWELS AND APPLY CLAMP PRESSURE TO THEM AS SHOWN IN SKETCH.

WHEN YOU ARE REBORING ANGLE TOP BLOCKS, YOU WILL FIND IT NECESSARY TO OCCASIONALLY RECOUNTERBORE THE TOP OF THE BLOCK FOR PROPER PISTON AND RING ENTRY. WE SUGGEST THAT YOU REGRIND YOUR TOOL BIT FOR THIS WITH APPROXIMATELY A 30° ENTRY ANGLE. AFTER BORING A BANK OF CYLINDERS, SET TO SIZE AND INSERT THE BORING TOOL.

IN ORDER TO CENTER FOR THIS OPERATION, RAPID TRAVEL DOWN SUFFICIENTLY FAR TO CENTER THE SPINDLE. CLAMP AND RETRACT THE SPINDLE WITH THE SPINDLE CLUTCH DISENGAGED UNTIL YOU CAN FREELY ROTATE THE CUTTER WITHOUT STRIKING BACK SIDE OF THE CYLINDER.

ANGLE TOP BLOCKS, CON'T

PRESS THE FEED BUTTON, ENGAGE THE SPINDLE CLUTCH, PUT THE SPEED CHANGE LEVER IN LOWEST SPEED, AND ALLOW THE MACHINE TO BORE UNTIL CHAMFER IS CUTTING 360° OF CYLINDER. RAISE SHIFT LEVER TO NEUTRAL POSITION AND DISENGAGE SPINDLE CLUTCH, DEPRESS UP PUSH BUTTON TO RETURN THE SPINDLE TO THE TOP.

CLAMPING ANGLE TOP BLOCKSBORING LARGE TRUCK BLOCK

THE FA-4B BORING MACHINE HAS THE CAPACITY TO BORE TRUCK ENGINES SUCH AS THE IN-LINE MACK AND IN-LINE GMC SERIES 71. IT IS NECESSARY WHEN BORING THESE LARGE BLOCKS TO REMOVE THE WEAR PADS (502-8-1) AND PLACE THE BLOCK DIRECTLY ON THE MAIN BASE (502-8-2). THE BLOCKS ARE THEN BORED ACCORDING TO THE INSTRUCTIONS.

FORD 401 AND THE IH-401 TRUCK V-8 BLOCKS

THE COMBINATION FIXTURE PROVIDES AN UPPER INDEX BAR LOCATION TO PROPERLY ALIGN THE MAIN BEARING LOCATION ON THESE BLOCKS. WEAR PADS MUST BE REMOVED AND BLOCK SHOULD BE LIFTED WITH THREADED EYE IN THE CYLINDER BANK RATHER THAN THE EYE IN THE HOLD DOWN BAR. TO CHANGE BANKS, LIFT BLOCK BACK INTO THE CRADLE AND PICKUP FROM THE OTHER BANK.

BEFORE SLIDING FORD BLOCKS INTO BORING POSITION, MOVE THE RIGHT CLAMP ARM CLEAR AND SLIDE THE SPINDLE TO THE RIGHT IN ORDER TO CLEAR THE EXTREME TOP OF THE WEDGE BLOCK.

THE GMC - 305 & FORD 2800cc, V-6 BLOCK

TO BORE THE GMC - 305 V-6 BLOCKS, THE OPTIONAL V-6 FIXTURE (502-3-14B) IS PLACED IN THE FA-4B MACHINE, WITH THE DOWEL PINS IN PLACE, (USE THE OUTER HOLES), AND THE BLOCK IS THEN MOUNTED ON THE FIXTURE. THE FIXTURE AND BLOCK ARE POSITIONED AND CLAMPED IN THE MACHINE AND THE FIRST BANK BORED. THE BLOCK IS THEN REMOVED FROM THE FIXTURE AND DOWEL PINS RE-LOCATED FOR BORING THE OTHER BANK. THE SECOND BANK IS THEN BORED IN THE SAME MANNER AS THE FIRST.

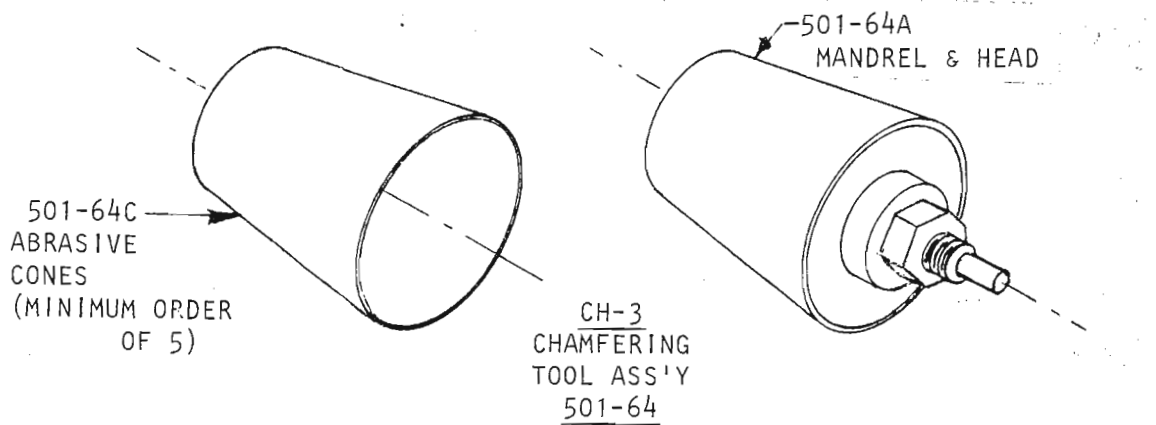
TO BORE THE FORD 2800cc V-6 BLOCK, USE THE INNER HOLES AND PROCEED AS ABOVE.

CHAMFERING

A SPECIAL TOOL IS AVAILABLE FOR CHAMFERING. TOOL MAY BE SET BY EITHER INSERTING IN THE HEAD AND APPROXIMATELY SETTING OR PLACING IN A MICROMETER AND SET APPROXIMATELY .100 OVER THE BORE SIZE. CHAMFERING CAN BE DONE EITHER BY USING SLOW FEED AND RELEASING WHEN ADEQUATE CHAMFER HAS BEEN DEVELOPED OR BY USE OF HAND FEED.

CHAMFERING, CON'T

CHAMFERING MAY ALSO BE SIMPLY DONE MOST EFFECTIVELY WITH AN OPTIONAL MODEL CH-3 ABRASIVE TOOL DRIVEN BY A DRILL MOTOR. THIS METHOD WILL NOT REQUIRE BORING BAR AND DEVELOPS A SMOOTH BURR FREE ENTRY FOR RINGS.

COUNTERBORING

COUNTERBORING WILL OFTEN BE REQUIRED IN RE-SLEEVEING LARGE ENGINE BLOCKS ON YOUR MODEL MACHINE AND FREQUENTLY A CLOSE TOLERANCE DEPTH MUST BE MAINTAINED IN ORDER TO PROPERLY SECURE THE SLEEVE INSTALLATION.

NOTE: Use HAND FEED.

UPPER AND LOWER DECK REPAIR OF DIESEL CYLINDER BLOCKS

MOST DIESEL BLOCKS USE THE CYLINDER HEAD TO CLAMP THE LIP OF THE WET SLEEVE AGAINST THE COUNTERBORE AND AT THE SAME TIME, LOCATION OF THE SLEEVE IS DETERMINED BY THE UPPER AND LOWER FIT.

THIS REQUIRES A GOOD DEAL OF CAUTION TO DETERMINE THAT:

1. COUNTERBORE IS PARALLEL TO THE TOP DECK
2. COUNTERBORE IS EXACTLY SQUARE WITH THE CONCENTRIC UPPER AND LOWER DECK BORE FIT DIAMETERS.

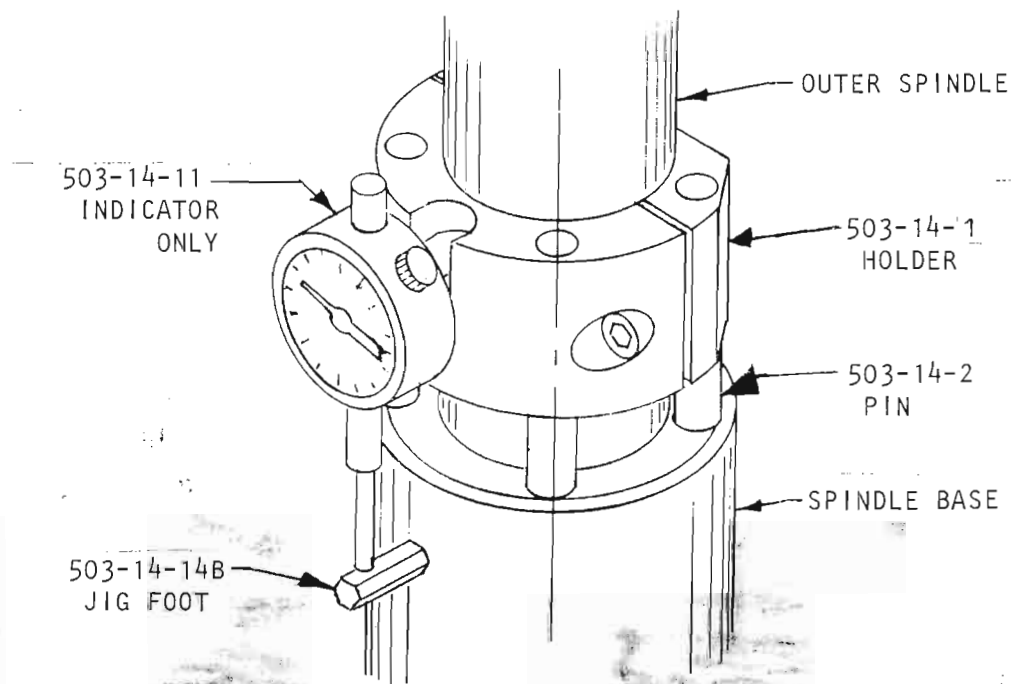
COUNTERBORING, CON'T

COUNTERBORING MAY BE BEST ACCOMPLISHED BY THE USE OF AN OPTIONAL 1" TRAVEL DIAL INDICATOR ASSEMBLY, 503-14A.

TO COUNTERBORE TO A CLOSE TOLERANCE DEPTH, CAREFULLY HAND FEED THE RF TYPE CUTTER BIT DOWN UNTIL THE CUTTER IS SLIGHTLY TOUCHING THE BLOCK SURFACE. ADJUST THE DIAL READING TO 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 PROPER NUMBER OF GRADUATIONS ON THE INDICATOR.

THE DIAL DEPTH INDICATOR CLAMP IS MANUFACTURED WITH SPRING PINS SO IT WILL COMPENSATE FOR THE WEIGHT OF THE SPINDLE AND ALLOW VERY ACCURATE DEPTH CONTROL. IT MAY BE CLAMPED INTO ANY POSITION WITHIN THE MACHINE'S SPINDLE TRAVEL.

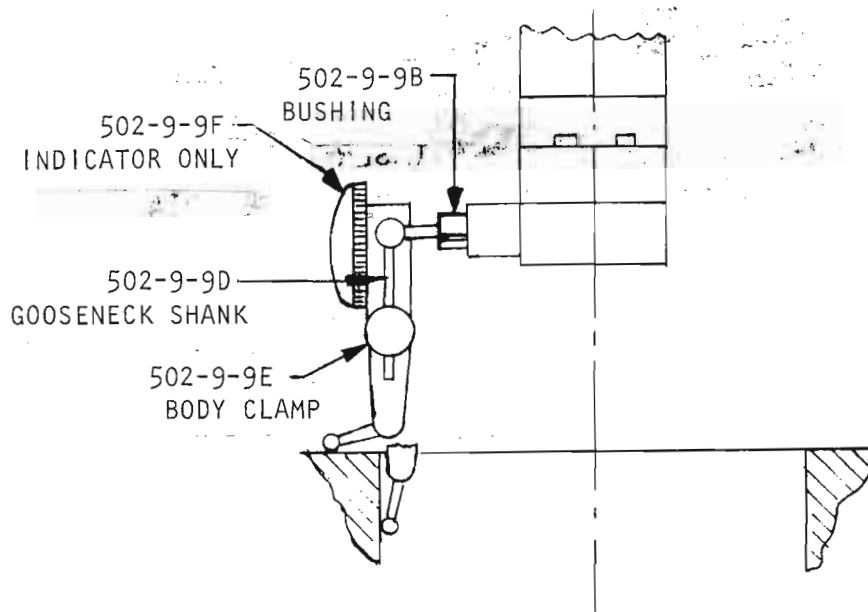
NOTE: 1/4 TURN OF THE RIGHT HAND CLAMP SCREW IS SUFFICIENT TIGHTENING FORCE. THIS WILL ALLOW THE COLLAR TO SLIP ON THE COLUMN (AFTER THE PINS RETRACT INTO COLLAR) IF THE COLLAR IS INADVERTENTLY LEFT IN WRONG POSITION DURING NORMAL CYCLE BORING OPERATION.



503-14A
DEPTH DIAL INDICATOR
ASS'Y

MECHANICAL DIAL RUNOUT INDICATOR (OPTIONAL)

502-9-9-A



502-9-9A

DIAL RUNOUT INDICATOR ASS'Y

AN INDICATOR TO CHECK BORE, AS WELL AS FACE RUNOUT, IS AVAILABLE FOR THE FA-4B MACHINE. THIS MECHANICAL INDICATOR SHOULD BE USED PARTICULARLY WHERE AN UPPER OR LOWER BORE MUST BE ALIGNED PERFECTLY WITH A MATCHING BORE. IF THE TOP OF THE BLOCK FACE RUNS OUT EXCESSIVELY, THE BLOCK MUST BE CHECKED TO SEE IF THE HEAD SURFACING HAS BEEN DONE PROPERLY PERPENDICULAR TO THE CENTER LINE OF THE CYLINDER. IF IT HASN'T, IT WILL BE NECESSARY TO SHIM THE BLOCK TO SECURE A BETTER INDICATOR READING. THIS PERPENDICULARITY MUST BE CHECKED CLOSELY ON BLOCK TOP SURFACE TO CLAMP THE CYLINDER LINER.

REMOTE RUNOUT INDICATING SYSTEM (OPTIONAL) 502-12-7A

AN OPTIONAL REMOTE INDICATION AIR PROBE AND GAUGE SYSTEM IS ALSO AVAILABLE TO CHECK BORE AND FACE RUNOUT.

THE STATIONARY INDICATOR ALLOWS EASIER READING AND CAN BE USED IN LOWER BORE EXTREMITIES WHERE THE MECHANICAL DIAL INDICATOR CANNOT BE SEEN. THE AIR PROBE CAN BE USED IN A CONSIDERABLY SMALLER BORE SIZE RELATIVE TO THE SPINDLE DIAMETER.

DEPTHS OF CUT

PRECISION FINISH BORES MAY BE CUT IN ONE PASS WITH STOCK REMOVAL UP TO .060 IN DIAMETER, PROVIDED THE SUGGESTED SURFACE SPEEDS OF 380 FEET PER MINUTE ARE USED. GENERALLY WHERE THE FINEST FINISHES ARE REQUIRED AND/OR A HEAVY STOCK REMOVAL MAY BE MADE, USE THE LIGHT FEED RATE. EXTREME BORE LENGTH JOBS MAY REQUIRE .040 FINISH CUT.

ROUGHING CUTS FOR SLEEVING OR SUBSTANTIAL STOCK REMOVAL CAN BE MADE UP TO .200 ON THE DIAMETER - USING THE FAST FEED RATE AND APPROXIMATELY 200 FEET PER MINUTE SURFACE SPEED.

STUB BORING BAR

HEAVY CUTS UP TO .150 ON THE DIAMETER CAN BE MADE WITH THE STUB BORING BAR.

T O O L B I T S H A R P E N I N G

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

THE PERFORMANCE OF YOUR BORING BAR AND QUALITY OF WORK IT WILL DO, IS ALMOST ENTIRELY DEPENDENT ON THE CARE OF THE CUTTING TOOL. IT IS THE MOST FREQUENT CAUSE OF SIZE AND FINISH PROBLEMS IN BORING.

TO SHARPEN THE CARBIDE BIT, INSERT THE TOOL HOLDER IN THE SHARPENING JIG SLOT. PLACE THE JIG OVER THE PIN PROVIDED ON THE TOP OF THE SJ3B 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, TO IMPROVE CUTTING AND PREVENT GROOVING OF THE DIAMOND WHEEL. AFTER SHARPENING A NUMBER OF TIMES DRESS EXCESS STEEL AWAY FROM THE CARBIDE WITH A GRINDING WHEEL.

TOOL BIT SHARPENING, CON'T

IF A CONSIDERABLE AMOUNT OF PRODUCTION IS ANTICIPATED WITH YOUR FA-4B MACHINE, WE WOULD RECOMMEND LOCATING A SILICON CARBIDE OR GREEN GRIT TYPE OF ABRASIVE GRINDING WHEEL ON A CLOSELY LOCATED BENCH. SO OPERATOR MAY CONVENIENTLY DRESS STEEL AWAY FROM THE CARBIDE AND GRIND AWAY UNUSED PORTIONS OF THE CARBIDE LANDS TO ALLOW FASTER DIAMOND WHEEL TOUCH UP. THIS WILL ALSO BE CONVENIENT IN THE EVENT A SMALL FRACTURE OCCURS IN CARBIDE, AND WILL REDUCE WEAR ON DIAMOND WHEEL. THE TOP SURFACE WILL CRATER .010 TO .015 BACK OF THE TIP WITH CONSIDERABLE BORING, SO THE TIP SHOULD BE OCCASIONALLY DRESSED BACK .020 TO .025.

CAUTION: SEE SHEET FOR TOOL SHARPENING REQUIREMENT.

DIAMOND WHEEL IS DESIGNED FOR CARBIDE ONLY AND IS NOT INTENDED FOR RAPID STOCK REMOVAL. STEEL TENDS TO LOAD IT. A TOOL BIT USED FOR ALUMINUM BORING SHOULD NEVER ALTERNATELY BE USED FOR CAST IRON OR STEEL. IRON WELD ON TOP OF THE BIT WILL CAUSE A ROUGH FINISH ON ALUMINUM WORK.

CAUTION: DO NOT ATTEMPT TO DRESS OR SHARPEN THE TOP OF THE TOOL BIT. GRIND OR DRESS THE FRONT AND SIDES ONLY.

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.

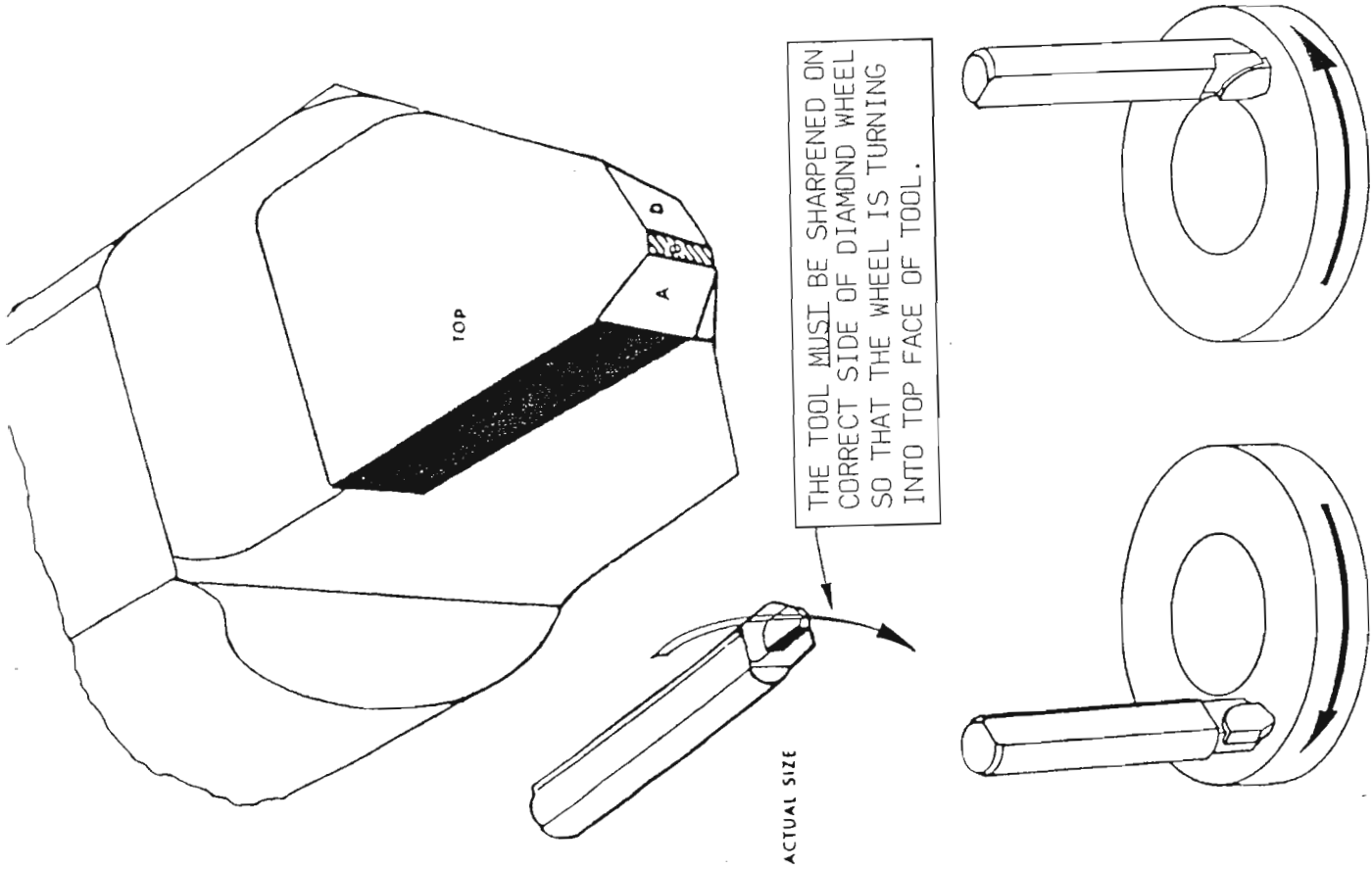
IN THE ACCOMPANYING SKETCH, LETTERS A,B,D, CORRESPOND TO THE LETTERS INDICATED ON YOUR SHARPENING JIG, IN OTHER WORDS, WHEN YOUR JIG IS SET IN THE A POSITION IT WILL SHARPEN THE "A" LAND AS SHOWN IN THE SKETCH.

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 STUB BORING HEADS AND LONG BORE OPERATIONS. SEE PAGE 41B 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.



TOOL SHARPENING REQUIREMENTS

CAUTION: BORING DEPTH VS. TOOL SHARPENING

THE FA-4B BORING BAR TOOL SHARPENING DOES NOT REQUIRE EXTREMELY CLOSE ATTENTION TO "B" LAND WIDTH FOR THE GREAT BULK OF PASSENGER CAR BORING UP TO 11" CYLINDER LENGTH, ALTHOUGH A .025 WIDTH "B" LAND SHOULD NOT BE EXCEEDED.

CYLINDER LENGTHS LONGER THAN 11" REQUIRE TOOL BIT "B" LANDS TO BE .005 TO .015 WIDE OR CHATTER WILL LIKELY RESULT AT THE BOTTOM OF THE HOLE.

TO PRODUCE THE BEST RESULT AT THE EXTREME LENGTH CAPACITY, USE A RF FACING TOOL, 501-29A, AND DO NOT SHARPEN AN "A" LAND. THIS TOOL BIT IS PARTICULARLY USEFUL FOR HEAVY STOCK REMOVAL ON LONG BORES.

CARE 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 THE PARTICLES THAT TEND TO LOAD THIS WHEEL, OTHERWISE YOU WILL NOT PRODUCE THE KEEN EDGE ON THE TOOL THAT ALLOWS THE MACHINE TO BORE ACCURATE HOLES WITH A FINE SURFACE FINISH.

TOOL LIFE

WITH TOOLS SHARPENED TO A PRECISION EDGE, IT SHOULD BE POSSIBLE TO BORE APPROXIMATELY 20 OVERSIZE CYLINDERS ON HIGH SPEED.

THIS APPLIES TO MOST AMERICAN PASSENGER 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 ORIGINAL KEEN EDGE.

TWO GRADES OF CARBIDE TOOL BITS ARE AVAILABLE:

R8 TOOL BIT: A TOUGH GRADE OF CARBIDE FOR HEAVY AND INTERRUPTED CUTS AND GENERAL BORING.

R1 TOOL BIT: A HARDER CARBIDE WITH BETTER WEAR CHARACTERISTICS, TO BE USED FOR NORMAL BORING WITH IMPROVED TOOL LIFE. SUGGESTED FOR PRODUCTION RE-BORING.

C E N T E R I N G F I N G E R S

C H A N G I N G O R I N S T A L L A T I O N O F C E N T E R I N G F I N G E R S

CAUTION: MOTOR MUST BE TURNED OFF AND SPINDLE CLUTCH LEVER MUST BE IN THE UP DETENT POSITION DURING ANY CENTERING FINGER OPERATION.

CENTERING FINGERS CAN BE TAKEN OUT BY SIMPLY ROTATING THE CENTERING KNOB CLOCK-WISE 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 CLOCK-WISE AND THEN COUNTER-CLOCKWISE TO INSURE THAT FINGERS ENTER PINION TEETH SIMULTANEOUSLY.

C E N T E R A C C U R A C Y C H E C K

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 BRING CONTACT AND PRESSURE TO ALL THE FINGERS, IT WILL BE NECESSARY TO DRESS CAREFULLY THE HIGH FINGER OR FINGERS WITH A FILE AND REPEAT THE LAPPING PROCESS.

M I C R O M E T E R

YOUR BORING MICROMETER, AS WITH ANY OTHER 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 THE MICROMETER ANVIL. CARE SHOULD BE USED IN THE METHOD OF LIGHTLY LOCKING THE TOOL BIT BEFORE TIGHTENING.

MICROMETER, CON'T

AFTER A PERIOD OF USE YOU WILL NOTE THAT THE TOOL BIT TIP WILL FORCE A DEPRESSION IN THE MIKE ANVIL. THIS, OF COURSE, WILL RESULT IN THE INCONSISTENT SIZES, PARTICULARLY AFTER RESHARPENING THE BIT. PERIODICALLY WE WOULD RECOMMEND TURNING THE ANVIL SLIGHTLY AND FINALLY END FOR END SO THAT A FLAT SURFACE IS EXPOSED TO THE TOOL BIT TIP.

CALIBRATING MICROMETER

1. BORE A HOLE.
2. REMOVE TOOL HOLDER AND BIT AND PLACE IN MICROMETER.
3. ADJUST MIKE SO THAT IT READS THE SAME SIZE AS THE HOLE YOU HAVE BORED. SMALL VARIATIONS MAY BE MADE BY TURNING THE MIKE SLEEVE WITH SPANNER WRENCH PROVIDED. LARGER CHANGES SHOULD BE MADE BY MOVING THE ANVIL.

SPECIAL MICROMETER INSTRUCTIONS(TO 9" DIAMETER)

FOR SETTING FA-4B MICROMETER TO HIGH AND LOW READING USING MICROMETER WITH A 2.9" TO 6.00" READING.

CAUTION: THE STANDARD FOR YOUR FA-4B BAR IS SET. DO NOT CHANGE IT, EXCEPT WHEN IT IS NECESSARY TO RECALIBRATE THE MICROMETER, THEN THE STANDARD SHOULD BE RESET TO MATCH THE MICROMETER.

TO BORE FROM 3.32 TO 6.00, PLACE STANDARD IN MICROMETER AND ADJUST THE MIKE ANVIL SO THAT THE MIKE READS 6.0"

NOTE: READ DIRECTLY AS SHOWN ON THE MICROMETER SLEEVE.

TO BORE FROM 6.0" TO 9.0" PLACE THE STANDARD IN THE MICROMETER AND ADJUST THE MIKE ANVIL SO THAT THE MIKE READS 3.0". THE MIKE READING IS 2.9" TO 6.0" AND WILL NOW ACTUALLY GAUGE TOOL FROM 5.9" TO 9.0". WHEN THE MIKE IS SET FOR LARGER BORES, REMEMBER THAT BAR WILL BORE 3" LARGER THAN MIKE READS.

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

LUBRICATION

FA-4B STYLE

- * THE FA-4B STYLE UPPER HOUSING UNIT SHOULD BE PACKED WITH UNION OIL UNOBA F1 OR F2 LUBE, APPROXIMATELY EVERY 25,000 BORING CYCLES. WHEN THIS GREASE IS CHANGED, THE UPPER HOUSING LID SHOULD BE REMOVED AND THE ORIGINAL LUBRICANT ENTIRELY REMOVED.
- △ THE UPPER HOUSING SPINDLE DRIVE GEAR BEARING SHOULD BE LUBRICATED MONTHLY, BY ADDING A FEW DROPS OF THREE AND ONE OIL TO IT. ADD BY REMOVING THE SMALL COVER ON THE FRONT OF THE UPPER HOUSING AND ADDING 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.

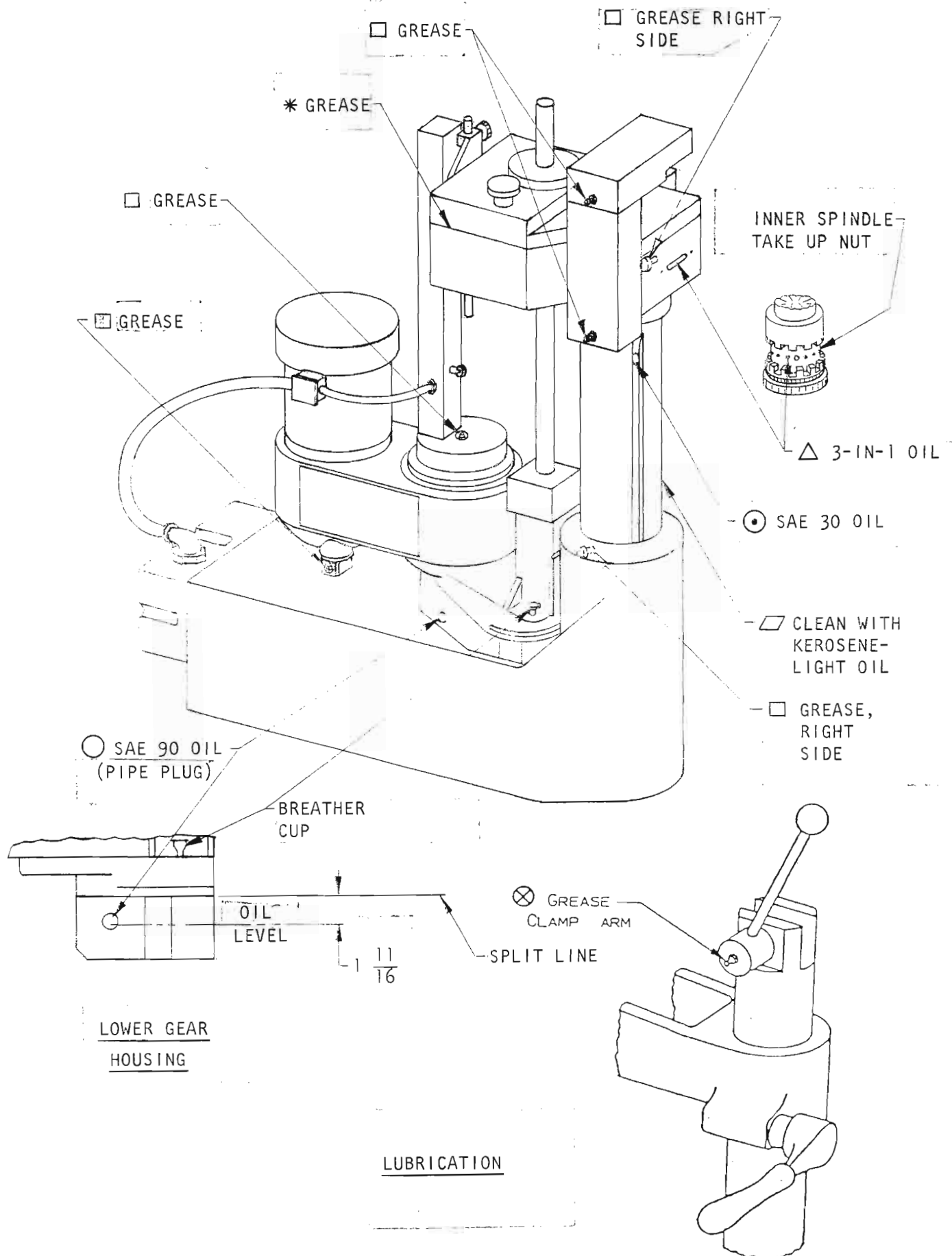
CAUTION: WHEN ADDING OIL OR REFILLING, DO NOT OVER-FILL.

CHANGE THIS GEAR LUBRICANT EVERY 40,000 BORING CYCLES. USE UNION SAE 90 MULTIPURPOSE GEAR LUBRICANT OR ANY EQUIVALENT S.A.E. 90 GEAR LUBRICANT.

NOTE: ON OLDER MACHINES, WHICH DO NOT HAVE OIL BREATHER CUP ON LEFT SIDE OF LOWER GEAR HOUSING, REQUIRE GREASE IN THIS HOUSING. THIS GREASE SHOULD BE KEPT AT THE SAME LEVEL AS THE OIL GEAR HOUSING ABOVE. ADD, WHEN NEEDED, 3 PARTS UNION OIL UNOBA F1 OR F2 LUBE TO 1 PART SAE 90 MULTIPURPOSE GEAR LUBRICANT.

LUBRICATION, FA-4B STYLE, CON'T

- IF YOUR FA-4B MACHINE IS OPERATED ON A CONTINUOUS BASIS, GREASE FITTINGS AT THE TOP OF THE SPINDLE UNIT AND AT THE BOTTOM OF FEED SCREW DRIVE, SHOULD BE LIGHTLY LUBRICATED DAILY, OR LESS OFTEN IF THE MACHINE IS NOT USED CONTINUOUSLY. LUBRICATE WITH UNOBA F1 OR F2 LUBRICANT (930 AAA LUBRICANT COULD BE AN ALTERNATIVE). GREASE FITTINGS ON THE VARIABLE DRIVE UNIT AND THE CENTERING CONTROL SHOULD BE LIGHTLY LUBRICATED MONTHLY.
- ⊙ TWO OR THREE DROPS OF S.A.E. 30 MACHINE OIL CAN BE ADDED WEEKLY TO THE BREATHER HOLE 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 LOCATED ON THE CLAMP ARM CAM BODY SHOULD BE LUBRICATED MONTHLY.



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, PROCEED AS FOLLOWS:

THE UPPER BEARING IS ADJUSTED BY REMOVING THE FELT RETAINING NUT AT THE TOP OF THE BASE, FORCING THE FELT UP AND ADJUST THE NUT WITH PUNCH.

FOR LOWER BEARING, FIRST BACK OFF #8-32 SET SCREW AT THE BOTTOM SPINDLE BEARING. THEN REMOVE THE FELT RETAINER AND FELT AT THE BOTTOM BASE AND TURN THE NUT WITH THE PUNCH.

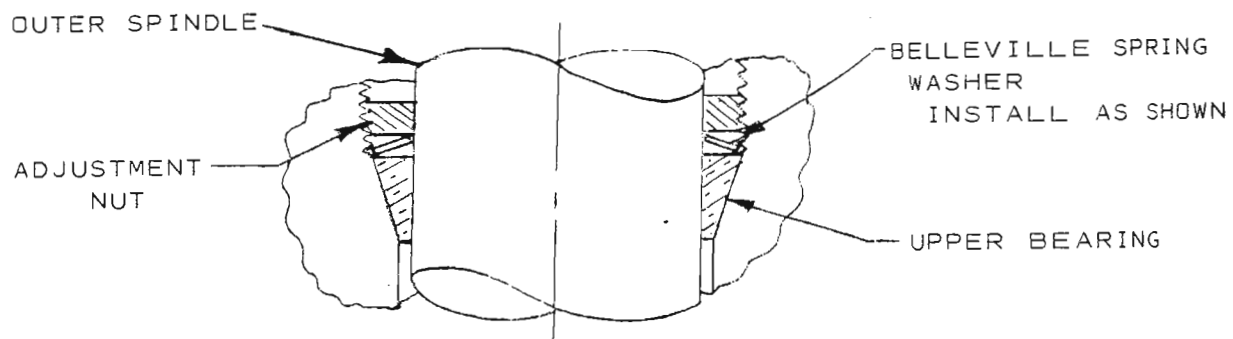
ADJUSTMENT PROCEDURE

1. RUN SPINDLE DOWN APPROXIMATELY 4" TO 6". LOOSEN BOTH ADJUSTING NUTS AND SET SCREW.
2. TIGHTEN THE UPPER BEARING UNTIL APPROXIMATELY 10 TO 15 POUNDS OF EFFORT IS REQUIRED TO OPERATE THE HAND FEED HANDLE.

REPEAT THIS SEQUENCE (2) ON LOWER BEARING, TAKING CARE THAT THE HAND FEED OPERATES ONLY SLIGHTLY TIGHTER OR 15 TO 20 POUNDS OF EFFORT IS REQUIRED TO OPERATE THE HAND FEED HANDLE. RELOCK #8-32 SET SCREW.

ADJUSTMENT OF OUTER SPINDLEADJUSTMENT PROCEDURE, CON'T

3. TRAVERSE THE BAR AT ALL POINTS OF TRAVEL AND MAKE SURE THE HAND FEED WORKS EASILY. SPINDLES ARE GROUND SLIGHTLY TAPERED TO SECURE MAXIMUM RIGIDITY AT LOWER LIMITS OF TRAVEL WHERE IT IS REQUIRED.
4. SPINDLE ADJUSTMENT MAY ALSO BE CHECKED BY FEEDING THE SPINDLE DOWN AND PULLING THE SLACK OUT OF THE FEED MECHANISM BY FORCING DOWN THE UPPER HOUSING. PRESSURE REQUIRED SHOULD BE 50 - 75 POUNDS.



ADJUSTMENT OF INNER SPINDLE

1. REMOVE TWO SCREWS AND SMALL COVER ON THE FRONT SIDE OF THE UPPER HOUSING.
2. REMOVE THE STOP SCREW RESTRICTING THE UP TRAVEL OF THE SPINDLE CLUTCH LEVER AND MOVE THE LEVER TO FULL UP POSITION (SEE DETAIL G). ROTATE THE SPINDLE APPROXIMATELY $1/2$ TURN AWAY FROM THE DETENT SPRING. POSITION THE TOOL HOLDER SLOT TO THE REAR.
3. INSERT A PIN (DIAMETER .180 OR LESS) IN ONE OF THE HOLES PROVIDED IN THE O.D. OF THE TAKE UP NUT. (SEE INNER SPINDLE NUT). HOLD THE SPINDLE KNOB WITH ONE HAND AND TURN THE TAKE UP NUT TO THE LEFT (CLOCKWISE). YOU WILL NOTE THE NUT RATCHETS IN NOTCHES AS YOU TAKE UP. TAKE UP UNTIL THE SPINDLE IS TIGHT AND BACK OFF $3/4$ TO $1-1/2$ NOTCHES. RUN THE BAR ON HIGH SPEED MAKING SURE THERE IS ONLY SLIGHT HEATING AT THE BOTTOM SPINDLE. IF THE HEAT IS EXCESSIVE, BACK OFF ONE NOTCH FURTHER.

CAUTION: BE SURE THE DETENT IS IN A NOTCH, NOT MIDWAY BETWEEN THE NOTCHES.

4. REPLACE THE COVER. READJUST THE SPINDLE CLUTCH CONTROL STOP SCREW.

SPINDLE CONTROL LEVER ADJUSTMENT

TO RE-ADJUST THE SPINDLE CONTROL LEVER, FIRST LOOSEN THE STOP SCREW LOCK NUT, THEN THE STOP SCREW.

NOW RAISE THE CONTROL LEVER TO ITS NEUTRAL (UP) POSITION (DETENT ENGAGED) ADJUST THE STOP SCREW SO THAT THE LEVER WILL NOT GO ANY HIGHER, LOCK WITH THE LOCK NUT.

SPINDLE STOP DETENT ADJUSTMENT

A SPRING LOADED BALL SCREW IS LOCATED IN THE UPPER GEAR HOUSING. (SEE SECTION D-D) TO PREVENT THE SPINDLE FROM TURNING WHILE TRAVELING. THE BALL SCREW MAY BE ADJUSTED SLIGHTLY INWARD FOR ADDED RESISTANCE.

CAUTION: OVER-ADJUSTING WILL DAMAGE THE BALL SCREW.
DO NOT EXCEED 1/2 TURN OF DETENT SCREW FROM POINT OF CONTACT WITH CLUTCH PIN.

U P P E R H O U S I N G B A C K F E E D A D J U S T M E N TT O A D J U S T T H E F E E D S C R E W P L A Y I N T H E U P P E R H O U S I N G

FIRST LOOSEN THE THREE ROUND HEAD SCREWS AROUND THE FEED SCREW, IN THE UPPER HOUSING. THEN LOOSEN THE THREE (3) ADJUSTING SCREW LOCK NUTS, THEN THE 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 $1/4$ TURN TO ALLOW FOR RUNNING CLEARANCE. HOLD ADJUSTING SCREW WITH AN ALLEN WRENCH AND LOCK THEM WITH LOCK NUT,

RUN MOTOR WITH LOWER GEAR BOX ENGAGED, SO THAT THE FEED SCREW IS TURNING TO CENTER BEARINGS RETAINER. TURN OFF MOTOR. TIGHTEN EVENLY THE (3) UPPER ROUND HEAD SCREWS.

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

THE FOLLOWING DESCRIBES THE MECHANICAL FUNCTION OF THE RAPID RETURN AND SHOULD ONLY BE INVESTIGATED IF THE UPPER HOUSING SHIFT LEVER IS NOT BEING PROPERLY RAISED BY THE AIR CYLINDER TO ENGAGE THE RAPID RETURN.

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

1. RUN BAR DOWN A FEW INCHES.
2. LOOSEN HORIZONTAL LOCKING SET SCREW AT UPPER REAR OF THE UPPER GEAR HOUSING. NOTE: THIS SET SCREW LOCKS TUMBLER ASSEMBLY (300-37 SEC. D-D & SEC. ZZ) .
3. MOVE THE TUMBLER ASSEMBLY DOWN APPROXIMATELY $1/64$, USING THE $1/4$ " VERTICAL SET SCREW IN THE TOP OF THE HOUSING. SEE SEC. D-D & SEC ZZ.
4. RELOCK WITH HORIZONTAL SET SCREW.
5. PRESS FEED BUTTON AND MANUALLY LIFT SHIFTING LEVER (500-38-1 SEC. D-D) UNTIL IT CONTACTS THE SPRING CARTRIDGE ASSEMBLY (500-40 VIEW FF). IMMEDIATELY ON LIFTING THE PIN IN CARTRIDGE ASSEMBLY (500-40) APPROXIMATELY $1/32$ ", THE RETURN TRAVEL CLUTCHES SHOULD START RATCHETING.

NOTE: PIN IN SPRING CARTRIDGE ASSEMBLY 500-40 SHOULD BE ADJUSTED SO THAT IT IS JUST TOUCHING THE SHIFT LEVER WHEN SHIFT LEVER IS IN NEUTRAL.
IF THE CLUTCHES RATCHET BEFORE THE PIN IS RAISED $1/32$ " RESET THE TUMBLER ASSEMBLY HIGHER.

RAPID RETURN ADJUSTMENT, CON'T

DO THIS BY FIRST BACKING OFF THE 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.

CAUTION: DISCONNECT ALL ELECTRICAL AND AIR POWER TO BORING BAR BEFORE MAKING ANY REPAIRS ON BORING MACHINE.

T H R U S T O V E R L O A D

IF AN EXCESSIVE THRUST LOAD OF APPROXIMATELY 3,000 POUNDS IS IMPOSED ON YOUR FA-4B MACHINE SPINDLE, THE THREADS OF THE NUT (500-41, Sec. CC) WILL SHEAR. THIS LOAD COULD TYPICALLY OCCUR BY EITHER RAPID TRAVELING OR FEEDING THE SPINDLE INTO THE TOP OF THE BLOCK. THIS ACCIDENT COULD HAPPEN WITH THE SPINDLE EITHER ROTATING OR STATIONARY.

THE EFFECT OF THIS WILL BE FOR THE MOTOR TO CONTINUE TO RUN, BUT WITH NO FEED OR DOWN TRAVEL. IF THE MACHINE CONTINUES TO RUN IN DOWN TRAVEL, THE DRIVE SPLINE WILL BE COMPLETELY PULLED OUT OF MESH AND FEED SCREW WILL NOT TURN. A SPARE NUT, 500-41, IS PROVIDED IN THE TOOL BOX, IN THE EVENT AN EXCESSIVE LOAD OCCURS.

DISASSEMBLY NECESSARY FOR REPLACEMENT IS:

1. REMOVE TWO SOCKET HEAD SCREWS AT THE BOTTOM OF THE HAND FEED HOUSING (500-97-2, Sec. CC) AND THE TWO SOCKET HEAD SCREWS ON THE TOP PLATE (500-96-4). TURN OUT (COUNTER-CLOCKWISE) THE BEVEL GEAR SHAFT (500-95) AND REMOVE THE FOUR COUNTERSUNK SCREWS AND THE END CAP HOUSING (500-70-1).
2. NOW, TO RAISE THE ASSEMBLY, REMOVE THE SIDE COVER (502-2-60) AT UPPER HOUSING VIEW FF, AND HOLD CAM BLOCK (500-43) TO THE LEFT WHILE HAND ROTATING FEED SCREW COUNTER-CLOCKWISE. THIS WILL RAISE THE LOWER ASSEMBLY OUT OF THE SPLINE AND ALLOW REPLACEMENT OF THE NUT AFTER REMOVAL OF THE SNAP RING (506-10). BE SURE TO REPLACE THE SNAP RING WITH BEVEL SIDE UP AND MAKE SURE YOU BOLT BEVEL GEAR HOUSING BACK IN PLACE WITHOUT BINDING THE GEAR ACTION.

MECHANICAL FAILURE DUETO OVERLOAD

ROTARY DECELERATION LOADS WHICH STALL THE MOTOR WILL CAUSE THE MOTOR OVERLOAD PROTECTION TO DROP OUT AND CAN BE CORRECTED SIMPLY BY PRESSING THE RESET BUTTON IN THE REAR OF THE MACHINE.

VARIABLE SPEED DRIVE ONLY

IF AN EXTREME ROTARY DECELERATION OF THE MACHINE IS CAUSED BY STRIKING AN OBJECT, THE MICARTA DRIVE KEY, 500-62, IN THE SHAFT COUPLING (500-61, Sec. BB) WILL SHEAR, CAUSING THE DRIVE TO FAIL. THIS WOULD ONLY OCCUR IF EXTREME RADIAL SHOCK WERE IMPOSED ON THE ROTATING SPINDLE OR FEED SCREW.

AN EXTRA DRIVE KEY IS PROVIDED IN THE TOOL BIT. IT IS REPLACED BY REMOVING THE UPPER BEARING RETAINER (502-9-11, Sec. AA), THE PULLEY ASSEMBLY AND SHAFT DRIVEN PULLEY (502-9-12), IN WHICH THE MICARTA KEY OPERATES. USE CAUTION IN REASSEMBLING THIS UNIT TO MAKE SURE THE MICRO SWITCHES ARE PROPERLY OPERATED BEFORE FURTHER MACHINE OPERATION.

FAILURE DUE TO LOWAIRLINE PRESSURE

A PRESSURE SWITCH PS (2) LOCATED IN THE CENTER TOP OF THE CONTROL PANEL, HAS NORMALLY OPEN CONTACTS, THAT CLOSE WHEN THE AIRLINE PRESSURE REACHES 80 TO 85 PSI. AS LONG AS THE LINE PRESSURE IS ABOVE THIS, THE MACHINE WILL OPERATE. IF THE LINE PRESSURE SHOULD FALL BELOW THIS VALUE, THE SWITCH CONTACTS OPEN, DE-ENERGIZING THE ENTIRE CIRCUIT AND THEREBY STOPPING THE MACHINE.

THIS IS A PROTECTIVE DEVICE TO PREVENT THE MACHINE FROM OPERATING WHEN THERE IS INSUFFICIENT AIR PRESSURE AVAILABLE TO OPERATE THE AIR CLAMP AND AIR CONTROLS.

C H A N G I N G T H E V A R I A B L E S P E E D D R I V E B E L T

(FOR VARIABLE SPEED UNIT ONLY)

WITH VARIABLE SPEED DRIVE ADJUSTED FOR HIGH SPEED, REMOVE SIDE PLATE ON SPEED ADJUSTER SIDE. REMOVE SPEED CHANGE, MECHANISM, 502-11-38, SEC. AA. TWIST BELT AROUND END OF DRIVING PULLEY SHAFT. AFTER BELT IS CLEAR OF THE SHAFT, PUSH THE BELT AS FAR AS POSSIBLE TOWARD THE FRONT OF THE MACHINE WHICH WILL RELIEVE THE TENSION ON THE SPRING LOADED PULLEY.

NOW REMOVE THE UPPER BEARING RETAINER 502-9-11, BEING CAREFUL TO AVOID DAMAGE TO LIMIT SWITCHES AND CONNECTIONS. REMOVE THE ~~RETAINING~~ RING AND PULLEY FROM THE DRIVEN PULLEY ASSEMBLY 502-11-37, AND REMOVE BELT.

[⊗] NOTE: USE CAUTION IN REMOVING RETAINING RING, AS SPRING WILL BE UNDER COMPRESSION.

TO INSTALL NEW BELT, REVERSE THE ABOVE PROCEDURE.

TO REMOVE CASE - FIRST REMOVE THE LOWER HALF OF THE DRIVEN PULLEY ASSEMBLY 502-11-37, THEN THE (4) MOTOR GEAR HOUSING SCREWS INSIDE THE CASE SUPPORT UNDER THE MOTOR SIDE OF THE CASE. NOW LIFT OFF CASE AND MOTOR. ALSO SEE PAGE (83) FOR REMOVAL AND INSTALLATION OF REAR CASE SUPPORT.

C H A N G I N G T H E T H R E E S P E E D B E L T A N D C A S E

(FOR V-BELT DRIVE UNIT ONLY)

TO CHANGE V-BELT:

FIRST DISCONNECT POWER FROM BORING BAR, THEN LOOSEN KNOBS ON SIDE COVERS AND PIVOT COVER TO GAIN ACCESS TO V-BELT. LOOSEN CLAMP HANDLE AND PIVOT MOTOR FORWARD, PASS V-BELT UNDER THE

CHANGING THE THREE SPEED BELT AND CASE, CON'TTO CHANGE V-BELT:

MOTOR SHEAVE AND OVER DRIVEN SHEAVE.

TO REMOVE MOTOR:

REMOVE LOCKING NUT OF CLAMP HANDLE STUD, REMOVE THE STUD, CLAMP AND CLAMP HANDLE.

THEN REMOVE PIVOT SCREW LOCKNUT ON THE OPPOSITE SIDE OF MOTOR.

THIS WILL ALLOW YOU TO REMOVE THE MOTOR, SHEAVE, AND ADJUSTING PLATE.

TO REMOVE V-BELT CASE:

FIRST REMOVE COVER, 502-9-21, BEING CAREFUL TO AVOID DAMAGE TO LIMIT SWITCHES AND CONNECTIONS.

THEN THE DRIVEN SHEAVE, THEN THE 4 MOTOR GEAR HOUSING SCREWS, (INSIDE THE V-BELT CASE) AND THEN THE 2 SCREWS IN THE SUPPORT 502-9-26.

RE-INSTALLATION OF V-BELT CASE:

FIRST, RE-INSTALL THE 4 MOTOR GEAR HOUSING SCREWS. THEN INSERT THE 2 SOCKET HEAD CAP SCREWS IN THE END SUPPORT, INSTALL COVER SHEAVE 502-9-21, MOTOR AND ETC. NOW LOOSEN THE SOCKET HEAD CAP SCREWS AND JACKING SET SCREWS IN END SUPPORT. NOW TURN THE JACKING SET SCREW IN UNTIL YOU RAISE THE MOTOR SLIGHTLY. NOW TIGHTEN THE 2 SOCKET HEAD CAP SCREWS.

TO INCREASE CLAMP HANDLE PRESSURE:

FIRST LOOSEN STUD'S LOCK NUT ON THE INSIDE OF THE V-BELT CASE, THEN, USING A SCREW DRIVER, TURN THE STUD IN OR OUT TO ADJUST PRESSURE, RETIGHTEN THE LOCK NUT.

DISASSEMBLY OF MOTOR HOUSING

NOTE: MOTOR HOUSING MAY BE REMOVED WITHOUT DISASSEMBLY OF THE UPPER HOUSING AND FEED SCREW.

SECTION A-1

REMOVE HEX SOCKET SCREWS (2) ON THE BOTTOM OF 500-97-2 FEED BRACKET, AND 2 SCREWS HOLDING 500-96-4 PLATE TO 500-70-1 HOUSING. TURN OUT (COUNTERCLOCKWISE) 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 CAM BLOCK (500-43) TO LEFT, AND ROTATE SCREW COUNTERCLOCKWISE, UNTIL THE FEED SCREW IS CLEAR OF THE MOTOR UNIT. ON RE-ASSEMBLY IT MAY BE NECESSARY TO ROTATE THE MOTOR AND SCREW, USING CARE IN ALIGNING SPLINE IN GEAR TO MATCH THE SCREW SPLINE. MAKE SURE THREADED KEY DOES NOT JAM ON ENTERING THE SLOT.

REMOVAL OF FEED SLEEVE AND BEARING

NOTE: FOR REMOVAL OF BRASS NUT ONLY. (THIS DISASSEMBLY IS NOT NECESSARY TO REMOVE MOTOR HOUSING.)

SECTION A-2

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.

REMOVAL OF MOTOR HOUSING

TO REMOVE THE MOTOR HOUSING, TAKE OUT THE 4 BOLTS IN THE HOUSING FLANGE. NOTE: IN REASSEMBLY, MOTOR ALIGNMENT MUST BE CHECKED AFTER SCREW SLEEVE IS IN PLACE BEFORE THE FLANGE BOLTS ARE PERMANENTLY LOCKED. USE SURFACE PLATE OVER SCREW AND SPINDLE.

TO DISASSEMBLE THE HOUSING, REMOVE TWO PINS AND SIX SCREWS AND BOTTOM SCREW IN THE MIDDLE OF BOTTOM OF THE GEAR POT. REMOVE SET SCREW AND PIN ON SPEED SHIFTER LEVER.

TAP LIGHTLY ON MOTOR PINION, 503-27, FOR VARIABLE SPEED DRIVE, OR 502-9-28 FOR V-BELT DRIVE, AND SCREW DRIVE GEAR (500-88) OR (500-69) AND HOUSING WILL COME APART. PINION SHAFT, 500-87, OR (500-68), WITH CLUTCH AND GEARS MAY BE TAPPED OUT WITH SMALL PUNCH THROUGH CENTER HOLE IN THE BOTTOM OF THE GEAR POT.

DISASSEMBLY OF UPPER HOUSING
AND SPINDLE REMOVAL

REMOVE CUTTER HEAD. REMOVE COVER 502-2-60. REMOVE CENTING ROD. REMOVE CENTING HOUSING BY REMOVING ITS 4 SCREWS. REMOVE 502-10-11 KNOB BY REMOVING ITS SCREW. REMOVE 600-18-2 KNOB BY RELEASING SOCKET SET SCREW. YOU MAY THEN REMOVE THE DRAW TUBE. UNSCREW THE SPINDLE CLUTCH LEVER STOP PIN. RAISE THE LEVER TO THE EXTREME TOP, WHICH WILL ALLOW THE REMOVAL OF THE COUNTERSUNK SCREW, AND LEVER ASSEMBLY. REMOVE THE SPRING 502-2-48, BRACKET, 502-2-47, BASE PLATE, 502-2-92, STOP BRACKET, 502-2-52. REMOVE 6 SCREWS HOLDING UPPER HOUSING SECTIONS TOGETHER AND LIFT OFF THE UPPER LID, 502-9-14.

NOW THE SHIFTING LEVER, 500-38-1 MAY BE REMOVED ALONG WITH 500-25, UPPER FAST RETURN GEAR, WITH PLUNGER AND SPRING, SPINDLE CLUTCH AND KEY, 500-3, BALL BEARING WITH TAKE UP SPRING, 500-14, (BE SURE SPRING IS REASSEMBLED PROPERLY) SLEEVE GEAR, 500-1, FEED NUT 500-2, AND FEED GEAR 502-10-12, WITH ITS THRUST WASHER.

NOW REMOVE THE SNAP RING 502-10-16 FROM THE TWO SPEED FEED SHAFT, UPPER FEED DRIVE GEAR 502-10-8, THRUST WASHER 501-21, LOWER FEED DRIVE GEAR, 502-10-9, THEN REMOVE THE RETAINER, 502-9-15, BEND LOCKWASHER, NOW PRESS THE FEED SHAFT AND GEAR 502-10-10, OUT OF BEARING, 500-74.

IF THE BAR IS IN A VERTICAL SPINDLE POSITION WE SUGGEST YOU PLACE SOMETHING UNDER THE SPINDLE NOSE TO PREVENT THE 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 503-6-1, MAY BE WORKED OFF ALONG WITH 500-4, SPACER, AND WOODRUFF KEY.

INNER SPINDLE MAY BE REMOVED NOW.

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 OFF OF FEED SCREW,

DISASSEMBLY OF UPPER HOUSING AND SPINDLE REMOVAL, CON'T

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.

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 SPRING FROM SNAPPING OUT.

C O N T R O L F U N C T I O N

TO PROVIDE A MOST CONVENIENT GUIDE IN THE EVENT OF A CONTROL FAILURE OF YOUR FA-4B, THE FOLLOWING INFORMATION DESCRIBES THE SEQUENCE OF CONTROL ACTIONS.

AIR ELECTRIC CONTROL IS DESCRIBED IN CAPITAL TYPE AND THE RESULTING MECHANICAL FUNCTION IN LOWER CASE, SO A DIFFICULTY MAY BE EASILY ISOLATED.

T O G G L E S W I T C H

THE TOGGLE SWITCH (502-2-25, Sec. JJ , OPENS AND CLOSSES THE 110 VOLT CONTROL CIRCUIT. WHEN OPENED, THIS SWITCH DEACTIVATES THE ENTIRE UNIT EXCEPT THE CURRENT TRANSFORMER.

C L A M P S E L E C T O R S W I T C H

THE CLAMP SELECTOR SWITCH TURNED TO THE LEFT CLOSSES THE CIRCUIT TO LSV (LIFT SOLENOID VALVE, PANEL LOCATION, UPPER VALVE, RIGHT SIDE). THIS NORMALLY CLOSED VALVE IS OPENED, ALLOWING AIR TO FLOW THROUGH THE REGULATOR (502-27-17, UPPER REGULATOR IN PANEL), AND THEN OUT THE ORIFICE ON THE BOTTOM OF THE SPINDLE UNIT. (REGULATOR MAY BE ADJUSTED UP OR DOWN TO FURNISH PROPER LIFT FOR EASY MOVEMENT OF THE SPINDLE UNIT.) FURTHER BALANCING OF FRONT AND REAR LIFT IS ADJUSTED BY THE FLOW CONTROL WITHIN THE SPINDLE BASE.

CLAMP SELECTOR SWITCH, CON'T

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

THE CYLINDERS LIFT TWO LEVER ARMS 502-2-5, SEC. JJ), PIVOTING ON THE CASTING RIB TO LIFT THE ARM (502-2-4) WHICH EXERT EFFORT THROUGH WASHERS AND NUT TO THE STUD (502-2-10).

F A S T D O W N P U S H B U T T O N

THE FAST DOWN BUTTON DEPRESSED, CLOSES THE CIRCUIT TO THE FDSV (FAST DOWN SOLENOID VALVE, PANEL LOCATION, LOWER VALVE, LEFT SIDE). THIS NORMALLY CLOSED VALVE OPENS, ALLOWING AIR TO FLOW TO THE HORIZONTALLY MOUNTED CYLINDER (502-2-59-A, VIEW FF) ON UPPER HOUSING.

THE CYLINDER MOVES THE CAM (500-43) FORWARD, ALLOWING THE LEVER (500-44) TO LIFT THE SHIFT LEVER (500-38-1) UPWARD TO NEUTRAL POSITION. THE SPRING CARTRIDGE (500-40) IS ADJUSTED SLIGHTLY ABOVE THE NEUTRAL POSITION SO THE LEVER WILL NOT EASILY RAISE FURTHER INTO UP TRAVEL. FURTHER FORWARD MOVEMENT OF THE CAM (500-43) HINGES THE PIVOT (500-30-2) FORCING THE PIN (500-30-3) INTO THE SLOT OF THE SLEEVE GEAR, BRAKING THE FEED NUT SO THE MACHINE WILL RAPID TRAVEL DOWN.

THE ABOVE MECHANICAL ACTION TAKES PLACE AS AIR PRESSURE BUILDS IN THE AIR CIRCUIT, AND UPON REACHING 75 PSI, CLOSES PRESSURE SWITCH #1 (PANEL LOCATION, UPPER LEFT) WHICH ENERGIZES (MS) MOTOR STARTER. FAST DOWN BUTTON MUST BE HELD TO MAINTAIN CONTACT AND WHEN RELEASED WILL DROP OUT CIRCUIT.

F E E D P U S H B U T T O N

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

MECHANICALLY, THE FA-4B IS NORMALLY IN THE IN-FEED POSITION, WITH THE KEY, (300-35) HOLDING THE SLEEVE GEAR (500-1) DOWN

FEED PUSH BUTTON, CON'T

INTO THE CLUTCH, CAUSING THE DIFFERENTIAL ROTATION TO TURN THE NUT (500-2) ON THE SCREW. IF NECESSARY, THE SHIFT LEVER (503-10-1) CAN BE MANUALLY LIFTED TO RAISE THE SLEEVE GEAR OUT OF FEED POSITION INTO THE NEUTRAL OR FAST RETURN.

WHEN IN-FEED, THE STOP BUTTON OR THE LLS (LOWER LIMIT SWITCH) WILL OPEN THE CIRCUIT. THE UP PUSH BUTTON WILL CAUSE THE UP CIRCUIT TO GO IN AND DROP THE FEED CIRCUIT OUT.

U P P U S H B U T T O N

THE UP BUTTON DEPRESSED, CLOSSES THE CIRCUIT TO (UR) UP RELAY, SEALING IN AND CLOSING CIRCUIT TO (MS) MOTOR STARTER AND THE USV (UP SOLENOID VALVE, PANEL LOCATION, LOWER VALVE, RIGHT SIDE). THE NORMALLY CLOSED VALVE OPENS TO ALLOW AIR TO TRAVEL TO THE LOWER VERTICALLY MOUNTED AIR CYLINDER (502-2-59-C)(VIEW FF) ON THE UPPER HOUSING.

THE CYLINDER RAISES THE SHIFT LEVER (503-10-1), VIEW FF) TO AN EXTREME UP LEVEL, DEPRESSING THE SPRING CARTRIDGE, 500-40. THE LEVER (500-38-1) THROUGH THE KEY (300-35) LIFTS THE SLEEVE GEAR (500-1) OUT OF THE CLUTCHED FEED POSITION, AND THE LUG, ON THE EXTREME RIGHT OF THE SHIFT LEVER (500-38-1), RAISES THE ARM OF THE TUMBLER ASSEMBLY (300-37), FORCING THE PIN OF THE TUMBLER ASSEMBLY DOWN INTO THE GEAR (500-25) ENGAGING IT WITH THE GEAR (500-26) TO TURN THE FEED NUT AND RETRACT THE SPINDLE. THE SPINDLE CAN BE MANUALLY RETRACTED BY STARTING THE MOTOR IN-FEED AND MANUALLY LIFTING THE LEVER (500-38-1) ALTHOUGH CARE MUST BE EXERCISED TO AVOID BYPASSING THE UPPER LIMIT SWITCH. IF THE RETURN FAILS TO COMPLETELY ENGAGE OR TENDS TO RATCHET A SIMPLE CLUTCH ADJUSTMENT CAN BE MADE. (SEE RAPID RETURN ADJUSTMENT.)

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

STOP PUSH BUTTON

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

TWO SPEED GEAR DRIVE

THE LOWER, SPEED SHIFTER IS PULLED OUT AND LOWERED FOR HIGH SPEED, OR RAISED FOR LOW. CARE SHOULD BE EXERCISED TO MAKE SURE THE PIN IS IN, WHEN SHIFTING, OTHERWISE, THE CLUTCH MAY CREEP INTO A NEUTRAL POSITION. AS SHOWN (SECTION BB) THE ARM, 501-3, IS ROTATED, CAUSING THE TWO KEYS (300-35) TO RAISE OR LOWER THE CLUTCH.

COMMON CAUSES OF TROUBLE

(POOR FINISH, INACCURATE HOLES, EXCESSIVE TOOL BIT HEAT, EXCESSIVE TOOL DRAG BACK LINES, ETC.)

THE GREAT MAJORITY OF THESE PROBLEMS ARE A RESULT OF TOOL BIT SHARPENING. CHECK TO MAKE SURE THE TOOL BIT "B" LAND IS OF PROPER WIDTH, WITH KEEN SHARP FACES AND THAT TOP OF BIT IS FREE FROM FLAWS, WITH THE ORIGINAL RAKE ANGLE AND SMOOTH FINISH. FREQUENTLY, A MINUTE FLAW, NOT VISIBLE TO THE NAKED EYE, WILL PREVENT A FINE FINISH.

A LOOSE OUTER SPINDLE BEARING WILL NOT GENERALLY RESULT IN TAPER OR INACCURATE BORES, BUT CAN ALLOW SPINDLE TO DROP SLACK IN THE FEED NUT, RESULTING IN A MARK IN THE CYLINDER.

WHEN THE SIZES ARE INCONSISTENT, CHECK THE FINISH ON THE MIKE ANVIL, DISTORTED AND WORN OUT TOOL HOLDERS AND TOOL BITS THAT HAVE BEEN GROUND ON THE TOP SURFACE AND HAVE INCONSISTENT HEIGHTS WHEN PLACED IN THE TOOL HOLDER. MAKE SURE THE TOOL HOLDER SLOT IS CLEAN.

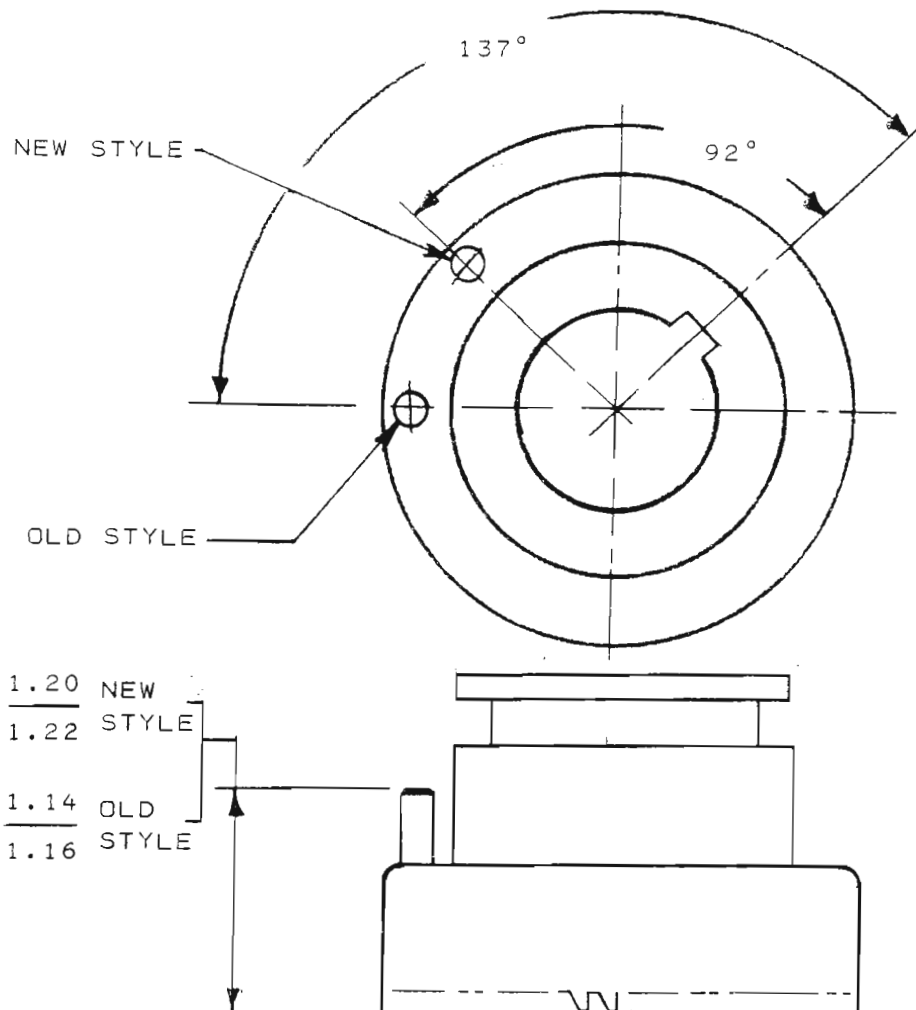
STOP PIN ASSEMBLY IN 500-3 CLUTCH SLEEVE

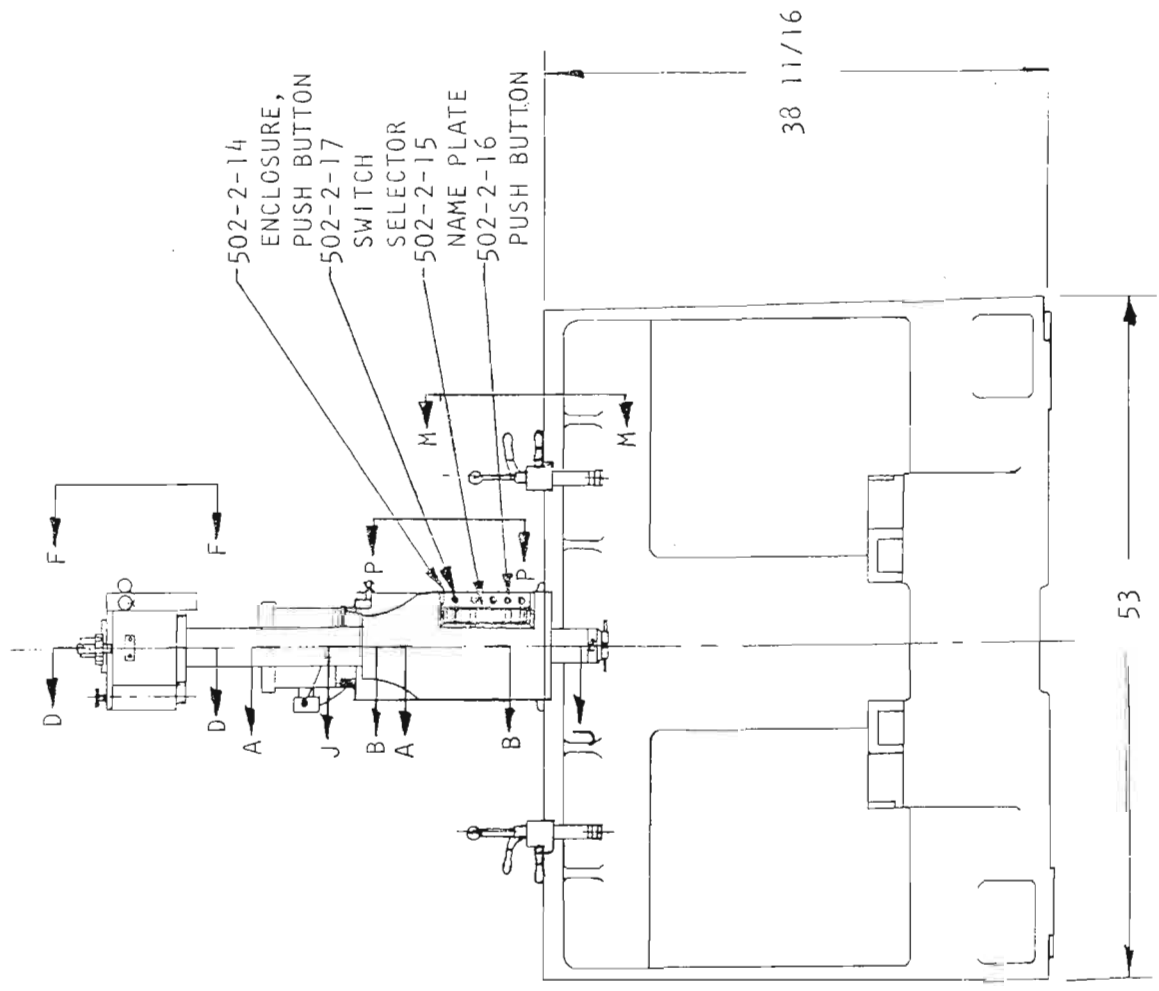
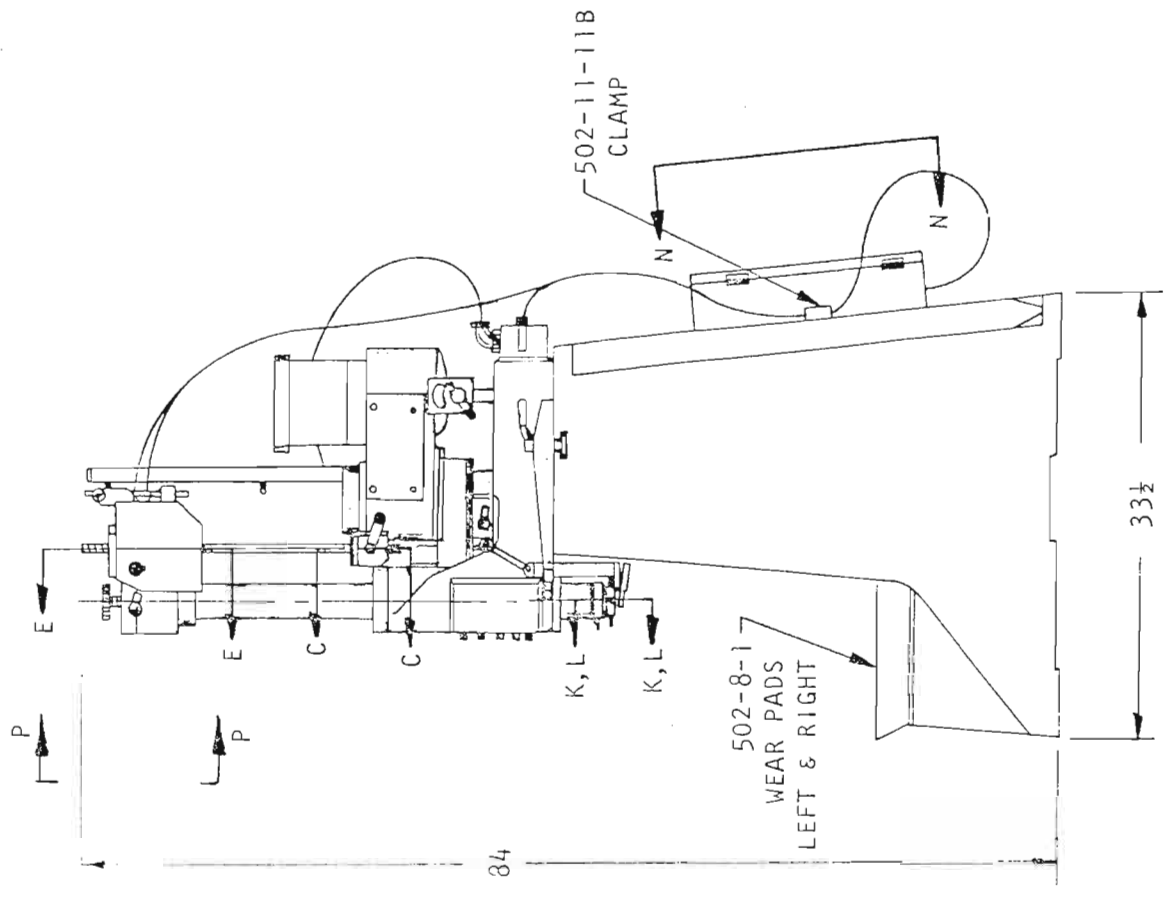
FOR (OLD AND NEW STYLE BALL DETENT)

REFER TO THE UPPER HOUSING DRAWING FOR THE OLD AND NEW BALL DETENT STYLES. PRESS PIN INTO CORRECT CLUTCH SLEEVE HOLE TO THE HEIGHT SHOWN BELOW.

THE PURPOSE OF THE BALL DETENT IS TO STOP THE SPINDLE FROM TURNING WITH THE TOOL BIT FACING THE MACHINE OPERATOR. THE NEW STYLE HAS THE ADVANTAGE OF BEING ABLE TO ADJUST THE BALL DETENT PLUNGER, 502-2-19, FROM THE OUTSIDE WHILE THE OLD STYLE HAD TO BE TAKEN OUT OF THE UPPER HOUSING CASE TO BE ADJUSTED.

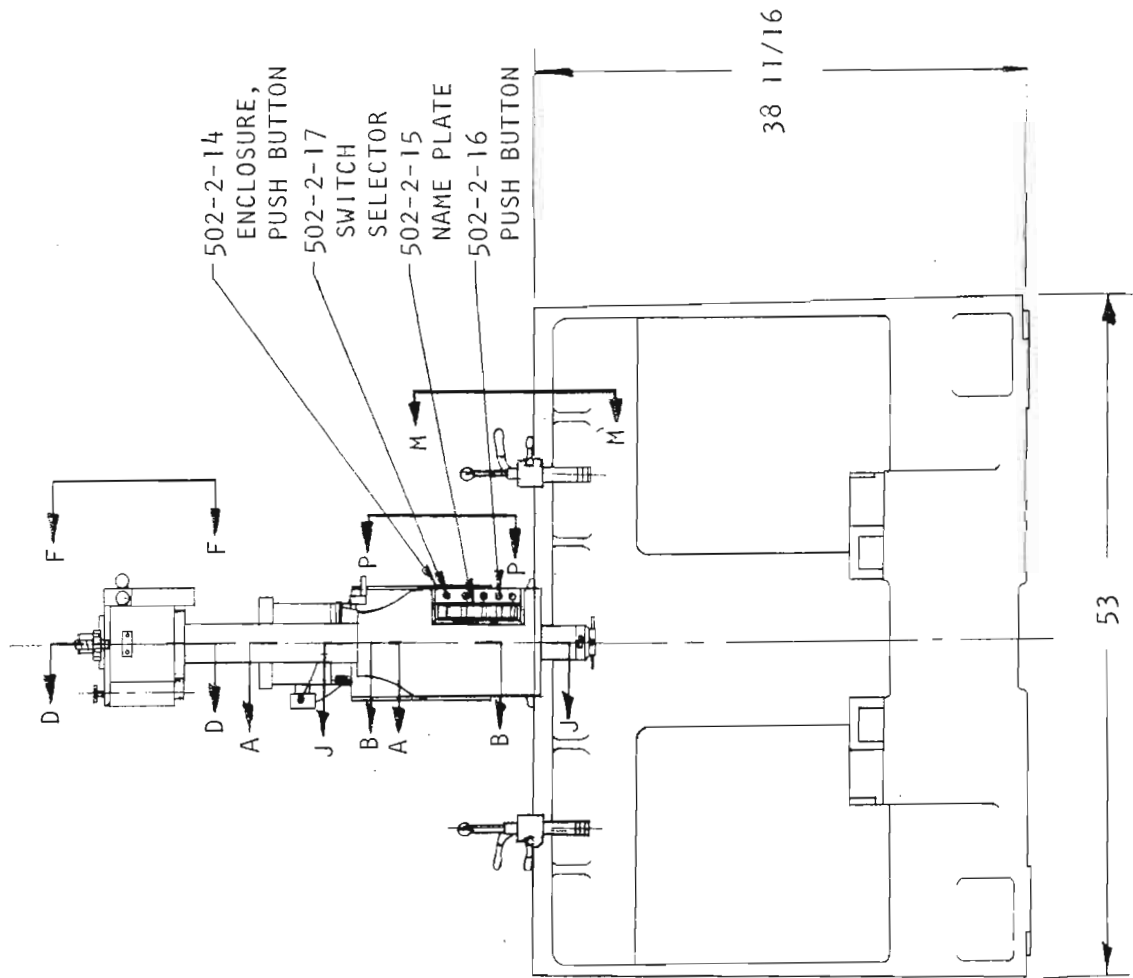
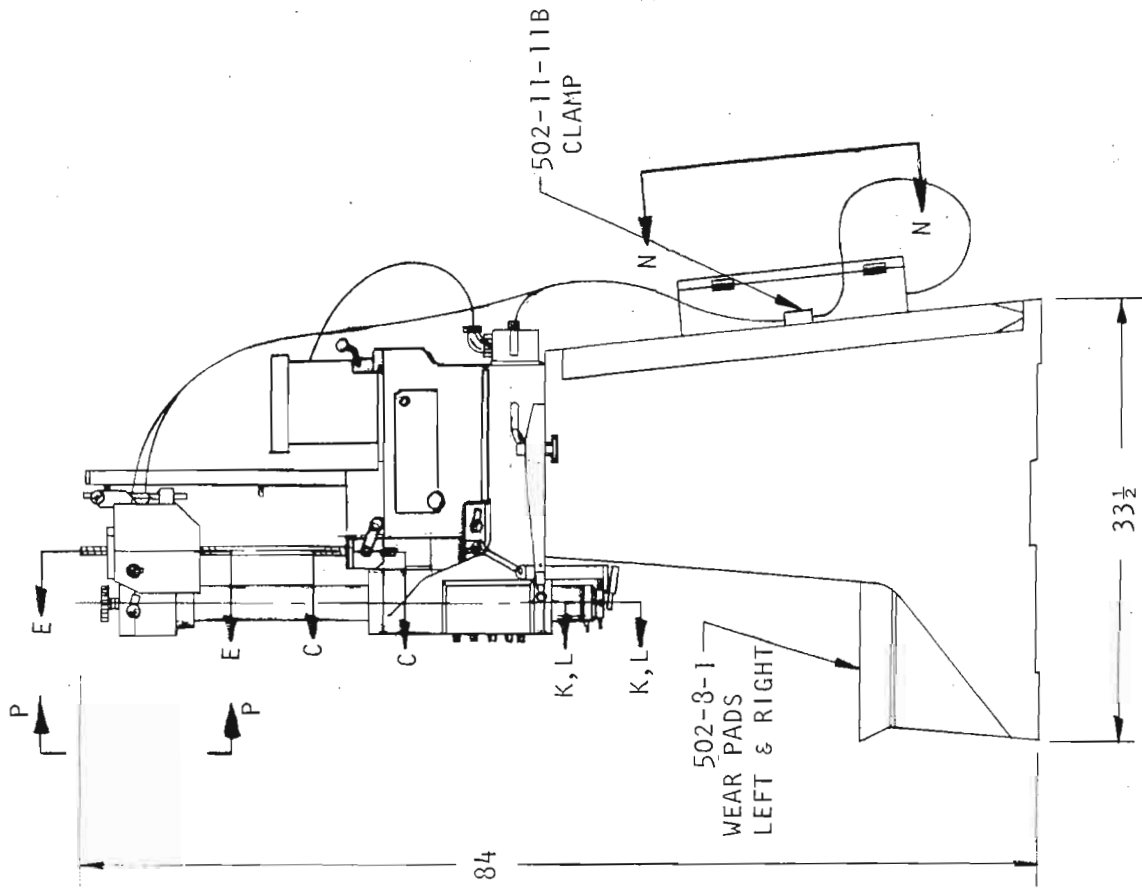
ASSEMBLE CLUTCH IN UPPER HOUSING AND ADJUST THE BALL DETENT PLUNGER SO THAT WHEN THE MACHINE IS IDLING AND THE SPINDLE CLUTCH IS DISENGAGED, THE SPINDLE WILL STOP TURNING WITH THE TOOL BIT FACING THE MACHINE OPERATOR.





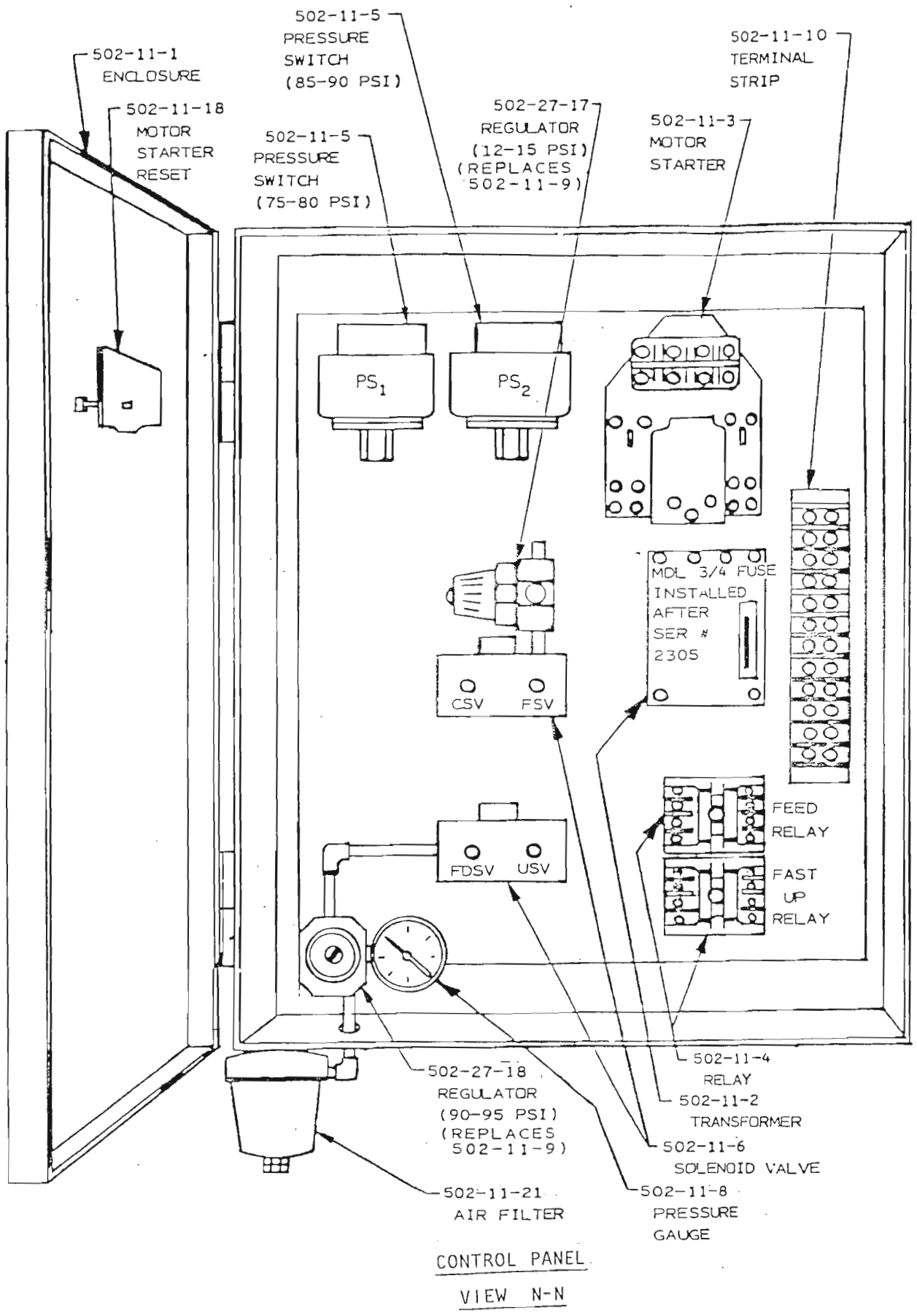
FA-4 BORING MACHINE

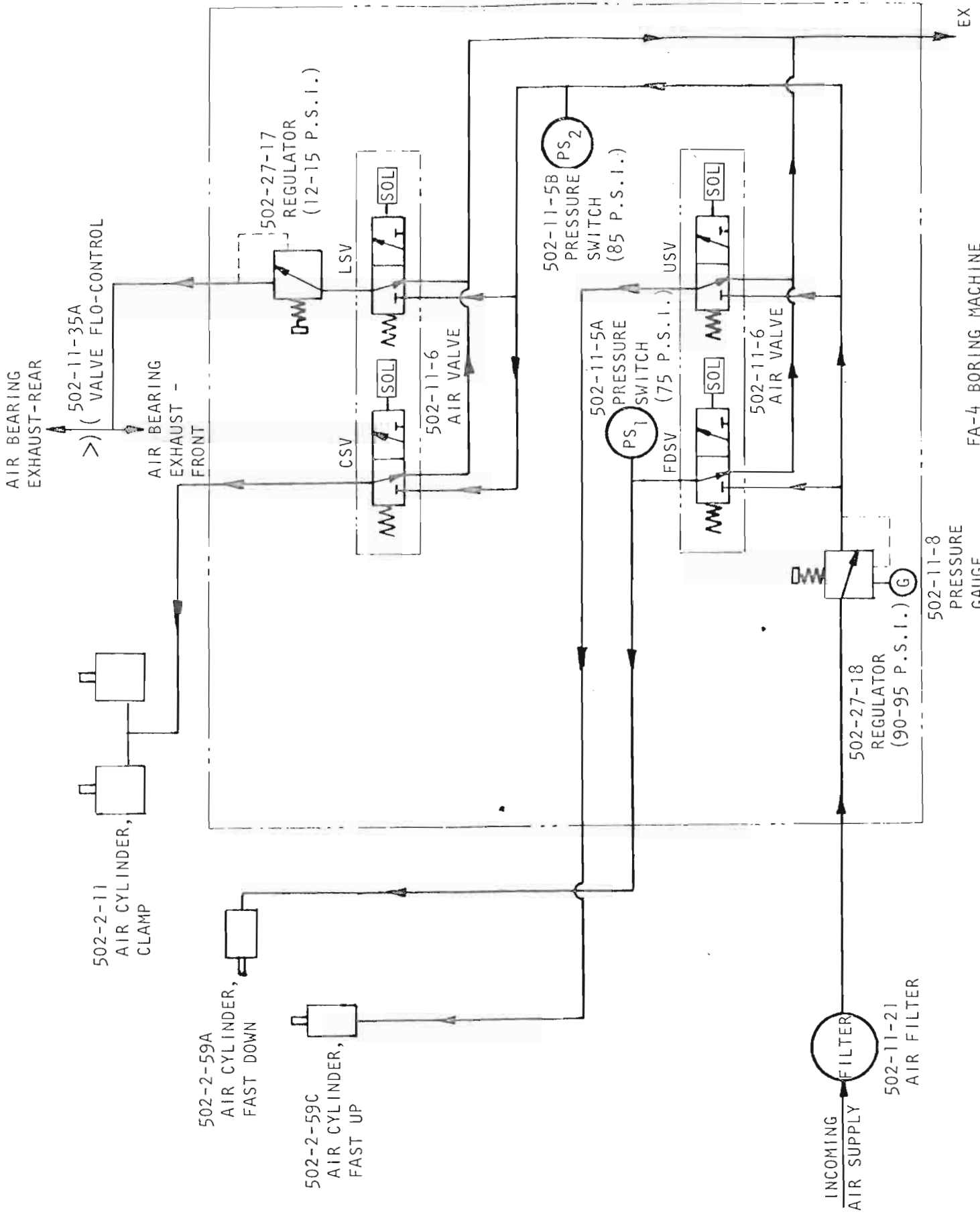
VARIABLE SPEED



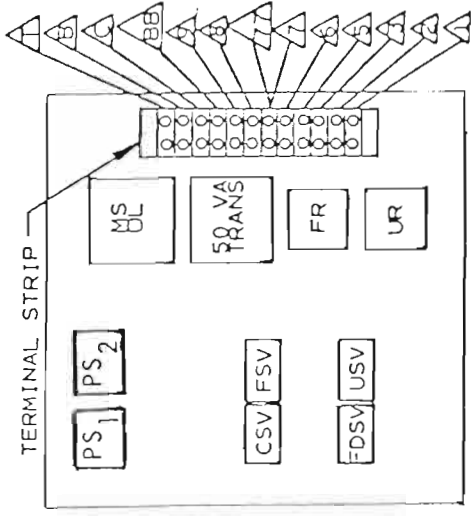
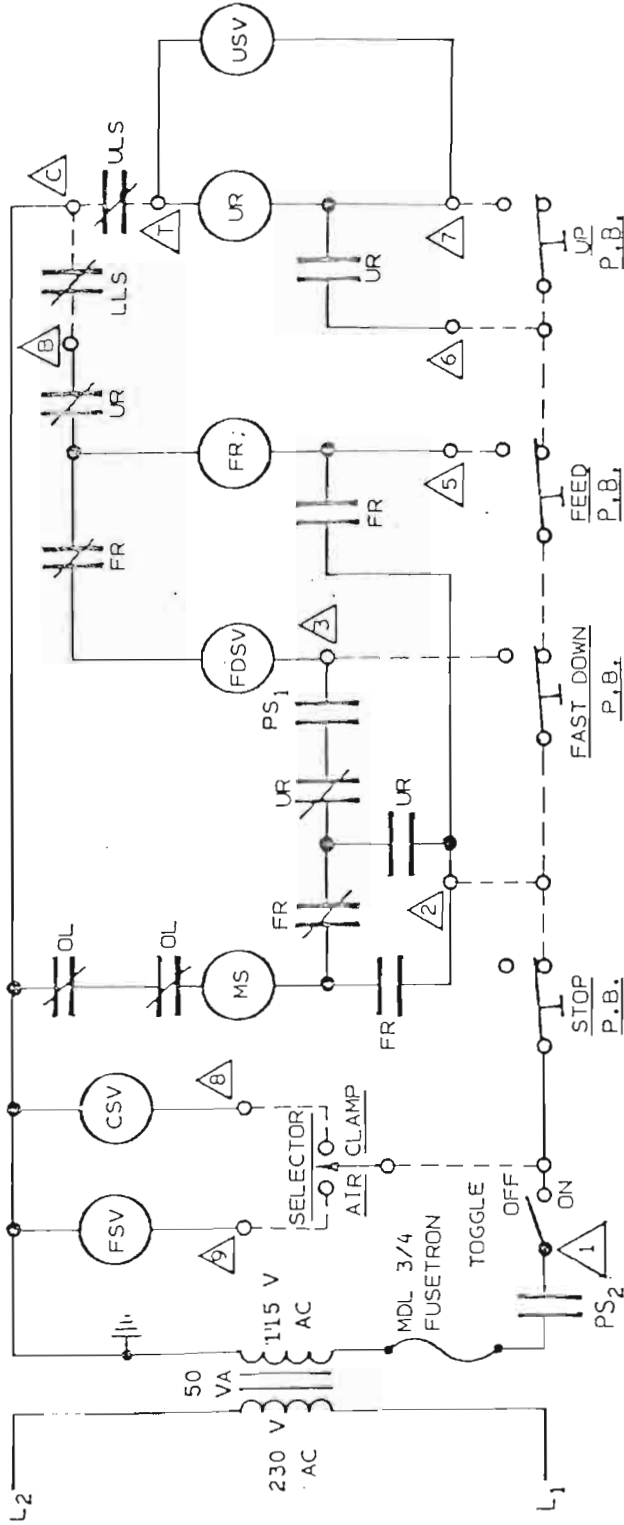
FA-4 BORING MACHINE

6 SPEED





FA-4 BORING MACHINE
PNEUMATIC CONTROL CIRCUIT DIAGRAM



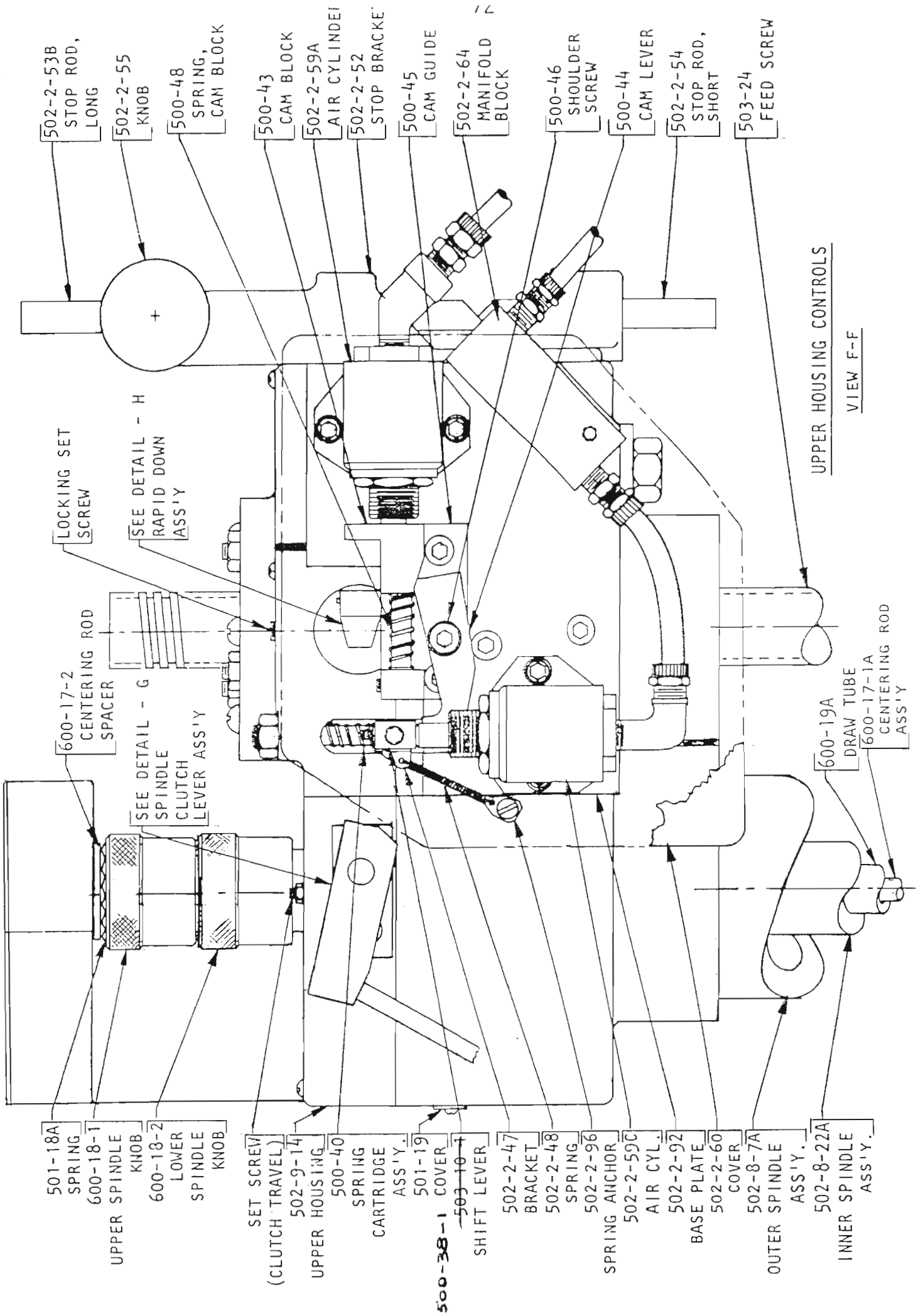
SCHEMATIC LAYOUT CONTROL PANEL

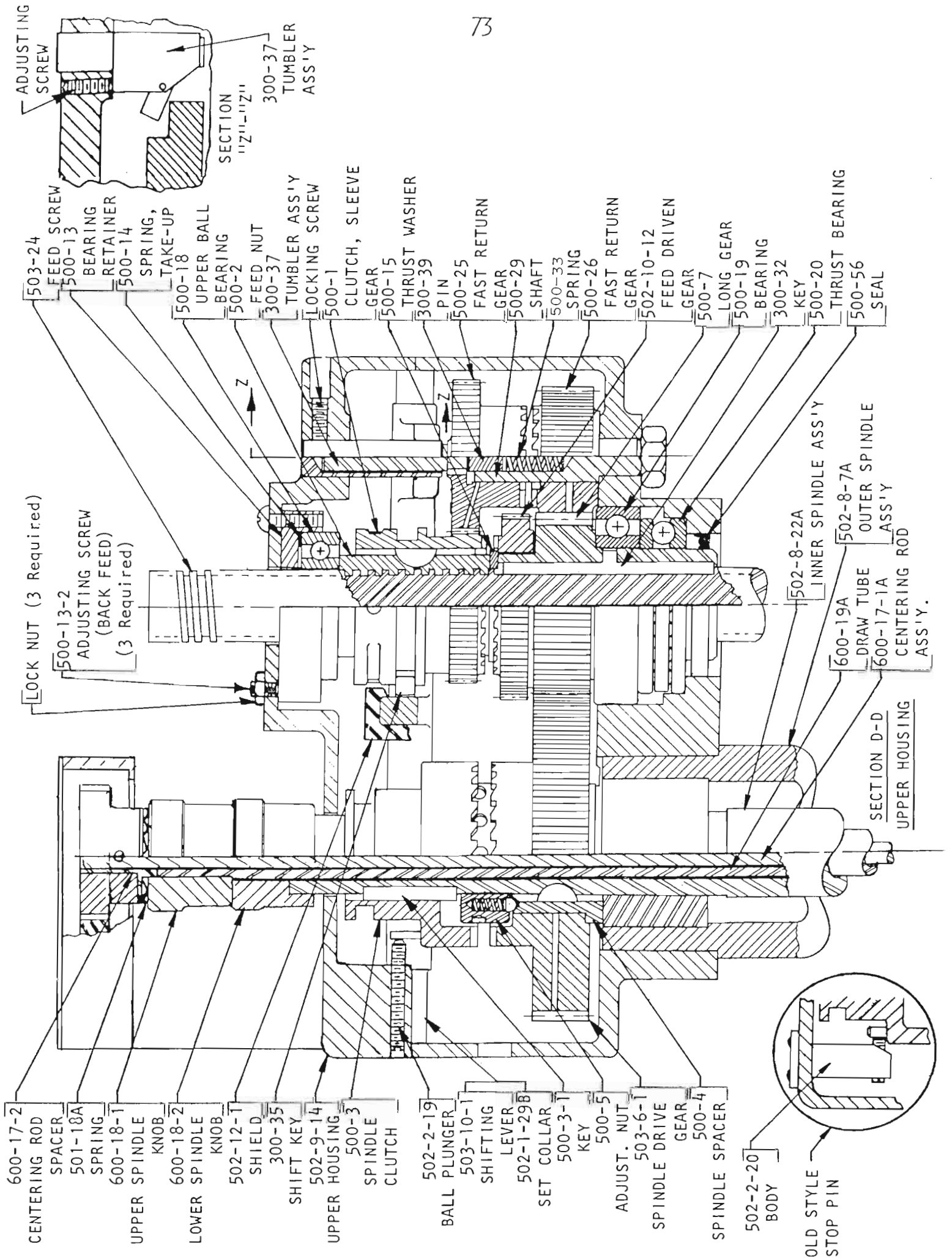
* FOR OLDER MACHINES FSV IS REFERRED TO AS LSV - LIJET SOLENOID VALVE

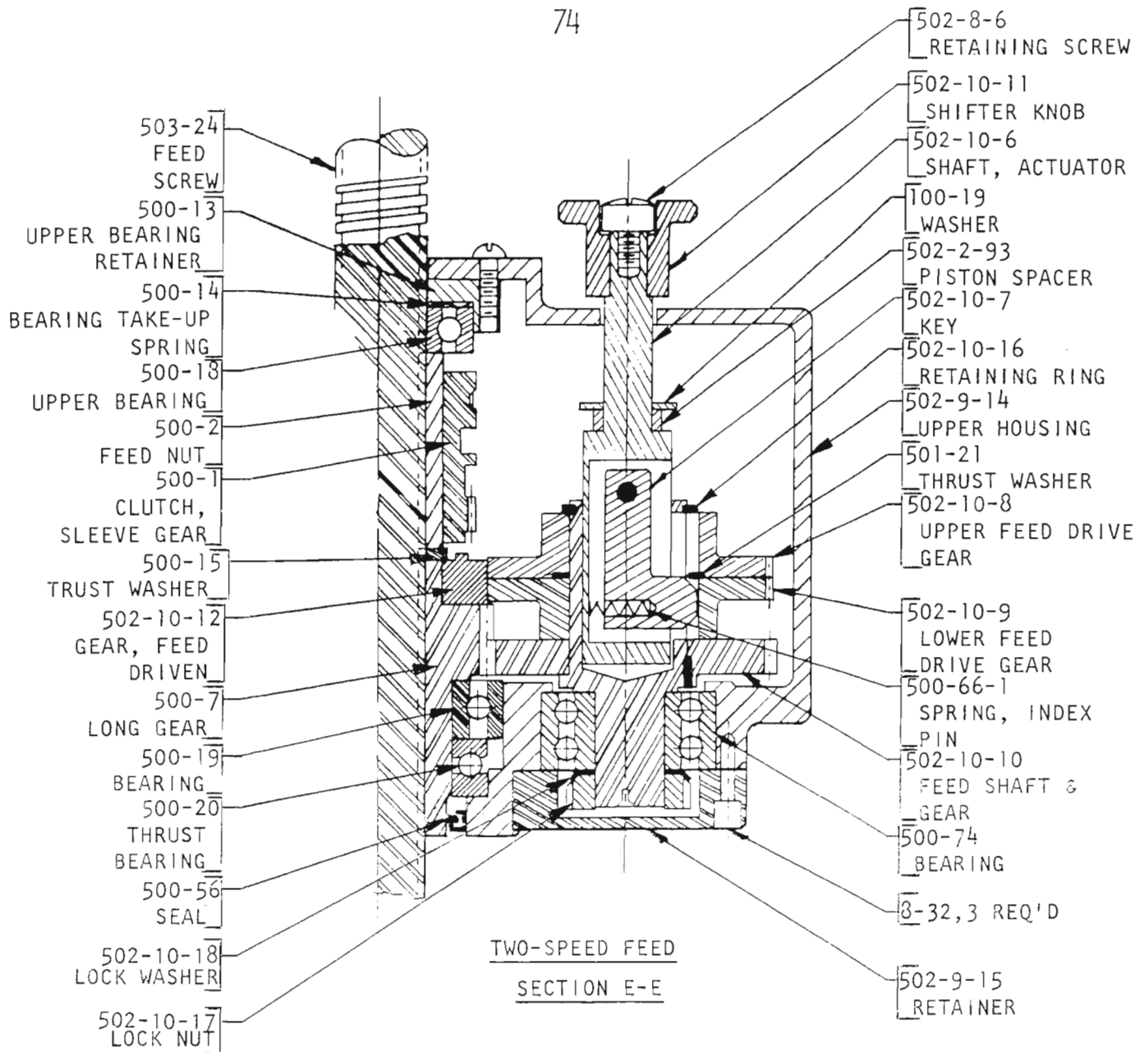
- LEGEND -
- CSV - CLAMP SOLENOID VALVE
 - FDSV - FAST DOWN SOLENOID VALVE
 - FR - FEED RELAY
 - LLS - LOWER LIMIT MICRO SWITCH
 - MS - MOTOR STARTER
 - OL - OVER LOAD, MOTOR STARTER
 - PS1 - PRESSURE SWITCH, N.O. CONTACTS CLOSED BY AIR PRESS. WHEN FDSV IS ENERGIZED
 - PS2 - PRESSURE SWITCH2 N.O. CONTACTS CLOSED BY SUPPLY AIR PRESS.
 - FSV - FLOAT SOLENOID VALVE
 - ULS - UPPER MICRO SWITCH
 - UR - UP RELAY
 - USV - UP SOLENOID VALVE
 - △ = WIRES & TERMINALS INDICATORS

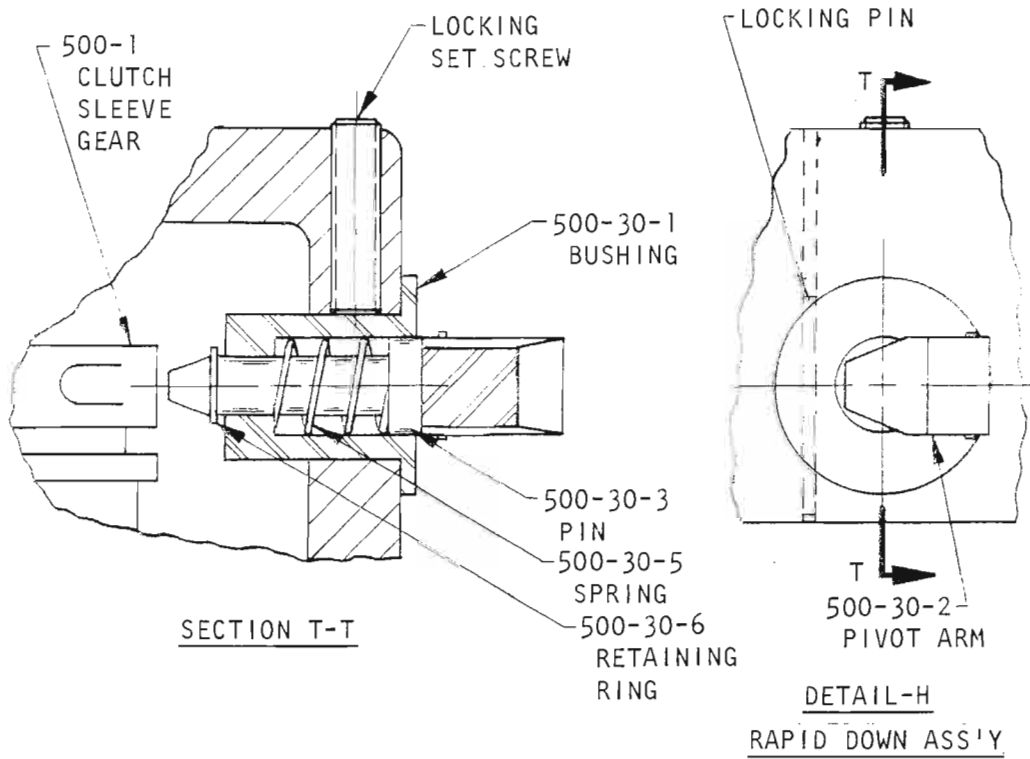
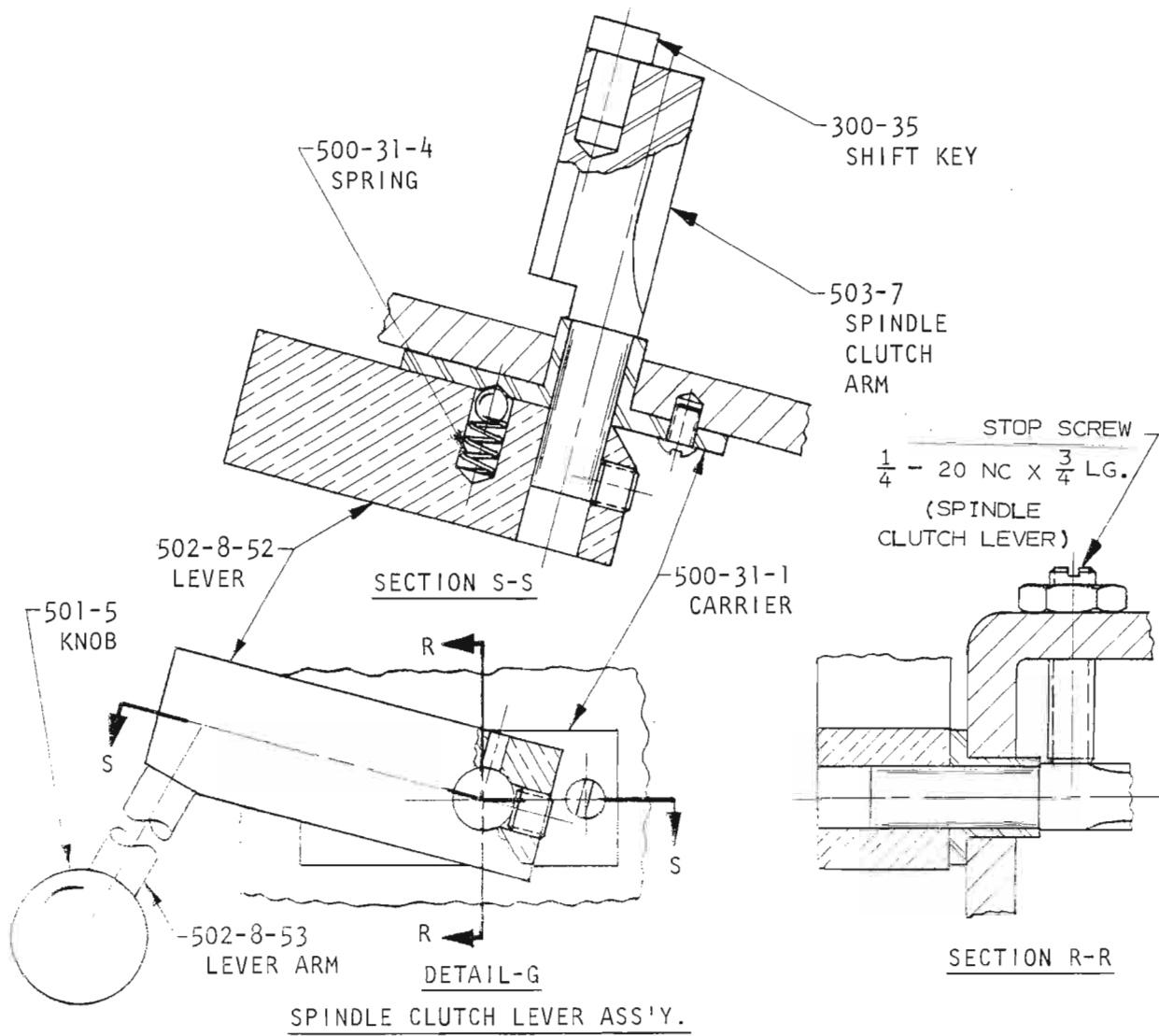
FA-4B BORING MACHINE

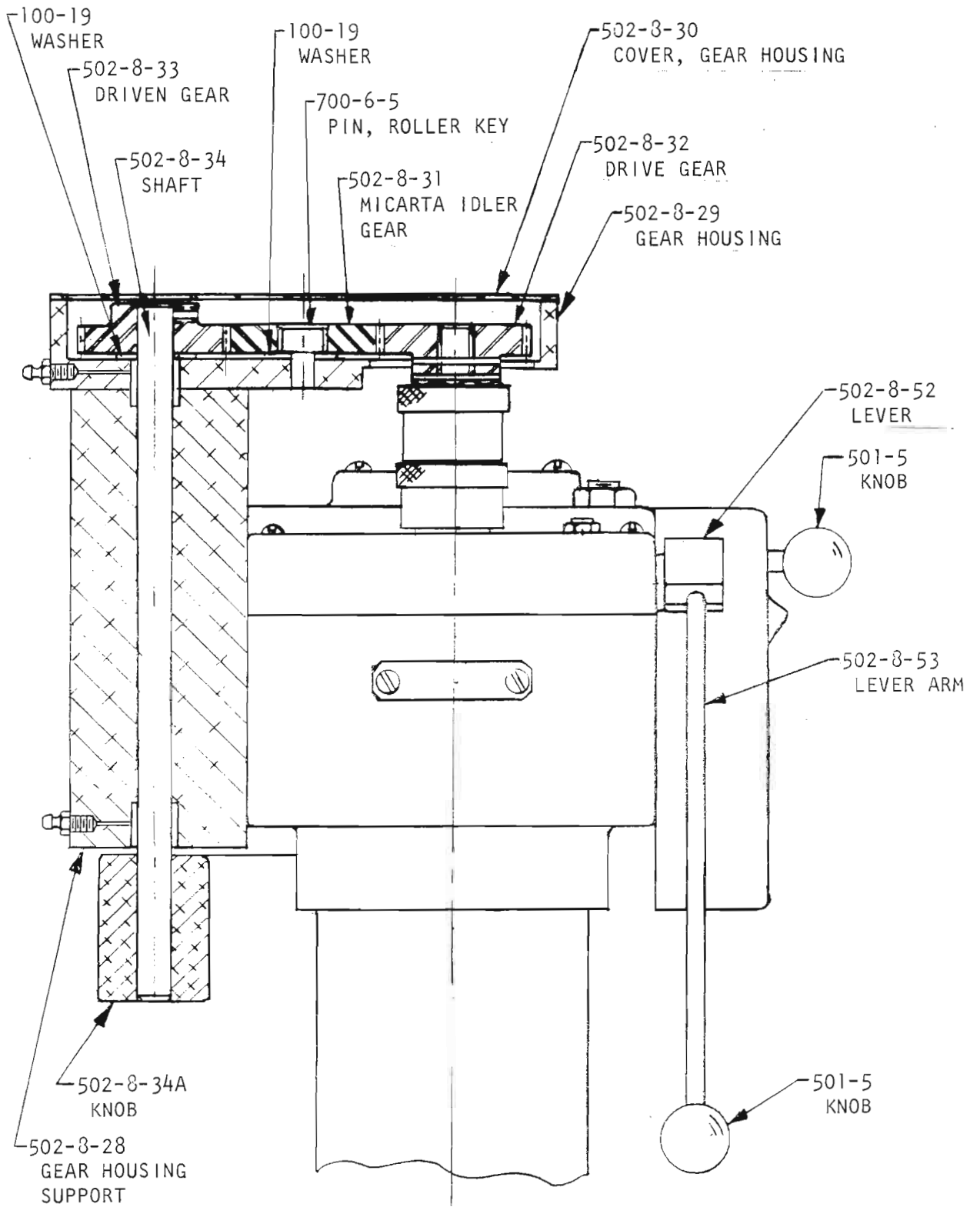
CONTROL CIRCUIT DIAGRAM





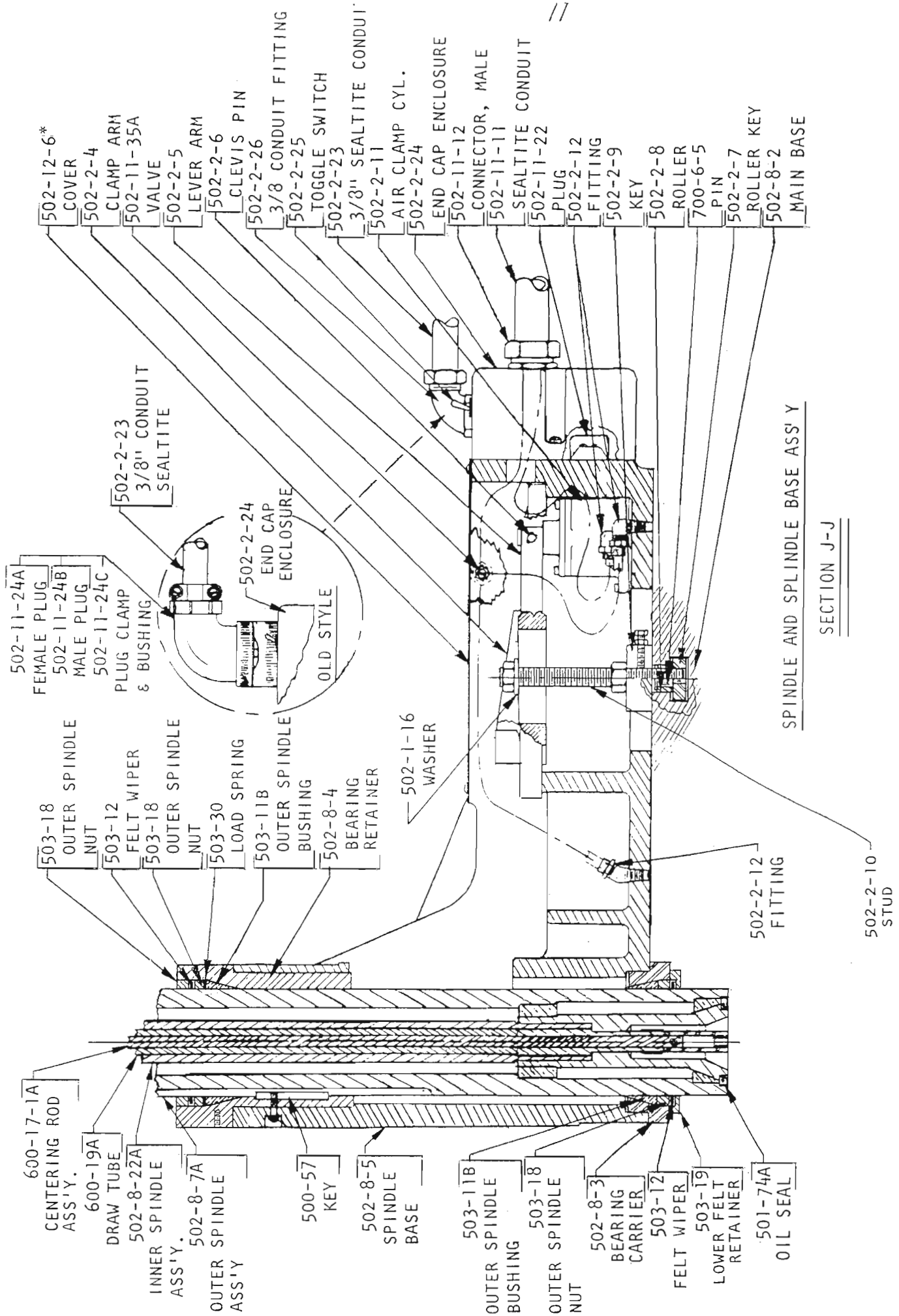






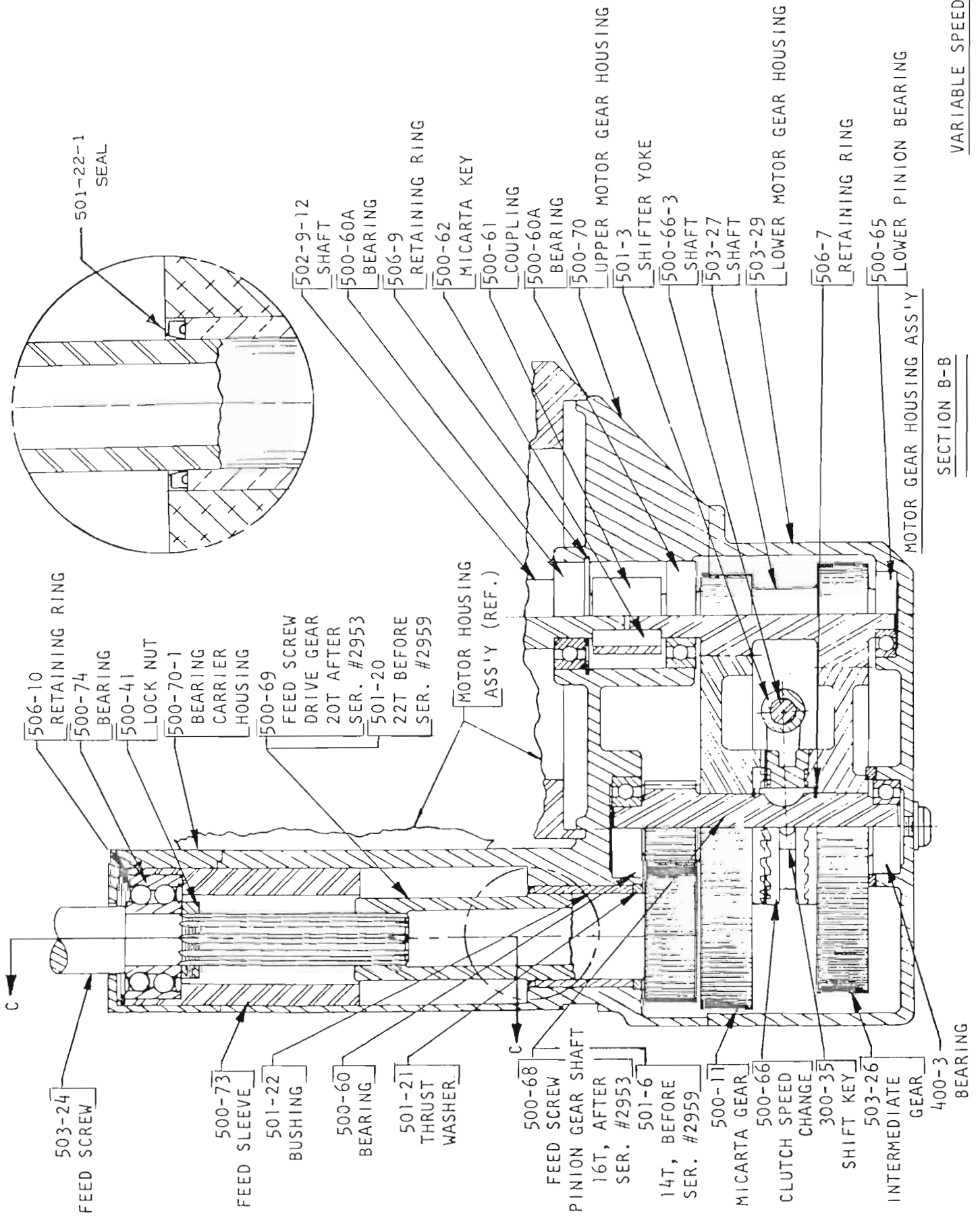
CENTERING CONTROL

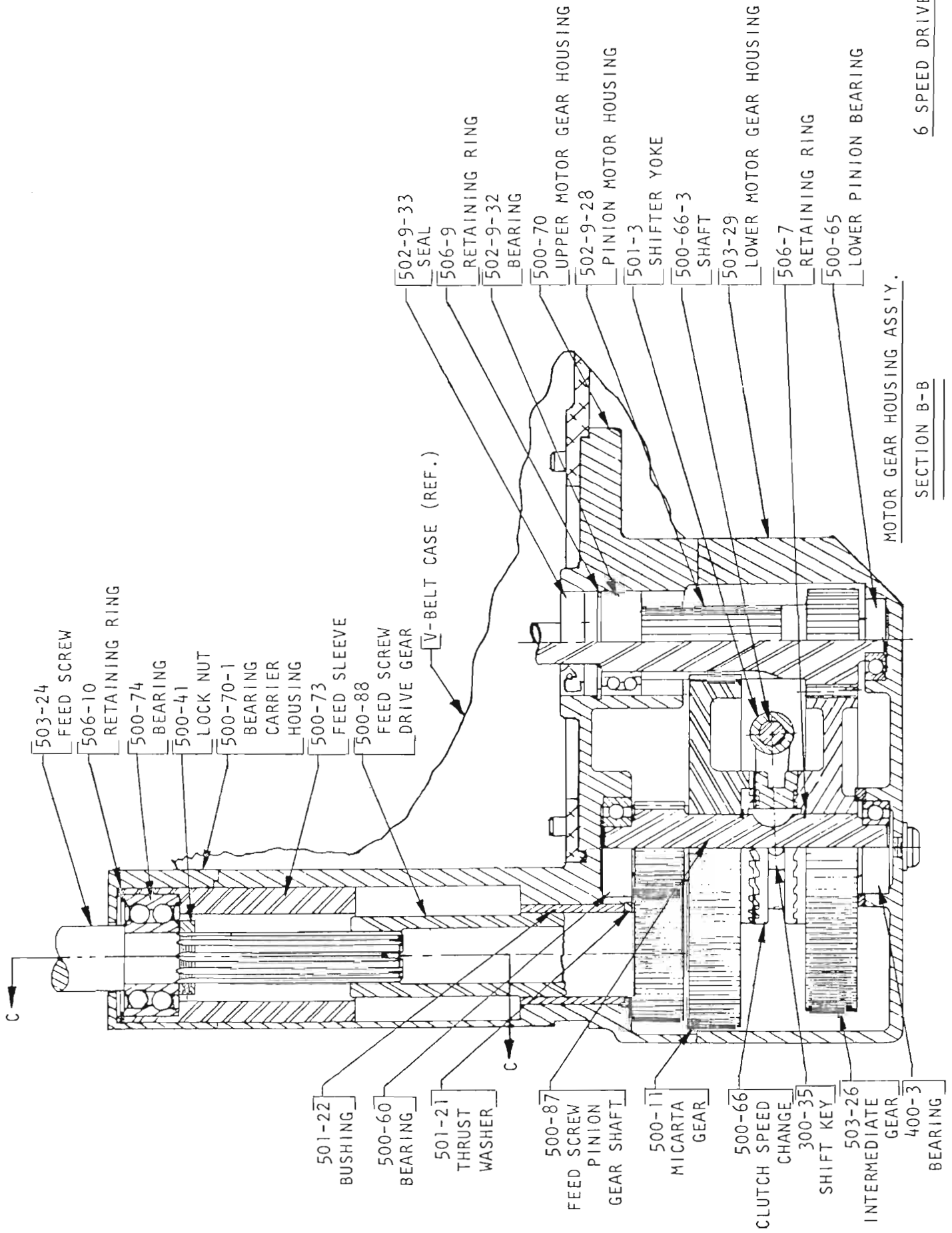
VIEW P-P

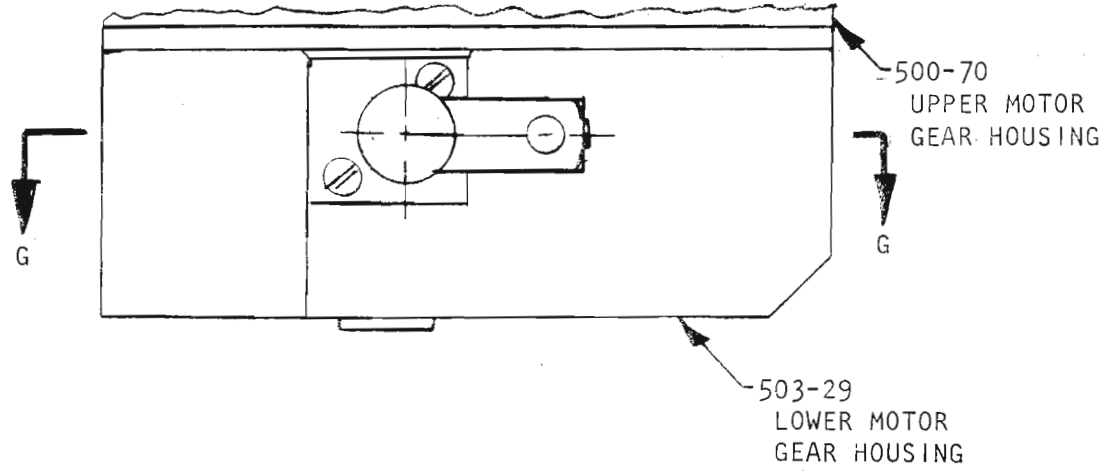
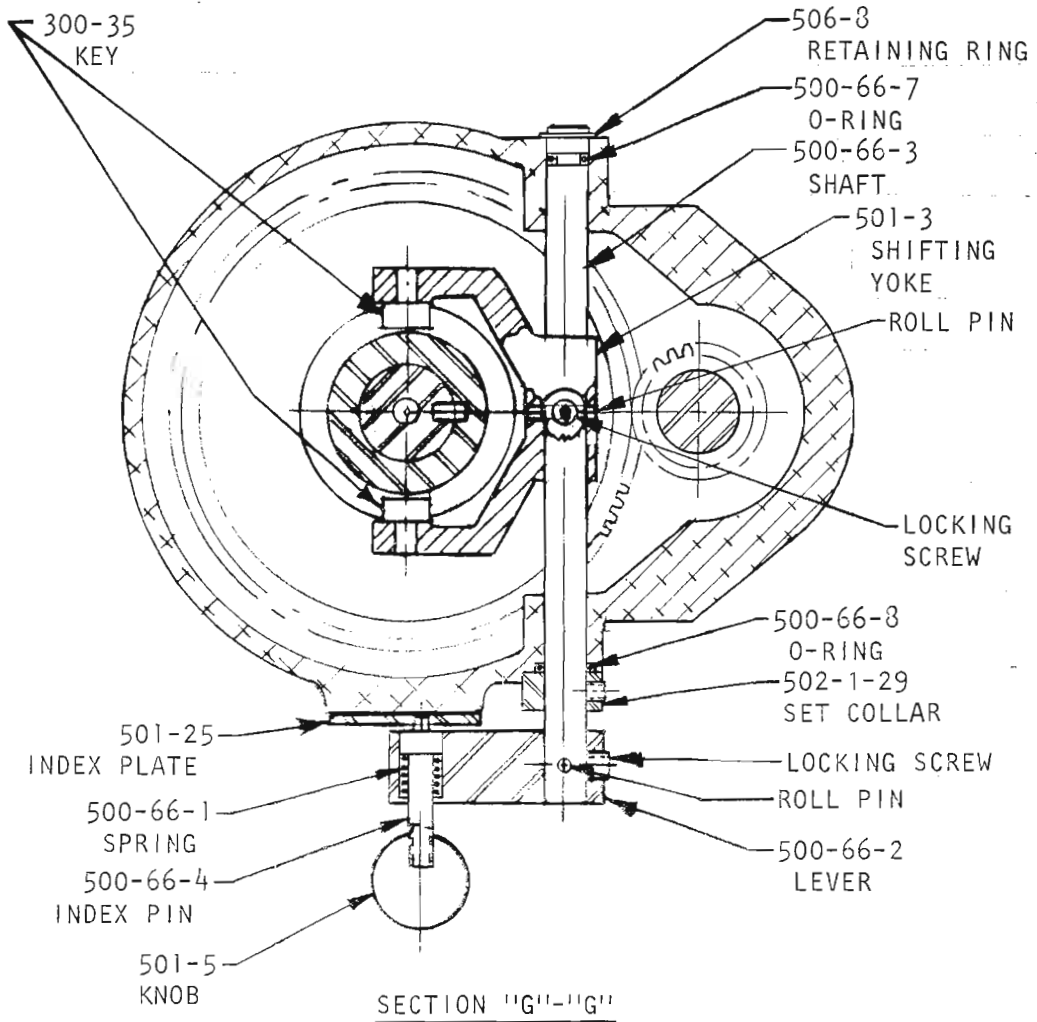


SPINDLE AND SPLINDLE BASE ASS'Y
SECTION J-J

*VARIABLE SPEED DRIVE ONLY

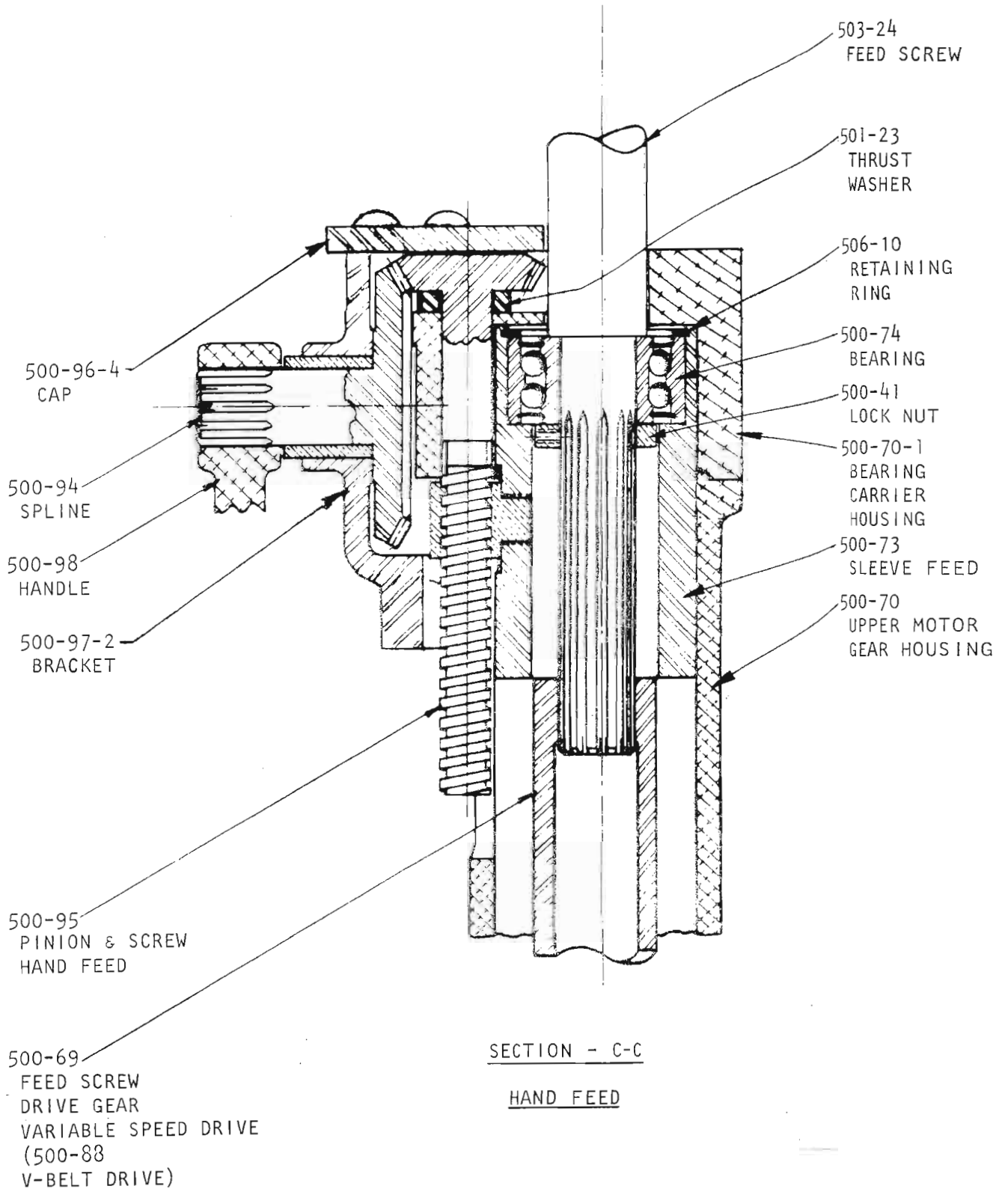


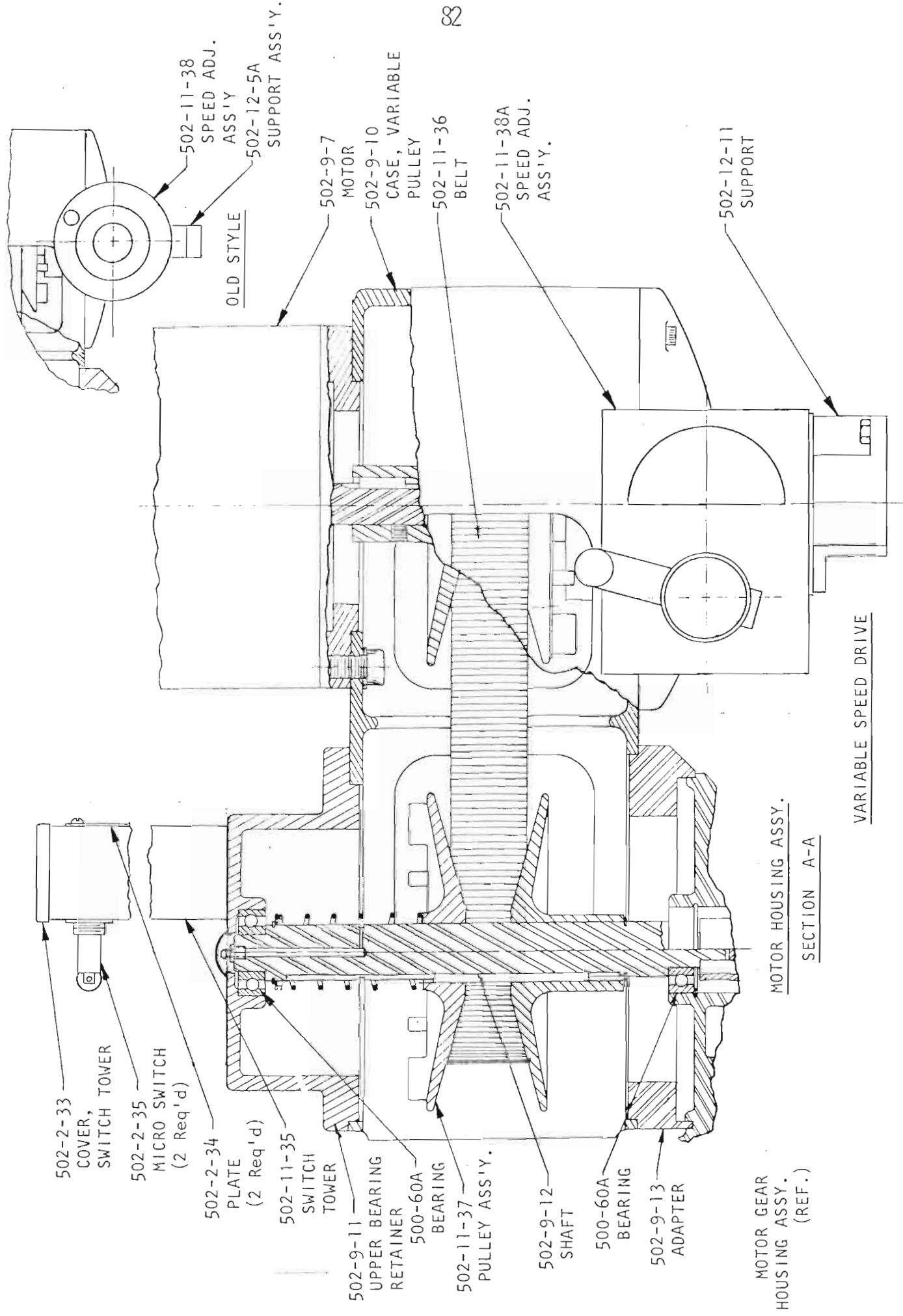




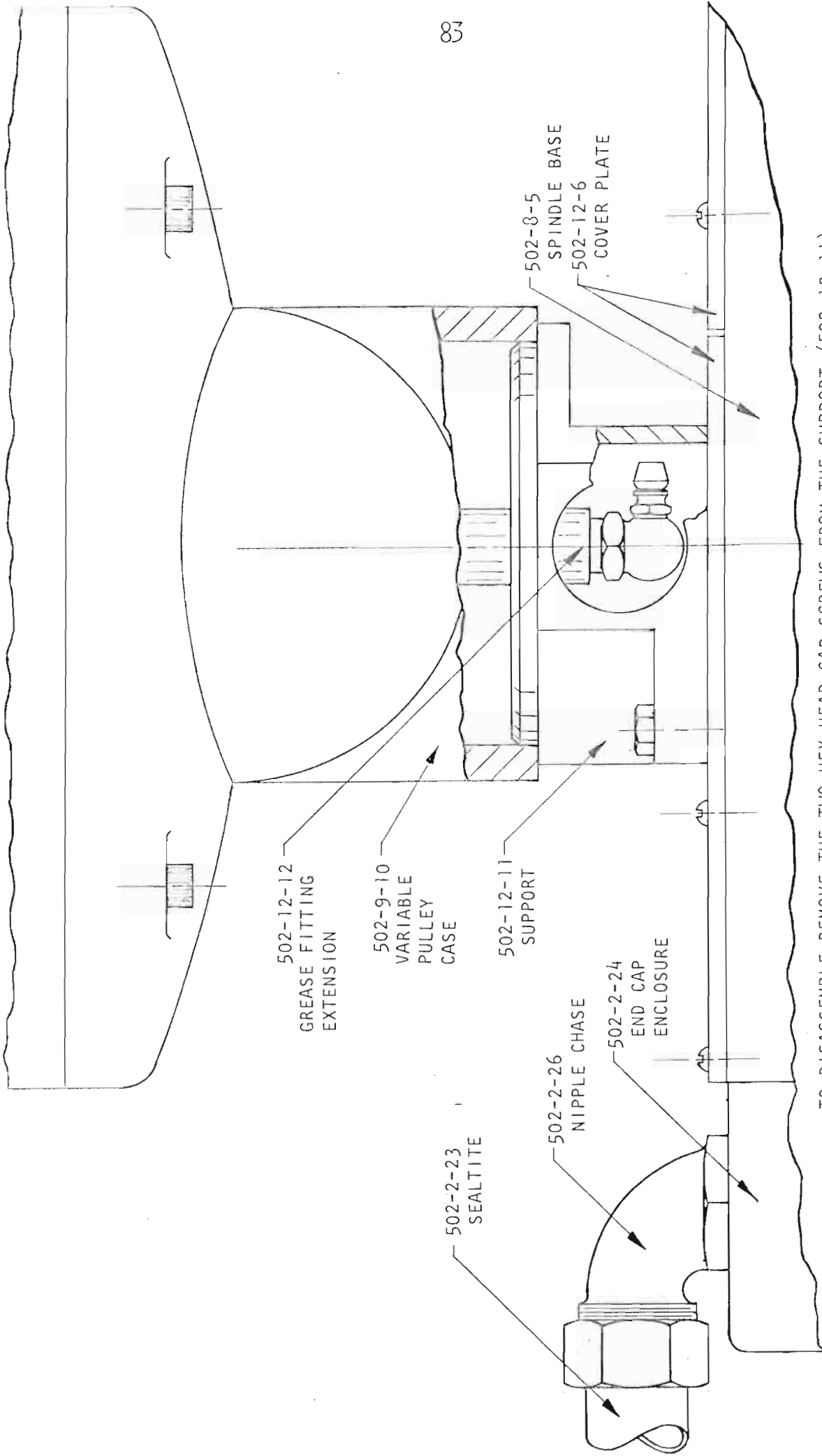
SHIFTING CONTROL

LOWER MOTOR HOUSING





MOTOR GEAR HOUSING ASSY. (REF.)



TO DISASSEMBLE, REMOVE THE TWO HEX HEAD CAP SCREWS FROM THE SUPPORT (502-12-11). THEN REMOVE THE FOUR ROUND HEAD SCREWS FROM THE REAR COVER PLATE (502-12-6). THEN LIFT THE SUPPORT AND THE RELIANCE CASE (502-9-10) ENOUGH TO SLIDE THE COVER PLATE OUT FROM UNDERNEATH THE SUPPORT. NOW THE SUPPORT MAY BE REMOVED.

RELIANCE MOTOR DRIVE

SUPPORT

USED ON MACHINE WITH
SER. #3007 AND HIGHER













