

MIMIK

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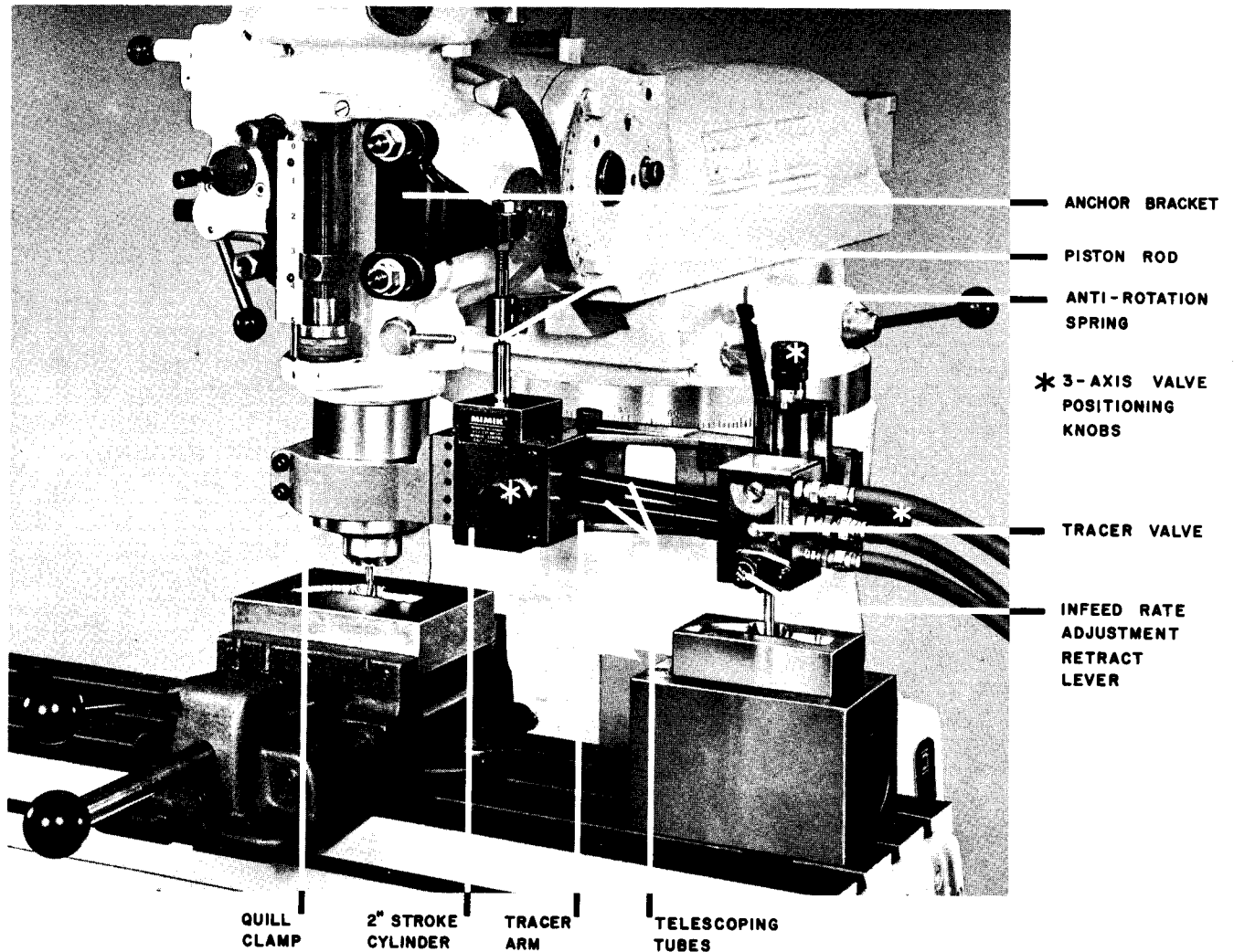
SERIES 4000 TRACER

**INSTALLATION & OPERATION
MANUAL**

OPERATING AND MAINTENANCE INSTRUCTIONS

MIMIK 4000 SERIES TRACER

I. INTRODUCTION



When fitted to the machine quill, it will duplicate any 180° vertical contour within its 4" working stroke. The operator merely traverses the table back and forth, pick-feeds after each traverse, and adjusts for depth of cut.

The position of the cutter is controlled automatically by the tracer. Any contour change in the pattern is sensed instantly by the stylus. Since the cutter moves in unison with the stylus, it produces a part contour identical to the pattern.

II. HOW TO INSTALL

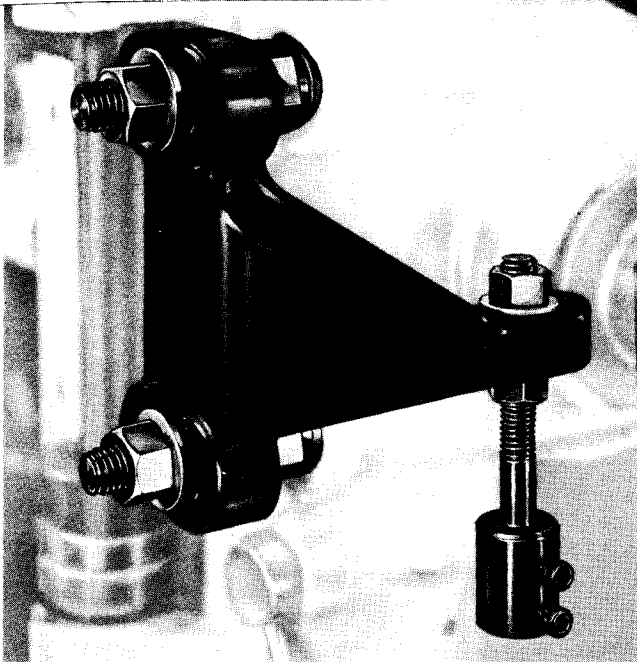
Only two components of the tracer require direct mounting to the machine. The main tracer assembly is clamped to the machine quill, and moves up and down with it. The anchor bracket is bolted to the quill housing to provide a rigid thrust anchor for the tracer piston rod. Installation is simple if you follow the steps given below.

CAUTION: There is no need to disconnect hoses from tank to tracer valve, but if disconnected they should be capped or plugged immediately to keep dirt out. If this has not been done they should be thoroughly flushed before reconnecting.

ANCHOR BRACKET

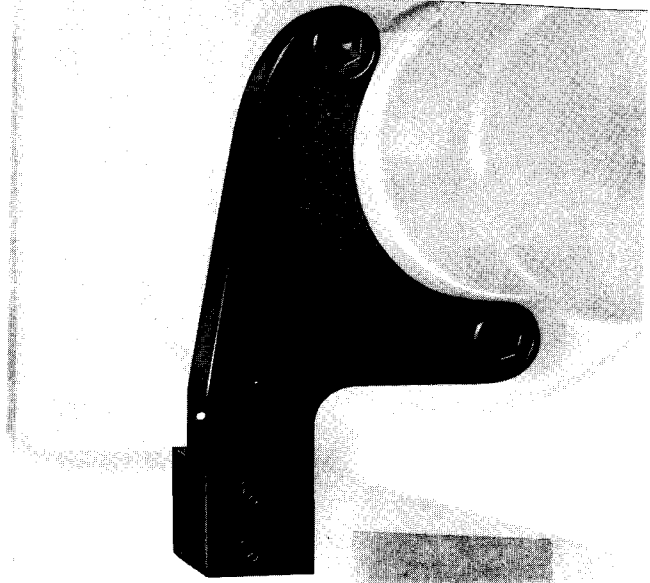
Install the anchor bracket rigidly on the quill housing as illustrated here. Any paint or burrs on the machine's mounting surface should first be removed.

STYLE I



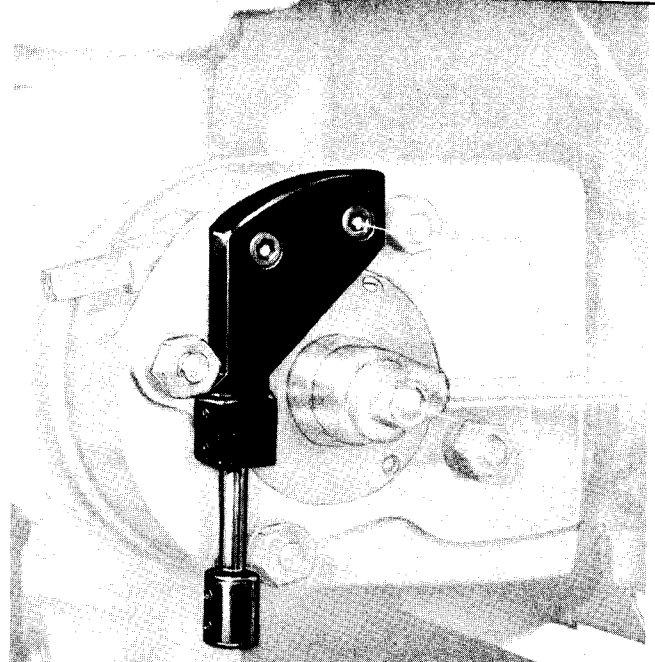
Remove the nuts from the two head mounting bolts at front right of quill housing and replace with MIMIK anchor extensions. Install anchor bracket on anchor extensions and tighten securely at center of mounting slots.

STYLE II



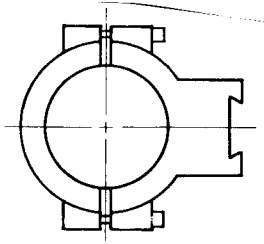
Remove 2 of the 3 socket cap screws from machined pad at base of quill elevation shaft on right side of quill housing. Fasten anchor bracket to pad, using socket cap screws provided.

STYLE III

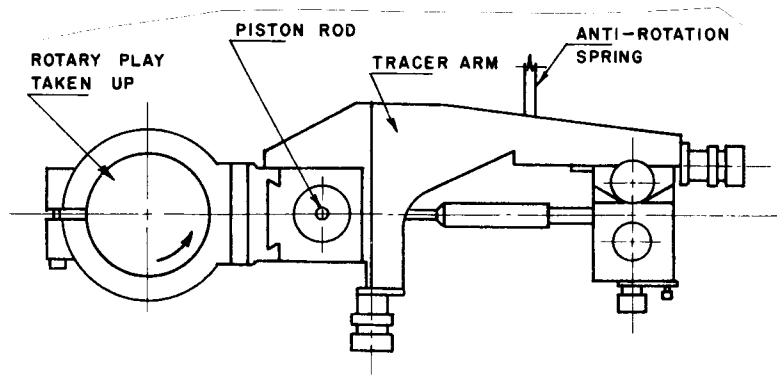


Drill and tap two holes $3/7-16$ by $5/8$ " deep in machined pad at base of quill elevation shaft on right side of quill housing. Fasten anchor bracket to pad. (Locate bracket as shown to lay out holes.)

III. HOW TO ASSEMBLE TRACER



2-PIECE QUILL CLAMP
(XLO & INDEX)



1-PIECE QUILL CLAMP
(BRIDGEPORT)

1. First extend the quill about 3" and lock it in this position. If the tracer has a one-piece quill clamp, loosen the clamping screws, spread the clamp slightly with a screwdriver if necessary and mount it on the bottom of the quill's major diameter with the tracer arm extending to the right.
2. If it has a two-piece quill clamp, remove the loose piece and mount the tracer on the quill just above the depth-rod anchor ring, with tracer arm extending to the right. (If quill has no anchor ring, install as in 1 above.)
3. Before tightening the clamping screws, roughly align the major axis of the tracer with the machine table, making sure any rotary play in the quill is taken up in a counter-clockwise direction. Tighten the clamping screws and connect the spring under tension from the rear of the tracer to the machine column to prevent further play in the quill.

ALIGNMENT OF PISTON ROD AND ANCHOR BRACKET

The piston rod must be aligned with the hole in the anchor bracket before it is inserted. Check alignment by raising the quill manually until the end of the piston rod meets the bottom of the anchor. If it will not enter the anchor hole freely, make adjustments as follows:

- Move anchor bracket sideways on its mounting slots and move anchor rod in or out on the anchor bracket slot.

When you are sure of alignment, raise the quill until the piston rod enters the anchor hole full depth. Tighten the anchor screws. As a final alignment check, look closely to make sure that inner and outer piston rods are concentric.

HYDRAULIC SUPPLY TANK

Install pressure gage and provide an outlet for the motor plug. (Make sure the supply cord cannot be unplugged accidentally.) Fill tank with a high quality hydraulic oil containing rust and oxidation inhibitors and a detergent. (See instructions on tank.)

The tank may be placed anywhere within reach of the hoses, as long as it is lower than the tracer valve. The drain hose must slope downward from valve to tank to provide gravity drainage from the valve.

IV. ADJUSTMENTS AND SETTINGS

HYDRAULIC PRESSURE

Adjust hydraulic pressure at the tank with an Allen wrench. Normal operating pressure range is 125 to 160 psi.

Adjust stylus pressure on the front face of the valve with an Allen wrench. A light setting is better for sensitivity but if it is too light it may cause hang-up. The best setting is usually about midway between midway and L.

INFEEED RATE

Adjust downward feed toward the machine table by turning the infeed rate knob on the front face of the valve, while you hold the retract lever to prevent movement. Normal setting is 10 to 15 in./min. (2" travel in about 10 seconds.) This is fast enough to follow any contour in most materials at normal table feed rates. A higher feed rate could cause the tracer to vibrate or to plunge into the work on downward slopes.

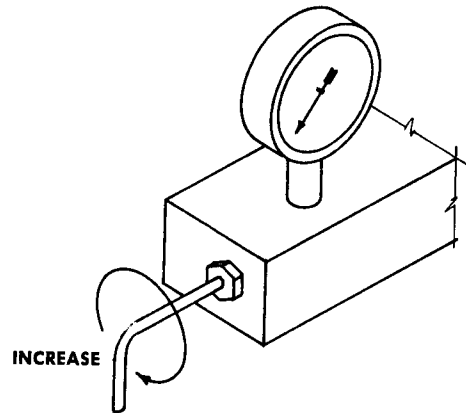
The tracer may be retracted upward at any time by moving the retract lever upward or deflecting the stylus by hand.

VALVE POSITIONING ADJUSTMENTS

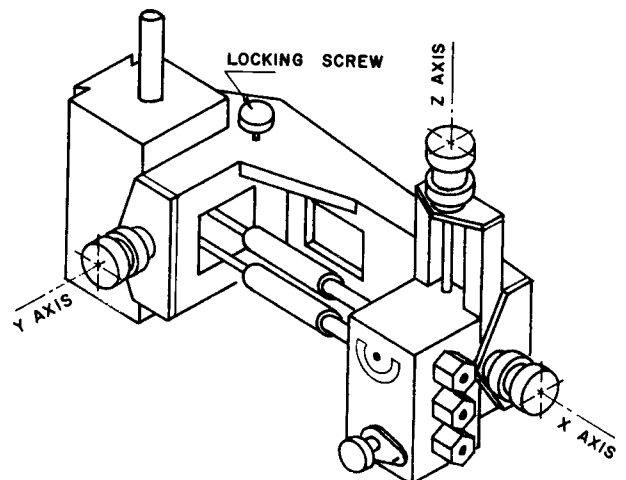
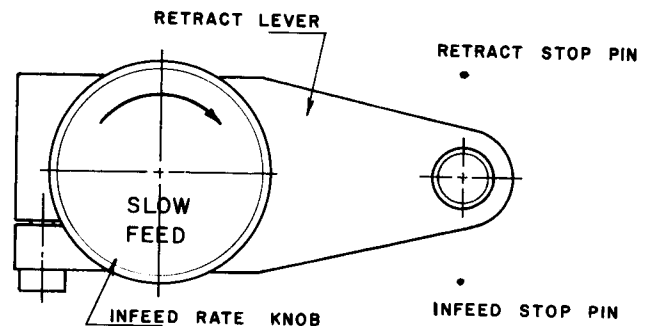
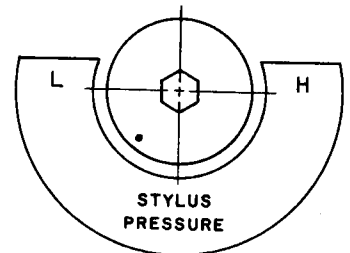
By turning the graduated adjustment knobs you can adjust the position of the stylus relative to the cutter.

With the two horizontal axis adjustments (x & y) you can compensate accurately for positioning errors of the master relative to the workpiece. They are adjusted during set-up & should then remain fixed while the job is being traced. (The thumbscrew at the top of the y-axis slide must be loosened before making an adjustment, and then tightened again.)

The vertical axis adjustment (z-axis) compensates for slight differences in height between master & workpiece, provides accurate depth of cut adjustments when finish-machining.



STYLUS PRESSURE



V. OPERATING PROCEDURES

RUNNING-IN

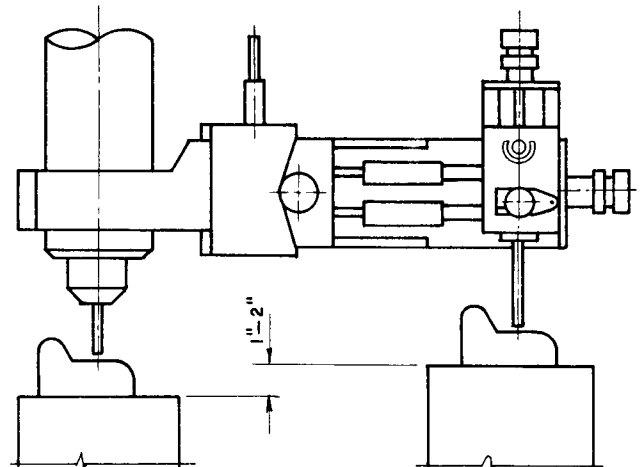
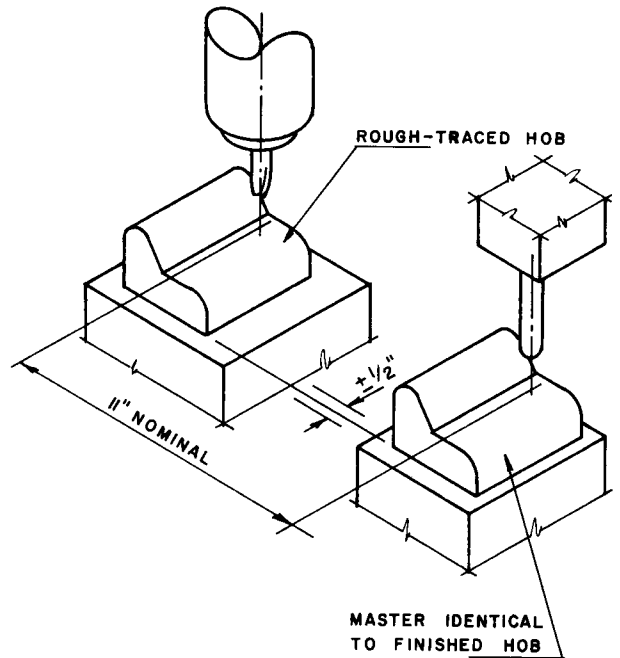
Before starting a tracing job the tracer should be run long enough to raise the oil temperature, as extreme temperature changes can affect tracing accuracy. Run-in can usually be done while the job is being set up. When the oil has warmed up, cycle the tracer full stroke at least 10 times to remove trapped air from the system.

WORKPIECE AND MASTER SET-UP

The pattern to be traced must be identical to the desired finished shape of the workpiece. Most materials available for pattern making are suitable, as stylus pressure is extremely light.

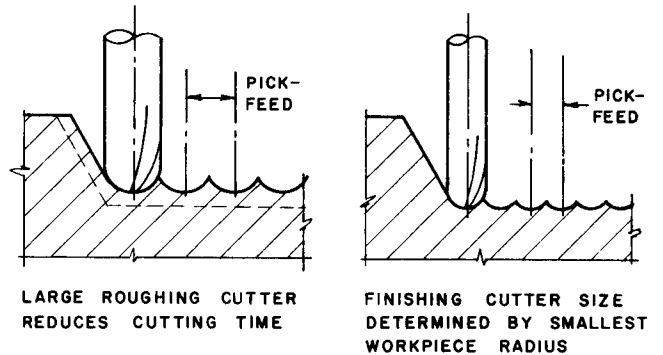
The master should be located to the right of the workpiece at approximately 11" spacing. It must be parallel to the workpiece, and aligned transversely within $\pm \frac{1}{2}$ ". Exact register can be obtained by adjusting the X and Y positioning knobs on the tracer. It is sometimes helpful to make tooling holes in workpiece and master to facilitate exact alignment.

When the valve is positioned at the center of its vertical slide, with the cutter & stylus equally extended, the tip of the stylus will be 1" to 2" higher than tip of the cutter. The master must therefore be mounted higher to compensate for this difference. Extreme accuracy of mounting is not necessary because final adjustment of about $\frac{1}{4}$ " either way can be made with the Z-axis adjustment knob, as explained on page 7.



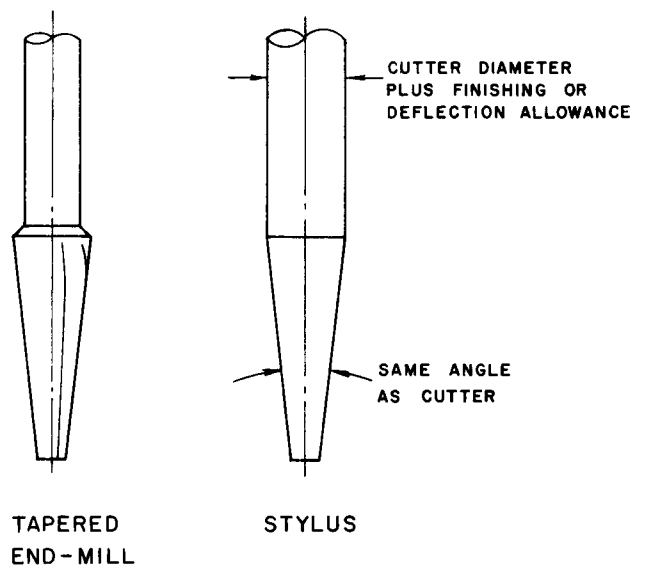
CUTTER SELECTION

Always use as large a cutter as possible to reduce roughing time, changing if necessary on finish cuts to one with a radius slightly less than the smallest radius to be traced. Ball-end cutters are most commonly used for both roughing and finishing.



Tapered end mills may be used for increased cutter strength where a small tip is needed & walls are not vertical. The stylus should be similar in shape.

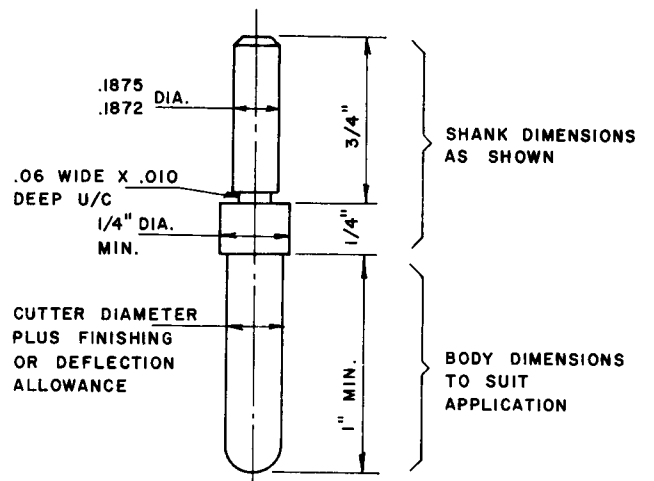
A flat end cutter will produce a radius under tracer control, and may be used on jobs which have both square & radiused internal corners.



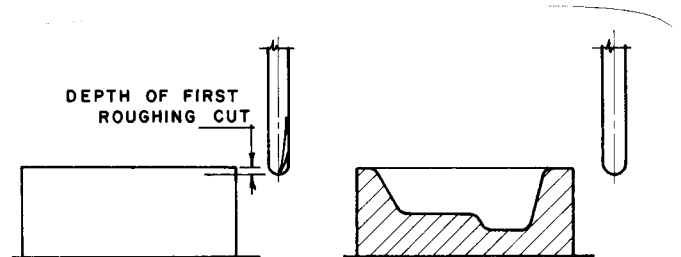
STYLUS DETAILS

The contact area of the stylus should always be the same shape as the cutter, except for finishing and deflection allowances as explained on pages 7 and 9.

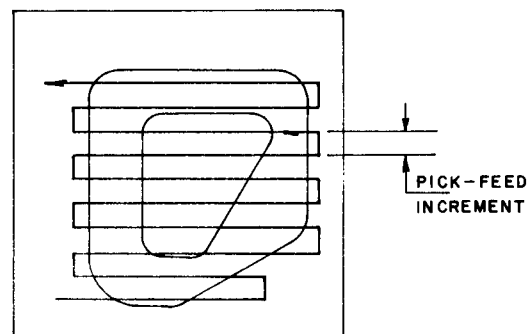
All shank dimensions are critical and must be exactly as specified. Body length may have to exceed 1" for some jobs, but should be kept as short as possible to avoid high deflections.



7. Leaving the tracer fully extended, lower the knee until the end of the cutter is level with the top surface of the workpiece. Now raise the knee the amount desired for the first roughing cut. On the first pass the stylus will only contact the master at its highest points.

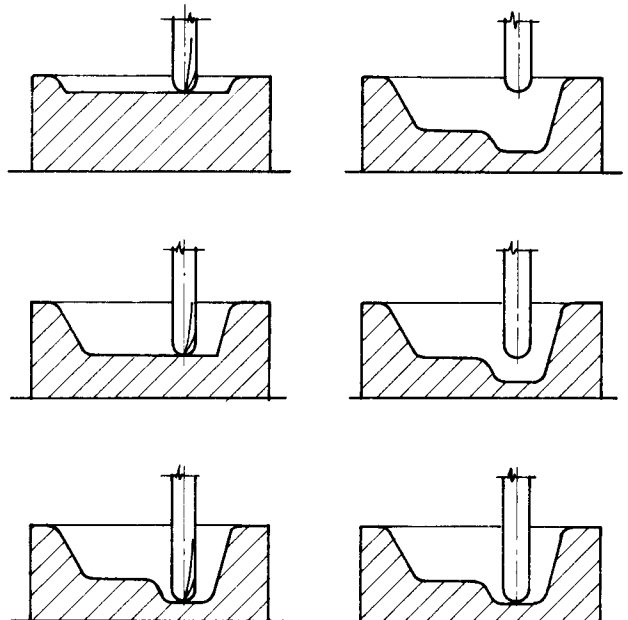


8. Scan the full contour of the master in the direction of greatest contour change. Pick-feed at the end of each traverse, using a fairly large increment on the first few passes and reducing it on final passes. (A part which has drastic contour changes in both directions may have to be scanned one section at a time in different directions.)



CUTTER PATH DURING ROUGH TRACING

9. Raise the knee the desired amount for each subsequent roughing cut, and continue until the stylus contacts the full contour. Exact knee position is not critical, since further elevation merely raises the tracer & the cutter will not remove any more metal. However, too much elevation beyond this point could cause the tracer to run out of stroke near the top of the contour.



VII. FINISH TRACING

DEFLECTION ALLOWANCE

In theory, the stylus and cutter have the same diameter but, when finish tracing, the stylus must be slightly larger than the cutter to compensate for dead zone or deflection in the valve. The amount of deflection allowance needed depends partly on the method used to make the finish cut, and should be determined before removing the roughing cutter and stylus.

Deflection is greater when climbing than when descending. Steep slopes should be finish traced either from the top down or from the bottom up: not up one side and down the other.

If traced from the top down, an unintentional increase in the table feed might cause the stylus to float off the master and leave excess material on workpiece. When traced from the bottom up, cutting action is more uniform, but excessive feeds can cause the cutter to dig in, due to stylus overdeflection. This method therefore requires more care.

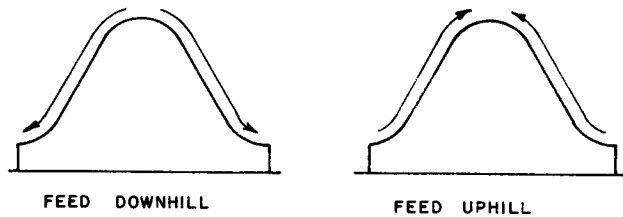
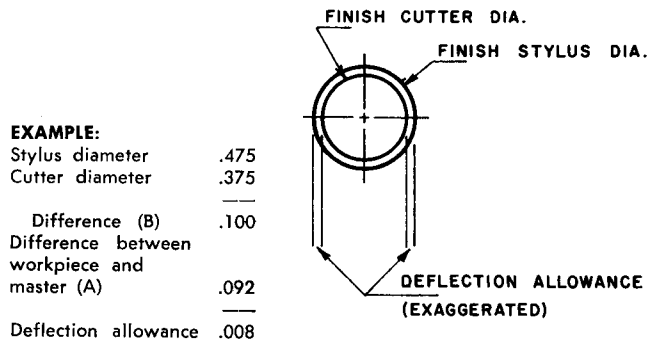
To determine the exact amount of stylus compensation, take a cut on two opposing slopes with the roughing cutter, using the cutting procedure and table feeds you intend using on the finish cut.

Measure the distance between the slopes at the same point on workpiece and master, and note the difference between the two measurements. See A. below.

Subtract this from the difference between stylus and cutter diameter. See B. below.

The remainder is the deflection allowance, or the amount by which stylus diameter should exceed cutter diameter for finish cuts.

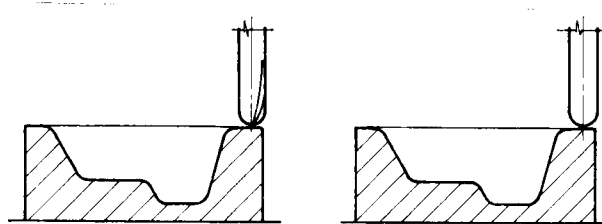
The deflection allowance worked out for the first job may be used on any future jobs involving normal tolerances. However, it should be measured and calculated again under operating conditions when exceptionally close limits are required.

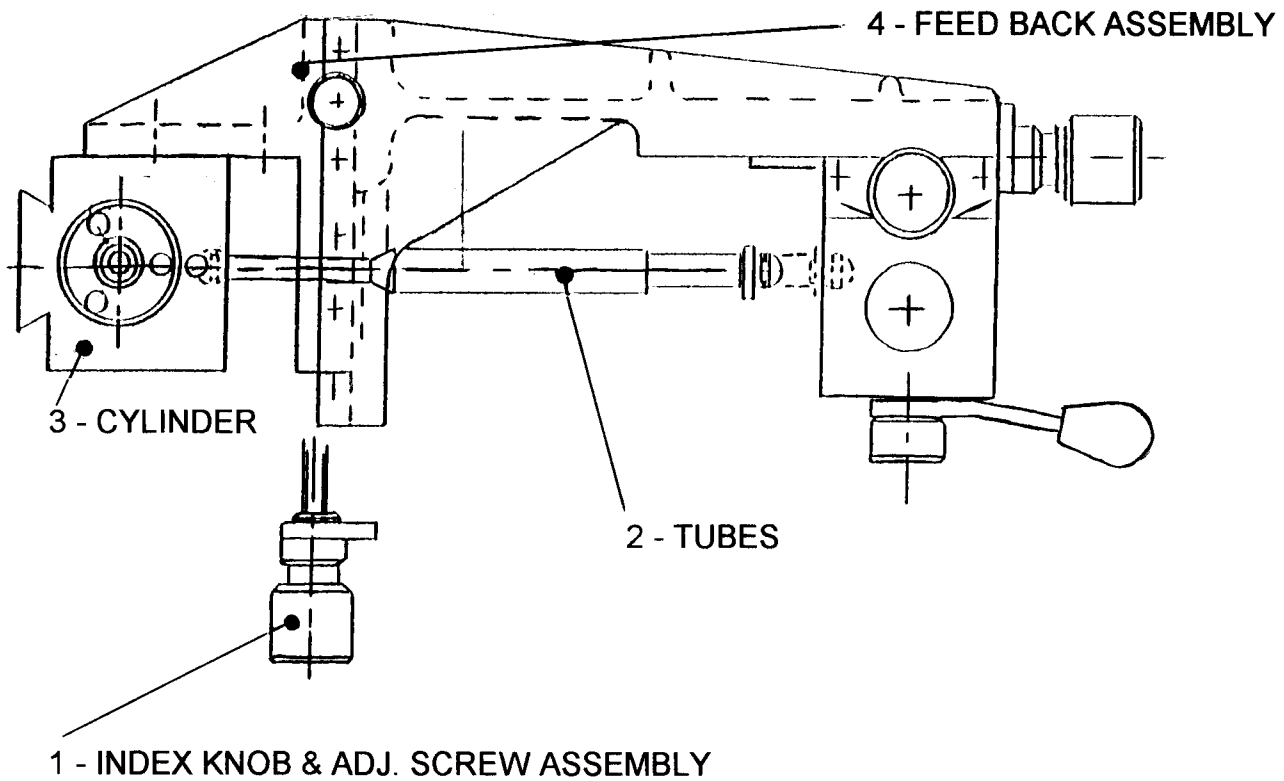


FINISH TRACING

CUTTING PROCEDURE

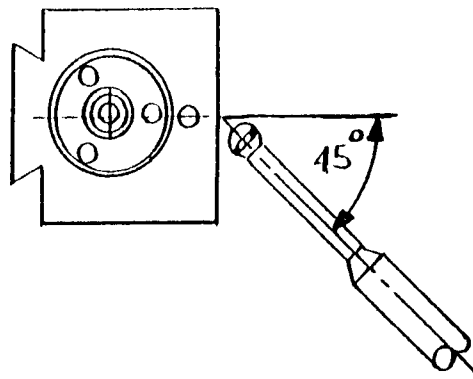
- 1 - Retract the tracer and remove the roughing cutter. Replace the roughing stylus with a finishing stylus of the same length. Feed the tracer downward and adjust the knee elevation if necessary to ensure that the tracer stroke will cover the complete contour.
- 2 - Retract the tracer and insert the finishing cutter, leaving the collet loose enough that the cutter can slide up and down.
- 3 - Feed the tracer downward until the stylus rests on a flat surface of the master, and adjust the cutter in the loose collet so it rests on the corresponding workpiece surface. Retract the tracer and tighten the collet, then recheck cutter position in case it has moved during tightening.
- 4 - Check vertical workpiece dimensions to determine amount of metal removal needed to bring it to finish size. Depth of cut is now adjusted by moving the valve upward on its vertical slide. Make a trial finish cut to partial depth to provide a smooth surface for exact measurements. Horizontal dimensions should also be checked to ensure that the finishing stylus diameter is correct.





CYLINDER 7 TUBES REPLACEMENT INSTRUCTIONS

1. Remove Item 1 (index knob & adj. screw assembly) as shown.
2. Assemble Item 2 (tubes) to Item 3 (cylinder).
3. Slide tubes & cylinder into position through holes in Item 4 (feed back assembly) and locate tubes into valve.
4. Fasten Item 3 (cylinder) to Item 4 (feed back assembly) and re-assemble Item 1 (index knob & adj. screw assembly).



NOTE: To avoid damaging O-rings @ assembly of tubes to cylinder, start tubes in place, as shown @ 45° approximately.