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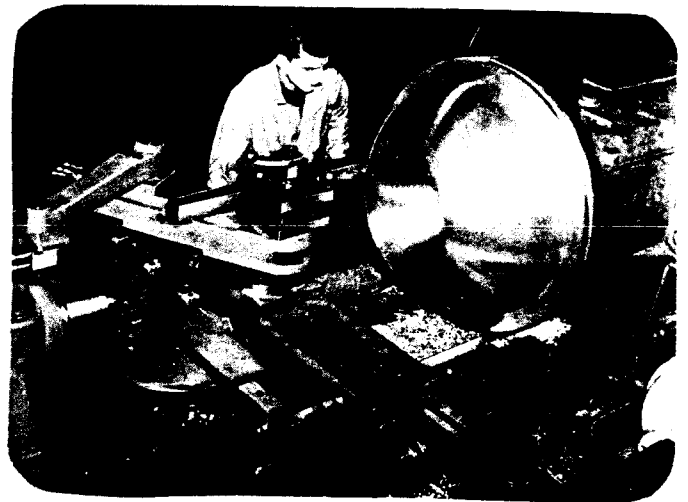
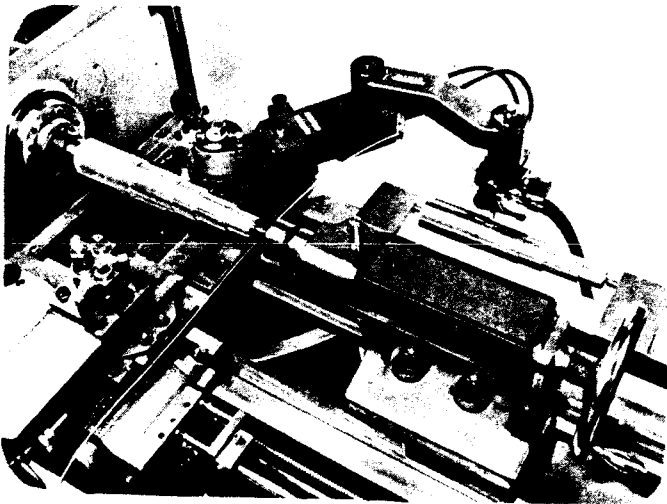
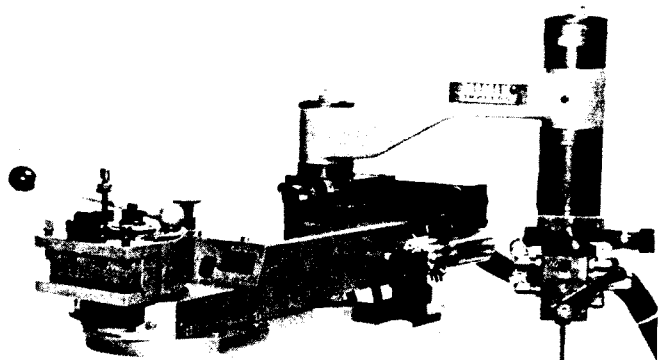
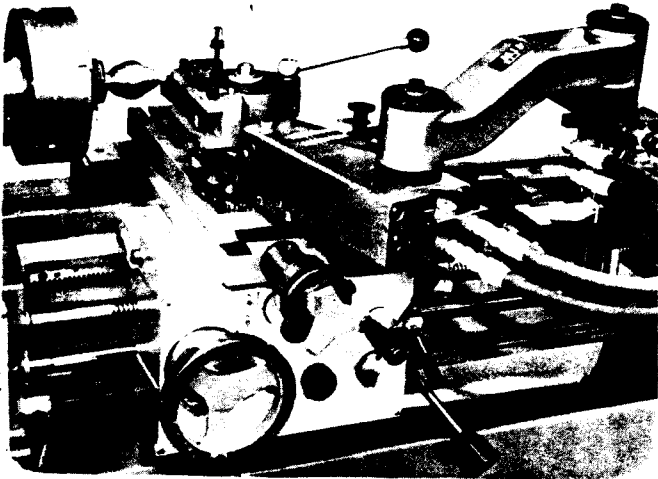
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SERIES UT UNIVERSAL TRACERS

INSTALLATION & OPERATION MANUAL

MIMIK SERIES UT TRACERS

INDEX

SECTION I	<u>GENERAL DESCRIPTION OF SYSTEM</u>	
	General Description	1
	Tracer Valve	2
	Stylus	2
	Tracer Slide	3
	Hydraulic Power System	3
	Hydraulic Oil	4
	Valve Adjustment Slide	4
	Template Bracketry	4
	Toolholders	4
	Reversing Valve	4
SECTION II	<u>INSTALLATION</u>	
	Installation Procedure	5
SECTION III	<u>SET-UP FOR CUTTING</u>	
	Instructions	8
	Rough and Finish Cutting	9
	Threading	9
	Making Templates	10
SECTION IV	<u>MAINTENANCE</u>	
	Care and Maintenance	11
	Special Note Re:Tapered Gib (for UT 3.5, 4.5, 6 +7)	11
	Gib Setting Procedure	12
	Infeed Rate Setting on Tracer Valve	13
	Infeed Assembly Drawing	13
SECTION V	<u>TROUBLE SHOOTING CHARTS</u>	
	Vibration	14
	Surface Finish Problem	14
	Part-to-Part Variations	15
	Template-to-Part Variations	15
	Slide Hang-Up	16
	Valve Hang-Up	16
SECTION VI	<u>TIME STUDY PROCEDURE</u>	18
SECTION VII	<u>TRACING TIPS</u>	21
APPENDIX	<u>TRACER VALVES - INSTALLATION INSTRUCTIONS</u>	

MIMIK SERIES UT TRACERS

INSTALLATION AND OPERATOR INSTRUCTIONS

I. GENERAL DESCRIPTION OF SYSTEM

The MIMIK slide tracer is a single-axis, self contained, hydraulic servo controlled attachment designed to suit both engine and turret lathes.

The MIMIK slide tracer is usually mounted to the lathe cross-slide. When front mounted, it is equipped with a swivel adapter which is bolted in place of the swivel compound, allowing the tracer to be positioned to any desired angle.

When rear mounted, as is common on turret lathes and on engine lathes with extended cross-slides, custom made swivel adapters are provided.

The MIMIK tracer valve is mounted to an X-Y co-ordinate adjustment slide connected to the tracer slide by a pivoting valve arm carrier. The operator may thus position the tracer valve at any desired location.

The MIMIK template bracket is either attached to the lathe V-ways, as is common with a front-mounted tracer, or to the headstock or bed when the tracer is rear-mounted.

Deflection of the tracer valve stylus as it is fed along the template contour directs hydraulic fluid to either side of the piston. The resulting slide movement, combined with the basic machine feed, moves the cutting tool in a path identical to the template profile.

The main components of this system and their functions are as follows:

TRACER VALVE

The tracer valve controls the amount and direction of oil flowing to the hydraulic cylinder. This is accomplished by deflection of the stylus which bears against the template.

MIMIK tracer valves are equipped with the following controls:

a) Infinitely Variable Infeed Rate Control

To adjust the infeed rate of the slide, rotate the knurled slow feed knob located on the tracer valve.

- Clockwise will decrease infeed rate.
- Counter clockwise will increase infeed rate.

The correct setting should provide an infeed slightly greater than needed to follow the template contour. Most workpieces can be traced at 10 i.p.m.

b) Retract Control Lever

This two position control selects either infeed or retract. Rate of retract is not adjustable.

c) Stylus Pressure Control

Stylus actuating pressure is a function of the spool return spring pressure and frictional resistance. Stylus pressure adjustment on the tracer valve provides a stylus pressure of approximately 4 ounces to 2 pounds. A light stylus pressure provides maximum sensitivity and good surface finish, but must be heavy enough to ensure positive spool return.

Recommended stylus pressure is between 4 and 8 ounces. (Dot on adjusting screw about 3/16" counter clockwise from 'L' position)

STYLUS

To ensure accurate template-to-part reproduction, the following basic rule must be observed:

Stylus and tool must be ground to a matching radius slightly less than the smallest radius to be traced. Most applications can be traced with the wedge-shaped stylus normally supplied.

As is normal with any tracer valve when a tool is cutting on more than 90° of its configuration, compensation has to be made for "stylus deflection". Stylus radius must be increased approximately .005", depending on the infeed setting, feed rate and tracer slide angle. (These three variables can all affect stylus deflection)

NOTE: When the correct compensation has been determined, the major variables noted above must not be altered.

TRACER SLIDE

The tracer slide consists of a lower fixed member mounted to the lathe cross-slide and an upper sliding member which carries the cutting tool and the tracer valve.

To ensure accurate and consistent duplication of the template contour, the MIMIK tracer slide is carefully handscraped, if dovetail ways, or ground if square ways and are equipped with Turcite "B" Way-Covering.

An adjustable tapered gib provides wear compensation for continued accuracy; automatic lubrication ensures minimum slide friction and wear. Wipers are also provided for the protection of the slide ways.

Fill oiler hole at regular intervals about once a week with Sunoco Way-Lube # 90 to ensure adequate lubrication at all times. When adding lubrication (open bleeder valves on top of slide) UT-7.0 & 9.0 & 11.0 only.

SPECIAL NOTE - UT 3.5 THROUGH UT-7

These incorporate hardened and ground square ways with factory-adjusted gib. No further adjustment should normally be required to the gib setting. See page 12 for gib setting procedures

HYDRAULIC POWER SUPPLY

For series UT-2, 3.5, 4.5, 6 & 7:

- a) 5 U.S. gallon capacity reservoir.
- b) 1.5 U.S. g.p.m. pump.
- c) 1/2 h.p., 110 volt, single phase electric motor.
- d) Operating pressure 175 - 200 p.s.i.; UT-2 only.
225 - 250 p.s.i.; UT-3.5 to UT-7.
(220-440-550 volt, three-phase electric motor on request)

For series UT-9 & UT-11:

- a) 18 U.S. gallon capacity reservoir.
- b) 8 U.S. g.p.m. pump.
- c) 2 h.p., 220-440-550 volt, three-phase electric motor.
- d) Operating pressure 250 - 275 p.s.i.

All hydraulic power units are equipped with 10 micron filtration.

The oil level should always be visible in the center of the sight glass, located on the side of the hydraulic reservoir.

KEEP YOUR HYDRAULIC SYSTEM CLEAN

HYDRAULIC OIL

Sunvis 747 is the hydraulic oil recommended by MIMIK. It is a detergent-dispersant type of oil with rust oxidation and anti-wear inhibitors having a viscosity of 200 SSU at 100°F.

If not available, other makes having the above characteristics may be used.

VALVE ADJUSTMENT SLIDE

The tracer valve is attached to an X-Y co-ordinate slide with large, easily read graduated dials to allow valve adjustments in .0005" increments (.001" on some models). Dial permits zero reset.

On turret lathe installations, the template mounting attachment is equipped with the X-Y adjustment slide described below.

TEMPLATE BRACKETRY

Three types of template bracketry are available:

- 1) A universal template bracket is supplied for front-mounted tracers. It is designed to clamp on the front V-way of the lathe bed, enabling the operator to raise and lower the template or rotate it for facing operations.
- 2) A bed-mounted template bracket is supplied for rear-mounted tracers. It provides adjustable positioning of flat templates for both turning and facing, and can be fitted with round master holders as an option.
- 3) A headstock-mounted template bracket is used on most turret lathe installations. Whenever possible, the lathe's pilot bar mounting area is utilized.

TOOLHOLDERS

Standard toolposts, such as Enco, Aloris, KDK, etc., can be used. A threaded bore in the center of the tracer slide tool platform accepts the toolpost stud.

REVERSING VALVE (Optional)

The reversing valve supplied as an optional control selects the direction of the tracer valve.

Normally, the direction of seek is forward. When tracing intricate contours on the I.D. of a workpiece, it is often necessary to trace in a reverse direction.

The reversing valve may be used to lock the slide in any desired position for setting up purposes by setting it to neutral.

CAUTION:

Direction of seek must not be changed while tool is near workpiece, or while stylus is at rest on the template.

II. INSTALLATION

To obtain correct and lasting operation, read complete instructions before attempting installation.

STEP 1 - Supply Tank

- a) Assemble one end of hydraulic hose fittings to tank. Assemble pressure gauge and tighten all Tru-seals.
- b) Fill tank to center of sight glass with hydraulic oil (Sunvis 747).
- c) With open end of hoses exhausting into tank, start pump. Make sure electric motor is running in proper direction (i.e.: oil flow from pressure line).
NOTE: Do not run pump in reverse rotation.
- d) Allow hydraulic supply tank to run with oil discharging to the tank while completing installation to Step 4.

STEP 2 - Front Mounting

- a) Remove lathe compound from cross-slide.
- b) Check the tracer mounting adapter spigot for fit to the cross-slide. Make sure mounting surface is free of dirt and burrs. If necessary, stone flat.
- c) Assemble spigot to bottom face of tracer mounting adapter. Check spigot & adapter mounting screws for proper length. **NOTE:** Do not bottom screws.
- d) Mount the tracer in its place, swivel to desired angle and clamp firmly in place using the existing compound T-bolts.

STEP 2 - Rear Mounting

- a) Remove any lathe accessories from rear of cross-slide and make sure surface is clean and flat.
- b) Mount adapter plate to cross-slide T-slots, or to dovetailed edges if applicable. If cross-slide is plain type, drill and tap mounting holes and bolt adapter down. If adapter is 2-piece, mount lower plate to lathe and upper plate to tracer slide, first assembling spigot to bottom of tracer slide to project into hole in lower adapter plate.
NOTE: Do not bottom screw into tracer slide.
- c) Mount tracer in place, swivel to desired angle, and secure to lower adapter plate.

STEP 3 - Install Tracer Valve - See Appendix

Assemble tracer valve and valve adjustment slide to the pivoting valve arm.

STEP 4

- a) Connect pressure, return and drain hoses to the tracer valve fittings where marked "P", "R" & "D" respectively. Lock all Tru-seals.
- b) Connect the two short hoses to opposite sides of the tracer valve where marked "A" & "B", leaving other end open to tank or clean container.
- c) Start tank motor, flush alternately through the two short hoses (one or two minutes) by moving the retract control lever of the tracer valve up and down.
- d) Stop tank and connect hoses to reversing valve where marked "A" & "B" (or to cylinder at "A" & "B"). Lock all Tru-seals.

NOTE - Re-check all previous steps!

STEP 5 (This step is not required on UT-3.5 through UT-7)

- a) Adjust tapered gib. - See page 12 for Gib Setting Procedures.

STEP 6 - Toolpost Installation

- a) Install toolpost and tighten mounting screws.
- b) Note whether tightening of the toolpost affects the smooth movement of the tracer slide at slow infeed rate. If so, toolpost is distorting slide - check mounting surfaces for flatness.

NOTE: Do not over-tighten. Tracer slide may be distorted.

STEP 7 - Set Pump Pressure (See page 3 for correct setting)

- a) Pump pressure should be set with tracer slide fully retracted.
- b) Cycle unit back and forth through the full stroke ten times to purge air from system.

STEP 8 - Template Bracket Installation

- a) Mount template bracket on front V-ways, rear of bed or turret lathe headstock. Set to desired location and clamp in place.

STEP 9 - Re-Check Installation

- a) The tracer is now ready to operate.
- b) Before attempting to produce parts, familiarize yourself with the operation of the tracer and its controls.

The customer must provide the following items for initial installation:

1. Electric wiring to the electrical box on the supply unit (for 3 phase electrics only).
2. Necessary tooling and templates.

If installation is to be done by a MIMIK serviceman, these items should be ready when he arrives.

III. SET-UP FOR CUTTING

INSTRUCTIONS

- a) Position tracer slide to most suitable angle to produce contour.

Wherever possible, slide angle should bisect minimum contained angle of contour.

For straight diameter work with 90° shoulders, slide angle should be 45° or 60°.

- b) Clamp tool in toolpost with cutting point exactly on center.

Included angle of tool point must be less than minimum contained angle of part contour. Tool geometry must suit all part contours. Check tool against template to be certain.

- c) Back off cross-slide until tool almost contacts finished workpiece diameter at starting end.

- d) Insert stylus in collet on tracer valve.

- e) Swing valve arm and set template along rail until stylus contacts template in approximately the same relative position as tool to workpiece. Clamp template in place. Adjust rail and indicate template for parallelism.

Make sure valve adjustment slides are square to lathe bed, (eye alignment adequate) and stylus is contacting template.

- f) Adjust tool-to-workpiece and stylus-to-template relationship using valve adjustment slides. If the tracer slide is set at an angle, some lengthwise adjustment will be necessary to keep the stylus on the desired point.

- g) All components are now in position for the finish-cut tracing pass. If stock removal is slight, and fairly uniform over the full contour, one tracing pass may be adequate. For heavier stock removal see notes below re: rough and finish tracing.

When first tracing a new part, watch arrows on tracer slide indicating stroke limits. If limit is reached before covering full contour re-position cross-slide to regain stroke.

Facing operations are performed in the same manner except cross-slide feed is used instead of carriage.

ROUGH AND FINISH CUTTING

Method 1 - Normally used when parts are produced from bar stock and require more than two rough cuts. With tracer slide advanced fully forward, position cross-slide for each rough cut at desired depth. Stylus contact with template will increase on each pass. When it engages full contour, further cross-slide movement will not affect tool position. Re-set tracer adjustment slides to take finish cut. Return both cross-slide and adjustment slides to original position for next part.

Method 2 - More suitable for parts produced from castings or forgings, where stock removal is uniform over contour, as tracer follows full contour on each pass. Set tool position for each pass, including finish cut, using tracer adjustment slides only.

Method 3 - Most practical for high volume parts produced in repeat runs. Use hinged or pinned overlays on finish-size template for rough cuts, and follow final template for finish cut. No operator settings are needed once the correct finish cut position has been established.

Method 4 - Provides uniform tool adjustment where tool is cutting around full nose radius (eg.: cutting a sphere with a button tool). Use removable stylus bushings of different diameters for rough cuts, and basic (round cross-section) stylus for finish cut. No operator settings are needed once correct stylus diameter for finish size is established.

NOTE: Where heavy stock removal causes excessive tool wear, separate tools for roughing and finishing are recommended. The finish tool can be pre-set to eliminate manual adjustment for finish size.

THREADING

A feature often overlooked is the ability to use the MIMIK tracer slide for threading.

With the tracer slide set to the desired angle (normally $29\frac{1}{2}^{\circ}$), infeed to preset depth using a straight template.

When desired length of thread has been cut, the tracer valve stylus contacts a 90° shoulder on the preset template. This causes the cutting tool to retract instantly, clearing shoulders, larger diameters, etc.

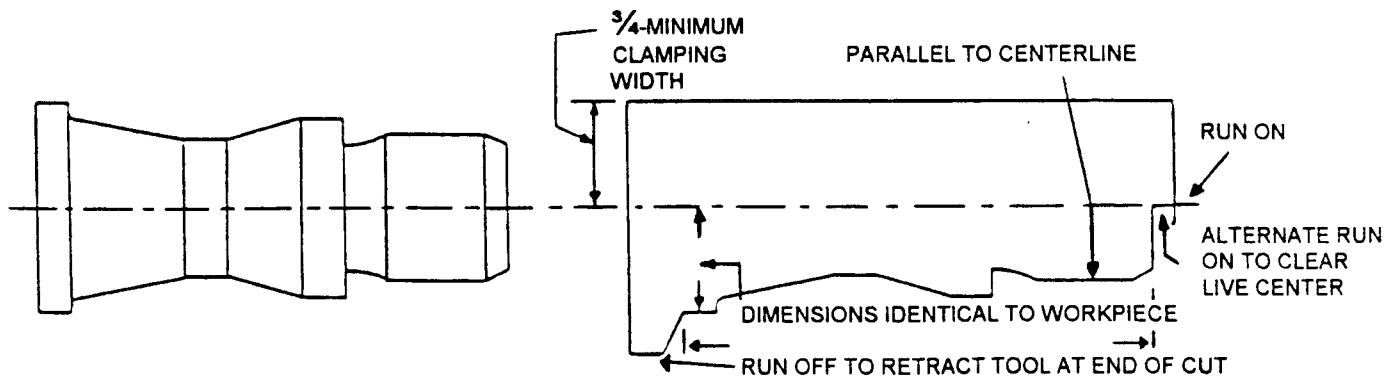
Carriage and cutting tool are then repositioned, using the cross-axis adjustment slide for each successive cut.

HOW TO MAKE A TEMPLATE

The choice of template material and method of production depends on such things as accuracy required, number of parts to be traced, future repeat runs, size of part, equipment available, etc.

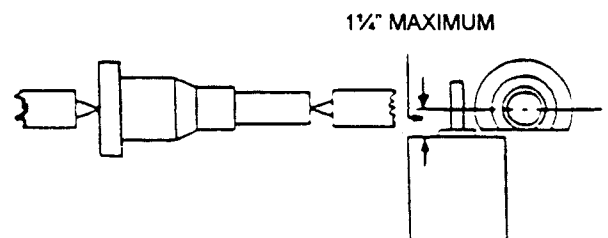
Regardless of material or method, all templates should have these common features:

- Contour must be an exact duplicate of the desired finished shape within less than half the drawing tolerance required on diameters.
- Both ends should have a run-off to guide the tool on and off the work.
- Both the rear edge and a portion of the profiled edge should be parallel or normal to the workpiece center line. These act as a dimensional reference, and provide a means of checking parallelism.
- The rear portion of the template should be wide enough to allow rigid clamping.



Sawing and filing to layout lines is often acceptable, although milling, grinding or polishing may be needed in some cases. The contoured edge should be square to the surface, and must be free of nicks and burrs. Remember that an error in template dimensions can be doubled when tracing a diameter!

Small turned parts can also be used as tracing masters. If made expressly for this purpose, a run-off should be provided at both ends. Round master holders can be supplied as an optional extra.



IV. MAINTENANCE

CARE AND MAINTENANCE

Unlike other machine slides, the tracer slide must accept the stresses of varying cutting loads while constantly changing its rate and direction of movement. To ensure high accuracy under these conditions, all MIMIK slide ways are fitted to close tolerances and are equipped with special lubrication systems.

The performance of your tracer depends on good maintenance, as outlined below:

- a) Keep the tapered gib properly adjusted. See below for special note on UT-3.5-UT-7 tracer.
- b) Provide an adequate supply of way lubrication. Use Sunoco Way-Lube # 90.
- c) Prevent the entry of foreign particles, since they can cause undue wear or scored ways. Make sure the way wipers are installed properly.
- d) Avoid uneven mounting of tracer slide and toolholders. Both can cause slide distortion. Do not clamp cutting tool directly to unit, use toolholder or proper mounting base.
- e) Keep hydraulic oil clean. Replace hydraulic oil and filter every 6 months (1000 hours).
- f) Do not over-tighten fittings. Turn them in finger-tight. Use wrench to lock Tru-seals.
- g) Actuate the stylus several times when starting the tracer. Avoid long idle periods which allow oil to gum up inside the valve. This may cause the spool to hang up, in which case the tracer will not feed toward the template or will continue to retract after leaving the template.

See Page 16 for corrective action.

SPECIAL NOTE RE: TAPERED GIB - Square way tracer slides only (UT-3.5, 4.5, 6 & 7)

The purpose of the tapered gib on these tracer slides is to facilitate assembly of the unit. Gib tightness is properly set at the factory and should not need adjustment during normal use. The gib is not intended as a means of compensating for wear, since it only provides horizontal adjustment, while slide wear can occur both horizontally and vertically.

If the slide way surfaces become excessively worn after several years of use, they should be re-ground to a precise fit and we recommend that this be done at the factory. The tapered gib should not need adjustment during this period, but if is re-set for any reason the following procedure should be used:

1. Remove hose fittings from tracer slide.
2. Loosen gib adjustment screw at front left of tracer slide.
3. Move slide by hand back and forth over full stroke to remove oil from cylinder. (Use clean receptacle to collect oil)
4. Carefully tighten gib adjustment screw as slide is moved back and forth until resistance due to gib tightness can be felt. Slide should still move freely and smoothly over full stroke but gib must be tight enough to prevent any sideways movement.
5. After re-connecting hoses, run tracer slide full stroke under power several times to remove air from the system.

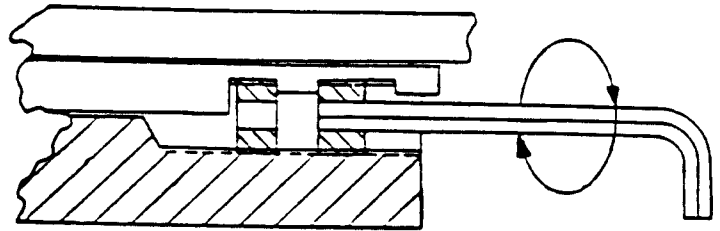
CAUTION - The above setting is not equivalent to the 50 p.s.i. setting used on dovetail-way slides (UT-2, 9 & 11). A 50 p.s.i. setting would result in an over-tight fit, which could cause galling or slide seizure.

GIB SETTING PROCEDURE -Dovetail way tracer slides only (UT-2, 9, 11 & older models)

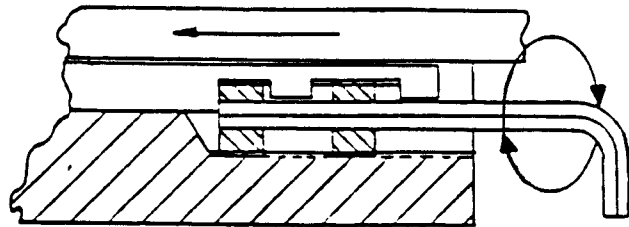
A double screw arrangement is used for positive adjustment and to lock gib firmly in position once the correct setting has been reached. A standard Allen wrench is needed to make this adjustment. Set pump pressure with tracer slide fully retracted. Adjustment must be made with tracer in forward seek.

- a) Set pump to 50 p.s.i.
- b) Open slow feed knob wide counter clockwise.

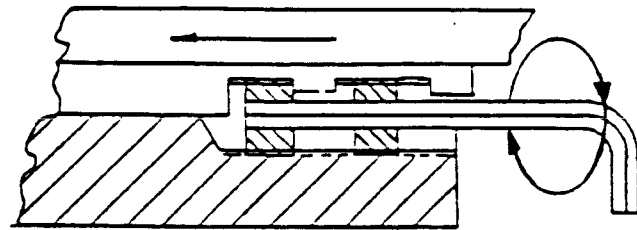
- c) Unlock Gib - Loosen outer screw $\frac{1}{4}$ turn then pass wrench through to inner screw & turn both screws counter clockwise to move gib toward rear of tracer.



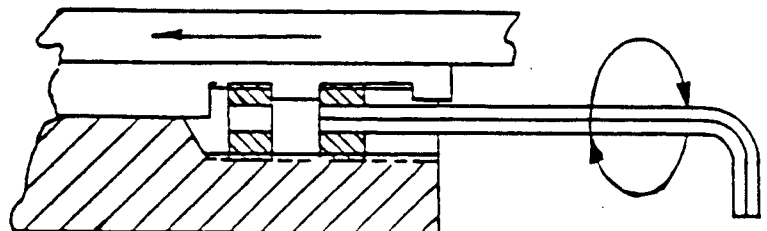
- d) Tighten Gib - Pass key through outer screw into inner screw. Tighten inner screw until slide movement stops.



- e) Loosen Gib - Loosen inner screw until slide will just creep with 50 psi on pump.



- f) Lock Gib - Lock outer screw against gib lug.



CAUTION: Do not overtighten.
Tracer slide must still creep
under 50 psi hydraulic pressure.

INFEED RATE SETTING ON TRACER VALVE

If the normal range of infeed cannot be obtained through "slow feed knob" rotation, the eccentric tapered pin may be out of position. To reset, proceed exactly as follows:

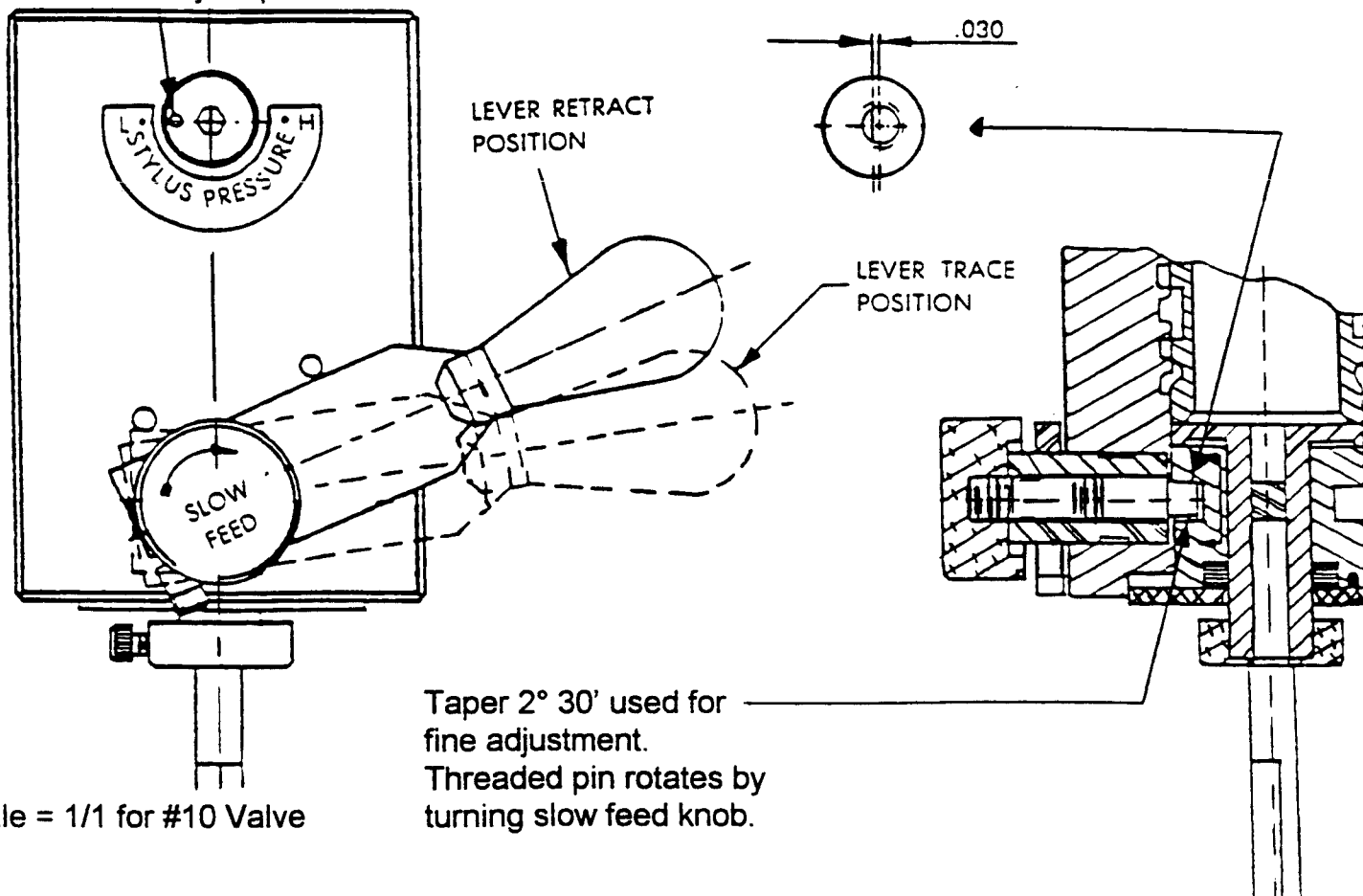
Before making any adjustments, be sure hoses are connected correctly.

- Turn slow feed knob fully in (clockwise).
- Loosen retract lever clamping screw and turn slow feed knob further clockwise. Continue turning until tracer slide begins feeding toward template. (It is possible for slide to retract before infeed stroke begins.)
- With retract lever in trace position, tighten clamping screw. Move retract lever slowly toward retract position until tracer slide just begins to retract.
- Hold slow feed knob, loosen clamp screw and return retract lever to trace position. Tighten clamping screw.
- Turn slow feed knob counter clockwise to obtain desired infeed rate.

Proper infeed rate adjustment automatically puts retract - trace mechanism into proper relationship.

Stylus Pressure Adjustment Pin.
Turn counter clockwise to increase stylus pressure.

Eccentric used for coarse adjustment.
Sleeve and threaded pin rotate with retract lever movement.



MIMIK TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDIES
1. <u>VIBRATION</u> Occurring When Stylus Feeds Into Template Or Meets Profile Change.	a) Infeed rate too high	Reduce by adjusting infeed rate knob. See Page 2 (a).
	b) Air in hydraulic system	Check slide full stroke. Check for leakage at valve & tank fittings. Check for adequate oil in reservoir.
	c) Hydraulic pressure is too high	Reduce for proper setting. See Page 3(d). Check for broken pressure gauge.
	d) Stylus pressure too high or too low	Adjust. See Page 2 (c).
	e) Mechanical looseness	Check mounting bolts, cross-slide, tool-holder, template bracket & tool insert for tightness. Check tracer gib adjustment and piston rod connection.
	f) Lathe vibration	Eliminate by balancing or leveling.
2. <u>SURFACE FINISH</u>	a) Vibration in tracer system	See Section 1 above.
	b) Template contour not smooth	File, grind or polish.
	c) Valve hang-up	See Page 16.
	d) Air in hydraulic system	See Section 1 (b) above.
	e) Mechanical looseness	See Section 1 (e) above.
	f) Uneven tracer movement	Reduce hydraulic pressure to 50 p.s.i. and check for uniform movement. Check for distortion & lubrication. If tracing small taper, increase slide angle to provide faster tracer slide movement.
	g) Excessive stylus pressure	Reduce.
	h) Incorrect tool geometry	Check for adequate clearance and correct rake & relief angle.

2. SURFACE FINISH PROBLEMS
continued....

i) Looseness or vibration in lathe

Check for spindle run out, loose carriage or cross-slide. Take straight cut with tracer in full forward or retract position and inspect for similar marks.

3. PART-TO-PART VARIATIONS

a) Varying cutting load

Provide uniform allowance for finish cut over entire contour.

b) Excessive tool wear

Use throw-away carbide inserts. Use separate tool for finish cut. Check proper speed and feed.

c) Operator errors

Use preset tools, turret stop, overlay templates, etc. Eliminate operator settings.

d) Mechanical looseness

See Section 1 (e) Page 14 + 2 (i) above.

e) Valve hang-up

See Page 16.

f) Uneven tracer slide movement

See Section 2 (f) Page 14.

g) Air in hydraulic system

See Section 1 (b) Page 14.

h) Excessive variation in oil temperature

Let oil warm up before tracing. Cycle slide frequently. Install oil temperature control. Contact MIMIK for details.

4. TEMPLATE-TO-PART VARIATIONS

a) Tool not on center

Adjust cutting point to exact center height.

b) Template not aligned in horizontal zone

Adjust template using a dial indicator.

c) Variation in cutting load over length of part

See Section 3 (a) above.

d) Incorrect tool-stylus relationship

Stylus-tool to have same profile and proper alignment. See Page 2.

e) Incorrect tool geometry

See Section 2 (h) Page 14.

f) Incorrect tracer slide angle

Reset slide to ensure full contour coverage.

g) Excessive stylus deflection

Reduce infeed rate to approximately 10-20 i.p.m.

- | | | |
|--|---|--|
| 4. <u>TEMPLATE-TO-PART VARIATIONS</u>
continued.... | h) Mechanical looseness

i) Valve hang-up

j) Uneven tracer slide movement

k) Excessive machine feed or insufficient tracer slide infeed | See Section 1 (e) Page 14.

See Section 6 Page 16.

See Section 2 (f) Page 14.

Reduce machine feed, increase tracer infeed or change slide angle so stylus will follow contour without floating off template or over-deflecting. |
| 5. <u>SLIDE HANG-UP</u>
Slide Will Not Feed Forward With Valve Set To Infeed & Stylus Off Template Or Slide Continues To Retract When Stylus Meets A Reduced Slope. | a) Incorrect feed setting

b) Slide at end of stroke

c) Hose lines installed incorrectly

d) No oil flow from pump

e) Slide hang-up

f) Valve hang-up | Adjust feed to desired rate.

Reposition cross-slide to regain stroke.

Connect hoses properly.

Check for loose motor-to-pump coupling, burnt out motor, broken fittings inside tank, faulty relief valve or plugged filter.

See Section 2 (f) Page 14.

See Section 6 - below. |
| 6. <u>VALVE HANG-UP</u> | a) Insufficient stylus pressure

b) Dirt or gummy oil deposits in valve

c) Distortion from over-tight fittings

d) Air lock in valve

e) Incorrect hydraulic oil | Increase stylus pressure and actuate stylus by hand. If tracer does not begin to infeed immediately, hang-up may be due to dirt.

Drain tank, flush complete system and replace hydraulic oil & filter. Run tank until oil warms up. Actuate stylus by hand until smooth stylus action and positive spool return are obtained.

Back off Tru-Seals, make sure fittings are just finger tight. Snug up Tru-Seals gently.

Cycle tracer slide full stroke several times by activating stylus.

Change to Sunvis 747. |