MIMIK

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FOR SERVICE OR PARTS CONTACT

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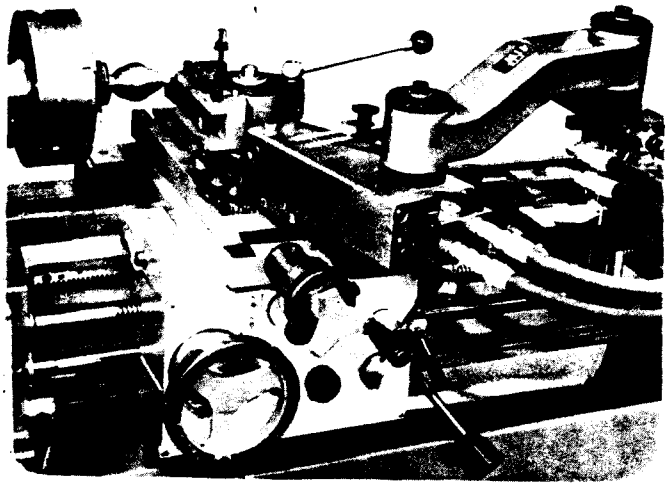

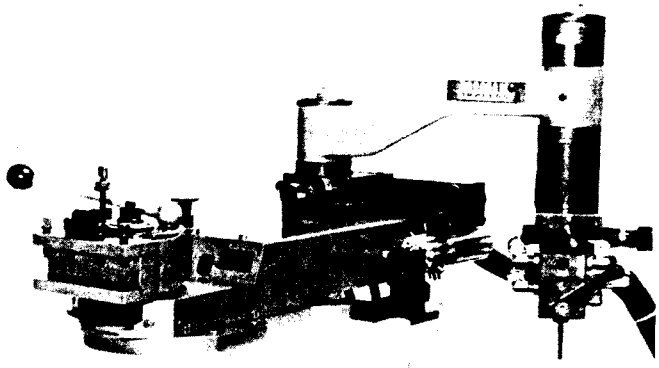

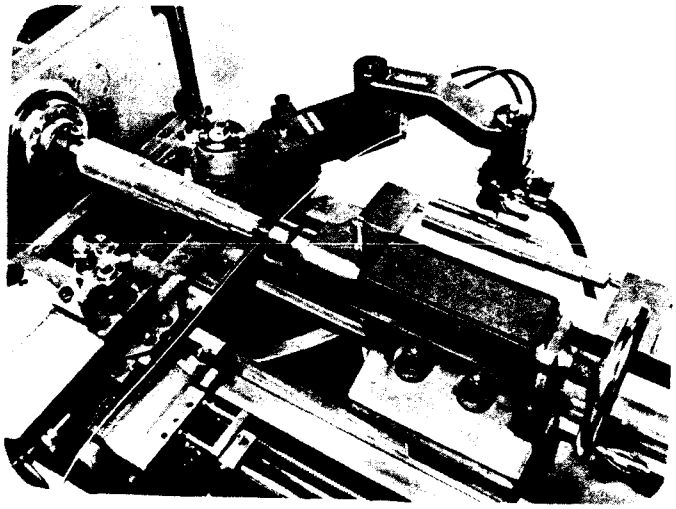

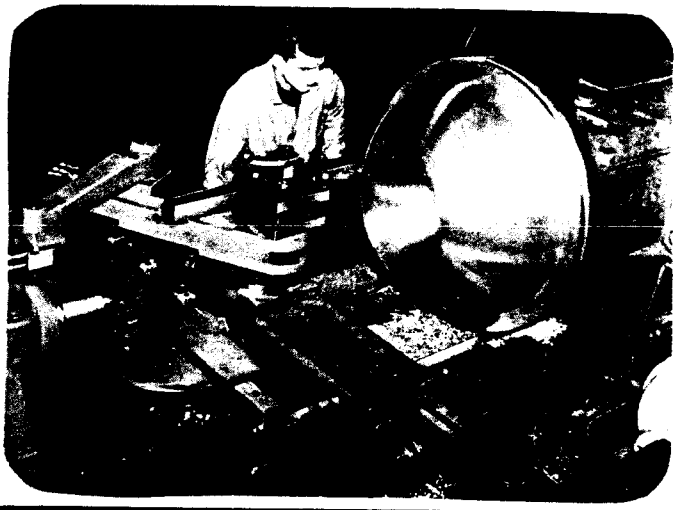

SERIES UT UNIVERSAL TRACERS

INSTALLATION & OPERATION MANUAL

MIMIK SERIES UT TRACERS

INDEX

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 ½°), 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.

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HOW TO MAKE A TEMPLATE

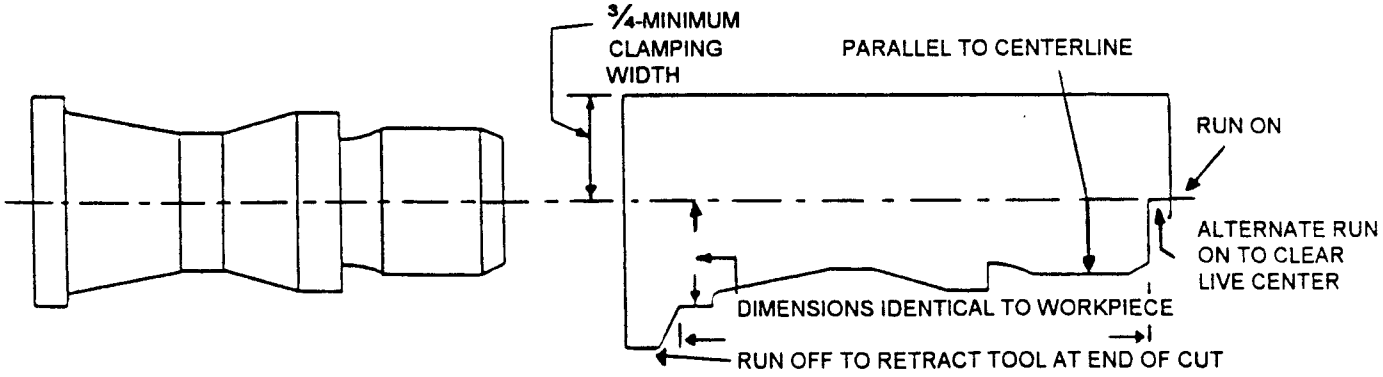
The choice of template material and method of production depends on such things as accuracy required, number of parts to be traced, future repeat runs, size of part, equipment available, etc.
Regardless of material or method, all templates should have these common features:

a) Contour must be an exact duplicate of the desired finished shape within less than half the drawing tolerance required on diameters.

b) Both ends should have a run-off to guide the tool on and off the work.

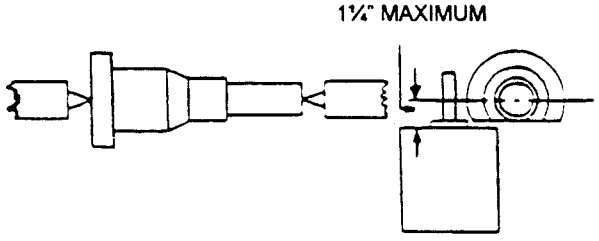
c) Both the rear edge and a portion of the profiled edge should be parallel or normal to the workpiece center line. These act as a dimensional reference, and provide a means of checking parallelism.

d) 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 in 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.

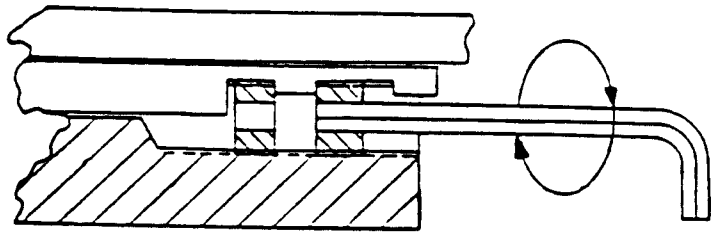
GIB SETTING PROCEDURE -Dovetail way tracer slides only (UT-2, 9, 11 & older models)

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.

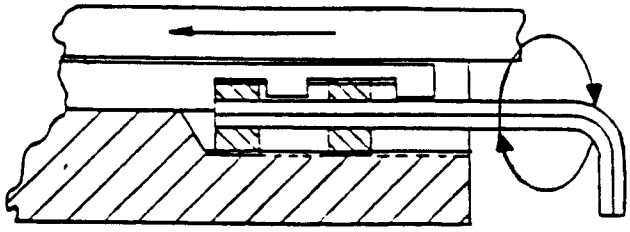
a) Set pump to 50 p.s.i.

b) Open slow feed knob wide counter clockwise.

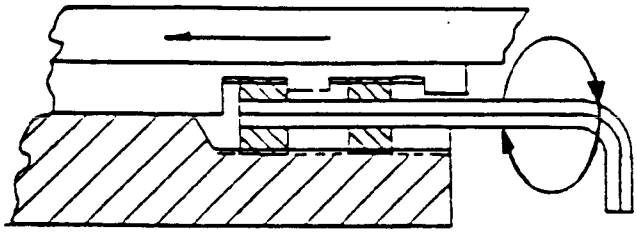
c) Unlock Gib - Loosen outer screw ¼ turn then pass wrench through to inner screw & turn both screws counter clockwise to move gib toward rear of tracer.



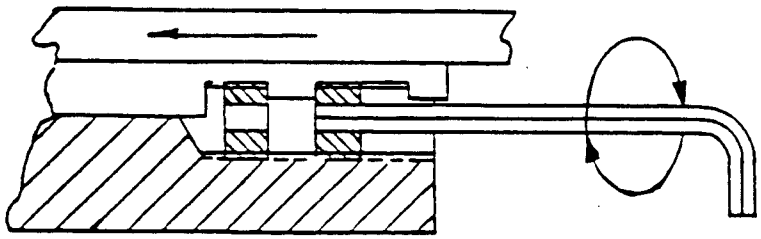
d) Tighten Gib - Pass key through outer screw into inner screw. Tighten inner screw until slide movement stops.



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.

a) Turn slow feed knob fully in (clockwise).

b) 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.)

c) With retract lever in trace position, tighten clamping screw. Move retract lever slowly toward retract position until tracer slide just begins to retract.

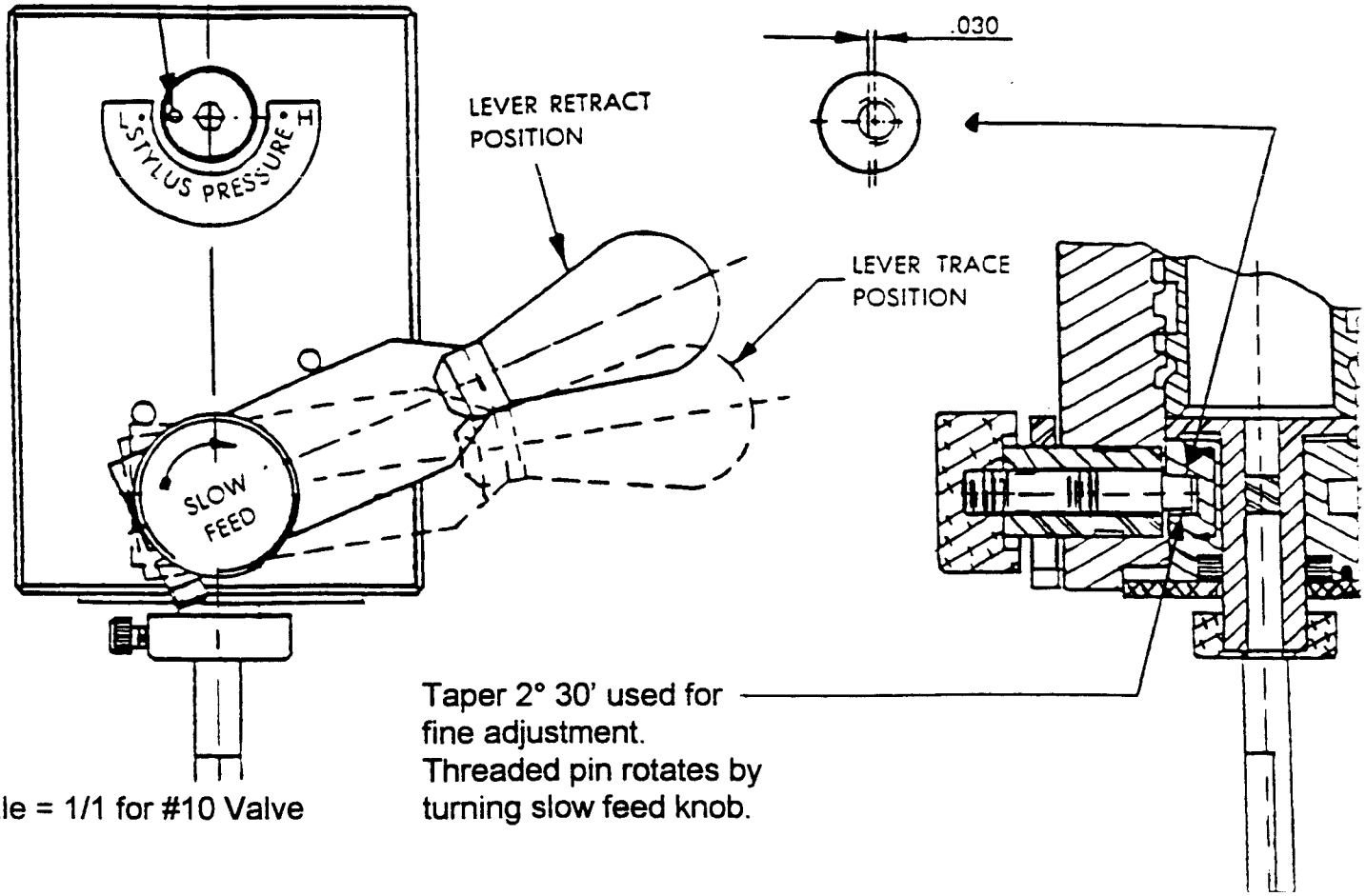
d) Hold slow feed knob, loosen clamp screw and return retract lever to trace position. Tighten clamping screw.

e) 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.



Scale = 1/1 for #10 Valve

V

MIMIK TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDIES
1. VIBRATION 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. SURFACE FINISH	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. TEMPLATE-TO-PART VARIATIONS continued....	h) Mechanical looseness	See Section 1 (e) Page 14.
	i) Valve hang-up	See Section 6 Page 16.
	j) Uneven tracer slide movement	See Section 2 (f) Page 14.
	k) Excessive machine feed or insufficient tracer slide infeed	Reduce machine feed, increase tracer infeed or change slide angle so stylus will follow contour without floating off template or over-deflecting.
5. SLIDE HANG-UP Slide Will Not Feed Forward With Valve Set To Infeed & Stylus Off TemplateOr Slide ContinuesTo Retract When Stylus Meets A Reduced Slope.	a) Incorrect feed setting	Adjust feed to desired rate.
	b) Slide at end of stroke	Reposition cross-slide to regain stroke.
	c) Hose lines installed incorrectly	Connect hoses properly.
	d) No oil flow from pump	Check for loose motor-to-pump coupling, burnt out motor, broken fittings inside tank, faulty relief valve or plugged filter.
	e) Slide hang-up ,	See Section 2 (f) Page 14.
	f) Valve hang-up	See Section 6 - below.
6. VALVE HANG-UP	a) Insufficient stylus pressure	Increase stylus pressure and actuate stylus by hand. If tracer does not begin to infeed immediately, hang-up may be due to dirt.
	b) Dirt or gummy oil deposits in valve	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.
	c) Distortion from over-tight fittings	Back off Tru-Seals, make sure fittings are just finger tight. Snug up Tru-Seals gently.
	d) Air lock in valve	Cycle tracer slide full stroke several times by activating stylus.
	e) Incorrect hydraulic oil	Change to Sunvis 747.

If the tracer valve continues to hang up,
Contact Rosebrook Tracers Inc

This valve is factory sealed.
Any attempt to dismantle the tracer valve
Can result in damage and will void it's guarantee

FOR SERVICE OR PARTS CONTACT

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Colorado Springs, CO 80907
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VI TIME STUDY PROCEDURE

To obtain maximum value from a time study, an operation should be broken down into elements of sufficient length. The following rules should be adhered to in dividing an operation into elements:

1) Constant elements to be separated from variable elements.

2) Handling elements to be isolated.

3) Machining time elements to be separated.

4) Elements to be as short as practical.

The machining time element, commonly referred to as the "Cutting" time, is a constant regardless of shop efficiency and can easily be calculated using the enclosed format illustrated as "Sample Study #1".

Before proceeding with any calculations, the following questions must be answered:

a) What is the workpiece material?
b) How must stock must be removed?
c) Portion of part to be traced?
d) How is the part fixtured?
e) What feeds and speeds are to be used?
f) What types of cutting tool is to be used?
g) Finish and accuracy requirements?
h) How many pieces?

Based on these answers, you can now proceed to fill in your calculation sheet.

For better illustration, this is further explained in our Sample Study #1.

SAMPLE STUDY #1:

1. CUSTOMER NAME: M.S. Company PART NAME: Axle

2. WORKPIECE DRAWING #: Sample Study #1

3. WORKPIECE MATERIAL: AISI 1045

4. TYPE OF TOOLING: Carbide

5. WORKPIECE DIAMETER: 1.5 INCHES
   Since most tracing jobs involve multiple diameters, a mean diameter must be used in our calculation. In our sample part where the large diameter is 2.375" and the small diameter is .625"; the mean diameter is: $\frac{2.375 + .625}{2} = 1.5$"

SAMPLE STUDY #1 (continued...)

6. DEPTH OF CUT: .062 Inches

7. FEED PER REVOLUTION: .010 Inches

8. REQUIRED CUTTING SPEED (SFPM): 450
   SFPM depends on the above items 3, 4, 6 & 7.

9. SPINDLE RPM: 1150
   The spindle RPM can be calculated as follows:

$$\text{RPM} = \frac{\text{Cutting Speed}}{\text{Circumference of Part (feet)}}$$

10. LENGTH OF CUT: 6.5 Inches
    This is an approximate calculation but close enough for general use.

11. CUTTING TIME: .57 Minutes
    The cutting time can be calculated as follows:

$$\text{Cutting Time} = \frac{\text{Length of Cut}}{\text{RPM x Feed}}$$

REMEMBER: THIS IS NOT FLOOR-TO-FLOOR TIME!

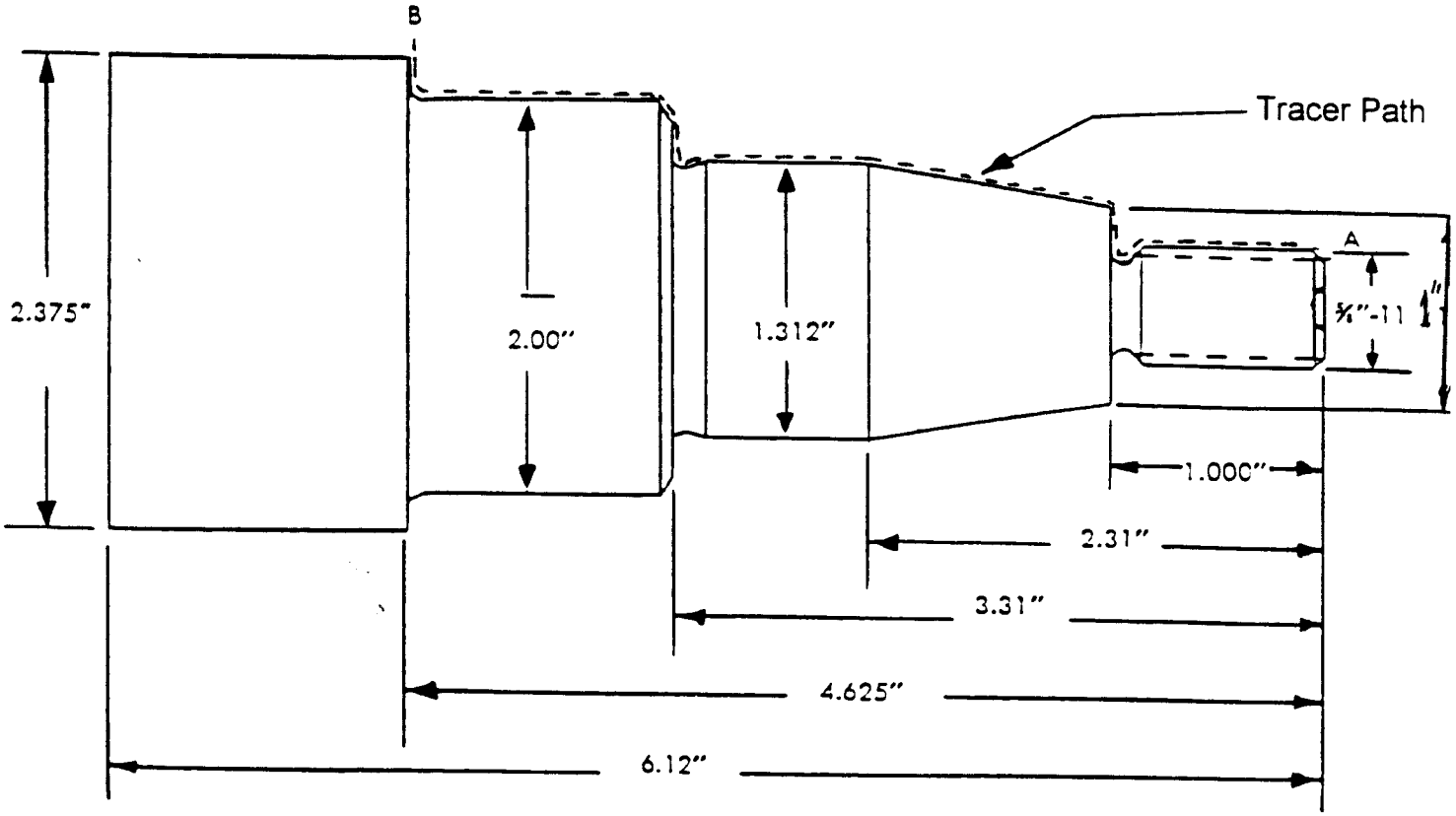
To calculate floor-to floor time add all other elements to the machining time.

NOTE: We have avoided calculating the undercut on this part since it would add very little to the total length and would be a rather involved procedure.

However, on part contours where undercuts, etc. are of major size, the exact length must be determined.

Surface finish is mainly a function of feed and nose radius on the cutting tool and their proper values should be suggested by the customer since he is more familiar with the job and his machine.

SAMPLE STUDY # 1



CUSTOMER: M.S. Company

PART NAME: Axle

PART #: Sample

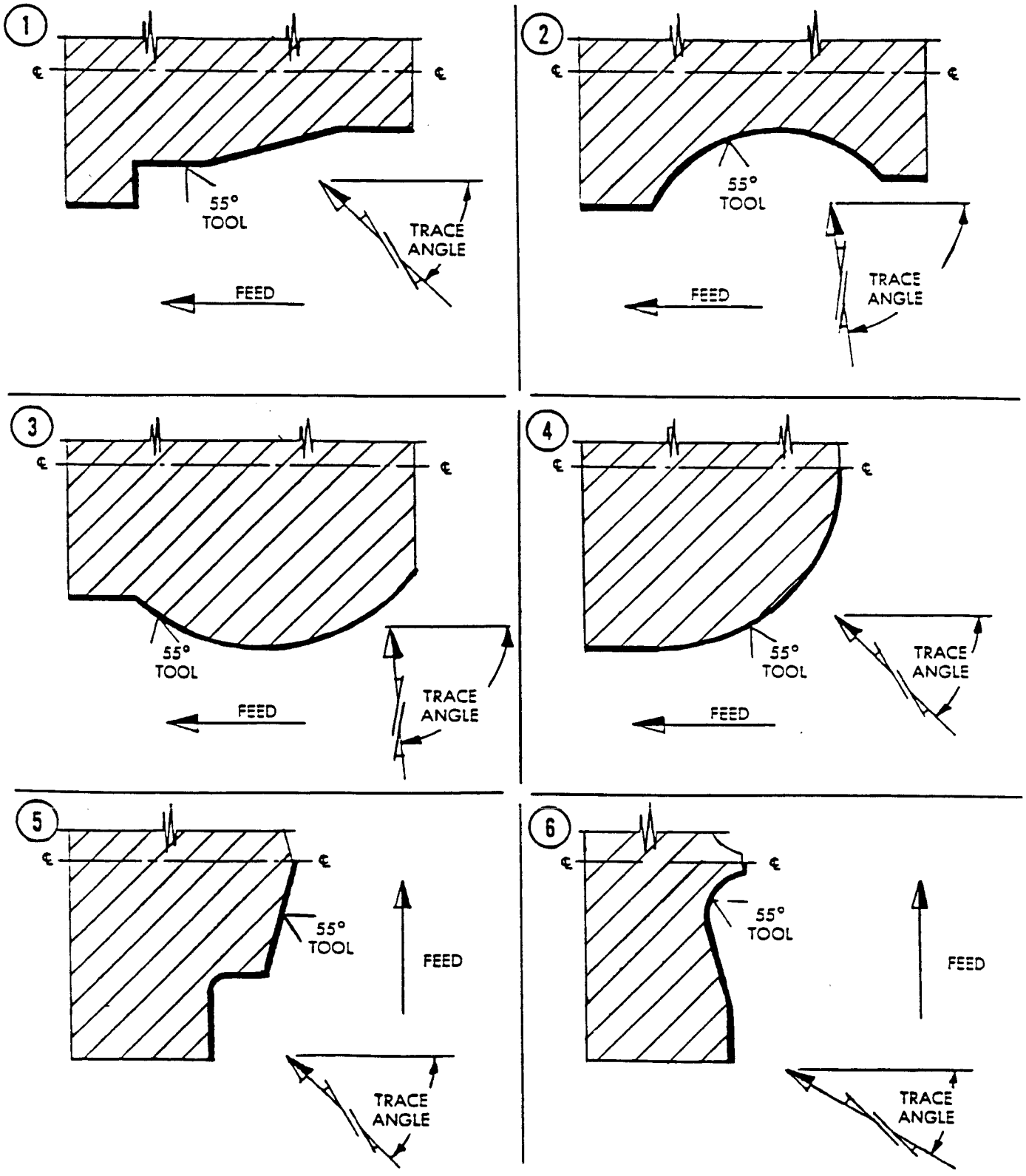
WORKPIECE MATERIAL: 1045 Forging

TYPE of TOOL: Carbide

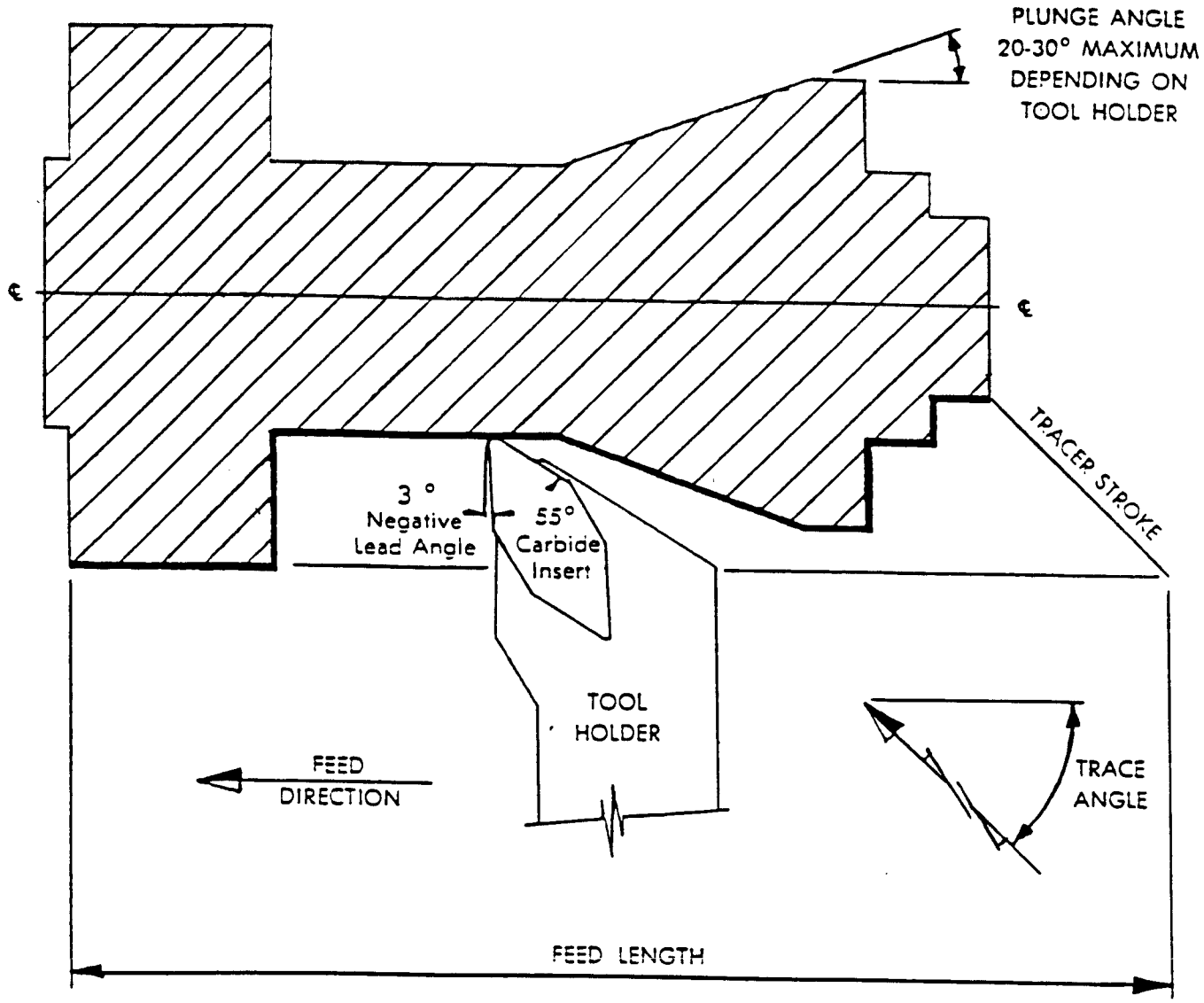
WORKPIECE DIAMETER: 1.5"

	ROUGH CUT	FINISH CUT
DEPTH OF CUT		.062"
FEED PER REVOLUTION		.010"
REQUIRED CUTTING SPEED		450
SPINDLE RPM		1150
LENGTH OF CUT		6.5"
CUTTING TIME		.57 Minutes

VII TRACING TIPS

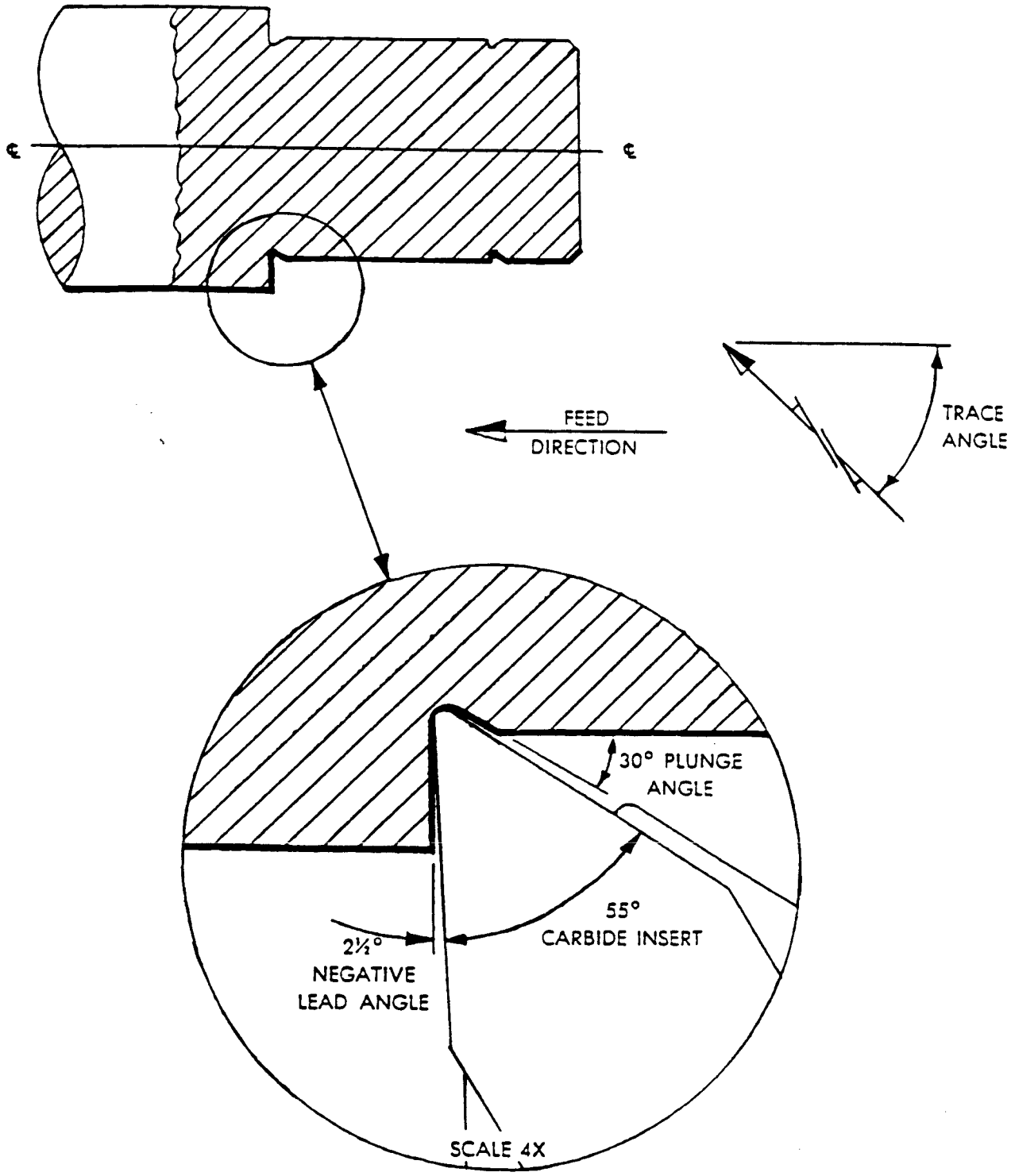


GENERALLY, THE TRACE ANGLE SHOULD BISECT THE SMALLEST CONTAINED ANGLE IN THE TRACE PATH.

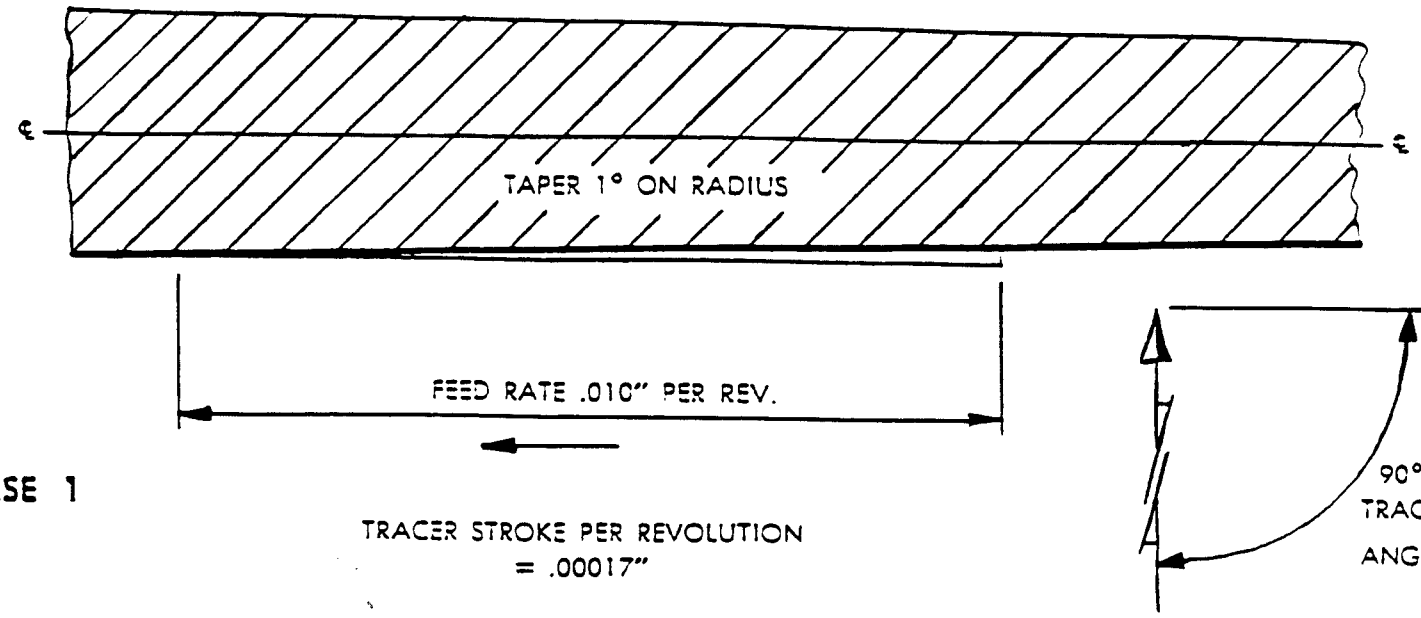


POINTS TO CONSIDER

1. Trace angle must be greater than plunge angle.
2. Back edge of tool & toolholder must clear plunge angle.
3. Maximum depth of cut on backfacing is .020 inch with 3° negative lead angle and 1/2" long side cutting edge.
4. Tool nose radius should be less than smallest radius in trace path.

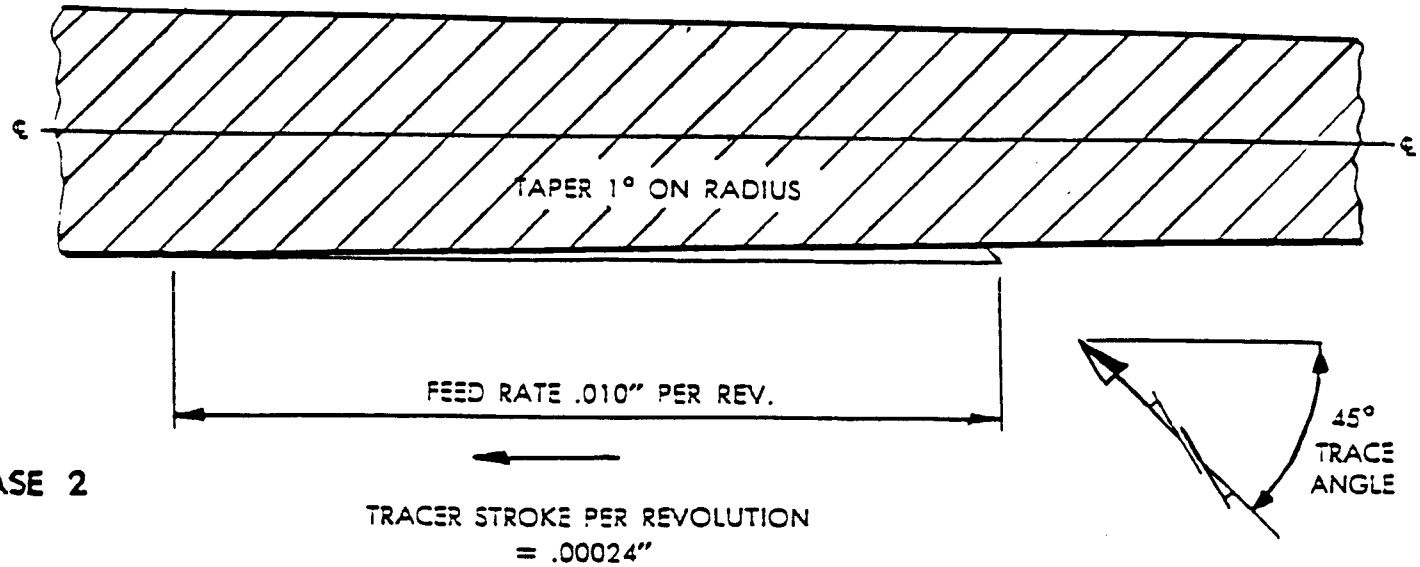


SUGGESTED METHOD FOR TRACING
UNDERCUTS IN SHAFTS



CASE 1

TRACER STROKE PER REVOLUTION
= .00017"



CASE 2

TRACER STROKE PER REVOLUTION
= .00024"

TRACE RATE INCREASED APPROX. 40%

METHOD OF INCREASING TRACE RATE BY ALTERING TRACE ANGLE IN ORDER TO MINIMIZE POSSIBILITY OF STICK-SLIP IN TRACER SLIDE

APPENDIX

MIMIK #10 AND #15 TRACER VALVES - INSTALLATION INSTRUCTIONS

The MIMIK tracer valve is a precision hydraulic valve that controls the amount and direction of oil flow. The following must be done when installing to ensure proper operation:

1. Make sure hydraulic oil is clean. Use Sunoco Sunvis 747 or equivalent. Change oil & filter and flush all hoses prior to installing the tracer valve.

2. If it is necessary to change or re-position the hose connectors at the valve;
   a) Use sealing nuts (with teflon inserts) on the connectors. Do not use teflon tape on fittings.
   b) When installing, put the sealing nut on the connector as far as it will go. Then screw connector into the valve finger tight at least 2½ turns.

   c) Tighten only sealing nut against valve body. Do not over tighten.

3. Connect hoses to valve connectors. Make sure they are connected as follows:
   a) Pressure line from tank to connect to "P" valve.
   b) Return line from tank to connect to "R" at valve.
   c) Connect drain line from tank to "D" at valve.
      NOTE: There are 2 "D" (drain) ports on the valve. Connect the drain hose to the lowest "D" port. Make sure the other "D" port in valve has vented brass plug in it.
   d) Connect lines from cylinder to "A" and "B" at valve. Turn on hydraulic tank to see if valve moves toward template with retract lever in infeed position. If it moves away, reverse cylinder "A" and "B" lines valve. If a reversing valve is in the circuit, make sure it is set in the forward position prior to doing this check.

4. Ensure that return line at tank is not coupled to any other line going to the tracer valve. Return oil must be able to flow directly into tank. If not, oil may leak out stylus end of valve during operation.

5. If pressure and return lines are reversed (in error) at the valve, or if the return line flow is restricted, oil will leak out of the stylus end of the valve during operation.

6. The drain line from valve to tank cannot be kinked, or looped up above the tracer valve, or oil may leak out stylus end of valve.

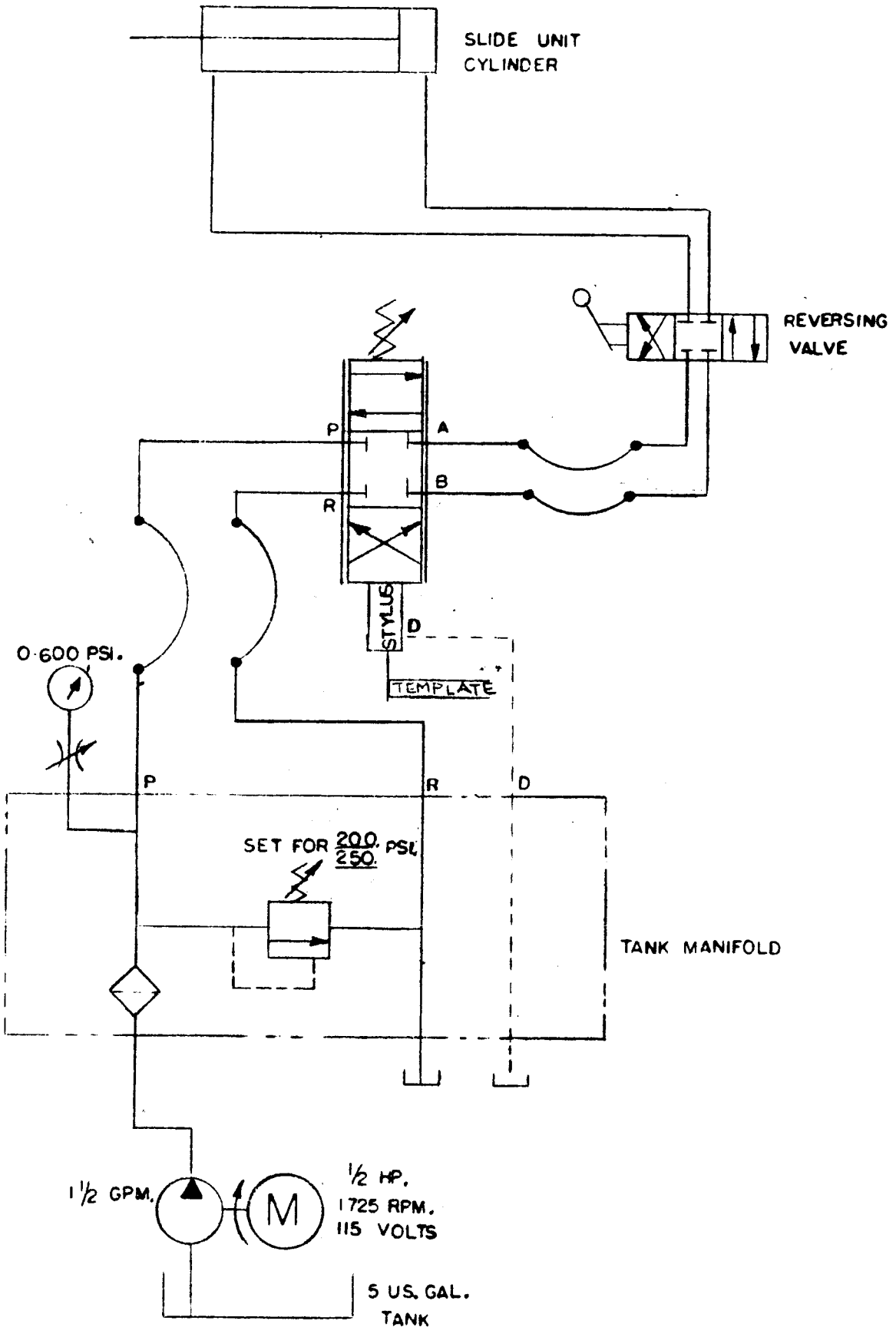
Change oil and filter at least annually to ensure trouble free operation.

If hoses are removed from valve for any reason, cap the hose ends and the hydraulic connectors on the valve to prevent dirt from entering.

SUPPLY UNIT #	MIMIK SYSTEM	FILTER MAKE & PART #	Suction Line	Press Line	EQUIVALENT MAKES					
					AC	BALDWIN	FRAM	PUROLATOR	WESTERN	WIX
D-2109•	3-Axis System	Kralinator # L-932-A	X		PF-132 PF-132 X	P-20 P-20-HD	CH-33-PL C-1652-PL	EP-78 P-130	P-157 P-232	PC-93-P CW-136-MP
D-2009• D-2015• D-2202	4000,6000,7000 UT-2, 3.5,4.5, 6&7 PT3.5,4.5,9000/3 & 8000	Bendix Element 038071-00-40		X						
D-2012	360° Dynatrace	Kralinator # L-932-A	X		PF-132 PF-132 X	P-20 P-20-HD	CH-33-PL C-1652-PL	EP-78 P-130	P-157 P-232	PC-93-P CW-136-MP
	MINI 360°	Bendix El.038071-00-40		X						
D2-9D•	Datadrive	Bendix El.038497-45-5		X						
DHI-502D•	1000; 2000	UCC-Cart.UC-SE-1457	X							
D-1965• Refrigerated	3-Axis System	Kralinator # L-932-A	X		PF-132 PF-132 X	P-20 P-20-HD	CH-33-PL C-1652-PL	EP-78 P-130	P-157 P-232	PC-93-P CW-136-MP
D-1964C•	6000	Bendix 5B-62344-H-80		X						
D-1955• Refrigerated	360° Dynatrace	Bendix El.038071-00-40		X						
		Kralinator L-932-A	X		PF-132 PF-132 X	P-20 P-20-HD	CH-33-PL C-1652-PL	EP-78 P-130	P-157 P-232	PC-93-P CW-136-MP
D-1953• Refrigerated	180° Dynatrace	Kralinator L-932-A	X		PT-132 PF-132 X	P-20 P-20-HD	CH-33-PL C-1652-PL	EP-78 P-130	P-157 P-232	PC-93-P CW-136-M
D-1944• D-1964•	4000Q, 7000, 8000, 9000/3	Kralinator D-25	X		PF-5, HC-7, PF-7	B-2, V-2-A, BT-112	PH-5 PH-10	PER-5	W-6 P-553	PC-55-P
D-1943	UT-9&11,3000,180A, 4000K,PTA 3.5,4.5,6,PT6	Kralinator L-932-A	X		PT-132 PF-132-X	P-20 P-20-HD	CH-33-PL CH-1652-PL	EP-78 P-130	P157 P232	PC-93-P CW-136-MP
D-1818• D-1820•	4000, 8000, 9000/3	Kralinator L-22	X		PF-1 PF-2	V-1-F	PH-1 PH-3	PER-1	W-1 P-87	PC-15 PC-15-P

MIMIK IND. INC. STANDARDS BOOK OIL FILTER REPLACEMENT CHART SK-A-1400-20-10

• Obsolete Units


SLIDE UNIT
CYLINDER
REVERSING
VALVE
P
A
B
R
STYLUS
D
0-600 PSI.
TEMPLATE
P
R
D
SET FOR 200. / 250. PSI.
TANK MANIFOLD
1½ GPM.
M
½ HP.
1725 RPM.
115 VOLTS
5 US. GAL.
TANK

CN*574

ROSEBROOK TRACERS INC
3105 North Cascade #106
Colorado Springs, CO 80907
USA

TOLL FREE 800.265.3564
FAX 719.632.8894
rbtracer@rosebrooktracer.com

HYDRAULIC OIL

MIMIK recommends the use of detergent-dispersant hydraulic oil for use in all our tracing systems. The oil should also contain rust and oxidation inhibitors as well as anti-wear foam depressant additives. The viscosity index should be around 100 or higher. The viscosity of the oil at 100°F should be between 190 and 225 SSU for best performance. Using a lower viscosity oil may cause the tracing unit to vibrate upon infeeding into the template and cause more leakage in the pump and valves. If the above factors are taken into account, the oils of as low as 125 SSU at 100°F can be used.

The detergent oil is recommended to reduce the possibility of a film deposit building up on critically fitted components which in turn could cause malfunction of the valve. Normally the disadvantage of using a dispersant type of oil is that it allows water to mix with the oil but, in industrial tracer applications, this has not been found to be a problem.

Too much detergent in the oil (as in modern engine oils) can cause clogging of filters prematurely and is not recommended for that reason. We require an oil that meets U.S. military specifications MIL-L-2104B. The oil should not exceed the detergent level specified there.

Preferred Hydraulic Oils

1. Exxon - Fleet HDX 10W
2. Gulf - Gulf Lube Motor Oil #10
3. Sunoco - Sunvis 747

In general low detergent motor oils meeting MIL-L-2104B of SAE #10 grade.

Alternate Hydraulic Oils

These oils are of the non-detergent type.

1. Atlantic Richfield – DURO AW S-215
2. Castrol Hyspin AWS 46
3. Exxon Nuto H48
4. Gulf Harmony 48 AW
5. Mobil DTE 32
6. Shell Tellus 32
7. Texaco Rando oils HD 215