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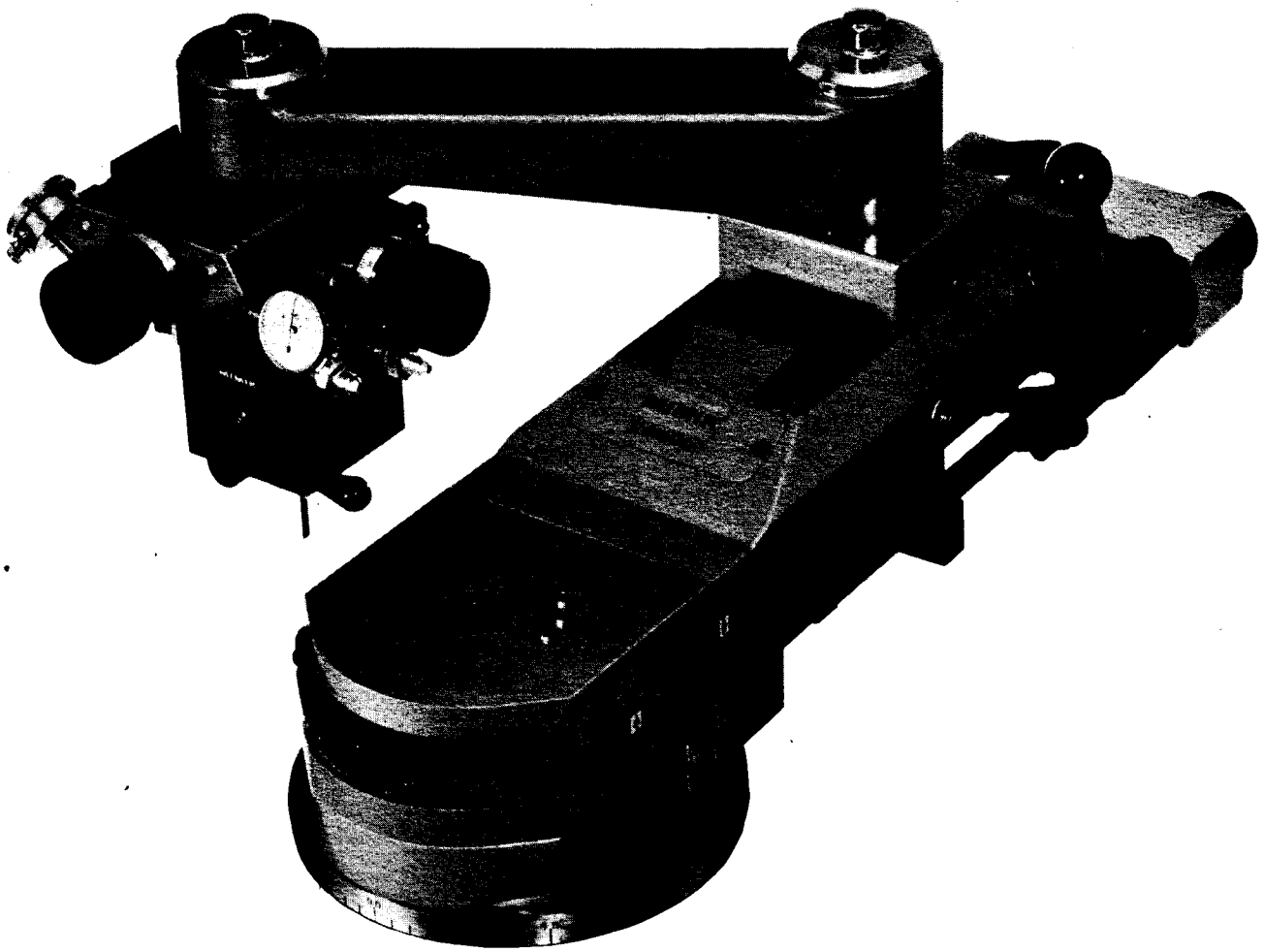

Series 8000 & 9000
Installation and Operation Manual

MIMIK SERIES 8000 and 9000

INSTALLATION and OPERATION INSTRUCTIONS

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MIMIK SERIES 8000 and 9000

INSTALLATION and OPERATOR INSTRUCTIONS

1. 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 carrier arm. 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
- Counterclockwise 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 ipm

b) Retract Control Lever

This three position control allows rapid advance towards the template, normal infeed for tracing, and rapid retract. The lever must be held in position for rapid advance. When released, it returns to normal feed.

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" counterclockwise 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.

NOTE: When the correct compensation has been determined, the major variables noted above which affect this type of error, must not be changed.

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.

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.

Check lubrication sight gauges at regular intervals and fill with Sunoco Way-Lube No. 90 to ensure adequate lubrication at all times.

HYDRAULIC POWER SUPPLY

For Series 8000 and 9000/3

a) 5 U.S. gallon capacity reservoir
b) .75 U.S. gpm pump
c) 1/3 hp, 110 volt single phase electric motor
d) Operating pressure 175 - 200 psi

For Series 9000/3-4-5-6 and 7

a) 5 U.S. gallon capacity reservoir
b) 1.5 U.S. gpm pump
c) 1/2 hp, 110 volt single phase electric motor
d) Operating pressure 225 - 250 psi

(220-440-550 volt three-phase electric motor on request)

For Series 9000/9 and 9000/11

a) 18 U.S. gallon capacity reservoir
b) 5 U.S. gpm pump
c) 1 1/2 hp, 220-440-550 volt three-phase electric motor
d) Operating pressure 250 - 275 psi

All hydraulic power units are equipped with 5 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 characteristic 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. Dials permit zero reset.

Dial indicators graduated in .0001" increments complete with mounting accessories are available. These items are optional equipment.

On turret lathe installations, the template mounting attachment is equipped with the x-y adjustment slide described above.

TEMPLATE BRACKETRY

Three types of template bracketry are available:-

1) A universal template bracket is supplied on standard equipment. 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) Across the bed brackets clamp on the front and rear ways of the lathe bed. This type is only supplied when the universal bracket cannot be used.

3) A headstock-mounted template bracket is used on most turret lathe installations. Whenever possible, the lathe's pilot bar mounting area is utilized.

4) On rear-mounted engine lathe installations, either headstock or rear-bed mounted brackets are used.

TOOLHOLDERS

Standard tool posts, 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

The reversing valve supplied with all Series 9000 tracers selects the direction of seek 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.

TURRET STOP

The manually operated six position turret stop allows multiple roughing cuts to be taken. The tracer slide moving forward contacts the pre-set stop causing the built-in control valve to shut off the oil flowing from the cylinder, providing a positive stop. Deflection of the tracer valve stylus will override the shut-off valve to allow retraction.

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. Check direction arrow on pump.

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 and 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.

REAR MOUNTING

a) Remove the rear toolpost (if machine is a turret lathe)

b) Check mounting surface for dirt and burrs.

c) Fasten bottom plate of special two piece adapter assembly on rear of cross-slide using the T-slots in the cross-slide.

d) Fasten upper plate of the two piece adapter to bottom

Rear Mounting Continued....

of tracer slide.

e) Mount tracer to bottom plate on cross-slide, swivel to desired angle and clamp.

CAUTION:- Mounting surfaces must be absolutely flat and clean. Uneveness will cause distortion and may result in scoring slide ways on the tracer slide.

STEP 3 - Install Tracer Valve

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

b) Make sure safety screw is installed in valve arm to prevent the tracer valve from being dropped accidentally.

STEP 4

a) Connect pressure, return and drain hoses to the tracer valve fittings where marked "P.R. and D" respectively. Lock all Tru-Seals.

b) Connect the two short hoses to opposite side of tracer valve where marked "A" and "B", leaving other end open to tank or clean container.

c) Start tank motor, flush alternatively 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" and "B" (or to cylinder at A and B)

Lock all Tru-Seals

NOTE: Re-check all previous steps.

STEP 5

a) Loosen tapered gib two full turns - See Page 15 - Gib Setting Procedure.

STEP 6 - Toolpost Installation

a) Install toolpost and tighten mounting screws.

Step 6 continued...

b) Note whether tightening of the toolpost affects the smooth movement of the tracer slide at 50 psi. If so, toolpost is distorting slide - Check mounting surfaces for flatness.

NOTE: Do not overtighten. Tracer slide may be distorted.

STEP 7 - Set Pump Pressure (See Page 4 for correct setting)

a) Pump pressure should be set with the tracer slide fully retracted.

b) Cycle unit back and forth through the full stroke ten times to purge air from the 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 - Recheck 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.

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°.

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 so tool clears largest workpiece diameter with tracer slide fully forward.

Advance cross-slide until tool almost contacts workpiece diameter at starting end.

d) Insert stylus in stylus 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.

Set-Up for Cutting continued....

g) Back off tool by turning the transverse valve slide knob counterclockwise. This moves the valve forward shortening the distance between stylus and tool.

Since the stylus is against the template the tool must move back. Keep turning until tool clears the largest o.d. on the workpiece.

Watch arrow on tracer slide indicating limit of stroke. If retract limit is reached back off cross-slide to regain tracer stroke.

h) Take desired depth of cut by turning valve adjustment slide clock-wise and start tracing by engaging the carriage feed. Continue taking desired cut increments with adjustment slide until close to finish size. Check part dimensions and adjust for finish cut.

i) Facing operations can be performed as above, except that cross-slide feed is used instead of carriage feed.

ROUGH and FINISH CUTTING

For workpieces requiring a certain amount of stock removal, the following methods, allowing successive cuts, may be applied:-

a) The turret stop provides up to 5 successive roughing cut positions and one finishing cut position. Using this technique together with an interchangeable type toolholder allows the use of a finishing tool for the last cut.

b) Use interchangeable type toolholders with cutting tools set for successive depth of cut.

c) Use a step stylus, or step bushing fitted to the stylus. After each pass, move stylus or bushing to the next smaller step.

d) Overlay templates,which are a series of rough templates held in position to the finishing template by dowels, are removed one at a time after each cut down to the finish size.

Set-Up for Cutting continued....

e) Manually adjust valve settings (described on previous pages)

f) Move lathe cross-slide back until tracer is in full forward position and can only reach high points on template. Cross-slide is moved forward after each cut so that cutting area increases until complete part is traced. This method requires a final cut to be taken either by valve adjustment after stylus contacts entire template or by indexing to a pre-set tool.

NOTE: Use roughing and finish tools whenever possible.

Turret stop is not available for Series 8000

THREADING

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

With the tracer slide set to 29 1/2° the threading tool will infeed to preset depth using either the turret stop or 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 turret stop or other tool positioning methods, outlined earlier, for the next cut.

This sequence is repeated until thread is completed.

HOW TO MAKE A TEMPLATE

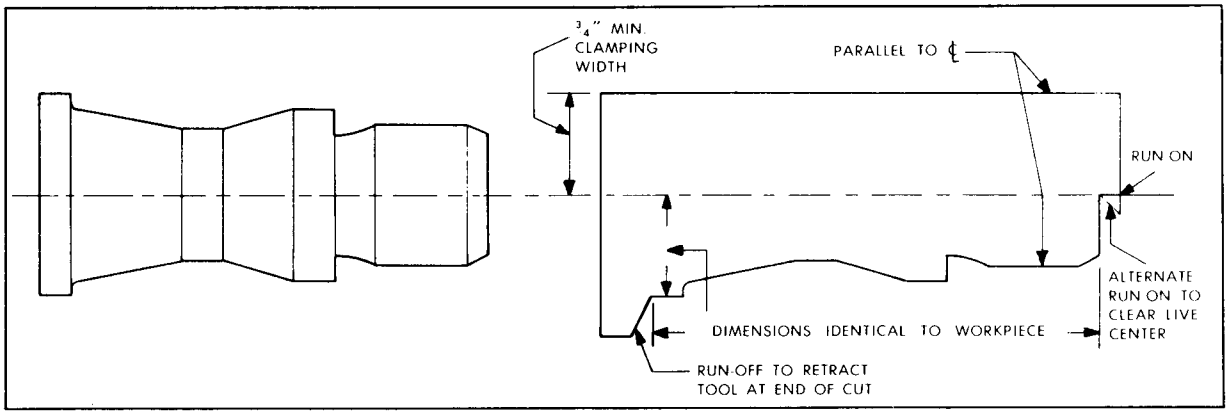
The choice of template material and method of production depends on such things as accuracy required, number of parts to be traced, future repeat runs, size of part, equipment available, etc. Regardless of material or method, all templates should have these common features:

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

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

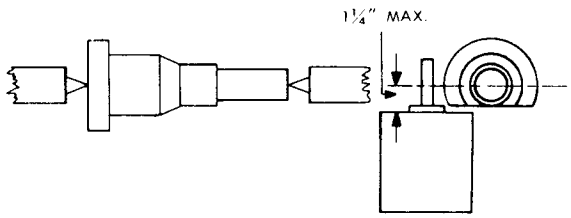
c) Both the rear edge and a portion of the profiled edge should be parallel or normal to the workpiece center line. These act as a dimensional reference, and provide a means of checking parallelism.

d) The rear portion of the template should be wide enough to allow rigid clamping.



Sawing and filling 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.

b) Provide an adequate supply of way lubrication. Use Sunoco Way-Lube No. 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 the hydraulic oil clean. Replace hydraulic oil and filter every 6 months (1000 hours).

f) Do not overtighten fittings. Turn them in finger-tight. Use wrench to lock Tru-Seals.

g) Actuate the stylus several times when starting tracer. Avoid long idle periods which allow oil to gum up inside the valve. This may cause 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 22 for corrective action.

Maintenance continued....

GIB SETTING PROCEDURE

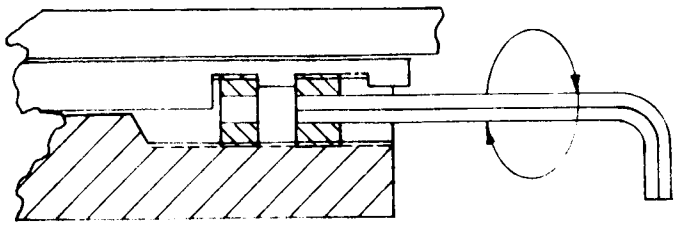
A double screw arrangement is used for positive adjustment and to lock gib firmly in position once the correct setting has been reached. A standard Allen wrench is needed to make this adjustment. Set pump pressure with tracer slide fully retracted. Adjustment must be made with tracer in forward seek.

a) Set pump pressure to 50 psi

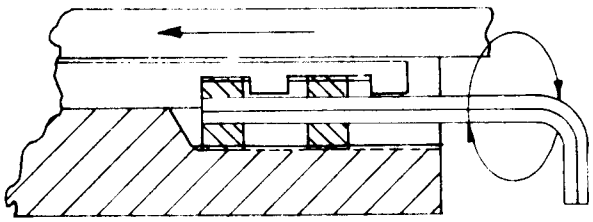
b) Open slow feed knob wide counterclockwise or position control lever in rapid infeed.

c) Unlock gib.

Loosen outer screw.

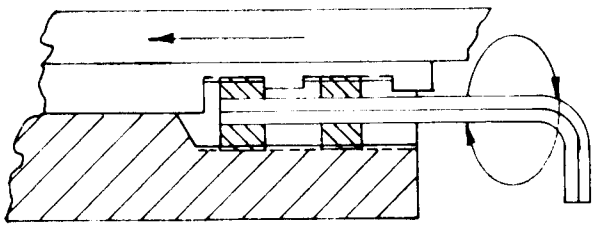


d) Tighten gib
Pass key through outer screw into inner screw. Tighten inner screw until slide movement stops.

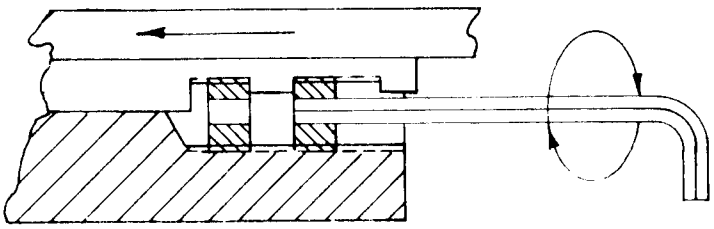


e) Loosen gib

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 over-tighten - Tracer slide must still creep under 50 psi hydraulic pressure.



Maintenance continued....

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)

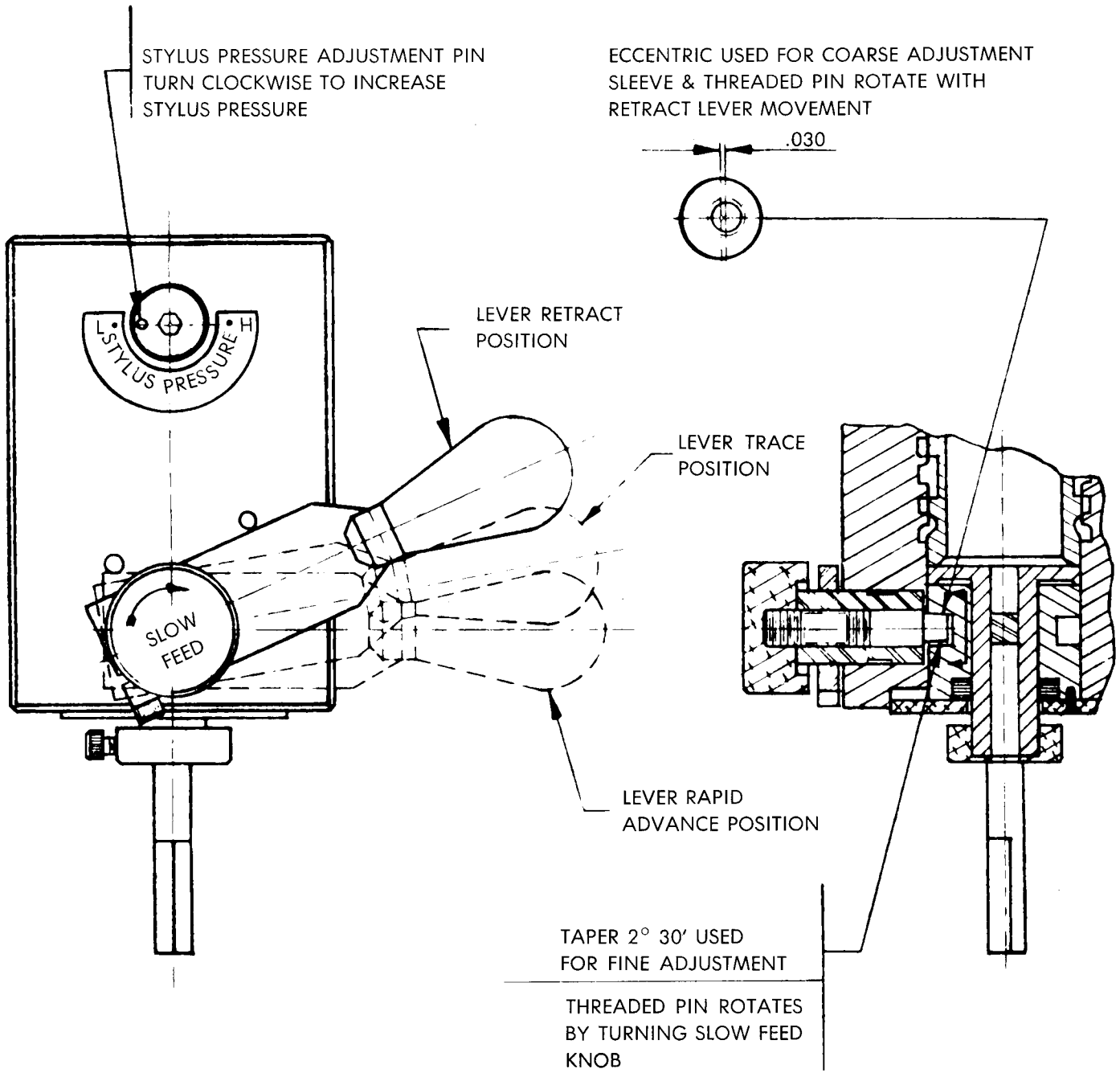
b) Loosen retract lever clamping screw and turn slow feed knob further clockwise. Continue turning until tracer slide begins feeding toward template. (It is possible for slide to retract before infeed stroke begins).

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 counterclockwise to obtain desired infeed rate.

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


STYLUS PRESSURE ADJUSTMENT PIN
TURN CLOCKWISE TO INCREASE
STYLUS PRESSURE
ECCENTRIC USED FOR COARSE ADJUSTMENT
SLEEVE & THREADED PIN ROTATE WITH
RETRACT LEVER MOVEMENT
.030
L
STYLUS PRESSURE
H
LEVER RETRACT
POSITION
LEVER TRACE
POSITION
SLOW
FEED
LEVER RAPID
ADVANCE POSITION
TAPER 2° 30′ USED
FOR FINE ADJUSTMENT
THREADED PIN ROTATES
BY TURNING SLOW FEED
KNOB

SCALE = 1/1

MIMIK TROUBLE SHOOTING CHART

	TROUBLE		CAUSE	REMEDIES
1.	VIBRATION	a)	Infeed rate too high	Reduce by adjusting infeed rate knob. See page 2 (a)
	Occurring when stylus feeds into template or meets profile change.	b)	Air in hydraulic system	Cycle slide full stroke. Check for leakage at valve and tank fittings. Check for adequate oil level in reservoir.
		c)	Hydraulic pressure too high	Reduce for proper setting. See page 4 (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, toolholder, template bracket and tool insert for tightness. Check tracer gib adjustment and piston rod connection.
		f)	Lathe vibration	Eliminate by balancing or levelling.
2.	SURFACE FINISH PROBLEMS	a)	Vibration in tracer system	See (1) above
		b)	Template contour not smooth	File, grind or polish
		c)	Valve hang-up	See page 22
		d)	Air in hydraulic system	Section 1 (b) above
		e)	Mechanical looseness	Section 1 (e) above

TROUBLE	CAUSE	REMEDIES
2. SURFACE FINISH PROBLEMS	f) Uneven tracer slide movement	Reduce hydraulic pressure to 50 psi and check for uniform movement. Check for distortion and 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 and relief angle.
	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.

TROUBLE	CAUSE	REMEDIES
Part-to-part variations continued...		Eliminate operator settings.
	d) Mechanical looseness	Section 1 (e) Page 18 Section 2 (i) Page 19
	e) Valve hang-up	See Page 22
	f) Uneven tracer slide movement	Section 2 (f) Page 19
	g) Air in hydraulic system	Section 1 (b) Page 18
	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 plane	Adjust template using a dial indicator
	c) Variation in cutting load over length of part	Section 3 (a) Page 19
	d) Incorrect tool-stylus relationship	Stylus-tool to have same profile and proper alignment. See Page 3
	e) Incorrect tool geometry	Section 2 (h) Page 19
	f) Incorrect tracer slide angle	Reset slide to ensure full contour coverage
	g) Excessive stylus deflection	Reduce infeed rate to approximately 10 - 20 ipm

	TROUBLE		CAUSE	REMEDIES
4.	TEMPLATE-TO-PART VARIATIONS continued...	h)	Mechanical looseness	Section 1 (e) Page 18
		i)	Valve hang-up	Section 6 Page 22
		j)	Uneven tracer slide movement	Section 2 (f) Page 19
		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 will not feed forward with valve set to infeed and stylus off template - or slide continues to retract when stylus meets a reduced slope.	a)	Incorrect feed setting	Adjust infeed 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 - pump coupling, burnt out motor, broken fittings inside tank, faulty relief valve or plugged filter
		e)	Slide hang-up	Section 2 (f) Page 19
		f)	Valve hang-up	Section 6 Page 22

TROUBLE	CAUSE	REMEDIES
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 and filter. Run tank until oil warms up. Actuate stylus by hand until smooth stylus action and positive spool return are obtained.
	c) Distortion from overtight 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 tracer valve continues to hang-up, contact MIMIK.

The tracer valve is factory sealed. Any attempt to dismantle the tracer valve can result in damage and will void its guarantee!

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 attached 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 much 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 type 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 explanation is made with reference to our Sample Study #1

1. CUSTOMER NAME: M.S. Company PART NAME: Axle
2. WORKPIECE DWG NO. Sample Study #1
3. WORKPIECE MATERIAL AISI 1045
4. TYPE OF TOOLING CARBIDE

5. Workpiece diameter (inches) 1.5"
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:-

$$\frac{2.375 + .625}{2} = 1.5"$$

6. Depth of cut (inches) .062"

7. Feed per rev. (inches) .010"

8. Required cutting speed (SFPM) 450
SFPM depends on the above items 3,4,6 and 7

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

$$RPM = \frac{\text{Cutting Speed}}{\text{Circumference of part (ft)}} = 1150$$

10. Length of cut (inches) 6.5
This is an approximate calculation but close enough for general use.

11. Cutting Time (minutes) .57

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

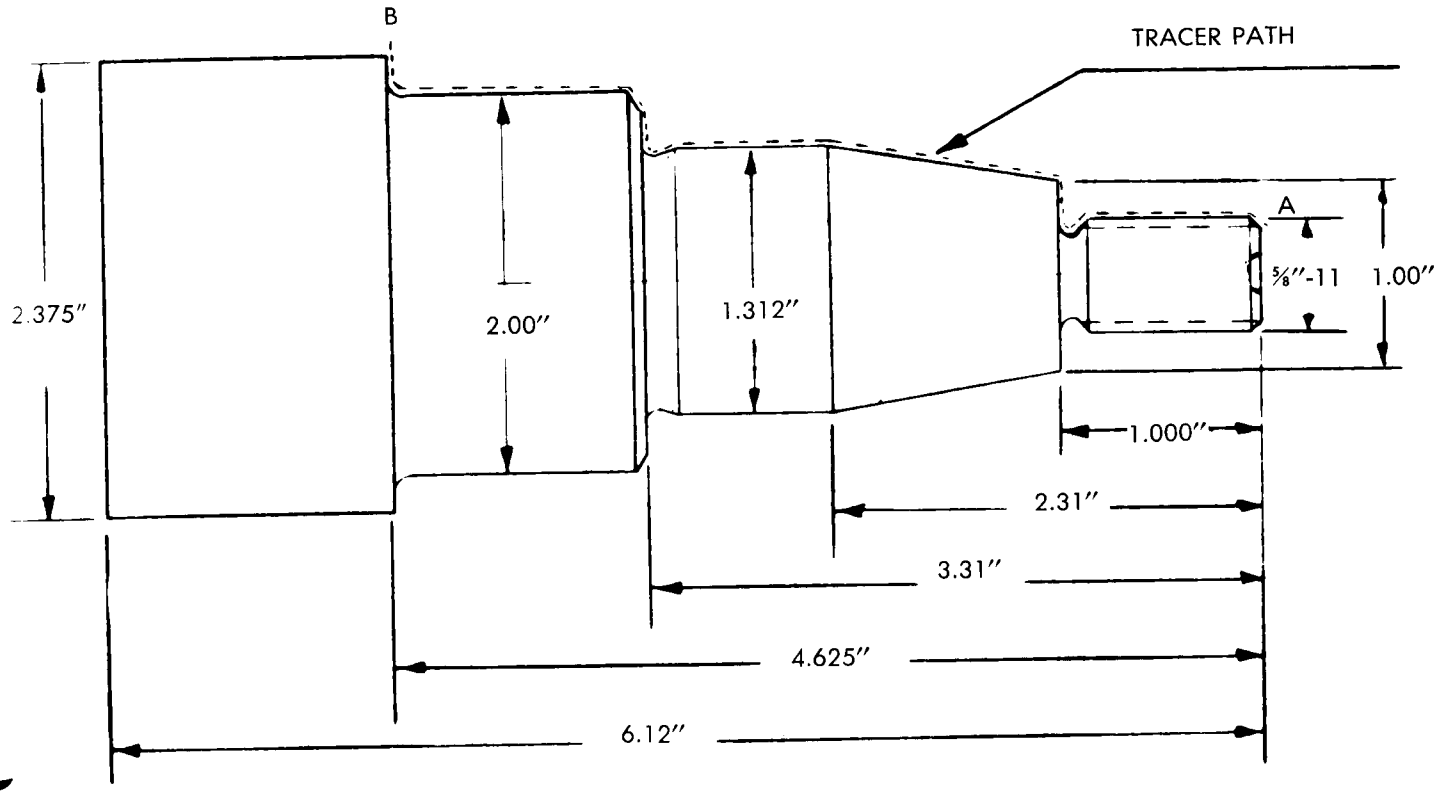
To calculate floor-to-floor time add all other elements to the machining time.

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 No. 1

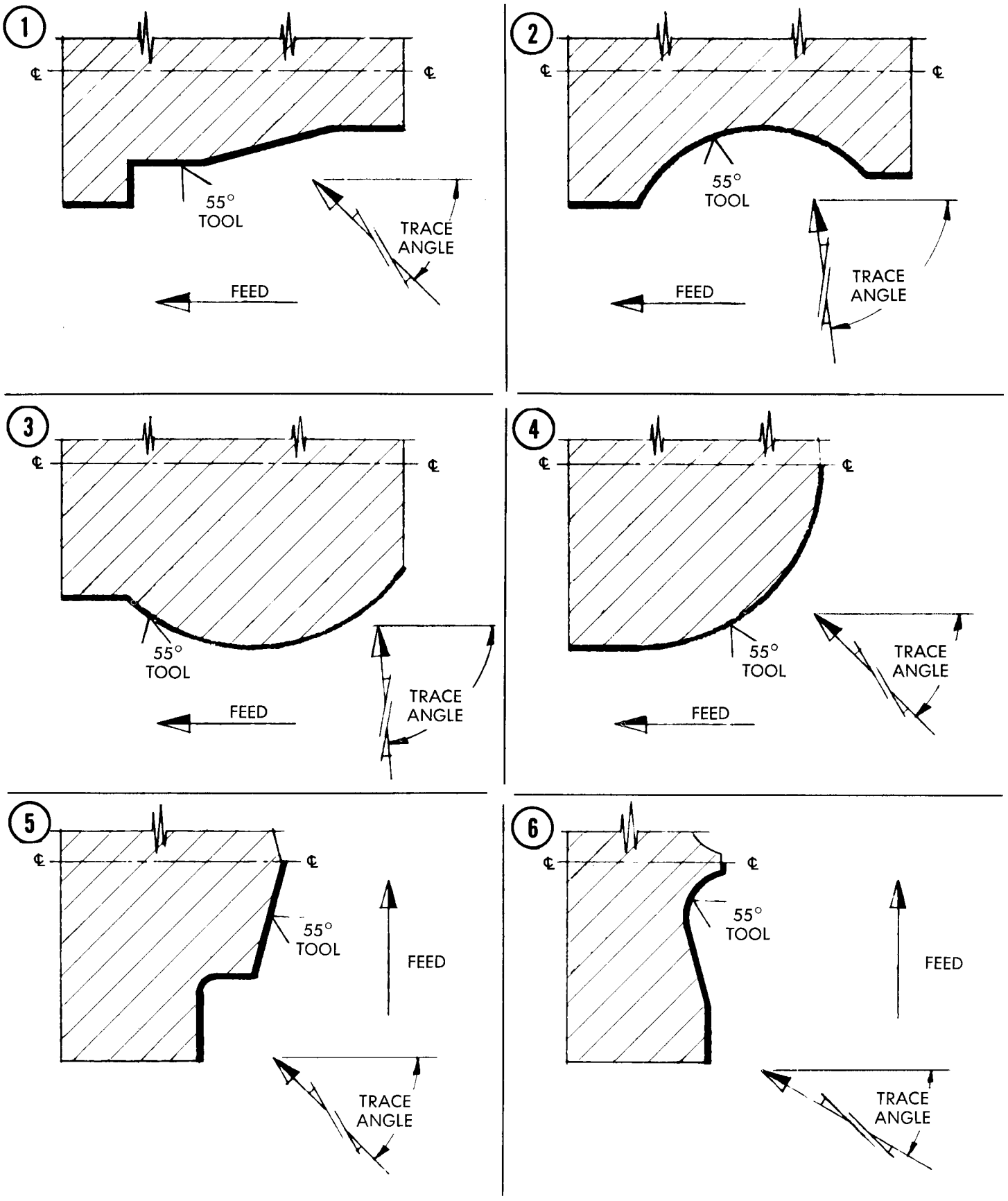


CUSTOMER: _____ PART NAME: **AXLE** PART No. **SAMPLE**

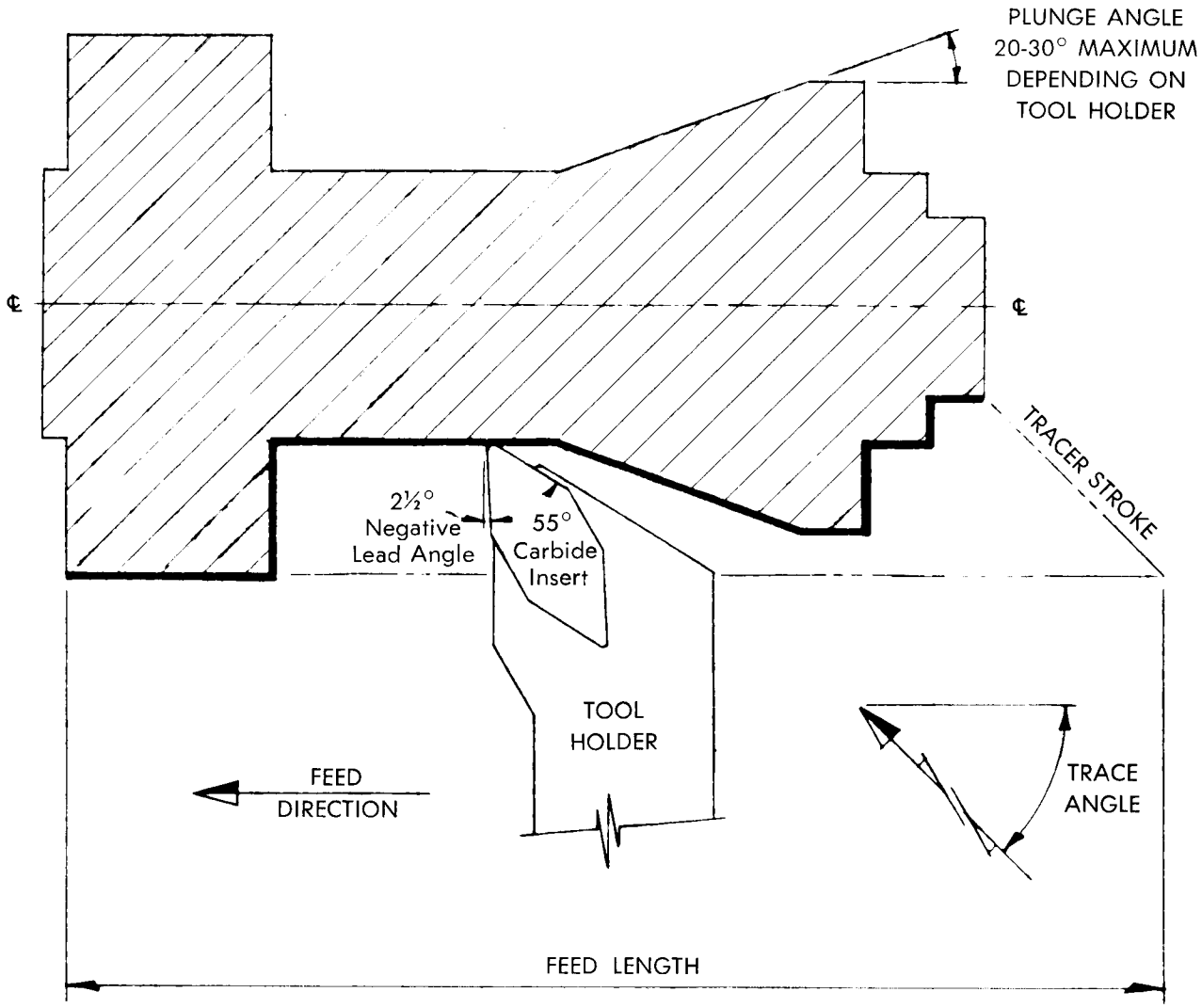
WORKPIECE MATERIAL: **1045 FORGING** TYPE OF TOOL: **CARBIDE**

WORKPIECE DIAMETER: **1.5"**

	RGH. CUT	FIN. CUT
DEPTH OF CUT	_____	.062"
FEED PER REV.	_____	.010"
REQUIRED CUTTING SPEED	_____	450
SPINDLE RPM	_____	1150
LENGTH OF CUT	_____	6.5"
CUTTING TIME	_____	**.57 Min.**

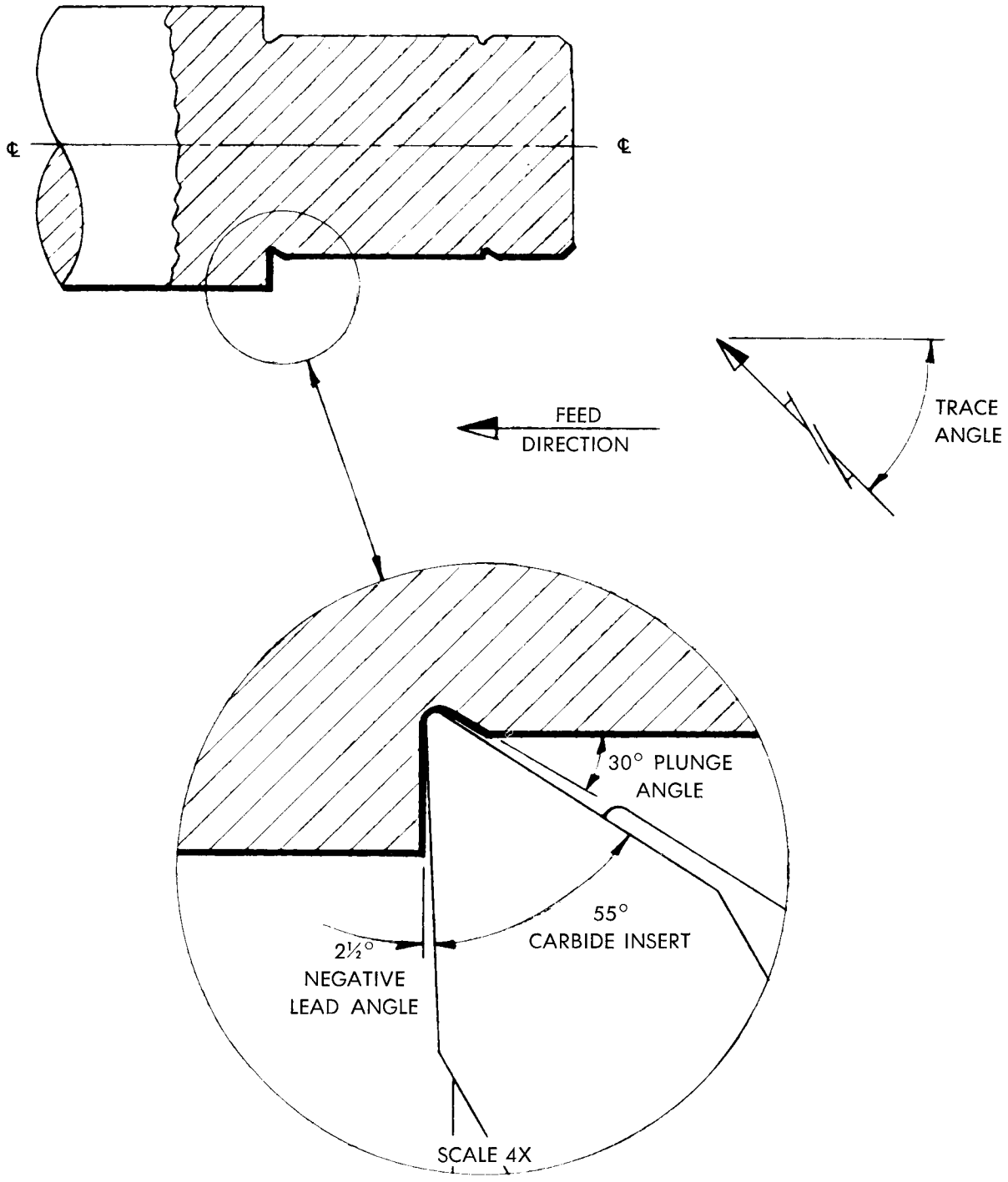


GENERALLY, THE TRACE ANGLE SHOULD BISECT THE SMALLEST CONTAINED ANGLE INCLUDED IN THE TRACE PATH

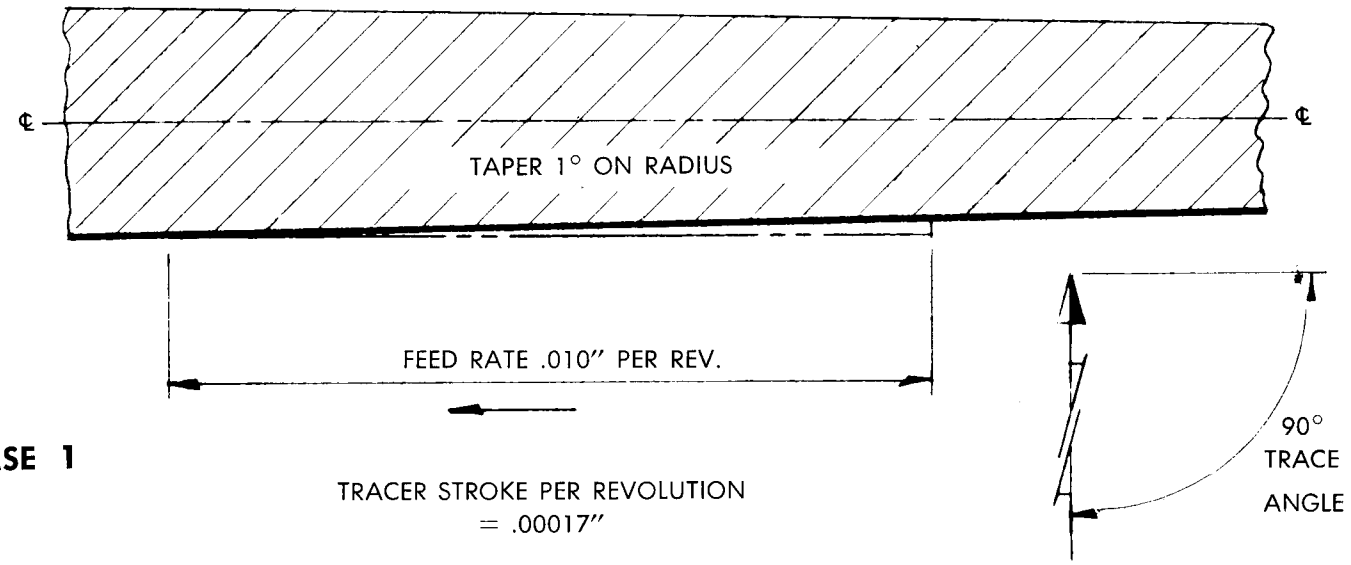


POINTS TO CONSIDER

1. **Trace angle must be greater than plunge angle.**
2. **Back edge of tool and tool holder must clear plunge angle.**
3. **Maximum depth of cut on backfacing is .020 inch/revolution when workpiece shoulder is greater in length than tool side cutting edge.**
4. **Tool nose radius should be less than smallest radius in trace path.**

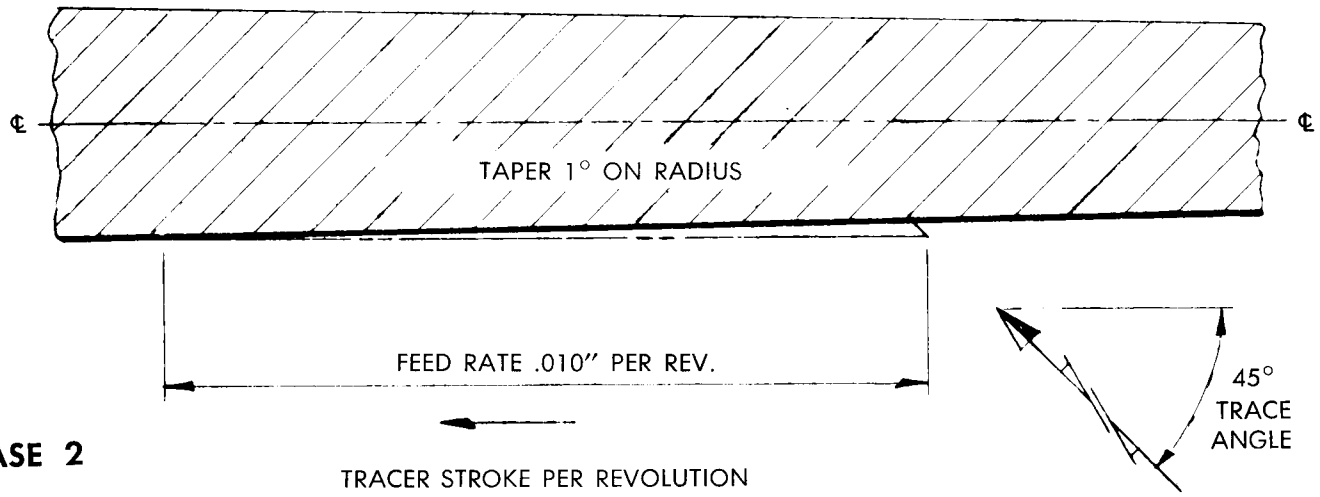


SUGGESTED METHOD FOR TRACING UNDERCUTS IN SHAFTS



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