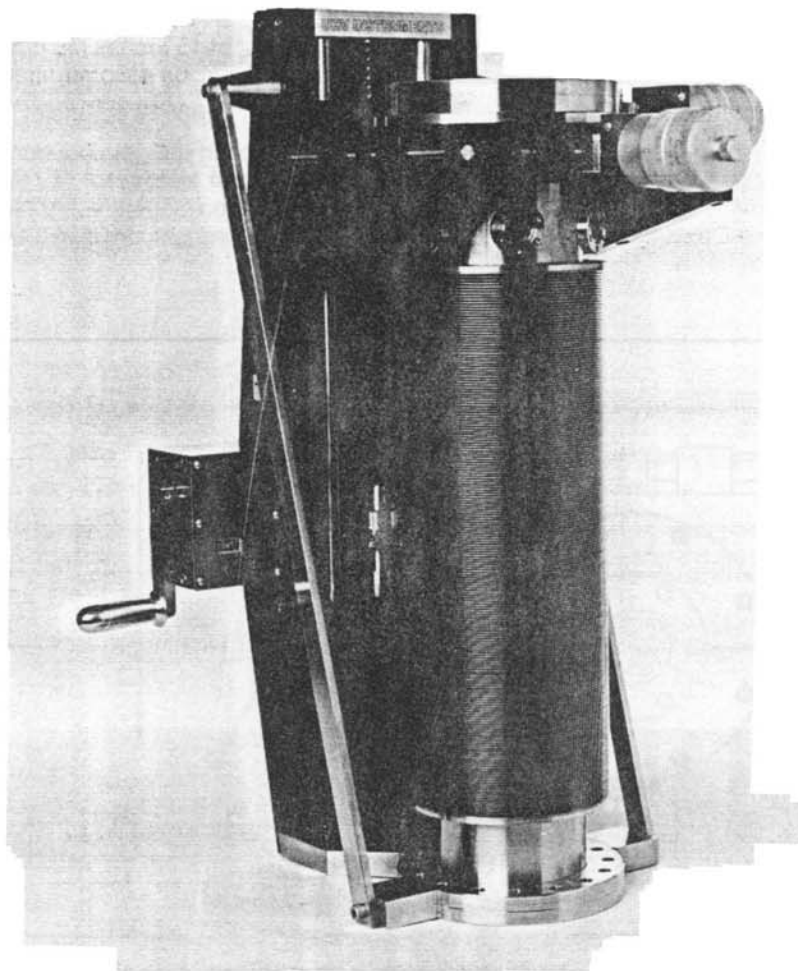


INSTRUCTION MANUAL
ULTRA HIGH VACUUM INSTRUMENTS
MODEL 3000 SERIES
XYZ MANIPULATOR

REVISED SEPTEMBER, 1985

Sample Manipulation Stage



Model 3000R long stroke XYZ manipulator.

BASIC MODEL 3000 XYZ MANIPULATOR

The 3000 series manipulator is designed for applications requiring a rugged and stable manipulator as found in surface physics and chemistry applications. Also, it can be used for positioning targets in particle or photon beams or as a manipulator to hold a multi-sample carousel in an analytical instrument. The 3000 series offers the building block approach to match specific motion and temperature requirements to the required applications. The manipulator is all metal and can be mounted horizontally or vertically on most standard analytical bell jar systems. It is bakeable to 200° C or more and suitable for 10⁻¹⁰ Torr or lower operation.

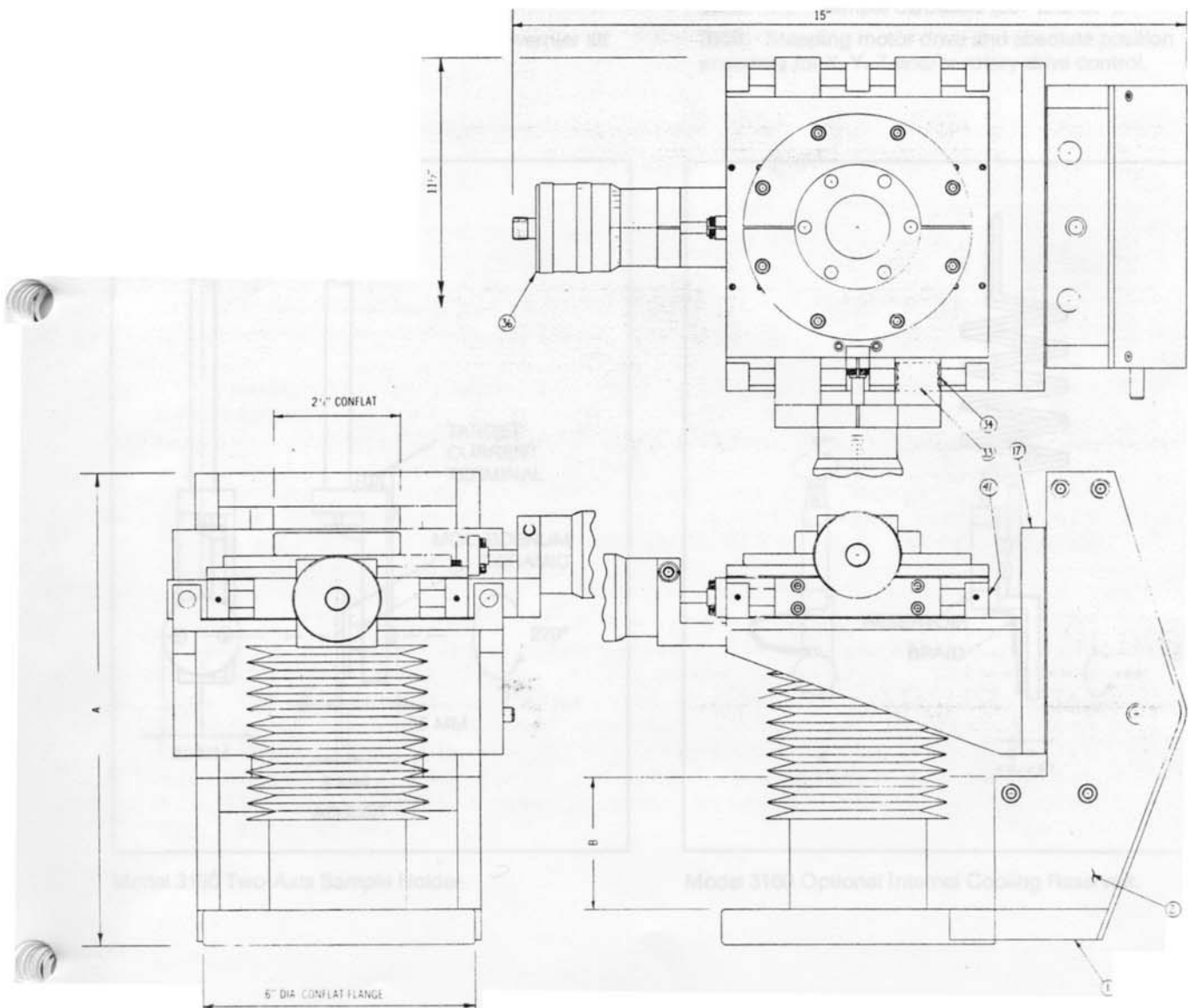
The standard stage is mounted on a 6" Conflat-type flange with a 2.75" Conflat at the top. XYZ Motion is 1" (2.54 cm) with an accuracy of .0001" (.002 mm). The standard Z gear drive has a drive/turn ratio of .025"/turn (calibrated). The welded steel bellows has a nominal cycle life of 10,000 full strokes. Longer Z strokes are available on request with a heavier set of hardened Z guide shafts and longer drive gears. The manipulator is normally made of aluminum. Steel is available on request. The manipulator is available with Z strokes up to 15" and bellows up to 6" in ID in the 3000R version. Other variations are also available.

Basic Model 3000 XYZ Stage

The Model 3000 has a number of innovative design features that differentiate it from other manipulators available on the market.

- Six hardened shafts rather than two for full X,Y and Z motion guidance. This gives smoother longer-lasting performance with improved reproducibility of settings and greater resistance to seizing and gauling. Shaft diameter tolerance is .0001".
- Use of an oversized 4-inch (10 cm) OD bellows rather than the standard 1.5" for greater flexibility of application: low vibration target stages, complicated feed-throughs along the Z axis moving end of the bellows.

- The Z positioning is done through a gear box rather than a vernier to avoid the vernier loading which is present in conventional designs. A large side-mounted drive controls the Z (height) position. The Z drive can be extended (on request) to provide motions of 15 inches (38 cm) or more, and larger bellows can be accommodated.



Model 3000R is available for Z strokes up to 15" (38 cm) or more. For such applications, distance A in Fig. 2 is $8.5" + 1.25 X (\text{stroke})"$ while distance B is $2.75 + 0.25 X (\text{stroke})"$. An optional coarse drive with a mechanical counter is also available.

Nonstandard Flanges are available including 6" Conflat types at each end or others on request.

Nonstandard Bellows up to approximately 6" OD (12.5 cm) can be accommodated.

Options:

The model 3000 comes with a variety of options to give the experimenter a manipulator suitable for specific applications.

3040 Optional rotary drive mechanism with 0.1° accuracy mounted on a cantilevered support bearing (internal) for θ rotation of single specimen or support of a carousel.

3050 As 3040, but with addition of internal linear shaft drive, 0.40" linear motion.

3060 Optional tilt mechanism with single vernier tilt angle adjustment.

3070 Optional four 1.33" conflat flanges for electrical or fluid feed-throughs. These can be installed at the moving end or the fixed end of the manipulator.

3100 Optional right angle drive with cantilevered support for holding carousel (horizontal installation) or single crystal.

3140 Optional heater, thermocouple (type K), and leads, designed to interface with option 3040 and 2000-IT digital controller.

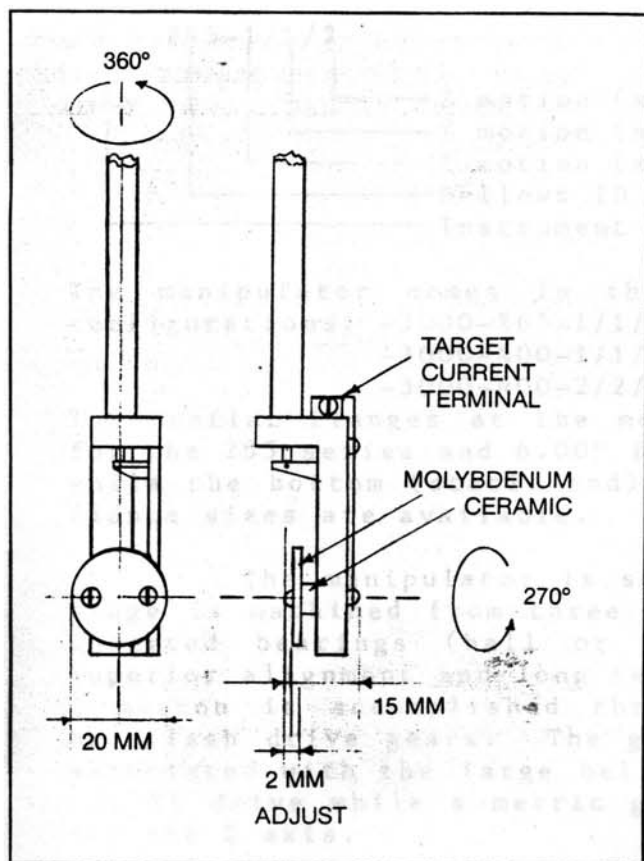
3150 Optional heating stage designed to interface with 2000-IT digital temperature controller (20°C to $+550^\circ\text{C}$). Consists of heater, thermocouples, and option 3180 plus option 3050.

3160 Optional internal cooling reservoir to minimize liquid nitrogen associated mechanical vibrations and temperature fluctuations, sample cooling to -200°C .

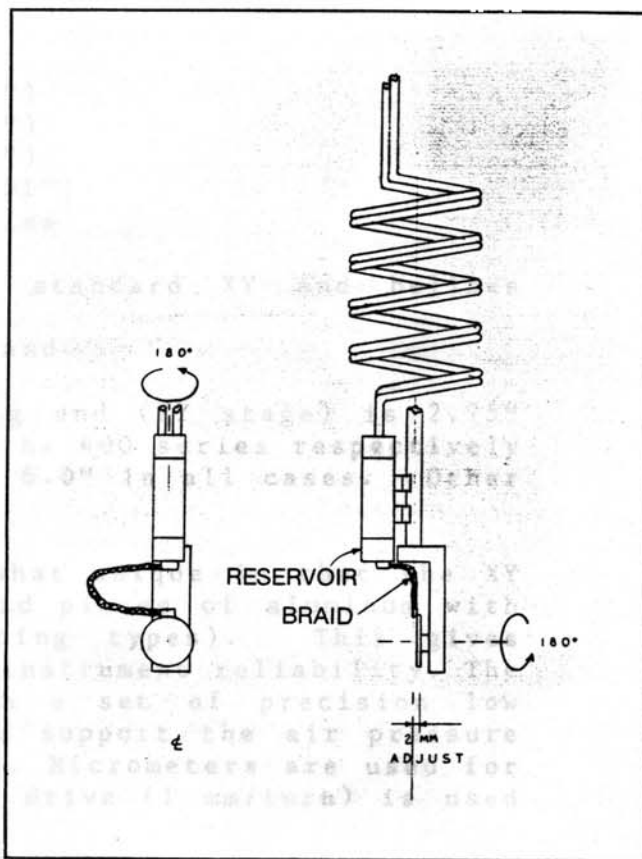
3180 Two-axis sample holders for single crystal alignment (θ, ϕ variable).

3200 Multi-sample carousels (30° and 60°).

3500 Stepping motor drive and absolute position encoders for X, Y, Z and/or rotary drive control.



Model 3180 Two-Axis Sample Holder.



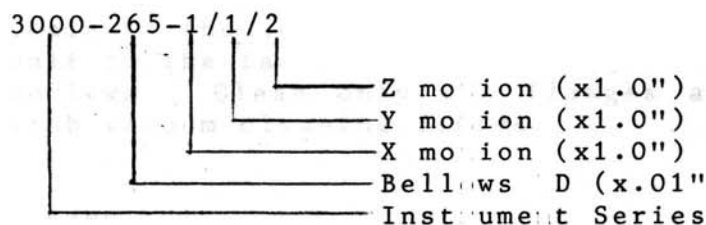
Model 3160 Optional Internal Cooling Reservoir.

INTRODUCTION

The model 3000 series manipulator is designed for applications requiring a rugged and stable manipulator as found in surface physics and chemistry applications. Also, it can be used for positioning targets in particle or photon beams, or as a manipulator to hold multiple specimen carousels in analytical instruments. The 3000 series offers the building block approach to match specific motion and temperature requirements to the required applications. The manipulator is all metal and can be mounted horizontally or vertically (see below) on most standard analytical bell jar systems. It is bakeable to 200 deg. C or more, and is used at vacuum pressure of 10⁻¹⁰ Torr or lower.

BASIC CONFIGURATIONS

Manipulator Nomenclature



The manipulator comes in three standard XY and bellows configurations: -3000-265-1/1/2, -3000-400-1/1/2, and -3000-400-2/2/2.

The Conflat flanges at the moving end (XY stage) is 2.75" for the 265 series and 6.00" for the 400 series respectively while the bottom (static end) is 6.0" in all cases. Other flange sizes are available.

The manipulator is somewhat unique in that the XY stage is machined from three solid pieces of aluminum with inserted bearings (ball or bushing types). This gives superior alignment and long term instrument reliability. The Z motion is accomplished through a set of precision low back-lash drive gears. The gears support the air pressure associated with the large bellows. Micrometers are used for the XY drive while a metric gear drive (1 mm/turn) is used for the Z axis.

INSTALLATION

The manipulator can be mounted vertically or horizontally. When mounted vertically, the manipulator is capable of supporting its own weight, air pressure forces, plus a vertical load of 50 lbs. Heavier loading can destroy the XY roller bearings or cause other damage. For horizontal installation, the XY stage should not be loaded more than 10-15 lbs without a counter weight or spring. Excessive loading can damage the micrometer support or strip the micrometer threads. As a safety precaution, one micrometer (X or Y) should be facing the floor (the micrometer pushing upwards) for horizontal installation.

CLEANING AND LEAKS

The bellows is carefully cleaned during manufacture. Contact with dust, oils, corrosive fluids, and sealants should be avoided. If a leak is found, return the unit to the factory. Do not apply temporary sealants to the bellows. Clean only the flanges and welded tube sections with vacuum cleaning fluids.

BAKING

Units manufactured after October 1, 1985 are fully lubricated with a high temperature lubricant. They are bakeable assembled up to 225 deg. C. For higher temperatures, option 3020 is required. Units manufactured before October 1, 1985 can be baked to 100 deg. C assembled and 200 deg. C with the micrometers removed. Occasionally after baking, seizing will occur. If this happens, apply new lubricant to the binding parts or a combination of unlocking (anti-seizing) spray plus new lubrication.

The grease recommended for lubricating the manipulator part is MOLYSLIP HTBG with molybdenum disulphide. This is a modified calcium complex lubricant with an operating range of -40 to +163 deg. C. The grease retains its lubricating properties up to 299 deg. C (when it will melt). As temperatures cool down from 299 deg. C, it will return to its normal state.

cont.

BAKING CONT

Grease Specifications: Base: modified calcium complex
 MoS2 content: minimum 1%
 MoS2 particle size: 2-5 micron
 Drop Point: 299 deg. C

CAUTION

When operating the manipulator after baking, make certain that all parts have cooled to room temperature.

CAUTION!

Some units have plastic or Teflon parts which require removal during baking. These parts included the plastic digital counter in option 3600, coarse mechanical drive, and the Teflon/O-ring braking pad found on the fine adjust knob on 400 series bellows drives. These items can be removed prior to baking with ordinary hand tools.

Unless pressures less than 10-10 are required, it is recommended that the bellows unit be given only a mild bake use a heat gun on "low heat". By heating the bellows to 50-100 deg. C, most water vapour CO, CO2, CH4, etc. can be removed with low heat.

SPECIAL BELLOWS PROBLEMS

The 3000 series is available in Z strokes up to 17" standard. For the longer strokes (over 3-4"), kinking or squirm of the bellows can occur.

CAUTION!

Excessive squirm can damage the bellows. Squirm is avoided by venting the bellows assemblies only in an extended position, keeping the bellows under tension. Under vacuum, the squirm is usually reduced or removed by the external air pressure.

cont...

CAUTION!

A bad combination is squirm (at partial bellows Z compression) plus system gas overpressure (as when venting with a nitrogen pressure gas feed). This will cause the squirm to be magnified by inflating the bellows and cause permanent damage.

For additional technical information, replacement parts, or accessories, call the factory direct: 416) 681-2607.

MODEL 3000 STANDARD OPTIONS

| | |
|------|--|
| 3020 | Demounting top plate, to permit removal of XYZ drive while under vacuum for baking (2.75" top Conflat only) |
| 3040 | Rotary drive and sample holder (single sample) |
| 3050 | Rotary/linear drive (cost varies with length) |
| 3060 | Tilt mechanism on 2.75" Conflats, single vernier |
| 3070 | 4-1.33" Conflat flanges (moving or static end) |
| 3100 | Right angle carousel drive (for side mounting) |
| 3140 | Heater and sample thermocouple installed (type K) |
| 3160 | Cooling reservoir (LN) |
| 3180 | Two rotational axis sample holder |
| 3200 | Carousel (to interface with Model 1000 sample holders) |
| 3510 | Z axis stepping motor drive and controller, with remote hand held speed controller, complete with limit switches |
| 3515 | Z axis DC drive and hand held controller |
| 3520 | XY stepping motor drives and flanging installed |
| 3522 | XY Joy stick controller, with two power supplies |
| 3600 | Coarse mechanical drive, manual driven with counter |
| 3610 | XY stage for 6" Conflat flange |

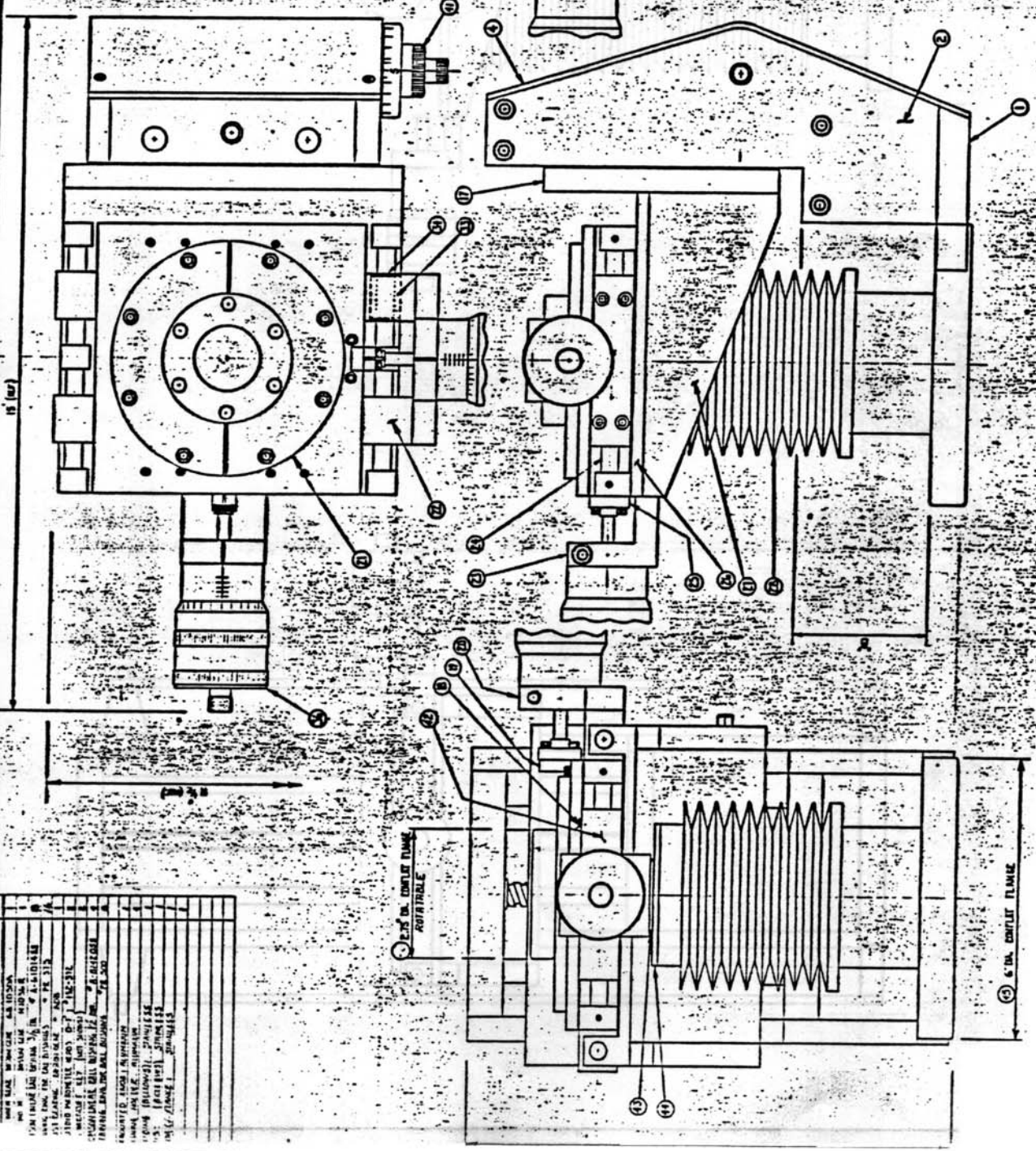
Note: Other XYZ combinations, flanges, and bellows are available on request. In addition, glass position encoders can be supplied with TTL outputs, for digital position display or computer interfacing. Stepping motor power supplies are 0-5000 steps/sec with external or internal controls.

LIST OF FIGURES

1. Basic Model 3000-265
2. Model 3000-400-1/1/10
3. Option 3020
4. Option 3040
5. Option 3160
6. Option 3120
7. Option 3040 and 3160
8. Option 3180

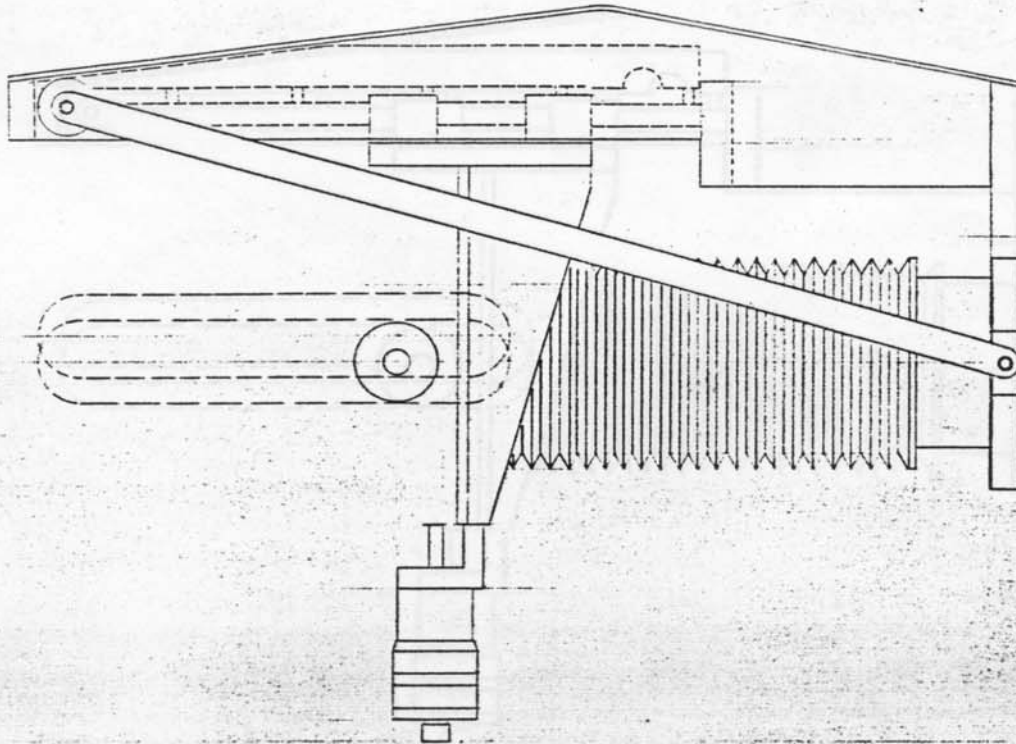
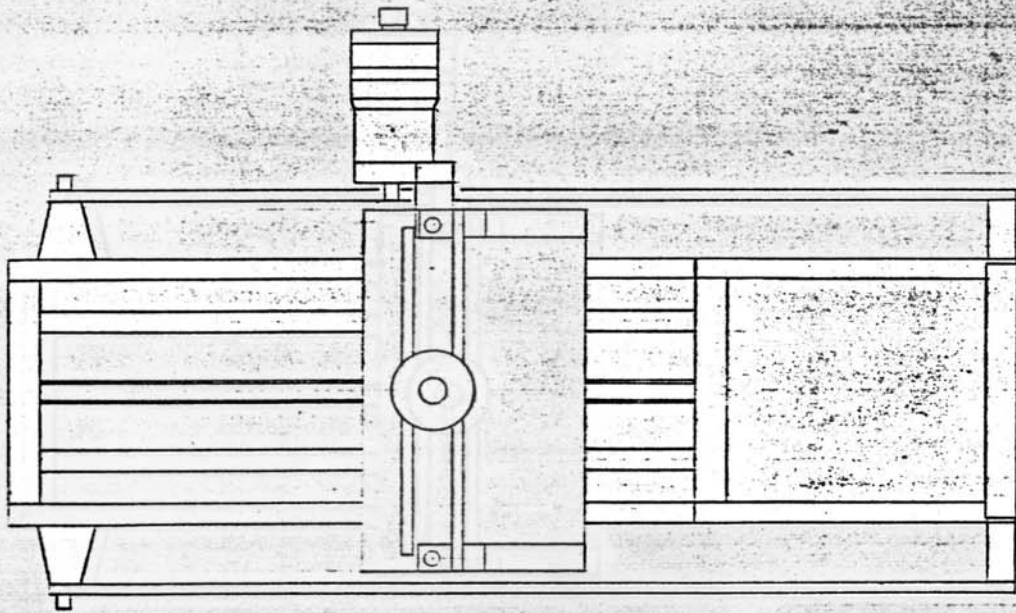
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1.5" DIA. FLANGE
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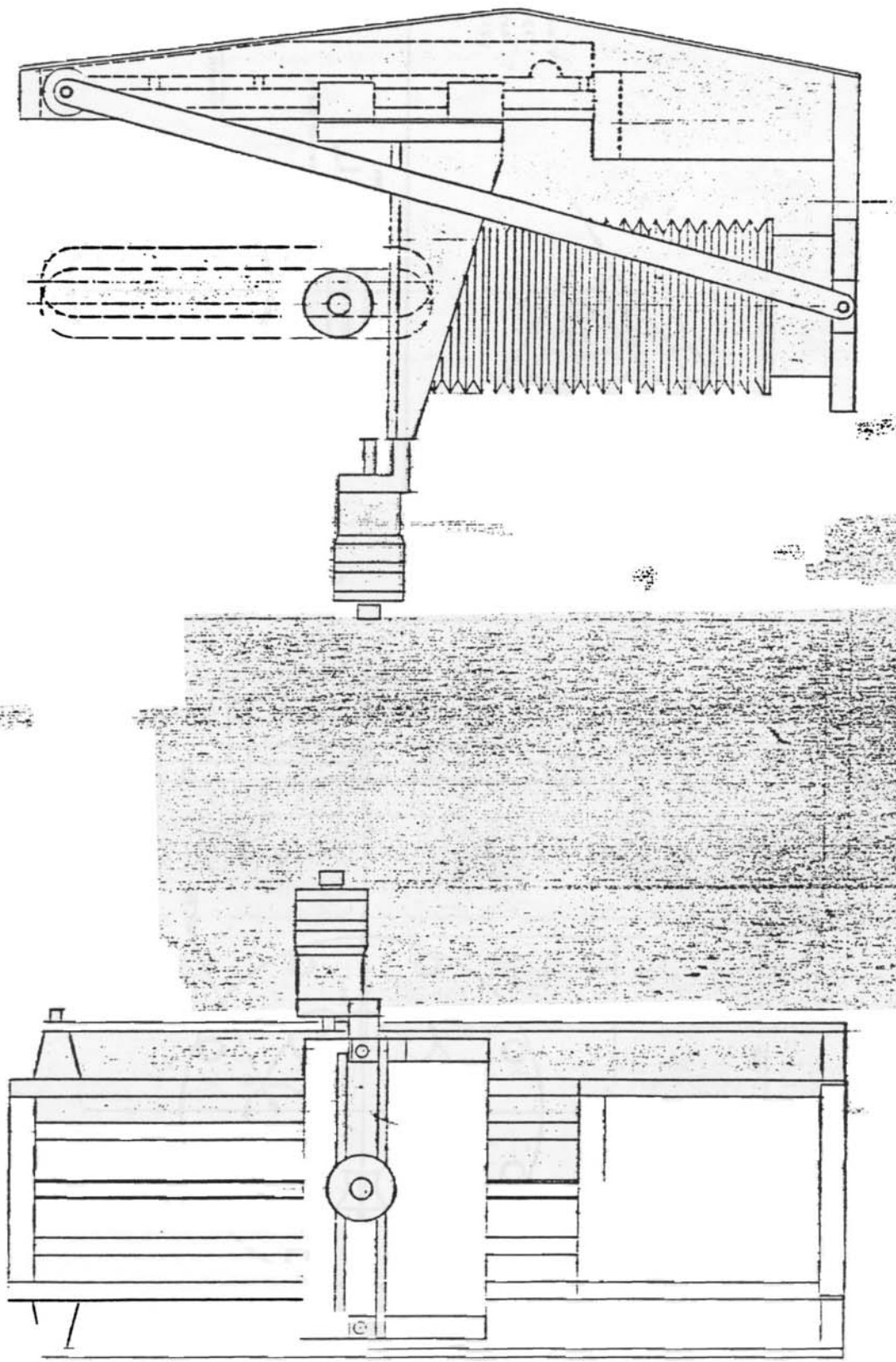


SCALE: 1 1/2

UHV INSTRUMENTS.

LAYOUT OF STRENGTHENING DETAILS
FOR MODEL 3000 XYZ MANIPULATOR

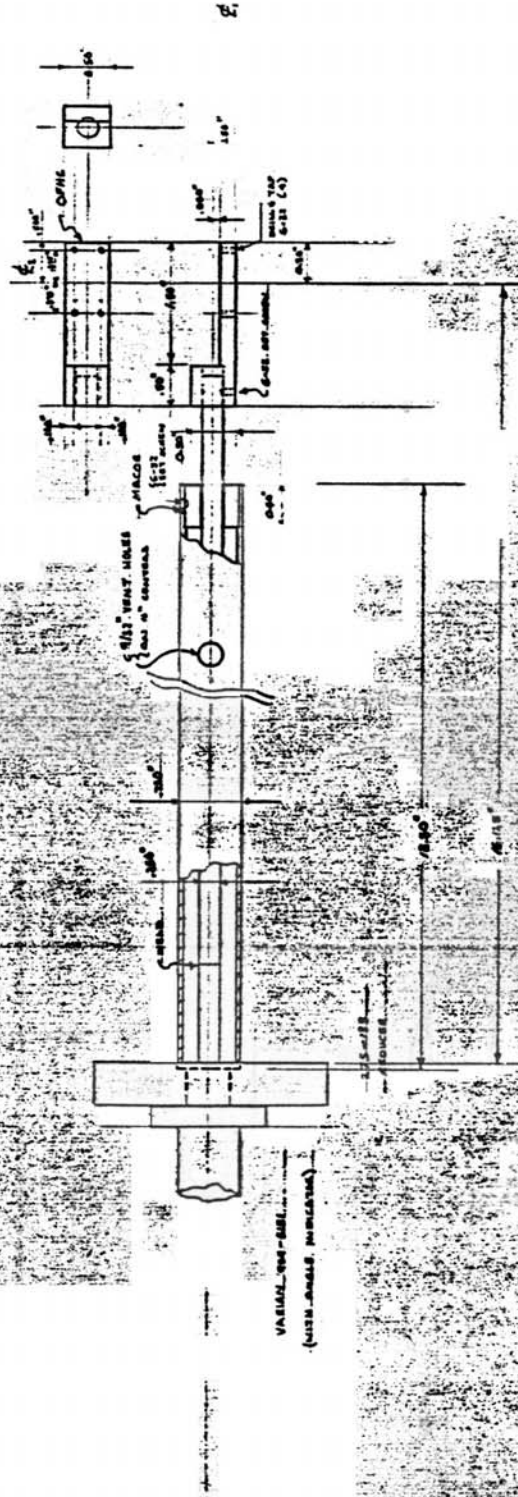
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LAYOUT OF S RENG REING DE
FOR MODEL 3000 XYZ MANIPULATOR

UHV INSTRUMENTS

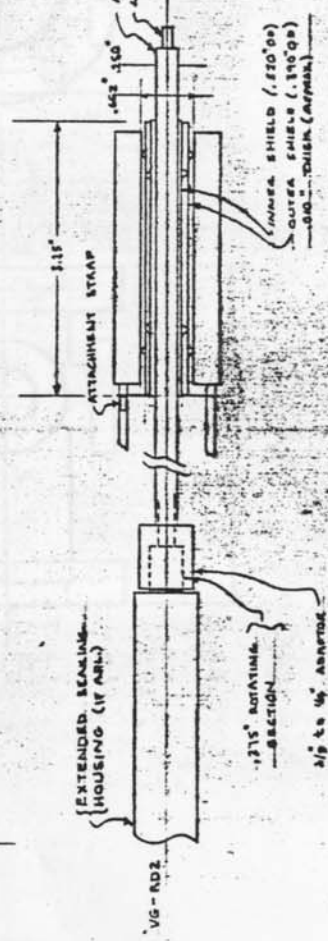
| | |
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| DESIGNED BY | J. STANBARD |
| CHECKED BY | ASTRAY DEITE |
| DRAWN BY | |
| INSTRUMENT NUMBER | (87-306) |



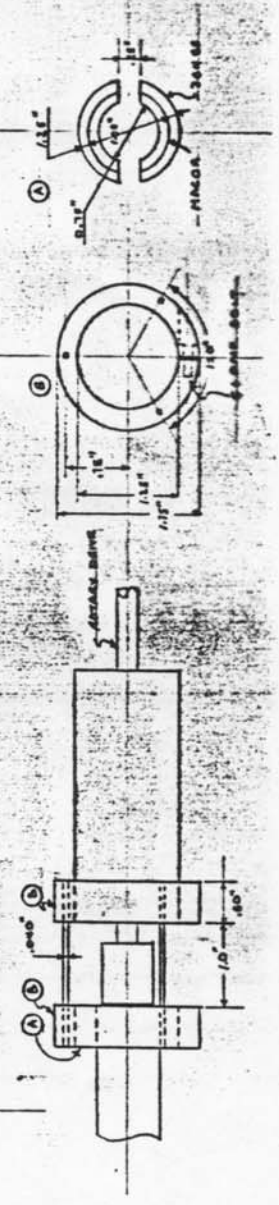
① LN RESERVOIR



② RADIATION SHIELD



③ MECHANICAL SUPPORT



- NOTES
- POLISH ALL SURFACES TO
 - REMOVE RADIATION SOIL
 - FINISH FROM NON-MAGNETIC
 - STAINLESS STEEL

| | |
|------------------------|-------------|
| UHV INSTRUMENTS | |
| DATE: FEB 55 | REVISION: 1 |
| LN RESERVOIR - A | |
| 3/60 | |

UHV INSTRUMENTS

STANDARD FEEDTHROUGH COLLAR

3120

