INSTRUCTION MANUAL

PMXYZ SERIES PRECISION MANIPULATORS

Version 1.2

This manual applies to:

Model #_______________________________

Serial #______________________________
Preface
Congratulations! You have purchased a precision vacuum positioning device from Nor-Cal Products. This unit is capable of many years of use with minimal care and maintenance. This manual is a tool to aid you in obtaining this service. We at Nor-Cal Products encourage your comments and suggestions on this manual.

Product Description
The PMXYZ series precision manipulators are a family of aluminum units which offer exceptional value per dollar. The PMXYZ series feature pre-loaded cross roller X & Y stages. The 2" Z travel model with the 1.39" ID bellows has a Micrometer drive.

The PMXYZ series are available with greater Z axis travel and larger bellows.

The PMXYZ Series instruments have a 20# equipment payload for vertical operation. For applications which need different payloads and/or other operational orientations, please consult the factory. See "installation" section below for complete payload considerations.

A full compliment of options are available... many suitable for field retrofit. This allows the unit to be modified to suit changing requirements as the role for the manipulator changes through its life.

Unpacking
PMXYZ manipulators are shipped in custom foam-in-place packing. We have found this the only system to provide adequate protection for shipment. The foam is separated approximately half way inside the crate with thin blue plastic. The bellows assembly is shipped in place protected by a cardboard or thick paper wrap about the bellows. This wrap should be left in place until the manipulator is fully mounted. We strongly recommend the packing be saved for possible future shipment or equipment storage.
High-Vacuum Containment and Control

**Installation**

********** WARNING **********

Shipping vibration can loosen screws. The user must check to verify the screw fasteners have not backed off on the unit during shipment. This is critical for safe operation.

***********THIS IS IMPORTANT ************

The standard PMXYZ Manipulator can be installed directly from the packing. As usual, care should be exercised to protect the knife seal edge. The standard units mount to a 2.75” or 6” OD flange. Proper tightening technique should be observed whenever tightening a metal sealed flange. We recommend a small quantity of high temperature anti-seize lubricant be used on all mounting bolts. This is especially important if the unit will be subject to bake-outs.

********** WARNING **********

It is necessary, especially on longer stroke manipulators, to have an axis rod or tube down the axis of the Z travel. This will keep the bellows from "springing" out when the pressure is returned to atmosphere (usually when the unit is near its most compressed mode). This function is usually satisfied by a "theta" rotation shaft or support tube. Damage to the equipment can occur if this precaution is not observed.
PAYLOAD CONSIDERATIONS
The PMXYZ Series instruments have a 20# equipment payload for vertical operation (NOT inverted). This payload is based upon the total load on the traveling flange with the base flange securely attached to the customers chamber, providing a strong and stable mounting. The payload center of gravity must be within the diameter of the traveling flange OD (Normally 2.75") and within 8" of the flange face.

Please consult the factory if your application requires:
Payload greater than 20#
Center of gravity beyond above limits
Mounting orientation other than standard vertical, such as angled, horizontal, inverted.

If the manipulator is to be used with the Z axis horizontal, the NOW vertical micrometer MUST be under the gradational load. The Z axis must be UNDER the drive axis.
Adjustments

Your PMXYZ manipulator is correctly adjusted prior to shipment. This section is included to aid the user in making changes in these settings if he so desires.

LINEAR CROSS ROLLER BEARINGS: The linear bearings are adjustable on the PMXYZ manipulator. There are two sets of 3 each, 8-32 set screws that apply tension to the sets of cross rollers. To adjust, the 4 SHCSs must be loosened to allow roller bar movement. The three set screws can then be tightened to a uniform tension to "just load" the roller sets. The 4 SHCSs can then be tightened to lock in the new position. This procedure can be repeated on the other axis.

MICROMETERS: Micrometer play is affected by two micrometer adjustments.

1. Micrometer thread engagement is adjustable by removing the micrometer handle and tightening or loosening a knurled nut on the barrel. This adjustment normally does not need to be performed in the field.

2. The micrometer to stage coupling is adjustable via the approx. 1" diameter knurled cylinder around the end of the micrometer spindle.

At the end of the micrometer spindle, under the 1" dia knurled cylinder, is a small, chrome plated, dome anvil. This must be finger tight to properly load onto the cross shaft. These are properly adjusted at the factory, and should not require further adjustment.

When re-installing the micrometer/micrometer bloc assemblies, the following procedure will assure the best alignment.

1. Install and snug the two 1/4-20 SHCS. Back each screw off 1/8 to 1/4 turn.

2. Assemble knurled collar/bearing at end of micrometer spindle into receiver on guide rod. Tighten firmly finger tight. This will align the micrometer block.

3. Tighten the two 1/4-20 SHCS. Back off the knurled adjustment collar to a light tension, without axial play. Test operation for smoothness.
Lubrication

All exterior bearings, micrometers, lead screws and guide rods are lubricated with GHT-2 high temperature lubricant. The user will need to add more lubricant from time to time, depending on the frequency and temperature of bakeouts and operating environment.

**************WARNING**************

Additional lubricant must be added to the lead screw (or Z axis micrometer threads) as the use and environment requires. The standard lifting mechanism is a bronze acme thread on a burnished steel acme lead screw. This is a sliding contact, requiring lubrication. Equipment overloading, heavy use, high temperature bakeouts, environmental conditions, etc. can and will remove the lubricant from this interface. THIS WILL CAUSE PREMATURE WEAR. If this is continued to an extreme, the nut will fail and allow the stage to suddenly drop. THIS SITUATION IS DANGEROUS TO EQUIPMENT AND PERSONNEL AND MUST BE AVOIDED. Inspect this mechanism and relubricate as needed. The Acme screw/nut mechanism should have 0.002" to 0.006" vertical (axial) backlash maximum. If more is detected, consult the factory for suitable repair.

************** WARNING **************

This lubricant has been tested to 230 C. We recommend limiting the temperature of the lubricant to 200 C or less.

Avoid inhalation of decomposition products formed above 300C. This material may give off toxic gasses at elevated temperatures.

Bakeout procedure

We recommend limiting the temperature of the lubricant and the bakeout temperature to 200 C or less.

See safety warnings under "Lubrication".

Do not run uncontrolled bakeouts or bakeouts approaching 300C
CONVENTIONAL BAKEOUT:
SUMMARY: The PMXYZ manipulator can be baked with standard UHV bakeout procedures.

See safety warnings under "Lubrication".

It is not necessary to remove the micrometers prior to standard bakeout. For high temperature bake-out, or repeated bake-outs of long duration, we do recommend micrometer removal.

MICROMETER REMOVAL:
1. Position both X & Y micrometers at mid travel. Lower the Z micrometer to it's minimum.

2. The pre-load coupling to the stage removes by simply un-threading the knurled collar. The same procedure is used on all X, Y and Z axis micrometers. Check under "Adjustments" for correct instructions for re-assembly after bakeout.

3. The X & Y micrometers are bolted to the frames with two 1/4-20 SHCS each. On large drum mics, it may be necessary to loosen a set screw and slide the inner graduated cylinder into the micrometer outer graduated cylinder in order to remove the socket head mounting screws. Remove each micrometer. The Z micrometer is retained by a clamp bolt and a safety snap ring underneath the traveling stage.

NOTE: We do not recommend stage temperatures exceed 180 degrees C continuously and 200 degrees C intermittently. The design of the manipulator allows room around the bellows for thermal insulation, making possible greater bellows temperatures while not exceeding our recommendations. Under no condition should heater tapes be used directly on a welded bellows. An electrical short would not only create a safety hazard, but possibly destroy the vacuum integrity of the thin bellows wall.

After bake and cool-down, re-attach micrometers.
We at Nor-Cal Products have a large stake in your new equipment operating up to your expectations. If you experience difficulty with this unit, or any other aspect of your endeavor where our experience might be of value, we want to hear from you. We want to be part of your success.