
McAllister Technical Services

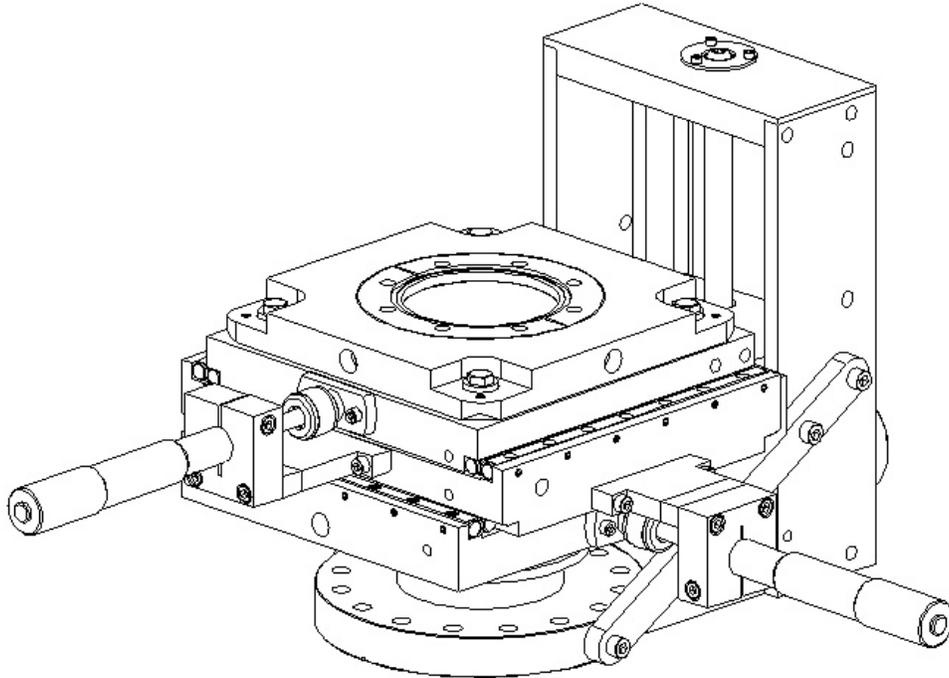
Manufacturers of surface analytical instruments and devices

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MB1500 Instructions



MB1500-series Manipulator

THANK YOU for your purchase of MTS' MB1500 series XYZ manipulator. It is the finest of its kind available. We appreciate the confidence you have placed in our company. We encourage your comments and suggestions on this product and its manual. Please read this manual carefully prior to assembling/mounting your manipulator. We have found this will answer many of the commonly asked questions, saving time and aid in understanding. It will be time well spent.

Leak Check Certificate

Model MB15 Date Job # Checked by _____

This is to certify that the above-referenced product has been checked on a Helium Mass Spectrometer leak detector having a sensitivity of _____ X 10⁻ std. cc/sec and has been found to have no measurable leak.

Check for Damage:

Many shipping companies require that claims for damage and/or loss be filed within a very short period of time, sometimes within one week of delivery! Promptly inspect the shipment for exterior as well as hidden damage. If **any** damage or loss is encountered, be sure to do **ALL** of the following:

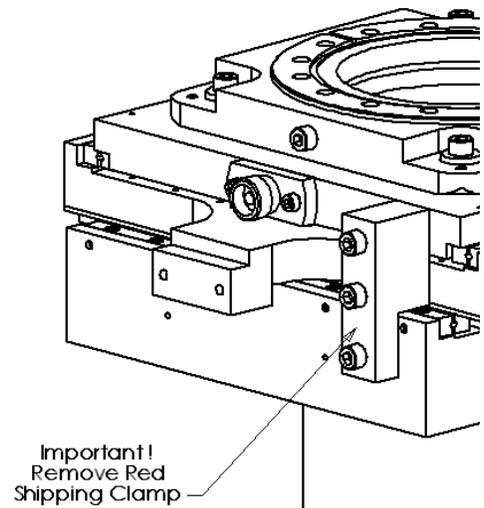
- C **Notify the shipper promptly.** If the damage is significant, insist on an on-site inspection.
- C Retain **ALL** packing materials.
- C **DO NOT** proceed with installation or unpacking.
- C **Do not** allow the shipping company to remove the goods from your premises without first notifying MTS.

Verify the shipment received against the enclosed packing list and against your order. Notify MTS promptly of any discrepancies. Clean any debris, dust or stray packaging material from the manipulator before removing the flange covers. Check for any loose screws.

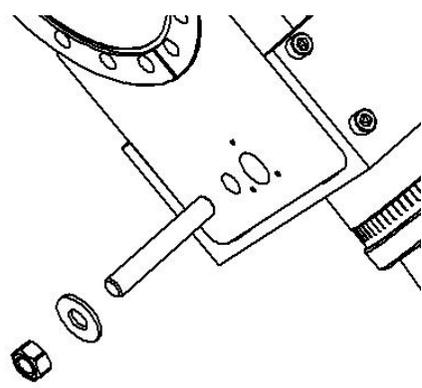
Unpacking Instructions:

Inspect the unit for any **hidden** damage from shipment. Translators are shipped with custom foam-in-place packing. We have found this to be the best way. The foam is separated approximately halfway inside the carton with thin white plastic. The unit is also bagged in polyethylene, and the flanges are covered with aluminum foil and plastic covers. The bellows is shipped in the **compressed** position and is **wrapped** to prevent damage. All of this is designed to get the unit to you in the same condition it left our shop. We recommend you save the packing box and materials, if possible, for equipment or possible future shipment.

1. Take the manipulator out of the box on a clean, dry, level surface.
2. Unwrap the bellows. In order to remove the wrapping, it may be necessary to extend the bellows by moving the traveling flange a bit away from the fixed flange.
3. **REMOVE ANY SHIPPING CLAMPS COMPLETELY!** Be sure to save them, and the screws, for later use. Note that the XY stages are now free to move. Be careful to not damage the bellows.



4. Install the micrometers: We ship your unit with the micrometers removed to prevent damage. The screws for each micrometer are enclosed in a plastic bag and packaged with the micrometers. Reassembly is a rather simple process. Insert the screws in the appropriate holes in the micrometer mount. Line up the screws and the micrometer nut with the mating holes/part on the manipulator. Start the screws, but do not tighten. Next, thread the knurled micrometer nut onto the micrometer insertion bracket. Tighten only finger tight. Finish tightening the two screws. Repeat the process for the other micrometer.
5. Remove the Z-Axis shipping clamp / bolt, nut, and washer which are located on the bottom side of the “foot”. They are painted red, for convenience.
6. Remove the shipping covers and aluminum foil from the flanges. The manipulator is now ready for installation.



General Precautions:

Under normal conditions your manipulator will provide years of trouble-free service, especially if the following simple maintenance is performed. After several bakeouts, it may be necessary to relubricate the lead screw and/or micrometers. Use the MoS₂ grease in the supplied syringe. The micrometers can be removed for easier access. When replacing the screws in the micrometer brackets or any other location on the manipulator, be sure to re-coat the threads with an anti-seize compound.

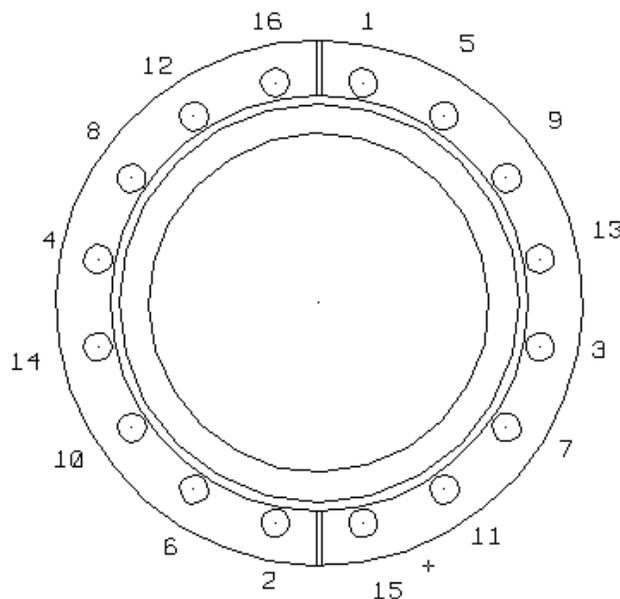
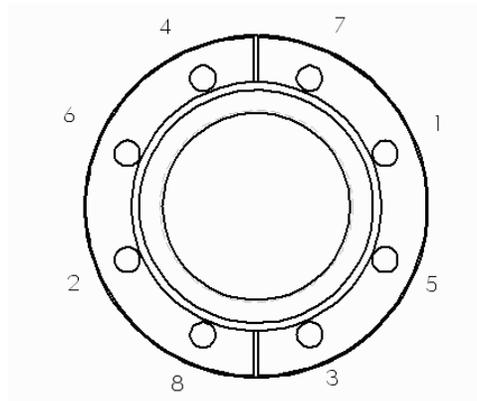
1. Do not allow contamination to get into the bellows interior.
2. The stainless steel bellows is made from thin material and is fragile. Do not hit it, or allow it to hit other objects.
3. Do not over-travel the unit. Hitting the side of the bellows may cause damage.
4. When compressing a manipulator with a Z stroke greater than ~8" that is **not** under vacuum, care must be taken to ensure that the bellows does not squirm or sag sideways. Hand support of the bellows may be required to prevent the bellows hitting nearby structures.

Use the appropriate bolts, nuts, washers and gasket to mount the manipulator to your chamber. The standard MB1500-series manipulator uses the following bolt sizes:

Location	Nominal Flange Size	Bolts SAE (Metric) Sizes
Top flange (Standard tapped)	4.5" (114 mm)	5/16-24 X 1-1/4 (M8 X 1.25 X 25)
Bottom Flange (Standard non-tapped)	4.5 or 6.0" (114 or 150 mm)	5/16-24 X 1-3/4 or 2 (M8 X 1.25 X 45 or 50)

When tightening the flange bolts, make sure the bolt heads and threads are in good condition, the threads are lubricated with anti-seize material, and that the wrench fits properly. Turn the bolts deliberately and with great care. A stripped, seized or broken bolt can be frustrating. A slipped wrench can puncture the bellows or cause personal injury. Install the MB1500-series manipulator on your chamber/flange as you would any other ConFlat type flange. Use standard, scratch-free, 0.080" thick, flat copper gaskets.

The following tightening sequence for **lubricated bolts with washers** is recommended. First finger tighten all bolts evenly, then sequentially torque the bolts in even steps.



For 4.5" & 6" ConFlats -
Maximum torque 120-150 in/lbs

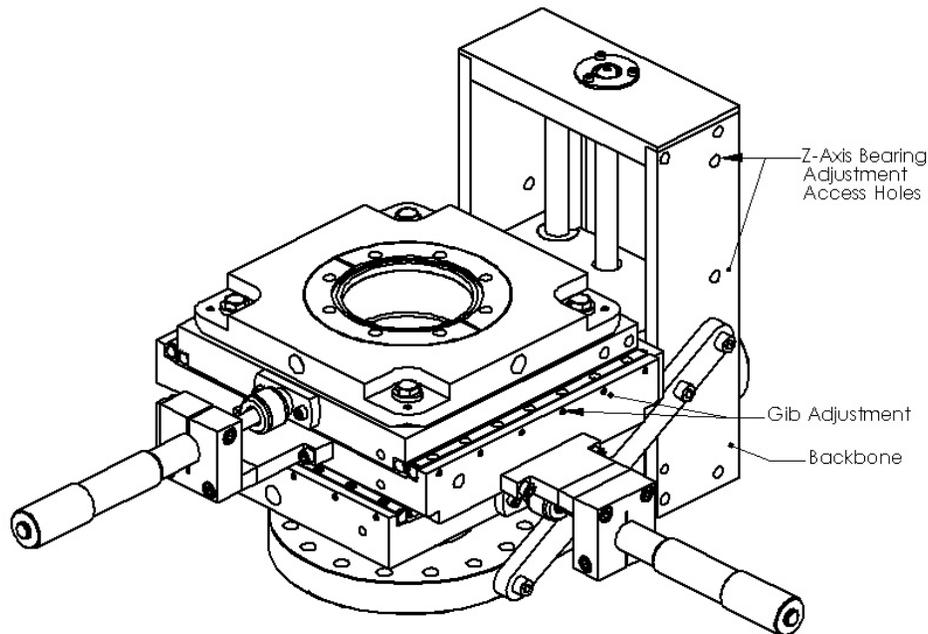
Bakeout:

Bakeout in normal fashion, but **NEVER** exceed 100°C with the micrometers attached during bakeout. Higher temperatures can damage the precision components. If the micrometers are removed, replace the shipping clamp and bakeout up to 200°C. Monitor the temperature during bakeout. Never translate the manipulator during bakeout or when it is above ambient temperature. Always remove any motor or limit switches before bakeout.

X-Y gib adjustment:

Lateral alignment of the X-Y slides is maintained by special crossed roller bearings made of hardened carbon steel. These bearings will eventually corrode. Do not allow moisture to condense on or in the bearings. Do not allow LN₂ to chill the bearings. The X-Y slides have an adjustment for side play. This is set at the factory and **virtually never** needs readjustment. In the rare event readjustment is necessary, this function should only be performed by a technician experienced in such adjustments.

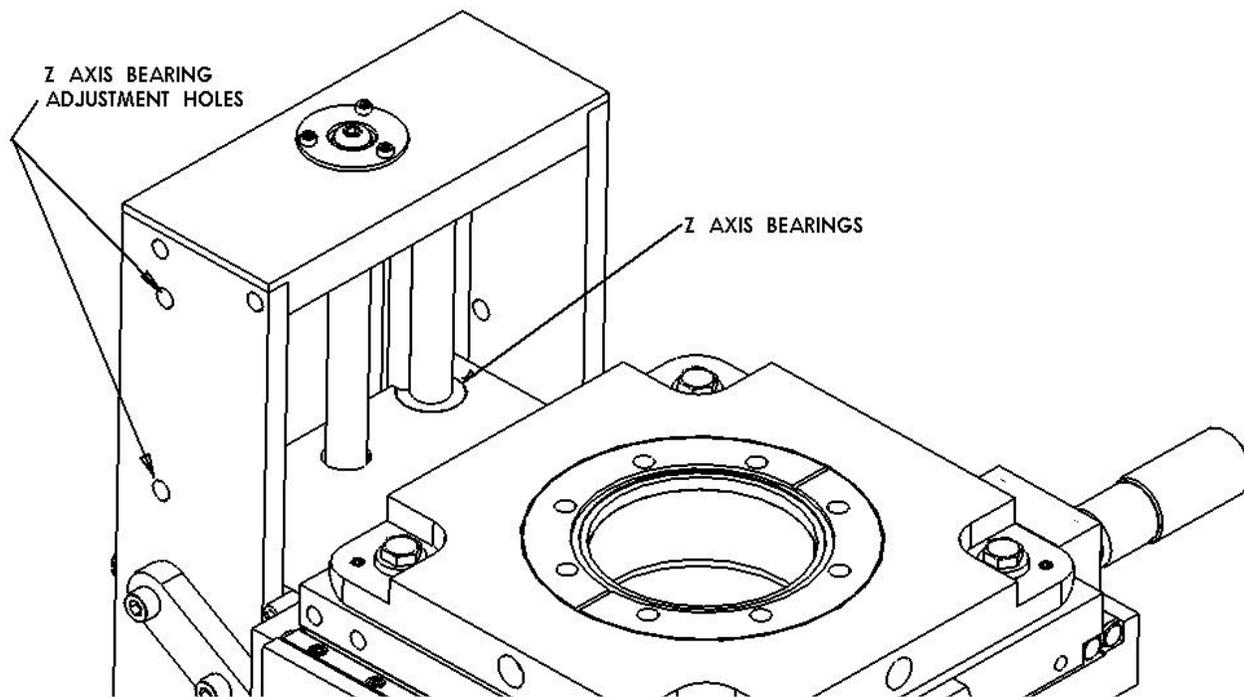
Make sure the slide bearing faces are clean and free from debris. Remove the micrometer of the axis to be adjusted so the slide moves freely. This is important because the technician must be able to feel whether or not the slide is tight or binds. Next, slightly loosen the bolts that retain the slide *nearest* the gib adjustment screws. Then readjust the side play and retighten the screws in the slide. Make sure the crossed roller cage is centered between both ends when the slides are in the middle of their travel. Do not over tighten the screws.



Gib Adjustment Figure

Z Axis bearing adjustment:

The Z slide travels on 4 specially constructed, self-lubricating linear bearings that slide on the two guide rails attached to the inside of the 'backbone'. The lateral play in these bearings is factory set and rarely needs changing. Adjustment may be required if the unit has seen considerable wear, or if the unit has been exposed to excessive vibration, which may result in loosening of the adjustment screws. In the event that readjustment is required, move the Z slide up until the four access holes (see graphic) line up with the adjustment screws. Vent the system to remove atmospheric load and deflection from the traveler. The screws deflect the sidewalls of the linear bearings, driving them



towards the shaft. Proper adjustment is important because if the bearings are too loose, it results in excessive play and binding. If adjusted too tight, the bearings will be "clamped" against the shaft, acting as a brake. Make the necessary adjustment but, if there is uncertainty about how much to adjust, it is best to err on the conservative side and leave them a bit loose because the maximum adjustment range is very small. These bearings need no lubrication but if some lube gets into them it will not hurt anything.

Z Axis guide rail adjustment:

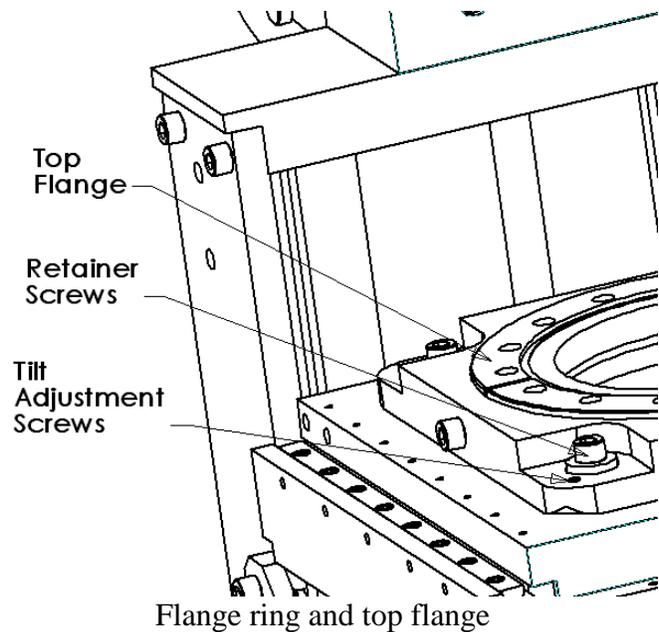
In the event that adjustment of the guide rails is required, the system should first be vented to eliminate vacuum loading on the translator. Next, loosen the rail mounting screws on one side - not both! Lightly tighten those in proximity with the traveler of the translator. Advance the traveler to the position of the next screws and tighten, repeating until all screws are tight. This process ensures that both rails are parallel and aligned with the bearings.

Non-tapped top flange:

On specially-ordered manipulators, the top flange is non-tapped (non-threaded) to allow mounting devices with tapped bolt holes. To mount such a device to the traveling flange of a MB1500-series manipulator, vent the manipulator and remove it from the vacuum system. Next, remove the 4 screws that hold the flange retainer ring on the top slide. Move the Z axis traveler towards the bottom (stationary) flange while supporting the top flange to prevent damage to the bellows. When there is enough room, install a new gasket and the mating equipment, inserting the lubricated bolts or studs only finger tight. Ensure that the new equipment is aligned properly as the top flange will no longer be rotatable after the bolts are tight. Support the new equipment securely to withstand the torque of tightening the bolts and to protect the bellows. Reattach the traveling flange and retainer ring to the top plate of the MB1500.

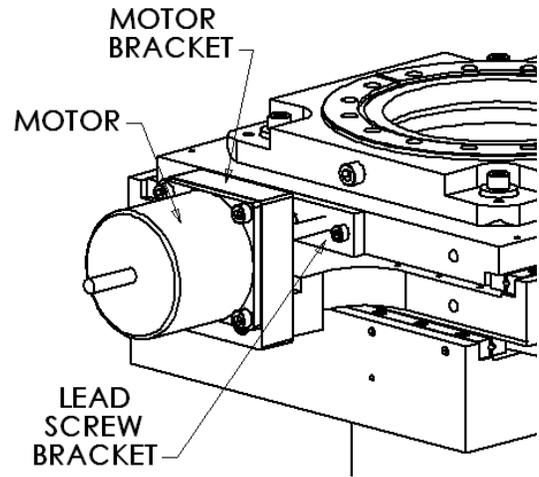
Adjusting the tilt of the top flange:

The top flange carries the ‘payload’ of whatever is mounted on it and also is loaded with approximately 150 pounds (~65 Kg) of atmospheric load. Any slight tilt can be adjusted to compensate for the atmospheric load or to compensate for a slight misalignment of chamber flanges. Each corner of the flange ring contains two screws. The larger Retainer Screws have a spherical washer and are used to clamp the flange ring to the slide even at an angle. After loosening the Retainer screws slightly, the smaller Tilt Adjustment screws can be adjusted to realign the top flange up to +/- 2°, to the desired orientation. This realignment can be done while the manipulator is under vacuum. Be sure to re-tighten the Retainer Screws in the flange ring afterwards.



Stepper Motors:

Stepper motors and limit switches can easily be installed in the field. To install stepper motors on the X-Y axes, remove the micrometer bracket and the micrometer insertion bracket. Replace them with the lead screw bracket, motor bracket and motor.

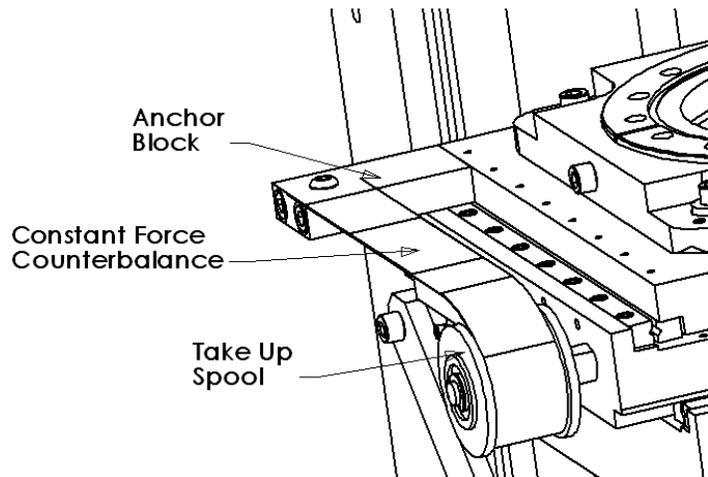


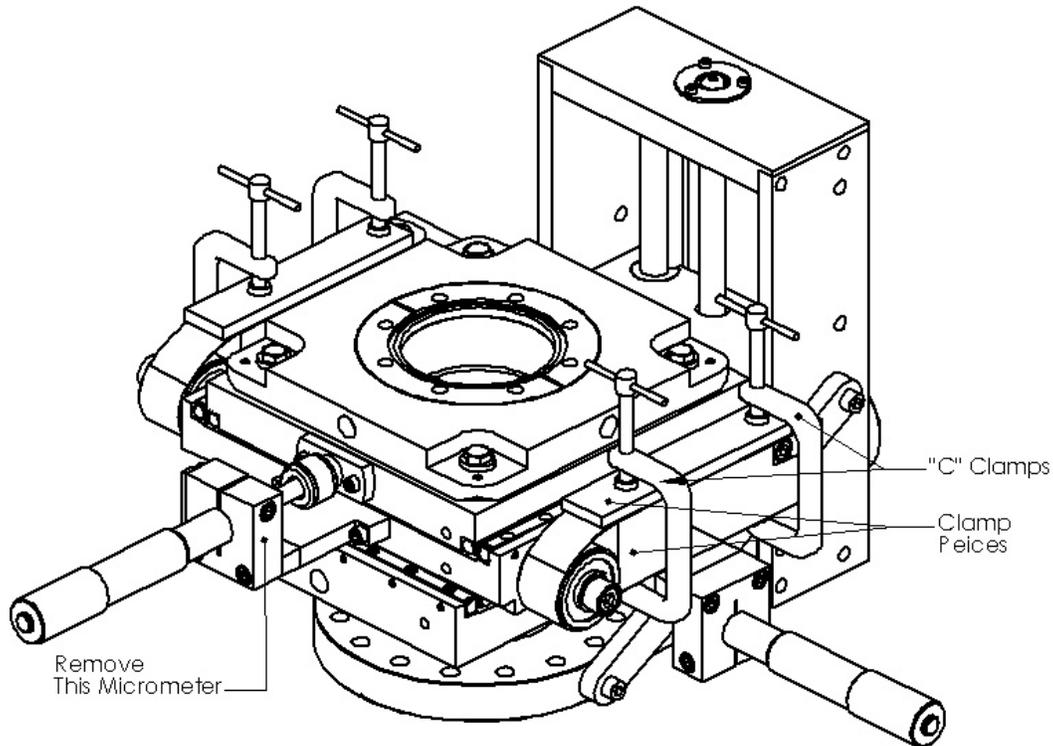
Horizontal Mounting Kit:

The Horizontal Mounting Kit is used when the manipulator must be mounted with the center axis horizontal (the flange faces are vertical). In this orientation, the load of the Y axis, the flange, and any installed

equipment are directly carried axially by the micrometer. This can easily exceed the rated end load for the micrometer, as well as make it difficult to adjust. To compensate for this loading, a Horizontal Mounting Kit is factory installed on specially-ordered manipulators, but can be retrofitted to any MB1500-series manipulator. The Horizontal Mounting Kit uses specially-selected constant-force springs that counterbalance the anticipated load.

Note that these springs are quite strong and, if accidentally released at the wrong time, can easily cause bodily injury, sometimes severe. Please use the supplied accessories and follow these simple guidelines whenever installing or removing the Horizontal Mount Kit.





Included with each Horizontal Mount Kit are four ‘C’ clamps and two sets of Upper and Lower Clamp Pieces, anodized red for easy identification. To remove the Horizontal Mounting Kit, place the Upper and Lower Clamp pieces on either side of the constant force spring, as shown. Be sure the Lower Clamp Piece fits snugly against the Attachment Bracket. Tighten the two ‘C’ clamps on either side of the micrometer, as shown. Restrain the Y-axis slide from falling due to gravity by loosely installing the shipping clamp. Next, disconnect the Y-axis micrometer nut and retract the micrometer until it is clear of the insertion bracket. Finally, remove the two screws in the Attachment Bracket and unscrew the Take up Spool from the X-Axis Slide. Be sure to leave the ‘C’ clamps in place during storage of the Horizontal Mounting Kit. To reinstall the Horizontal Mounting Kit, reverse the above procedure.

Lubrication:

Under normal conditions, your manipulator will provide years of trouble-free service. As delivered, the lead screw and ball bearings are lubricated with high temperature grease. Re-lubricate the ball bearings every third or fourth bake out with the molybdenum disulfide grease provided. **Do not** use a hydrocarbon grease such as Felpro C100™ for bearings on lead screws that will be baked because the hydrocarbon greases will cake and dry out. After several bake outs, it may be necessary to re-lubricate the drive screw. Use the MoS₂ grease in the supplied syringe. A small amount applied to the drive screw as you run it up and down is sufficient.

We have operated your unit prior to shipment to assure that it works properly. Prior to calling the factory, check to make certain you have removed all shipping constraints, have read these

instructions, and have checked for shipping damage. If you do call, it is best to have the manipulator close to the phone, for ease of description.

Packaging for storage or reshipment:

The bellows on your unit is particularly susceptible to damage/contamination. Normal precautions for shipment are, therefore, usually inadequate. Please follow these guidelines:

1. Work on a clean surface when packaging.
2. Place aluminum foil over the bellows openings, then re-install the shipping covers. Do not allow any contamination to get into the bellows interior.
3. Remove the micrometers. Place the screws in a bag. Wrap the micrometers and the bag in bubble pack.
4. Re-install the shipping clamp screw.
5. Wrap cardboard around the bellows and seal with tape. Make certain the cardboard extends up/down into the plate areas. The bellows is most susceptible to damage if the box is dropped and it bangs into the plates. Move the Z axis to the fully compressed position.
6. Place the unit in a polyethylene bag.
5. Place the lower piece of foam-in-place packaging in the box (check the condition of the box and replace as necessary). Place the unit into the foam as indicated by the outline in the foam. Now place the micrometers into the box as indicated. Place the upper piece of foam-in-place packaging over the unit as indicated by the outline. Secure the box shut, and the manipulator is ready to ship or store.

Accessories included:

1. Hex wrench kit
2. Lubrication kit

Parts and factory service:

Replacement parts and non-warranty factory service are available on a fast turnaround basis. Please consult the factory with your specific need.

End